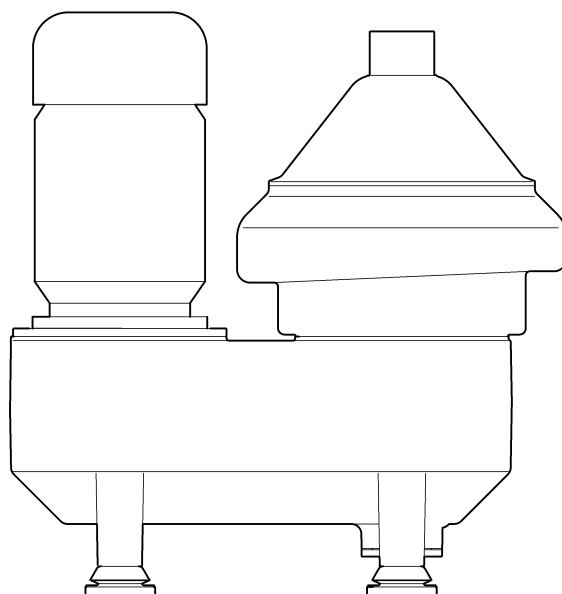




Instruction manual

Separator

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The authors are always grateful for remarks and suggestions for improving the documentation. Remarks and suggestions can be sent to:

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1.1 Application

This document applies for all persons who work with or on the centrifuge.

It is applicable for the plant operator as a basis for creating standard operating procedures for conduct at the workplace at the centrifuge.

1.2 Other applicable documents

- Centrifuge datasheet
- P&ID (Piping & Instrumentation Diagram)
- Dimensioned drawing
- Documents on control of the centrifuge, e.g. descriptions and settings.
- Instruction manuals of components of other manufacturers such as motors and valves.
- Further order-specific documents if relevant.

1.3 Structure of the safety references

The centrifuge has been designed and built so that it functions and can be operated safely. Reference will be made in this manual to further potential risks by using warnings where appropriate.

A differentiation is made between hazards which result in damage to the centrifuge, plant components and environment and hazards which lead to possible or probable injury or loss of life.

Signal words and their meaning

DANGER

Denotes impending danger. If the preventive measures are not implemented, death or serious injury will be the consequence.

WARNING

Denotes a potentially dangerous situation. If the preventive measures are not implemented, death or serious injury may be the consequence.

CAUTION

Denotes a potentially dangerous situation. If the preventive measures are not implemented, minor injury may be the consequence.

NOTICE

Denotes a potentially damaging situation. If the preventive measures are not implemented, the centrifuge or something else in its vicinity can get damaged.

Danger signals



This is the danger signal. It warns of injury risks.

- Comply with all measures marked with the danger signal to avoid injury or death.

Structuring of the safety references according to the 5-point rule

1. **Danger signals as a warning of injury risks.**
2. **Signal words** signal the degree of risk.
3. **The type and source of the hazard** indicate from where the hazard originates.
4. **Explanation of the hazard and consequences in the case of non-compliance** describe the threat and the consequences of human error.
5. **Measures** give instructions to avoid the hazard.



Type and source of the hazard

Explanation of the hazard and the consequences in the event of non-compliance.

➤ Measures to avert or minimise the hazard.



Type and source of the hazard

Explanation of the hazard and the consequences in the event of non-compliance.

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Type and source of the hazard

Explanation of the hazard and the consequences in the event of non-compliance.

➤ Measures to avert or minimise the hazard.



Type and source of the hazard

Explanation of the hazard and the consequences in the event of non-compliance.

1.4 Target groups

The target groups for this documentation are all persons involved in installing, assembling, operating, maintaining and repairing the centrifuge.

What work may be carried out by what target group depends on the qualification of the personnel and on the type of work.

In the tables in the chapters **Troubleshooting** and **Maintenance** the responsible target group as well as the operation is specified.

1.4.1 Operator

Abbreviation: Op

The operator is employed by the customer and has been briefed in the following operations:

- Starting and shutting down the machine.
- Monitoring the machine and process (e.g. by means of indicators).
- Execution of easy re-lubrication and cleaning operations.

When given specific directions, the operator is able to carry out simple modifications to the process, e.g.:

- Adjusting temperatures, pressures and throughput capacities.
- Dosing additives.

1.4.2 Skilled worker

Abbreviation: Skilled

The skilled worker is normally employed by the customer and has been briefed in the following areas:

- Performing easy assembly work
- Performing routine maintenance work or servicing
- Limited settings and parametrization on the components and control system

The skilled worker has basic technical knowledge. The basic knowledge corresponds to a technical apprenticeship (mechanical or electrical).

The skilled worker is selected and deployed by the employer (plant operator).

GEA Westfalia Separator will carry out the briefing only in specific technical features that are part of the supply schedule and will indicate potential hazards.

This briefing is no substitute for an apprenticeship.

1.4.3 Trained specialist

Abbreviation: Tspec

The trained specialist normally belongs to the service team of GEA Westfalia Separator Group.

In exceptional cases, skilled workers employed by the customer can obtain a corresponding qualification by attending training courses held by GEA Westfalia Separator Group.

1.5 Additional documentation

Request further information and technical documentation from the following places:

- Directly from GEA Westfalia Separator in Oelde.
- From the nearest representative of GEA Westfalia Separator.
- Per Internet under: gea.com
- Via e-mail at: wsinfo@gea.com

1.5.1 Training

GEA Westfalia Separator regularly holds training courses for customer employees.

The training content is aimed at the operating and service personnel of the customer who work with the centrifuge. The operator must know how the centrifuge functions.

Trained operators assure the operating safety of the centrifuge.

Many different applications require competent process engineering know-how. Only adequately trained employees in service ensure a high quality standard. This requires ongoing further training.

The demands on the qualification of the service staff are growing increasingly. GEA Westfalia Separator consequently offers a qualification model and training concept.

Contact the following addresses for training courses for operating and service staff.

- GEA Westfalia Separator Group GmbH • Werner Habig Straße 1 • 59302 Oelde (Germany) • Tel. +49 (0)2522 77-1469 • Fax +49 (0)2522 77-31469 • info.learningcenter@gea.com • www.gea.com
- GEA Westfalia Separator Systems GmbH • Am Neuländer Gewerbepark 6 • 21079 Hamburg (Germany) • Phone +49 40 589650-0 • Fax +49 40 7380585 • info.learningcenter@gea.com • www.westfalia-separator.com

1.5.2 Service

GEA Westfalia Separator offers comprehensive service for the following areas:

- Assembly
- Commissioning
- Regular maintenance
- Repairs
- Checking the operating state
- Checking in dismantled state
- Decommissioning for a long-term shut-down
- Storage and conservation during long-term standstill
- Restarting
- Decommissioning and disposal
- Training

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2 Safety precautions

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2.1 Intended use

The centrifuge separates media with different densities by centrifugal force.

The centrifuge is intended exclusively for commercial operation. It is technically designed in compliance with the operating mode contractually agreed with the manufacturer and the specifications in the technical data of the centrifuge.

The centrifuge is suitable for the following applications:

- Separating liquid mixtures
- Separating solids from liquids
- To combine the tasks separating and solids removal

It must be noted that the solids to be discharged must always be sufficiently fluid to ensure a uniform solid discharge. In this connection, the rheological characteristics (deformation and flow behaviour) of the solids play an important role.

For information on process conditions, operating conditions, and environmental conditions, see:

- Centrifuge nameplate
- Data sheet

The following provisions must be met to ensure that the centrifuge is operated safely at all times.

- Use only original spare parts and original operating materials.
- Comply with limits.
- Do not alter or upgrade the centrifuge.
- Do not feed product which is categorised as explosive.
- Do not deploy the centrifuge in zones classified as explosion hazardous.

NOTE: Centrifuges suitably equipped for use in explosion hazarded areas are exempt from this restriction.

2.2 Reasonably foreseeable misuse

The manual contains instructions for the intended use. Operation of the centrifuge that is not in conformity with the intended use is considered to be misuse.

Reasonably foreseeable misuse includes:

- Use the centrifuge only for its intended use.
- Use of unsuitable spare parts
- Use of non-permitted operating materials
- exceeding the defined limit values
- Modifying or upgrading the centrifuge.
- Changing the process conditions, operating conditions and environmental conditions without the consent of the manufacturer.

Any misuse of the centrifuge can lead to severe damage to persons and property.

Operating modes that result in imbalance due to concentration of product and consequent caking are considered as not in conformity with the intended use. The plant operator is responsible for damage arising as a consequence of this non-conformance, the manufacturer is not liable.

2.3 Qualification of the personnel

Special knowledge and skills are required for working on and with centrifuges. The qualification of the personnel with this expertise is an important requirement for the operational reliability.

The requirements in respect of qualification levels are set out in the chapter "About this document / Target groups". They depend on the tasks assigned.

Faulty operation, assembly and handling errors can result in danger to life and limb as well as causing severe damage to property.

The plant operator must implement measures for the qualification of its personnel:

- Assign only reliable personnel to work on the centrifuge.
- Allow only authorized personnel to work on the centrifuge.
- Give special training and briefings to the personnel for the tasks assigned.
- Clearly define responsibilities.
- Make sure that the authorized persons have read and understood the **safety information** before beginning work.
- Make sure that the authorized persons have read and understood all sections of the **instruction manual** required for their work before beginning work.
- Give special briefings to persons who cannot read, and monitor their work.
- Persons still undergoing training may only be deployed under supervision.

2.4 Responsibility of the plant operator

The operation of a centrifuge is subject to rules and regulations for machine safety and occupational health and safety.

The order of the following rules and regulations is not a reflection of their priority. The list lays no claim to completeness.

- Regulations relating to safety and health (accident prevention regulations) based on Article 118a of the foundation treaty of the EEC, e.g. RL 89/655/EEC and follow-up versions or corresponding national regulations issued by the country of operation.
- Regular check of safety devices
- Compliance with the Machinery Directive 2006/42/EC or corresponding national regulations issued by the country of operation when working within the responsibility as manufacturer.
- Compliance with the German Equipment and Product Safety Act or corresponding national regulations issued by the country of operation when working within the responsibility as manufacturer.

The plant operator is responsible for complying with rules and regulations and the safety-conscious work of the assigned persons. These include the following measures:

- Ensuring that the statutory and other binding regulations on safety, accident prevention and health and safety protection are known and complied with.
- Only qualified and authorized personnel with technical understanding and fundamental technical knowledge and skills may be assigned to work on the centrifuge.
- Clearly define and notify responsibilities for tasks.
- Operate the centrifuge only in perfectly functional conditions in line with the intended use. For the intended use, refer to the section "**Intended use**".
- Before starting the machine, always check all safety devices.

- Have the centrifuge checked regularly by qualified persons for its operating safety. Have the centrifuge checked at least once a year in operational status and in accordance with the maintenance schedule.

2.5 Modifications to the centrifuge

Modifications to the centrifuge are prohibited. They represent an unintended use and endanger the operational reliability of the centrifuge. This may cause physical injury and damage to property.

- Clarify the planning and the measures for the modifications to the centrifuge with GEA Westfalia Separator.
 - If modifications to the centrifuge are necessary, e.g. due to new operational sequences or product changes, contact GEA Westfalia Separator.
 - Modifications or alterations to the centrifuge must be added to the documentation. The instruction manual, schedule for lubrication and maintenance, as well as the spare parts catalogue, must be adapted.

2.6 Requirements to be met by spare parts and consumables

Spare parts, wear parts and consumables can cause damage to persons and property if they do not meet the requirements.

Original spare parts and consumables from GEA Westfalia Separator Group satisfy all pre-conditions for the operating safety of the centrifuge.

- Use only original spare parts.
- Use only original operating materials.
- Use the order-specific spare parts catalog supplied.
- See the chapter "Spare parts" for ordering spare parts and consumables.
- Keep to the limit values.

2.7 Hazards through products and operating materials

Hazardous materials are all materials which, on physical contact, represent a hazard for the persons operating in the environment of the centrifuge.

Centrifuges which have been purpose-built for the operation with hazardous materials are marked with safety stickers.

Hazards resulting from the following product characteristics and operating materials are known from product observation.

- Hot products
- Cold products
- Hazardous, chemically critical products
- Hazardous, biologically critical products
- Detergent

2.7.1 The health hazards involved when handling heavy oils and lube oils

As a result of the deterioration in quality of fuel oils, the danger has arisen that the heavy oils used on board contain greater amounts of substances injurious to health. These include:

- polycyclic aromatic hydrocarbons,
- lead compounds,
- chemical residues.

An increased amount of polycyclic aromatic hydrocarbons is also present in used lube oils (waste oils).

The health hazards for the operating personnel depend to a large extent

- on the concentrations of the dangerous substances,
- the ambient air (inhalation of oil vapours/oil mist),
- the intensity and duration of the contact with the skin or mucous membrane.

Possible short-term effects:

- headaches,
- dizziness,
- nausea,
- itching or burning of the skin.

Possible long-term effects:

- allergic reactions, especially skin allergies,
- festering inflammation of the skin pores (oil-acne),
- damage to the central nervous system after inhalation over a long period,
- skin cancer caused by direct skin contact over a long period,
- lung cancer or cancer of the digestive organs after inhalation over a long period (not certain as the causes are difficult to separate from the effects of smoking and alcohol).

2.7.2 Code of practice and personal protective measures

- Avoid skin contact with heavy oils or lube oils if possible.
 - Wear suitable protective gloves.
 - Apply a protective ointment to the skin (e.g. ointment no. 76), especially if no protective gloves are worn.
- Avoid breathing in oil vapours if possible.
- If possible, improve the air circulation in the room.
- Fully open the air regulation flaps in the outlets of the air supply ducts in the centrifuge and filter area.
- Wash affected areas of skin frequently and thoroughly.
- Afterwards, replenish the skin with care or protective ointment.
- Make sure the boy is always kept clean.
- Change the oil-contaminated working clothes frequently.

Exercise special care when carrying out maintenance work on and cleaning heavy oil and lube oil centrifuges and filters.

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3.1 Noise emissions

Noise emissions from the centrifuge are caused by rotating machine parts, sound-emitting surfaces and resonant plant components.

The intensity of the noise emissions depend on the type of construction of the centrifuge, the operating mode and the ambient conditions.

The operating personnel must observe the local standard operating procedures (SOPs) issued by the plant operator and wear personal protective gear, e.g. ear protection.

Refer to the datasheet for the sound pressure level and sound power level.

Factors that increase the noise level in the area of the centrifuge:

- Reverberating walls (e.g. glass, tiles, tank walls etc.),
- Installation in corners of rooms.
- Resonant platforms.
- Resonant fittings.
- Auxiliary equipment (e.g. pumps, valves etc.).

The following measures reduce the noise nuisance for the operators:

- Install the centrifuges in separate rooms.
- Line the walls with sound absorbing materials.
- Organise internal processes so that centrifuge rooms have to be entered as rarely as possible.
- Use personal noise protection.

3.2 Product hazards

In the case of products which have to be allocated to a specific hazard class, adhere to the corresponding local safety precautions when handling these products.

The local standard operating procedures must be observed and the required personal protective gear must be worn.

In the event of accidents, keep to the local rules of conduct when handling products of the respective hazard class and take appropriate first-aid measures when injury is involved.

Following accidents, notify in-house or local emergency services immediately so that appropriate action can be taken. The emergency services comprise, for example, fire brigade, paramedics, security and other emergency facilities.

3.3 Hazards caused by cleaning liquid

For CIP (cleaning-in-place), only chemicals may be used that have been recommended by GEA Westfalia Separator.

The cleaning media are acids and caustics which can cause severe personal injury when used without due care.

Cleaning may under certain circumstances be carried out at high temperatures. The surfaces of the centrifuge, especially the hood and pipes, get hot.

The local standard operating procedures must be observed and the required personal protective gear must be worn, such as:

- Face protection and protective goggles
- Protective suit
- Protective gloves
- Protective boots or safety shoes
- Apron

The prevailing local rules of conduct pertaining to handling acids and caustics with a view to preventing accidents must be complied with.

Carry out first-aid measures when injury is involved.

Following accidents, notify in-house or local emergency services immediately so that appropriate action can be taken. The emergency services comprise, for example, fire brigade, paramedics, security and other emergency facilities.

Chemicals and incorrect concentrations of chemicals not specified and approved by GEA Westfalia Separator can cause damage through corrosion.

The corrosion can occur both on bowl parts as well as on the hood and the concentrate collector.

Inadequate flushing can also lead to chemical residues entering the product rendering it useless.

The bowl gaskets can swell as a result of inadequate flushing.

3.4 Hazards due to rotating machine parts

The centrifuge is equipped with a metal bowl rotating at high speed which represents a high hazard potential on account of the rotational energy.

If not handled properly, open, rotating machine parts can be a danger for life and limb of the operating and maintenance personnel. The bowl must be stationary before starting work on the centrifuge.

IMPORTANT: Observing the motor fan is not a reliable method of checking standstill.

Wait until the centrifuge run-down time has elapsed(see data sheet).

The motor or its fan can be at standstill while the bowl is still rotating. Furthermore, a standstill indication may under certain circumstances provide false information because, for example, the electronics have failed or the drive belt or gear in the drive is defective.

At least two checks must therefore be carried to reliably determine that the bowl is at a standstill.

The following options are available for checking standstill on centrifuges depending on the version:

- Electric speed indicator
- Speed revolution indicator or sight glass in the frame for observing the drive belt
- Visual check of direction of rotation of the drive motor and fan wheel.
- Noise check
- Vibration check
- Visual standstill check of the drive belt through the sight glass

3.5 Personal protective gear

To avoid danger to life and limb, the specified protective gear must be worn when operating the centrifuge or carrying out maintenance work or repairs on the centrifuge.

The personal protective gear depends on:

- local accident regulations,
- plant instructions issued by the operator or employer and
- the safety precautions described in this instruction manual.

Everyone who works with or on the centrifuge is responsible for ensuring that the personal protective gear is worn and that it is in good, functional condition.

- Replace damaged protective gear with new gear.
- Clean dirty protective gear.



Fig. 1

Use hearing protection!

- Use hearing protection when working in loud environments!

The noise level in a plant can exceed 85 dB(A).

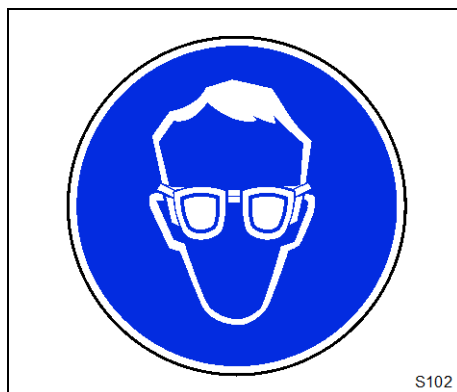


Fig. 2

Wear protective goggles!

- Wear protective goggles when working on pipes and fittings.

Possible residues of caustic liquids in valves and pipes and piping systems not relieved from pressure.

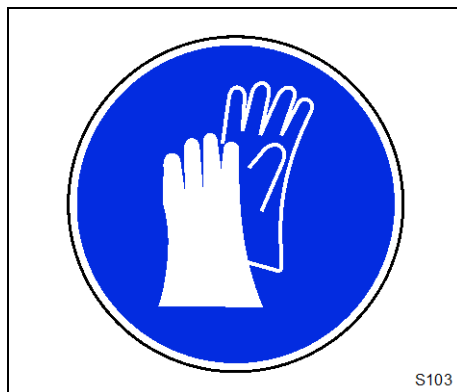


Fig. 3

Wear protective gloves!

- Wear protective gloves when working on hot or cold surfaces of separator and piping.

Possible temperature ranges
-10 to +80°C or 14 to 176 °F.



Fig. 4

Wear breathing protection!

If inert gases are used as ignition shield gases in explosion-hazardous zones, wearing breathing protection is mandatory if there is a risk of the oxygen content dropping below the admissible value in the air.

An inert gas is, e.g. nitrogen. See SOP issues by the plant operator.

3.6 Meaning of the safety markings

The following safety markings must be attached to the centrifuge as adhesive labels:



Fig. 5

It is important for all persons working with or on the centrifuge to be able to identify the meaning of all the symbols on the safety stickers. The safety stickers are attached to the centrifuge and/or the control cabinet.

In case of non-compliance with the safety markings, GEA Westfalia Separator accepts no liability for resulting damage.

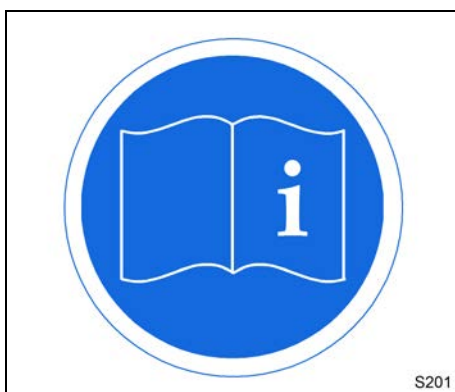


Fig. 6

Refer to the machine documentation

- Every person who is assigned the task of installing, operating, maintaining and repairing the machine must have read and understood the documentation.
- The documentation must be complete, kept near to the machine and be readily accessible to the respective target group.



Fig. 7

Disconnect machine from power supply

- Danger of injury through electrical current and unintentional start-up of the centrifuge.

Before working on the centrifuge and electrical plant components:

- Ensure standstill of the centrifuge.
- Isolate all electrically supplied equipment from the power supply using the main switch.
- Secure the plant against unintended restarting with locking devices.



Fig. 8

Work on rotating bowl is prohibited

- Do not loosen any part and do not carry out maintenance or repair work on the centrifuge before the bowl is at a standstill.

Methods of how to check standstill are described in this manual.

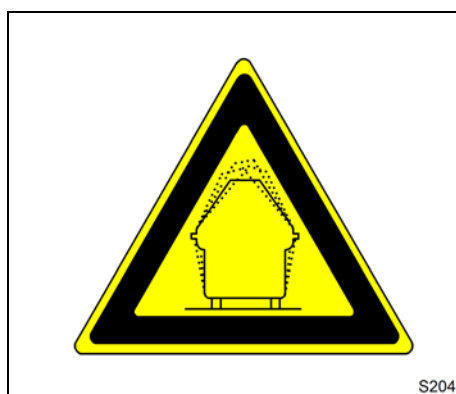


Fig. 9

Warning of unusual noises or vibrations

- Follow the instructions in the instruction manual.
- Do not trigger a bowl ejection.
- Press EMERGENCY-STOP.

Danger to life and limb through rotating machine parts!

- Bring persons into safety and leave the room.
- Do not enter the room again until the bowl has come to a standstill.

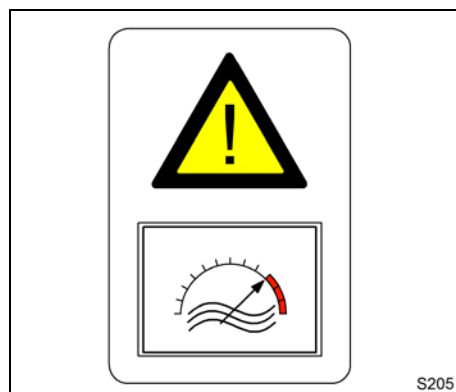


Fig. 10

Frequency converter operation

- When setting the frequency converter, do not exceed the admissible bowl speed (see nameplate).
- Parametrization of the frequency converter may only be done by a technical specialist.
- Check the bowl speed whenever replacing the drive parts.

Risk of damage to the centrifuge. The centrifuge may only be operated with an additional independent device for speed limiting.



Fig. 11

Warning of hot or cold surfaces

- There is a danger of injury. The surfaces of the centrifuge and plant components can be very hot or cold.

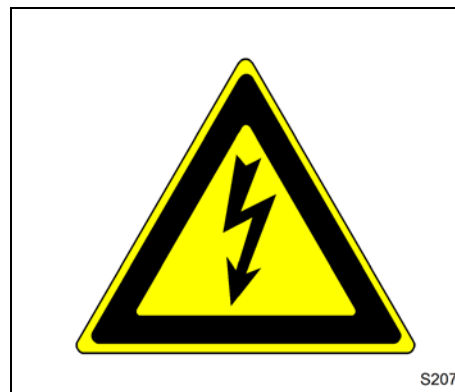


Fig. 12

Warning of electric voltage

- Danger to life and limb through electric shock.

The parts marked in this way can carry voltage even when the main switch is switched off.

Before working on electrical components:

- Isolate all electrically supplied equipment from the power supply using the main switch.
- Secure the centrifuge against unintended restarting with locking devices.
- Implement corresponding protective measures:
 - in accordance with national rules and regulations
 - in Germany in accordance with the stipulations of the VDE (German Electrical Engineering Association) or the responsible power supply company
- Have work on electrical plant components carried out only by authorized specialists.

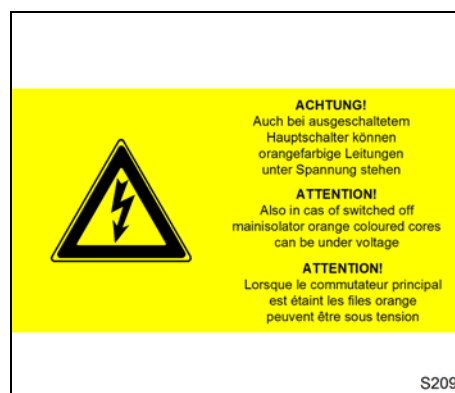


Fig. 13 Example

Safety markings with warning text

In certain cases, safety markings can also be combined with warning texts.

IMPORTANT! Orange coloured leads are fitted as standard at GEA Westfalia Separator.

Different colour leads can be fitted if requested by the customer.

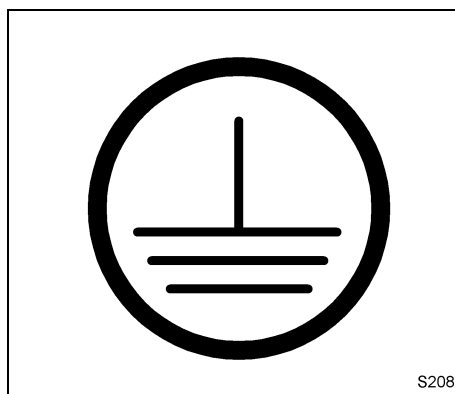


Fig. 14

Potential equalisation (protective-earth terminal)

The grounding protection is a measure which, in the case of a malfunction, leads off the touch voltage into the earth.

3.7 Safety devices

The following safety devices are always installed on centrifuges/units:

- Main switch
- EMERGENCY-STOP button

The following safety devices can be installed on centrifuges/units:

- Speed monitoring
- Vibration monitoring
- Temperature monitoring
- Hood switch
- Product supervisory equipment (project-specific)
- Further safety devices as appropriate (project-specific)

IMPORTANT! When safety devices on the centrifuge/unit respond, the centrifuge/unit must stop being operated until the cause has been identified and remedied.

3.8 Centrifuge control and supervisory equipment

The following must be taken into account when designing and programming centrifuge control systems:

- Pay attention to the following notes on centrifuge control systems.
- Assign only qualified personnel with the task of constructing and programming the control system.
- Adhere to the admissible operating parameters of the centrifuge so as not to endanger the operating safety of the centrifuge and protect personnel from hazards.
- Comply with local and generally valid laws and rules on the construction, programming and use of control systems.

If further information is required on constructing a centrifuge control system, it can be requested from the following places::

- Directly from GEA Westfalia Separator in Oelde..
- From the nearest representative of GEA Westfalia Separator.
- Per Internet under: www.gea.com
- Via e-mail at: Info@gea.com

Control systems from GEA Westfalia Separator

The control unit documentation is included in the scope of delivery and is part of the overall documentation.

The CE mark may only be attached and the declaration of conformity may only be issued when the centrifuge and control system are jointly tested for conformity.

GEA Westfalia Separator checks the control unit and the documentation for compliance. An acceptance test at the factory is mandatory prior to commissioning.

Centrifuge and control unit

The centrifuge is complete and functional only with its control unit. Only in this combination is it entitled to receive the CE declaration of conformity in accordance with the Machinery Directive.

Centrifuges without control systems from GEA Westfalia Separator

If the customer commissioned a third-party supplier to manufacture the centrifuge control unit, this supplier is liable for all control-related injuries to persons or damage to machines.

The documentation for the control unit must be provided by the control unit manufacturer.

The person who has the control unit manufactured and completes the centrifuge becomes manufacturer of the centrifuge.

As manufacturer of the flour mixer this person must carry out a conformity assessment. After conformity has been established, this persons must attach the "CE" mark as well as issue the Certificate of Conformity.

Measuring probe

If a measuring probe is used in the centrifuge environment, it must be ensured that the probe functions in conjunction with the medium to be measured and that it emits control signals, e.g. for a probe that controls a pump.

Starting up and shutting down centrifuges containing residuals

Starting up and shutting down partially filled centrifuges can cause inadmissible machine vibrations. For this reason, partially filled bowls must be avoided during start-up and shut-down.

In the case of nozzle separators, the minimum required liquid volume must always be supplied during start-up and shut-down, see "Nozzle capacity table" in the chapter "Description / Determining nozzles".

The method of start-up and shut-down of the centrifuge depends on:

- Operating status of the centrifuge
- Constructional design of the centrifuge
- Field of application of the centrifuge

Switch off the centrifuge by means of EMERGENCY STOP.

The EMERGENCY STOP function ensures the functional safety in an emergency or case of risk and ensures the fastest possible halting of processes. All rotating parts are stopped as quickly as possible.

The stop categories 0 or 1 can be used:

- Stop category 0: Power supply to the drive elements is disconnected immediately (only possible when the sudden disconnection of the power does not pose a risk).
- Stop category 1: controlled shut-down: The machine is put in a safe state; only then is the power supply completely disconnected from the drive elements. This makes sense when terminals, brakes or similar require power.

The centrifuge and all auxiliary equipment are not de-energised with the Emergency Stop. The functionality of all components is maintained even when the centrifuge is stationary.

The voltage must be disconnected manually.

Monitoring centrifuges with speed regulation

Speed monitoring must be configured so that exceeding the admissible bowl speed due to incorrect parametrization or a defect in the frequency converter (FC) is reliably avoided.

An inadmissibly high bowl speed is prevented by means of a speed monitoring device independent from the frequency converter conforming to Performance Level "c" according to EN ISO 13849-1.

Only components approved for these tasks may be used.

Vibration monitoring

The maximum admissible vibration velocity and the admissible limit values may not be exceeded.

See the separate data sheet for the admissible vibration velocities and limit values.

The measured values of the vibration pickups depend on the measuring point. The position of the sensor on the centrifuge must therefore not be changed.

3.9 Load suspension devices

Fork-lift trucks and hoists are used to transport the centrifuge to the installation site. They must be supplied by the customer.

Hoists (e.g. crane) must be provided by the plant operator which are required for removing or fitting the following components.

- Hood
- Bowl
- Solids vessel
- Drive
- Motor

Load suspension devices and slings needed for disassembling or fitting certain components are included in the special tools supplied.

- Hood
- Bowl
- Solids vessel
- Drive
- Motor

In accordance with their intended use, they must not be used for other lifting work. Slings include, for example, the chain suspension gear, and the load suspension devices include the lifting eye nuts and eye bolts.

3.10 EMERGENCY STOP

The "EMERGENCY-STOP" ensures functional safety in an emergency or risk situation. It ensures that processes are stopped, and that all moving parts come to a standstill, as quickly as possible.

The centrifuge and all auxiliary equipment are not de-energised by the EMERGENCY-STOP. The functionality of all components is maintained even when the centrifuge is stationary. The switch to neutral must be done manually.

EMERGENCY-STOP can be triggered manually or automatically. EMERGENCY-STOP is triggered automatically when the centrifuge is vibrating and either vibration stage 2 is reached or after 5 minutes of vibration stage 1 status.

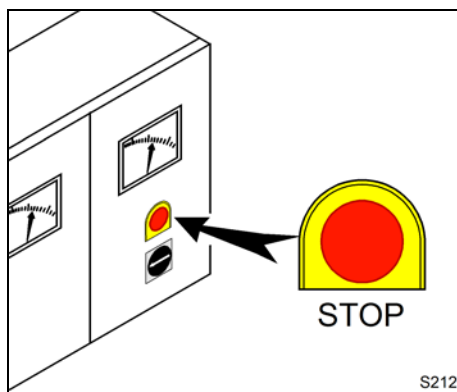


Fig. 15

EMERGENCY-STOP button

- **EMERGENCY-STOP** buttons are located in the control cabinet.
- Precise information on the position of the **EMERGENCY-STOP** buttons is given in the electrical documentation.
- The control cabinet is installed in accordance with the specifications of the plant operator.
- The position of the EMERGENCY-STOP button is given in the SOP of the plant operator.

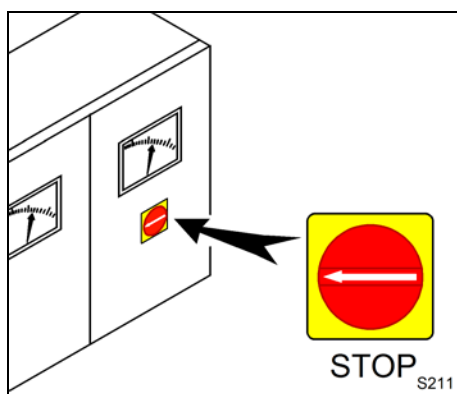


Fig. 16

Main switch

- Precise information on the position of the main switch on the control cabinet is given in the electrical documentation.
- The control cabinet is installed in accordance with the specifications of the plant operator.
- The position of the control cabinet with the main switch is given in the SOP of the plant operator.

3.11 Danger areas

Touch the centrifuge and the feed and discharge lines only when wearing protective gloves.

The surfaces reach temperatures of minus 30 °C to over 80 °C depending on the product processed and the operating speeds.

In normal operating mode, with mounted protective devices and functional supervisory equipment, there are no further danger areas on the centrifuge.

3.12 Nameplate

 		GEA Westfalia Separator Group GmbH 59299 Oelde, Germany	
Type			
Year of manufacture		Serial-No.	
Max. permitted rated bowl speed in rpm			
Max. permitted density of product in kg/dm ³			
Heavy liquid kg/dm ³		Solids kg/dm ³	
Min./max. Temperature of feed product in °C			
Min./max. Housing pressure range in bar			
Min./max. Throughput m ³ /h			

3.13 Components on the separator

All measuring, control and/or safety elements on the separator or in connection with separator parts such as valves, pumps and other auxiliaries not manufactured by GEA Westfalia Separator are not described in detail in the separator documentation.

To avoid operating errors and safety risks, the corresponding user information and equipment descriptions of the respective manufacturers must be observed. They contain instructions on assembly, commissioning, operation and maintenance.

IMPORTANT: The positions of special safety devices such as sensors must not be changed. Safety devices must likewise not be disabled.

3.14 Safety markings on the separator

The safety markings are attached clearly visibly on the hood, the concentrate catcher and the frame of the separator.

The safety markings must be attached complete and properly and be clean and legible.

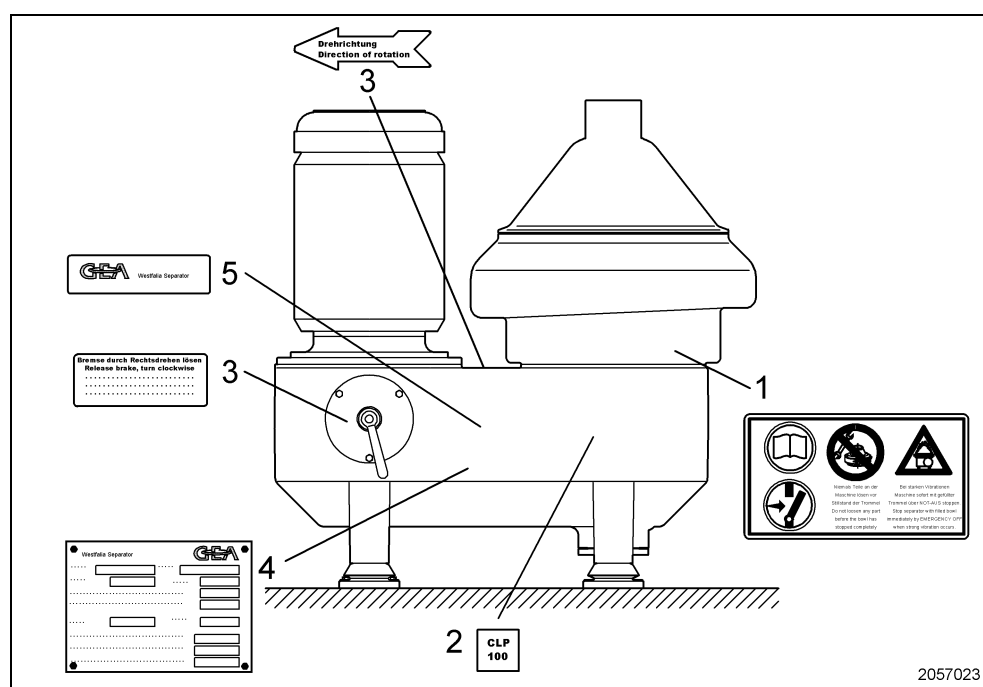


Fig. 17 Example labelling of a separator

- 1 Warning symbol (safety sticker)
- 2 Oil quality
- 3 Labels
- 4 Nameplate
- 5 Company label

3.15 Assembly overview

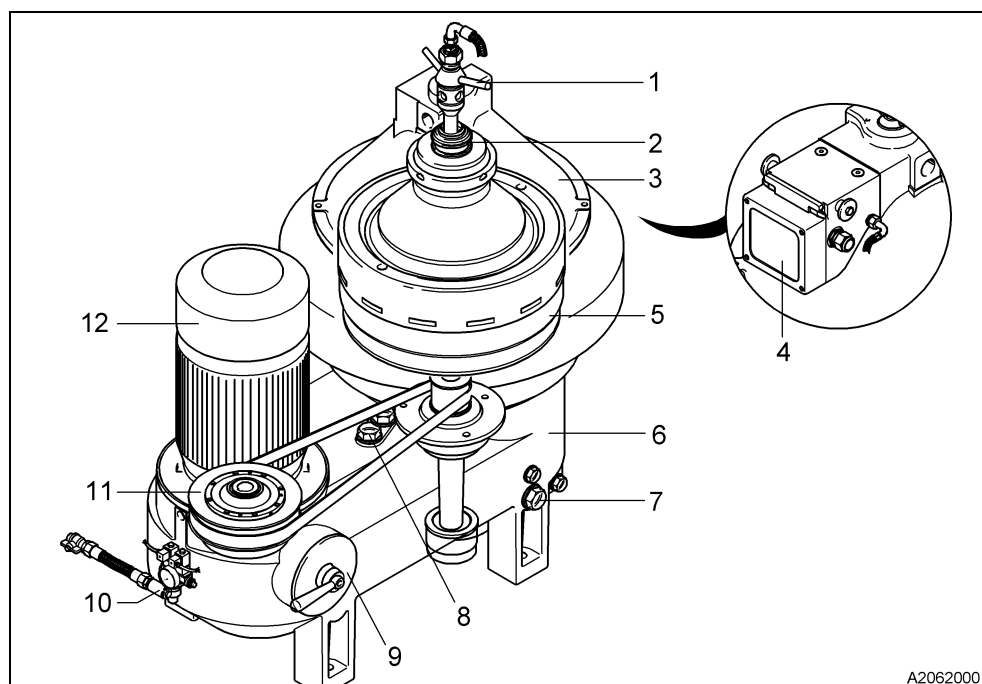


Fig. 18

Designation	Function
1 Handle connection piece	- connects centripetal pump and hood. - accommodates the filling and displacement water line.
2 Centripetal pump	discharges the cleaned liquid under pressure.
Sensing liquid pump	discharges the heavy liquid via the monitoring system.
3 Hood	- covers the rotating bowl. - holds the feed and discharges.
4 Sensor block	- is fitted to the hood. - is used to measure the pressure and conductivity of the product and to control the flow of the product.
5 Bowl	generates high centrifugal forces by means of rotation to effect separation and clarification.
Bowl hydraulics	opens and closes the bowl for the "Separate" and "Drain" functions.
6 Frame	- contains the drive parts. - supports motor, bowl and hood.
7 Sight glass	For oil level check.
8 Sight glass	for checking the drive belt.
9 Brake (if installed)	to reduce the run-out time of the bowl (e.g. service and maintenance work).
10 Solenoid valve block	controls the operating, filling and displacement water.
11 Drive	transmits the drive power of the motor (12) to the bowl spindle .
12 Motor	- accelerates the separator to the required speed. - is protected against overload during operation.

3.15.1 Centripetal pump

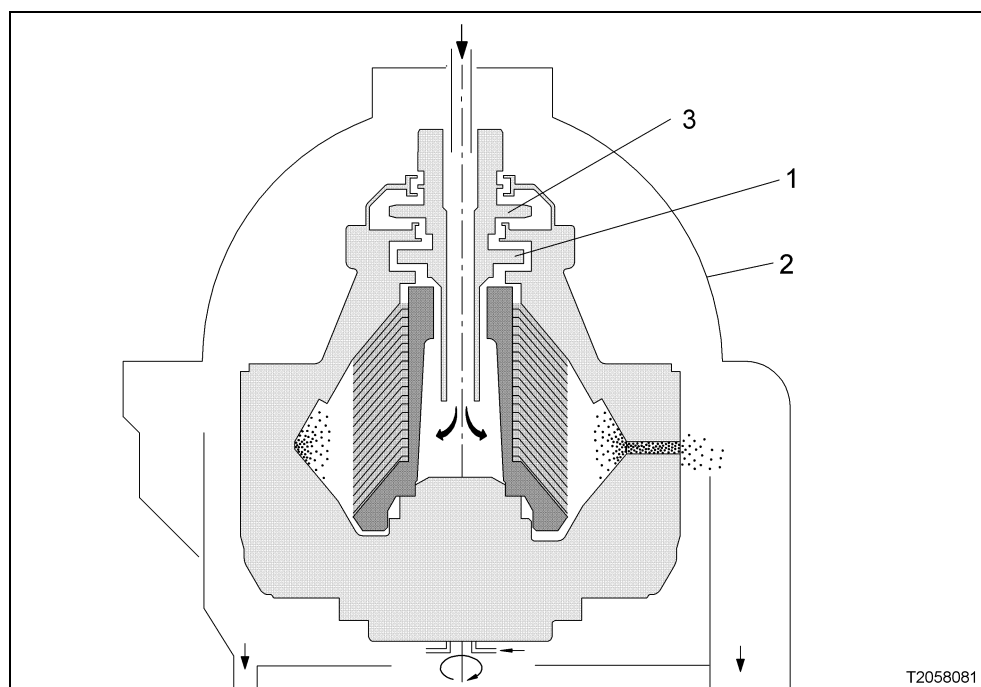


Fig. 19

Designation	Function
1 Centripetal pump	- discharges the cleaned liquid under pressure. - is permanently connected to the hood (2) of the separator.
3 Sensing liquid pump	- discharges the heavy liquid via the monitoring system. - works in the same way as the centripetal pump (1).

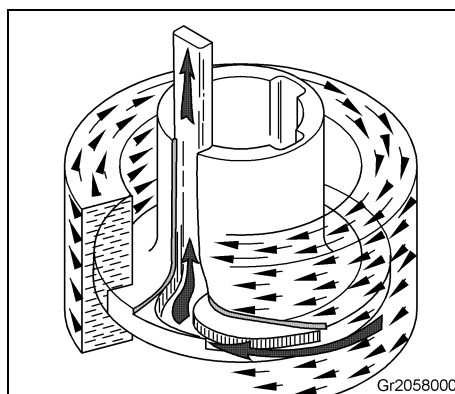


Fig. 20

The disk equipped with channels is immersed in the liquid rotating with the bowl.

The liquid is "pared off" by the centripetal pump and flows through its spiral channels from the outside to the inside. The kinetic energy is converted into pressure energy which enables discharging the liquid under pressure.

IMPORTANT: Depending on the centripetal pump design and the throughput rate, we recommend the slight throttling of the centripetal pumps in order to avoid cavitation and noise. See data sheet for centripetal pump back pressure.

3.15.2 Bowl

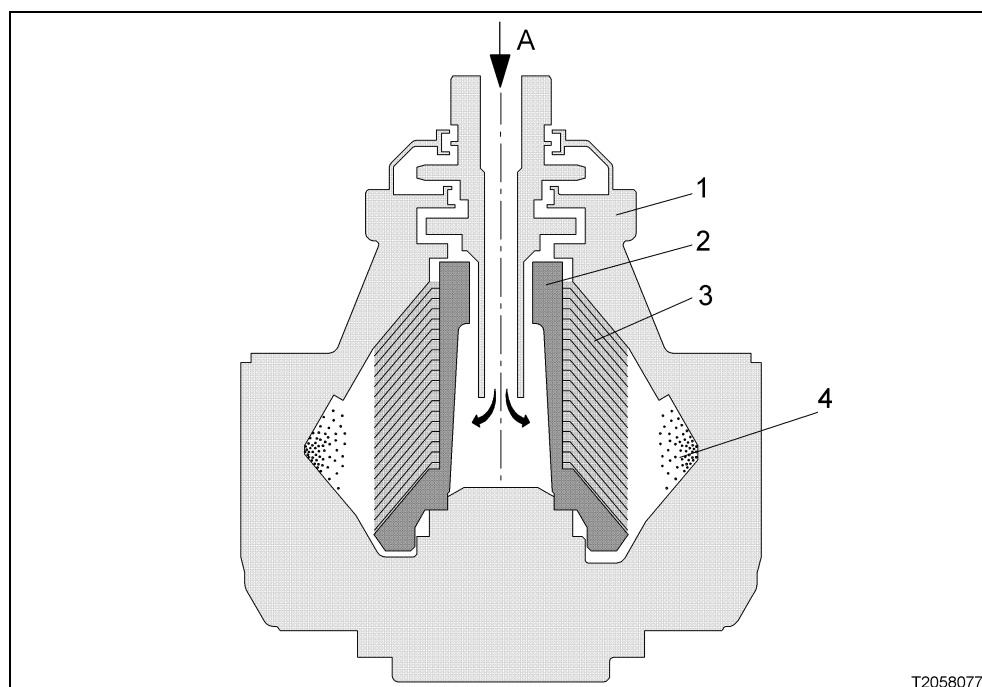


Fig. 21

Term	Function
1 Bowl	generates high centrifugal forces by means of rotation to effect separation and clarification.
2 Distributor	accelerates the product fed in through feed (A) to the rotational velocity of the bowl and then feeds it to the disk stack.
3 Disk stack	- separates a liquid mixture composed of a light and a heavy phase, e.g. oil-water, into its component parts. - consists of a large number of conical disks placed one above the other. Each disk is provided with spacers so that narrow intermediate spaces between the individual disks are precisely defined. The smooth disk surfaces help the solids to slide down and hence also the self-cleaning effect of the disks.
Separating space	The entire separating space consists of a large number of parallel individual spaces of low height. This results in very small radial sedimentation paths for the product.
Solids	The solids accumulate on the upper wall of the space between each disk and slide down into the solids holding area.
4 Solids holding space	collects the solids separated in the disk stack.

3.15.3 Bowl hydraulics

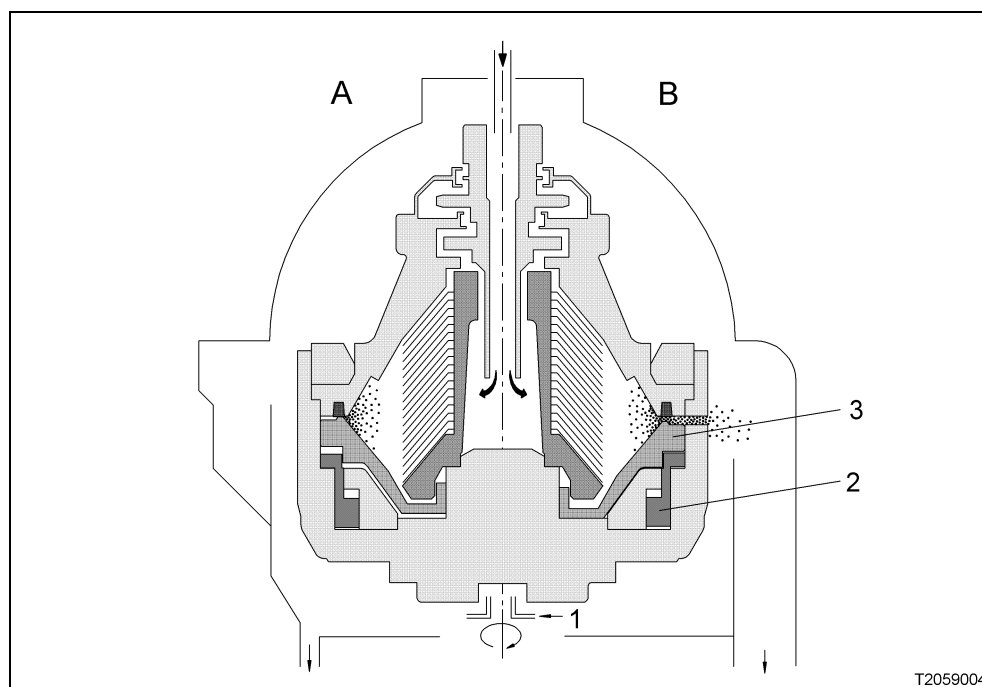


Fig. 22

A Separation – bowl closed
B Ejection – bowl open

Term	Function
1 Operating liquid (mostly water)	In the rotating bowl the incoming, rotating operating liquid generates a high centrifugal pressure. This pressure is utilised to actuate the annular piston (2) and sliding piston (3) which close and open the bowl.
2 Annular piston	• is located inside the bowl bottom. • rotates with the same angular velocity as the other bowl parts. • is axially movable.
3 Sliding piston	• is located inside the bowl bottom. • rotates with the same angular velocity as the other bowl parts. • is axially movable.

Closing the bowl (separation)

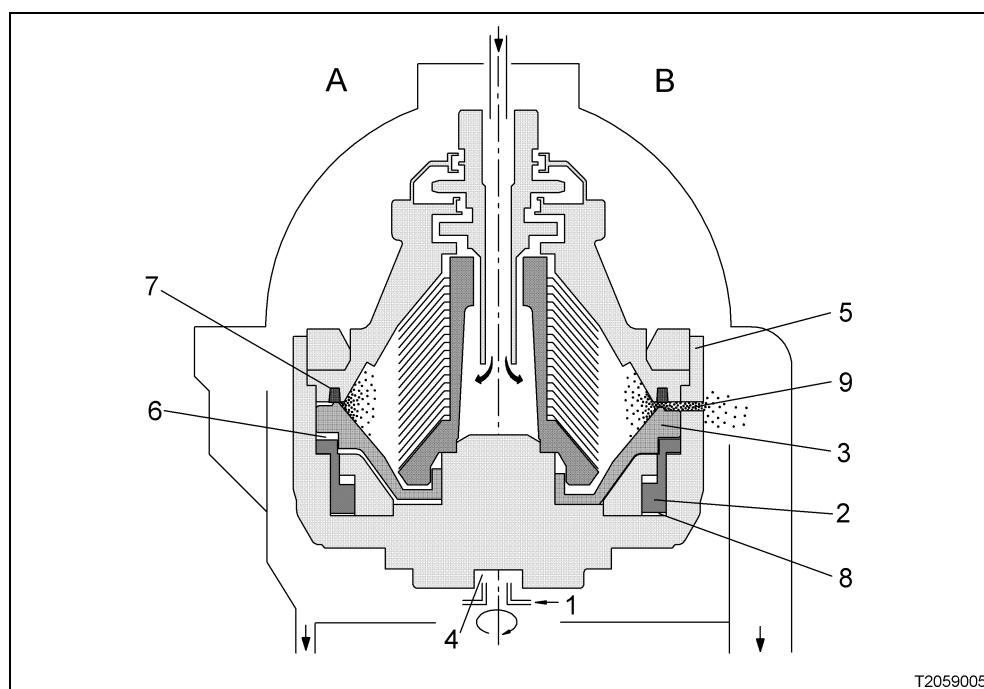


Fig. 23

- A Separation – bowl closed
B Ejection – bowl open

After starting the separator the solenoid valve for operating liquid is actuated with the aid of the control unit and the bowl is closed as follows:

Term	Function
1 Operating liquid	Flows into the injection chamber (4) of the bowl bottom (5) and from there into the closing chambers (6) through feed holes. This closes the bowl.
2 Annular piston	goes into closed position.
3 Sliding piston	- is raised due to the hydrostatic pressure in closing chamber (6). - is pressed against the gasket (7) of the bowl top due to the hydrostatic pressure and therefore closes the bowl.

Opening the bowl (ejection)

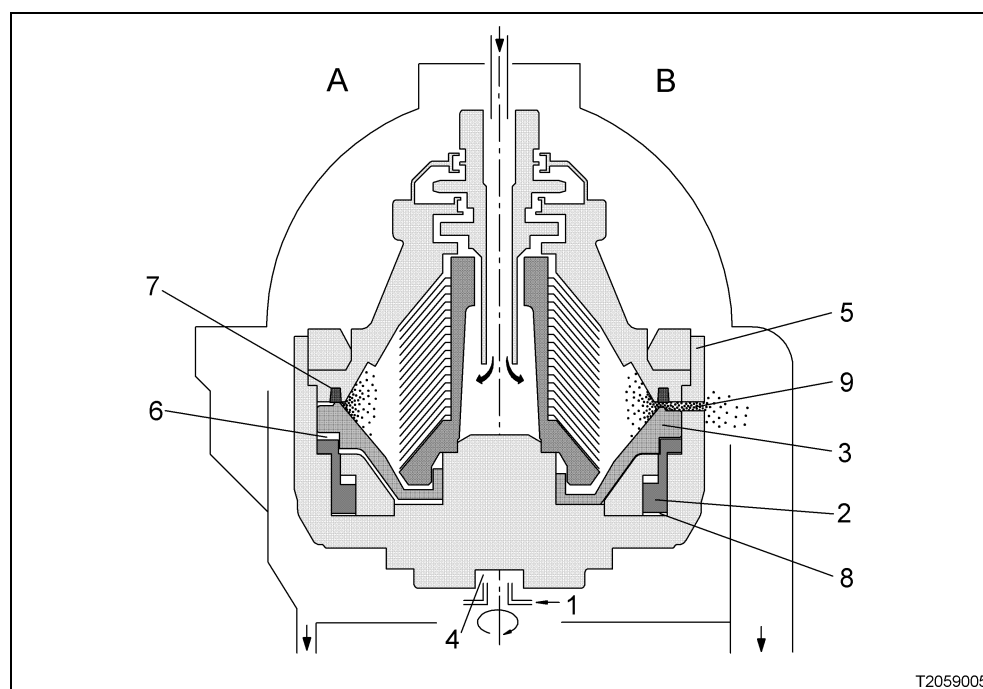


Fig. 24

- A Separation – bowl closed
 B Ejection – bowl open

The solenoid valve for operating liquid is opened with the aid of the control unit and the ejection cycle is triggered as follows:

Term	Function
1 Operating liquid	first flows into the injection chamber (4) and from there into the opening chamber (8).
2 Annular piston	rises and empties the closing chamber (6).
3 Sliding piston	moves down and opens the ejection ports in the bowl bottom (5) for the separated solids (9).

3.15.4 Drive

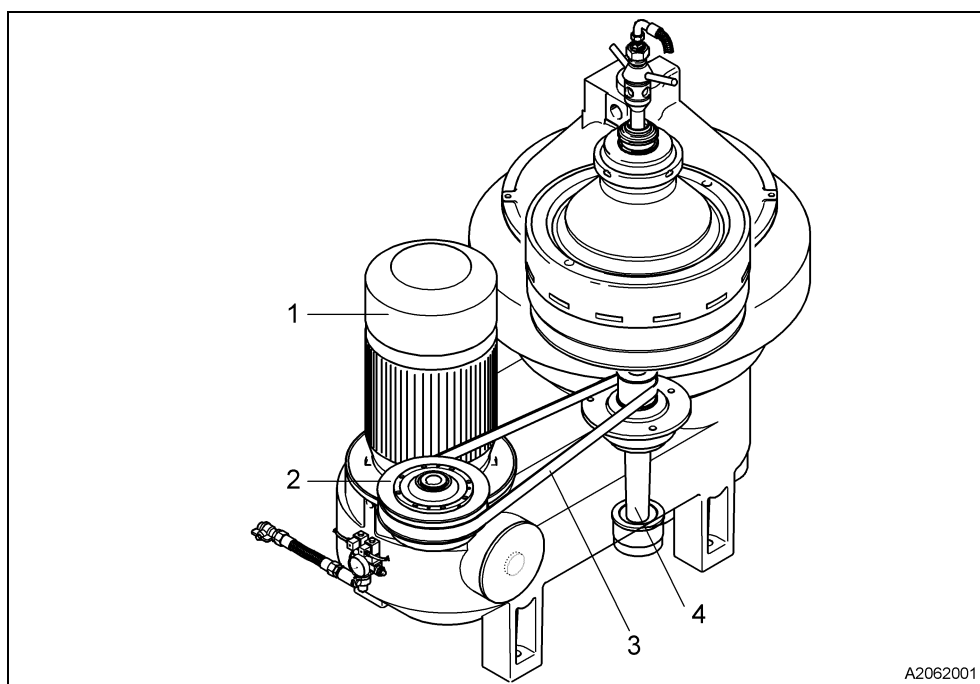


Fig. 25 Example

Designation	Function
1 Drive motor	drives the separator. Power is transmitted to the motor belt pulley by the centrifugal clutch and to the bowl spindle by the drive belt.
2 Centrifugal clutch	- transmits power between motor, drive belt and spindle. - accelerates the bowl gradually to rated speed. - eliminates premature wear on the drive belt and motor. NOTE: - The new clutch shoes entrain better after several starts. - Smoke emission from the centrifugal clutch is normal during first starts and disappears after a short operating time. - Wear to the clutch shoes depends on the number of starts and on the ejection frequency. See chapter "Maintenance / Maintenance schedule".
3 Drive belt	transmits the drive power of drive motor (1) to bowl spindle (4). Check regularly that the drive belt is correctly located and in good condition. Check the inspection and replacement intervals, see chapter "Maintenance / Maintenance schedule".
4 Bowl spindle	supports the bowl.

