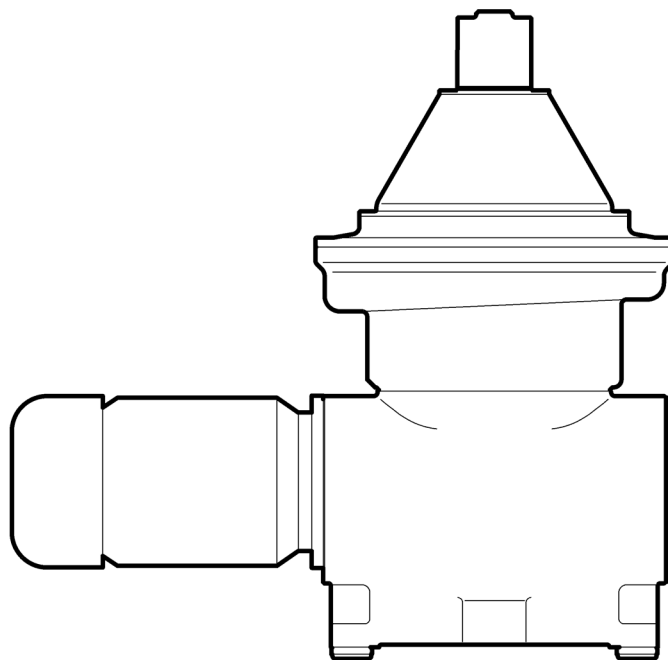


INSTRUCTION MANUAL

Original document



Separator

GEA Westfalia Separator Group GmbH
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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.



DANGER

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.



WARNING

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.



CAUTION

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.

NOTICE

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: Sworker

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.

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

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: www.gea.com/contact

1.5.1 Training and Services

GEA Westfalia Separator regularly holds training courses for customer employees.

Training content is aimed at the customer's operating and service staff who work with the machine. The operator must know how the machine functions.

Trained operators assure the operating safety of the machine.

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.

For further information about the training of operating and service personnel as well as GEA services:

- Contact local GEA representatives or
- Visit the website gea.com/services.

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 limit values.
- Do not alter or upgrade the centrifuge.

For centrifuges outside hazardous areas, the following additional requirements apply:

- Do not feed or discharge product which is categorised as explosive (flammable liquids and dust).
- Do not deploy the centrifuge in zones classified as explosion hazardous.

2.2 Reasonably foreseeable misuse

This instruction manual contains information relating to intended use. Operation of the centrifuge that is not in conformity with the intended use is considered to be misuse.

Reasonably foreseeable misuse includes:

- Non-observance of this instruction manual
- Use of the centrifuge in areas where the legal basis does not comply with the manufacturer's declaration of conformity
- Use of non-original spare parts
- Use of non-permitted operating materials
- Exceeding the defined limit values
- 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 unbalance 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

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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.

Chloric cleaning agents attack stainless steel and can lead to corrosion.

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

Carry out regular checks for damage and wear on sight glasses in product lines through which CIP liquid is fed.

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.

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
- Revolution indicator or sight glass on the gear cover of centrifuges with a toothed gear.
- Optical speed check of the drive motor
- Noise check
- Vibration check
- Visual speed check by opening the inspection ports on hood and frame
- Visual check by removing the gear cover or opening the port in the drive housing on the bowl side.

3.5 Personal protective equipment

To prevent any hazard to limb or life, the prescribed personal protective equipment must be worn when operating the centrifuge or carrying out maintenance work and repair work at the centrifuge.

The personal safety equipment conforms to:

- Locally applicable accident prevention regulations
- Instruction manual of the operator or employer
- Instructions in the safety information in this instruction manual

Anybody working with or at the centrifuge is responsible that the personal protective equipment is worn and that it is in proper condition.

- Replace damaged safety equipment with new equipment.
- Clean dirty safety equipment.



Fig. 1

Wear hearing protection

- Wear hearing protection when working in a loud environment.

The noise level in a plant can exceed 85dB(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

- When working at hot or cold surfaces of centrifuges and pipelines, wear protective gloves.

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



Fig. 4

Wear breathing protection

In potentially explosive areas even inert gases are used as protective gas, e.g. nitrogen.

- When there is the risk of undercutting the permitted oxygen content of the air, wearing adequate breathing protection is mandatory (see operating instructions of the operator).

3.6 Meaning of the safety markings

Used safety markings are attached as adhesive sign to the centrifuge and/or the control cabinet.

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.

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



Fig. 5

Refer to the machine documentation

- Any 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, near to the machine and stored accessible for the respective target group.



Fig. 6

Disconnect machine from power supply

- Danger of injury from electrical voltage and unintentional start-up of the centrifuge.

Before working on the centrifuge and electrical plant components:

- Ensure that the centrifuge is at a standstill.
- Disconnect all electrically supplied equipment from the power supply using the main switch.
- Secure the plant against unintended restarting with locking devices.



Fig. 7

Work on rotating bowl is prohibited

- Do not loosen any parts or carry out any maintenance or repair work on the centrifuge before the bowl has come to a standstill.

Options for checking standstill are described in this instruction manual.