3.15.5 Solenoid valve block

The solenoid valve block for operating, filling and displacement water consists of two 2/2-way solenoid valves with servo control. They are equipped with a manual override for testing purposes.

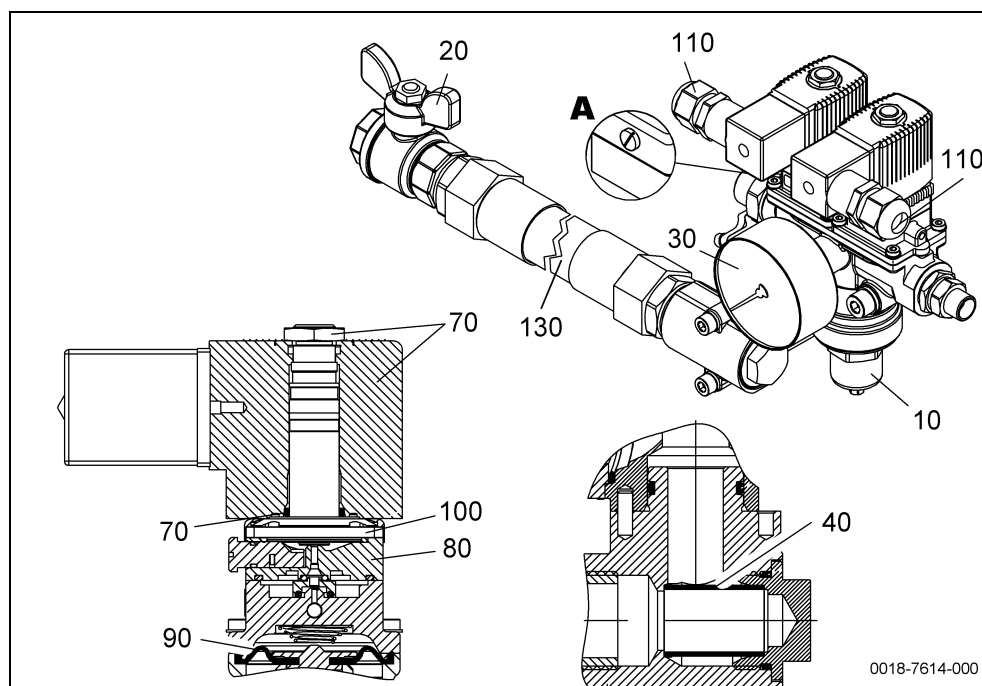


Fig. 26

- | | |
|------------------------|--------------------|
| 10 Pressure controller | 90 Diaphragm |
| 20 Ball valve | 100 Solenoid core |
| 30 Pressure gauge | 110 Coupler socket |
| 40 Filter element | 130 Hose |
| 70 Solenoid coil | |
| 80 Housing | A Manual override |

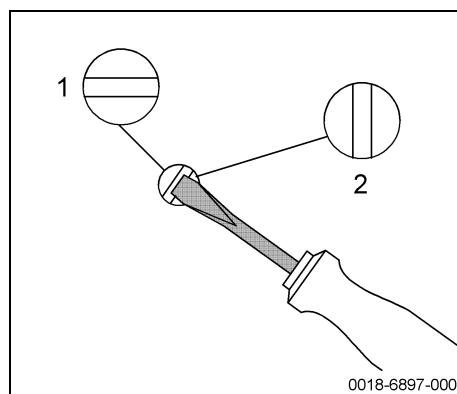


Fig. 27

Manual override A

IMPORTANT: The manual override can be adjusted only using a screwdriver.

- 1 Valve closed
- 2 Valve open

3.15.6 Sensor block

The sensor block is used to measure the pressure and conductivity of the product and to control the flow of the product. The sensor block consists of the following parts and can be exchanged as a complete unit.

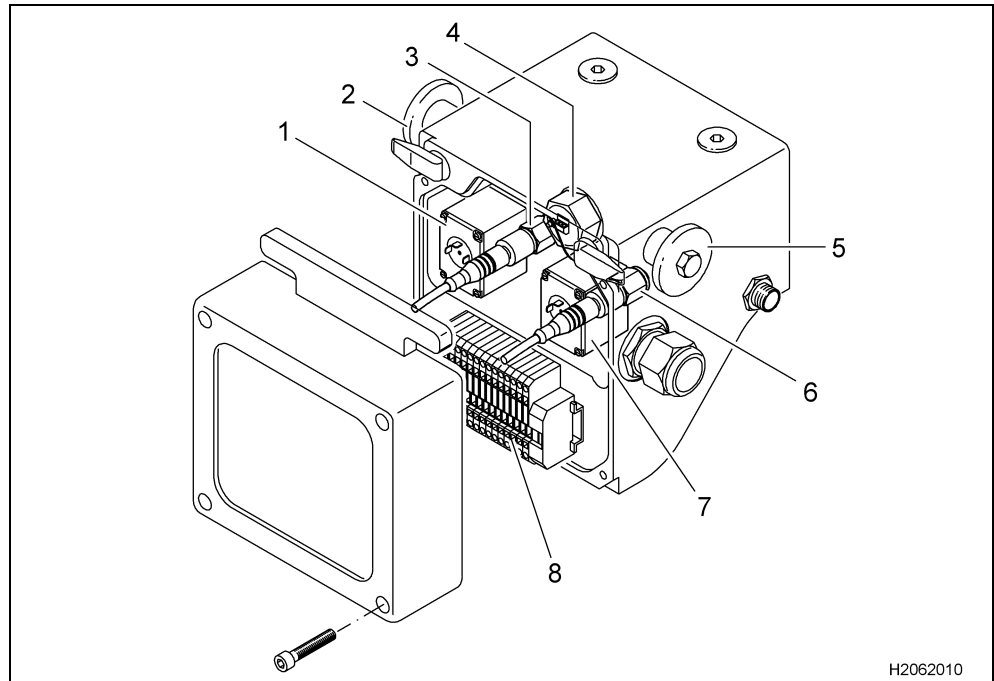


Fig. 28

- 1 Pressure transmitter (product discharge line)
- 2 Pressure transmitter (**unitrolplus** system – SMS-function)
- 3 2/2-way solenoid valve (water discharge)
- 4 2/2-way solenoid valve (circuit)
- 5 Water detector (**unitrolplus** system – WMS function)
- 6 Test flange (product discharge pressure)
- 7 Test flange (circulation pressure **unitrolplus** system)
- 8 Terminal strip and cabling

3.15.7 Pressure transmitter

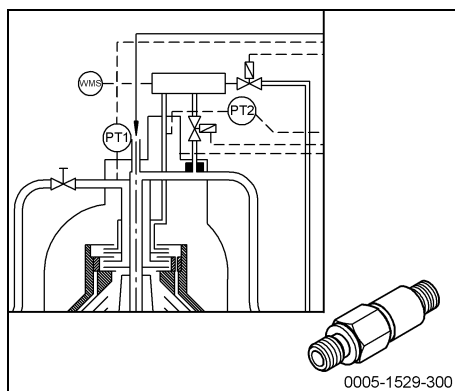


Fig. 29

The pressure transmitter **PT1** monitors the pressure in the product discharge line.

The pressure transmitter **PT2** monitors the pressure in the circuit of the **unitrolplus** system.

Term	Function
PT1 and PT2 (Pressure Transmitters)	• are used for alarm registration PAH (Pressure Alarm High) and PAL (Pressure Alarm Low). • switch process-specifically in case of pressure drop or increase. • can be checked with software for correct functioning and the switching points can be adjusted. • are maintenance-free.

3.15.8 Water detector:

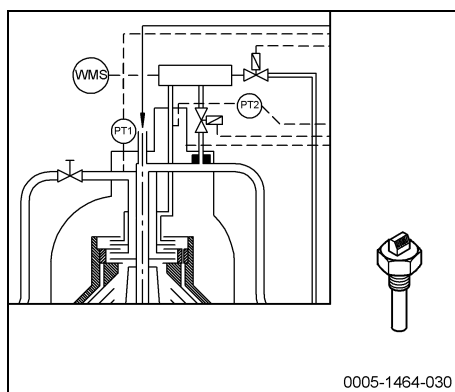


Fig. 30

The water detector **WMS** is installed in the circuit of the **unitrolplus** system.

Term	Function
WMS (WMS-Sensor)	• monitors the partial flow that is discharged from the bowl via the separating disk and the sensing liquid pump, • can be checked for functionality using appropriate software.

3.15.9 Solenoid valve

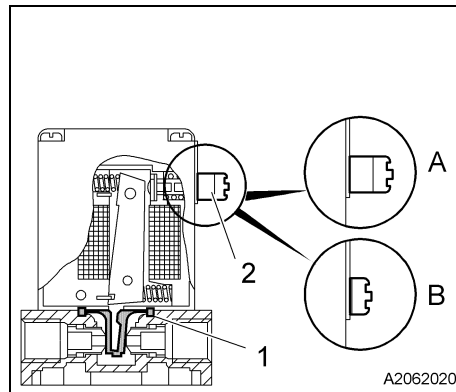


Fig. 31

The solenoid valve is a 2/2-way diaphragm straight-way valve with internal piloting.

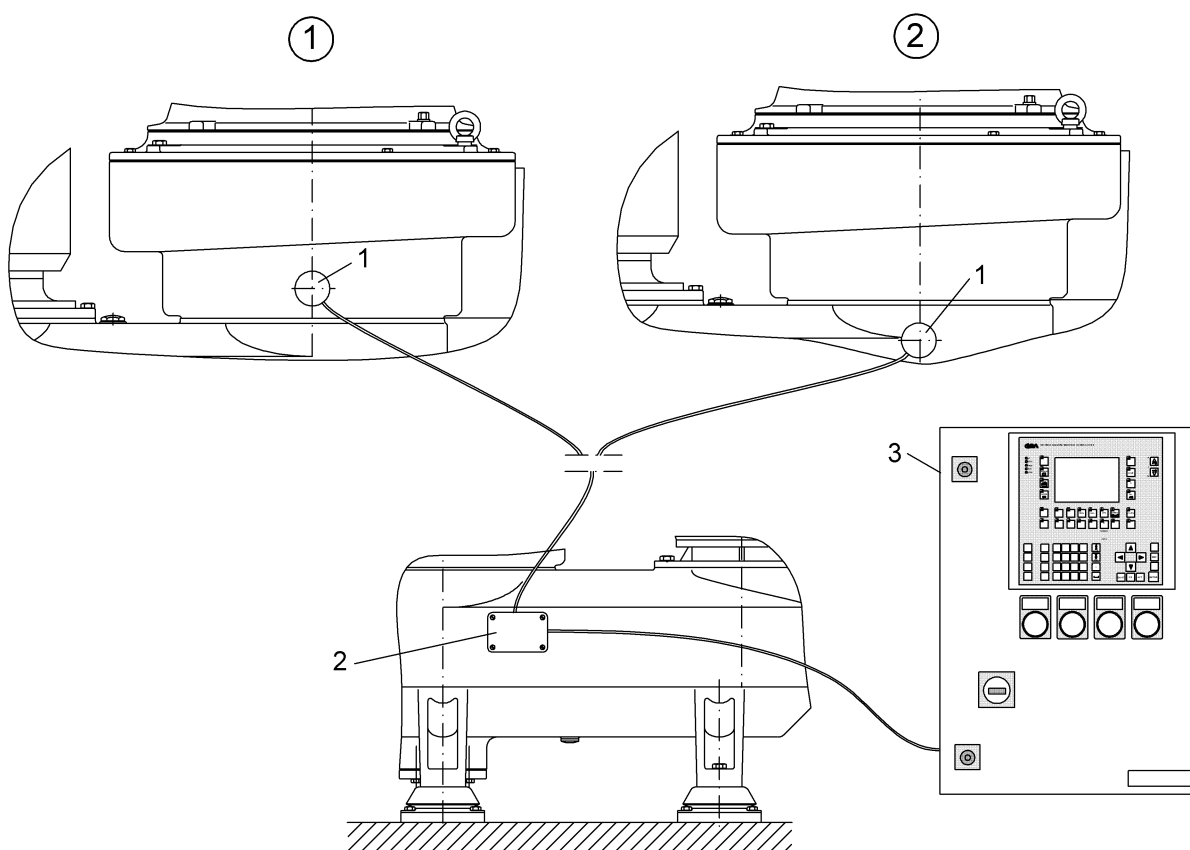
Term	Function
1 Diaphragm	controls the release of the cross-sectional area of the valve.
2 Manual override (lockable)	switches between normal operating mode and emergency manual operation.
A Operating status	is secured by means of a locking mechanism to prevent accidental actuation.
B Emergency manual override	has to be pressed and turned through 90°.

3.16 Supervisory equipment

The separating process of the separator plant is monitored and controlled by an automatic control system. Further details are given in the control system manual.

3.16.1 Vibration monitoring device (option)

An electronic device protects the separator against exposure to unacceptably high levels of vibration.



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Fig. 32 Installation examples

Term	Function
1 Vibration pickup	- is fitted at the upper part of the frame (example 1) or the lower part of the frame (example 2). - converts the separator vibrations into electric signals.
2 Terminal box	is mounted at the lower section of the frame.
3 Vibration monitoring unit	- is installed in the control cabinet. - Evaluates the signals coming from the vibration pickup. The signal is evaluated in the control cabinet, on the control unit or directly on the vibration pickup (depending on the type). If limit values are exceeded, error messages are output and follow-up measures are initiated. - The separator motor switches off automatically. - The operating status can be read off on the control unit.

IMPORTANT: Observe the applicable documents.

- Operating manual for the vibration monitoring device
- Control unit operating manual
- Terminal diagram for the control cabinet
- Circuit diagram

3.16.2 Speed monitoring device

The electronic device displays the bowl speed. Speed deviations up to 5% are permissible. The following values are monitored:

- a drop in speed
- if the speed is exceeded
- if the starting time is exceeded

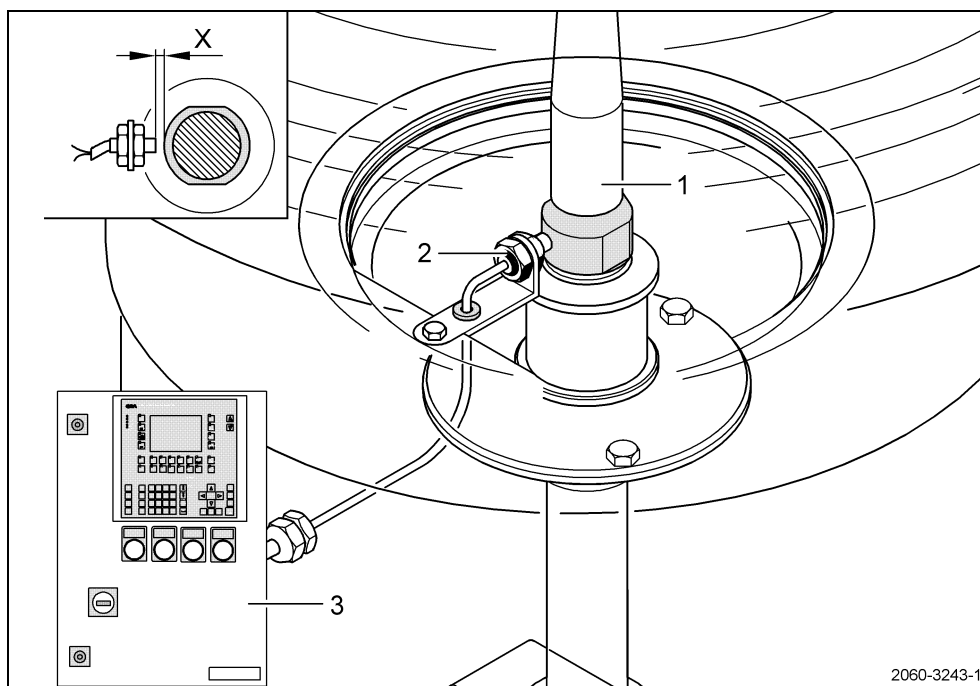


Fig. 33 Installation example

Designation	Function
1 Spindle	• rotates and generates speed pulses at the proximity switch (2).
2 Proximity switch	• transmits the pulses triggered from the spindle to the control unit (3). IMPORTANT: Align the proximity switch as illustrated. The distance X between spindle and proximity switch must be 3,5 mm.
3 Control unit	• evaluates the speed pulses. • triggers an alarm if the bowl speed is too low or too high. • initiates a shut-down process if the bowl speed is too low or too high. • indicates the current bowl speed. • permits setting of limit values.

IMPORTANT: Refer to the other applicable documents.

- Control unit manual
- Terminal plan of the control cabinet

3.16.3 Product feed and discharge line

The separator is adapted to the conditions and requirements of the throughput rate and line pressure by installing orifice plates in the product feed line (A) and product discharge line (B).

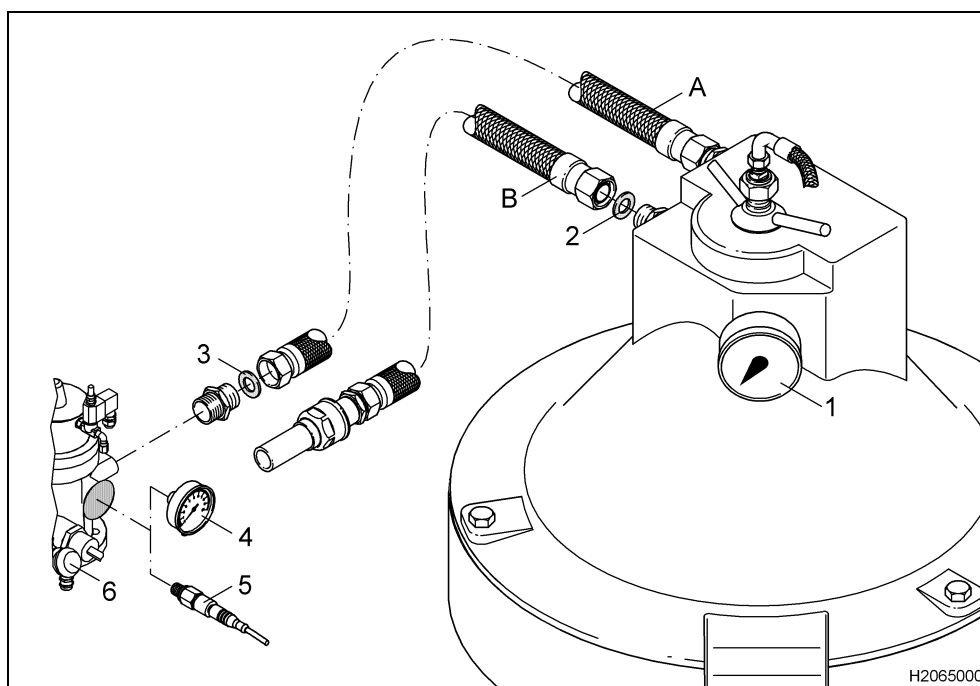


Fig. 34

Term	Function
A Product feed line	directs the product to be purified into the centrifuge.
B Product discharge line	discharges the purified product.
1 Pressure gauge	displays the pressure in the product feed line.
2 Orifice plate	creates a dynamic pressure in the feed line.
3 Orifice plate	creates a dynamic pressure in the drain (discharge pressure monitoring).
4 Flow indicator (for control unit D10)	measures the dynamic pressure in the feed line, which is generated by the orifice plate (2) for the flow detection. See chapter "Commissioning / throughput detection (product feed line A)."
5 Pressure transmitter (for control unit E40)	measures the dynamic pressure in the feed line, which is generated by the orifice plate (2) for the flow detection in the control unit display. See chapter "Commissioning / throughput detection (product feed line A)."
6 3/2-way valve	switches between the product feed line (A) and the circulating line depending on the process.

4 Technical data

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4.9	Water detector:	55

4.1 Note on technical data

This chapter contains technical data and process data not set out in the separate data sheet furnished with the documentation.

4.2 Standard operating-water parameters:

Suspended matter	max. 10 mg/l
Particle size	max. 50 µm
Hardness	
- up to 55 °C separating temperature	< 12° dH
- above 55 °C separating temperature	< 6° dH
To convert the hardness values stated, use the following equation: 1° dH = 1.79° fH = 1.25° eH = 17.9 ppm CaCO ₃	
Chloride ions	< 100 mg/l
pH	6.5 - 7.5

dH = German hardness | fH = French hardness | eH = English hardness

4.3 Normal separating temperature of the product

Diesel oil (DO)	20 °C (68 °F)
Marine diesel oil (MDO)	40 °C (104 °F)
Lubricating oil (LO)	90 °C (194 °F)
High-performance lubricating oil (LO HD)	95 °C (203 °F)
Heavy oil (HFO)	98 °C (208 °F)

Due to the large number of products to be treated, it is not possible to specify an exact separating temperature of the product in this manual.

The exact separating temperature of the product (in °C) is stated in the order-specific data sheet.

4.4 Product feed pump

Pump unit (gear pump or screw pump)	
Output	Depending on design of system
Suction head	Max. 0,4 bar
Pressure head	Max. 2 bar

4.5 Weights

Separator (without motor, without bowl)	210 kg
Bowl	100 kg
Motor	90 kg

4.6 Solenoid valve block

Observe the specifications on the nameplate of the solenoid valve block.			
Operating principles		2/2-way NC	
Material:	Seal	EPDM	
	Housing	CuZn	
Solenoid valves:	Coil size	32 mm	
	Nominal diameter (DN)	13 mm	
	Operating voltage	Direct current	24 V DC
	Rating	per solenoid valve	8 W
	Coupler socket	with installed electronics, 24 V DC, LED and free-wheeling diode with connected cable (1.5 m long)	
Pressure:	Medium	0 – 10 bar	
	Control range	1 – 6 bar	
Pressure setpoint with open operating water solenoid valve		2 bar	
Temperature:	Medium	-10 – 80 °C	
		14 – 176 °F	

4.7 Solenoid valve (sensor block)

Operating principles	2/2-way valve normally closed
Nominal width	3 mm
Gasket material	FKM
Material	CuZn
Line connection	Flange
Voltage	24 V
Kind of current	DC (direct current)
Rating	8 W

4.8 Pressure transmitter

Voltage	24 V DC
Department	0 – 16 bar
Output signal	4 – 20 mA
Pressure connection	(O-ring) outside
	Tightening torque
	G ¼ in
	max. 25 Nm
Connector plug (5-pin)	M 12 x 1
Cable (PUR 2-wire)	1.5 m
with cable box	M 12 x 1, 5-pin, Pin 1- (white), Pin 4+ (black)
Type of protection	IP 67
Operating/medium temperature	-40 – 125 °C
	-40 – 257 °F

4.9 Water detector:

Switching hysteresis	depending on the process (e.g. HFO/LO)
Ambient temperature	-30 – 125 °C
	-22 – 257 °F
	LED -30 – 100 °C
	-22 – 212 °F
Temperature drift	dependent on medium
Enclosure (according to IEC 60529)	Terminal strip: IP 54
	Probe: IP 68 10 bar
Housing material	MS
	Immersion tube: PTFE
Connector plug	Terminals
	See terminal assignment
Connection	M 30 x 1.5
	Jaw span 32
Supply voltage U_B	10 – 35 V DC
Conformity	EMC (electromagnetic compatibility) according to IEC 60947-5-2)

Note
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5 Transport and storage

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5.1 Safety during transport

When the centrifuge is transported with hoists and fork-lift trucks, hazards can occur. Risk of injury and material damage are a threat when unqualified persons are deployed and unsuitable or damaged lifting gear is used.

Therefore, pay attention to the following points during transportation:

- Assign only qualified personnel with the task of transporting the centrifuge.
- Use approved and intact lifting gear and hoists for transportation.
- Use only suitable hoists with adequate lifting capacity.
 - For the weight of the centrifuge, refer to the chapter "Technical Data / Weights".
- Remove the bowl whenever transporting the centrifuge.

5.2 Using load-suspension devices safely

The working load limit of the slings depends on the method of use. They may only be used for their intended purpose.

Unintended use may cause the slings to tear. There is risk to the life and limb of persons and of damage to property.

For the reduction of the working load limit in individual cases, see the manufacturer's specifications.

GEA Westfalia Separator recommends the use of round slings made of synthetic fibres.

Observe the points below when using load-suspension devices.

- Check the slings and ropes for damage before use.
- Do not use damaged or incomplete load-suspension devices and slings.
- Use slings only in the way approved by the manufacturer.
- Never load the slings beyond their maximum working load limit (WLL). The WLL specification is located on the sling label.
- Conduct regular training for persons assigned to perform transport work.
- Use only the load fastening points specified in the documentation.
- Use only suitable fork-lift trucks and hoists with an adequate capacity.
- Pack and secure the load in accordance with the CTU (Cargo Transport Unit) transport guidelines before transporting it.
- Observe all regional regulations and laws governing transport and transport securing.

5.2.1 Load suspension devices for transporting the centrifuge

Fork-lift trucks and hoist for transporting the centrifuge to the installation site must be provided by the plant operator.

Hoists (e.g. a crane) suitable for dismantling or installing heavy components must be provided by the operator.

Heavy components are, e.g. Hood, bowl, solid tank, drive etc.

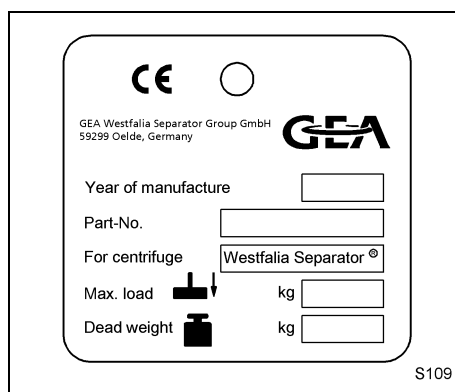
5.2.2 Suspension devices for repairing the centrifuge

Lifting gear and slings required for fitting or removing the hood, bowl, solid tank and drive are included in the scope of special tools supplied.

In accordance with their intended use, load suspension devices and slings must not be used for other lifting work. Slings include, for example, the chain suspension gear, and the load suspension devices include the lifting eye nuts and eye bolts.

Use slings safely; observe the following points for this:

- Use only slings with a nameplate.



The nameplate on the sling shows the following data:

- CE mark
- Manufacturer
- Year of manufacture
- Part number
- Intended use
- Maximum load
- Inherent weight

Fig. 35

- Use sling gear only as described in this instruction manual.
- Observe the permitted loading limit.
- Check the sling for visible damage before each use.
- Use only slings in perfect condition.
- Do not carry out repairs to slings.
- Send damaged slings to the manufacturer.
- Always screw in threaded rods as far as they will go.
- Tighten all nuts fully.
- Tighten all bolts fully.
- Do not walk under suspended loads.
- Check slings regularly, see chapter "Maintenance / Maintenance schedule".

5.3 Using lifting eye bolts or lifting eye nuts as load handling devices

Incorrect use of lifting eye bolts or lifting eye nuts during transport can lead to serious accidents, e.g. due to overload.



WARNING

Deformed lifting eye bolts or lifting eye nuts due to overload!

Danger to life and limb through falling loads when lifting eye bolts or lifting eye nuts break!

Observe the following points to avoid accidents:

- The pertinent standards and guidelines of the national associations in the country of origin on the operation of load handling devices in lifting mode
- Only trained specialists are authorized to mount lifting eye bolts or lifting eye nuts.

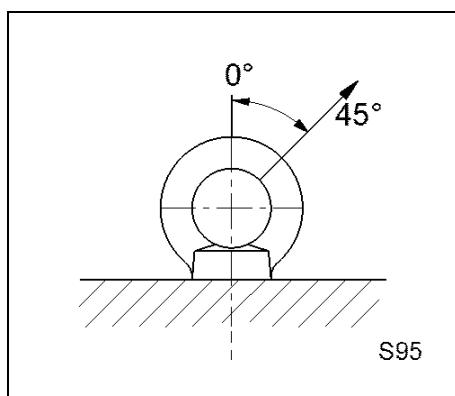


Fig. 36

- Mount lifting eye bolts or lifting eye nuts only as illustrated.
- Screw in lifting eye bolts or lifting eye nuts completely.
- Attach load handling devices as vertically as possible, e.g. chains.
 - Pull max. 45° diagonally.
 - Modes of assembly other than those shown are not admissible, e.g. lateral pull.

5.4 Transport in the transport packaging

5.4.1 Transport with the aid of a hoist

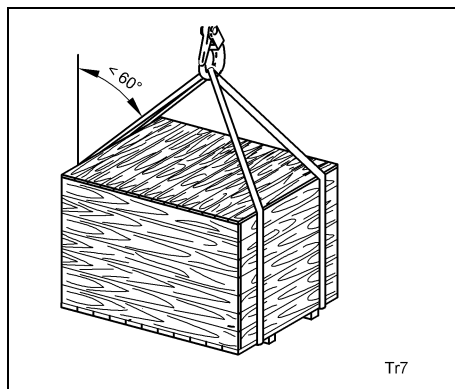


Fig. 37

- Always secure the goods to be transported in a suitable way against slipping and tilting.
- When transporting the centrifuge in the transport packaging, use only suitable vehicles or suitable cranes.
- Ensure an even pressure distribution on the bottom panel.

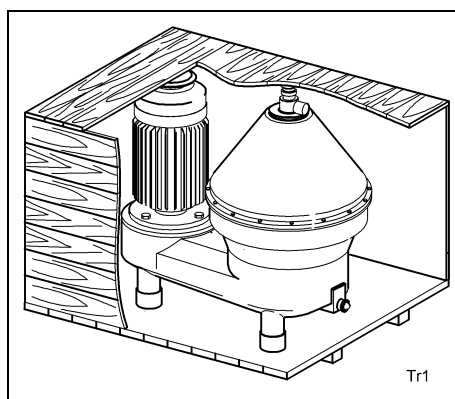


Fig. 38

Packaging example: Centrifuge with belt drive

5.4.2 Transport with fork-lift trucks

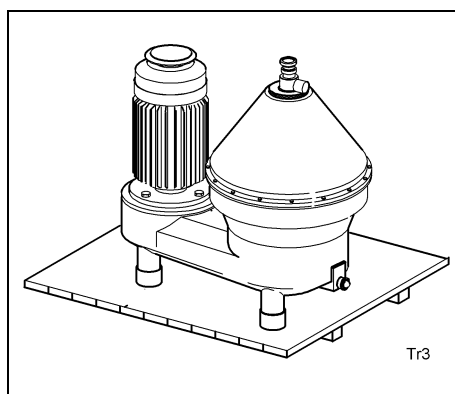


Fig. 39

- Remove side walls, filling material and all loose parts.
- Use the bottom panel of the transport packaging as a pallet for transporting the centrifuge with a fork-lift truck.
- Ensure an even pressure distribution on the bottom panel.

5.5 Storage procedures for the centrifuge

5.5.1 Storage after delivery

If the centrifuge and control unit are not installed immediately after delivery, they must be stored in the original transport packaging.

IMPORTANT: When stored under proper conditions, all centrifuge parts are adequately protected for maximum one year. A storage duration longer than 12 months is only possible after prior consultation with GEA Westfalia Separator.

- Check all preserved parts regularly at intervals of 6 months.
 - Renew the preservation if required.
- Observe the recommended maintenance intervals.

In the case of short-term storage (up to 24 months):

- Check all centrifuge parts in accordance with the maintenance schedule and replace when necessary.
 - See table "Maintenance every 4000 operating hours – or after 6 months at the latest"
 - or see table "Maintenance every 8000 operating hours – after 1 year at the latest".

In the case of long-term storage (longer than 24 months):

- Replace all centrifuge parts in accordance with the maintenance schedule.
 - See table "Maintenance after 8000 operating hours – after no more than 1 year".

5.5.2 Requirements for the place of storage

The storage site for centrifuges and components must satisfy the following pre-conditions:

- Room closed to the outside
- Storage temperature in accordance with the installation guidelines
- Dry (avoid the formation of)condensation water.)
- Dust-protected
- Light-protected (avoid direct sunlight and UV radiation.)
- Vibration-free
- Moderately ventilated
- Free from aggressive media (e.g. salts, acids, lyes, solvents)

5.5.3 Storing the control system

- Store the controls and accessories in a protected room.
- Use suitable packing to protect the control system and accessories from dust and heat.
 - Storage temperature in accordance with manufacturer's specifications.
- In the case of extreme cold, connect the control cabinet heating separately to an external energy source to avoid damage.

5.5.4 Preserving the centrifuge

If the centrifuge is at a standstill for an extended time period, it must be preserved.

Required material:

- Slushing oil only after consultation with GEA Westfalia Separator.
- Grease, e.g. lubricating grease, see the chapter "Maintenance / Lubrication schedule".
- Dry rags
- Collecting vessel for lubricating oil

5.5.5 Transporting the separator



WARNING

Danger of injury due to overturning of the separator during transport

Separators and their transport packagings can cause injuries through impacts and crushing and tilting or slipping.

- Transport only by briefed and assigned persons.
- Pay attention to separator weights, see chapter "Technical Data".
- Comply with the instructions for safe transportation.
- Secure separators adequately against slipping and tilting.
- Always transport the separator **without** installed bowl.
- Remove the bowl from the frame before transporting the separator.
 - Open the hood.
 - Remove bowl and place it on an even, non-slip surface.

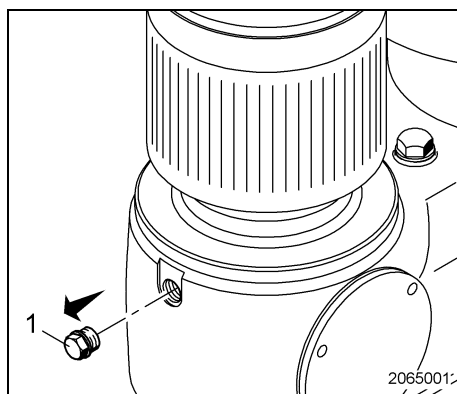


Fig. 40

- Unscrew screw plug (1) from the lower section of the frame.

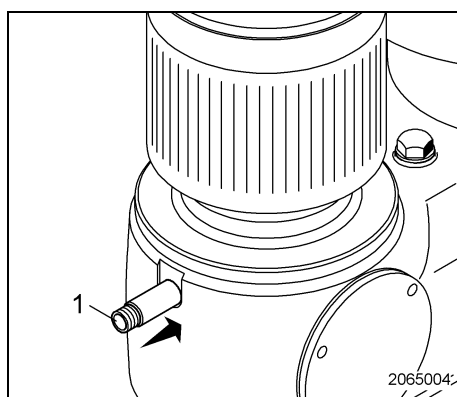


Fig. 41

- Screw double nipple (1) into the hole in the frame.

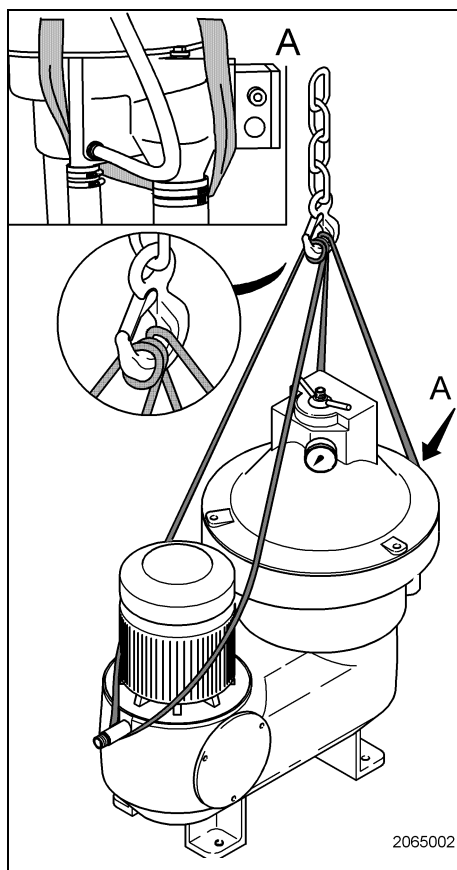


Fig. 42

- **IMPORTANT:** Do not use the horizontally screwed-in eye bolts of the motor to suspend the separator.
- Hang in the transport ropes.
 - Do not damage any machine components when fastening the transport ropes.
 - Swing the transport ropes around the machine **A** and the double nipple and hang it in the load hook of the hoist.
 - Prevent the frame from overturning: Place part of the rope around the load hook in such a way that the frame is lifted horizontally (see detail).
 - Make sure that the transport ropes cannot slip.
 - Ensure even load distribution.

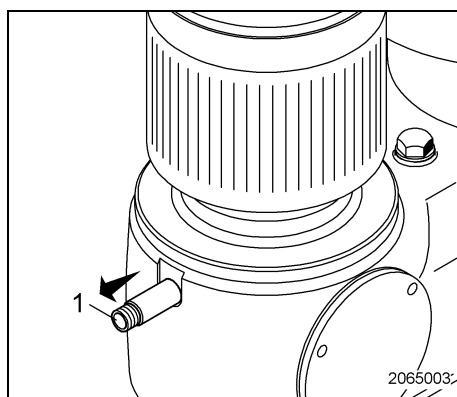


Fig. 43

- After transport
- Remove the hoist and transport ropes.
 - Unscrew double nipple (1).

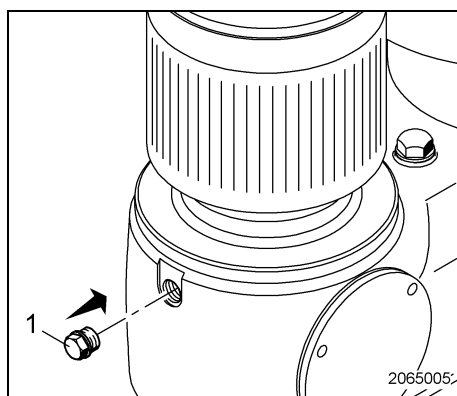


Fig. 44

- Screw in plug (1) with gasket.
- Installing the bowl, see chapter "Servicing / installing the bowl".
- Closing the hood (see "Servicing / closing the hood").

6 Assembly and installation

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6.1 Safety during assembly and installation

Pay attention to the following points during assembly and installation:

- Install the centrifuge at the installation site in accordance with the installation diagrams.
- For rating piping, refer to the specifications in the P&ID (Piping and Instrumentation Diagram) in the installation diagram and in the datasheets.
- Connect all feed and discharge lines flexibly to the centrifuge by means of U-shaped conduits or compensators.
 - Loading the pipelines through tensile force is not admissible.
 - All pipe joints are rated without taking into consideration tensile forces.
- Do not fit a shut-off device in the frame drain or connect it with closed piping.
 - Operating water must be able to flow off unimpeded.

Fastening material

Unsuitable fastening material endangers the statics and operating safety of the centrifuge. This can lead to damage to the centrifuge.

- Use the specified, furnished fastening means. They are rated for machine frame and foundation.

6.2 Allow for sufficient space for maintenance work.

When planning the installation of the centrifuge, ensure that the centrifuge is easily accessible from all sides.

Keep to the minimum clearances from walls of buildings or other machines so that the following points are assured.

- All machine parts must be readily accessible for maintenance and repair work.
- Sufficient space must be available for setting down large machine parts safely.
 - Protective hoods
 - Bowl
 - Drive motors

6.3 Demands on the configuration of the installation

- Configure the installation so that backflows of product or utilities cannot occur.
- Ensure uniform feed rates. Recommendation: Mono pump
- Ensure uniform feed concentration. Recommendation: Agitator

6.4 Requirements to be met by solids discharge

The solids discharge must meet the following requirements:

- Design the solids discharge to prevent damming. If product backflow cannot be ruled out by suitable design concepts, the discharge line should be monitored electronically, e.g. by means of a sensor.
- Do not constrict the solids discharge.
- Ensure adequate venting of the solids chute or downstream solids tank.
- The solids discharge must be equipped with a flow-diverting device because liquid discharges through the solids outlet during start-up, shut-down and flushing.

6.5 Requirements to be met by feed and discharge lines

- Valves and pumps must be adapted to the product.
- Do not connect feed and discharge lines firmly to the centrifuge. Provide flexible connections.

- Contact with the rotating bowl must be excluded.
- Operating personnel must not be endangered by discharged product. Danger zones must be made inaccessible.
- The feed must be provided with a shut-off device so as to be able to interrupt the product supply in case of operating malfunctions.
- The feed system should enable uniform product supply with a constant solids content.

6.5.1 Rating of compensators

Compensators installed in the lines on the centrifuge must meet the following requirements: These are the values specified in the table for the minimum required movement absorption and the maximum admissible adjusting forces. The values depend on the direction of movement and size of the compensator.

6.6 Requirements for the assembly location

Requirement for the base and the installation position:

- The foundation must meet the requirements, see load specifications and the dimensions in the installation diagram and dimensioned drawing.
- The foundation must be designed so that no vibrations are transferred from the environment to the centrifuge.
- Provide sufficient room for maintenance work. See dimensioned drawing and installation diagram.

Requirements for load suspension equipment:

- Use fork-lift trucks etc. having the required lifting capacity.
- Use permissible and adequately dimensioned slings. Compare the specifications on the slings with those from the dimensioned drawing and data sheet.

Requirements for the environment of the centrifuge:

- The centrifuge must be so installed so that no ambient vibrations can be transferred to the centrifuge.
- Ensure the ventilation of the centrifuge.
- Install the centrifuge as a stand-alone unit and keep the ventilation ports free.
- Ambient temperature must be at least 5° C to maximum 40° C. The order-related, permitted ambient temperatures can be found in the separate data sheet.

6.6.1 Requirements for protective devices

- Rate protective devices according to DIN EN ISO 13857 and follow-up standards to ensure that arms and legs cannot access danger points.
- Contact with the rotating bowl must be excluded.
- Operating personnel must not be endangered by discharged product.
- Access to danger areas prevented through suitable measures.

6.7 Installing the separator

Depending on local conditions, the foundation frame is fastened on a steel foundation or concrete foundation. The required fastening materials are supplied to suit the order.

**DANGER****Risk of accident due to suspended loads**

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.
- Transport the foundation frame to the installation site with a suitable hoist and load suspension devices.
- Align the foundation frame in accordance with the dimensioned drawing or installation diagram.
- Drill fastening holes in the foundation in accordance with the assembly diagram or dimensioned diagram and the screws or anchor bolts supplied (if required).

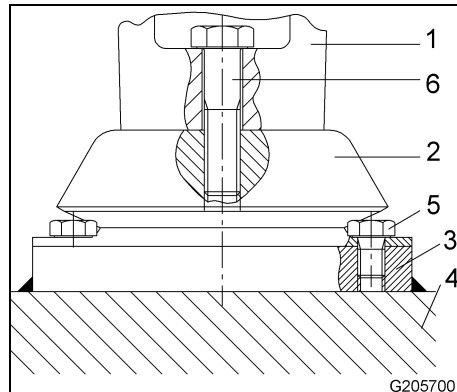
6.7.1 Steel foundation

Fig. 45

- Align separator (1) on foundation (4) using machine feet (2) and plates (3).
- Fasten the plates (3) in position.
- Unscrew the screws (5).
- Lift the separator including the feet.
- Weld plates (3) to foundation (4).
- Position the separator on the plates (3) and tighten using screws (5).
- Tighten screws (6) firmly.

6.7.2 Concrete foundation

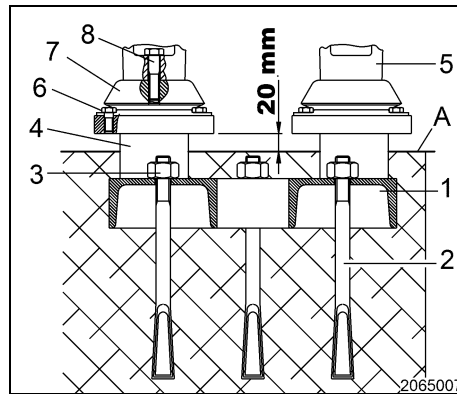


Fig. 46

- Screw four anchor bolts (2) into the foundation.
 - Embed the foundation frame (1) in the floor and align it horizontally.
 - The foundation frame must be absolutely level.
 - Fasten and tighten the foundation frame (1) with four hexagon nuts (3).
-
- Grout in the foundation frame up to **A** with grouting compound, e.g. cement mortar.
 - The four cams (4) must protrude from the foundation by **20 mm**.
 - Let the grouting compound set hard.
 - Align separator (5) with feet (7) on the foundation frame (1).
 - Tighten all screws (6).
 - Tighten all screws (7).

6.8 Connecting the three-phase AC motor

All centrifuges are driven by three-phase AC motors. Depending on the construction, the following drive variants are available:

- Direct drive
 - with frequency converter
- Gear drive
 - with fluid or centrifugal clutch
 - with frequency converter
- Belt drive
 - with controlled torque motor
 - with frequency converter
 - with clutch

Refer to the data sheet, motor plate and/or the documentation of the motor manufacturer.



DANGER

Danger to life through electric voltage

Danger to life and limb through electric shock!

- The electrical connection of the three-phase AC motor may only be performed by authorized specialists, e.g. electricians and high voltage electricians.
- Power must be cut off to the connections and it must be ensured that it cannot be switched back on.

Operation with frequency converter

- The centrifuge may not be started without frequency converter.
- Do not under any circumstances manipulate the frequency converter to exceed the permissible bowl speed (see nameplate).

- The centrifuge may only be operated with an independent device for speed limitation.
- Adjust the speed limit 5 % above rated speed.
 - See the centrifuge nameplate for the rated speed of the bowl.

Required start-up current

Drive with frequency converter: approx. rated current

Drive with fluid or centrifugal clutch: 1.5 - 2 times rated current

In the case of controlled torque starting, 2 - 3 times the rated current is required as starting current.

Motor protection

If the motor is equipped with a PTC thermistor, it must be connected to a certified tripping device.

The measuring circuit line (between tripping device and motor) has to be laid separate from other lines.

Connect motor cooling water (option water-cooled motor).

6.9 Shipboard operation

When operating the machine on board of ship, pay attention to the installation guidelines issued by the respective classification societies.

When using ship wiring cables, cable entry must be by means of marine-type glands.

6.10 Connecting the control**Connecting the electrical connections**

- Comply with the local regulations governing electrical installations and utilities.
- The frequency and voltage of the power supply must correspond to the machine specification.
- Carry out potential equalisation.
- Observe statutory regulations; e.g. in the EU the EC Directives.

Main switch on the control cabinet

Precise information on the position of the main switch on the control cabinet is given in the electrical documentation.

The control cabinet is installed in accordance with the specifications of the plant operator. The position of the control cabinet with the main switch must therefore be taken from the instruction manual of the plant operator.

Positioning the EMERGENCY STOP button

EMERGENCY STOP buttons are located in the control cabinet.

Precise information on the position of the **EMERGENCY STOP** buttons is given in the electrical documentation.

The control cabinet is installed in accordance with the specifications of the plant operator. The position of the EMERGENCY STOP switches must therefore be taken from the instruction manual of the plant operator.

If the control cabinet is not installed in the direct machine environment, additional EMERGENCY STOP switches must be installed on site.

Additional EMERGENCY STOP switches may be required in the plant in which the centrifuge is integrated. They must be installed based on the risk assessment of the plant operator. The EMERGENCY STOP function of the centrifuge must, if necessary, be integrated in a shut-down concept of the plant or of plant components.

6.11 Connecting the feed and discharge line assemblies

Checking the feed line installation

When product feed pipes have been installed by welding, it must be ensured that the inside of the pipes have been deburred and cleaned at the welds.

This work must be carried out by the executing persons or the assigned company after completion of the installation work and must also be documented.

NOTICE

Foreign bodies in the feed installation, e.g. metal fines from welding

If the above is not observed, metal fines can enter the bowl and damage gaskets and other bowl parts.

Downtime of the centrifuge and high repair costs would be the result. GEA Westfalia Separator accepts no liability for damage caused in this way.

➤ Check that all feed lines are clean and deburred.

If the pipes have already been installed and bolted tight, request an acceptance report from the equipment manufacturer confirming that the pipes were deburred, cleaned and tested upon completion of the installation work.

Feed and discharge line assemblies

- Install the feed and discharge lines flexibly to avoid the transfer of vibrations, e.g. by means of U-shaped conduits.
- Close the feed and discharge lines to reduce noise development.
- Valves and pumps must be adapted to the product.
- Install feed and discharge assemblies separately from the centrifuge.
- The feed line must be provided with a shut-off device so as to be able to interrupt the product supply in case of operating malfunctions.
- The feed line should enable uniform product supply with a constant solids content

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7 Settings

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7.1 Adjusting the separation time

The separation time is the time span between two bowl ejections. When using time-dependent automatic control programs, accurate setting of the separation time is only possible if the throughput rate and solids loading in the feed remain constant. If this is not the case, it may be necessary to correct the settings during operation.

The separation time depends on the following factors:

- The preselected operating mode (partial or total ejection mode)
- Solids content of the material to be centrifuged
- The consistency of the solid
- Effective solid space volume of the bowl
- Throughput rate of the separator

Given constant conditions, the separating time can be determined by calculation.

The following times have proven appropriate in practice (examples):

Product	Total ejection	Partial ejection
Heavy oil (HFO)	Max. 2 h	Max. 1 h
Marine diesel oil (MDO)	Max. 2 h	Max. 1 h
Diesel oil (DO)	Max. 4 h	Max. 2 h
Lubricating oil mild (LO)	Max. 4 h	Max. 2 h
High-performance lubricating oil (LO HD)	Max. 2 h	Max. 1 h

7.1.1 Determining the separation time

Example for calculating separating time:

Assuming:	Solid content ⁽¹⁾	p = 0.05 %
	Solid space volume	V = 1,5 l
	Solids holding space given 75 % utilisation	V' = 1,13 l
	Throughput rate ⁽¹⁾	Vo = 2 000 l/h
Wanted:	Separating time	t = ? min

The separating time to be set is calculated as follows:

$$t = \frac{V'}{V^{\circ} \cdot p} \cdot 60 \cdot 100 = \frac{1,13}{2\,000 \cdot 0.05} \cdot 6\,000 = 141 \text{ min} = 1,1 \text{ h}$$

¹⁾ Solids content and throughput rate must be determined on site or taken from the order specification.

7.2 **Setting the pressure setpoint for the operating water**

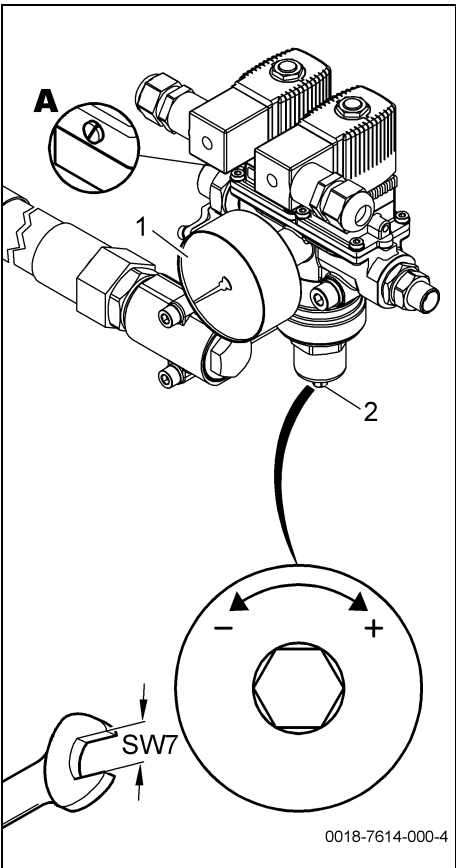


Fig. 47

The preset pressure setpoint is indicated on the manometer (1) and can be corrected by adjusting the setscrew (2) on the pressure regulator.

- Open the solenoid valve for the operating water via the manual override **A**.
- Pressure setpoint is too low:
 - Increasing the pressure setpoint:
 - Turn the setscrew (2) clockwise.
- Pressure setpoint is too high:
 - Decreasing the pressure setpoint:
 - Turn the setscrew (2) counter-clockwise.
- Close again the solenoid valve for the operating water via the manual override (**A**).

SW = jaw span

Set pressure or supply pressure

Pressure range	
with the operating water valve open	2 – 2.5 bar
with closed operating water valve	4-6 bar

7.3 Setting the switching points of the pressure transmitter

The switching points were programmed in the factory.

Factory settings		
Product discharge line		unitrolplus-System
Pressure transmitter PT1		Pressure transmitter PT2
PAL	PAH	PAL
1 bar ⁽¹⁾	3 bar ⁽²⁾	0,5 bar

⁽¹⁾ The product discharge pressure on the pressure gauge (separator) must be 0.5 to 1 bar above the switching point.

⁽²⁾ The product discharge pressure on the pressure gauge (separator) must be 0.5 to 1 bar below the switching point.

IMPORTANT: Please pay particular attention to job-specific settings. See separate instructions "Settings and faults".

7.4 Setting the switching points of the water detector

The switching points are preset at the factory for the specific field of application (e.g. HFO, LO).

8 Commissioning

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8.1 Safety during commissioning

Initial commissioning

Commissioning of the centrifuge after erection and installation may only be carried out by specialists from GEA Westfalia Separator or authorized service partners.

Non-professional execution of commissioning by unsuitable personnel can lead to accidents with personal injury and property damage.

Observe the following points during commissioning:

- Assign only trained and authorized specialists to the task of commissioning.
- Only use water instead of the product during commissioning.
- Eliminate faults during commissioning immediately, e.g. leaky pipe joints.
- Check the function of all safety and protective devices, identify faults and eliminate them immediately.

Before every start-up

Operate the centrifuge after maintenance or repair work only when no defects are present which could endanger safe operation.

The plant operator is responsible for assuring that necessary checks are done carefully.

take care of the following points before starting the centrifuge:

- Check that all screwed connections are tight.
- Check "O" marks.
- Check the disk pressure on disk-type bowls.
- Check the direction of rotation of the centrifuge.
 - The direction of rotation must correspond to the direction of rotation arrow on the frame or solids catcher.
- Check connections, pressures and temperatures of the product, the operating materials and utilities.
- Eliminate all faults detected prior to starting.

8.2 Filling the drive chamber with oil

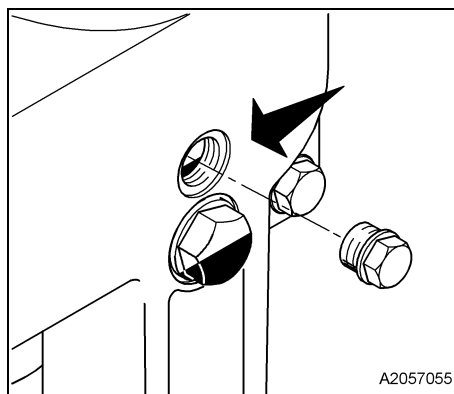


Fig. 48 Example of an oil filling

- Unscrew the screw plug .
- Pour in oil through the filling hole.
 - See chapter "Maintenance / Oil level in the drive chamber"

8.3 Fitting orifice plates, flow indicator, pressure transmitter

One set of orifice plates and one set of commissioning parts are supplied with the separator.

- The set of orifice plates is fastened to the separator hood. The orifice plates have different internal diameters.
- The set of commissioning parts comprises the flow indicator (4) or the pressure transmitter (5).

Installation of an orifice plate enables throughput monitoring of the separator. The effective throughput rate of the separator is specified on the order-specific data sheet.

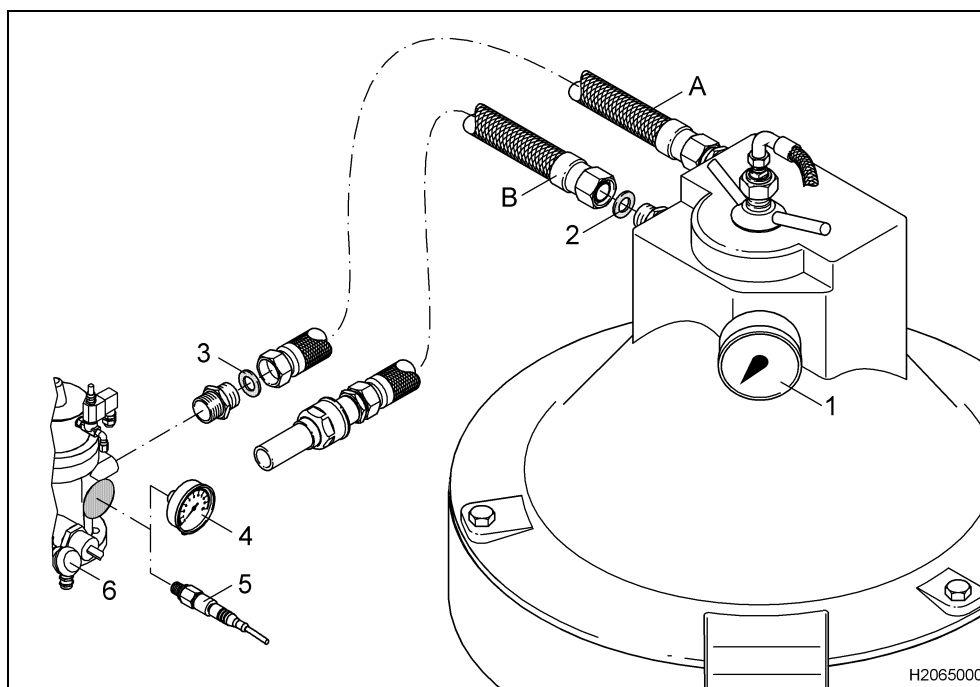


Fig. 49

- A Product feed line
- B Product discharge line
- 1 Pressure gauge
- 2 Orifice plate
- 3 Orifice plate
- 4 Flow indicator (option – for control unit **D10**)
- 5 Pressure transmitter (option – for control unit **E40**)
- 6 3/2-way valve

8.3.1 Fitting the orifice plates

- Select the orifice plates for the product feed line (A) according to the required throughput rate from the set of orifice plates supplied.
 - See chapter "Throughput monitoring" or "Throughput detection"
- Select the orifice plates for the discharge feed line (B) according to the required throughput rate from the set of orifice plates supplied.
 - See chapter "Pressure control"
- Install the orifice plates as described on the next page.
 - Orifice plate (3) in the product feed line (A)
 - Orifice plate (2) in the product discharge line (B)

The installation of the orifice plates is explained using the product discharge line B example.

Required material:

- Open-ended wrench
- Lubricating grease

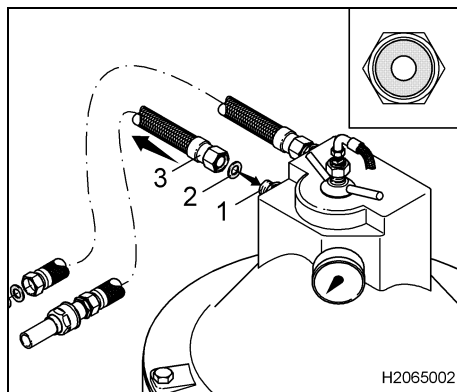


Fig. 50

- Unscrew corrugated hose (3).
- Install the selected orifice plate (2) in the connection piece (1) and press in evenly by hand.

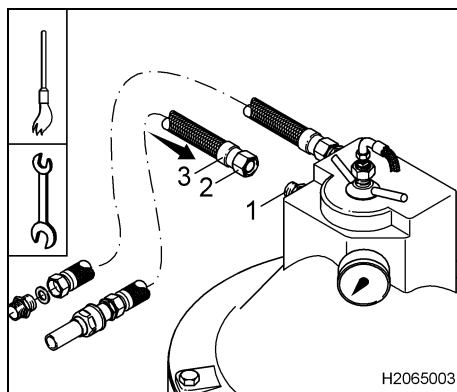


Fig. 51

- Apply a thin coat of grease to the threaded area of the connection piece (1).
- Fit corrugated hose (3) and fasten with hexagon nut (2).

8.3.2 Installing the flow indicator

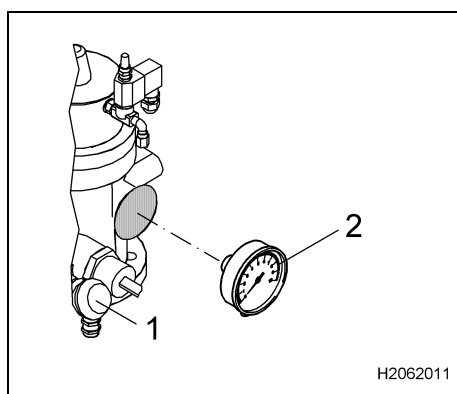


Fig. 52

Only valid when using control unit D10

- Remove the plug from the corresponding bore of the 3/2-way valve (1).
- Secure the thread of the flow indicator (2) with a half-strength screw lock.
- Install the flow indicator (2) in the 3/2-way valve (1).

8.3.3 Installing the pressure transmitter

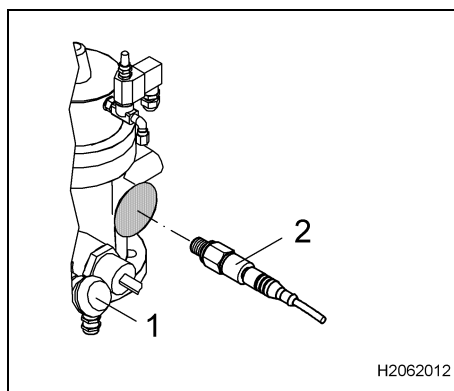


Fig. 53

Only valid when using control unit D40

- Remove the plug from the corresponding bore of the 3/2-way valve (1).
- Install the pressure transmitter (2) into the 3/2-way valve (1) and connect it to the control unit.
 - See circuit diagram.

8.3.4 Throughput monitoring (product line A)

The required inner diameters of the orifice plates for the different throughput capacities are given in the following table:

Flow indicator - Scale: 0 – 10	
Throughput rate [l/h]	Orifice plate inner diameter [mm]
1 000 – 1 400	6
1 400 – 2 200	6
2 200 – 3 300	10
3 300 – 4 800	12
4 800 – 7 000	14
7 000 – 13 000	no orifice plate

When using the control unit D10

- When commissioning, mark the indicated scale range on the flow indicator (4) (Fig. 49) with the supplied sticker.

When using the control unit E40

The effective throughput rate is indicated by the pressure transmitter on the control unit.

Deviations of the throughput rate between the actual value and the setpoint can be adjusted in the control unit.

8.3.5 Throughput detection (product feed line A) - only for control unit D10

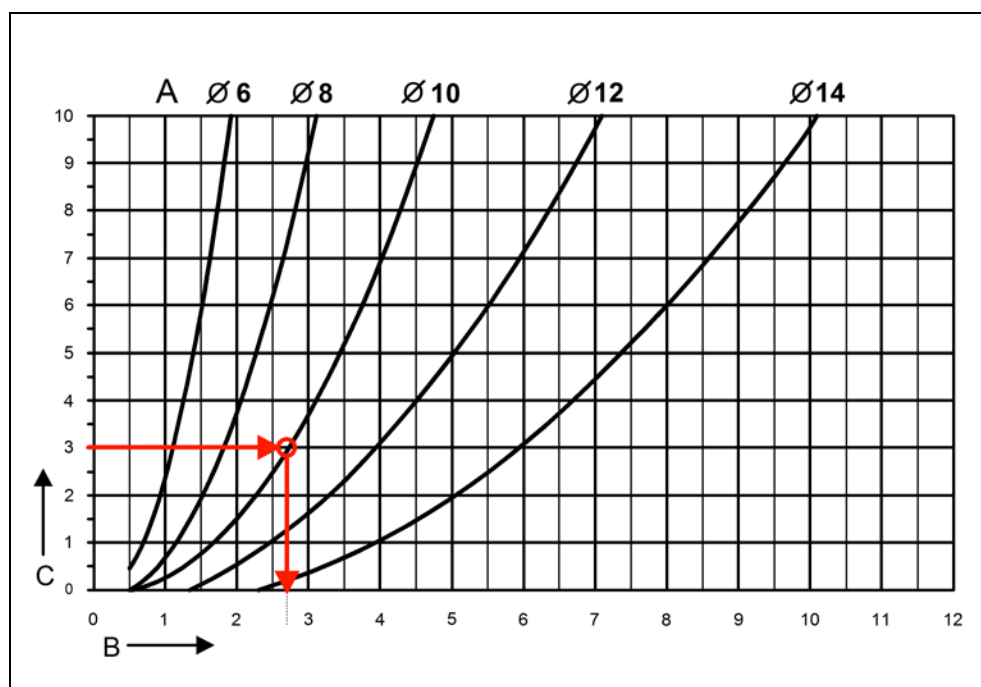


Fig. 54 Diagram for detecting the throughput

- A** Orifice plate inner diameter (mm)
- B** Throughput rate (x 1000 l/h)
- C** Scale range of the flow indicator

The throughput rate of the separator (volume of product fed per unit of time) can be determined with the aid of the diagram.

Procedure:

- Read off the scale value on flow indicator (4) (Fig. 49).
- Take the scale value (e.g. **3**) in the diagram and move up to the horizontal position of the curve of the installed orifice plate diameter **A** (e.g. Ø 10).
- Read the throughput rate **B** on the vertical axis: e.g. 2.7 (= 2 700 l/h)

The accuracy of the throughput detection depends on the following characteristics of the product:

- Viscosity
- Temperature
- Density

The above characteristics can result determination variations of the throughput rate.

8.3.6 Pressure monitoring (product discharge line B)

The pressure in the product discharge line is indicated on pressure gauge (1) (Fig. 49).

- Observe the factory set values for the switching points. See chapter "Settings / setting the switching points of the pressure transmitter".

The required inner diameters of the orifice plates for the different throughput capacities are given in the following table:

Pressure gauge - Measuring range: 0 – 10 bar	
Throughput rate [l/h]	Orifice plate inner diameter [mm]
1 000 – 1 800	6
1 800 – 2 800	8
2 800 – 4 300	10
4 300 – 6 300	12
6 300 – 9 100	14
9 100 – 13 000	no orifice plate

8.4 Checking the starting time of the bowl

- The target values for starting time and operating speed are specified in the order-specific datasheet.
- Make sure that the bowl reaches the specified operating speed within the starting time.

8.5 Checking the run-down time of the bowl

The run-down time of the bowl is the maximum time span required from switching off the centrifuge to standstill of the bowl. It can be found in the datasheet.

The run-down time specified in the datasheet refers to the operating speed with free run-down and at atmospheric pressure. The operating speed is specified on the nameplate of the centrifuge

Mechanical or electrical brakes and various process factors can influence the run-down time of the bowl.



Danger to life through high-speed rotating machine parts !

There is a risk of serious injury due to being pulled into the machine and through ejection of machine parts or product residues.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- wait until the run-down time has elapsed, see data sheet.
- Secure the machine against unintentional switching-on.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to 2 hours.
- Check and ensure that all machine components are at standstill, see chapter "Maintenance / Standstill check of the rotating machine parts".

8.6 Checking the direction of rotation of the bowl

The bowl must rotate in clockwise direction when viewed from above.

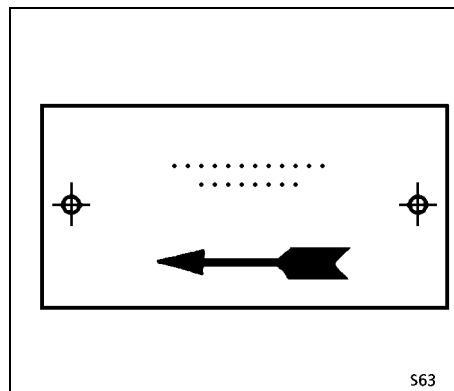


Fig. 55

The direction of rotation of the bowl must correspond to the direction of rotation arrow on the frame, the solids catcher or the motor.

If this is not the case, the electrical connection must be checked.

DANGER

Danger to life through electric voltage

Danger to life and limb through electric shock.

- The electrical connection of the three-phase AC motor may only be performed by authorized specialists, e.g. electricians and high voltage electricians.
- Power must be cut off to the connections and it must be ensured that it cannot be switched back on.

8.7 Checking the bowl speed

When must the bowl speed be checked?

- Before the first start-up.
- When drive parts are replaced that impact the speed, e.g. belt pulleys or gear-wheels.

NOTICE

Damage to the roller bearings during the test run without fitted bowl

If the centrifuge is operated without fitted bowl, this results in damage to the roller bearings.

- Do not carry out a test run without fitted bowl.
- Have the speed check done only by a skilled worker.
- Carry out the speed check only when the hood is mounted.
- Check the speed with a suitable measuring device.
 - Contact GEA Westfalia Separator.
- Pay attention to the direction of rotation of the bowl. It must rotate clockwise, see arrow on frame. If this is not the case, an authorized specialist (electrician) must alter the electrical connection at the motor.
- Ensure that the admissible bowl speed is not exceeded during the test run.

8.8 Commissioning check list

Operator: Trained specialist

When must the check list be worked off:

- Before commissioning the centrifuge
- When re-starting after repairs and a long standstill period

IMPORTANT:

- Check the remaining unit components such as hose pipes, sight glasses, etc. for signs of ageing and mechanical damage.
- Replace damaged installation components with new parts immediately.

Documents

Centrifuge manual is available.	
Data sheet is available.	
Spare parts list is available.	
Instruction manuals for optional auxiliary equipment are available, e.g.	
- Control / monitoring	
- Automatic lubricating system (if fitted)	
- Motor	
P&ID is available.	
Order-specific dimensioned drawing is available.	
Lubricating oil table is available.	

Centrifuge

Centrifuge has been installed and assembled to the specifications.	
Bowl is fitted and can be rotated by hand.	
Bowl height and centripetal pump play are adjusted correctly (if required).	
Bowl lock rings are tight as specified.	
Bowl sealing cover is tight as specified.	
Handle connection piece is screwed tight (if applicable).	
Spindle screw is tight.	
Screws for fastening the hood and feed and discharge connections are tight.	
Feed and discharge connections are fitted correctly and the screwed connections are tight (If applicable).	
Sight glasses are tight.	
Frame drains are free.	
Lubricating oil is filled in as per lubrication schedule and oil level is correct.	
Supervisory equipment is mounted complete and connected electrically to the control system (If applicable).	
Limit values for pressurized hoods, concentrate catchers and vessels are set correctly.	
Brake is released (if applicable).	
Cover of lower part of frame is mounted as specified (if applicable).	
Safety stickers are complete, attached properly, are clean and legible.	

Product paths

Feed lines are deburred and cleaned or acceptance report of the plumber.	
Corrugated hoses or compensators are fitted torsion-free (if applicable).	
Product feed is tight.	
The product corresponds to the specifications on the nameplate.	
Operating pressures prevail.	
Temperature is correct.	
Exclude the return of residual liquid from feed and discharge.	

Supply lines

Electrical connections for fittings are properly connected.	
Lubricating oil lines are connected (only in the case of external lubricating oil unit).	
Operating water and control air are connected and open (if applicable).	
Operating liquid and filling and displacement liquid are connected and open (if applicable).	
Compressed air as specified in the data sheet prevails at the pressure reducer (If applicable).	
Cooling liquid for slide-ring packings is connected (if applicable).	
Ignition shield gas is connected (only on machines in explosion-hazarded areas and inert gas as explosion protection).	

Cooling and flush liquid (if applicable)

Cooling liquid lines to the oil circulation lubrication systems are connected and open.	
Liquid pressure in the cooling system is limited to the max. value (see data sheet).	
The flush liquid lines are connected and operational.	

Control unit

Electrical connections have been executed professionally.	
Protective devices function, e. g. light barriers or switches on protective covers.	
Turbidity meter for ejection control functions (if available).	
EMERGENCY STOP and EMERGENCY OFF buttons are in the intended places and are functioning.	
Supervisory equipment is connected and functions, e.g. speed monitoring, vibration monitoring, temperature monitoring, flow meters, oil flow monitoring, temperature and pressure indicators.	
The bowl speed is correct.	
Starting time of the bowl is correct.	
The switch-on point of the oil pump is correct (if applicable).	
Safety switching circuits and alarms have been tested and are functional.	

Drive motor

Transportation locking device has been removed (if fitted).	
The motor has been correctly assembled.	
Connection values on the motor nameplate match the specifications on the centrifuge nameplate and the connection values of the local power supply.	
Electrical connection has been executed professionally.	
Direction of rotation of the bowl is correct.	

8.9 Performing a test run

IMPORTANT! Commissioning entails risks since hidden faults may not emerge until the centrifuge is started.

pay attention to the following points during the test run.

- Perform the commissioning test run with water or an inert medium.
- Test the centrifuge only with cold water if possible.
- If the test run is carried out with product, wear the prescribed protective gear.
- Check the ejection system and ejection volume.
- Check that the program times have been adjusted on the control unit in accordance with the operating conditions. Refer to the control unit manual.

Carry out the test run as follows:

- Start the centrifuge, see chapter "Operation / Switching on the separator".
- Feed water to the centrifuge.
- Check the tightness of the bowl through the sight glass on the ejection vessel or at the outlet of the ejection vessel.
- Ensure that the bowl does not overflow due to an excessively high centripetal pump discharge pressure.
- Check the installation for leaks.
- If unusual noises occur, shut down the separator immediately.

Proceed as follows when the bowl leaks:

- When the bowl leaks, stop the operating mode with water.
- Press the <Total ejection> function key.
- Refill bowl with water and check again for leaks.

Bowl still leaks.

- Press the <Total ejection> function key.
- Allow bowl to warm up for max. 15 minutes without adding water.
 - This will make the polyamide seal adapt to the counter-surface of the ejection system.
- Then fill the bowl with water again and check for leaks.

If the bowl nevertheless continues to leak:

- Shut down the separator.
- Dismantle the bowl after it has come to a stop and check it (polyamide gasket, gaskets in bowl hydraulic system etc.), see chapter "Servicing / Dismantling the bowl".

8.10 Preparing for re-starting

Before a prolonged shut-down of the centrifuge, various storage measures have been carried out. Machine parts have been dismantled and stored separately, e.g. the bowl.

Permanent corrosion protection for drive parts with the specified slushing oil can be guaranteed for a maximum of 1 year.

When the centrifuge is put back into operation after a long standstill period, the following operations and tests must be performed:

- remove packaging and covers.
- Strip down the bowl and check the bowl parts for corrosion damage. In case of doubt, have the bowl parts checked by service personnel from GEA Westfalia Separator.
- If the centrifuge has been stored for longer than one year, replace the drive roller bearings as specified in the "Maintenance schedule", see chapter "Servicing / Assembling the spindle assembly".
- Prior to fitting, check the gaskets for damage and brittleness and replace if necessary. If the centrifuge has been stored for longer than one year, replace all gaskets. For fitting, see the corresponding sections in the chapter "Servicing".
- Re-assemble the bowl, see chapter "Servicing / Assembling the bowl".
- Drain the remaining slushing oil from the gear chamber and thoroughly clean the gear chamber.
- Top up the gear oil in accordance with the specifications in the chapter "Servicing / Lubrication". See the separate datasheet for the required oil quantity.
- In the case of centrifuges with an external lubricating oil unit, fill it in accordance with the instructions in the external lubricating unit manual.
- Remove the bowl hood, take off the neck bearing splash cover and uncover the spindle end.
- Fit the bowl, see chapter "Servicing / Assembling the bowl".
- Check the bowl height, see chapter "Servicing / Bowl height".
- Mount and fasten the bowl hood, see chapter "Servicing".
- Let the bowl run with fitted bowl for 10 minutes to ensure that the lubricating oil reaches all bearing points.
- Fit the feed and discharge connections, see chapter "Servicing".
- Check water shut-off devices for functionality and leakage.
- Re-connect the water lines if they were disconnected before decommissioning.
- Open the operating water feed at the main connection if applicable.
- Open valves for product feed line and discharge lines.
- If appropriate, carry out a test run with water as described in the section "Start-up / Performing a test run".

8.11 Start the centrifuge at operating state temperature

Centrifuges with three-phase AC motors which are controlled by a frequency converter can be re-started at all times. This does **not** apply for motors featuring controlled torque starting.

NOTICE

Heating on centrifuges with motors for controlled torque starting

A centrifuge with motor for controlled torque starting is started with a high current consumption. This can result in overheating of the coupling and the three-phase AC motor.

- Do not re-start centrifuges with motors for controlled torque starting at operating state temperature until after a cooling off time of 60 minutes.

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9 Operation

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9.1 Safety during operation

Operating a centrifuge can involve risks when the operator does not operate the centrifuge correctly in accordance with its intended use.

The plant operator is responsible for ensuring that necessary checks are done carefully and that suitable personnel are deployed.

- Comply with the operating instructions.
- Only operate the centrifuge if there are no defects that could impair safe operation.
- Only operate the centrifuge for the intended purpose and in accordance with the agreed process conditions.
- Only operate the centrifuge at the bowl speed specified on the nameplate and in the data sheet.
- Use only qualified personnel, see chapter "Safety precautions / Qualification of the personnel".



Fig. 56

- Wear ear protection.

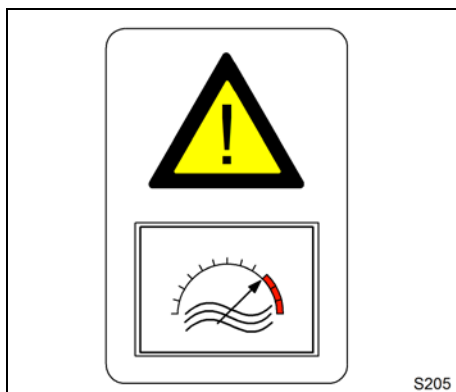


Fig. 57

In case of frequency converter operation:

- Never manipulate the frequency converter to exceed the permitted bowl speed (see nameplate).
- The centrifuge may only be operated with an independent device for speed limitation.



Fig. 58

Some plant components can get very hot.

- In normal operating conditions, this applies, for example, to the bearing housing.
- In hot operating conditions, this particularly applies to parts coming into contact with the product (e.g. pipes and hoses, traps).
- Warning signs must be attached to the machine to protect personnel if the hot surfaces are in an accessible area.

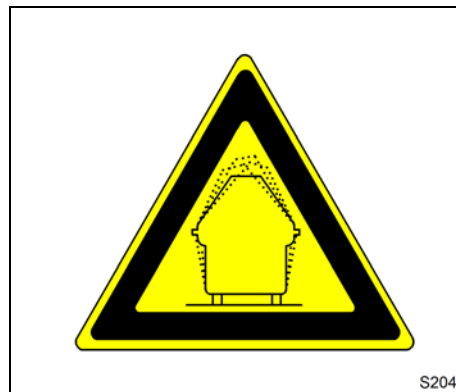


Fig. 59

- Shut down the centrifuge immediately if unusual noises, vibrations or overheating occur.
- Evacuate the room and do not re-enter the room until the centrifuge has come to a standstill.

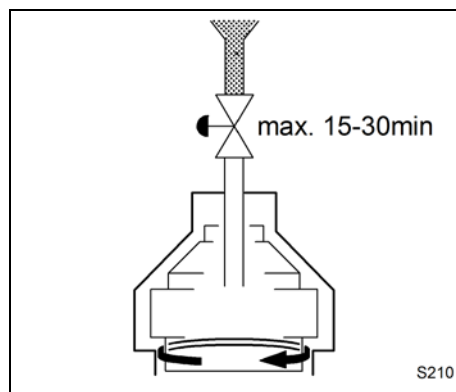


Fig. 60

- The bowl is not allowed to run for more than 15 to 30 minutes without a supply of liquid, otherwise overheating of the bowl material may result.



Fig. 61

- Do not feed product that is subject to explosion protection (see data sheet for agreed product)
- Do not deploy the centrifuge in zones classified as explosion hazardous.

9.2 Immediate action in case of power outage

In the event of power outage, the centrifuge runs down to standstill.

If the installation is not shut down automatically by the control, the operator must do the following:

- Close valve at product feed.
- Open the discharge to the sewer and all other discharge valves.
- Open the shut-down water valve, if fitted.
- Drain ejection systems completely if fitted.
- Switch off the separating program.
- Secure the drive motor against unintentional switching-on.
- Cooling water / sealing medium must be available for the slide-ring packing (if present).

Nozzle separators

Even in the case of a power outage, the minimum quantity of water required for a nozzle separator must be supplied. This quantity of liquid depends on the bowl speed and the resulting nozzle capacity, see chapter "Operation / Quantity of shut-down liquid during a power outage". One possibility of ensuring the availability of nozzle liquid even without pumps is, for example, the installation of a high tank. Responsibility for provision of an adequate shut-down liquid volume lies with the plant operator.

After a power outage

Before the centrifuge can be re-started after a power outage, the service personnel must carry out the following operations:

- Open, check and clean the bowl, see chapter "Servicing".

9.3 Avoidance of solid deposits in the hood

Soiling of the hood inner contour negatively impacts the heat transport out of the hood chamber and must therefore be avoided. In extreme cases, contact or grinding of the bowl with the deposits can occur. This is then accompanied by extremely strong heat generation and can result in substantial damage to the machine in a very short period of time.

Depending on the product properties and operating mode, this risk may be more or less pronounced. Therefore, pay attention to the following points to avoid the corresponding risks.

- never operate the separator when significant deposits are present in the hood and/or in the solid catcher.
- Be sure to avoid operating states in which product can enter the hood (e.g. bowl overflow).
- If the hood is equipped with flushing devices, adapt the flushing frequency and intensity to the respective product properties to avoid deposits or to flush away residues already present.
- To avoid soiling the hood, CIP must be carried out regularly. In this connection, note that the hood is flushed with cleaning agents through the targeted use of bowl overflows.
- Activate hood and catcher cooling if fitted.
- If necessary, firm residues must be removed manually from the hood and/or the solid catcher.

- Check the interior of the hood regularly for cleanness. The frequency of such checks and cleaning depends on the tendency of the product to form firm deposits as well as on the operating mode of the separator.
- In the event of increased current consumption, or if unusual noises occur, be sure to check the hood chamber for deposits and remove them if present.

9.3.1 Avoiding one-sided solid deposits in the bowl.

In the case of self-cleaning separators, it cannot be ruled out that the solids to be discharged lose their flowability due to an excessively high concentration. This can lead to a situation where partial and/or total ejections take place unevenly and one-sided product deposits form in the bowl which can cause inadmissibly high machine vibrations.

It is therefore essential to ensure that the solid consistency allows an even solid discharge. For this purpose, the solids to be discharged must be kept free-flowing through corresponding adjustment of the ejection frequency and volume. The resultant admissible concentration of the solids depends on its rheological properties (deformability, flowability) and must consequently be checked regularly.

This operating mode is necessary for safe operation of the separator and has priority over potential product losses.

9.4 Operation time without product feed

The bowl heats up due to the air friction after a separator starts rotating at operating speed.

This heat must be dissipated by the liquid supplied.

Cooling with stopgap water must take place after 15 minutes of separator operation with no supply of liquid. The bowl filling volume as a minimum must be replaced once every 15 minutes. See data sheet for bowl filling volume.

Cooling water / sealing medium must be available for the slide-ring packing (if present).

9.5 Monitoring operation

In addition to constant monitoring of operations at control stations and in control rooms or online monitoring, regular inspection rounds must be carried out.

During operation monitoring and daily inspection rounds, especially during the first 1500 operating hours, the following must be observed:

- OIL LEVEL
- Temperatures
- Pressures
- Check the pipe joints and hoses for leaks.
- Vibrations
- Current consumption
- Starting time
- Check the separating result (product, solids) in terms of quality and quantity.
- Check personnel-occupied areas of the centrifuge for cleanliness.

IMPORTANT:

- Regularly check plant components such as hose pipes, sight glasses for signs of aging and mechanical damage.
 - Replace damaged installation components with new parts immediately.
- In the event of damage or deviations, inform the service personnel of GEA Westfalia Separator.

9.6 Monitoring vibrations

The automatic vibration monitoring unit protects the centrifuge from excessive vibrations. When preset limit values are exceeded, error messages and follow-up measures are output.

When limit value 1 (preliminary alarm) is reached and remains for 5 minutes, the centrifuge is shut down automatically. When limit value 2 (shut-down) is reached or exceeded, the centrifuge is shut down automatically.

- Interpret faults, identify and remedy faults with the aid of chapter "Troubleshooting".
- Notify service personnel for troubleshooting if necessary so that the necessary action can be taken.
- In case of doubt, inform the service department of GEA Westfalia Separator and discuss further measures.

9.7 Using sight glasses safely

Sight glasses subjected to pressure can burst. Glass fragments flying around can damage eyes. Aggressive cleaning liquids attack the sight glass material and can damage it. Discharging hot liquids can cause skin burns.

- When optional sight glasses are used in pipes and centrifuges, do not exceed the permitted pressures.
- Carry out regular checks for wear on sight glasses in product lines through which CIP liquid is fed (option).
- Wear personal protective gear.

9.8 Cleaning the centrifuge after operation and preventing corrosion

Centrifuge bowls are made of high-strength stainless materials, so under normal circumstances, have adequate protection from corrosion attack by the customary media.

Nevertheless, it is never possible to rule out corrosion attack completely, especially if there is contact with aggressive liquids such as acids, lyes or even water containing salt. This effect is exacerbated further if this contact is accompanied by elevated temperatures and prolonged contact times.

In this context, it is therefore of key importance that centrifuges are adequately flushed or cleaned immediately after contact with corrosive media. This also applies to times when the centrifuge is at a standstill, as it is in this situation, particularly, that residues of liquid can dwell in edges and cracks.

We are unable to accept any warranty if corrosion damage occurs.

9.9 Technical information

Pay attention to the sections below.

9.9.1 Separation

Procedure:

- Select the desired operating mode on the control unit.
- Set the separating time on the control unit.
- Starting the separator.

9.9.2 General information on bowl ejection

The bowl is ejected automatically at full speed during the program sequence.

The timing for ejection is determined by the following factors:

- Preset separation time
- or
- Filling level of the bowl, if:
 - SMS was selected on the control unit.
 - The filling level of the bowl is reached before the separation time has expired.

For determining the separation time, see chapter "Settings / set separation time".

Ejection sequence

- Separating time has elapsed.
- Product feed valve is closed.
- Displacement water pushes the light phase over to the clean oil side (option).
- Operating water opens and closes the bowl hydraulically at full bowl speed.
- Waiting time for speed recovery.
- Filling water supply (option)
- Product valve is opened.
- Separating time resumes.

Displacement (optional)

- During separation, the loss of product, which results each time ejection occurs, can be reduced to a minimum if the product is displaced from the bowl by water before the solids are ejected. This is particularly important if the product is of high value.
- The duration of the displacement of water supply can be found in the overview of the timer. Refer to operating manual of control unit.
- If the displacement time is too long, water will exit from the light liquid outlet.
- If the displacement time is too short, part of the product remains in the bowl and is lost during ejection.

Flush ejection

Solids are not completely ejected under the following circumstances.

Cause	Remedy
Dwell time in the bowl is too long.	➤ Shorten the separating time.
Solids adhere too firmly to the wall of the solids holding space due to their compensation.	➤ Follow total ejection with a flush ejection. - Re-fill the bowl with water or product and then eject the contents again.

Program control

- "Displacement", "ejection" and "flush ejections" at precisely defined intervals are carried out with the automatic control unit for the best results.
- The clean oil discharge and water discharge can be monitored.
- Faults can be signalled visually or audibly.

9.10 Before every start-up

This section gives only general instructions for operating the separator. For this reason, be sure to refer to the project-specific documents.

- In addition, pay attention to:
 - Instruction manual of control unit.
 - Instructions on "Settings and faults".
 - Only feed product which conforms to the specifications on the nameplate.
- Pay attention to the safety precautions for operation.

Check the following points:

- Sight glasses in the frame for observing the drive belt are clean.
- Sight glass in the frame for observing the oil fill level is clean.
- Drive chamber is filled with oil, see chapter "Maintenance / Lubrication schedule".
- The machine has been correctly mounted.
 - Tighten the bowl lock ring securely (**left-hand thread**).
 - Tighten the spindle screw to the separator-specific torque (**left-hand thread**).
 - Tighten the centripetal pump chamber lock ring or centripetal pump chamber cover securely (**left-hand thread**).
- The hood has been correctly mounted.
- The handle connection piece is tightly bolted to the centripetal pump.
- The hoses and hose pipes (1) are not damaged and connected.
- The feed and drain pipes are connected.
- The monitoring equipment is complete as well as mechanically and electrically functional.
- The product and supply lines are ready for operation.
 - Observe air and water pressures. See order-specific operating data sheet.
- Product heating facilities are ready for operation (if available).
 - Observe volume, pressure and temperature. See order-specific operating data sheet.
- System parts such as valves, water pressure reducer, compressed air unit etc. are ready for operation.
- The motor has been correctly assembled.

IMPORTANT:

- Check the remaining unit components such as hose pipes, sight glasses, etc. for signs of ageing and mechanical damage.
- Replace damaged elements immediately.

9.10.1 Before the first start-up after maintenance and repair

IMPORTANT: Danger to operating safety of the separator as a result of long standstill or storage times.

- Observe the recommended maintenance intervals.

If the bowl has been out of commission for more than 6 months:

- Check all bowl parts in accordance with the maintenance schedule and replace when necessary.
 - See table "Maintenance every 4000 operating hours / or after 6 months at the latest"

If the separator has been out of commission for longer than 12 months

- Check all bowl parts in accordance with the maintenance schedule and replace when necessary.
 - See table "Maintenance every 8000 operating hours / or after 1 year at the latest".

If the separator has been out of commission for longer than 24 months

- Replace all bowl parts in accordance with the maintenance schedule.
 - See table "Maintenance every 8000 operating hours / or after 1 year at the latest".

Check the following points:

- Sight glasses in the frame for observing the drive belt are clean.
- Sight glass in the frame for observing the oil fill level is clean.
- The gearbox is filled with oil.
- The cover on the lower part of the frame has been correctly mounted.
- Bowl height has been set correctly.
- Brake housing is mounted correctly (if applicable).
- Release the brake by turning the handle clockwise (if fitted).
- Bowl can be rotated by hand.
- The machine has been correctly mounted.
 - Tighten the bowl lock ring securely (**left-hand thread**).
 - Tighten the spindle screw to the separator-specific torque (**left-hand thread**).
 - Tighten the centripetal pump chamber lock ring or centripetal pump chamber cover securely (**left-hand thread**).
- The hood has been correctly mounted.
- The handle connection piece is tightly bolted to the centripetal pump.
- The hoses and hose pipes 1 are not damaged and connected.
- The feed and drain pipes are connected.
- The monitoring equipment is complete as well as mechanically and electrically functional.
- The product and supply lines are ready for operation.
 - Observe air and water pressures. See order-specific operating data sheet.

- Product heating facilities are ready for operation (if available).
 - Observe volume, pressure and temperature. See order-specific operating data sheet.
- System parts such as valves, water pressure reducer, compressed air unit etc. are ready for operation.
- Motor has been connected correctly.
- The motor has been correctly assembled.

9.11 Starting the separator

- Switch on the control unit.
- Switch on motor.
 - Make sure that the bowl reaches the specified operating speed within the starting time.
 - The target values for starting time and operating speed are specified in the order-specific data sheet.
 - **For control unit D10:** The run-up phase of the motor is signalled by the slow flashing of the LED in the <Status Separator> button.
 - **For control unit E40:** The run-up phase of the motor is displayed by a graphical representation of the motor in the control unit. Observe the color scheme for <motor acceleration and deceleration> in the operating manual of the control unit.
- Switch on the product feed pump (if installed).
 - Ensure that the product feed valves to the suction and pressure side are open.
 - **IMPORTANT:** Before the first start-up after maintenance and repair work check the direction of rotation of the product feed pump..
 - The direction of rotation of the product feed pump is correct if the fan wheel of the pump motor is turning clockwise.
- Start up pre-heater (if installed).
 - Steam or thermal oil feed valves and discharge valves are open.
 - Electric pre-heater is switched on.
- Open the product discharge valve in the product discharge line (if installed).

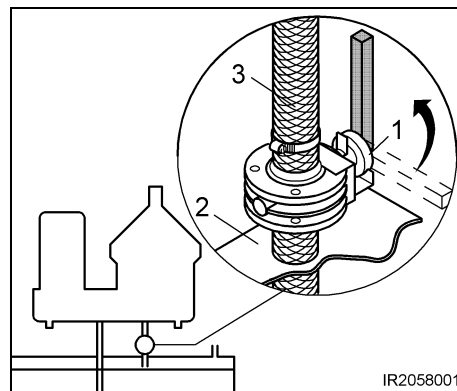


Fig. 62

- Open the shut-off flap in the solids discharge (if installed).

- 1 Shut-off flap
- 2 Solids tank
- 3 Solids discharge

- Start the program.

Pre-conditions:

- Permanent lighting of the LED in the <Status Separator> button.
- The specified separating temperature has been reached.
- A release for the solids tank has been given (filling level switch **LSHH**).
- The solids tank is empty.

After the product feed valve has opened automatically:

- Set the back pressure in the product discharge line to approx. 1.5 – 2.5 bar.
 - See order-specific data sheet.
- Adjust the desired throughput rate.
 - Maintain the back pressure in the product discharge line within the range specified.
- **IMPORTANT:** Check the drainage of the solids and waste water.
 - No oil may flow here during the separation process.

9.12 Bowl ejection

Sequence in automatic mode

- Initiate ejection program by pressing the <Process START> button:
 - Product feed is closed (process-dependent)
 - Displacement (process-dependent)
 - Bowl ejection
 - Speed recovery
 - Filling water (process-dependent)
 - The product feed opens again

Sequence in manual mode (in case of an unforeseen stop)

- Close the product feed line.
 - Close the product feed valve manually.
- Bowl ejection:
 - Open operating liquid valve with manual override approx. 2 – 3 seconds.
- Waiting time for speed recovery:
 - approx. 20 – 30 seconds

New separating operation

- Open the product feed valve manually.

9.13 Shutting down the separator

Sequence in automatic mode

- Exit the separation program with the <Process STOP> button:
 - Two total ejections are performed automatically.

Sequence in manual mode (in case of an unforeseen stop)

- Switch off pre-heater (optional).
 - Allow product to run on for a few minutes because the pre-heater carries on heating.
- Close the product feed line.
 - Close the product feed valve manually.
- Product displacement (option):
 - Open the displacement water valve using the manual override.
 - The bowl contents are displaced without loss by opening the displacement water valve.
- Bowl ejection:
 - Open operating liquid valve with manual override approx. 2 – 3 seconds.
- Switch off the separator.
- Switch off the product feed pump (if installed):
 - The product feed pump continues to run (timer 23).
 - The LED in the <FEED> button shows the overrun phase by flashing slowly.
 - The control valves for the thermal oil and steam pre-heater close automatically.

ATTENTION**Damage to the pre-heater**

If the control unit or the control voltage 24 VDC fails, the automatic overrun phase of the product feed pump is disabled.

The product feed pump may never be switched off to the steam shut-off valve without a delay time. The pre-heater may become damaged.

- All heaters (e.g. steam, thermal oil, electric heaters) must be switched off manually.
- Delay switching off the product feed pump when switching it off manually.
- Close the product feed valve in the suction side of the product feed pump (if installed).
- Switch off the motor.
- Wait until the bowl has come to a standstill.

**DANGER****Danger to life due to high-speed rotating machine parts**

There is a risk of serious injury from being pulled into the machine and from machine parts or product residues being ejected.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- Wait until the deceleration time has elapsed, see data sheet.
- Secure the machine against unintentional restart.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to 2 hours.
- Check and ensure that all machine parts are at standstill.

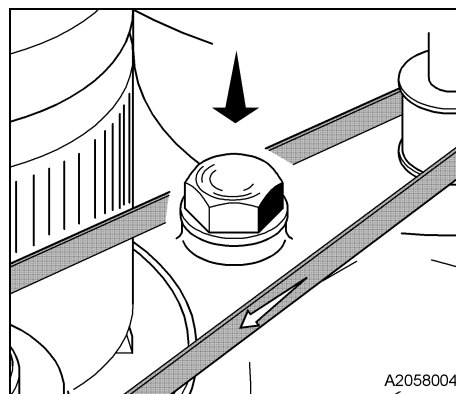


Fig. 63

Bowl standstill is indicated by standstill of the drive belt.

- Shine a torch through the sight glass in the frame and perform a visual check of standstill of the drive belt.
 - Depending on the machine configuration, there may be two sight glasses in the frame.

IMPORTANT:

Applying the brake is ineffective (if installed).

**WARNING****Danger of injury from rotating drive belt**

Touching the rotating drive belt can cause serious injury to fingers.

- Only carry out a visual check to ensure that the drive belt is no longer moving.
- Do not touch the drive belt through the sight glass opening in the frame.

If the sight glass in the frame is not clear:

- Unscrew the sight glass and shine a torch through its opening in the frame.
- Clean the sight glass and screw it back in.

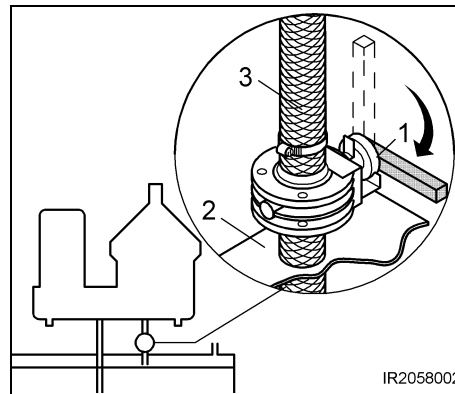


Fig. 64

Only after standstill of the bowl:

- Close the shut-off flap in the solids discharge (if installed).

- 1 Shut-off flap
- 2 Solids tank
- 3 Solids discharge

**Danger of injury from electrical voltage and unintentional start-up of the separator**

Before working on the separator and electrical plant components.

- Isolate all electrically supplied equipment from the power supply using the main switch.
- Secure the plant against unintended restarting with locking devices.

9.14 After shut-down

- Close the manual shut-off valves in the feed and discharge.
- Close utility lines (e.g. operating water and cooling water) of the separator.

9.15 Shutting down self-cleaning separators via EMERGENCY STOP

The EMERGENCY STOP function ensures the functional safety in an emergency or case of risk and ensures the fastest possible halting of processes. All rotating parts are stopped as quickly as possible.

The separator and all auxiliary equipment are not de-energised with the Emergency Stop. The functionality of all components is maintained even at standstill. The voltage must be disconnected manually.

Shut-down via EMERGENCY-STOP can be initiated as follows:

- Automatically
 - By the control unit (vibration stage 2).
 - By the control unit (vibration stage 1 after 5 minutes)
- Manually
 - By pressing the EMERGENCY-STOP button.

The EMERGENCY STOP button is located in the control cabinet. Precise information on the position of the EMERGENCY-STOP buttons is given in the electrical documentation. The control cabinet is installed according to the specifications of the plant operator. The position of the EMERGENCY STOP button must therefore be taken from the plant instructions of the user. After EMERGENCY-STOP has triggered, the centrifuge runs down to standstill.

Avoidance of one-sided deposits in the bowl

In the case of self-cleaning separators, it cannot be ruled out that the solids to be discharged lose their fluidity due to an excessively high concentration. This can lead to a situation where partial and/or total ejections take place irregularly and one-sided product deposits form in the bowl which can cause impermissible high machine vibrations.

It is therefore essential to ensure that the solid consistency allows an even solid discharge. For this purpose, the solids to be discharged must be kept free-flowing through corresponding adjustment of the ejection frequency and volume. The resultant admissible concentration of the solids depends on its rheological properties and therefore must be checked regularly.

This operating mode is necessary for safe operation of the separator and has priority over potential product losses.

Procedure after EMERGENCY STOP triggered

- The product feed valve is closed.
- The shut-down liquid valve is opened if present.
 - The liquid volume is dependent on the machine size and should be 20 x bowl volume / h. Bowl volume, see data sheet.
 - The operating company is responsible for providing a sufficient amount of shut-down liquid.
 - If necessary, route the shut-down liquid to a suitable location by switching the Separator-drainage to sewage as an option.
 - The valve in the separator drain opens. (heavy phase drainage without pressure)
- In the case of a frequency converter with braking option, the separator runs down braked to minimize run-down time.
- As soon as the separator is at a standstill, the message <<Bowl standstill>> is displayed.
- The shut-down liquid valve is closed when the bowl comes to a standstill.

Before re-starting the separator after EMERGENCY-STOP**DANGER****Danger to life due to high-speed rotating machine parts**

There is a risk of serious injury from being pulled into the machine and from machine parts or product residues being ejected.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- Wait until the deceleration time has elapsed, see data sheet.
- Secure the machine against unintentional restart.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to 2 hours.
- Check and ensure that all machine components are at a standstill, see section entitled "Maintenance / Standstill check of the rotating machine parts".

The following operations must be carried out by specialist personnel before re-starting the separator.

- Note the safety precautions when carrying out maintenance and repair work.
- Open, check and clean the bowl.
- Check the drive and replace all defective parts.

10 Trouble shooting

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10.5	Faults - solenoid valve (sensor block)	120

10.1 Safety when eliminating operating malfunctions

Faults during troubleshooting can endanger the operating safety of the decanter. This can lead to accidents with damage to persons and property.

- When troubleshooting, pay attention to and comply with the instructions in the chapter "Servicing / Safety during servicing".
- Determine the source of the fault and inform the responsible departments in the company if necessary. Carry out troubleshooting and fault elimination with care.
- When safety devices on the centrifuge/installation respond, stop operating the centrifuge/installation until the cause has been identified and remedied.
- Ensure that persons are not put at risk through the troubleshooting.
- Observe the local standard operating procedures (SOPs) at the workplace and wear the specified protective gear.
- Cordon off the working area and hang up a warning sign.
- Remove unauthorized persons from the cordoned-off working area.
- Before troubleshooting, all rotating parts of the centrifuge (drive, bowl) must be at a standstill.
- Prior to troubleshooting, switch off the main switches and secure against re-activation.
- Set down dismantled centrifuge parts only on level, anti-slip surfaces, e.g. rubber mat or wooden pallet.
- Secure dismantled centrifuge parts by suitable means to prevent them from overturning or rolling away, e.g. with wooden wedges or square timbers.
- Never weld the bowl, hood or solids catcher.
- Do not machine the bowl, hood and solid catcher.
- Do not climb onto or sit on the centrifuge or parts of the centrifuge.
- Before re-starting, ensure that there is no unbalance due to fouling. Open and clean the bowl prior to start-up.
- Bowls may be balanced only by authorized specialists and authorized workshops.
- After carrying out maintenance and repair work on centrifuges, reattach all protective devices and check the safety devices.

10.2 Faults on the separator

Fault	Possible cause	Action	Target group
The bowl does not come up to the specified speed or takes too long to do so.	Brake applied (if installed).	➤ Release the brake by turning the handle clockwise.	Op
	Product has dripped down along the spindle onto the drive belt; drive belt is slipping on the bowl spindle.	➤ Clean the belt surface of the spindle and flat belt pulley. ➤ Replace the drive belt.	Skilled
	Motor is incorrectly connected.	➤ Check connection.	Tspec
	Not enough clutch shoes fitted (if installed).	➤ Increase the number of clutch shoes. ➤ Make sure that the clutch shoes are evenly spaced.	Skilled
	Drive belt has become stretched and is slipping on the bowl spindle.	➤ Replace the drive belt.	Skilled
	Drive belt has not been correctly fitted.	➤ Check the position of the drive belt on flat belt pulley and bowl spindle.	Skilled
	Liquid or solids have accumulated in the upper section of the frame, this is braking the bowl.	➤ Check the operating water discharge: The liquid must flow off freely. ➤ Clean the inside of the upper part of the frame.	Skilled
Bowl speed drops during operation.	Friction surfaces of the clutch shoes are oily (if installed).	➤ Wipe dry the friction surfaces. - IMPORTANT: Do not use benzene, trichloroethane or other solvents.	Skilled
	Drive belt has become stretched and is slipping on the bowl spindle.	➤ Replace the drive belt.	Skilled
	Motor speed drops during operation.	➤ Check motor and line voltage.	Skilled
If clutch shoes are fitted: Bowl reaches rated speed too quickly (in less than 2 minutes. This results in an unacceptably high start-up current of the motor ($I_{\max} > 2 \times I_N$).	Too many clutch shoes have been fitted.	➤ Reduce the number of clutch shoes. ➤ Make sure that the clutch shoes are evenly spaced.	Skilled

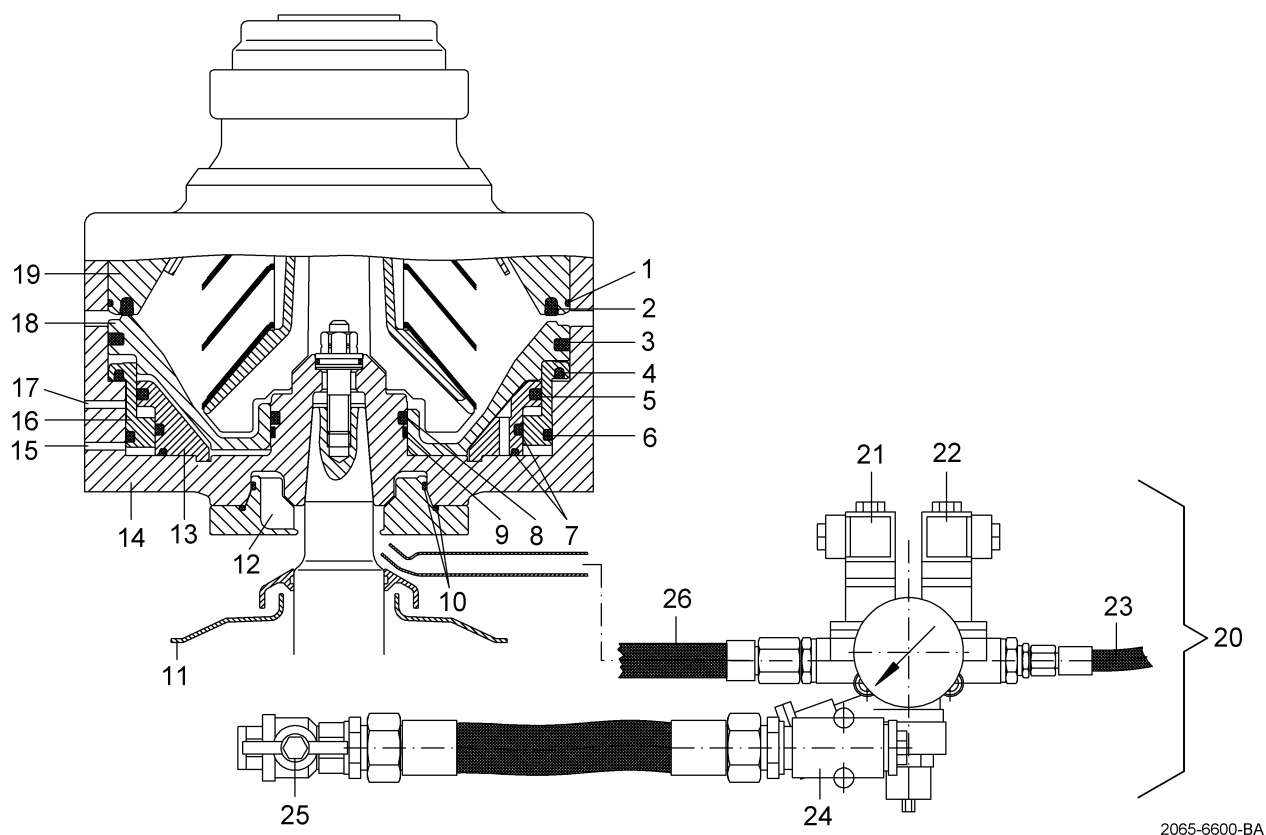
Op = Operator / Spec = Specialist / Tspec = Trained specialist

Fault	Possible cause	Action	Target group
Uneven run of the separator. • Bowl is out of balance.	See following causes.	In any case: ➤ Shut down the separator. - IMPORTANT: The bowl may not be emptied, otherwise the vibrations occurring during run-down will intensify. ➤ Apply brake (if installed). ➤ Close product feed and discharge. If the bowl leaks: ➤ Open the water feed completely.	Skilled
	Solids have deposited unevenly in the bowl and are partially not ejected.	➤ Dismantle and clean the bowl.	Skilled
	Bowl is not correctly assembled or parts of different bowls have been interchanged.	➤ Assemble the bowl in accordance with the instructions in this manual.	Skilled
	The pressure in the disk stack has slackened: • The bowl lock ring is not screwed on as far as the "0" mark. • Too few disks are fitted.	➤ Screw on the bowl lock ring until the "0" marks on the lock ring and bowl bottom are aligned.	Skilled
	Bowl parts are damaged.	➤ Check number of disks, put in an extra disk if necessary.	Skilled
	Bowl parts are damaged.	➤ Send the bowl to the factory for repair.	Tspec
	Roller bearings are worn.	➤ Replace damaged roller bearings.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Note
注释
Noter
Notas
Notes
وتلاحظ
Notater
Notatki
Notizen
Notities
Бележки
Pastabos
Märkmed
Σημειώσεις
Anotaciones
Для записей
Muistiinpanot

10.3 Faults on the bowl



2065-6600-BA

Fig. 65 Bowl and operating water supply unit

- 1 Gasket (bowl top)
- 2 Gasket (bowl top)
- 3 Gasket (sliding piston)
- 4 Gasket (annular piston)
- 5 Gasket (closing chamber bottom)
- 6 Gasket (annular piston)
- 7 Gaskets (closing chamber bottom)
- 8 Gasket (bowl bottom)
- 9 Piston slide ring (bowl bottom)
- 10 Gaskets (water chamber bottom)
- 11 Operating water supply unit
- 12 Injection chamber
- 13 Closing chamber bottom
- 14 Bowl bottom
- 15 Discharge hole
- 16 Annular piston
- 17 Discharge hole
- 18 Sliding piston
- 19 Bowl top
- 20 Solenoid valve block
- 21 Solenoid valve for operating water
- 22 Solenoid valve for filling and displacement water
- 23 Filling and displacement water line
- 24 Strainer
- 25 Shut-off cock
- 26 Operating water line

Fault	Possible cause	Action	Target group
The bowl does not close. • Product flows out of the solids discharge. • Current consumption too high.	Operating water		
	Control unit defective.	➤ Check control unit.	Tspec
	Control unit not set correctly.	➤ Check program parameters and reset if necessary. See control unit documentation.	Tspec
	Operating water pulse too short	➤ Set 1,5 sec (see also documentation of the control unit).	Tspec
	Strainer (24) in the operating, filling and displacement water line is soiled.	➤ Close shut-off cock (25). ➤ Clean the strainer (24).	Skilled
	The feed rate of the operating water is too low.	➤ Check the pipe pressure, increase if necessary. Operating water data: • Pressure 2 – 3 bar (when valve is open) • Volume stream min. 1 800 l/h (gauge the rate by litres) $\cong$ 1,0 l in 3 sec	Skilled
	The operating water line (26) has become constricted due to dirt accumulation or damage. Insufficient operating water is entering the injection chamber.	• Clean or replace the operating water line (26).	Skilled
	The operating water solenoid valve (21) does not open properly.	• Check solenoid valve (21) and replace if necessary.	Skilled
	Bowl hydraulics		
	Bowl hydraulics soiled.	➤ Remove the hood. ➤ Dismantle and clean the bowl. ➤ Clean all boreholes thoroughly. - Thoroughly check drain hole (15) and clean if necessary.	Skilled
	Gaskets, guide strips and piston guide ring are damaged.	➤ Replace all sealing elements. ➤ Use spare parts set "Bowl/hood" (see spare parts catalogue). ➤ IMPORTANT: Only replace the polyamide gasket (5) if it is damaged (time-consuming installation).	Skilled
	Sealing surface of the piston slide valve (18) damaged.	➤ Re-grind the sealing surface of the piston slide valve (max. 1 mm). OR ➤ Send in the piston slide valve for repair.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

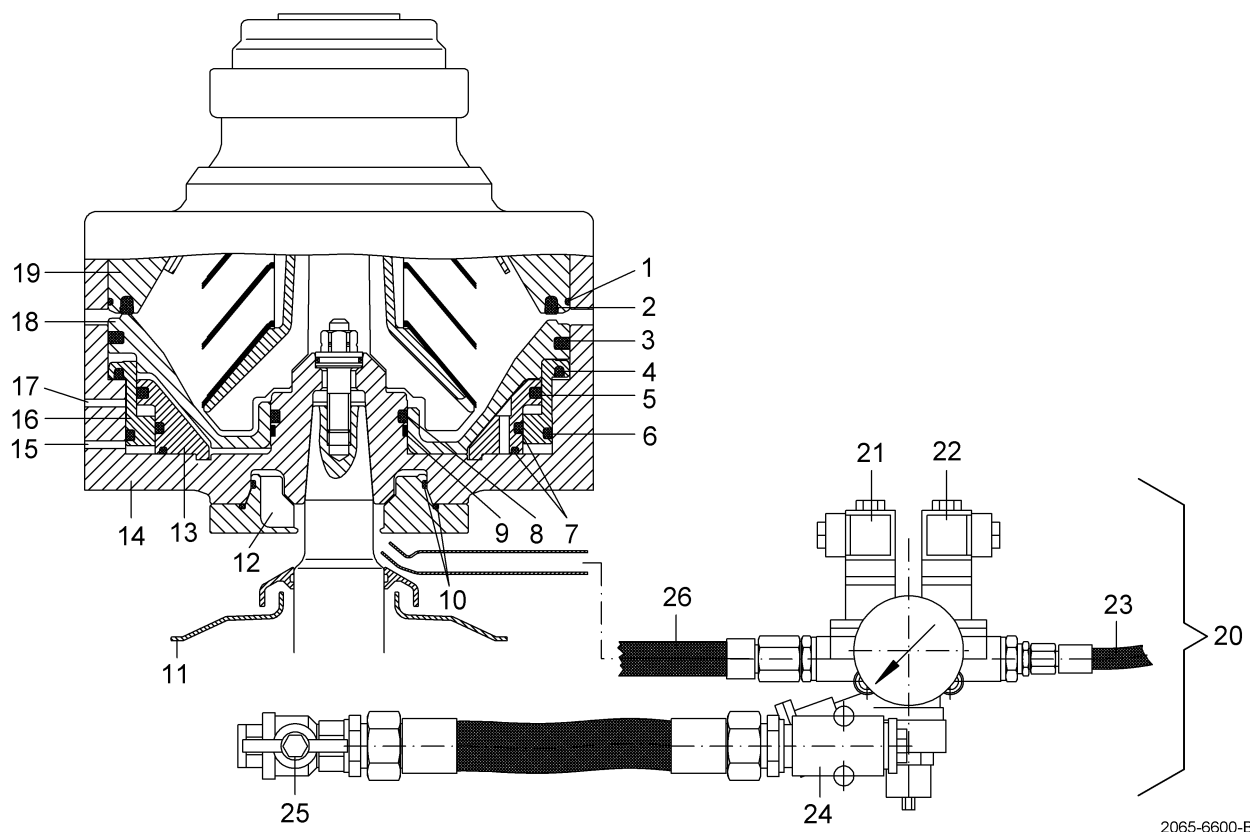


Fig. 66 Bowl and operating water supply unit

- 1 Gasket (bowl top)
- 2 Gasket (bowl top)
- 3 Gasket (sliding piston)
- 4 Gasket (annular piston)
- 5 Gasket (closing chamber bottom)
- 6 Gasket (annular piston)
- 7 Gaskets (closing chamber bottom)
- 8 Gasket (bowl bottom)
- 9 Piston slide ring (bowl bottom)
- 10 Gaskets (water chamber bottom)
- 11 Operating water supply unit
- 12 Injection chamber
- 13 Closing chamber bottom
- 14 Bowl bottom
- 15 Discharge hole
- 16 Annular piston
- 17 Discharge hole
- 18 Sliding piston
- 19 Bowl top
- 20 Solenoid valve block
- 21 Solenoid valve for operating water
- 22 Solenoid valve for filling and displacement water
- 23 Filling and displacement water line
- 24 Strainer
- 25 Shut-off cock
- 26 Operating water line

Fault	Possible cause	Action	Target group
The bowl does not open or does not open fully.	Operating water		
	Control unit defective.	➤ Check control unit.	Tspec
	Control unit not set correctly.	➤ Check program parameters and reset if necessary. See control unit documentation.	Tspec
	Operating water pulse too short	➤ Set 1,5 sec (see also documentation of the control unit).	Tspec
	Strainer (24) in the operating, filling and displacement water line is soiled.	➤ Close shut-off cock (25). ➤ Clean the strainer (24).	Skilled
	The feed rate of the operating water is too low.	➤ Check the pipe pressure, increase if necessary. Operating water data: • Pressure <2 – 3 bar (when valve is open) • Volume stream min. 1 800 l/h (gauge the rate by litres) $\cong$ 1,0 l in 3 sec	Skilled
	The operating water line (26) has become constricted due to dirt accumulation or damage. Insufficient operating water is entering the injection chamber.	• Clean or replace the operating water line (26).	Skilled
	The operating water solenoid valve (21) does not open properly.	• Check solenoid valve (21) and replace if necessary.	Skilled
	Bowl hydraulics		
	Bowl hydraulics soiled.	➤ Remove the hood. ➤ Dismantle and clean the bowl. ➤ Clean all boreholes thoroughly. - Thoroughly check drain hole (17) and clean if necessary.	Skilled
	Gaskets, guide strips and piston guide ring are damaged.	➤ Replace all sealing elements. ➤ Use spare parts set "Bowl/hood" (see spare parts catalogue). ➤ IMPORTANT: Only replace the polyamide gasket (5) if it is damaged (time-consuming installation). ➤ Carefully check the polyamide gasket (5) for tight fit in the groove.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

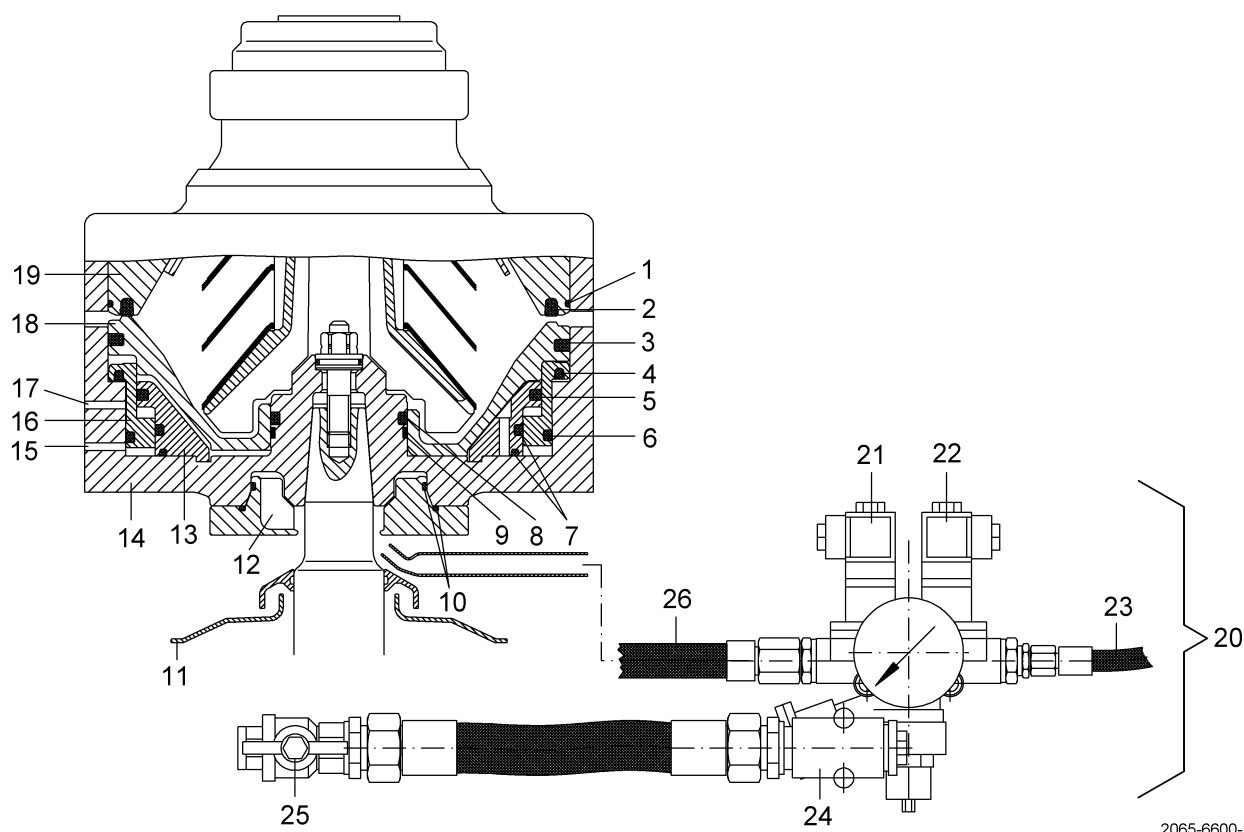


Fig. 67 Bowl and operating water supply unit

2065-6600-BA

- 1 Gasket (bowl top)
- 2 Gasket (bowl top)
- 3 Gasket (sliding piston)
- 4 Gasket (annular piston)
- 5 Gasket (closing chamber bottom)
- 6 Gasket (annular piston)
- 7 Gaskets (closing chamber bottom)
- 8 Gasket (bowl bottom)
- 9 Piston slide ring (bowl bottom)
- 10 Gaskets (water chamber bottom)
- 11 Operating water supply unit
- 12 Injection chamber
- 13 Closing chamber bottom
- 14 Bowl bottom
- 15 Discharge hole
- 16 Annular piston
- 17 Discharge hole
- 18 Sliding piston
- 19 Bowl top
- 20 Solenoid valve block
- 21 Solenoid valve for operating water
- 22 Solenoid valve for filling and displacement water
- 23 Filling and displacement water line
- 24 Strainer
- 25 Shut-off cock
- 26 Operating water line

Fault	Possible cause	Action	Target group
The bowl does not empty completely. Solids remain in the bowl.	The feed rate of the operating water is too low.	➤ Check the pipe pressure, increase if necessary. Operating water data: • Pressure 2 – 3 bar (when valve is open) • Volume stream min. 1 800 l/h (gauge the rate by litres) $\cong 1,0$ l in 3 sec	Skilled
	Preset separation time is too long. • Solids content too high.	➤ Reduce the separating time.	Skilled
The bowl opens during the separation time.	Closing water pulse too short. • Closing water evaporates.	➤ Reset the closing water pulse to 0.1 sec. See control unit documentation.	Skilled
	Closing water pulse is too long. • Closing water pulse opens the bowl.		Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

10.4 Solenoid valve block faults

IMPORTANT:

- Refer to the instruction manual and nameplate of the solenoid valve block.
- Direct intervention in the solenoid valve block is only allowed by authorised specialists and with the proper tools.

Fault	Possible cause	Action	Target group
Solenoid valve does not function.	Control unit defective.	➤ Call service engineer.	Op
	Faulty wire in connecting terminal.	➤ Replace wire.	Tspec
	Connecting terminal loose on terminal strip.	➤ Tighten the screw on the connecting terminal.	Tspec
	Poor contact on the connecting terminal.	➤ Clean contact or replace it.	Tspec
	Coupler socket loose or leaky.	➤ Tighten coupler socket.	Skilled
	Solenoid coil defective.	➤ Replace the magnetic head completely.	Tspec
	Diaphragm defective.	➤ Replace diaphragm.	Skilled
	Strainer in the operating, filling and displacement water line is dirty.	➤ Close the shut-off valve. ➤ Clean the strainer.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

10.5 Faults - solenoid valve (sensor block)

IMPORTANT:

- Refer to the instruction manual and nameplate of the solenoid valve block.
- Direct intervention in the solenoid valve block is only allowed by authorised specialists and with the proper tools.

Fault	Possible cause	Action	Target group
Solenoid valve does not function.	Control unit defective.	➤ Call service engineer.	Op
	Faulty wire in connecting terminal.	➤ Replace wire.	Tspec
	Connecting terminal loose on terminal strip.	➤ Tighten the screw on the connecting terminal.	Tspec
	Poor contact on the connecting terminal.	➤ Clean contact or replace it.	Tspec
	Solenoid coil defective.	➤ Replace the magnetic head.	Tspec
	Diaphragm defective.	➤ Replace diaphragm.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

11 Maintenance

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11.1 Safety during maintenance

Regular maintenance of the centrifuge is crucial in terms of service life, safety and operating readiness. Failure to carry out regular maintenance will result in increased wear, poorer product quality, and higher energy consumption. Increased wear reduces the stability of the components and can lead to severe damage to bowl and drive. This can lead to accidents with damage to persons and property.

Observe the following points to avoid hazards:

- Keep to the specified maintenance intervals even if the operating hours have not been reached.
 - The maintenance intervals apply to standard applications.
- Read off the total number of operating hours on the hour counter to keep to the maintenance intervals.
- In the case of increased load, shorten the service intervals in consultation with GEA Westfalia Separator Service.
 - Increased loads can be generated due to special operating conditions, special products or hot operation.
- Check safety-relevant components regularly, see chapter "Maintenance / Maintenance schedule".

safety-relevant and particularly high stressed parts of the separator are, for example, bowl lock ring, bowl bottom, bowl top and disk stack.

- If a check reveals a fault, correct the fault and put the centrifuge back into operation.
- If a check reveals damage, replace the damaged elements immediately with genuine spare parts from GEA Westfalia Separator.
- If problems arise during maintenance work, consult GEA Westfalia Separator or take advantage of the training opportunities, see chapter "Safety precautions / Personnel and "About this document / Training".

Before all maintenance and servicing:

- Refer to the chapter "safety precautions".
- Shut down the separator in a controlled way via the control.



Fig. 68

- Isolate all electrically supplied equipment from the power supply using the main switch.
- Secure the plant against unintended restarting with locking devices.



Fig. 69

- Wait until the bowl has come to a standstill.
 - See the separate data sheet for the run-down time of the bowl.
- Do not loosen any part of the centrifuge before the bowl has come to a standstill.



Fig. 70

- Do not start maintenance work until all machine parts have adequately cooled down.
 - The cooling down time depends on the product processed and the machine size.
- Check the surface temperature before starting work.

11.2 Preventive maintenance

The product can cause corrosion and erosion damage. Concrete instructions on preventive maintenance are set out below to prevent consequential damage to the separator and associated plant components and to avoid long downtimes.

Corrosion

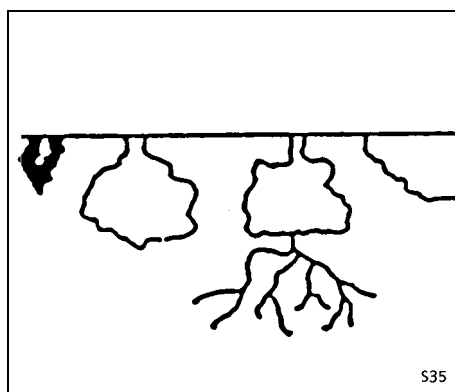
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and They merit special attention.

Corrosion on stainless steel bowl material should be examined thoroughly and documented.

Flat-spread corrosion can usually be measured and results in a reduction of wall thickness.

Pit- or crack-shaped corrosion cannot be measured without using non-destructive techniques. At the initial stage pit-shaped corrosion is generally caused by chloride ions.

Depending on the stressing of the part, pitting corrosion can result in crack formation. This in turn can lead to a loss of strength and the machine is then no longer safe to operate.



Possible formation of pitting corrosion.

Fig. 71

Such pittings can only be investigated by a materials expert.

In case of crack-shaped corrosion attack on bowl parts with or without superposed flat-spread and pit-shaped corrosion, the separator must be shut down immediately.

For a precise examination, contact the nearest representative of GEA Westfalia Separator.

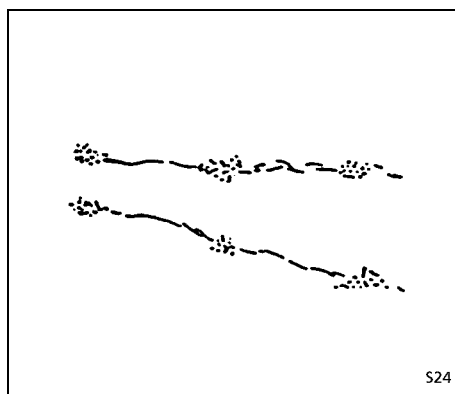


Fig. 72

Pittings

Such pittings should be investigated by a materials expert.

Pittings which are close together or form a linear pattern can signify crack formation beneath the surface.

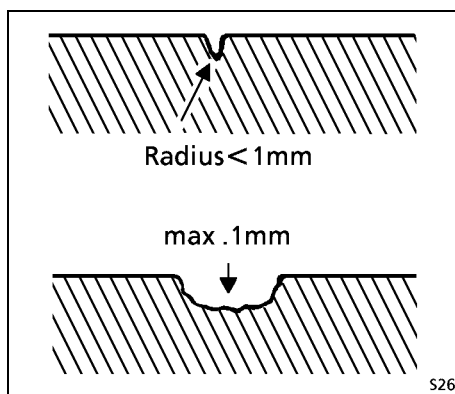


Fig. 73

Corrosion indications which must be notified immediately to the nearest representative of GEA Westfalia Separator.

- The bottom of the corrosion mark has a radius smaller than 1 mm (large notch effect).
- The depth of corrosion mark exceeds 1 mm at the deepest point.

Erosion

Erosion is caused by solid particles in the process liquid.

These solid particles grind marks into the surfaces with which they come into contact.

The following factors favour the occurrence of erosion:

- hard solid particles
- high throughput capacities

The first signs of erosion should be carefully observed and documented. Erosion can deepen rapidly, thereby weakening the high-stressed bowl material. Checks should be carried out at short intervals.

For a precise examination, contact the nearest representative of GEA Westfalia Separator. Information on the nature of the damage can be provided in the form of photos, plaster casts or lead molds.

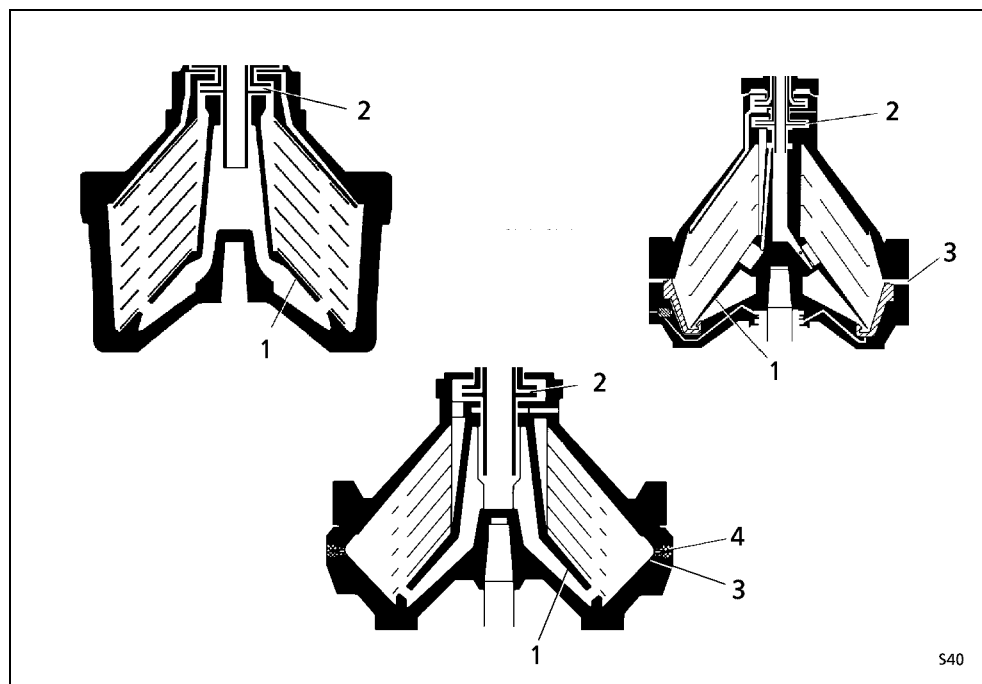


Fig. 74 The surfaces most susceptible to erosion are:

- 1 Underside of the distributor
- 2 Centripetal pump (cavitation)
- 3 Surfaces in the area of the solid discharge ports
- 4 Nozzles

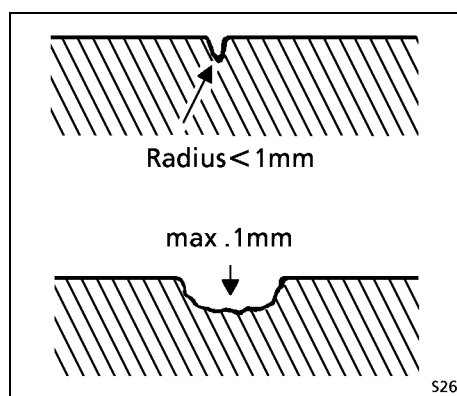


Fig. 75

Erosion indications which must be notified immediately to the nearest representative of GEA Westfalia Separator.

- The bottom of the erosion mark has a radius smaller than 1 mm (large notch effect).
- The depth of erosion mark exceeds 1 mm at the deepest point.

11.3 Regular checks

The centrifuge must be checked regularly to ensure operating safety.

The inspection intervals depend on the field of application and the level of stress and are documented in the instruction manual, see chapter "Maintenance / maintenance Schedule".

In addition, the centrifuge and its supervisory equipment must be checked on the following occasions:

- before initial start-up
- before start-up after a prolonged standstill

The following points should be particularly kept in mind.

- The scope and result of each check must be documented.
- Have the centrifuge assessed at least once a year by a qualified person.

- Have the centrifuge assessed in a dismantled state at least every three years by a qualified person.
- When processing corrosive or erosive products, implement shorter inspection intervals.
- Following unusual events which may have a negative impact on safety, have the centrifuge checked immediately. Unusual events are:
 - Modifications to the centrifuge
 - Accidents
 - Natural events, e.g, earth quakes, sand storm, flooding

11.3.1 Recurring checks on load suspension devices

Load suspension devices must be checked at regular intervals. The recurring check would be limited to a visual check after cleaning.

IMPORTANT: Cleaning agents may not attack the base material or conceal cracks or surface damage.

Pay special attention to the following points:

- Visible deformation of parts, e.g. chain links, threads, carrier bolts, eye bolts etc.
- Cuts, notches, cracks, upsetting deformation of contact surfaces.
- Wear in contact areas.
- Jamming of elements that normally move together.
- Excessive corrosion or discolouration through heat.
- Missing or illegible markings.

Every check or test must be documented and the document must be archived.

NOTE: Damaged or incomplete load suspension devices included in the set of tools must be sent to GEA Westfalia Separator for checking and repair.

11.4 Safety information on the maintenance schedule

Depending on the operating mode, centrifuges are lubricated with different lubricating oils and different lubricating techniques. Correct lubrication ensures the operating safety and reliability of the centrifuge. Mixing different lubricating oils can result in damage to the drive and bearings of the centrifuge and contaminate the product.

- Pay attention to the footnotes in the maintenance schedule and execute only appropriate instructions. See the chapter "Lubrication" or the separate data sheet for information on lubricating oils and lubrication technique.

11.5 Handling instructions for lubricating grease

Product information

The lubricating grease is a fully synthetic, water-resistant adhesive grease for the food and pharmaceutical industries.

This lubricant forms a reliably isolating lubricating film between the components to be mounted and prevents cold shut.

NOTICE

Swelling of EPDM sealing material

When using mineral lubricating grease, swelling of the EPDM gaskets and seals can occur.

- Do not bring gaskets made from the special material EPDM (ethylene-propylene-diene-caoutchouc) in contact with mineral oils and greases.
- Use compatible silicon greases (as per lubrication schedule) for mounting EPDM sealing materials.

Intended use

- during bowl assembly
 - Bowl bottom – threads for bowl lock ring
 - All screwed connections (except for screws with fluid screw sealant)
 - Bowl top – sliding surface for bowl lock ring
 - Threads on the centripetal pump chamber lock ring
 - Sliding surface on the sliding piston (not applicable for EPDM seals.)
- On frame
 - Screwed connections on spindle bearing housing
 - Hub elements / worm wheel shaft – motor shaft
 - All screwed connections
 - Screwed connections for hood
 - Centripetal pump, feed tube, ring (not available for EPDM gaskets).
 - Spring pistons on neck bearing bridges
 - Threads on pipe joints
 - Threads of puller screws / tools

Processing instructions

- Clean surfaces. Remove water, detergent or old grease residues.
- Apply the assembly grease in a thin, closed film to the guide surface.
- Apply a coat of assembly grease to the threads of screwed connections over the entire circumference.
- Pay attention to working hygiene.
 - Re-seal open containers after use.
 - Do not contaminate containers.

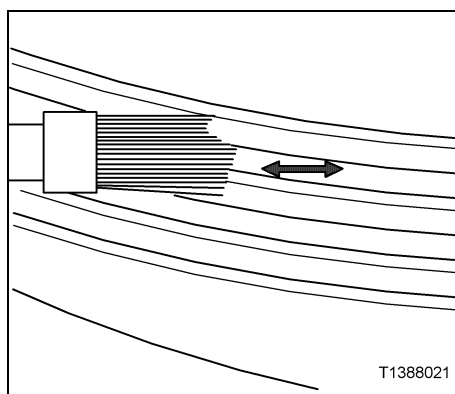


Fig. 76 Example

- Clean and dry the surface of the component.
- Apply the assembly grease with a fine brush.
- Ensure that the lubricating film is thin and closed.

11.6 Handling instructions for silicon vacuum grease

Product information

The silicon sealing grease is a fully synthetic grease on silicon oil basis for the food and pharmaceutical industries. **The** silicon grease is resistant against cold and hot water as well as against disinfectant and cleaning solutions.

The silicon sealing grease is particularly suitable for:

- Assembly of EPDM sealing materials.
- Lubrication of components with material pairing: Plastic/metal, plastic/**plastic, ceramic/ceramic and ceramic/plastic**.
- Press-in and mounting aid for O-ring seals and gaskets (particularly for EPDM gaskets).

NOTICE

Damage to painted or coated surfaces

Silicon sealing grease damages painted or coated surfaces.

- Do not bring silicon sealing grease in contact with painted or coated surfaces; cover the surfaces if necessary.
- Remove surplus grease immediately.

NOTICE

Functional impairment of the bearings

Silicon sealing grease is not suitable for bearings with the pairing steel/steel. The functionality of these bearings is not assured when silicon sealing grease is used.

- Use silicon sealing grease only for roller and slide bearings with the following material pairings:
 - Plastic/metal
 - Plastic/plastic
 - Ceramic/ceramic
 - Ceramic/plastic

Application

- during bowl assembly
 - Sliding surface and sealing surface on the sliding piston when using EPDM seals.
- Frame
 - Gasket on spindle cap
 - Gasket on pipe joints (EPDM)
- In pipe fitting
 - Threads and gasket on sterile unions

Processing instructions

- Clean surfaces. Remove water, detergent or old grease residues.
- Apply the silicon sealing grease in a thin, closed film to the guide surface.
- Pay attention to working hygiene.
- Re-seal open containers after use. Do not contaminate containers.

Example:

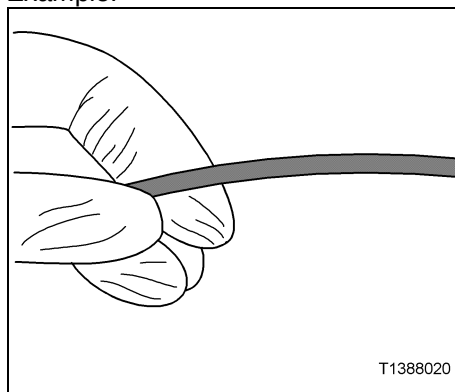
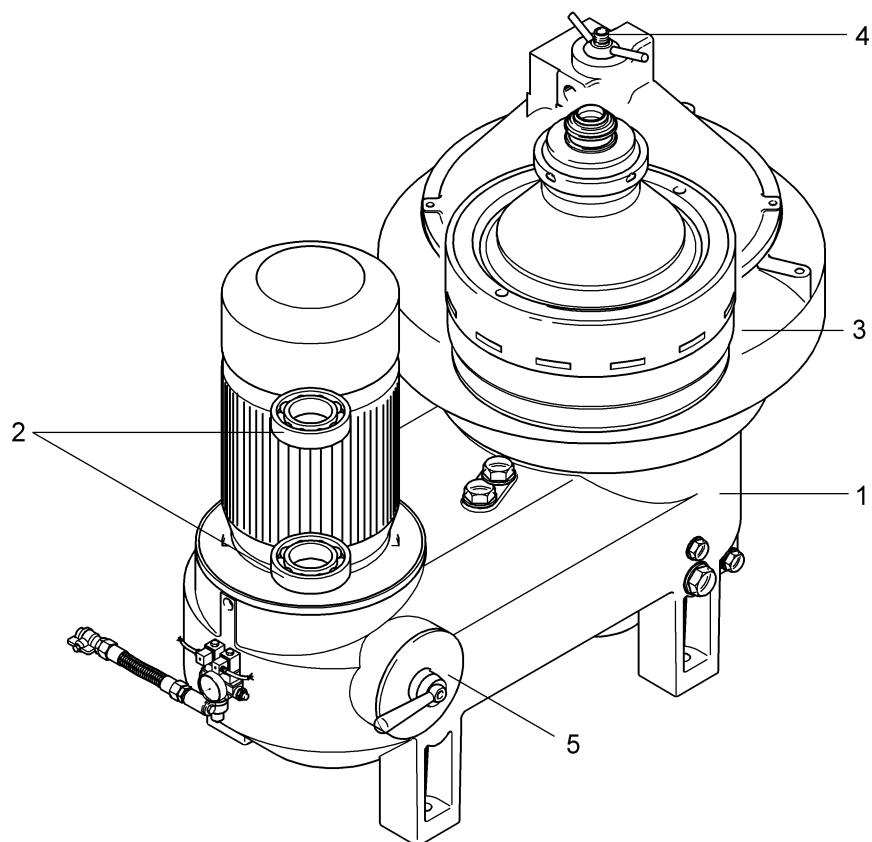


Fig. 77

- Clean and dry the surface of the component.
- Wear gloves when applying grease (pay attention to working grease).
- Apply the silicon sealing grease in a thin, closed film.

11.6.1 Lubrication schedule



A2062002

Fig. 78 Example

Lubri- cation point	Lubricant		Lubrication frequency		Lubricant qty.	Lubrication point	Operator
	Designati- on	Marking	after opera- ting hours	yearly			
1	Lube oil (mineral)	See spare parts cata- logue or lubri- cating oil table	4000	Twice	2 250 cm ³	Drive chamber	Op Skilled Tspec
	Lube oil (synthetic)		8000	Once	2 250 cm ³		
2	Acc. to instructions of motor manufacturer					Motor bearings	Op Skilled Tspec
3	Lubricating grease	See spare part catalog	as re- quired	Twice	Apply thin coat	Gaskets, threaded and contact surfaces of the bowl and of the centripetal pump	Skilled Tspec
4				Once		Threads of fittings	Op Skilled Tspec
5				Once		Manually-operated parts such as brake (if fitted)	Op Skilled Tspec
–				as requi- red		Threads of tools	Op Skilled Tspec
–	Roller bea- ring grease	Berulub FG-H2SL NSF-H1	8000	Once	400 g	Hydraulic compress- ing device (if appli- cable)	Op Skilled Tspec
–	Slushing oil	SHELL En- sis Fluid E or equivalent	When decom- missioning		2 250 cm ³	Drive chamber	Skilled Tspec

Op = Operator / Spec = Specialist / Tspec = Trained specialist

The use of untested lubricants has the following risks:

- Safety risks
- Less durability of the parts
- Reduced availability of the separator
- Increased maintenance requirement

IMPORTANT: Use only lubricants for separators that have been tested and approved by GEA Westfalia Separator. GEA Westfalia Separator will accept no liability or warranty claims if untested lubricants are used.

Take the usual precautionary measures whenever working with lubricants. Silicon greases in particular can act as separating agents in case of carry-over.

11.7 Lubrication

The spindle bearings are lubricated from a central oil bath.

11.7.1 Motor bearings

Follow the instructions of the motor manufacturer for lubricating motor bearings.

11.7.2 Oil level in the drive chamber

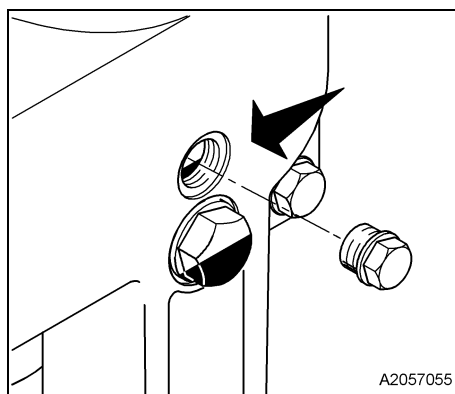


Fig. 79

Filling oil

- Fill the drive chamber with oil before the initial start-up of the separator.
- Unscrew the screw plug.
- Pour in oil through the filling hole.
 - Filling quantity: approx. 2,25 litres

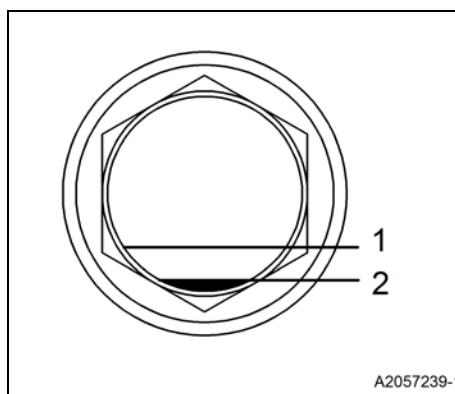


Fig. 80

Oil level

- Check the oil level only and always when the separator is at standstill!
 - The oil level must never drop below the minimum oil level (2) during operation.

- 1 Maximum oil level
(with separator at a standstill)
- 2 Minimum oil level
(with separator at a standstill)

roughly up to the lower third of the sight glass

slightly above the lower rim of the sight glass

11.8 Maintenance schedule

The following maintenance intervals are recommendations which apply only to normal operating conditions.

Non-beneficial operating conditions (e.g. low-grade product, excessively high temperature, excessively strong vibrations, frequent starting and stopping of the separator, etc.) may necessitate shorter maintenance intervals.

Follow manufacturers' servicing and lubrication instructions for auxiliary equipment (e.g. motor, product pump, pre-heater, solenoid valve block etc.).

11.8.1 Basic information on maintenance

- Keep to the specified maintenance intervals even if the specified operating hours have not been reached.
- The maintenance intervals specified are for standard applications.
- The intervals are more frequent when the load increases.
 - special environmental conditions
 - special products
 - hot operating conditions

If a fault or damage is detected during checking:

- Remedy the faults before re-starting.
- Replace damaged elements immediately.
- Avoid safety risks.
- Follow the instructions only when the relevant part is fitted.
- In the case of problems consult GEA Westfalia Separator.
- Make use of training offers.

Start-up date (to be filled in by user)	
---	--

Maintenance whenever the separator is at standstill		
Machine component	Action	Operator
Upper section of frame	➤ Clean the inside of the upper part of the frame and check for cavitation, cracks or indentations.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance on each daily inspection		
Machine component	Action	Operator
Drive chamber (lower section of frame)	➤ Check the oil level.	Op
Display units (separator), process overview (control unit)	➤ Check pressures. ➤ Check temperatures. ➤ Check flow.	Op
Separator	➤ Check for leaks. ➤ Check hose and hose pipes. ➤ Check pipe joints, e.g. flange or screwed connections, pipe clips.	Skilled
	➤ Check safety markings for damage and cleanliness.	Op
Separator or vibration monitoring device in switch cabinet	➤ Check for smooth running. ➤ Shut down the separator immediately when unusual noises or vibrations occur. - See chapter "Shut down separator via EMERGENCY STOP"	Op
Control unit	➤ Check rated speed of the bowl. ➤ Check the starting time of the bowl. ➤ Check current consumption of the drive.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance before each assembly		
Machine component	Action	Operator
Standard tools, Special tools	➤ Check tools for visible damage.	Op
Bowl and centripetal pump	➤ Clean bowl and centripetal pump parts. ➤ Check bowl and centripetal pump parts for wear, damage or corrosion. - In case of wear, damage or corrosion of structural bowl parts, contact the manufacturer. ➤ Grease thread and contact surfaces.	Tspec
Bowl bottom	➤ Clean and dry cone.	Tspec
Drive chamber	➤ Clean and dry drive chamber.	Tspec
Centrifugal clutch (if fitted).	➤ Check roller bearings of centrifugal clutch and replace if necessary. ➤ Check thickness of brake shoes and replace if necessary.	Tspec
Brake (if fitted).	➤ Check thickness of brake lining and replace if necessary.	Tspec
Spindle	➤ Clean and dry cone. ➤ Check roller bearings and replace if necessary.	Tspec
Separator	➤ Check safety markings for damage and cleanliness.	Op

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance after 700 operating hours – after 1 month at the latest		
Machine component	Action	Operator
Control cabinet	➤ Clean filter of control cabinet fan with air. - Replace filter if very dirty.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance work after 1000 operating hours - no later than after 2 months		
Machine component	Action	Operator
Standard tools, Special tools	➤ Check tools for visible damage.	Op
Centrifugal clutch (if installed)	➤ Check thickness of brake shoes and replace if necessary. - Use set of spare parts "drive" (operation: 2 years or 16,000 hours). - Observe Fig. 85.	Skilled

IMPORTANT: In the case of frequent starting and stopping of the separator, shaft-driven alternator operation and in power plants, the condition of the clutch shoes must be checked more often than stated in this schedule. It is not possible to give a specific interval,

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance after 2000 operating hours – after 3 months at the latest		
Machine component	Action	Operator
Standard tools, Special tools	➤ Check tools for visible damage.	Op
Separator motor	➤ Check separator motor. - Follow the instructions provided by the motor manufacturer. - Follow the directions on the motor nameplate. ➤ Re-lubricate motor bearings (if required). - Follow the instructions provided by the motor manufacturer.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

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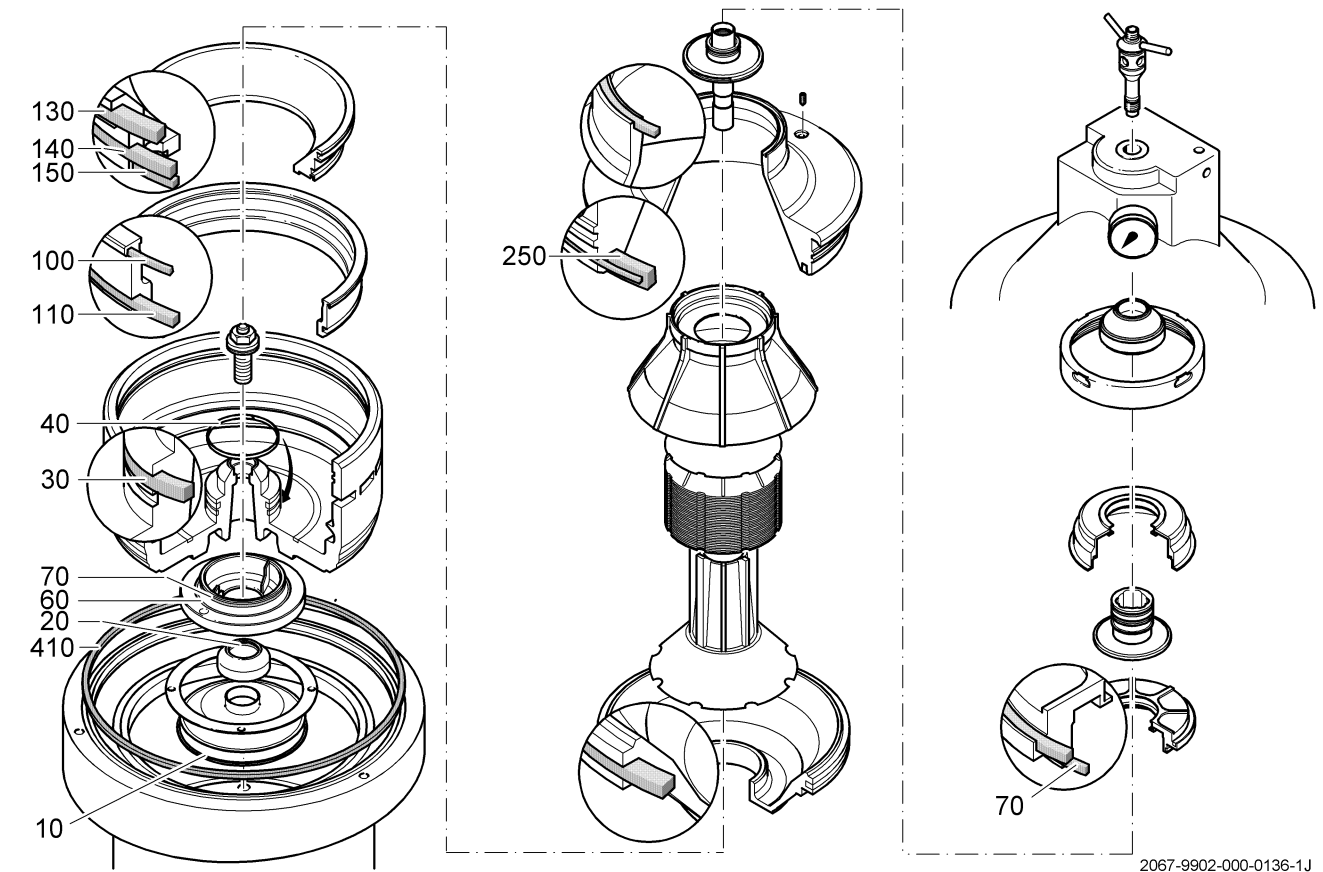


Fig. 81 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

Maintenance work - After 4000 operating hours – after 6 months at the latest - After 12,000 operating hours – after 1 ½ years at the latest - After 20,000 operating hours – after 2 ½ years at the latest - After 28,000 operating hours – after 3 ½ years at the latest - After 36,000 operating hours – after 4 ½ years at the latest - After 44,000 operating hours – after 5 ½ years at the latest		
Machine component	Action	Executor
Standard tools, Special tools	➤ Check tools for visible damage.	Op
Bowl and centripetal pump	➤ Dismantle and clean bowl and centripetal pump parts. ➤ Clean all boreholes, chambers and nozzles (if installed) of the hydraulic system. ➤ Check bowl and centripetal pump parts for wear, damage or corrosion. - In case of wear, damage or corrosion to structural bowl parts (e.g. bowl bottom, bowl top, bowl lock ring, sliding piston), contact the manufacturer. ➤ Grease thread and contact surfaces.	Tspec
Bowl bottom	➤ Replace wear inserts (option). ➤ Clean and dry cone.	Tspec
Hood, bowl and centripetal pump	➤ Use set of spare parts "bowl/hood" (operation: 1 year or 8,000 hours). - Refer to adjacent figure. ➤ Replace gaskets. - IMPORTANT: Only replace the polyamide gasket (100) if it is damaged (time-consuming installation).	Tspec
Drive chamber	➤ Clean and dry sight glasses. ➤ Change mineral oil.	Op
Spindle	➤ Clean and dry spindle cone. ➤ Check roller bearings of spindle and replace if necessary.	Tspec
Centrifugal clutch (if installed)	➤ Check thickness of brake shoes and replace if necessary.	Tspec
Brake (if installed).	➤ Check thickness of brake lining and replace if necessary.	Tspec
Upper section of frame	➤ Clean the inside of the upper part of the frame and check for cavitation, cracks or indentations.	Skilled
Solenoid valve block, Operating liquid feed	➤ Clean the strainer and operating liquid line on the self-cleaning separator.	Skilled
Lower section of frame	➤ Clean the sight glass(es) for observing the drive belt.	Skilled
Filling and displacement water line (if installed)	➤ Carefully clean the boreholes in the non-return valve and rinse with water. ➤ Check the non-return valve is working correctly.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance work - After 4000 operating hours – after 6 months at the latest - After 12,000 operating hours – after 1 ½ years at the latest - After 20,000 operating hours – after 2 ½ years at the latest - After 28,000 operating hours – after 3 ½ years at the latest - After 36,000 operating hours – after 4 ½ years at the latest - After 44,000 operating hours – after 5 ½ years at the latest		
Machine component	Action	Executor
Hood	➤ Carefully clean the water detector (if installed) with a soft cloth, use diesel oil if necessary.	Skilled
	➤ Check pressure gauge(s) for damage, display and functionality.	Op
Separator motor	➤ Check separator motor. - Follow the instructions provided by the motor manufacturer. - Follow the directions on the motor nameplate. ➤ Re-lubricate motor bearings (if required). - Follow the instructions provided by the motor manufacturer.	Skilled
Separator	➤ Check hose and hose pipes. ➤ Check pipe joints, e.g. flange or screwed connections, pipe clips.	Skilled
	➤ Check safety markings for damage and cleanliness.	Op
Product feed pump (option)	➤ Clean the filter in the suction line of the product feed pump. ➤ Check the direction of rotation of the product feed pump.	Skilled
Control cabinet	➤ Clean filter of control cabinet fan with air. - Replace filter if very dirty.	Skilled
Control unit	➤ Check the starting time of the bowl.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

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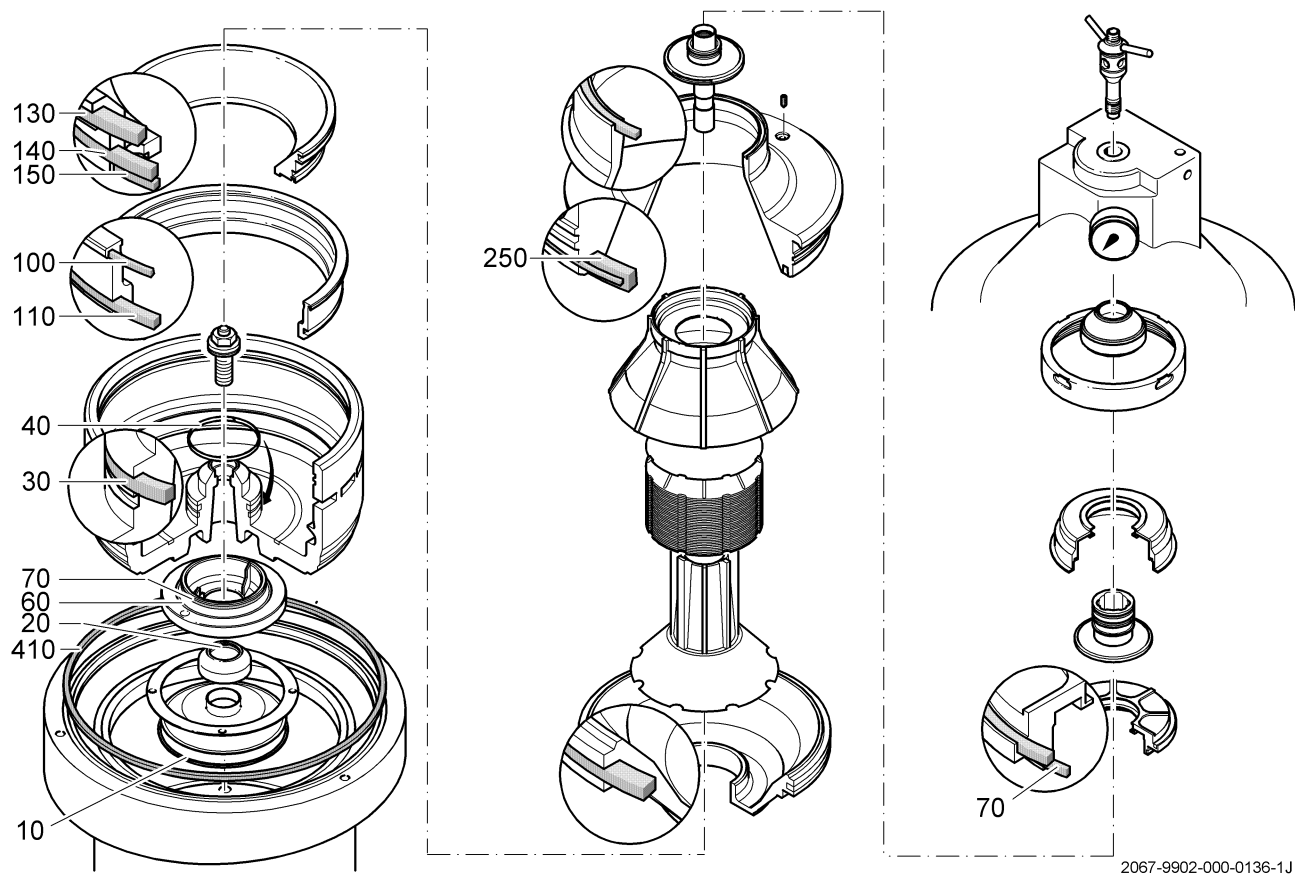


Fig. 82 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

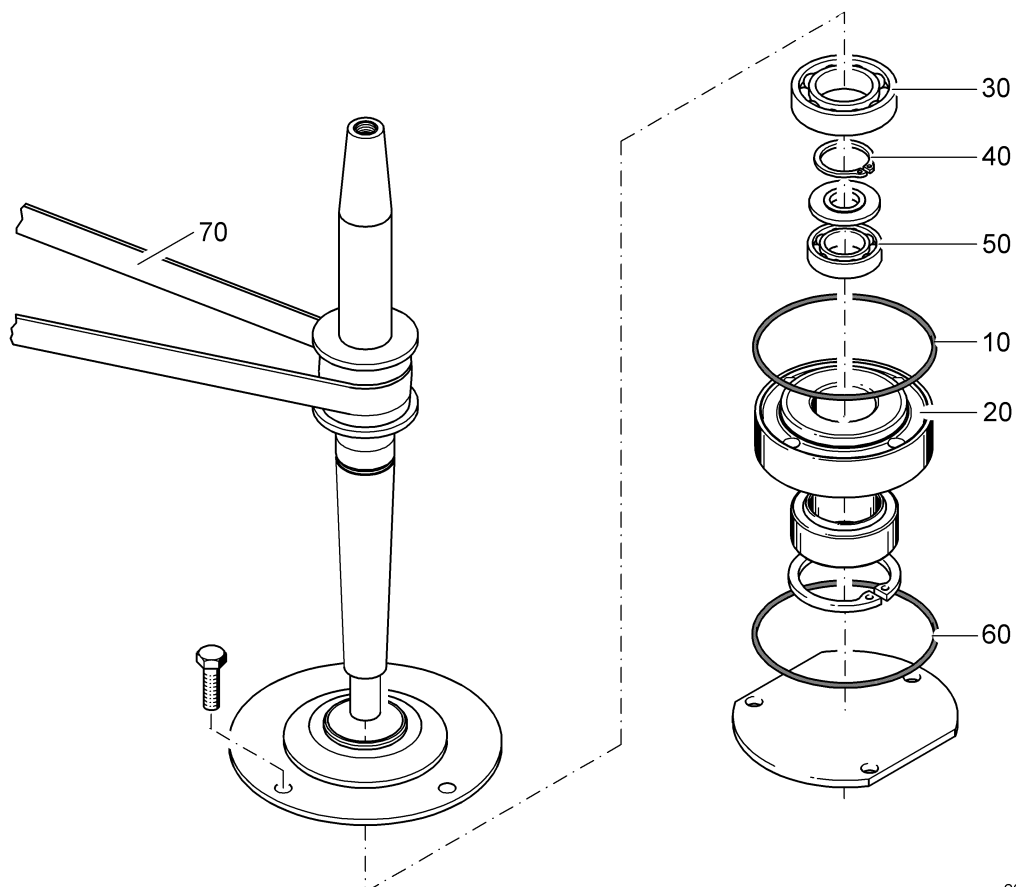


Fig. 83 "Drive" set of spare parts (operation: 1 year or 8000 hours)

Maintenance work - After 8000 operating hours – after 1 year at the latest - After 24,000 operating hours – after 3 years at the latest - After 40,000 operating hours – after 5 years at the latest		
Machine component	Action	Executor
Standard tools, Special tools	➤ Have the operating safety of the load-carrying equipment checked by a competent person. ➤ Check tools for visible damage.	Op
Separator	Recommended to assure correct functioning and operating safety: ➤ Have the separator inspected once a year by a service professional of GEA Westfalia Separator.	Tspec
Bowl and centripetal pump	➤ Dismantle and clean bowl and centripetal pump parts. ➤ Clean all boreholes, chambers and nozzles (if installed) of the hydraulic system. ➤ Check bowl and centripetal pump parts for wear, damage or corrosion. - In case of wear, damage or corrosion to structural bowl parts (e.g. bowl bottom, bowl top, bowl lock ring, sliding piston), contact the manufacturer. ➤ Grease thread and contact surfaces.	Tspec
Bowl bottom	➤ Replace wear inserts (option). ➤ Clean and dry cone.	Tspec
Hood, bowl and centripetal pump	➤ Use set of spare parts "bowl/hood" (operation: 1 year or 8,000 hours). - Refer to adjacent figure. ➤ Renew sealing elements. - IMPORTANT: Only replace the polyamide gasket (100) if it is damaged (time-consuming installation).	Tspec
Drive chamber	➤ Change mineral or synthetic oil. ➤ Clean and dry drive chamber and sight glasses.	Tspec
Drive	➤ Use set of spare parts "drive" (operation: 1 year or 8000 hours) - Refer to adjacent figure. - Replace gaskets. - Replace the drive belt. - Clean and dry spindle cone. - Replace spindle roller bearings. - Replace the rubber-metal cushion.	Tspec
	➤ Use set of spare parts "drive" (operation: 2 years or 16,000 hours) - Observe Fig. 85. ➤ Check roller bearings of centrifugal clutch and replace if necessary. ➤ Check thickness of brake shoes and replace if necessary.	Tspec
Brake (if installed).	➤ Check thickness of brake lining and replace if necessary.	Tspec

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance work - After 8000 operating hours – after 1 year at the latest - After 24,000 operating hours – after 3 years at the latest - After 40,000 operating hours – after 5 years at the latest		
Machine component	Action	Executor
Upper section of frame	➤ Clean the inside of the upper part of the frame and check for cavitation, cracks or indentations.	Skilled
Installed bowl and centripetal pump	➤ Check the bowl height.	Tspec
Installed spindle	➤ Check the direction of rotation of the bowl. ➤ Check bowl speed.	Tspec
Solenoid valve block, Operating liquid feed	➤ Clean the strainer and operating liquid line on the self-cleaning separator.	Skilled
Lower section of frame	➤ Clean the sight glass(es) for observing the drive belt.	Skilled
Filling and displacement water line (if installed)	➤ Carefully clean the boreholes in the non-return valve and rinse with water. ➤ Check the non-return valve is working correctly.	Skilled
Hood	➤ Carefully clean the water detector (if installed) with a soft cloth, use diesel oil if necessary.	Skilled
	➤ Check pressure gauge(s) for damage, display and functionality.	Op
Separator motor	➤ Check separator motor. - Follow the instructions provided by the motor manufacturer. - Follow the directions on the motor nameplate. ➤ Re-lubricate motor bearings (if required). - Follow the instructions provided by the motor manufacturer.	Skilled
Separator	➤ Check hose and hose pipes. ➤ Check pipe joints, e.g. flange or screwed connections, pipe clips.	Skilled
	➤ Check safety markings for damage and cleanliness.	Op
Vibration monitoring device (option)	➤ Check the functionality of the vibration sensors.	Skilled
Speed monitoring device (option)	➤ Check the functionality of the speed monitoring device.	Skilled
Product feed pump (option)	➤ Clean the filter in the suction line of the product feed pump. ➤ Check the direction of rotation of the product feed pump.	Skilled
Control cabinet	➤ Clean filter of control cabinet fan with air. - Replace filter if very dirty.	Skilled
Control unit	➤ Check the starting time of the bowl.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

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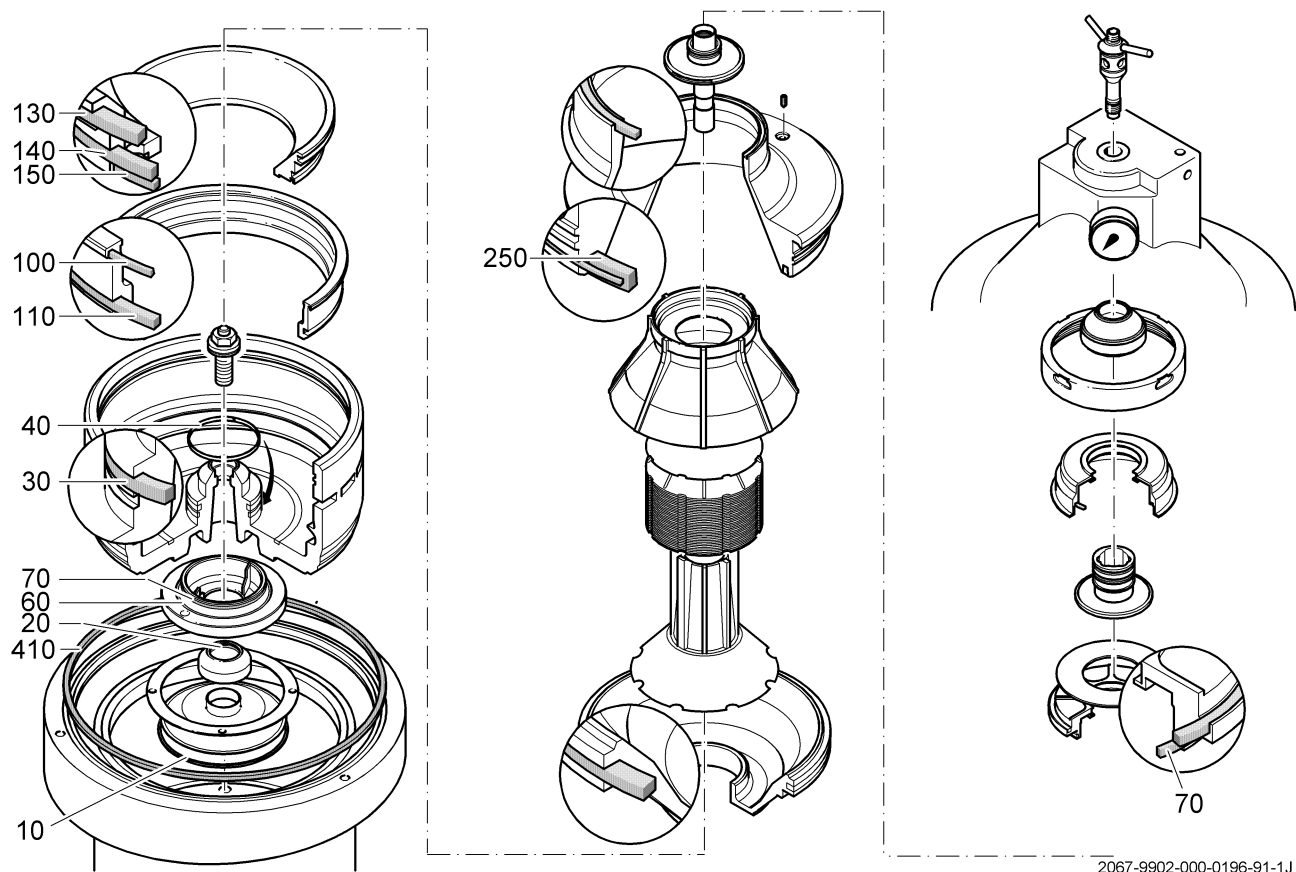


Fig. 84 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

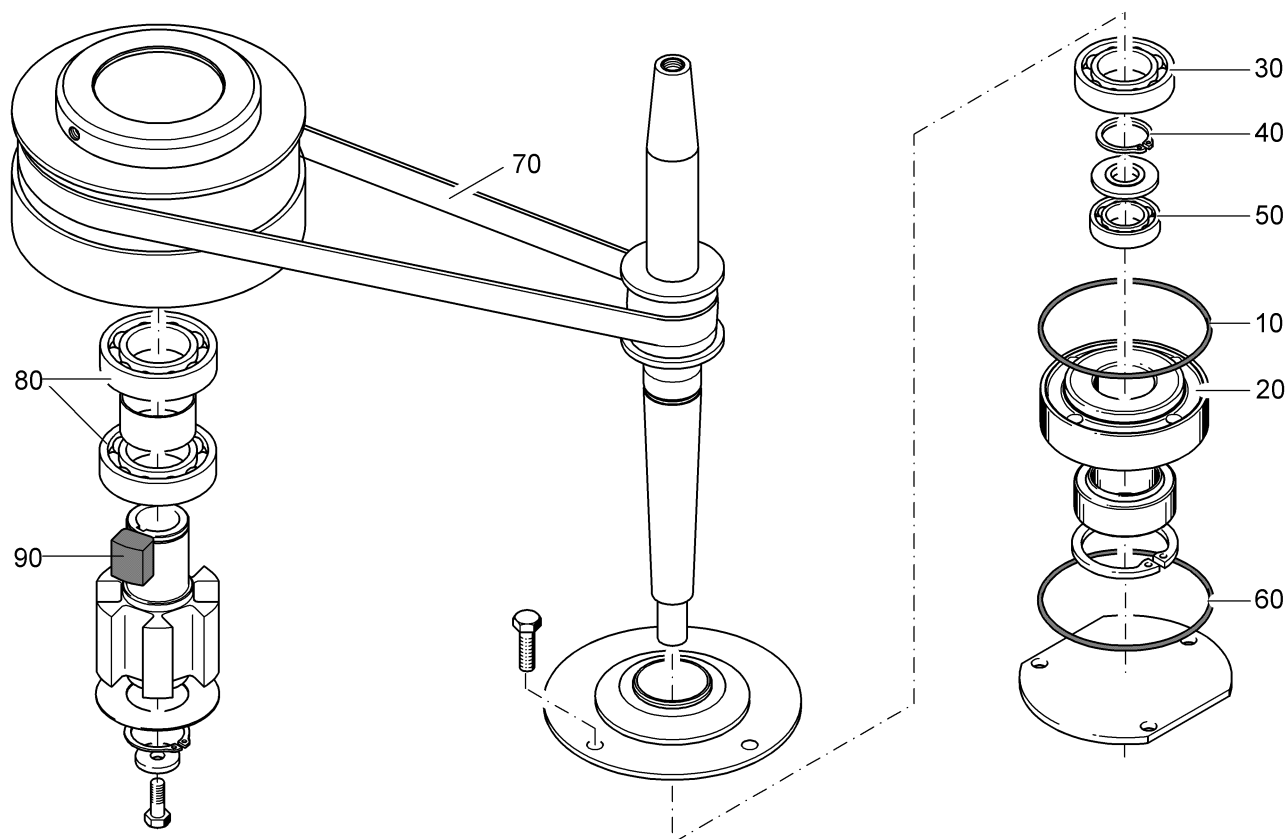


Fig. 85 "Drive" set of spare parts (operation: 2 years or 16,000 hours)

Maintenance work - after 16,000 operating hours – after 2 years at the latest - after 32,000 operating hours – after 4 years at the latest - after 48,000 operating hours – after 6 years at the latest		
Machine component	Action	Executor
Standard tools, Special tools	➤ Have the operating safety of the load-carrying equipment checked by a competent person. ➤ Check tools for visible damage.	Op
Separator	Recommended to assure correct functioning and operating safety: ➤ Have the separator inspected once a year by a service professional of GEA Westfalia Separator.	Tspec
Bowl and centripetal pump	➤ Dismantle and clean bowl and centripetal pump parts. ➤ Clean all boreholes, chambers and nozzles (if installed) of the hydraulic system. ➤ Check bowl and centripetal pump parts for wear, damage or corrosion. - In case of wear, damage or corrosion to structural bowl parts (e.g. bowl bottom, bowl top, bowl lock ring, sliding piston), contact the manufacturer. ➤ Grease thread and contact surfaces.	Tspec
Bowl bottom	➤ Replace wear inserts (option). ➤ Clean and dry cone.	Tspec
Hood, bowl and centripetal pump	➤ Use set of spare parts "bowl/hood". (Operation: 1 year or 8000 hours) - Refer to adjacent figure. ➤ Renew sealing elements. - IMPORTANT: Only replace the polyamide gasket (100) if it is damaged (time-consuming installation).	Tspec
Drive chamber	➤ Change mineral or synthetic oil. ➤ Clean and dry drive chamber and sight glasses.	Tspec
Drive	➤ Use set of spare parts "drive" (operation: 2 years or 16,000 hours). - Refer to adjacent figure. - Replace gaskets. - Replace the drive belt. - Replace spindle roller bearings of centrifugal clutch. - Clean and dry spindle cone. - Replace spindle roller bearings. - Replace the rubber-metal cushion. ➤ Check thickness of brake shoes and replace if necessary.	Tspec
Brake (if installed).	➤ Check thickness of brake lining and replace if necessary.	Tspec
Upper section of frame	➤ Clean the inside of the upper part of the frame and check for cavitation, cracks or indentations.	Skilled
Installed bowl and centripetal pump	➤ Check the bowl height.	Tspec

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance work - after 16,000 operating hours – after 2 years at the latest - after 32,000 operating hours – after 4 years at the latest - after 48,000 operating hours – after 6 years at the latest		
Machine component	Action	Executor
Installed spindle	➤ Check the direction of rotation of the bowl. ➤ Check bowl speed.	Tspec
Solenoid valve block, Operating liquid feed	➤ Clean the strainer and operating liquid line on the self-cleaning separator.	Skilled
Lower section of frame	➤ Clean the sight glass(es) for observing the drive belt.	Skilled
Filling and displacement water line	➤ Carefully clean the boreholes in the non-return valve and rinse with water. ➤ Check the non-return valve is working correctly.	Skilled
Hood	➤ Carefully clean the water detector (if installed) with a soft cloth, use diesel oil if necessary.	Skilled
	➤ Check pressure gauge(s) for damage, display and functionality.	Op
Separator motor	➤ Check separator motor. - Follow the instructions provided by the motor manufacturer. - Follow the directions on the motor nameplate. ➤ Re-lubricate motor bearings (if required). - Follow the instructions provided by the motor manufacturer.	Skilled
Separator	➤ Check hose and hose pipes. ➤ Check pipe joints, e.g. flange or screwed connections, pipe clips.	Skilled
	➤ Check safety markings for damage and cleanliness.	Op
Vibration monitoring device (option)	➤ Check the functionality of the vibration sensors.	Skilled
Speed monitoring device (option)	➤ Check the functionality of the speed monitoring device.	Skilled
Product feed pump (option)	➤ Clean the filter in the suction line of the product feed pump. ➤ Check the direction of rotation of the product feed pump.	Skilled
Control cabinet	➤ Clean filter of control cabinet fan with air. - Replace filter if very dirty.	Skilled
Control unit	➤ Check the starting time of the bowl.	Skilled

Op = Operator / Spec = Specialist / Tspec = Trained specialist

Maintenance work after 48,000 operating hours – after 6 years at the latest		
Machine component	Action	Executor
Separator	➤ Replace machine feet.	Skilled
	➤ Have the separator inspected by a service professional of GEA Westfalia Separator.	Tspec

Op = Operator / Spec = Specialist / Tspec = Trained specialist

11.9 Checking the safety devices

Check the safety devices for functionality once a year.

On all centrifuges:

- Emergency Stop function
- Speed monitoring / speed limiting

On centrifuges operating in explosion-hazarded areas:

- Vibration monitoring unit
- Safety-relevant temperature monitoring

On centrifuges with inert gas supply:

- Function of the gas flow control
- Failsafe protection in the case of potential malfunctions
- Unimpeded supply and discharge of the ignition shield gas

11.10 Checking sight glasses

Sight glasses are subject to signs of wear. When the wall thickness of a sight glass or a sight glass housing decreases by more than 10 %, there is a risk that they will burst under pressure. In this case, there is a danger of injury due to discharging product.

Regularly check all sight glasses in the feed and discharge lines of the separator for wear. The same applies to all sight glasses in the environment of the separator. Further information can be found in the standards DIN 7097 and DIN 7080.

Take the following action when the sight glass thickness decreases below 10 %.

- Shut-down the separator.
- Replace sight glass and / or sight glass housing immediately.

11.11 Cleaning the bowl manually

Manual cleaning of the bowl is only necessary if the type of product and the ejected solids require it or if the separator will remain inactive for a long time.

- Dismantle the bowl and clean all components. See chapter "Maintenance / maintenance schedule".

ATTENTION

Damage due to unsuitable cleaning agents and tools

Unsuitable cleaning agents and tools can damage the surfaces of disks, bowl and solid tank.

- Do not use acidic or chlorine-containing cleaning agents; chlorine, for example, attacks parts of stainless steel.
- When cleaning disks and bowl parts, do not use metal scrapers, metal brushes or sharp-edged cleaning tools.

Clean the bowl as follows:

- Clean bowl parts thoroughly and remove burrs.
- Remove the sealing elements from the bowl parts.
- Clean grooves and gaskets to prevent corrosion in the grooves.
- Replace damaged, bulging, hardened or brittle gaskets immediately.

- Clean the small boreholes for the feed and discharge of the operating liquid extremely carefully to ensure smooth functioning of the ejection process.
- Check the threads, contact and guide surfaces for impact marks.
 - Impact marks can lead to seizing.

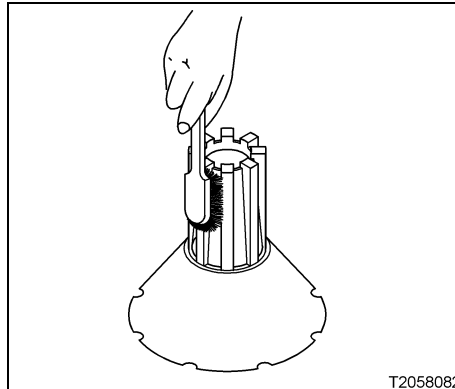


Fig. 86

- Clean the distributor between the ribs inside and outside with the brush.
 - If the distributor neck is heavily contaminated, the feed will get blocked which can cause overflow.

- Lightly grease guide surfaces and threads of the bowl parts after drying.
 - Ensure that the greased surfaces are free from sand and filings, otherwise the surfaces can become scored.
- Reassemble the bowl immediately after cleaning.
- If the bowl is not re-assembled immediately, protect the bowl parts against dust and dirt and place these parts into storage.

11.12 Cleaning the operating water feed

The operating water feed regulates opening and closing of the bowl. Carry out regular cleaning of the dirt filter and the small discharge holes of the operating water feeding device to ensure reliable functioning of the centrifuge. The cleaning interval depends on the load and is specified in the maintenance schedule in chapter "Maintenance".

- The strainer in the water pressure reducer and the small discharge holes in the operating water feeding device should be cleaned when necessary.

11.13 Cleaning the drive chamber

The drive chamber must be cleaned whenever changing the oil to remove metal abrasives from housing walls and corners.

- Use thin-bodied oil as cleaning agent.
- Do not use cotton waste, but rather non-fluffy cloths.
- Carefully remove metal particles from walls and corners.
- Dispose of contaminated cloths in accordance with local regulations.

11.14 Cleaning the upper part of the frame

When the separated solids or the product necessitate it, the upper part of the frame in the area below the bowl is cleaned.

- Remove the bowl, see chapter "Servicing".

ATTENTION**Discharging cleaning liquid**

When the bowl is dismantled, no cleaning fluid may escape via the spindle onto the drive belt.

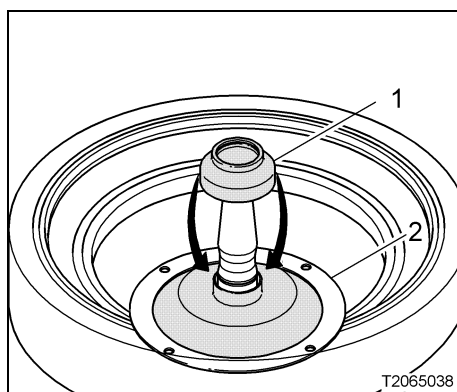


Fig. 87

- Ensure that safety cap (2) and spindle cap (1) with gasket are fitted.

ATTENTION**Damage to the upper section of frame**

Cavitation, cracks or indentations on the upper section of frame and on the hood caused by operating liquid.

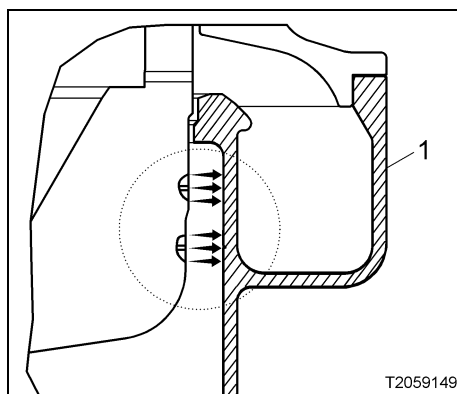


Fig. 88

- Observe the maintenance plan (see chapter "Maintenance / maintenance schedule").
- Check the inside of the upper section of the frame and hood for cavitation, cracks or indentations.
- In case of damage in the area at risk (see arrows), that is deeper than 2 mm, contact GEA Westfalia Separator.

11.15 Cleaning the strainer and operating water supply unit

The strainer and the operating water supply unit must be cleaned depending on the quality of the operating water and overall load. The cleaning interval depends on the load and is specified in the maintenance schedule in chapter "Maintenance".

11.15.1 Replacing or cleaning the filter element

- Close the main valve for operating water, filling and displacement water.

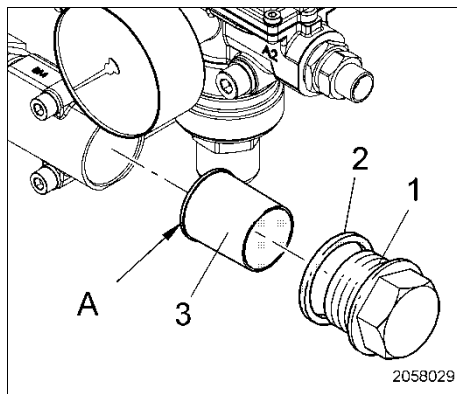


Fig. 89

- Undo plug (1) (jaw span 22) with fitted gasket (2).
- Remove filter element (3).
- Clean or replace filter element (3).
 - Use citric acid in case of furring.
 - Thoroughly clean the parts with water.
- Fit the cleaned or new filter element (3).
 - **IMPORTANT:** Pay attention to the assembly position; the copper collar (A) must point inwards.
- Hand-tighten plug (1) with fitted gasket (2) so that it seals well.

11.16 Lubricating the bowl parts

When the bowl is assembled, lubricate threads, guide surfaces and contact surfaces of the bowl parts. See the "Lubrication schedule" for suitable lubricating pastes or greases.

IMPORTANT: Use only lubricants tested and approved by GEA Westfalia Separator.

When lubricants are used which have not been tested, there is a risk of safety hazards, shorter service life of the parts, reduced availability of the separator and an increased service requirement.

In this case, GEA Westfalia Separator shall assume no liability or warranty.

During assembly, note:

NOTICE

Swelling of EPDM sealing material

When using mineral lubricating grease, swelling of the EPDM gaskets and seals can occur.

- Do not bring gaskets made from the special material EPDM (ethylene-propylene-diene-caoutchouc) in contact with mineral oils and greases.
- Use compatible silicon greases (as per lubrication schedule) for mounting EPDM sealing materials.

11.17 Check disk stack compression

When a new disk stack is installed, disk-stack compression is lower during the initial operating months until the disk stack settles into position.

ATTENTION

Material damage due to inadequate disk compression

Inadequate disk compression can lead to unbalance. Unbalance can cause severe damage to the centrifuge, e.g. to bearings in the drive.

Inadequate disk compression can lead to damage to the disk stack, e.g. disk cracks can appear.

- After installing a new disk stacks, check the disk compression at least once a month in the first 3 months, see chapter "Servicing / assembling the bowl".

12 Repair

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12.1 Safety during maintenance work

Personnel in the area of maintenance are at risk if no measures are taken to ensure their safety.

- Ensure that maintenance work does not endanger persons.
- Observe the local standard operating procedures (SOPs) at the workplace and wear the specified protective gear.
- Cordon off the working area and hang up a warning sign.
- Remove unauthorized persons from the area of the malfunction.
- Switch off the main switch and secure it against restarting.
- Firmly close all lines and secure against unintended opening.
- Before carrying out maintenance or repair work on the motor, bear in mind that there may still be residual voltage.
 - Refer to the manufacturer documentation and implement suitable protective measures.
- Refer to the frequency converter manual (option).
- Carry out a standstill check of the centrifuge, see chapter "Servicing / standstill check".
- Do not start work until the components have cooled down or warmed up to room temperature.

12.2 Avoiding damage during maintenance

Safety and operating readiness of the centrifuge are conditional on the maintenance being carried out properly.

Improperly executed maintenance can damage centrifuge parts. During operation, this can lead to accidents with damage to persons and property.

- Centrifuges may only be maintained by persons qualified to perform these tasks, e.g. service technicians from GEA Westfalia Separator and personnel trained and authorized (certified) by GEA Westfalia Separator.
- Place dismantled centrifuge parts on a suitable base, e.g. rubber or wood.
- Secure dismantled centrifuge parts by suitable means to prevent them from overturning or rolling away, e.g. with wooden wedges or square timbers.
- Never weld the bowl, hood or solids catcher.
- Do not machine the bowl, hood and solid catcher.
- Do not climb onto the centrifuge or parts of the centrifuge.
- After carrying out maintenance and repair work on centrifuges, reattach all protective devices.

12.3 Risk due to unbalance.

Centrifuges rotate at high speeds. When new bowl parts are fitted in the centrifuge during maintenance and they are not balanced, this leads to unbalance during operation. Unbalance causes strong vibrations and can damage the bowl and drive. Vibrations can produce resonances and excite the environment of the centrifuge to vibrations. If the issue of unbalance is not addressed, there is a risk of damage to persons and property.

- When certain new bowl parts are fitted, rebalance the bowl.

These bowl parts are, for example, bowl bottom or bowl top, see chapter "Servicing / Bowl overview".

- Bowls may only be balanced by specialists of GEA Westfalia Separator and specialist workshops authorized by GEA Westfalia Separator.

12.4 Risk from exceeding or undershooting limit values

The centrifuge has been constructed for the intended use and rotates at a defined, permitted maximum speed and operating speed range. This is limited by the max. speed and min. speed. Neither value may be exceeded or undershot.

The functionality, life cycle and operating safety of the centrifuge have been factored into rating the max. speed and operating speed range.

Exceeding the max. speed and undershooting the min. speed constitute non-compliance with the intended use and can:

- destroy the centrifuge.
- lead to damage to persons and property.
- impair the functionality of the centrifuge.

- Do not manipulate speed-changing components which prevent the centrifuge from exceeding the maximum admissible speed of the bowl.

See chapter "Description / nameplate" for the maximum machine speed. A speed-changing component is, for example, the frequency converter.

12.5 Avoiding damage by heating

When centrifuge parts are heated with burners or soldering lamps to loosen jammed parts, the properties of the centrifuge materials deteriorate. As a result, the centrifuge can be impaired in its function which can result in damage to persons and property.

- Do not heat bowl parts for dismantling with a flame. Steam or hot water are, for example, admissible.

12.6 Mounting safely with locking devices and markings

Markings and locking devices are attached to centrifuge parts for safe assembly. If the markings and locking devices are not heeded and centrifuge parts are not mounted properly, there is a risk that the centrifuge will get damaged. This impairs the function and operating safety of the centrifuge and can lead to damage to persons and property.

- Bowl parts with markings and locking devices must be mounted in the correct position relative to each other.
- Before assembly, ensure that all locking devices and markings are in perfect condition.
- If locking devices and marks on the bowl parts are damaged, do not operate the centrifuge.

12.7 Screw torques

The torques apply for the following conditions:

- Metric screws with coarse-pitch threads.
 - Hex head screws according to DIN EN ISO 4014
 - Allen screws according to DIN EN ISO 4762
- Through holes according to DIN ISO 20273 (medium).
- Greased screws (total minimum coefficient of friction = 0.10).
- Torque wrench with a scatter (tolerance) of $\pm 10\%$.
- Material combinations:
 - Steel-steel
 - Stainless steel-stainless steel.

IMPORTANT: Screws whose torque deviates from this table are marked with the required torque in the manual.

12.7.1 Screw torques in Newton meters (Nm)

Strength class	8.8	10.9	12.9	A2-70 A4-70	A2-80 A4-80	Super Duplex 1.4501	Hastelloy 2.4819
Yield stress/yield strength in N/mm ²	640 660	940	1100	450 250	600	550	360
Parameter	Torque in Nm						
M 4	2.6	3.9	4.5	1.9	2.5	1.9	1.5
M 5	5.2	7.6	8.9	3.6	4.8	3.6	2.9
M 6	9.0	13.2	15.4	6.3	8.4	6.3	5.0
M 8	21.6	31.8	37.2	15.2	20.2	15.2	12.1
M 10	43.0	63.0	73.0	30.0	40.0	30.0	24.0
M 12	73.0	108.0	126.0	52.0	69.0	52.0	42.0
M 14	117.0	172.0	201.0	82.0	109.0	82.0	65.0
M 16	180.0	264.0	309.0	126.0	168.0	126.0	100.0
M 18	259.0	369.0	432.0	177.0			
M 20	363.0	517.0	605.0	248.0			
M 22	495.0	704.0	824.0	187.0			
M 24	625.0	890.0	1041.0	237.0			
M 30	1246.0	1795.0	2077.0	472.0			
M 36	2164.0	3082.0	3607.0				

Screws made of Super Duplex 1.4501 are treated like A4-70 screws while neglecting the higher yield stress.

In the case of screws larger than M 16, an individual drop in strength due to the degree of deformation of the screw raw material and the thread rolling procedure must be taken into account.

12.7.2 Screw tightening torques in inch-pound (inlb)

The following formula is used to convert the torques (M_a) from “Nm” to “inlb”:

$$Ma_{inlb} = Ma_{Nm} \times 8.85$$

Example:

Ma_{inlb} = Wanted (screw tightening torques in “inch-pound”)

Ma_{Nm} = 50 (screw tightening torques in “Newtonmeter”)

Ma_{inlb} = 50 Nm x 8.85

Mainlb = 442.5 inlb

12.8 Standstill check of the rotating machine parts

The centrifuge has machine parts that rotate at high speed.



DANGER

Danger to life through high-speed rotating machine parts

There is a risk of serious injury due to being pulled into the machine and through ejection of machine parts or product residues.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- Wait until the run-down time has elapsed (see data sheet).
- Secure the machine against unintentional restart.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to 2 hours.
- Check and ensure that all machine parts are at a standstill (see following section).

Use several options for checking standstill

The motor or its fan wheel can be at standstill while the bowl is still rotating. Furthermore, a standstill indication may under certain circumstances provide false information because, for example, the electronics have failed or the drive belt is defective.

At least two checks must therefore be carried out to reliably determine that the bowl is at a standstill

The following options are available for checking standstill on centrifuges depending on the version:

- Electric speed indicator
- Speed revolution indicator or sight glass in the frame for observing the drive belt
- Visual check of direction of rotation of the drive motor and fan wheel.
- Noise check
- Vibration check
- Visual standstill check of the drive belt through the sight glass
- Wait until the centrifuge run-down time has elapsed, see data sheet
 - Normal run-down time (without braking)
 - Run-down time without drive belt (with torn, detached or defective drive belt)

12.9 Tools

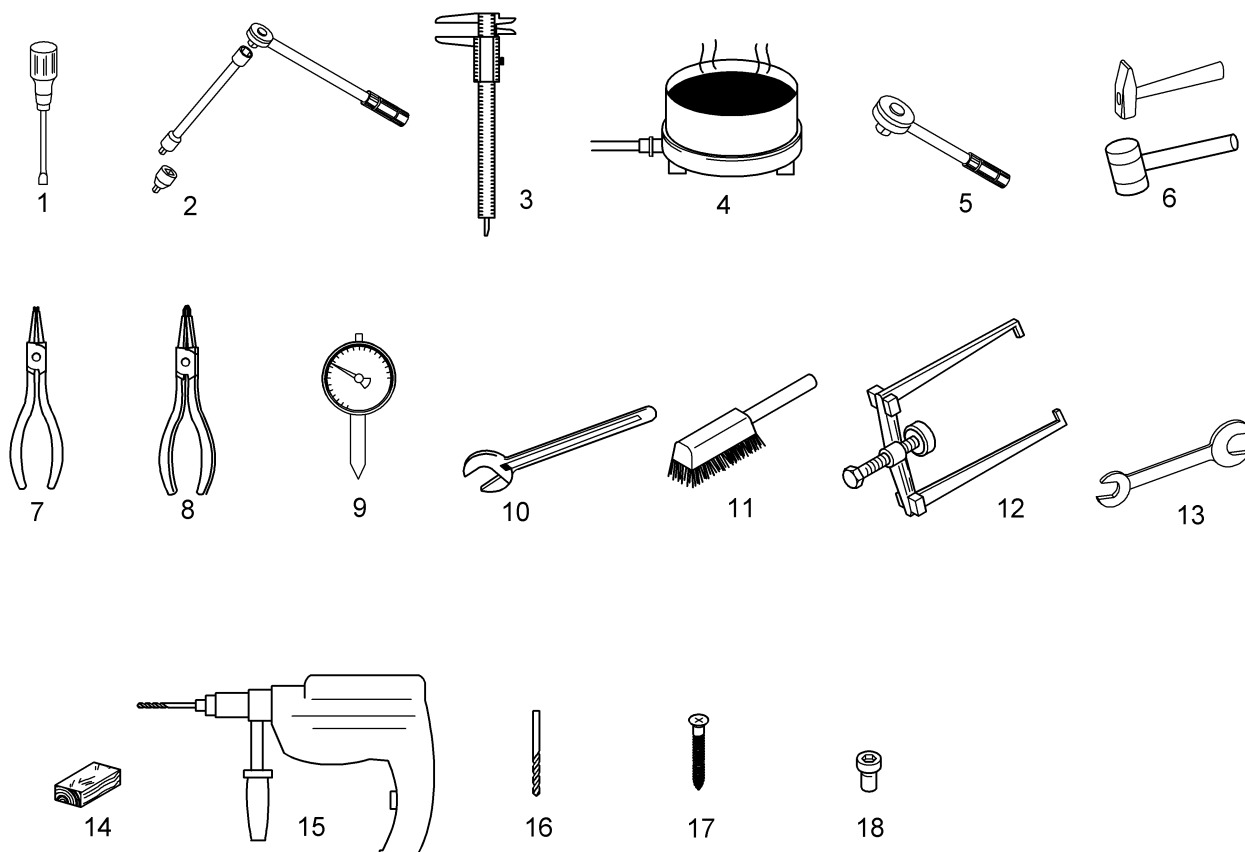
12.9.1 Risk through unsuitable tools

The use of unsuitable tools can lead to damage to centrifuge parts and endanger the operating safety of the centrifuge.

- Use special tools from GEA Westfalia Separator.
- Use the special tools only as described in the documentation.
- Check the special tools for damage before use.
- Do not use damaged or incomplete special tools.
- Certain tools must be checked for compliance with local rules and legislation, e.g. measuring instruments and gauges.

12.9.2 Standard tools

Commercially available standard tools are not included in the supply schedule. These include, for example, open-ended wrenches and screwdrivers. These must be supplied by the customer.



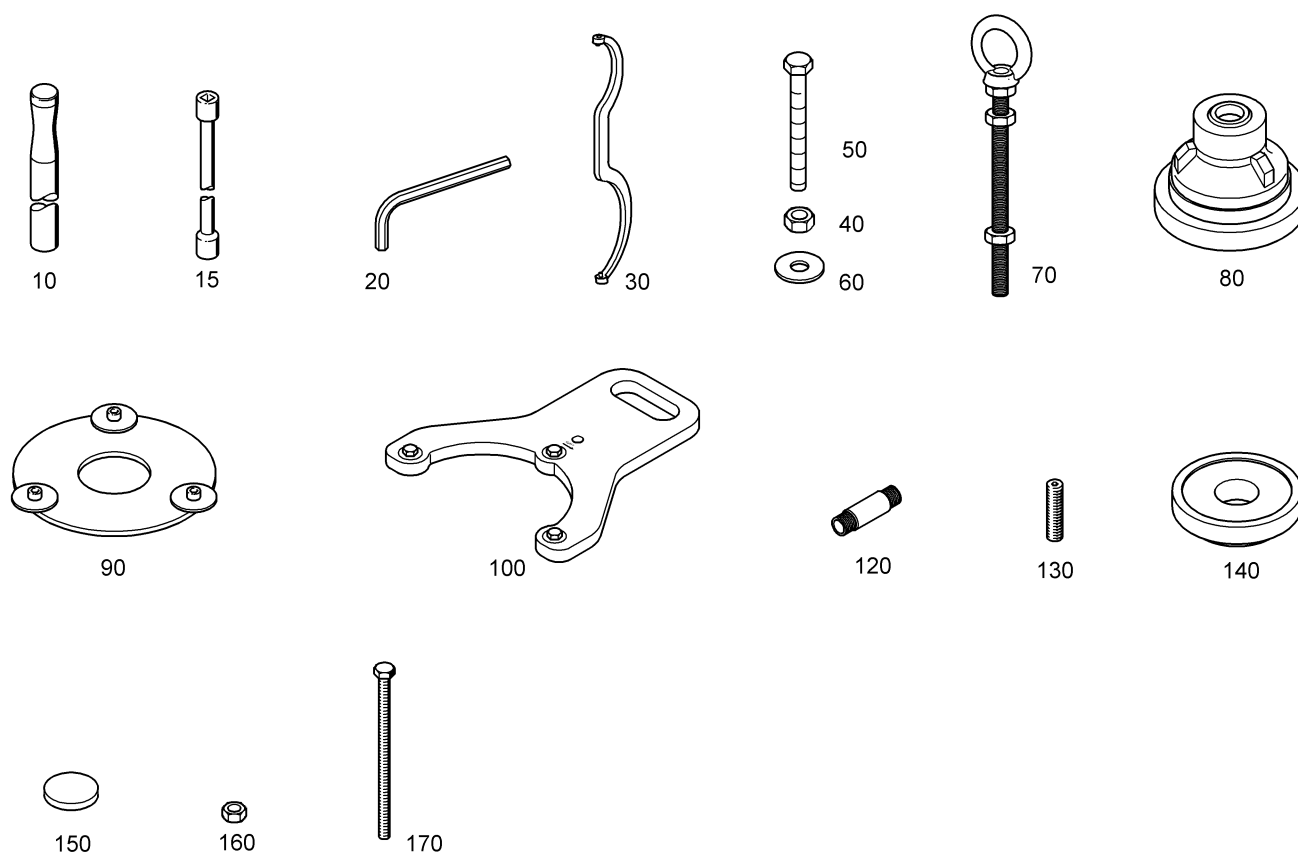
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Fig. 90

- 1 Screwdriver
- 2 Torque wrench (0 – 100 Nm) with inserts and extension
- 3 Calliper gauge
- 4 Electric oil heater for ball bearings
- 5 Ratchet wrench with inserts and extension
- 6 Standard hammer and mallet
- 7 Inner snap pliers with offset jaws (Ø 40 mm)
- 8 Outer snap pliers (Ø 35 mm)
- 9 Hand-held speedometer
- 10 Wrench, adjustable
- 11 Brushes
- 12 Puller (200 x 200 mm (H x W))
- 13 Open-ended wrench (jaw spans: 19, 32, 55 mm)
- 14 Hardwood blocks
- 15 Drill
- 16 Drill bit (Ø 2 mm)
- 17 Wood screws (max. Ø 4 mm x 50 mm length)
- 18 Allen screws (M 8 x 20)

12.9.3 Special tools

The scope, type and number of the special tools are specified in the order-specific parts list. Special tools are provided by the manufacturer.



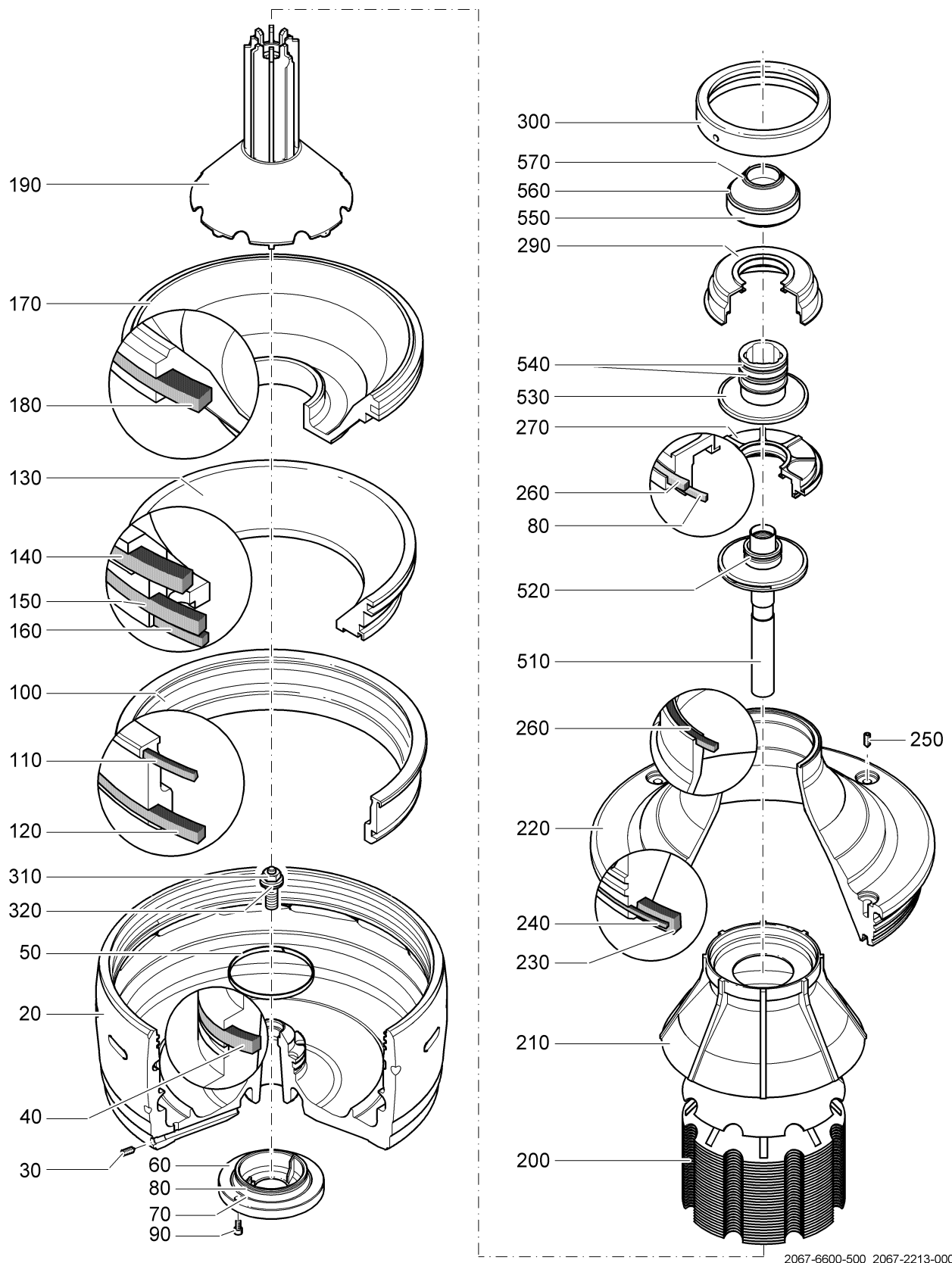
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Fig. 91

- 10 Striking pin
- 15 Wrench (spindle screw)
- 20 Socket wrench / hexagonal offset screwdriver (centripetal pump)
- 30 Double hook wrench
(centripetal pump chamber lock ring)
- 40 Hexagon nut M 10 (centrifugal clutch)
- 50 Hex head screw M 10 x 200 (centrifugal clutch)
- 60 Disk 11 x 27 x 2 (centrifugal clutch)
- 70 Eye bolt, complete (bowl / centrifugal clutch)
- 80 Bell-shaped piece (bowl top / disk stack / sliding piston)
- 90 Complete assembling device (closing chamber bottom / annular piston)
- 100 Ring spanner, complete (bowl top)
- 120 Double nipple (transport of separator)
- 130 Threaded pin M 12 x 40 (centrifugal clutch)
- 140 Disk (centrifugal clutch)
- 150 Pressure piece (centripetal pump)
- 160 Hexagon nut M 12 (centrifugal clutch)
- 170 Hex head screw M 12 x 200 (centrifugal clutch)

12.10 Bowl overview

Bowl and centripetal pump in the order of assembly



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Fig. 92 Exploded drawing of the bowl and the centripetal pump

20	⁽¹⁾ Bowl bottom, compl.	
30	Threaded pin	
40	Gasket	
50	⁽²⁾ Piston guide ring	
60	Water chamber bottom	
70	Gasket	
80	Gasket	
90	Allen screw	ISO 4762 – M 8 x 16 - A4-80
100	Annular piston	
110	Gasket	
120	Gasket	
130	Closing chamber bottom	
140	Gasket	
150	Gasket	
160	Gasket	
170	Sliding piston	
180	Gasket	
190	⁽¹⁾ Distributor	
200	Disk stack, compl.	
210	Separating disk	
220	⁽¹⁾ Bowl top	
230	Gasket	
240	Gasket	
250	Threaded pin	ISO 4026 – M 12 x 16 - 1.4571
260	Gasket	
270	Centripetal pump chamber cover	
290	Centripetal pump chamber cover, compl	
300	Lock ring	
310	Spindle screw	
320	Gasket	
510	Centripetal pump. complete	
520	Gasket	
530	Sensing liquid pump	
540	Gasket	
550	Gasket	
560	Spacer ring	
570	Gasket	

⁽¹⁾ **IMPORTANT:** This part may only be replaced by service professionals from GEA Westfalia Separator.
The complete bowl must be rebalanced in one of our authorized workshops or at the factory.

⁽²⁾ **IMPORTANT:** This part may only be replaced by service professionals from GEA Westfalia Separator.
A vibration check must be carried out on the machine by service professionals from GEA Westfalia Separator.

12.11 Dismantling the bowl



WARNING

Danger of injury from falling components

When lifting bowl parts, loose parts inside can get twisted or jam. There is a risk that parts suddenly become dislodged when moved, fall down and cause serious injuries.

- Wear protective gear, e.g. safety shoes and protective helmet.
- Never walk under suspended loads.
- Before dismantling the bowl, ensure that the bowl is aligned horizontally so that bowl parts do not jam or twist during lifting or moving.
- When lifting or moving parts, ensure that no other parts, in particular internal parts, are unintentionally lifted or moved as well.
- Keep to the order described when dismantling.
- Avoid damage to the bowl parts during dismantling by taking the following action.
 - positioning accurately,
 - avoiding diagonal pull.
 - Select the low lifting speed of the hoist.
- Dismantled bowl parts must only be placed on an even, non-slip surface, e.g. a rubber mat or wooden pallet.
- Secure bowl parts with suitable means against overturning and rolling away, e.g. with wooden wedges or square-shaped timbers.
- Parts put together must be completely dismantled from each other.
- Handle the parts with care.
- When carrying out disassembly work on several separators, be careful not to interchange parts of different bowls.
 - Each bowl must be balanced with its respective components. The parts are marked with the serial-number of the machine or with the last three digits of the serial number.

IMPORTANT:

- Use only suitable hoists and load suspension devices.
- Always use complete tools and use them only for the intended use, see chapter "Maintenance/ Tools".

12.11.1 Hinging up the hood

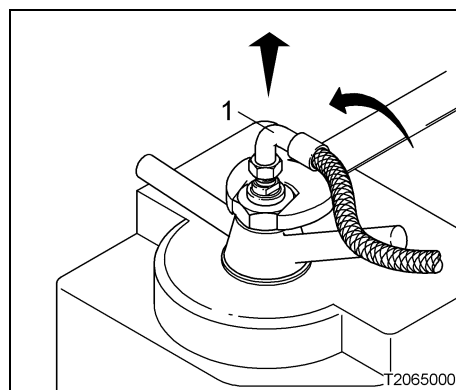


Fig. 93

- Disconnect filling and displacement water feed line (1).

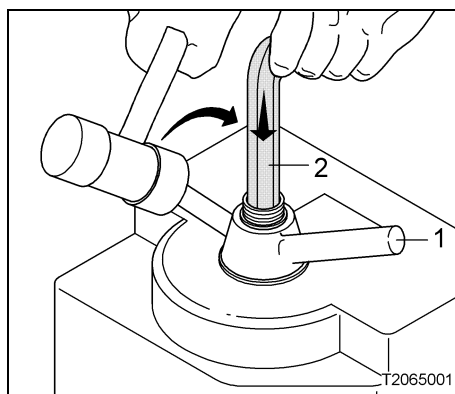


Fig. 94

- Hold centripetal pump with socket wrench or hexagonal offset screwdriver (2).
- Screw tight handle connection piece (1) by lightly hammering with a mallet (**left-hand thread**).

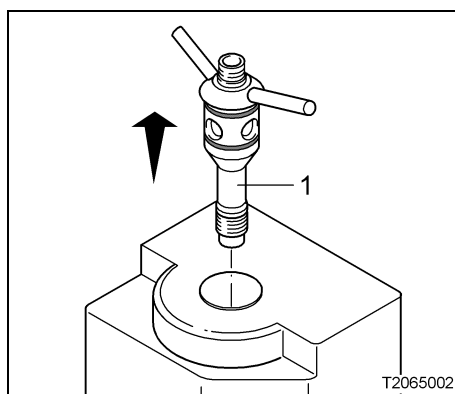


Fig. 95

- Remove handle connection piece (1).

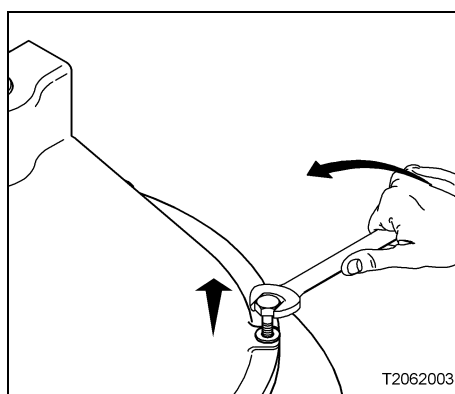


Fig. 96

- Unscrew the hex head screws including the washers.
 - The screws connect the hood to the upper part of the frame.

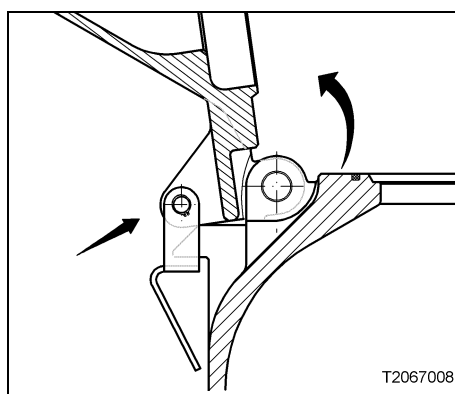


Fig. 97

- Open the hood.
 - The retaining ring must engage properly.

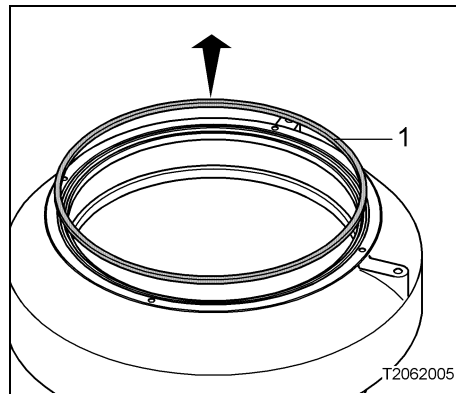


Fig. 98

- Remove the gasket (1) from the upper frame part (if necessary).
- See chapter "Maintenance / maintenance schedule".

12.11.2 Dismantling the centripetal pump

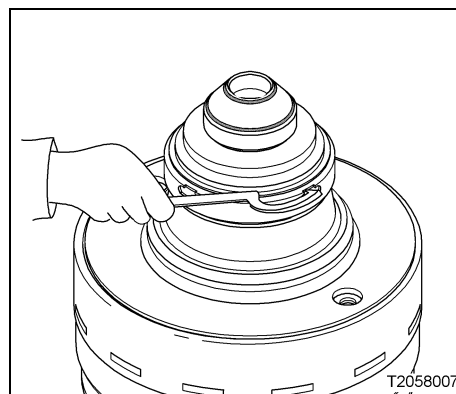


Fig. 99

Special tools required:

- Double hook wrench

- Unscrew the centripetal pump chamber lock ring using the double hook wrench (**left-hand thread**) and remove it.

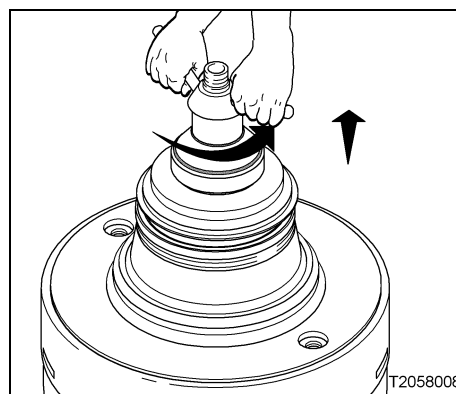


Fig. 100

- Screw handle connection piece into the centripetal pump (**left-hand thread**).
- Lift off the complete centripetal pump together with the centripetal pump chamber cover.

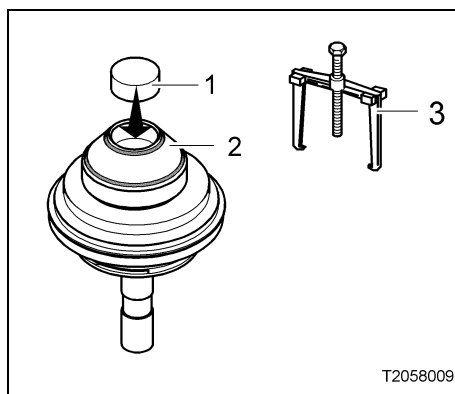


Fig. 101

Required tools:

- Pressure piece (1)
- Pullers (3), commercially available

- Insert pressure piece (1) in spacer ring (2).
- Use the puller to remove the spacer ring (2) and the inserted gaskets.

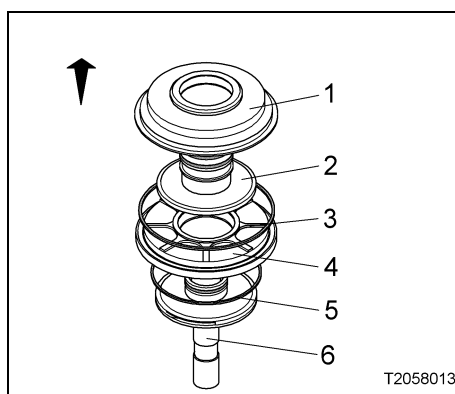


Fig. 102

- Remove the following parts:
 - Centripetal pump chamber cover (1)
 - Sensing liquid pump (2) with inserted gaskets
 - Centripetal pump chamber cover (4) with gaskets (3 and (5)
 - Centripetal pump (6) with inserted gasket
- If required, carry out maintenance work, see chapter "Maintenance".
- Take the gaskets out of these parts.

12.11.3 Lifting out the bowl

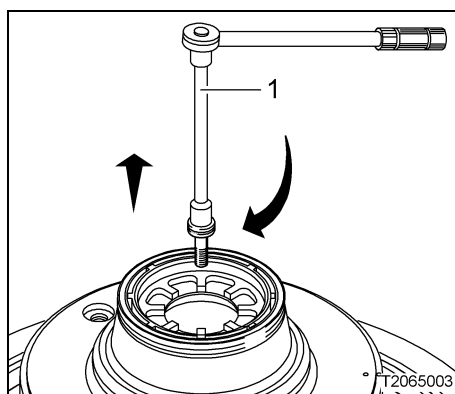


Fig. 103

Required tools:

- Socket wrench (1)
- Ratchet (commercially available)

- Unscrew the spindle screw (with fitted gasket) using tools (**left-hand thread**) and remove it.

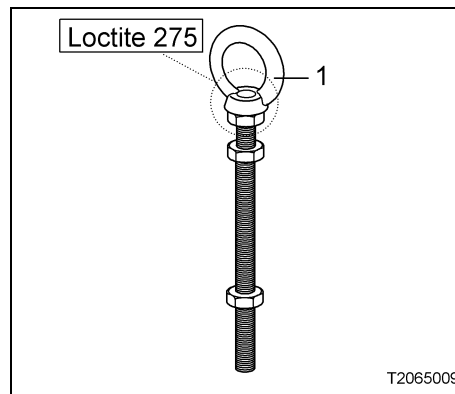


Fig. 104

Required special tool:

- Eye bolt (1)
It consists of a ring nut, hexagon nuts and bolts.



CAUTION

Risk of injury due to faulty tools

There is a risk of injury from the use of damaged or incomplete tools.

- Only use tools that are in perfect condition.
 - The ring nut and the upper hexagon nut must always be screwed onto the bolt and secured with a high-strength thread-locking sealant (e.g. Loctite 275).

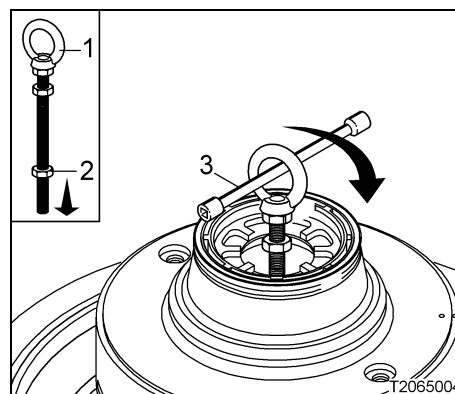


Fig. 105

- Unscrew nut (2).
- Screw eye bolt (1) into the bowl bottom.
- Force bowl at least 10 mm off spindle cone using a socket wrench.

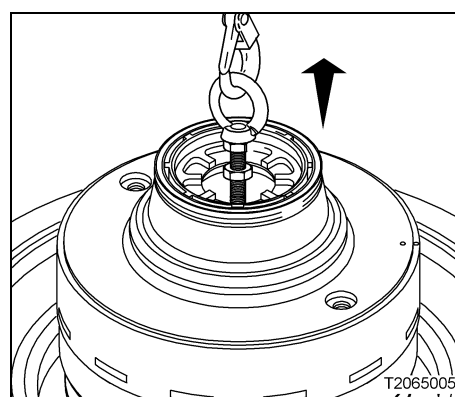


Fig. 106

- Lift the bowl out of the frame by means of the hoist.
- For further assembly, set the bowl down on a smooth, skid-proof base.

12.11.4 Compressing the disk stack

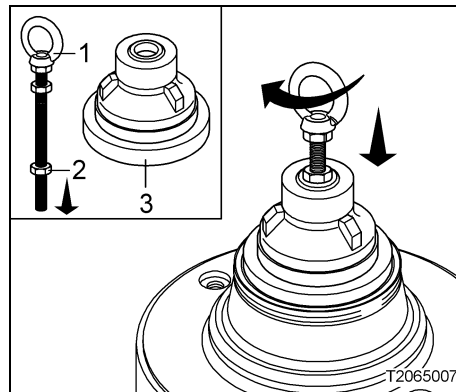


Fig. 107

Special tools required:

- Eye bolt, complete (1)
- Bell-shaped piece (3)

- Grease the bearing surface of the bell-shaped piece (3).
- Mount bell-shaped piece (3) on the bowl top.
- Unscrew hexagon nut (2).
- Screw eye bolt (1) into the bowl bottom.

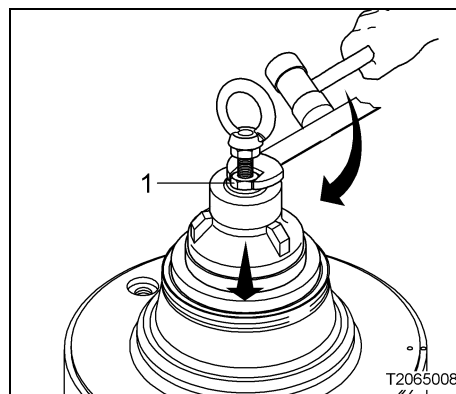


Fig. 108

- Compress the disk stack firmly.
 - Firmly tighten hexagon nut (1).

12.11.5 Lifting off the bowl top

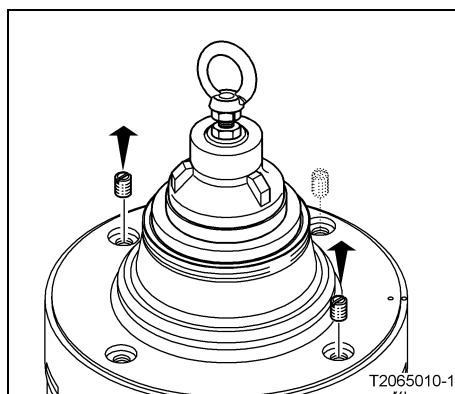


Fig. 109

- Unscrew threaded pins from the bowl top with a screwdriver.

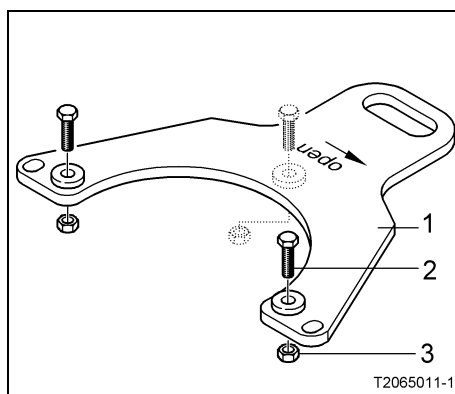


Fig. 110

Required special tool:

- Ring spanner, complete (1)
- Remove the nuts (3) from the screws (2).

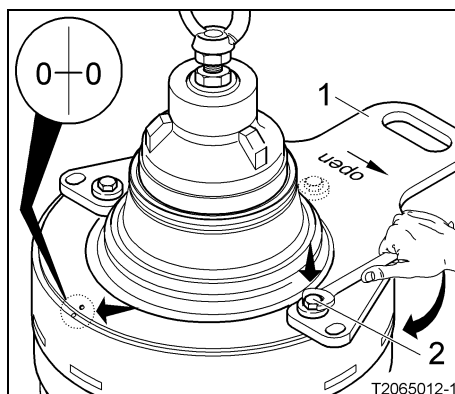


Fig. 111

IMPORTANT:

- The "0" marks of the bowl top and of the bowl bottom must be visible.
 - Do not cover them with ring spanner (1).
- The arrow and the "open" label of the ring spanner must face upwards.
- Screw ring spanner (1) to the bowl top.
 - The bushes of ring spanner (1) must engage in the boreholes of the bowl top.
- Screw in two hex head screws (2) of the ring spanner and firmly tighten.



CAUTION

Risk of injury due to rotating lever

There is a risk of injury caused by sudden turning of the lever.

- Do not stand in the range of rotation of the lever.

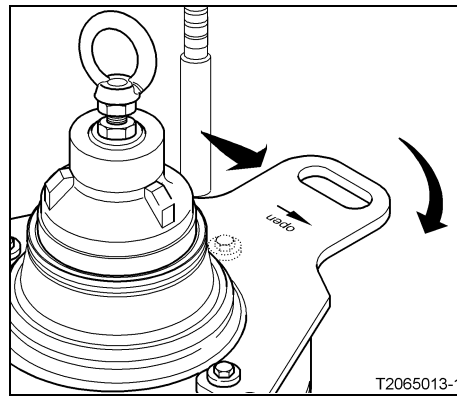


Fig. 112

- Strike open the bowl top with a striker **(left-hand thread)** and unscrew it.

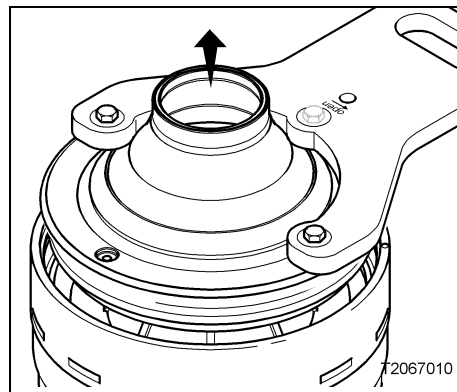


Fig. 113

- Lift off the bowl top "including the inserted gaskets) by hand.
- Set down the bowl top with built-in ring spanner on a rubber mat or wooden pallet.

If necessary:

- Take the gaskets out of the bowl top.

12.11.6 Removing the separating disk

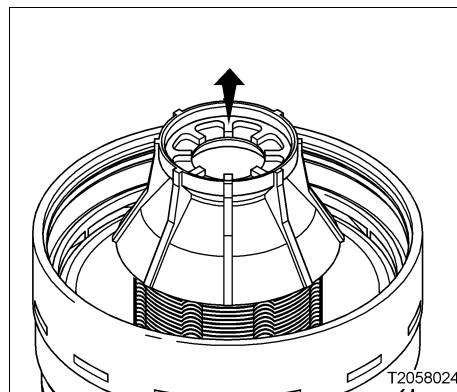


Fig. 114

- Remove the separating disk from distributor neck.

12.11.7 Removing the disk stack and the distributor

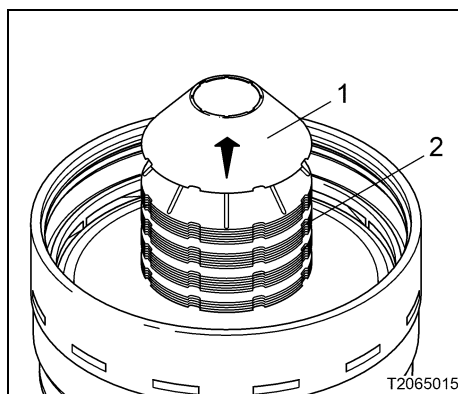


Fig. 115

- Remove the disks from the distributor, one by one (1) or in groups (2).

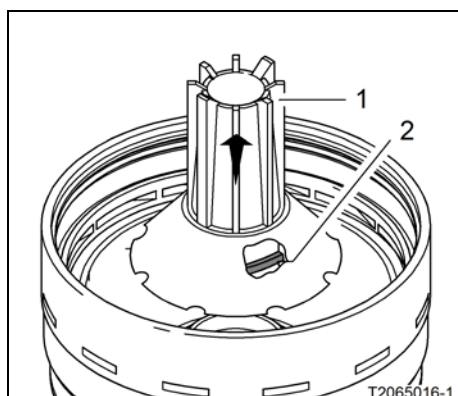


Fig. 116

- Remove the distributor (1).
- Check the inner gasket (2) if installed.

12.11.8 Removing the sliding piston

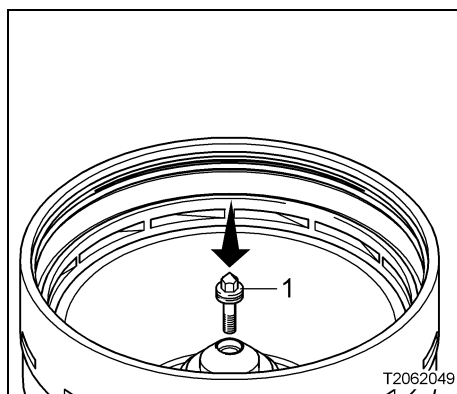


Fig. 117

- Insert spindle screw (1) into the hub.

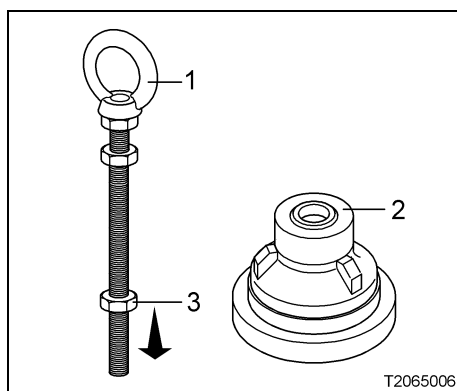


Fig. 118

Special tools required:

- Eye bolt (1)
- Bell-shaped piece (2)

- Unscrew hexagon nut (3).

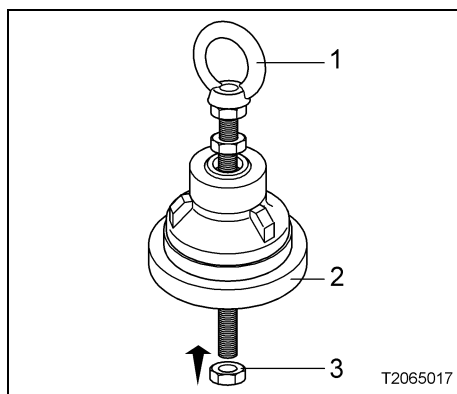


Fig. 119

- Assemble eye bolt (1) and bell-shaped piece (2):

- Screw eye bolt (1) into bell-shaped piece (2).
- Screw eye bolt (1) into hexagon nut (3) by approx. 20 mm.

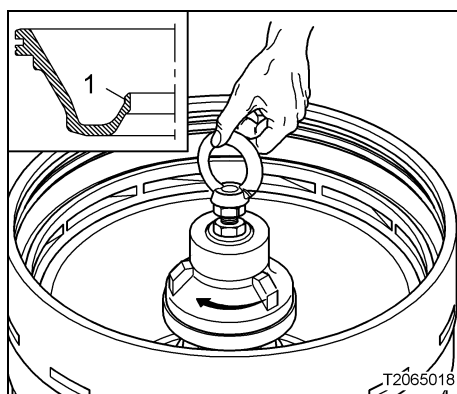


Fig. 120

- Grease the threads the sliding piston (1).
- Screw the bell-shaped piece together with the eye bolt into the thread of the sliding piston.

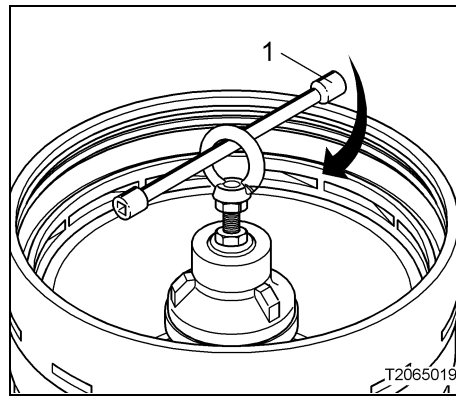


Fig. 121

Required special tool:

- Socket wrench (1)

- Force off sliding piston from the bowl bottom by turning the wrench clockwise.

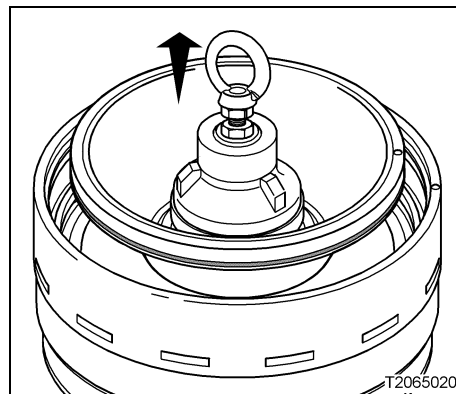


Fig. 122

- Remove the sliding piston (with fitted gasket) with bell-shaped piece and eye bolt.
- Remove the bell-shaped piece and eye bolt.

12.11.9 Removing the annular piston and closing chamber bottom

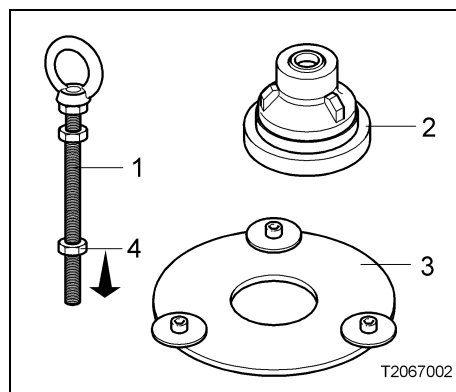


Fig. 123

Required tools:

- Eye bolt (1)
- Bell-shaped piece (2)
- Assembling device (3)

- Unscrew hexagon nut (4).

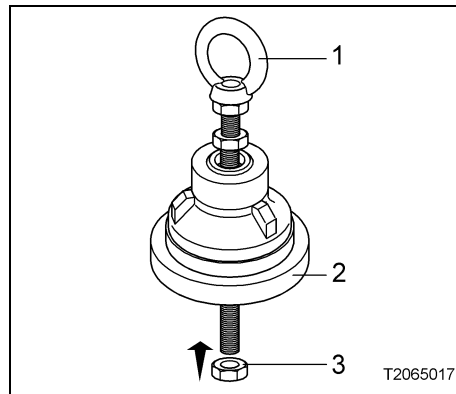


Fig. 124

- Assemble eye bolt (1) and bell-shaped piece (2):
 - Screw eye bolt (1) into bell-shaped piece (2).
 - Screw eye bolts (1) into hexagon nut (3) by approx. 20 mm.

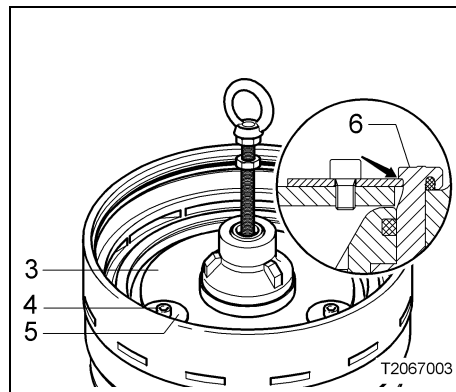


Fig. 125

- Install the bell-shaped piece and eye bolt into the bowl bottom.
- Mount assembling device (3) onto the bell-shaped piece.
- Loosen three Allen screws (4) using the ratchet wrench (with extension and socket).
- Slip three disks (5) of the assembling device towards the periphery, under the rim of annular piston (6).
- Make sure that disks (5) are properly positioned in the mounting groove of the annular piston.
- Firmly re-tighten Allen screws (4).

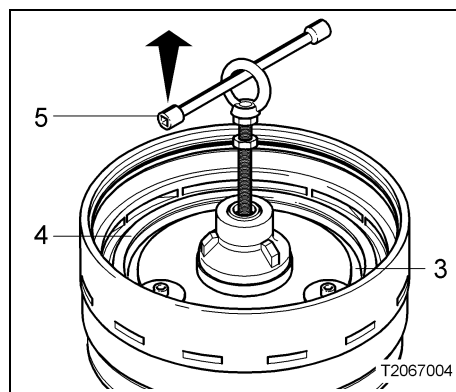


Fig. 126

- Force off closing chamber bottom (3) together with annular piston (4) by turning wrench (5) clockwise.

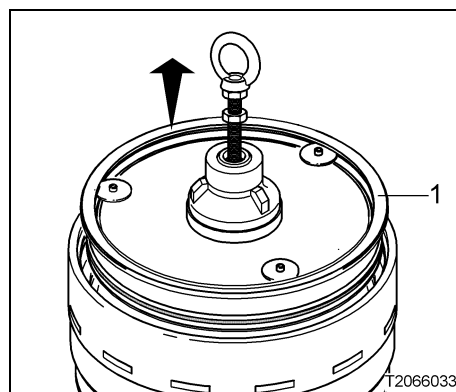


Fig. 127

- Remove closing chamber bottom (1) and annular piston (including the inserted gaskets) with the bell-shaped piece and the eye bolt.
- Remove the bell-shaped piece and eye bolt.

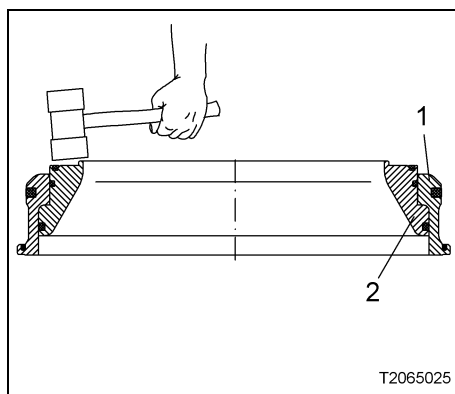


Fig. 128

- Drive apart the ring piston (1) and closing chamber bottom (2) with a mallet.

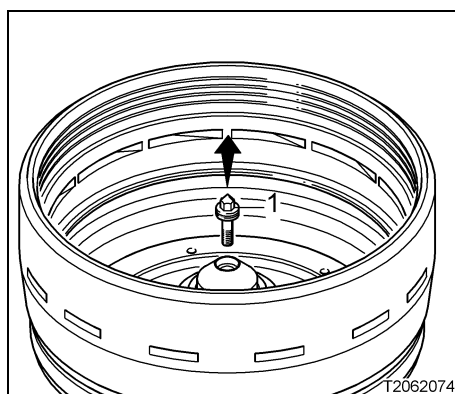


Fig. 129

- Remove the spindle screw (1) including the inserted gasket.

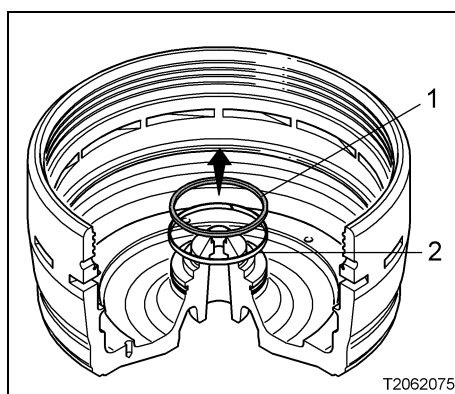


Fig. 130

- Remove gasket (1) and piston guide ring (2), refer to the maintenance schedule if necessary.

12.11.10 Removing the water chamber bottom

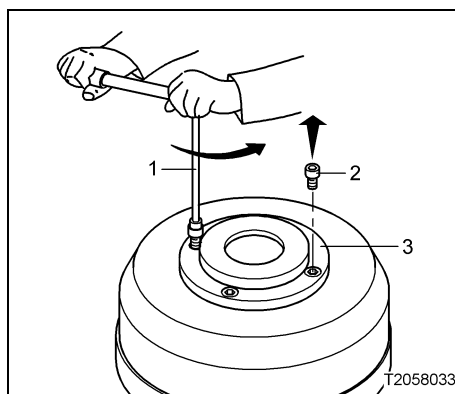


Fig. 131

Required special tool:

- Socket wrench (1)

- Turn bowl through 180° (opposite the fitting position).
- Unscrew four cylinder screws (2) from water chamber bottom (3).

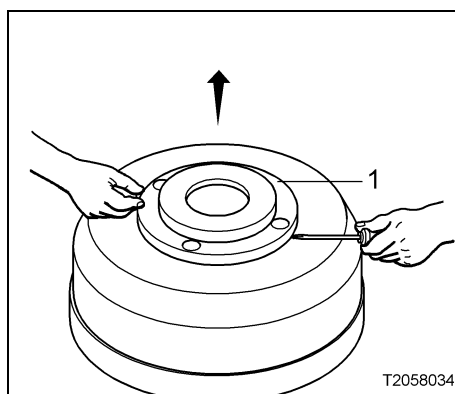


Fig. 132

- Force off water chamber bottom (2) with a screwdriver and remove together with the inserted gaskets.

12.11.11 Checking the wear inserts (option)

If wear inserts are installed, they must be checked. If they are worn, they must be replaced.

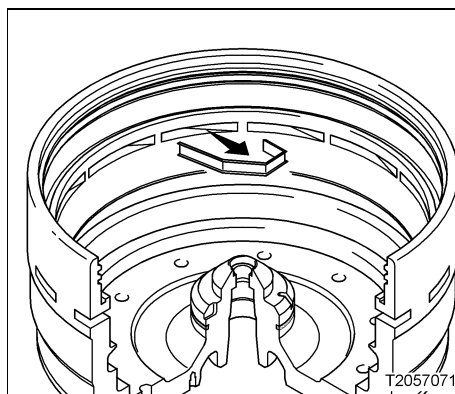


Fig. 133

- Replace the wear inserts, see "Replacing the wear inserts".

12.12 Assembling the bowl

Observe the points below when working on bowls:

- When carrying out assembly work on several separators, be careful not to interchange parts of different bowls.
 - Each bowl must be balanced with its respective components. The parts are marked with the serial-number of the machine or with the last three digits of the serial number.
- Keep to the order described when mounting.
- Avoid damage to the bowl parts during assembly by taking the following action.
 - positioning accurately,
 - avoiding diagonal pull.
 - Select the low lifting speed of the hoist.
- Some bowl parts must be arranged in fixed positions relative to one another. Pay attention to the locking devices and marks.
 - Any locking devices and alignment marks must be in perfect condition. The separator may not be operated when locking devices and marks on the bowl parts are damaged.
- Worn gaskets must be replaced.
- After fitting certain new bowl parts, the bowl must be re-balanced, e.g. in the case of bowl bottom or bowl top.
 - Bowl balancing may be carried out only by specialists from GEA Westfalia Separator or specialist workshops authorized by GEA Westfalia Separator. If in doubt, consult the service department of GEA Westfalia Separator.
- Speed varying components, e.g. frequency converter, must not be manipulated so that the permissible maximum speed of the bowl is not exceeded.
- Supervisory equipment must not be manipulated, e.g. speed sensor. Their function must be checked, see instructions in the chapter "Maintenance / Maintenance schedule".
- After carrying out maintenance and repair work, reattach all protective devices.
- When carrying out maintenance and repair work, perform a visual check of the separator components. Have the components checked for damage through corrosion and erosion by authorized specialists and proceed in accordance with the instructions in chapter "Maintenance / Maintenance schedule".
- To lubricate the threads and guide surfaces of the bowl parts, see chapter "Maintenance / Lubrication".

12.12.1 Fitting the water chamber

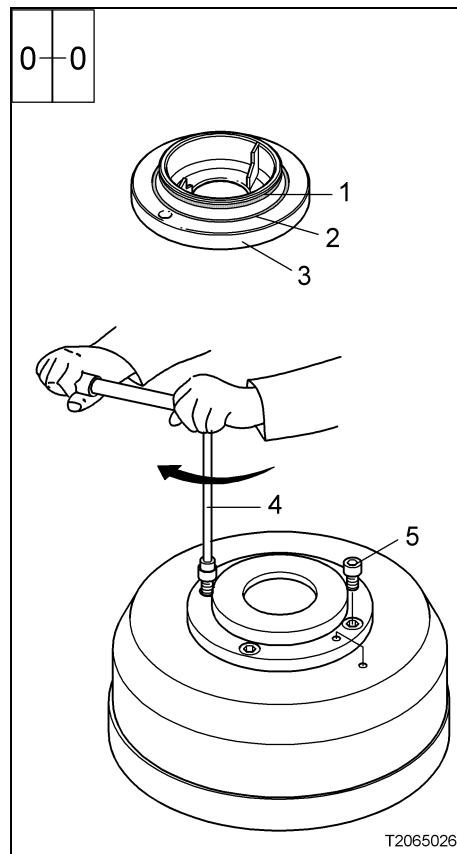


Fig. 134

Required special tool:

- Socket wrench (4)

- Insert gaskets (1), (2) into the grooves of the water chamber bottom (3).
- Turn bowl through 180° (opposite the fitting position).
- Place the water chamber bottom (3) on the bowl bottom.
- Check "0" marks of the bowl bottom and the water chamber bottom.
 - The "0" marks must be aligned.
- Screw in the four cylinder screws (5).
 - The cylinder screws connect the water chamber bottom with the bowl bottom.
 - Tightening torque: **25 Nm**

12.12.2 Installing the annular piston and closing chamber bottom

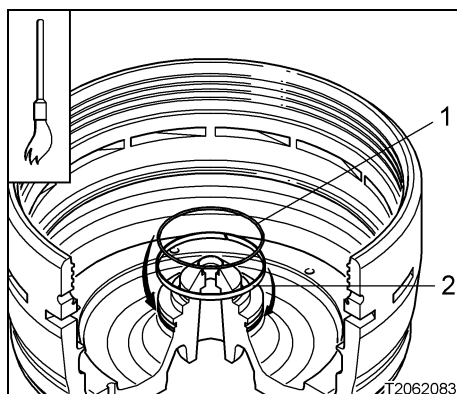


Fig. 135

- Grease the guide surfaces in accordance with the lubrication schedule.
- Insert gaskets (1) and piston guide ring (2) in the grooves of the bowl bottom.

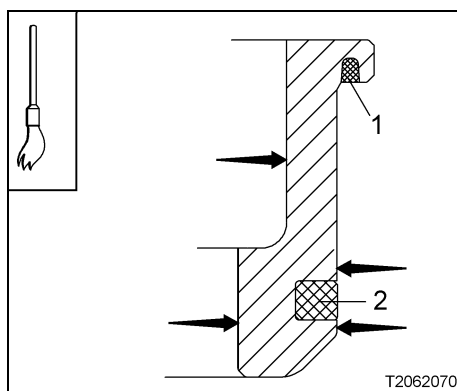


Fig. 136

- Replace the polyamide-gasket: (1), see section "Servicing / replacing the polyamide-gasket".
- Insert gasket (2) into the groove of the annular piston, applying firm and even pressure.
- Grease the guide surfaces in accordance with the lubrication schedule.

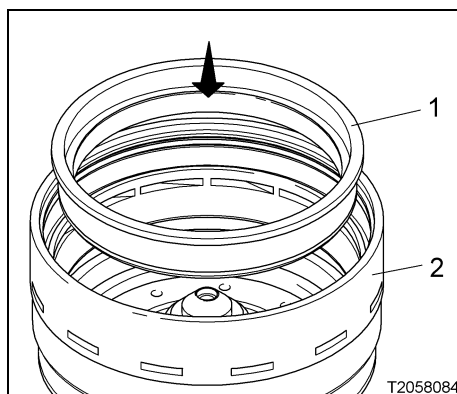


Fig. 137

- Insert annular piston (1) into bowl bottom (2).

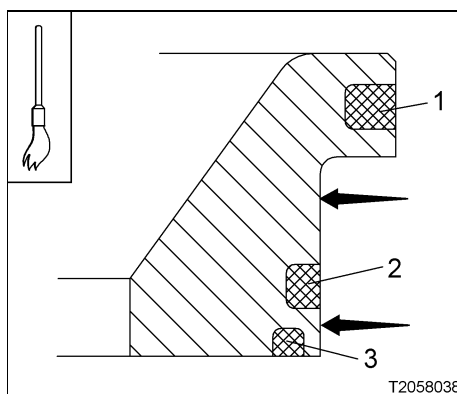


Fig. 138

- Insert gaskets (1), (2) and (3) in the grooves of the closing chamber bottom.
- Grease the guide surfaces in accordance with the lubrication schedule.

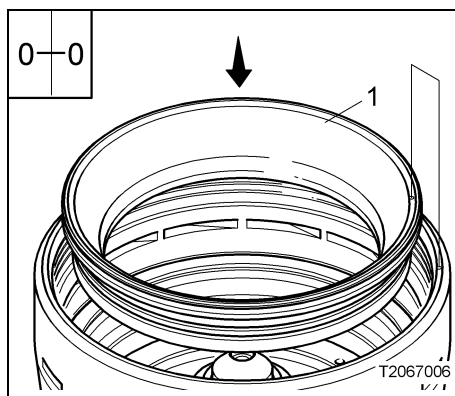


Fig. 139

- Check the "0" marks of the bowl bottom and the closing chamber bottom.
 - The "0" marks must be aligned.
- Insert closing chamber bottom (1) into the annular piston.

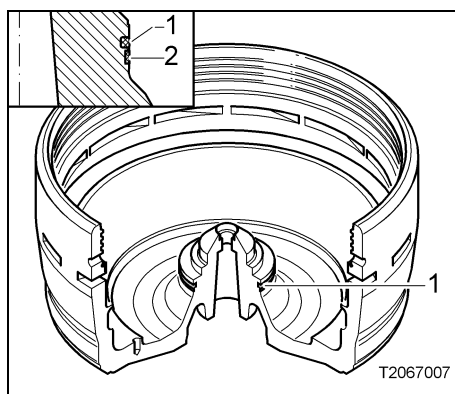


Fig. 140

- Make sure that the gasket (1) and the piston guide ring (2) are installed correctly.

12.12.3 Fitting the sliding piston

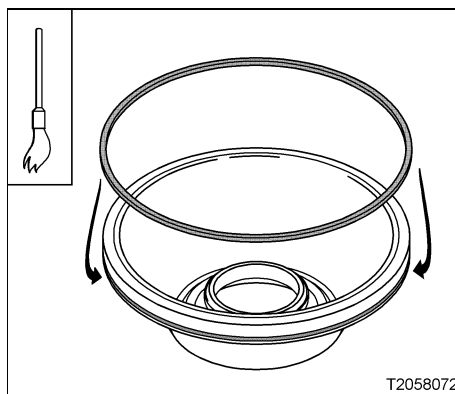


Fig. 141

- Insert gasket into the groove of the sliding piston.
- Grease the guide surfaces in accordance with the lubrication schedule.

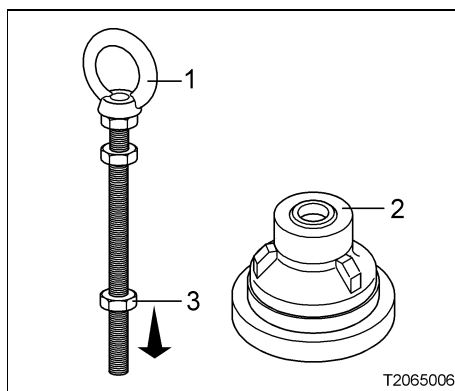


Fig. 142

Special tools required:

- Eye bolt (1), complete
- Bell-shaped piece (2)
- Unscrew hexagon nut (3).

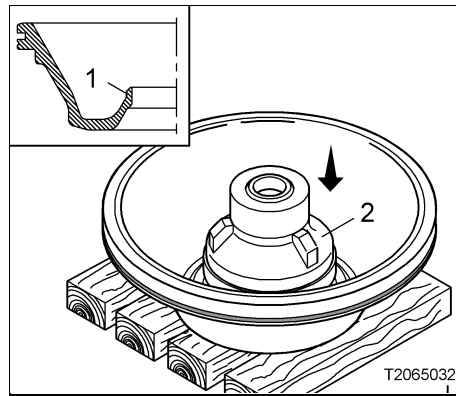


Fig. 143

- Grease the threads (1) of the sliding piston.
- Screw bell-shaped piece (2) into the thread of the sliding piston.

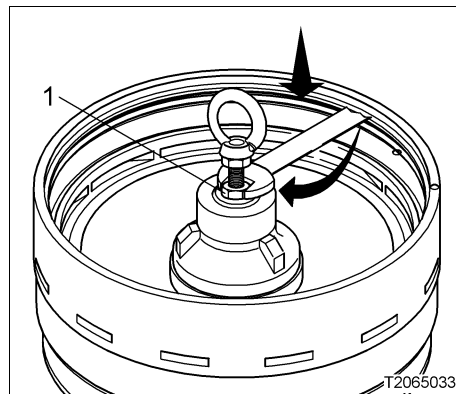


Fig. 144

- Install the sliding piston with fitted gasket into the bowl bottom, with screwed-in bell-shaped insert.
- Screw eye bolt through the bell-shaped piece into the bowl bottom.
- Press the sliding piston into its seat as far as it will go by turning hexagon nut (1) clockwise with an open-ended wrench.
- Remove the tools.

12.12.4 Installing the distributor and the disk stack

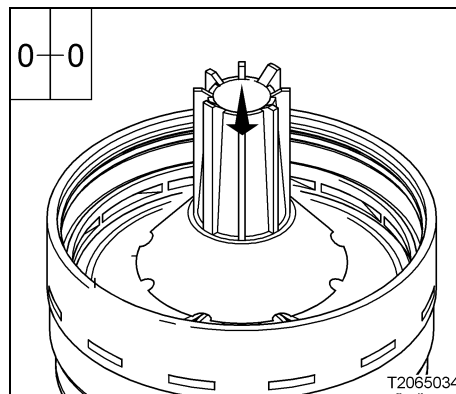


Fig. 145

- Insert the distributor into the sliding piston.
 - Pay attention to correct positioning.
- Check "0" marks on the bowl bottom and the distributor.
 - The "0" marks must be aligned.

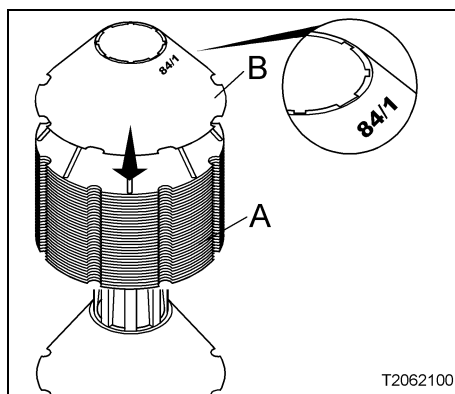


Fig. 146

ATTENTION: Make sure that the total number of disks is correct.

This is marked on the blind disk, e.g. 84/1:

- Total number of disks A and B = **84**(number of disks with spacers A + number of blind disks B)
- Number of blind disks B = **1**

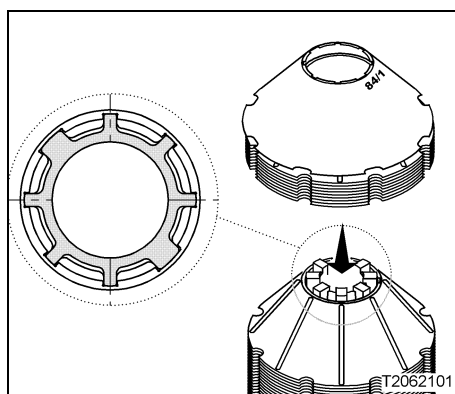


Fig. 147

ATTENTION: The last disks must be properly inserted into the guide ribs of the distributor.

- Carefully stack the disks on the distributor neck, one by one or in groups.

12.12.5 Fitting the separating disk

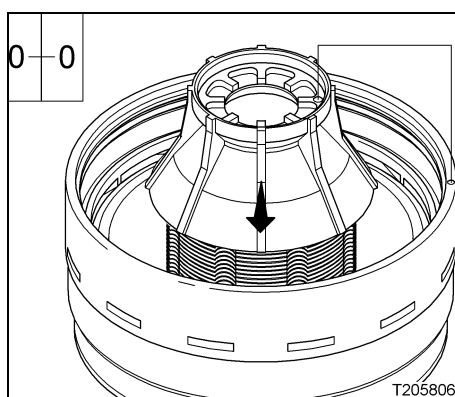


Fig. 148

- Mount the separating disk.
 - Pay attention to correct positioning.
- The "0" marks of the bowl bottom and the distributor must be aligned.
 - The "0" marks must be aligned.

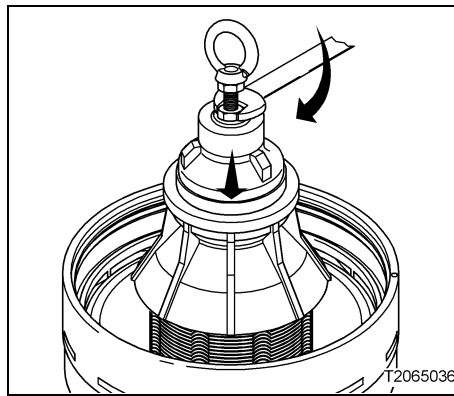


Fig. 149

- Lightly compress the disk stack with the bell-shaped piece and the eye bolt.

12.12.6 Installing the bowl top

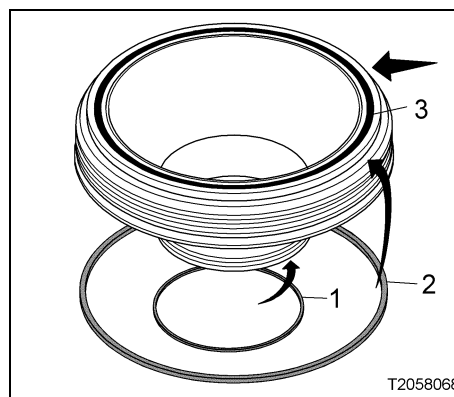


Fig. 150

- Thoroughly clean the grooves for gaskets (1) and (2) in the bowl top.
- Check the gaskets (1) and (2):
 - Replace the gaskets if damaged.
 - Insert the gaskets.
- Check inserted gasket (3).
 - Replace the gaskets if damaged.
 - Replacing the polyamide-gasket (3), see chapter "Servicing / replacing the polyamide-gasket of the bowl top".

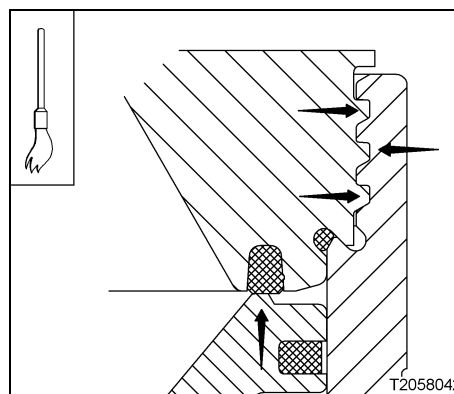


Fig. 151

ATTENTION: Prevent seizing of the threads.

- The following items must be carefully cleaned, wiped dry and greased in accordance with the lubrication schedule (see chapter "Maintenance / lubrication schedule"):

 - Threads and guide surfaces of bowl bottom and bowl top.
 - Contact surfaces on the bowl top.
 - Sealing surface on the bowl top.

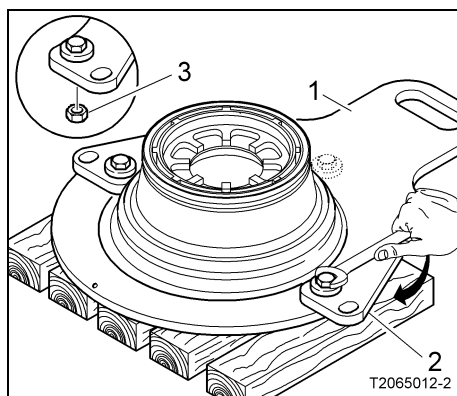


Fig. 152

Required special tool:

- Ring spanner, complete (1)
- Remove three hexagon nuts (3) from hex head screws (2).

IMPORTANT:

- The "0" mark on the bowl top must be visible.
- Do not cover them with ring spanner (1).
- If threaded pins are screwed into the bowl top, remove them with a screwdriver.

- The arrow and the "open" label of the ring spanner must face upwards.
- Screw ring spanner (1) to the bowl top.
- The bushes of ring spanner (1) must engage in the boreholes of the bowl top.
- Screw in three hex head screws (2) of the ring spanner and firmly tighten.

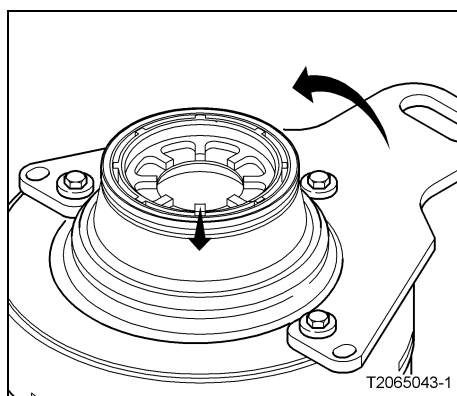


Fig. 153

- Screw the bowl top by hand as far as it will go into the bowl bottom (**left-hand thread**).

12.12.7 Compressing the disk stack

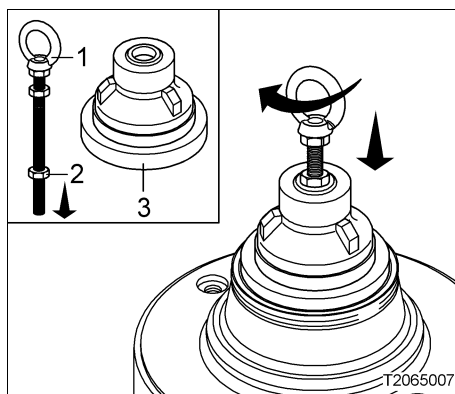


Fig. 154

Required special tools

- Eye bolt, complete (1)
 - Bell-shaped piece (3)
- Grease the bearing surface of the bell-shaped piece (3).
 - Mount bell-shaped piece (3) on the bowl top.
 - Unscrew hexagon nut (2).
 - Screw eye bolt (1) into the bowl bottom.

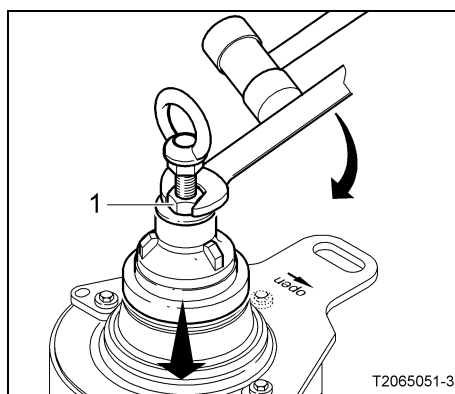


Fig. 155

- Compress the disk stack firmly.
 - Firmly tighten hexagon nut (1).

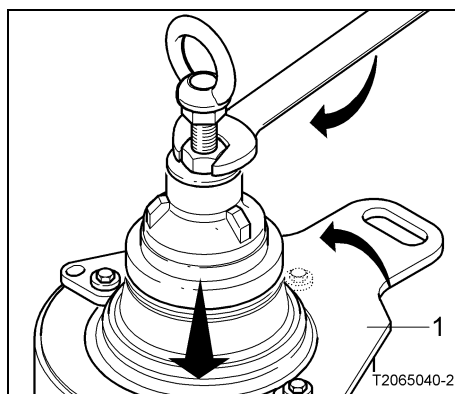


Fig. 156

- Compress the disk stack again, at the same time screw in the bowl top with the ring spanner (1) (**left-hand thread**) .

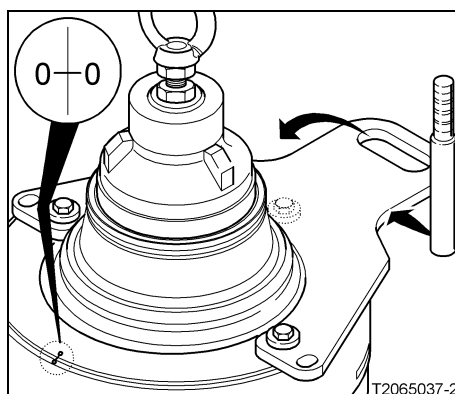


Fig. 157

- Strike the bowl top with a striker until the "0" mark is reached (**left-hand thread**).
- Check "0" marks of the bowl top and the bowl bottom.
 - The "0" marks must be aligned.
- Detach the tools.

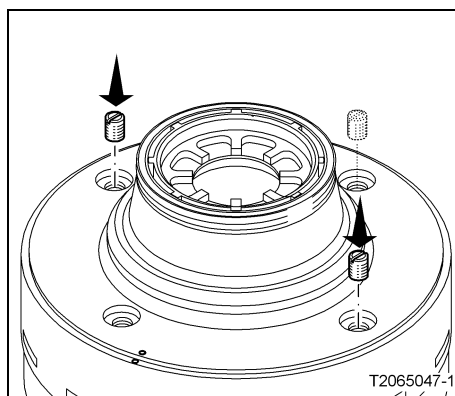


Fig. 158

- Screw in threaded pins using a screw-driver.

12.12.8 Installing the complete bowl and the centripetal pump

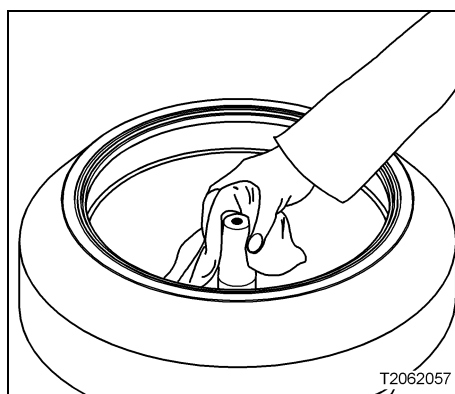


Fig. 159

- IMPORTANT:** Do not grease cone parts.
- Dry and clean the spindle cone with a suitable cloth.

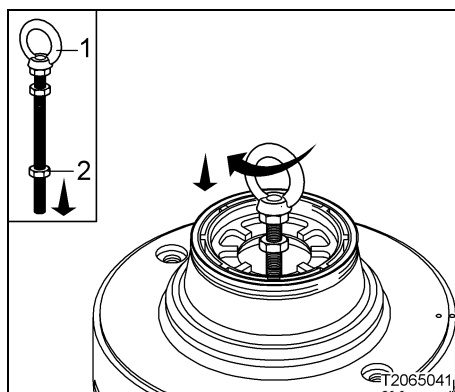


Fig. 160

Required special tool:

- Eye bolt (1)
- Unscrew hexagon nut (2).
- Screw eye bolt (1) completely into the bowl bottom.

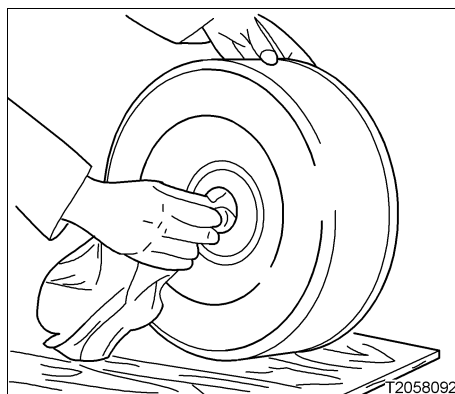


Fig. 161

- Turn bowl through 90° (opposite the fitting position)

- IMPORTANT:** Do not grease the bowl hub.
- Clean the bowl hub with a suitable cloth.
 - The cone must be clean and dry.

**DANGER****Danger to life from suspended loads**

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

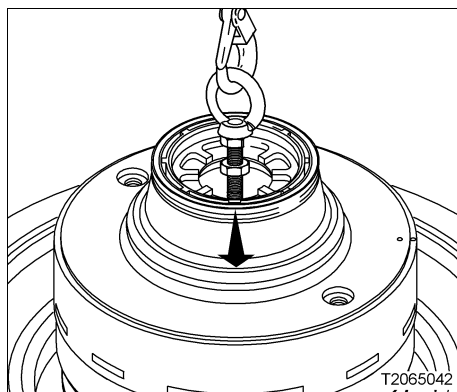


Fig. 162

- Carefully place the bowl on the spindle cone using the eye bolt and hoist.
- Undo the eye bolt from the bowl bottom and remove the hoist.

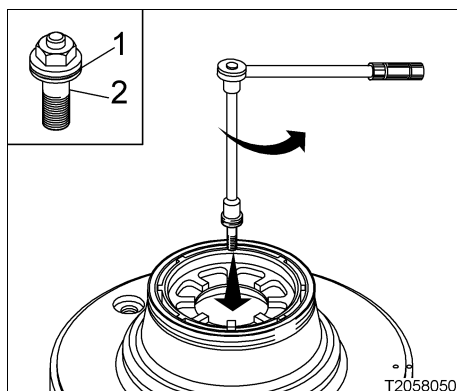


Fig. 163

Required special tool:

- Socket wrench
- Torque wrench

- Fit gasket (1) to spindle screw (2).
- Grease the thread of the spindle screw.
- Put spindle screw in socket wrench and screw in (**left-hand thread**).

**DANGER****Danger to life through from machine parts**

If the spindle screw is not sufficiently tightened machine parts can become detached while the separator is in operation. The ejection of machine parts can result in serious and life-threatening injuries.

- Make sure that the spindle screw is tightened to the specified torque setting.

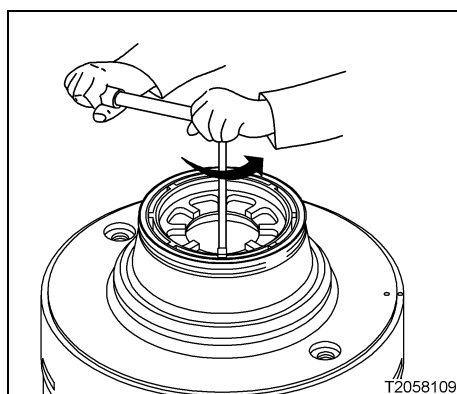


Fig. 164

- Tighten the spindle screw firmly.
 - Tightening torque: **50 Nm**

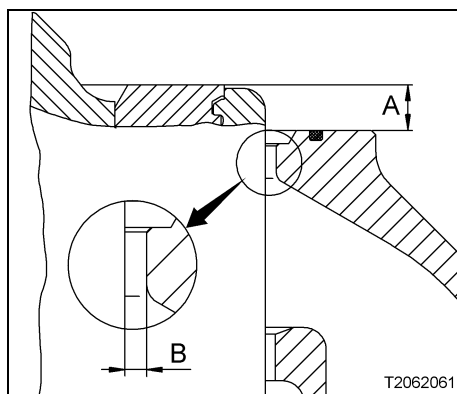


Fig. 165

- Check that the spindle and bowl are centred.
 - The reference dimension **B** is **4 (±1.5) mm** between bowl and upper part of frame.
- Check for correct bowl height **A**, see chapter "Servicing / Bowl height".

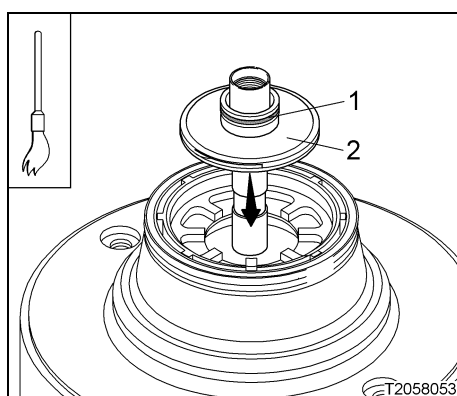


Fig. 166

- Insert gasket (1) in the centripetal pump groove.
- Apply a thin coat of grease to threads and contact surfaces of the centripetal pump.
- Mount the centripetal pump (2).

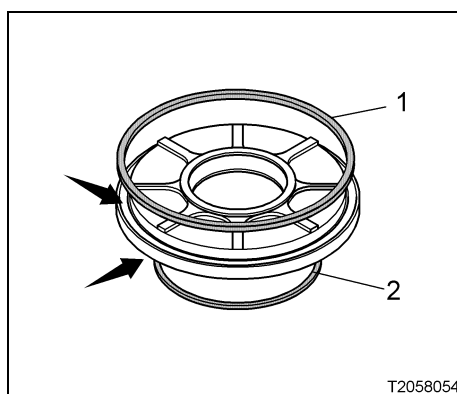


Fig. 167

- Insert gaskets (1), (2) into the grooves of the centripetal pump chamber cover.

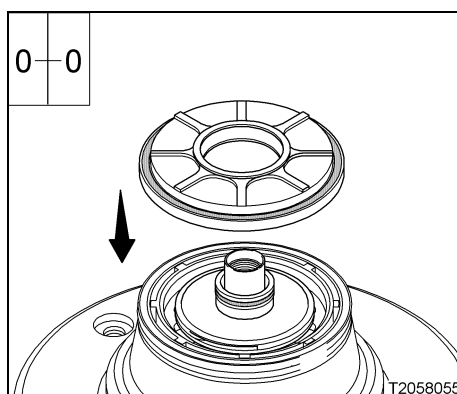


Fig. 168

- Mount the centripetal pump chamber cover.
- Check "0" marks of the centripetal pump chamber cover and the bowl bottom.
 - The "0" marks must be aligned.
- Check locking mechanism has properly engaged.

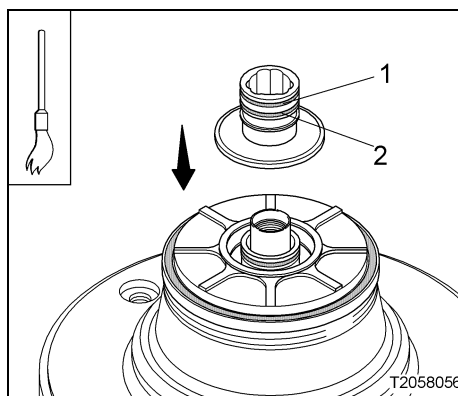


Fig. 169

- Insert gaskets (1), (2) into the grooves of the bowl top.
- Grease the guide surfaces.
- Install sensing liquid pump.

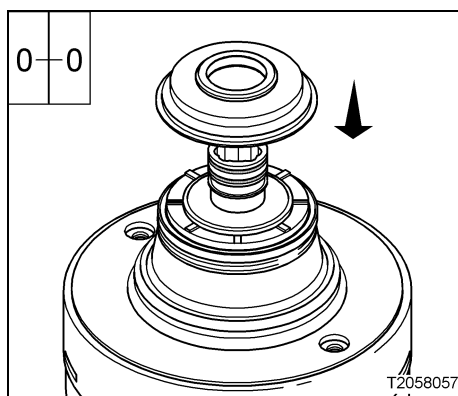


Fig. 170

- Mount the centripetal pump chamber cover.
 - The "0" marks of the centripetal pump chamber cover and the bowl top must be aligned.

**DANGER****Danger to life through from detached machine parts**

If the centripetal pump chamber locking ring is insufficiently tightened, machine parts can become loosened while the separator is in operation. The ejection of machine parts can result in serious and life-threatening injuries.

- Make sure that the centripetal pump chamber locking ring is properly tightened.

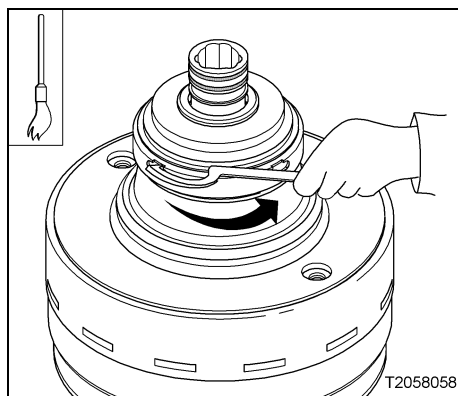


Fig. 171

- Grease the threads on the bowl top and the centripetal pump chamber lock ring as specified in the lubrication schedule.
- Screw the centripetal pump chamber locking ring on to the bowl top and tighten (**left-hand thread**).

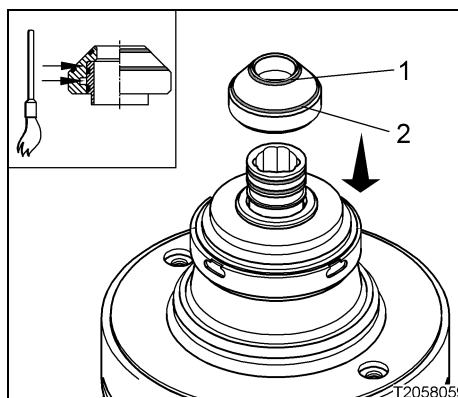


Fig. 172

- Insert gaskets (1) and (2) into spacer ring.
- Grease the contact surfaces of the centripetal pump according to the lubrication schedule.
- Fit spacer ring.

12.13 Replacing the wear inserts (option)

The wear inserts protect the highly stressed bowl material in the area of the solids ejection ports against premature wear.

During servicing, the wear inserts must be checked and replaced if they are worn.

ATTENTION

Bowl wear at the solid discharge ports

The discharging solids impact the bowl webs directly, resulting in a high level of wear of the bowl material and a premature bowl change.

- Regularly check the wear inserts.
- Replace the wear inserts in time.

12.13.1 Removing the wear inserts

ATTENTION

Damage to the bowl bottom from using unsuitable tools.

Unsuitable, metal tools can damage the bowl bottom when removing the wear inserts.

- Do not damage the bowl bottom by using unsuitable tools.
- Use a plastic tip hammer (mallet).

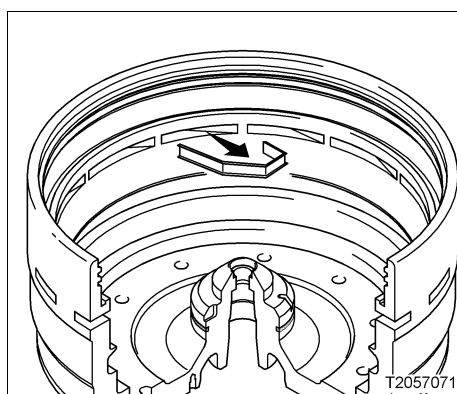


Fig. 173

- Bend back the nose at the end of the wear insert.
- Tap the wear insert carefully inwards.

12.13.2 Fitting the wear inserts

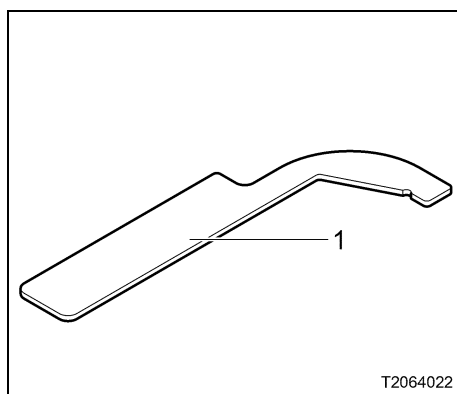


Fig. 174

Required special tool:

- Clamping piece (1)

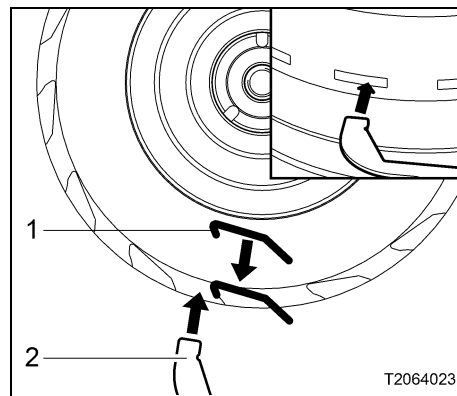


Fig. 175

- Install the wear insert (1).

The wear insert must snugly rest against the bowl wall.

- Insert clamp piece (2) in the slot in the bowl bottom.

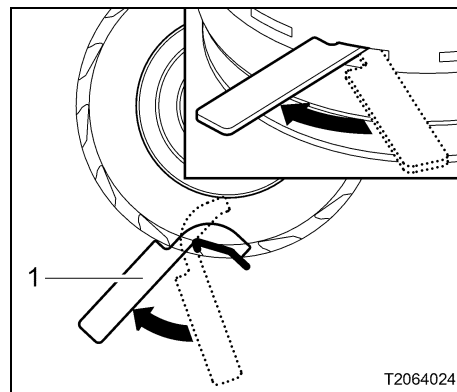


Fig. 176

- Carefully bend the nose of the wear insert with clamp piece (1).

ATTENTION

Damage to the bowl bottom from using unsuitable tools.

Unsuitable, metal tools can damage the bowl bottom when installing the wear inserts.

- Do not damage the bowl bottom by using unsuitable tools.
- Use a plastic tip hammer (mallet).

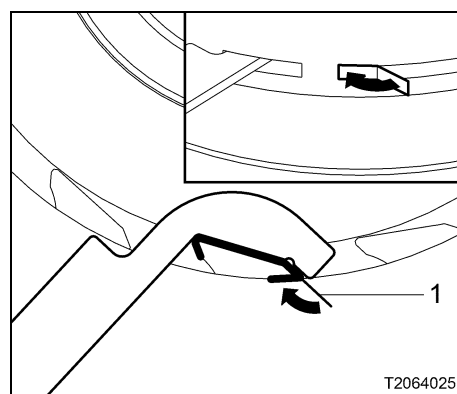


Fig. 177

- Gently hammer down the protruding end of the wear insert (1) (see arrow).

The wear insert must snugly rest against the bowl bottom.

- Repeat this procedure until all wear inserts are fitted in the bowl bottom.

12.14 Replacing the polyamide gasket of the bowl top

ATTENTION

Damage to the groove in the bowl top

When drilling and raising the polyamide gasket, the groove in the drum top can get damaged by the drill or the wood screws used for lifting.

- Position the drill bit on the polyamide gasket vertically and in the centre of the groove.
- Drill carefully and not too deeply.
- Screw in the wood screws carefully.

REMOVAL

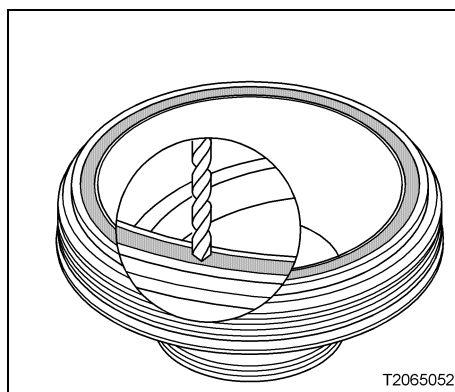


Fig. 178

Required tools:

- Drill bit (Ø 2 mm)
 - Wood screws (max. Ø 4 mm x 70 mm length)
 - Hardwood block
- Drill the damaged polyamide gasket at two points with a spacing of approx. 50 to 60 mm.

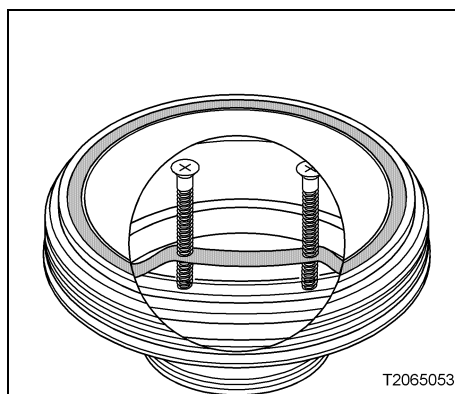


Fig. 179

- Screw two wood screws into the bore-holes in the polyamide gasket.
- Force off the polyamide gasket with the wood screws.
- incrementally lever it out of the groove using a screwdriver.

NOTE: If the polyamide gasket cannot be removed, repeat this procedure multiple times.

INSTALLATION

- **IMPORTANT:** To facilitate installation, thoroughly clean dry the groove and polyamide gasket in the bowl top.



CAUTION

There is a risk of injury through burning or scalding.

Hot water can cause burns.

- Do not put your hands in the hot water bath.
- Wear protective gloves.
- Heat the new polyamide-gasket in a water bath at approx. 80° C (176° F) for five minutes.
- Thoroughly wipe dry the polyamide gasket.

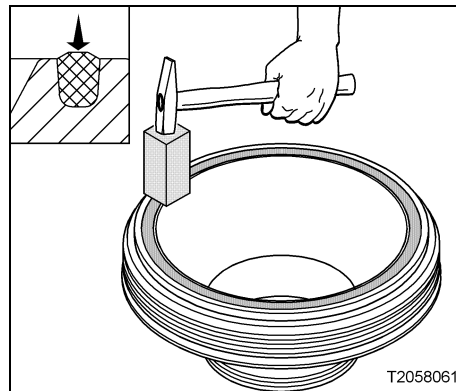


Fig. 180

- Fit the polyamide gasket into the groove of the bowl top (with the narrow side facing the bowl top).
- Mount a smooth piece of hard wood.
- Hammer the polyamide gasket evenly into the groove.

- Assemble the bowl and centripetal pump and install in the separator see chapter "Servicing / assembling the bowl".
- Closing the hood see "Servicing / closing the hood".
- Starting the separator, see chapter "Operation / starting the separator".

- **IMPORTANT:** Do not execute the program until after an initial startup period of 30 minutes.
This running time must be adhered to so that the polyamide gasket is pressed properly into the bowl top.

If the separator motor is switched off due to the program:

- switch on the separator motor by pressing the start key.
- Wait until the bowl has reached the speed specified on the separator nameplate.

Note on control unit D10:

The run-up phase of the separator motor is signalled by the slow flashing of the LED in the <Status Separator> button.

Note on control unit E40:

The run-up phase of the separator motor is displayed by a graphical representation of the separator motor in the control unit. Refer to the graphical representation for "motor run-up and post-running" in the control unit manual.

12.15 Replacing the polyamide gasket of the annular piston

REMOVAL

IMPORTANT: Change the polyamide gasket only when it is damaged. Installation is very time-consuming.

ATTENTION

Damage to the groove in the annular piston

When drilling and raising the polyamide gasket, the groove in the annular piston can get damaged by the drill or the wood screws used for lifting.

- Position the drill bit on the polyamide gasket vertically and in the centre of the groove.
- Drill carefully and not too deeply.
- Screw in the wood screws carefully.

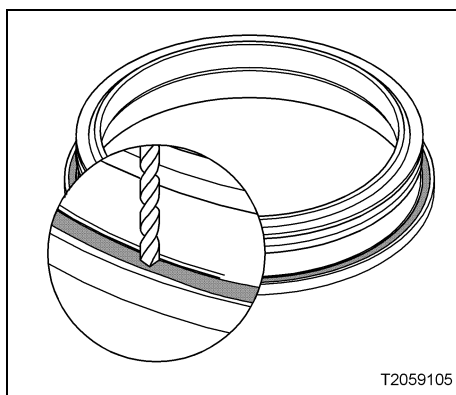


Fig. 181

Required tools:

- Drill bit (Ø 2 mm)
- Wood screws (max. Ø 4 mm x 70 mm length)
- Drill the damaged polyamide gasket at two points with a spacing of approx. 50 to 60 mm.

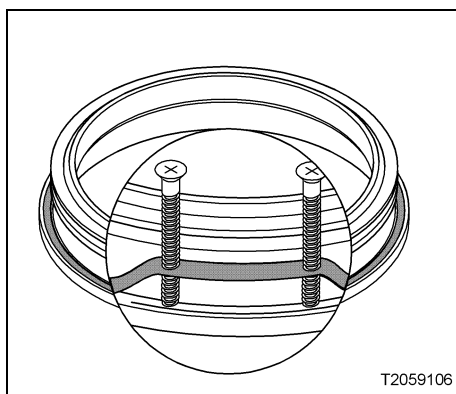


Fig. 182

- Screw two wood screws into the bore-holes in the polyamide gasket.
- Force off the polyamide gasket with the wood screws.
- incrementally lever it out of the groove using a screwdriver.

NOTE: If the polyamide gasket cannot be removed, repeat this procedure several times and increase the number of wood screws if necessary.

INSTALLATION

- **IMPORTANT:** To facilitate installation, thoroughly clean dry the groove and polyamide gasket in the annular piston.



CAUTION

There is a risk of injury through burning or scalding.

Hot water can cause burns.

- Do not put your hands in the hot water bath.
- Wear protective gloves.
- Heat the new polyamide-gasket in a water bath at approx. 80° C (176° F) for five minutes.
- Thoroughly wipe dry the polyamide gasket.

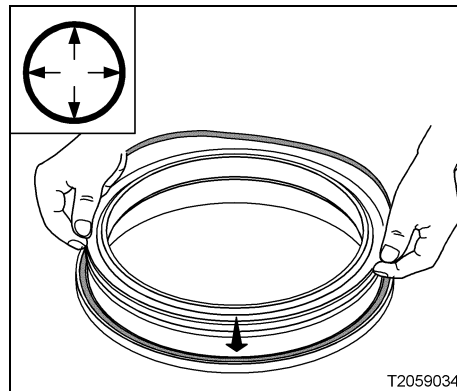


Fig. 183

- Press the gasket evenly from 4 opposite positions into the groove in the groove, so that it does not fall out during assembly.

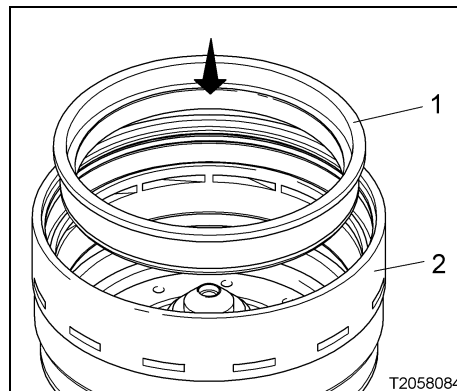


Fig. 184

- Insert annular piston (1) into bowl bottom (2).

- Assemble the bowl and centripetal pump and install in the separator see chapter "Servicing / assembling the bowl".
- Closing the hood see "Servicing / closing the hood".
- Starting the separator, see chapter "Operation / starting the separator".
- **IMPORTANT:** Do not execute the program until after an initial startup period of 30 minutes.
This running time must be adhered to so that the polyamide gasket is pressed properly into the bowl top.

If the separator motor is switched off due to the program:

- switch on the separator motor by pressing the start key.
- Wait until the bowl has reached the speed specified on the separator nameplate.

Note on control unit D10:

The run-up phase of the separator motor is signalled by the slow flashing of the LED in the <Status Separator> button.

Note on control unit E40:

The run-up phase of the separator motor is displayed by a graphical representation of the separator motor in the control unit. Refer to the graphical representation for "motor run-up and post-running" in the control unit manual.

12.16 Reworking the sliding piston

The bowl is sealed by the following measures:

- Sealing surface (A) of the sliding piston (Fig. 185)
 - Piston slider edge in new condition: $H = 2,0 \text{ mm}$
- Polyamide gasket (B) of the bowl top (Fig. 186)

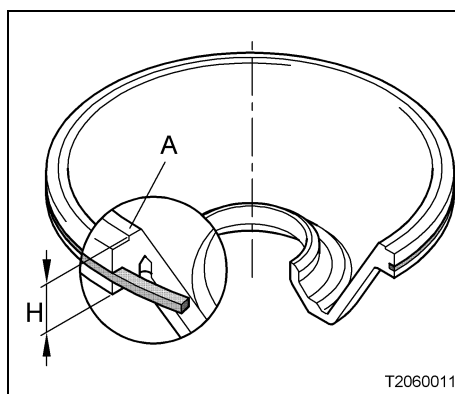


Fig. 185

The sealing surface (A) of the sliding piston can be reworked through machining (turning) when it is worn.

- Turn the sealing surface:
 - at the first signs of erosion (0.2 mm deep).
 - as soon as the bowl starts to leak
- Minimum dimension: May not be less than $H = 1,0 \text{ mm}$.
 - Replace the sliding piston if the minimum dimensions cannot be met.
 - The sealing surface must be turned perfectly flat.

Reference values for the flat turning of the sealing surface A

Surface quality	$Ra 2 \mu\text{m}$ ($Rz 12.5 \mu\text{m}$)
Tool	Hard metal steel of ISO quality M 30 or K 20
speed	55 min^{-1}
Cutting depth	Max. 0.15 mm
Feed	Max. $0.1 \text{ mm/revolution}$

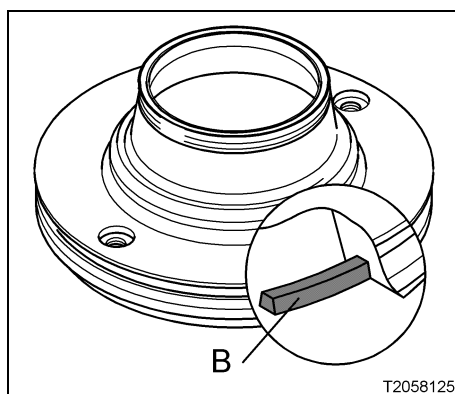


Fig. 186

- **IMPORTANT:** Install a new polyamide sealing ring in the bowl top after each flat turning of the sealing surface.
 - See chapter "Servicing / replacing the polyamide-gasket of the bowl top".

12.17 Adapting the disk stack

The delivered disk stack consists of a certain number of disks. It must be adapted to operational requirements in terms of the number of disks fitted.



DANGER

Danger to life through the ejection of machine components

Incorrect configuration/installation of the disk stack can cause strong vibrations and lead to destruction of the separator with associated risk to persons.

- The new disk stack may only be fitted by qualified specialists.
- In the case of unusual noises or vibrations on the separator:
 - Stop the separator immediately.
 - Evacuate the room.
 - Do not enter the room again until the separator has come to a standstill.

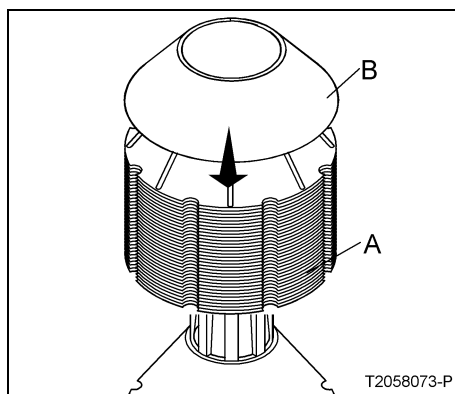


Fig. 187

- Adapting the disk stack
- **IMPORTANT:** Pay attention to the fitting position and material thickness.
 - The blind disk (B) is an overall thinner disk or a disk with a higher spacer thickness; it must always be fitted on top as the last disk.

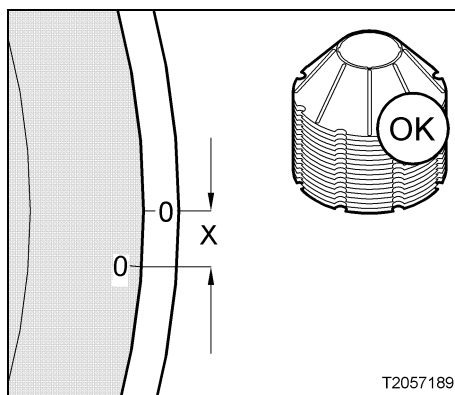


Fig. 188

Correct number of disks used

The "0" mark of the bowl lock ring is approx. 2 cm (X) before the "0"-mark of the bowl bottom.

- Strike the Bowl lock ring up to the "0"-mark.

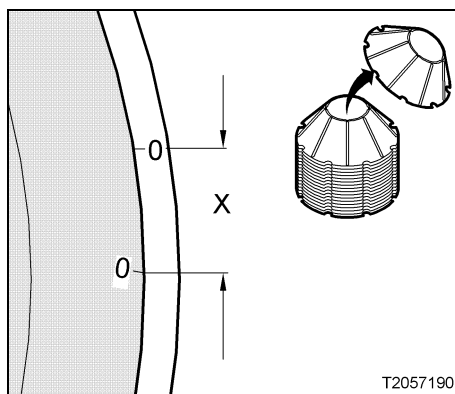


Fig. 189

Too many disks used

If the distance X is greater than 2 cm between the "0" mark of the bowl lock ring and the bowl bottom:

- Remove one disk or the end disk from the inserted disk stack.
- Compressing the disk stack, see chapter "Servicing / compressing the disk stack".
 - Repeat this procedure until a distance (X) of approximately 2 cm is reached.

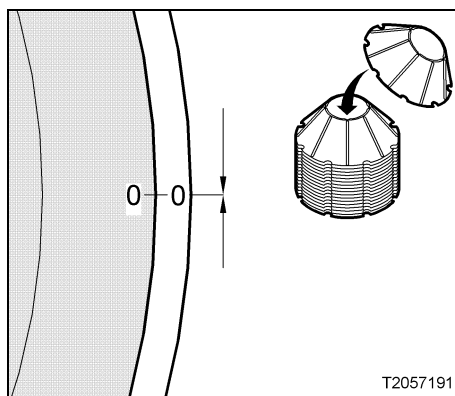


Fig. 190

Too few disks used

If the "0" marks of the bowl lock ring and the bowl bottom are aligned after compressing:

- add one disk or an end disk.
- Compressing the disk stack, see chapter "Servicing / compressing the disk stack".
 - Repeat this procedure until a distance (X) of approximately 2 cm is reached.

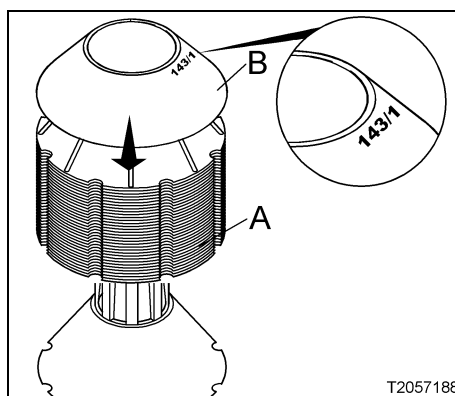


Fig. 191

After determining the exact number of disks

- Mark the number of disks on end disk (B).
- Put the end disk back on the distributor neck.

Example: 143/1

- Total number of disks $A + B = 143$
- Number of end disks $B = 1$

A = number of disks with spacer strips
B = Number of end disks

- **IMPORTANT:** Let the supplying factory have the exact number of disks determined and marked on the end disk, quoting the machine no. This is important for completion of our technical documentation.

12.18 Closing the hood

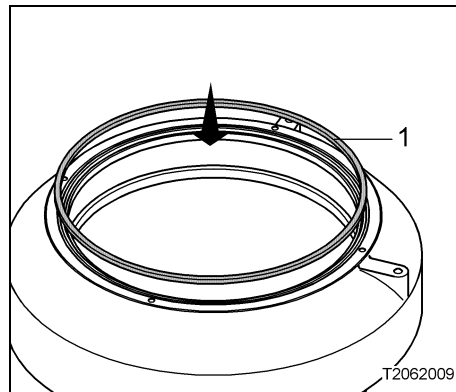


Fig. 192

If the gasket has been removed to keep to the service intervals:

- Insert a new gasket (1) in the groove of the upper part of the frame.

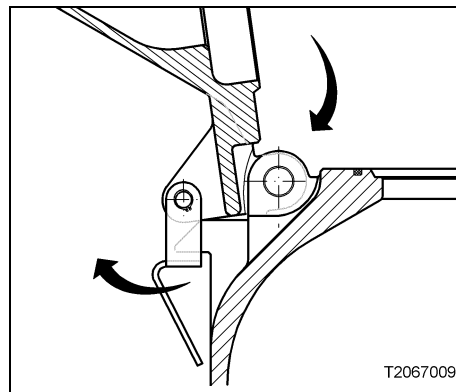


Fig. 193

- unlock stirrup.
- Close the hood carefully.

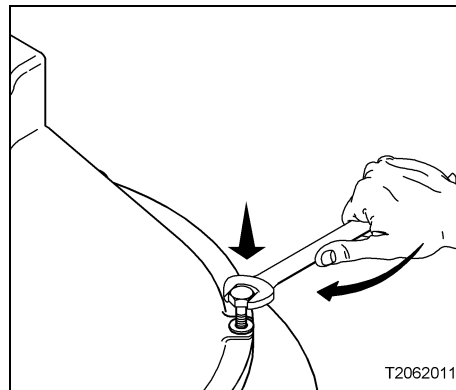


Fig. 194

- Screw in three screws (M 12 x 30) with washers.

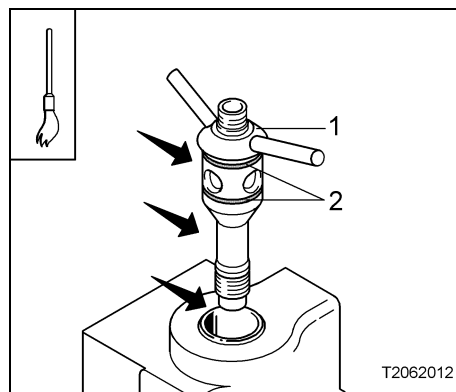


Fig. 195

If the gaskets (2) have been removed to keep to the service intervals:

- Provide handle connection piece (1) with new gasket (2).
- Apply a thin coat of grease to the guide surfaces and threads of the handle connection piece as specified in the lubrication schedule.

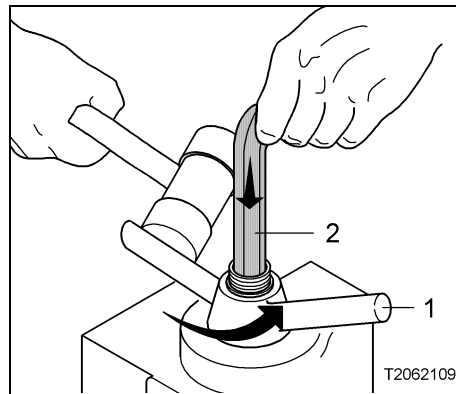


Fig. 196

Required special tool:

- Socket wrench (2)

- Fit handle connection piece (1) in the hood.
- Hold the centripetal pump with a socket wrench.
- Screw tight the handle connection piece (1) by striking lightly with a mallet (**left-hand thread**).

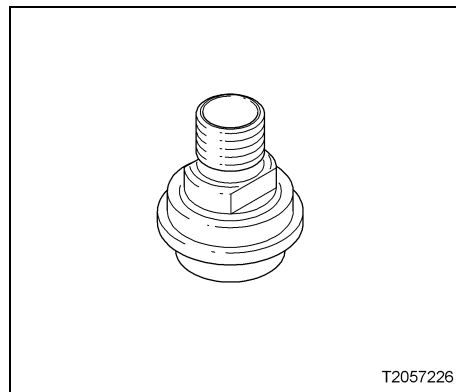


Fig. 197

- Carefully clean the boreholes in the non-return valve and rinse with water.
- Check the non-return valve is working correctly.

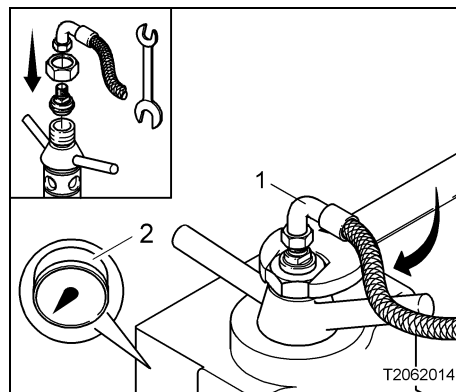


Fig. 198

- Assemble filling and displacement water feed line (1) and connect.
- Ensure that pressure gauge (2) is fitted and functional.

NOTE: The pressure gauge (2) is secured with high-strength thread-locking sealant.

12.19 Sensor block

The following additional safety precautions apply to servicing work on the sensor block:

- Switch off the pressure and vent the pipes before disconnecting the pipes and valves.
- Operate all components of the sensor block with 24 V DC power.
- Keep the sensor block away from easily combustible materials and media and do not touch with bare hands.
- Do not close the labyrinth-type under-tunnelling (4) of the gasket (3) on the underside of the housing. See the figure below.
 - The under-tunnelling ensures pressure equalization and ventilation of the housing interior. The under-tunnelling allows leakage to the outside to prevent the sensor block from filling with medium when a leak occurs, which can lead to a short circuit or to bursting.

12.19.1 Removing the housing cover

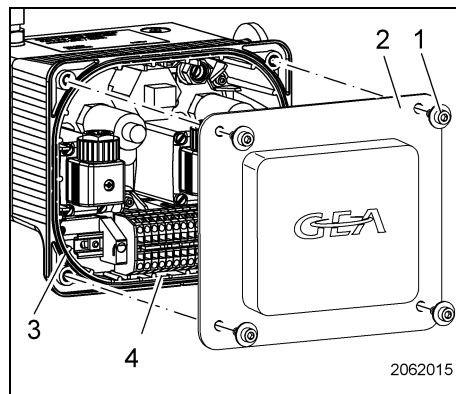


Fig. 199

Required tool:

- Allen wrench (wrench size 4)

REMOVAL

- Unscrew the four screws (1).
- Remove housing cover (2) from housing attachment.
- Make sure the gasket (3) in the housing attachment does not get lost.

INSTALLATION

IMPORTANT: Make sure that the gasket (3) is inserted into the housing attachment and is properly seated in the groove.

- Screw the housing cover (2) down with four screws (1).
 - Tightening torque: **2 Nm**

12.19.2 Replacing the solenoid valves

Required tools:

- Crosstip screwdriver
- Slotted screwdriver (blade 1.2 x 6.5)

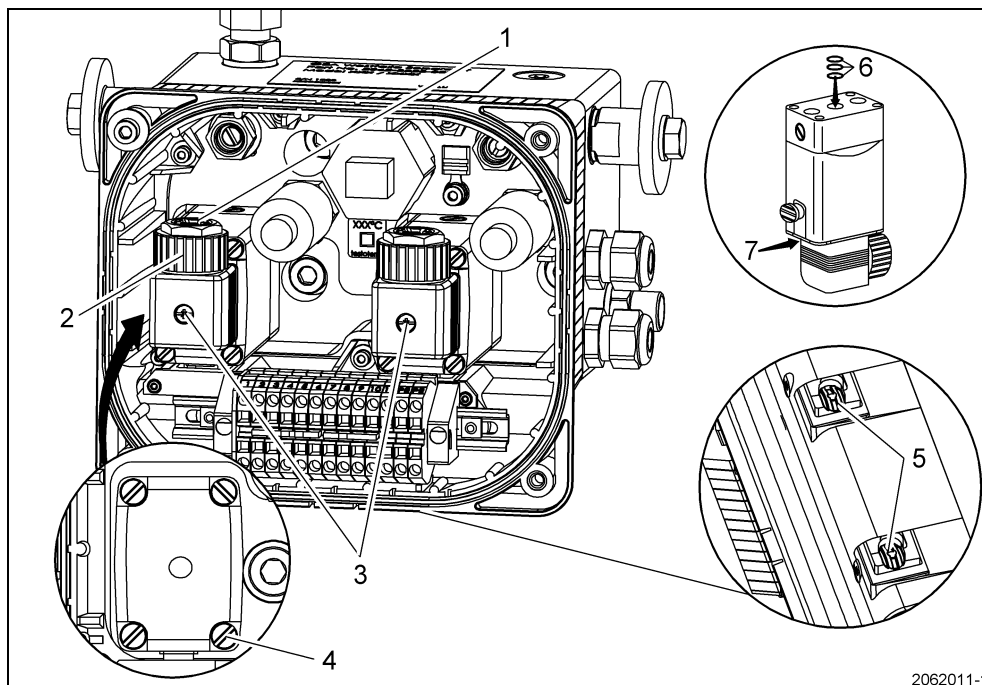


Fig. 200

REMOVAL

- Remove housing cover, see chapter "Removing the housing cover".
- Unscrew the connection cable (1) and detach the socket outlets (2) from the device.
- Unscrew the solenoid valve (3) by loosening the two unsealed screws (4) from the housing block.
- Press the manual override (5) of the solenoid valve on the outside:
 - Remove the solenoid valve from the interior of the sensor block.
- Make sure the three gaskets (6) on the flange of the solenoid valve do not get lost.

INSTALLATION

- Make sure that three gaskets (6) are inserted into the flange of the solenoid valve.
- Insert the seal (7) underneath the socket of the device.
- Insert the solenoid valve (3) with manual override (5) in the direction of the protective cap in the housing wall.
 - Press down the manual override during insertion.
- Screw the solenoid valve (3) to the housing block using two screws (4).
 - Tightening torque: **1.6 Nm**
- Attach the device socket with the screw (8).
 - Tightening torque: **1 Nm**
- Screw in the connecting cable (1).

12.19.3 Replacing the pressure transmitter

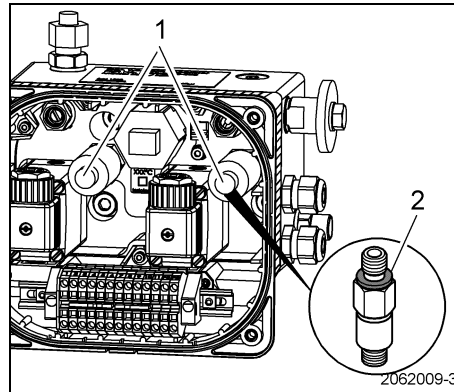


Fig. 201

Required tool:

- Deep socket wrench (wrench size 19)

REMOVAL

- Remove housing cover, see chapter "Removing the housing cover".
- Unscrew the union nut from the connecting cable and detach the plug socket.
- Unscrew the pressure transmitter (1).
- Make sure the gasket (2) does not get lost.

INSTALLATION

- Make sure that the gasket (2) rests on the pressure transmitter.
- Screw in the pressure transmitter (1).
 - Tightening torque: **20 Nm**
- Insert the socket and screw on the union nut of the connecting cable.

12.19.4 Replacing the water detector

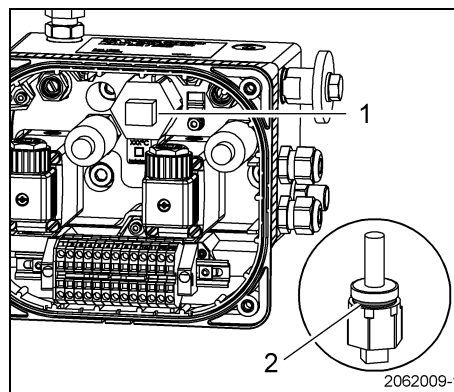


Fig. 202

Required tools:

- Socket wrench (wrench size 32)

REMOVAL

- Remove housing cover, see chapter "Removing the housing cover".
- Detach the plug from the connecting cable.
- Unscrew the water detector (1).
- Remove the gasket (2).

INSTALLATION

IMPORTANT: After each removal, use a new gasket (2).

- Lubricate the gasket (2) according to lubrication schedule and insert into the groove.
- Screw in water detector (1).
 - Tightening torque: **20 Nm**
- Insert the plug from the connecting cable.

12.19.5 Replacing the shut-off valves

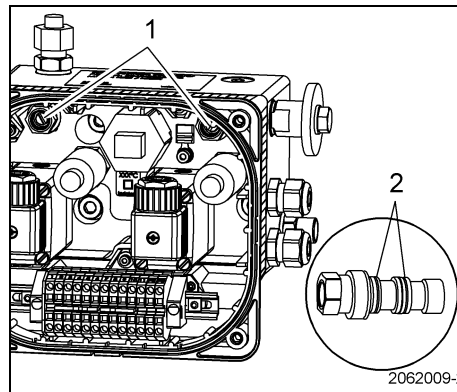


Fig. 203

Required tools:

- Socket wrench (wrench size 15)

REMOVAL

- Remove housing cover, see chapter "Removing the housing cover".
- Unscrew the shut-off valve (1).
- Remove the gaskets (2).

INSTALLATION

IMPORTANT: After each removal, use a new gasket (2).

- Lubricate the gaskets (2) according to lubrication schedule and insert into the groove.
- Screw in the shut-off valve (1).
 - Tightening torque: **10 Nm**
- Secure the shut-off valve (1) with punch mark.

12.20 Drive overview

Exploded view of the drive

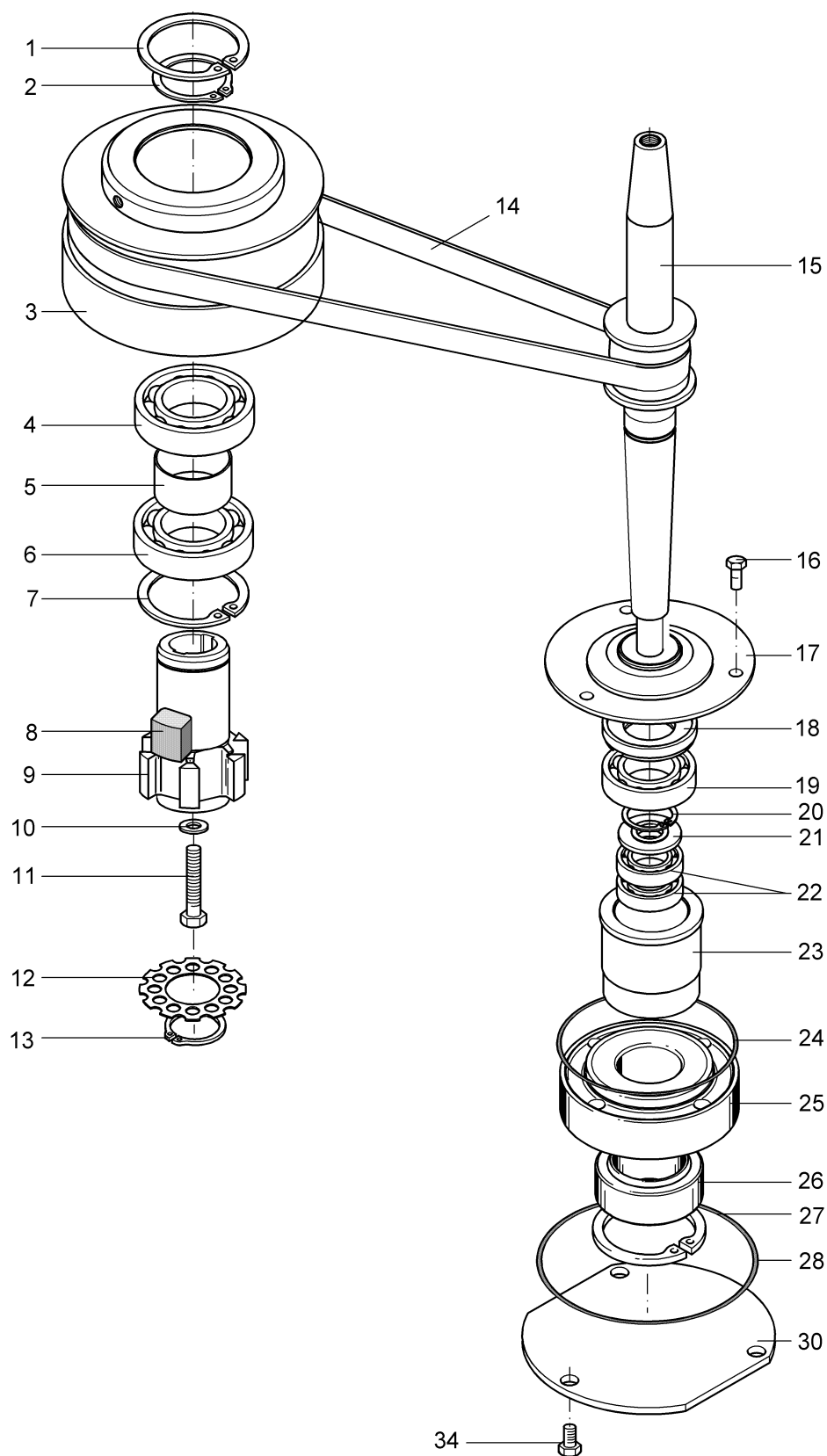


Fig. 204 Exploded view of the drive

A2064000-Antrieb-2

1	Retaining ring	95 x 3
2	Retaining ring	60 x 2
3	Clutch pulley	
4	Grooved ball bearing	
5	Spacer bush	
6	Grooved ball bearing	
7	Retaining ring	95 x 3
8	Clutch shoe	
9	Clutch driver	
10	Washer	
11	Hex head screw	M 12 x 60
12	Washer	13 x 33 x 3
13	Retaining ring	60 x 2
14	Drive belt	
15	Spindle	
16	Hex head screw	M 10 x 20
17	Bearing cover	
18	Bearing cover	
19	Grooved ball bearing	
20	Retaining ring	35 x 1.5
21	Ball bearing protection ring	
22	Angular contact ball bearing	
23	Bearing sleeve	
24	Gasket	
25	Rubber-metal bush	
26	Pivoting bearing	
27	Retaining ring	90 x 3
28	Gasket	
30	Bearing cover	
34	Hex head screw	M 10 x 20

12.20.1 Dismantling the drive belt and spindle assembly

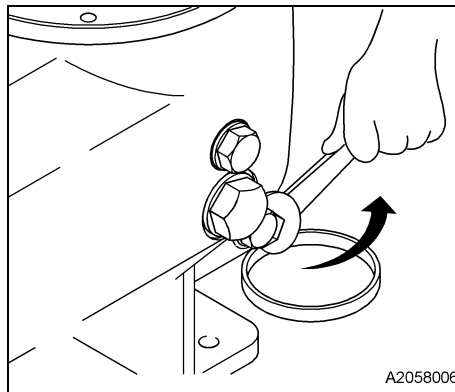


Fig. 205

- Place the oil pan (min. 5 litres) beneath the outlet.
- Loosen oil drain screw and drain the oil.

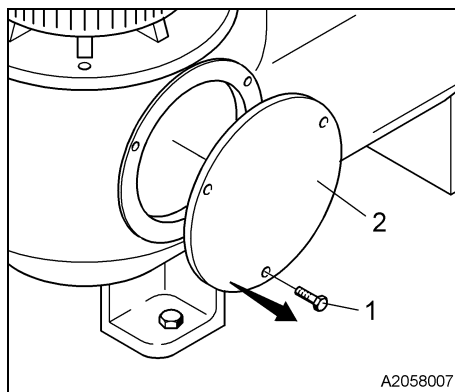


Fig. 206 Standard design

Standard design

- Undo three hex head screws (1).
- Remove cover (2).

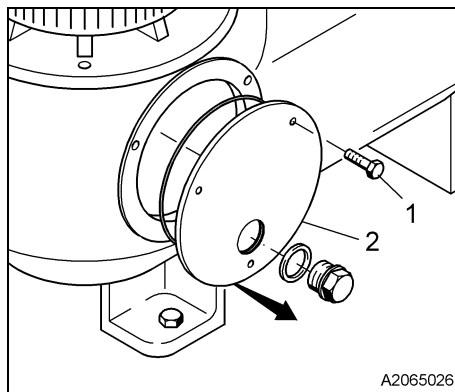


Fig. 207 Special design

Special design

- Undo three hex head screws (1).
- Remove cover (2) together with the gaskets and screw plug.

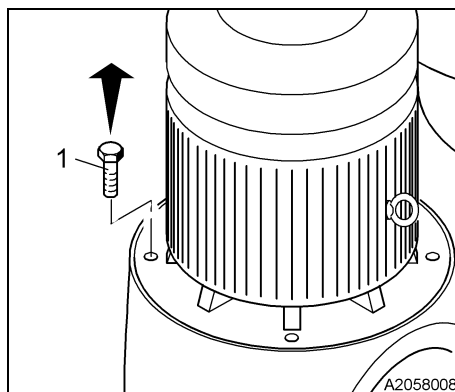


Fig. 208

- Unscrew four hex head screws (1).

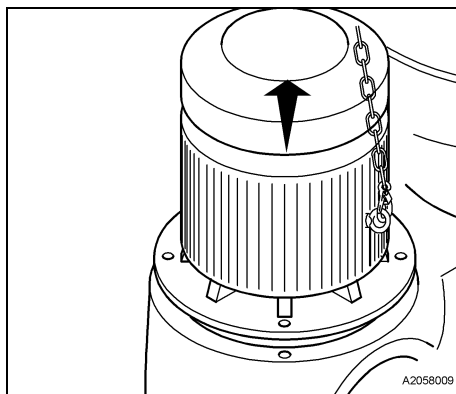


Fig. 209

- Use a hoist to pull the motor out of the flange guide (approx. 5 mm).
 - The drive belt is slackened.
- **IMPORTANT:** Pull the drive belt downwards off the clutch pulley (centrifugal clutch).

**DANGER****Danger to life due to suspended loads**

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

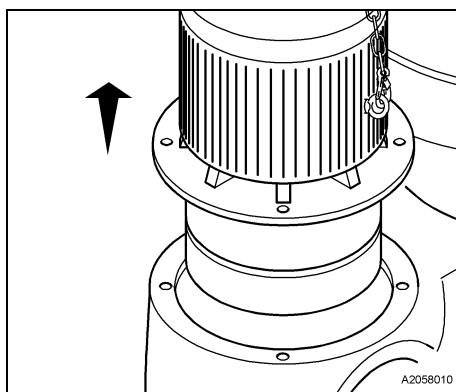


Fig. 210

- Lift the motor with centrifugal clutch out of the lower section of frame.
- Place the motor on a level surface (mat or wooden pallet).

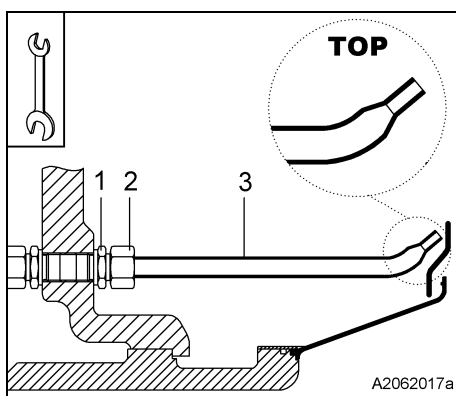


Fig. 211

If installed:

- Remove the operating water supply unit from the frame.
 - Loosen the nut (2).
 - Take off the pipe (3).

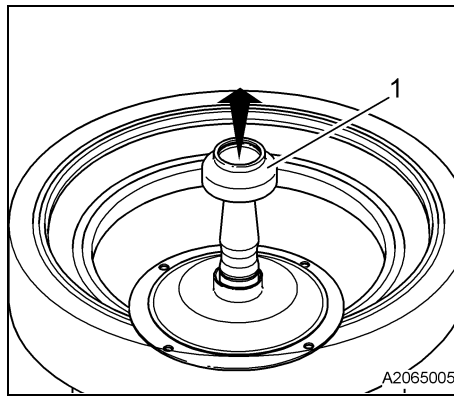


Fig. 212

- Remove spindle cap (1) with fitted gasket.

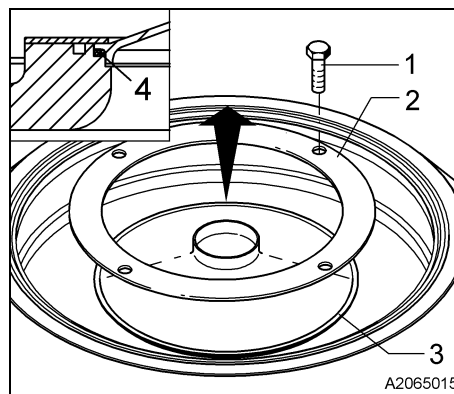


Fig. 213

- Unscrew four hex head screws (1).
- Take out ring (2) and protective cap (3) with fitted gasket (4).

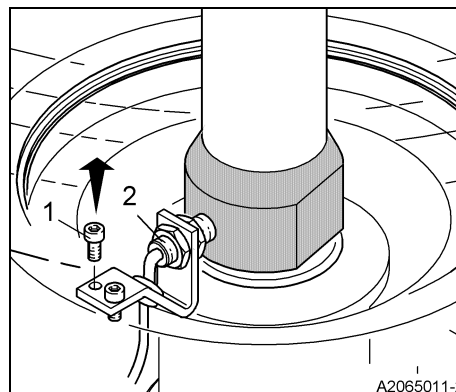


Fig. 214

If installed:

- Dismantling the speed monitoring device:
 - Unscrew Allen screws (1).
 - Take off speed monitoring device (2) and place in the lower section of frame.

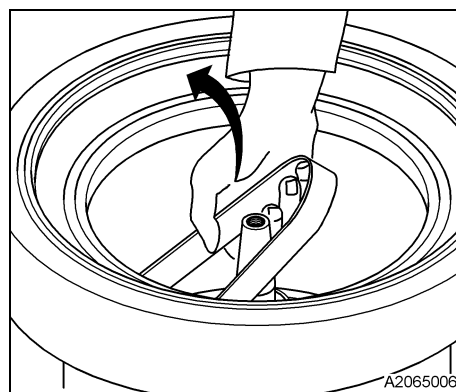


Fig. 215

- Remove the drive belt from the lower section of the frame.

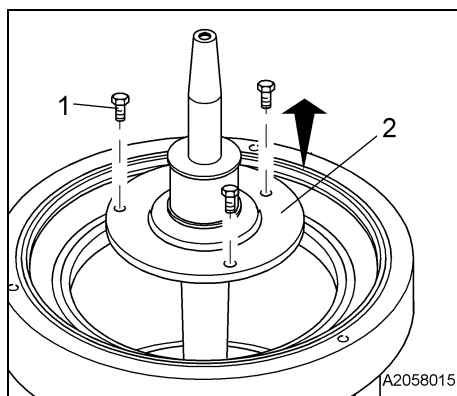


Fig. 216

- Undo three hex head screws (1).
- Lift spindle assembly (2) out of the lower part of the frame.
 - Dismantle the spindle assembly, see chapter "Servicing / dismantling the spindle assembly".

NOTE: If the rubber-metal bush is also pulled out of the frame,

- Loosen the rubber-metal bush from the spindle assembly by striking the spindle on a wooden surface.

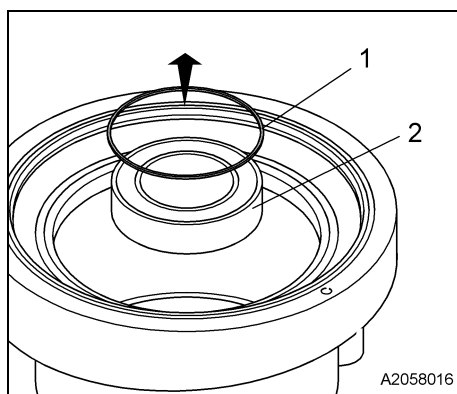


Fig. 217

- Remove from the lower section of the frame:
 - Gasket 1,
 - Rubber-metal bush (2).

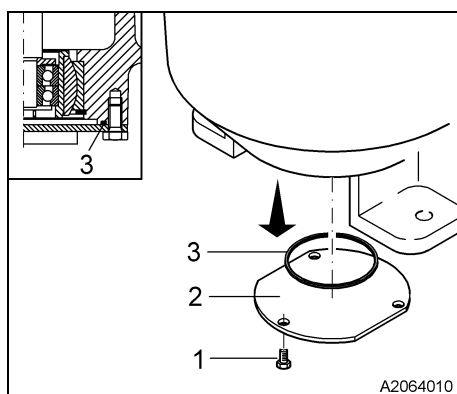


Fig. 218

If necessary:

- Unscrew three hex head screws (1) and remove bearing cover (2).
- Take out gasket (1).

12.20.2 Dismantling the spindle assembly

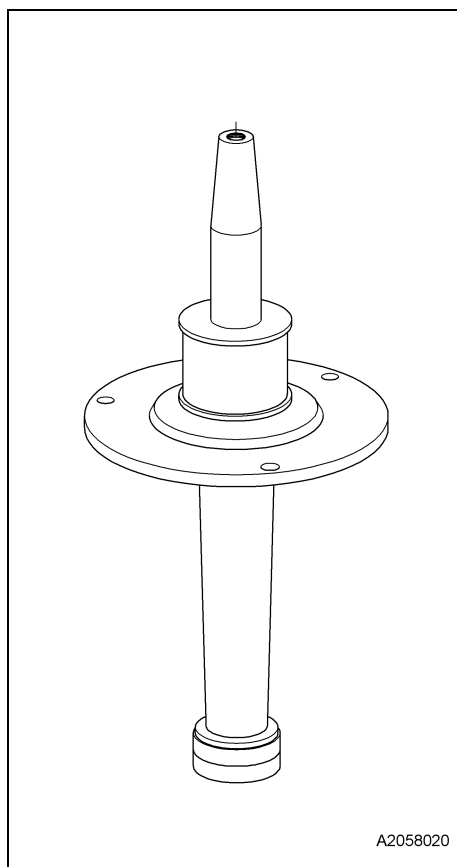


Fig. 219

Spindle assembly

Required standard tools:

- Puller
- Open-ended wrench
- Outer snap pliers

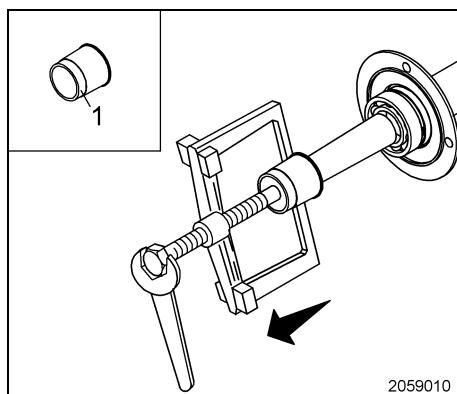


Fig. 220

- Detach the bearing sleeve (1) from the spindle.

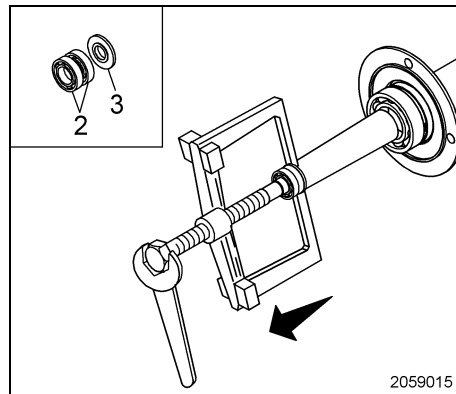


Fig. 221

- Pull off the spindle:
 - Angular contact ball bearing (2)
 - Ball bearing protection ring (3)

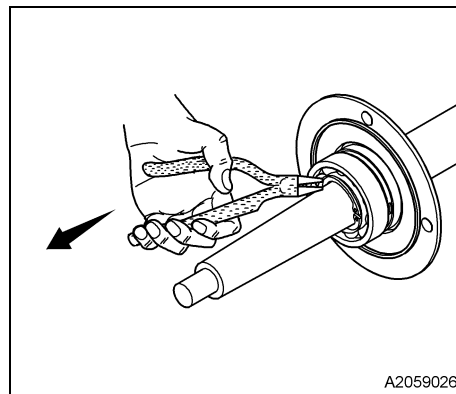


Fig. 222

- Remove retaining ring.

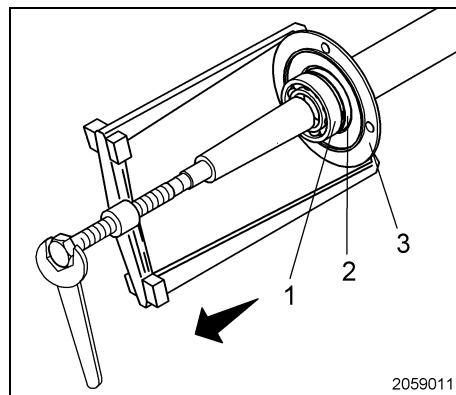


Fig. 223

- Pull off the spindle:
 - Grooved ball bearing (1)
 - Bearing cover (2)
 - Bearing cover (3)

12.20.3 Removing the centrifugal clutch

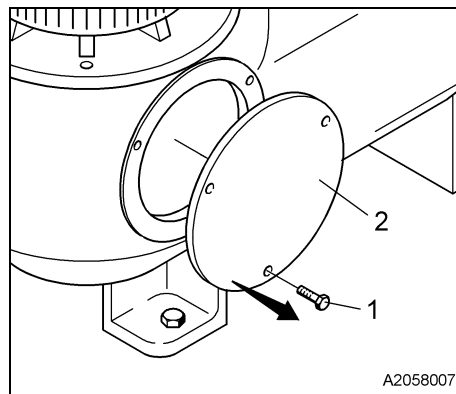


Fig. 224 Standard design

Standard design

- Undo three hex head screws (1).
- Remove cover (2).

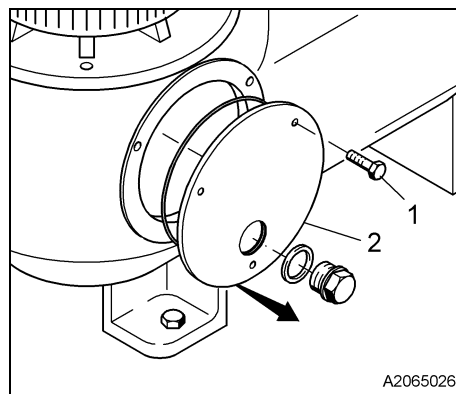


Fig. 225 Special design

Special design

- Undo three hex head screws (1).
- Remove cover (2) together with the gaskets and screw plug.

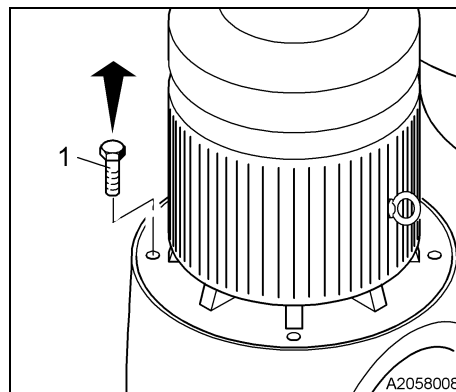


Fig. 226

- Unscrew four hex head screws (1).

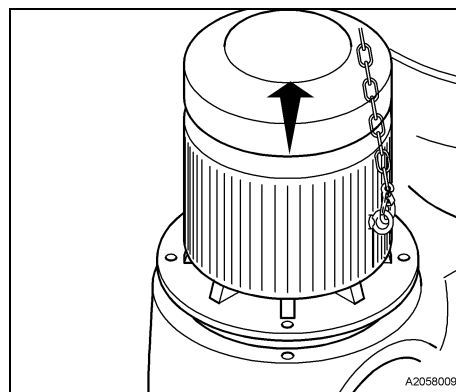


Fig. 227

- Pull the motor with hoist out of the flange guide (about 5 mm).
 - The drive belt is slackened.
- **IMPORTANT:** Pull the drive belt downwards off the clutch pulley (centrifugal clutch).

**DANGER****Danger to life due to suspended loads**

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

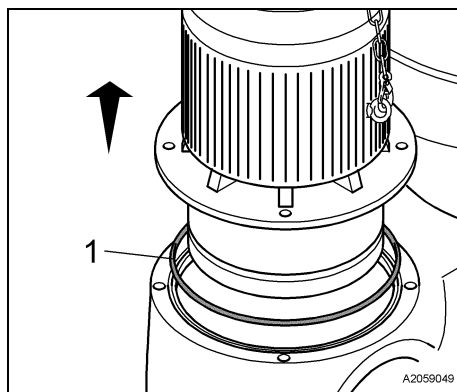


Fig. 228

- Lift the motor with centrifugal clutch out of the lower section of frame.

If installed:

- In the event of damage, take gasket (1) out of the groove in the lower part of the frame.

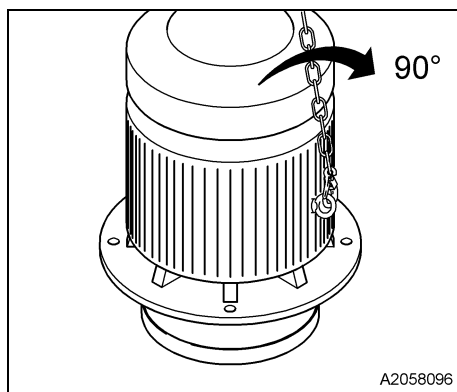


Fig. 229

- Set down the motor together with the centrifugal clutch on a flat surface (mat or wooden pallet).
- Use a hoist!
- Rotate the motor by 90° (opposite the installation position) and secure.

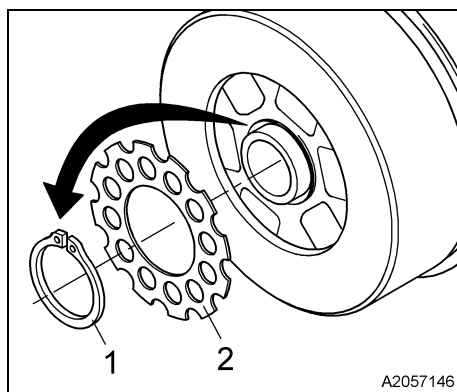


Fig. 230

- Loosen retaining ring (1).
- Remove disk (2).

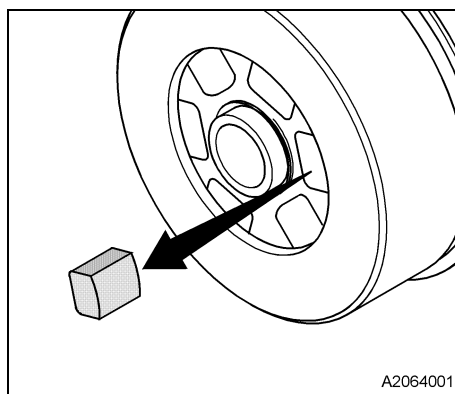


Fig. 231

- Take clutch shoe out of the clutch driver.

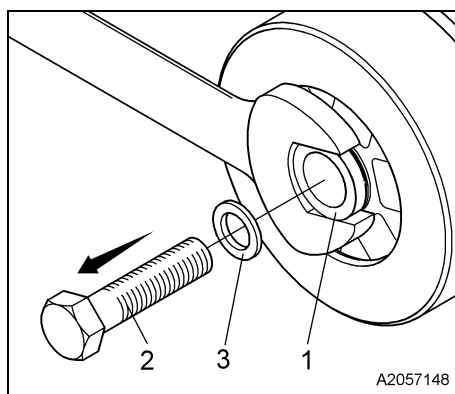


Fig. 232

- Arrest clutch driver (1) with the open-ended wrench.
- Unscrew hex head screw (2) out of the motor shaft end.
- Remove disk (3).

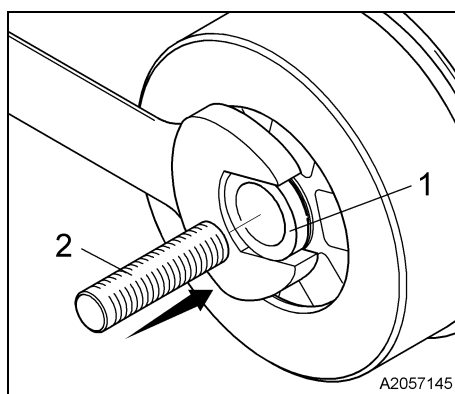


Fig. 233

Special tools required:

- Allen screw (2) (M 10 x 20)

- Arrest clutch driver (1) with the open-ended wrench.
- **IMPORTANT:** Sensitive part. Do not damage the motor shaft end.
 - Screw Allen screw (2) into the thread of the motor shaft end.

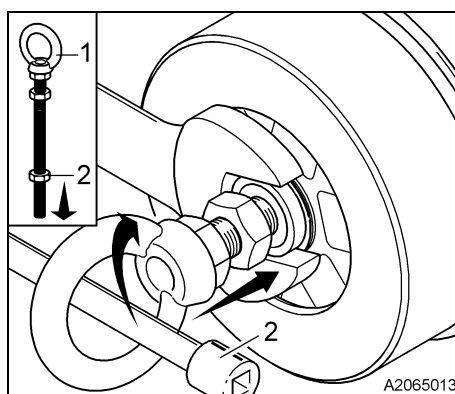


Fig. 234

Required special tool:

- Eye bolt (1)
- Socket wrench (3)

- Unscrew hexagon nut (2).
- Screw eye bolt (1) into the clutch driver.
- Arrest clutch driver with the wrench.
- Force the centrifugal clutch off the motor shaft end by turning the hex head screw clockwise.

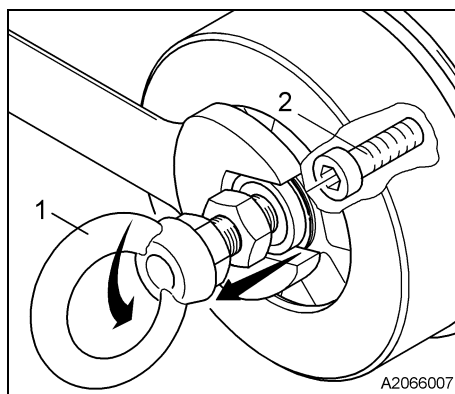


Fig. 235

- Unscrew eye bolt (1) from the clutch driver.
- Unscrew Allen screw (2) from the motor shaft end.

DANGER

Danger to life due to suspended loads

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

WARNING

Serious injury due to rolling away or overturning

There is a risk of serious injury due to rolling away or overturning of the motor or other heavy machine parts.

- Secure the motor with suitable aids (e.g. wedges).
- Wear personal safety equipment, e.g. safety shoes and protective gloves.

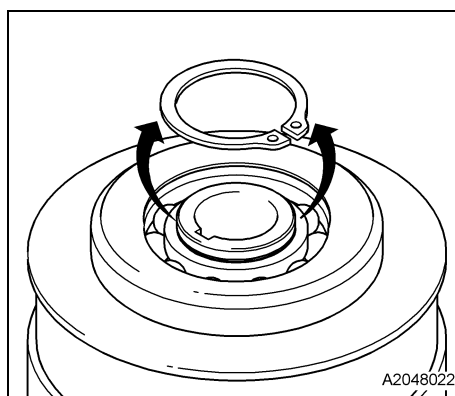


Fig. 236

- Place clutch pulley and clutch driver on a wooden base using transport ropes and hoist.
- Take the retaining ring out of the groove of the clutch driver.

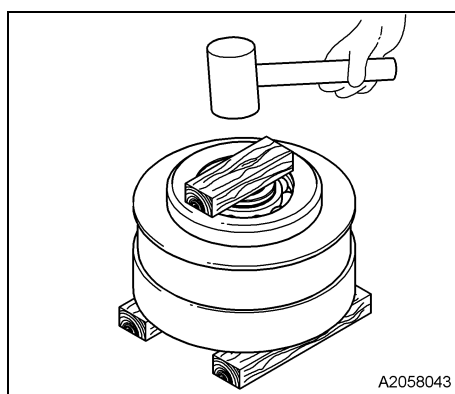


Fig. 237

- Install a wooden block.
- Drive the clutch driver downwards by lightly hammering.
- Loosen the clutch driver from the seat of the ball bearings.

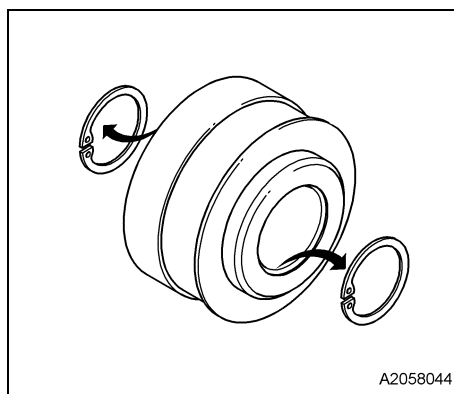


Fig. 238

- Turn clutch pulley through 90°.
 - Opposite the fitting position.
 - With the aid of a hoist.
- Secure the clutch pulley with bolted flat belt pulley with suitable means against overturning and rolling away, e.g. with wooden wedges or square-shaped timbers.
- Take the retaining rings out of the grooves of the clutch drum.

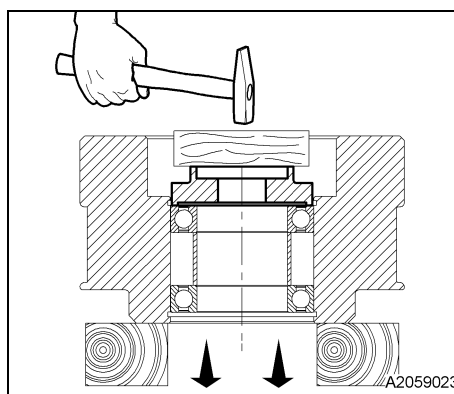


Fig. 239

Required tools:

- Disk (Ø 86 - 94 mm)
 - Wooden block
 - Hammer
- Turn the clutch pulley through 180° and set down on the wooden base.
 - Drive the two grooved ball bearings and distance bush out of the clutch pulley.

12.21 Assembling the drive

- Keep to the order described when mounting.



DANGER

Danger to life through electric voltage

When working on live leads, there is a risk of electric shock. An electric shock leads to serious injury or death.

- Have the motor connected only by authorized personnel.
- Refer to the manual of the motor manufacturer.
- Refer to the frequency converter manual (option).
- Avoid damage to the bowl parts during assembly by taking the following action.
 - positioning accurately,
 - avoiding diagonal pull.
 - Select the low lifting speed of the hoist.
- Never walk under suspended loads.
- Do not use force when removing or fitting parts.
- Thoroughly clean and dry the drive chamber.
- Thoroughly clean and dry the spindle parts.
- Check the roller bearings of the spindle and centrifugal clutch (if applicable).
- Always operate the centrifuge with the bowl fitted.

12.21.1 Installing the spindle assembly

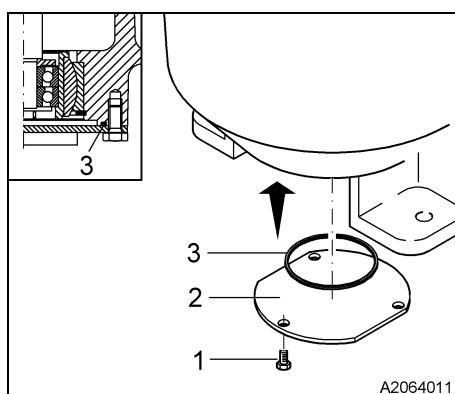


Fig. 240

If necessary:

- Insert gasket (3) in the groove of the lower part of the frame.
- Screw down the bearing cover (2) with three hex head screws (1).

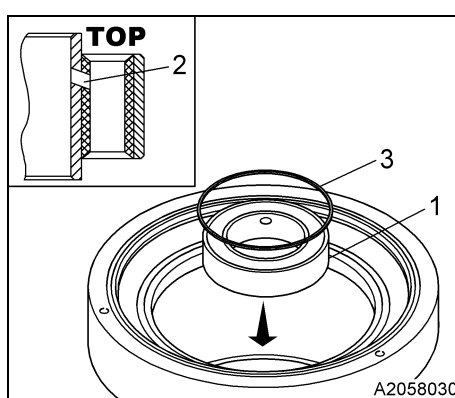


Fig. 241

IMPORTANT: Ensure the vibration absorbers are correctly fitted! The two opposite inner boreholes (2) must be pointing upward.

- Insert rubber-metal bush (1).
- Insert gasket (3) in the groove of the lower part of the frame.

- Turn spindle through 180° (upside down).



CAUTION

There is a risk of injury through burning or scalding.

Hot machine parts and hot oil can cause burns.

- Do not put your hands in the hot oil bath.
- Wear protective gloves.

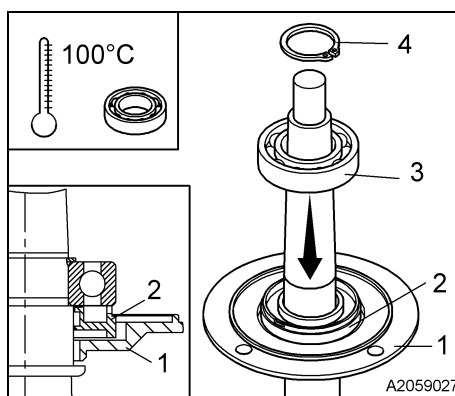


Fig. 242

- **IMPORTANT:** Ensure the bearing covers are correctly fitted.
 - Install the bearing covers (1) and (2).
- Heat grooved ball bearing (3) to 100° C (212° F) in an oil bath and slide it onto the spindle.
- Insert retaining ring (4) into the spindle groove.

ATTENTION**Danger of bearing failure**

Incorrect installation of the angular contact ball bearings can result in bearing failure.

- Ensure that the narrow rim of the ball bearing inner ring faces upwards.

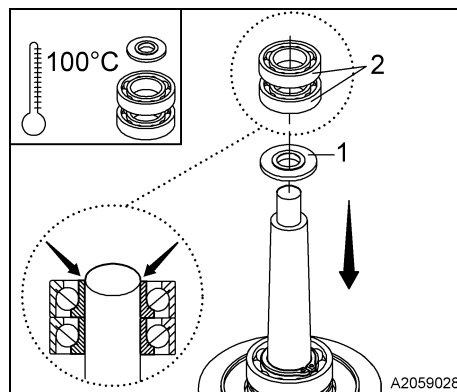


Fig. 243

- Heat ball bearing protection ring (1) and angular contact ball bearing (2) in an oil bath up to 100° C (212° F).
- Slide ball bearing protection ring (1) and angular contact ball bearing (2) onto the spindle.

**CAUTION****There is a risk of injury through burning or scalding.**

Hot machine parts and hot oil can cause burns.

- Do not put your hands in the hot oil bath.
- Wear protective gloves.

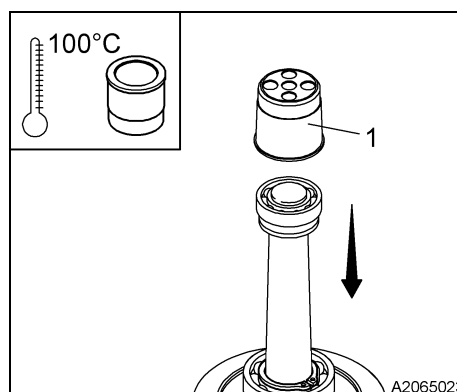


Fig. 244

- Heat bearing sleeve (1) in an oil bath up to 100° C (212° F).
- IMPORTANT:** Before installation of the bearing sleeve (1), make sure that the installed angular contact ball bearing has cooled down to room temperature.
- Slide bearing sleeve (1) over the angular contact ball bearing and the ball bearing protection ring.

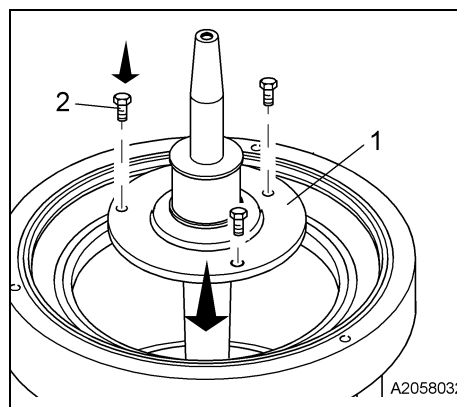


Fig. 245

- **IMPORTANT:** Pay attention to the correct fitting position of the spindle.
 - The boreholes in the bearing cover (1) must be aligned with the threaded boreholes in the lower part of the frame.
- Install the assembled spindle in the lower section of frame.
 - Pay attention to correct positioning.
- Screw down the spindle with three hex head screws (2).

12.21.2 Fitting the centrifugal clutch

NOTE: For the dimensions of the parts, see chapter "Servicing / Drive overview".

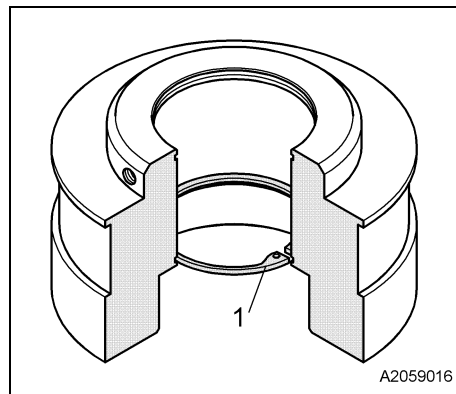


Fig. 246

- Clean the clutch pulley.
- Fit the retaining ring (1) in the lower groove.
- Check that retaining ring (1) is correctly fitted.

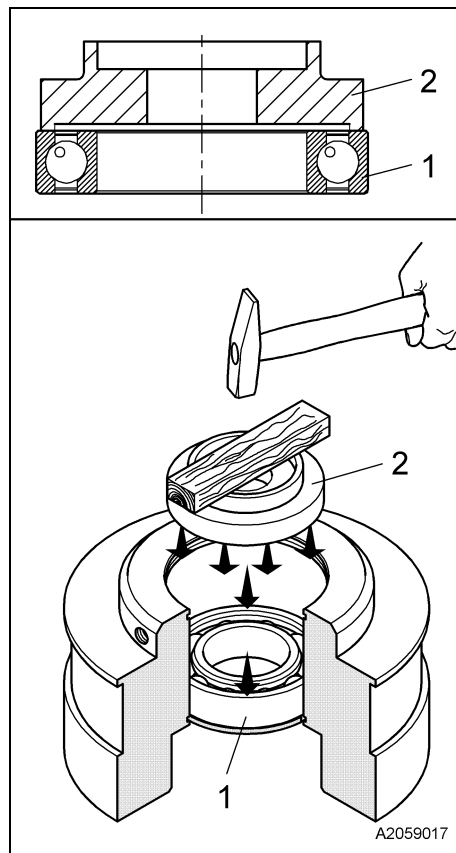


Fig. 247

Required tools:

- Disk (2) (Ø 86 – 94 mm)
- Wooden block
- Hammer

- **IMPORTANT:** Pay attention to the correct fitting position.
 - Disk (2) may only contact the outer ring of grooved ball bearing (1).
- Carefully drive the first grooved ball bearing (1) with disk (2) up to the retaining ring.

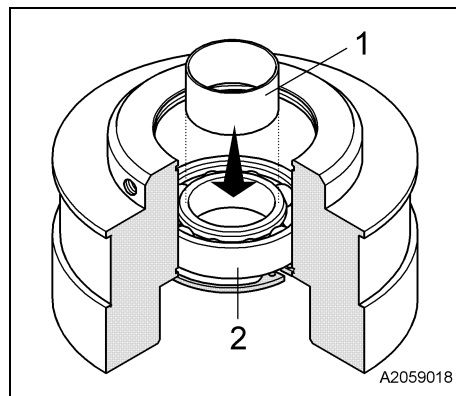


Fig. 248

- **IMPORTANT:** Pay attention to the correct fitting position.
 - Spacer bush (1) may have contact only with the inner race of grooved ball bearing (2).
- Position the spacer bush (1) on the inner race of the ball bearing.

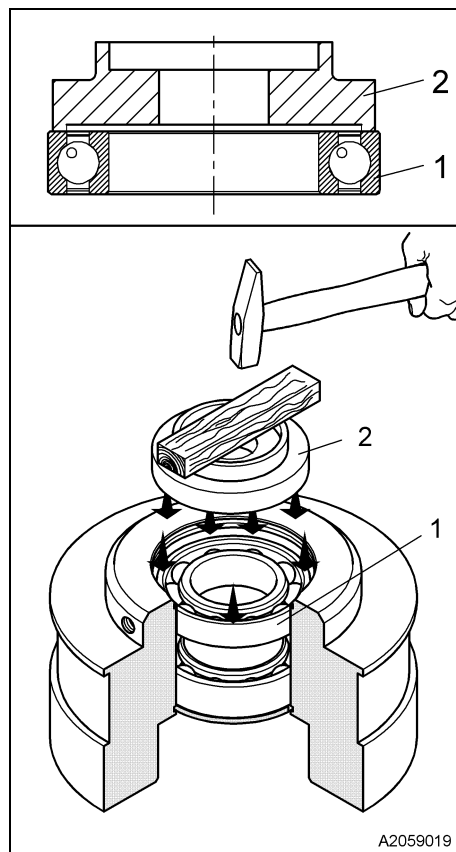


Fig. 249

- **IMPORTANT:** Pay attention to the correct fitting position.
 - Disk (2) may only contact the outer ring of grooved ball bearing (1).
- Carefully drive in the second grooved ball bearing (1) with a suitable disk (2) right up to the spacer bush.

NOTICE**Material damage due to unbalance.**

Incorrect fitting of the retaining rings can result in unbalance and cause bearing failure.

- Fit the retaining rings offset by 180° relative to one another.

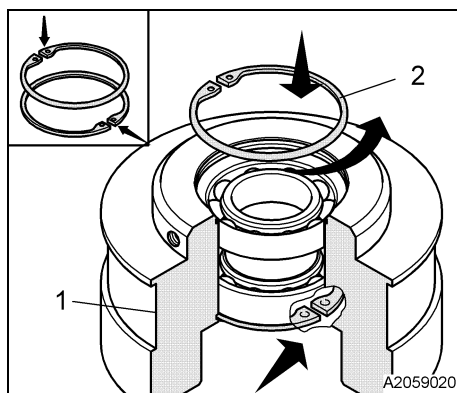


Fig. 250

- Insert retaining ring (2) 180° offset relative to retaining ring (1) in the upper groove.

**DANGER****Danger to life due to suspended loads**

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

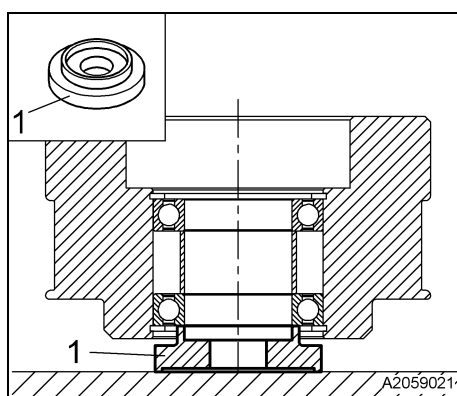


Fig. 251

Required tool:

- Disk (1) (Ø 61 – 69 mm)

- Turn clutch pulley with fitted grooved ball bearings through 180° with the aid of the hoist.
- **IMPORTANT:** Pay attention to the correct fitting position.
 - Disk (1) may have contact only with the inner race of grooved ball bearing (1).
- Position the inner race of the ball bearing on disk (1).

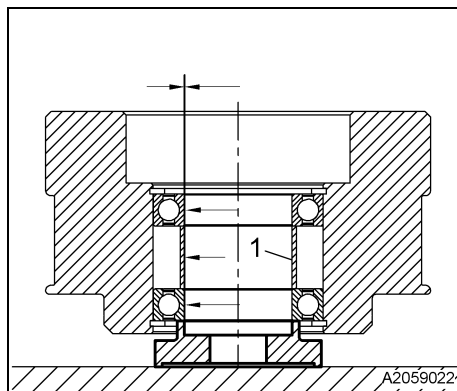


Fig. 252

- **IMPORTANT:** Pay attention to the correct fitting position.
 - Spacer bush (1) must be flush with the inner races of the grooved ball bearings.

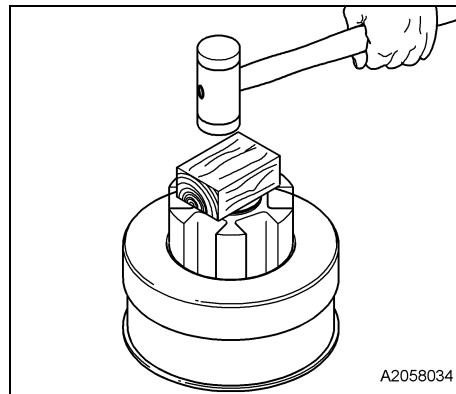


Fig. 253

Required tools:

- Wooden block
- Rubber mallet

- Carefully drive the clutch driver into the grooved ball bearing with light blows of the mallet.

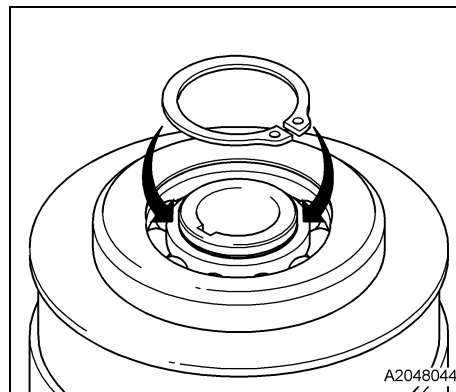


Fig. 254

- Turn clutch pulley through 180°.
- Fit the retaining ring in the groove of the clutch driver.



DANGER

Danger to life due to suspended loads

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

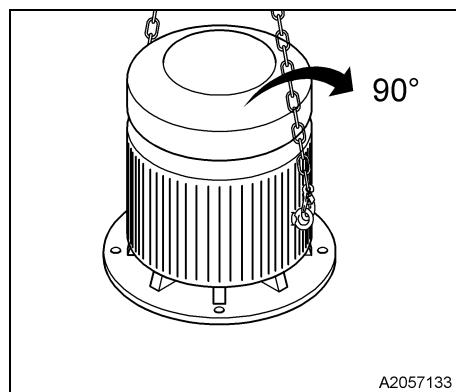


Fig. 255

- Set down the motor with fitted parts on a flat surface (mat or wooden pallet) with the aid of a hoist.
- Rotate the motor through 90° (opposite the fitting position) and secure against rolling away and overturning.

Required tools:

- Ring spanner (2)
- Hex head screw (3) (M 10 x 200)
- Hexagon nut (4) (M 10)

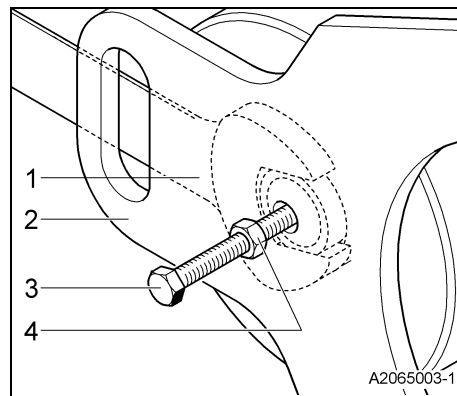


Fig. 256

- **IMPORTANT:** Pay attention to the feather key groove.
- Fit the mounted centrifugal clutch on the motor shaft end.
- Arrest clutch driver (1) with the open-ended wrench.
- Fit ring spanner (2).
- Screw hex head screw (3) with hexagon nut (4) into the motor shaft end.

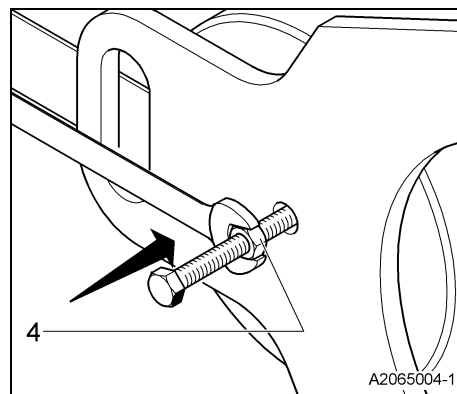


Fig. 257

- Pull the centrifugal clutch onto the motor shaft end as far as it will go by turning hexagon nut (4) with a second wrench.

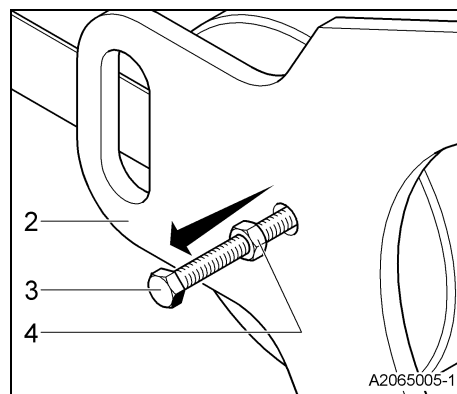


Fig. 258

- Unscrew hex head screw (3) together with hexagon nut (4).
- Remove ring spanner (2).

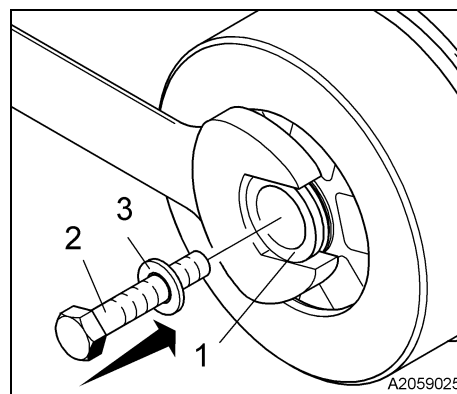


Fig. 259

- **IMPORTANT:** When clutch driver (1) is arrested:
- Fit hex head screw (2) with washer (3) and screw it into the motor shaft end.

NOTICE**Material damage due to unbalance.**

Replacement of only individual clutch shoes can lead to unbalance, resulting in damage.

- Be sure to replace all clutch shoes simultaneously.
- Make sure that the clutch shoes are evenly spaced.

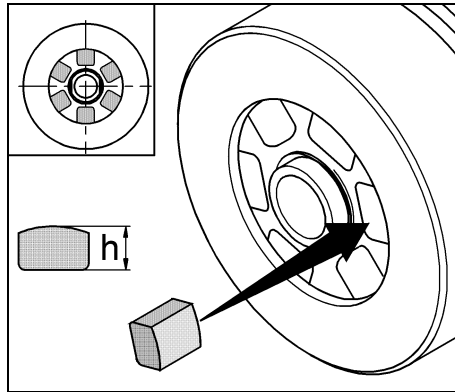


Fig. 260

- Check thickness of clutch shoes.
 - Replace clutch shoes when **h** is less than 18 mm.
- Fit the clutch shoes.

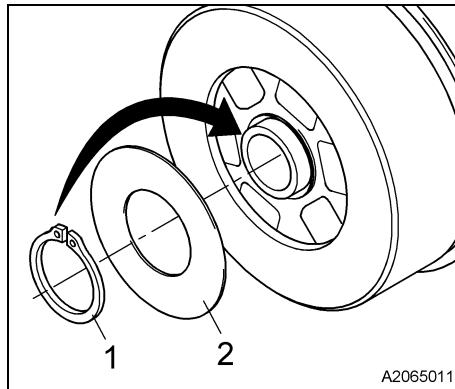


Fig. 261

- Fit washer (2).
- Fit the retaining ring (2) in the groove of the clutch driver.

12.22 Fitting the motor



Danger to life due to suspended loads

There is risk of fatal injury through raised and unsecured loads.

- Never stand under suspended loads.
- Use only hoists with adequate lifting capacity and suitable load suspension devices.

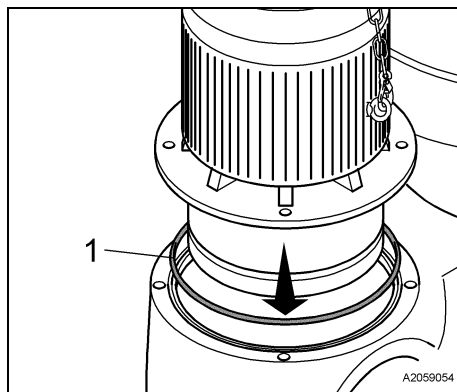


Fig. 262

If the gasket has been removed to keep to the service intervals:

- Insert a new gasket (1) into the groove of the lower part of the frame.
- Carefully place motor with fitted centrifugal clutch on the lower section of the frame.
 - Use the hoist.

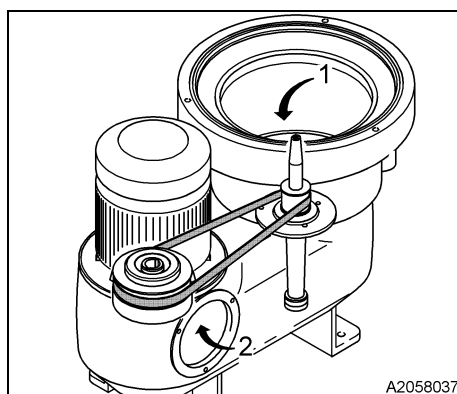


Fig. 263

- **IMPORTANT:** Degrease the belt contact surfaces of the spindle and the clutch pulley.
- Mount the drive belt:
 - through the opening in the upper part of the frame (1) and
 - through the brake housing opening (2).
- Pay attention to correct seating of the drive belt on the flat belt pulley and spindle pulley.

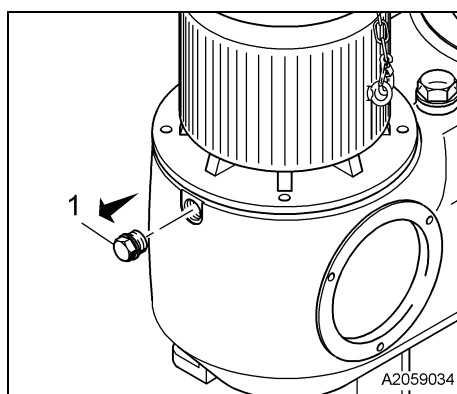


Fig. 264

- Remove screw plug (1) from the lower section of the frame.

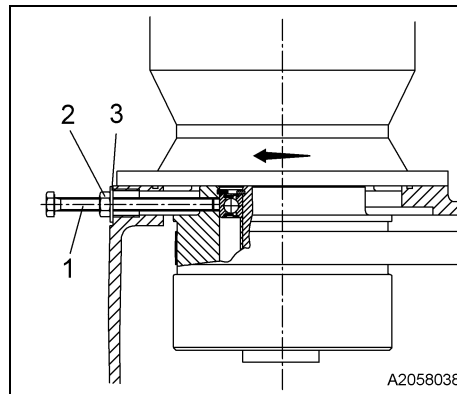


Fig. 265

IMPORTANT: Avoid damage to the grooved ball bearing.

- Do not screw in hex head screw (1) all the way.

- Screw hex head screw (1) (M 10 x 200) with hexagon nut (2) and washer (3) through the borehole in the frame into the threaded borehole of the centrifugal clutch.
- Tension the drive belt by turning hexagon nut (2) clockwise until the motor flange engages in the opening in the frame.

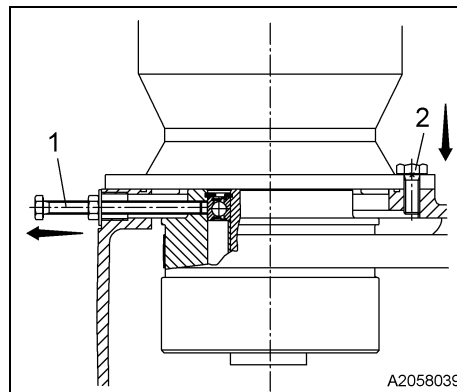


Fig. 266

- Fasten the motor with four hex head screws (2) (M 12 x 30).
- Unscrew hex head screw (1) (with hexagon nut and washer) from the centrifugal clutch.

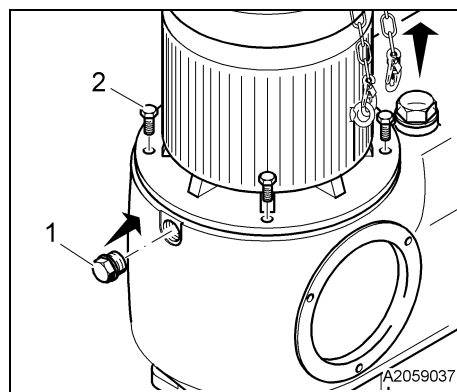


Fig. 267

- Screw in plug (1).
- Remove the hoist.

NOTE: Due to the design concept used, the spindle is at an inclined angle relative to the opposite side of the motor when the drive belt has not been fitted or tensioned. See figure below, pos. 2.

The spindle is only concentric when the belt is tensioned. See figure below, pos. 1.

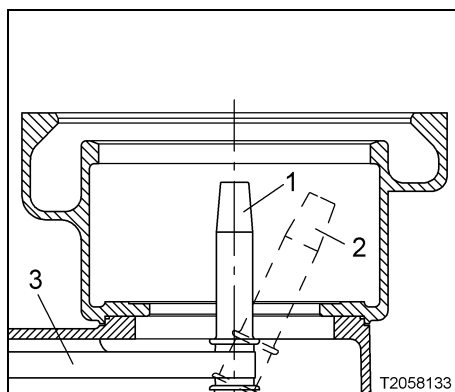


Fig. 268 Example

- Check that the spindle (1) can be easily rotated.
- Check whether the spindle has been pulled into the centric axis by tensioning the drive belt (3).

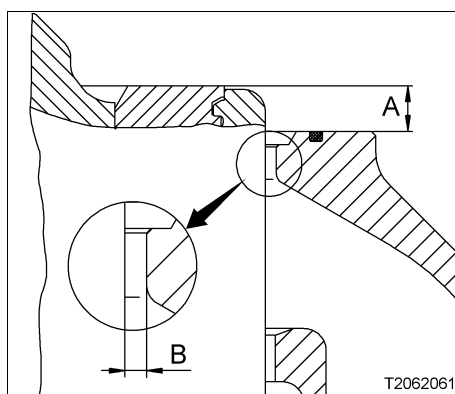


Fig. 269

- Check that the spindle and bowl are centric.
 - The reference dimension **B** is **4 (±1.5) mm** between bowl and upper part of frame.

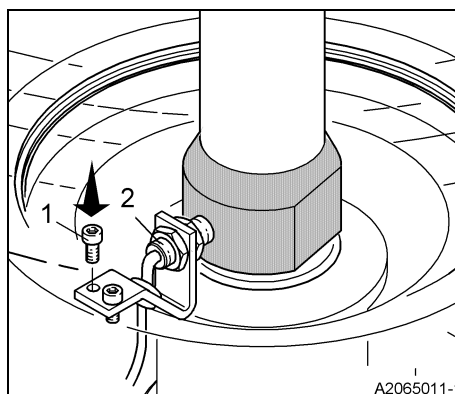


Fig. 270

If installed:

- Place speed monitoring device (2) on the lower part of the frame and screw down with screws (1).

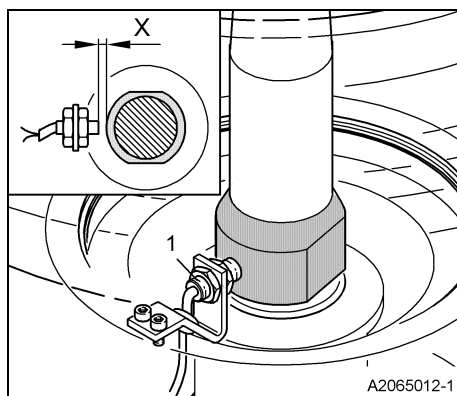


Fig. 271

- **IMPORTANT:** Pay attention to proper installation.
 - The distance **X** between spindle and proximity switch must be 3,5 mm.
- Align proximity switch (1).

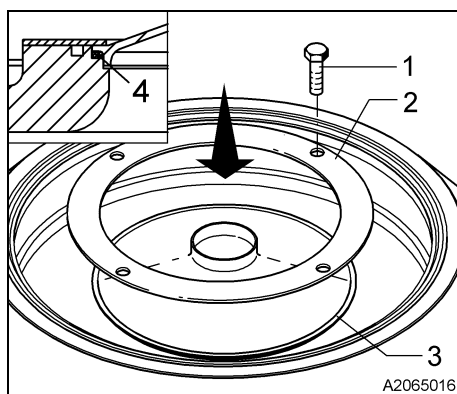


Fig. 272

- Insert protective cap (3) with fitted gasket (4) and ring (2) and screw down with six hex head screws (1) (M 8 x 12).

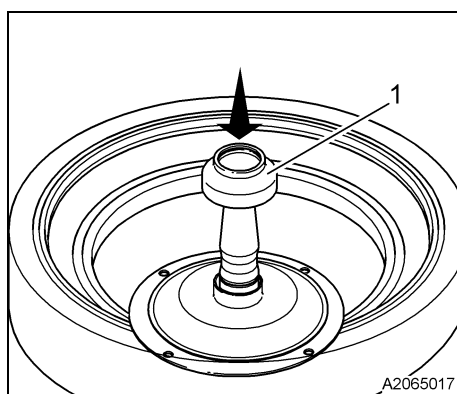


Fig. 273

- Place spindle cap (1) with fitted gasket on the spindle.
 - Pay attention to correct positioning.

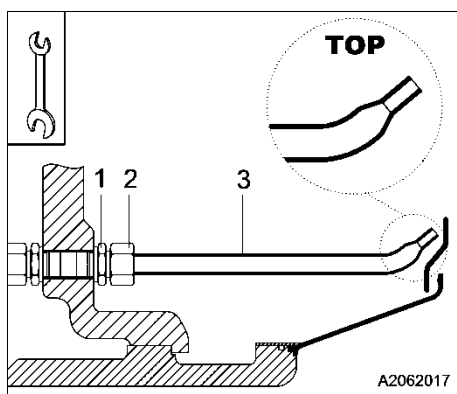


Fig. 274

If installed:

- Install the operating water supply unit in the upper section of the frame.
 - Slide nut (2) over pipe (3).

IMPORTANT: The tip of the pipe must point upward.

- Insert pipe (3) with nut (2) into the screwed connection (1) and slide on up to the stop.
- Tighten the nut (2).

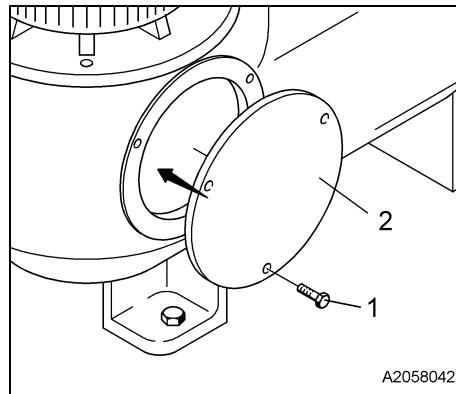


Fig. 275 Standard design

Standard design

- Fit cover (2) to the lower section of the frame with three hex head screws (1) (M 8 x 20).

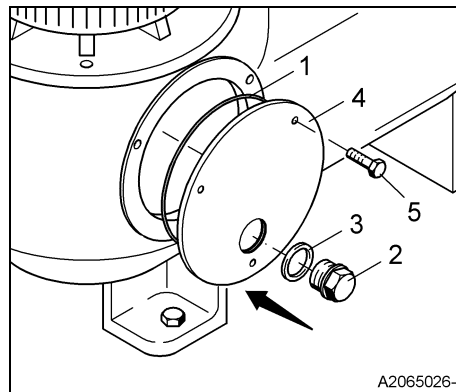


Fig. 276 Special design

Special design

- Make sure that gasket (1) and screw plug (2) with inserted gasket (3) are installed.
- Fit cover (4) to the lower section of the frame with three hex head screws (5) (M 8 x 20).

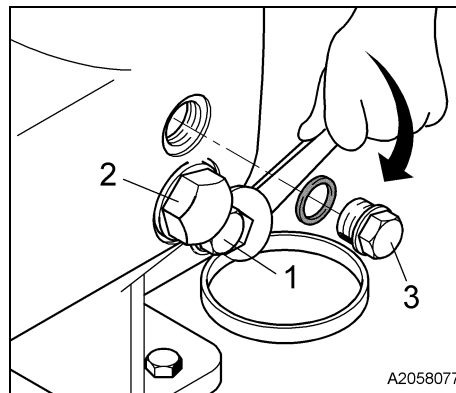


Fig. 277

- Screw in oil drain screw (1) with fitted gasket.
- Screw in sight glass (2).
- Top up oil in accordance with the chapter "Maintenance/lubrication".
- Screw in plug (3) with gasket.

**DANGER****Danger due to electrical current**

When working on live leads, there is a risk of electric shock. An electric shock leads to serious injury or death.

- Have the motor connected by authorized personnel.
- Work only on de-energised wires.

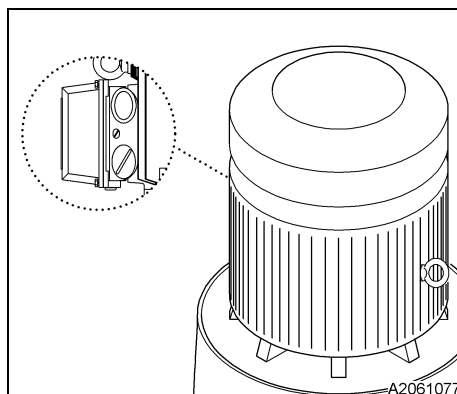


Fig. 278 Example of a motor

- Connect the motor.

12.23 Bowl height

The bowl height is correctly adjusted at the factory before the separator is shipped.

IMPORTANT: Correct adjustment of the bowl height is essential to ensure operating safety. Checking and adjusting the bowl height must be done with the utmost care.

12.23.1 Checking the bowl height

IMPORTANT: The bowl height may only be measured with fitted and tensioned drive belt.

Check the bowl height and re-adjust if necessary:

- After replacing the drive parts
- After exchanging the bowl
- After exchanging the centripetal pump
- As soon as the centripetal pump shows any grinding marks.

Pre-conditions for correct pre-setting of the bowl height:

- Bowl lock rings are tightened firmly.
- The "0" marks on the bowl lock ring and the bowl bottom or the bowl top are aligned.

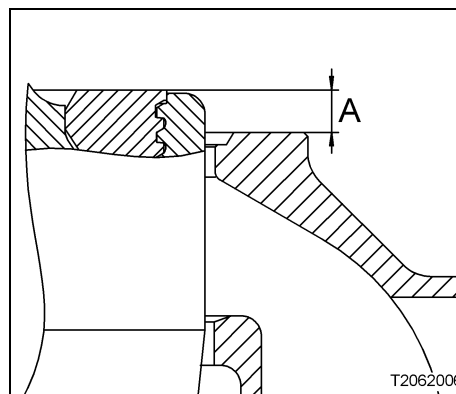


Fig. 279

- Check the bowl height.
 - Reference dimension **A = 5.5 (±2) mm** between the upper edge of bowl lock ring and top part of frame.

12.24 Checking the centripetal pump clearance

IMPORTANT: The correct centripetal pump play is very important for operational safety. Therefore, the checking of the centripetal pump play must be carried out with the extreme care.

Preparation for measuring the centripetal pump play

Separator with double centripetal pump

- Dismantle the bowl head so that only the lower centripetal pump chamber cover remains assembled.
- Remove the gaskets between the bowl top and centripetal pump chamber cover.
- Remove the upper centripetal pump.

Separator with single centripetal pump

- Dismantle the bowl head so that only the lower centripetal pump chamber cover remains assembled.
- Remove the gaskets between the bowl top and centripetal pump chamber cover.
- Remove sealing disk if installed.

Measuring the centripetal pump play

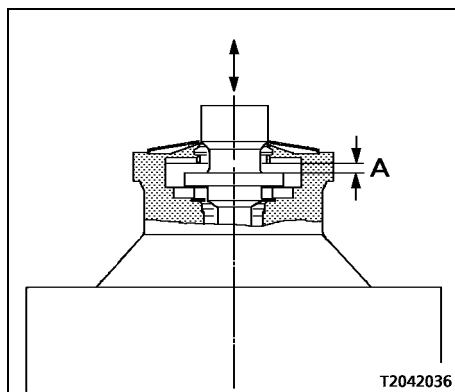


Fig. 280

Required special tools see chapter "Special tools":

- Socket wrench or
- Hexagonal offset screwdriver

- Move the centripetal pump to and fro in the centripetal pump chamber in an axial direction.
 - Measure the entire clearance **A** (approx. 10 mm).
- Assemble the bowl completely.
- Close the hood.
- Check that the hood is correctly seated on the frame rim.
- Check that the screws for fastening the hood are tight.

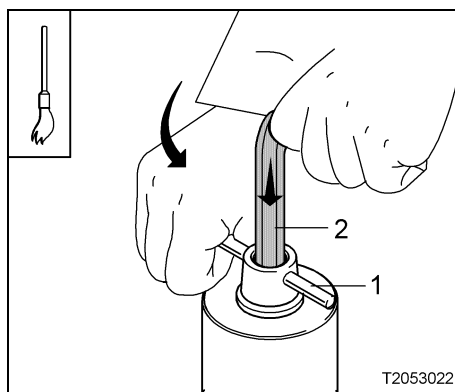


Fig. 281

- Apply a thin film of grease to the thread of the centripetal pump in accordance with the lubrication schedule.
- Push handle connection piece (1) into the centripetal pump.
- Hold the centripetal pump with special tool (2)
- Screw handle connection piece into the centripetal pump as far as it will go (**left-hand thread**).

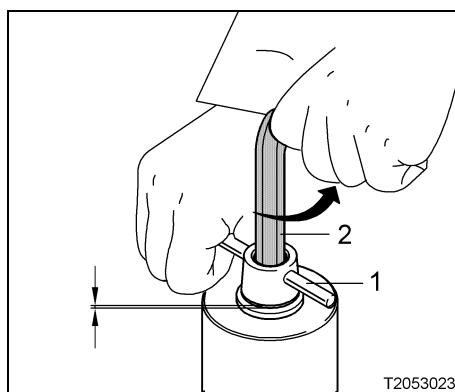


Fig. 282

- Hold handle connection piece (1) steady,
- Turn the special tool (2) until the handle connection piece is raised slightly from the hood (approx. 0.5 mm).

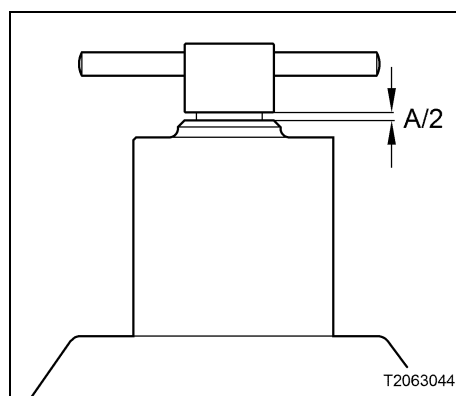


Fig. 283

- Lift the handle connection piece as far as it will go.
- Measure axial play:
 - $A_{1/2} = 4 - 6 \text{ mm}$

12.25 Final check after servicing

Before starting the separator

The following checks must be carried out after every service, depending on the repair scope

Check	Chapter
Bowl height	12.23
Oil level in the drive chamber	11.7.2
Direction of rotation of the bowl	8.6
Bowl speed	8.7
Starting time of the bowl	8.4
Smoothness of running of the separator	—
Suction line of product pump (if present) for leaks	—

When starting the separator

The following checks must be carried out after every repair when starting the separator:

Check	Document
Product temperature	Data sheet
Observe at all discharges whether the bowl is functioning correctly	Dimensional drawing of the separator

Note
注释
Noter
Notas
Notes
وتلاحظ
Notater
Notatki
Notizen
Notities
Бележки
Pastabos
Märkmed
Σημειώσεις
Anotaciones
Для записей
Muistiinpanot

13 Decommissioning

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13.1 Safety during decommissioning

Decommissioning the centrifuge can entail risks when the plant operator is not decommissioned professionally.

- Comply with standard operating procedures (SOPs).
- Assign only qualified personnel with work involved in decommissioning the centrifuge, see chapter "Safety precautions / Qualification of the personnel".

13.2 Risks from electric current

Risks due to electric current can arise when the supply lines are not disconnected correctly. When working on live leads, there is a risk of electric shock. An electric shock leads to injury or death.

- Have electrical connections disconnected by qualified personnel.
- Work only on deenergised leads.

13.3 Risks through hazardous fluids

Residues of hazardous fluids can be in hollow spaces and pipes and lead to injuries and damage.

Risks can arise when the centrifuge and pipes are dismantled and transported.

- Prior to decommissioning, drain off fluids in pipes and vessels and dispose of these in accordance with local regulations.
- During dismantling, check pipes and vessels for fluid residues and dispose off them in accordance with local regulations.

13.4 Prior to a long-term shut-down

- Switch off and shut down the centrifuge.
- Wait until the bowl has come to a standstill.



DANGER

Danger to life through high-speed rotating machine parts

There is a risk of serious injury due to being pulled into the machine and through ejection of machine parts or product residues.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- Wait until the deceleration time has elapsed, see data sheet.
- Secure the machine against unintentional restart.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to three hours.
- Check and ensure that all machine components are at a standstill, see section entitled "Maintenance / Standstill check of the rotating machine parts".

If a machine is not operated for a prolonged period, it must be ensured that no damage arises as a result of standstill. Carry out the following measures and checks to ensure that the centrifuge does not exhibit serious damage when put back into operation.

- Take the bowl off the spindle and dismantle it (see chapter "Servicing / Dismantling the bowl").
- Remove all sealing elements of the bowl.
- Clean, wipe dry and grease all bowl parts and all unvarnished machine parts.
- Clean the bowl seals and re-fit them. When putting the machine back into operation after longer than one year, all seals must be replaced.
 - See table "Maintenance after 8000 operating hours – after no more than 1 year".
- Re-assemble the bowl, see chapter "Servicing / Assembling the bowl").
- Store the covered bowl in a protected and dry place.
- Rub slushing oil by hand into the upper end of the spindle and put a protection cap or plastic foil bag over the spindle.
- Clean upper part of frame and motor.
 - Never rinse off the motor with a direct jet of water.
 - Clean the motor only using the procedures specified by the manufacturer.
- Check water shut-off devices for leakage.
- If necessary, disconnect water supply lines to avoid damage caused by drip water.
- Switch off the operating water supply (if fitted) at the mains to prevent inrush of water caused by inadvertent opening of the shut-off valve.
- The storage site must be free from vibrations to prevent damage to the bearings and drive.
- Refer to chapter "Preserving the centrifuge".

13.4.1 Preserving the centrifuge

- Switch off and shut down the centrifuge.
- Wait until the bowl has come to a standstill.



DANGER

Danger to life through high-speed rotating machine parts

There is a risk of serious injury due to being pulled into the machine and through ejection of machine parts or product residues.

- Do not loosen any part of the machine before the bowl has come to a standstill.
- Wait until the deceleration time has elapsed, see data sheet.
- Secure the machine against unintentional restart.
- Do not start work until the components have cooled down to room temperature. Depending on the application and product temperature, the cooling phase can take up to three hours.
- Check and ensure that all machine components are at a standstill, see section entitled "Maintenance / Standstill check of the rotating machine parts".
- Remove and clean the feed and discharge connections.
- Dismantle and clean the feed and discharge assembly fittings.
- Remove the hood or open and clean.
- Drain the lubricating oil and dispose of it properly.
- Fill the lubricating oil chamber with a slushing oil up to the middle of the sight glass, see lubrication schedule.



WARNING

The rotating spindle may cause injury

Touching the rotating spindle can cause serious injury.

- Keep a safe distance away from the rotating spindle.
- After switching off the centrifuge, wait until the spindle has stopped rotating.
- Run the separator without bowl for approx. 1 minute to make sure that all drive parts are coated with slushing oil.
- Drain the slushing oil out of the lubricating oil chamber completely.
- Slacken the drive belt, see chapter "Servicing / Replacing the flat belt".
- Remove, dismantle and clean the bowl, see chapter "Servicing / Removing the bowl".
- Remove the sealing elements, clean and store in a safe place.
- Thoroughly clean the bowl parts, including the gasket grooves.
- Protect the bowl parts with Valvoline Tectyl 506 or an equivalent product.
- Assemble the bowl and pack it in airtight foil.
- Store the bowl in a suitable container, e.g. In a wooden case, in a protected place.
- Dry-clean and apply grease to unvarnished machine parts.
- Rub slushing oil by hand into the upper end of the spindle and put a protection cap or plastic foil bag over the spindle.
- Mount the hood or close and bolt tight respectively.
- Mount the feed and discharge connections.

13.5 Notes on long-time storage of the decanter and individual rotors

The decanter/rotor will get damaged if it is not operated for a prolonged period and inadequate preserving measures are taken. This also applies for the time before commissioning.

When the machine is shut down for longer than 12 months, special measures are required to avoid the machine getting damaged during standstill.

If this action is not taken, the roller bearings of the machine in particular will be damaged by corrosion and one-sided load. This bearing damage results in high consequential costs.

The required preserving measures should be monitored by GEA Westfalia Separator Service.

13.5.1 Painted parts

An intact paint coating provides adequate corrosion protection. For this reason, painted parts must be examined for damage or changes once a month.

- Touch up the damage in accordance with the instructions of the paint manufacturer.
- Refer to the paint instructions (consult GEA Westfalia Separator).

13.5.2 Drive motors

The drive motors must be prepared as follows for long-term storage.

- Option: Connect the space heaters for the motor winding. This is especially important in the case of high air humidity in the environment.
- Carefully clean the motor according to the specifications of the motor manufacturer.
 - Never rinse off the motor with a direct jet of water.
- Spray on corrosion inhibiting wax (refer to documentation of the motor manufacturer).
- Check and, when necessary, touch up the corrosion protection once a month.

13.6 Disposing of the centrifuge

When the centrifuge has reached the end of its useful service life, the plant operator is responsible for proper and correct disposal.

It is recommended to commission a company specialized in the disposal of machines or to obtain information from GEA Westfalia Separator service.

- Observe the local disposal regulations.
- Be sure to adhere to applicable environmental protection legislation.
- Have electrical connections disconnected by qualified personnel, e.g. electricians.

IMPORTANT: Residual liquids in feed lines and utility lines can cause injury. Protective clothing must therefore be worn when dismantling lines.

**WARNING****Danger of acid and alkali burns**

After cleaning, hot lye and acid residues can still be in the centrifuge and the pipelines. When working on the centrifuge, contact with the lyes and acids can cause burns.

- Wear acid-resistant protective gear, e.g. protective goggles, protective gloves, protective overalls or protective suits.
- Take special care.
- Observe the standard operating procedures (SOPs) issued by the operator on handling acids and caustics as well as the local disposal regulations.
- Be sure to adhere to applicable environmental protection legislation.
- Drain residual liquids in feed lines and utility lines into suitable vessels and dispose of them properly.
- Observe regulations on product contact.
- Dismantle feed lines and utility lines, clean superficial impurities caused by lubricants or product with suitable media and dispose of separately.
- Dismantle all seals and non-metallic materials, clean them to remove lubricants and dispose of them separately or recycle.
- Separate and sort metal parts and recycle them.

13.6.1 Disposing of utilities

When the centrifuge is decommissioned, the gear oil must be drained and disposed of. The plant operator is responsible for the proper disposal of the utilities.

- Observe the local disposal regulations.
- Comply with applicable environmental protection legislation.
- Drain off gear oil into suitable vessels and dispose of it properly. See data sheet for oil quantity.

13.6.2 Disposing of cleaning fluids

Chemicals are used for the chemical cleaning process which are specified in the user information or a datasheet issued with the user information. They are dangerous and can cause injuries and environmental damage.

**WARNING****Danger of acid and alkali burns**

Danger of chemical burns when handling chemical cleaning fluids and danger of burns by hot water.

- Wear acid-resistant protective gear, e.g. protective goggles, protective gloves, protective overalls or protective suits.
- Take special care.
- Observe the standard operating procedures (SOPs) issued by the operator on handling acids and caustics as well as the local disposal regulations.
- Comply with applicable environmental protection legislation.
- Drain residual liquids in feed lines and utility lines into suitable vessels and dispose of them properly.
- Observe regulations on product contact.

14 Spare parts

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14.1 Use only genuine spare parts.

All spare parts, wear parts and operating materials are originally packed by GEA Westfalia Separator.



The original packing is provided with the marking shown.

Fig. 284



WARNING

Danger due to defective spare parts

Non-genuine or non-approved spare parts or operating materials reduce the availability of the centrifuge.

Non-genuine or non-approved spare parts or operating materials reduce the availability of the centrifuge.

- Use only genuine spare parts from GEA Westfalia Separator to assure the operating safety and optimum availability of the centrifuge.

14.2 Information on ordering spare parts

A spare parts catalogue is part of the documentation of the centrifuge. It contains all spare parts, wear parts and operating materials.

Spare parts kits are not generally included in the scope of supply of the centrifuge. The following spare parts kits are available to suit the appropriate technical service intervals:

- "Bowl and hood" spare parts kit for operation of 1 year or 8000 hours
- "Drive" spare parts kit for operation of 1 year or 8,000 hours
- "Drive" spare parts kit for operation of 2 years or 16,000 hours (for a centrifuge with centrifugal clutch)

The following information is required to order spare parts.

Information on ordering spare parts for centrifuges

- Centrifuge type: see nameplate
- Serial number: see nameplate
- Bowl serial number (can differ from the machine serial number, see spare parts catalogue).
- Designation: see spare parts catalogue
- Part number: see spare parts catalogue.

The part number is sometimes engraved on the individual parts.

Information for ordering spare parts for pumps and pump connecting parts

- Pump type: see pump nameplate
- Pump number: see pump nameplate

14.3 Storing wear parts and operating materials

Pay attention to the following for storing wear parts and operating materials.

14.3.1 Sealing elements and drive belts

Unfavourable storage conditions change the physical properties of rubber.

Possible causes:

- Shortened service life
- Completely unserviceable

If the following instructions are adhered to, it is possible that gaskets and drive belts will retain their properties for several years.

Requirements to be met by the storage room:

- Cool (5 to max. 50 °C)
- Dry (avoid the formation of condensation water.)
- Dust-free (as possible)
- Dark, no direct solar radiation or bright artificial light (if necessary, paint the windows red or orange).
- Moderately ventilated and draft-free

Method of storage:

- Wrap up the gaskets and drive belts or pack them in antistatic foils or bags made of paper, polyethylene or polyamides).
- Do not store in the vicinity of heat sources.
- Do not store together with solvents, fuels, lubricants, acids, disinfectants etc.
- Stress-free, i.e. without tension, pressure or other deformation.
- Avoid different material compositions from coming in contact with one another.
- Avoid direct contact with metals (copper and manganese in particular have a negative impact on rubber products).
- Drive belts are preferentially hung up on so-called "saddles" or large diameter pipes. The diameter should be at least ten times the height of the drive belt cross-section.
- Very long drive belts can be stacked on top of each other in piles if they have been folded together properly.
- Shorter drive belts can be stored in racks. Piles exceeding 300 mm in height should be avoided because otherwise the bottom drive belts will be deformed.
- Do not use hooks and nails for hanging up the drive belts.

14.3.2 Roller bearings

Roller bearings must be kept in their original packing during storage; the packing may only be opened at the workplace and directly prior to fitting. Otherwise there is a risk that the bearings will become soiled and rust.

Larger bearings whose raceways have a relatively small thickness should be stored horizontally, not vertically and be supported around the entire circumference.

Before packing the roller bearings are immersed in slushing oil. This oil does not resinify or harden and is neutral towards all commercially available roller bearing greases. Roller bearings are reliably protected against external influences in their original packaging.

However, this protection is only effective for a prolonged period when the packed bearings are stored in a dry (relative air humidity 60%) and frost-free room.

No aggressive chemicals such as acids, ammonia or chloride of lime may be stored in the same room.

14.3.3 Lubricants

Always keep lubricant containers tightly closed and store them in closed rooms.

Avoid large temperature fluctuations as they cause respiration of the containers. As a result, moisture penetrates into the containers.

Clean the lubricant containers before opening them to prevent contaminants from getting into the lubricant. Even the smallest foreign matter in the lubricant can drastically reduce the life of the roller bearings.



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