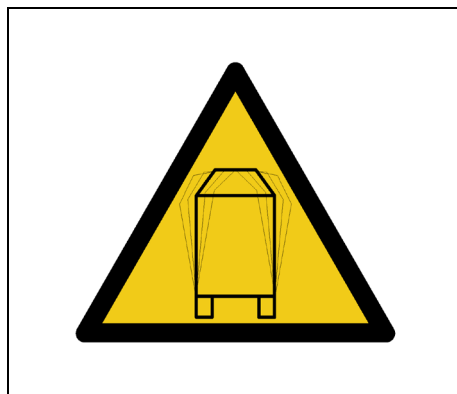


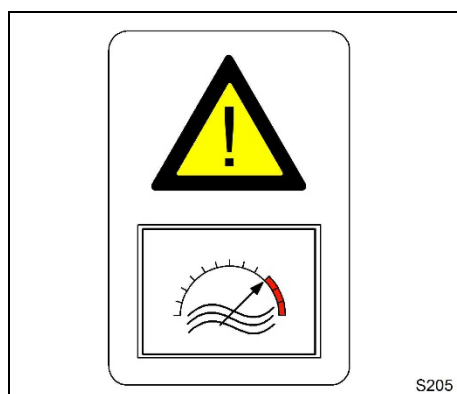
Fig. 8

Warning of unusual noises or vibrations

- Follow the instructions in the instruction manual.
- Do not initiate 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.



S205

Fig. 9

Frequency converter operation

- When setting the frequency converter, do not exceed the admissible bowl speed (see type plate).
- The parametrisation of the frequency converter must be carried out only by an instructed technician.
- Check the bowl speed whenever replacing the drive parts.

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



Fig. 10

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. 11

Do not enter or climb on the separator or its components.

There is a risk of injury from slipping or falling down.

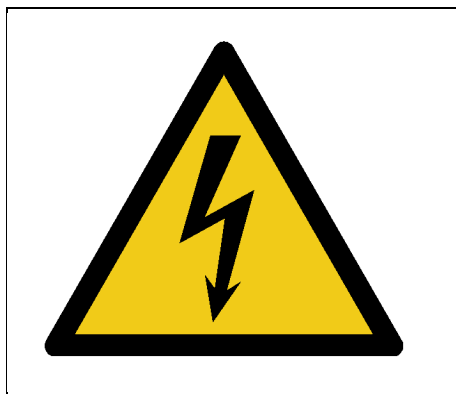


Fig. 12

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 off.

Before carrying out any work on electrical components:

- Disconnect all electrically supplied equipment from the power supply using the main switch.
- Secure the centrifuge with a lock to prevent it from being accidentally switched on.
- Take appropriate protective measures:
 - according to the national provisions
 - in Germany in accordance with the stipulations of the VDE (German Electrical Engineering Association) or the responsible power supply company
- Work on electrical system parts may only be carried out by authorised specialists, e.g. electrician.

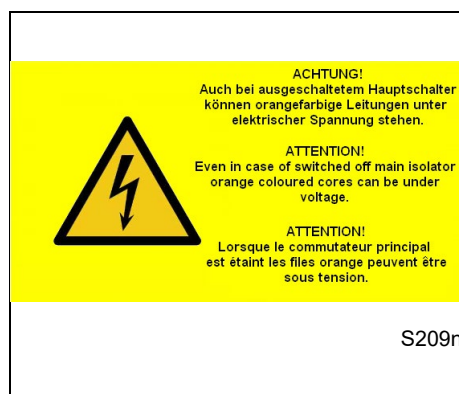


Fig. 13 Example: Control cabinet sticker

Safety markings with warning text

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

IMPORTANT: Electrical lines that are still energised after switching off the main switch, are marked with orange insulation at GEA Westfalia Separator. Also leads of different colours can be installed depending on the customer.



Fig. 14

Equipotential bonding (protective earth connection)

The protective earth connection is a measure that diverts dangerous contact voltage to the earth in the event of a malfunction.

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

EMERGENCY STOP restores functional safety in an emergency or hazardous situation. It ensures that processes are stopped and all moving parts are brought to a standstill as quickly as possible.

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.

Shutdown **EMERGENCY STOP** can be initiated manually or is carried out automatically, if a vibration monitoring unit is available. 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.

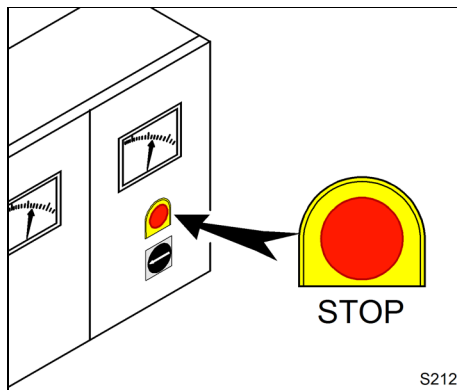


Fig. 15

EMERGENCY STOP button

- EMERGENCY STOP buttons are located on the control cabinet.
- Exact information on the position of the EMERGENCY STOP buttons can be found in the electrical documentation.
- The control cabinet is installed according to the specifications of the plant operator.
- The position of the EMERGENCY-STOP button is given in the SOP of the plant operator.

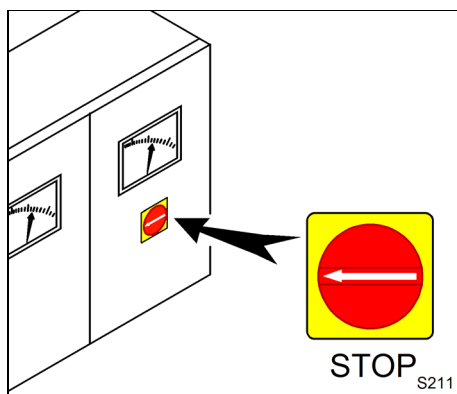


Fig. 16

Main switch

- Precise information on the position of the main switch on the cabinet is given in the electrical documentation.
- The control cabinet is installed according to 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 Elements on the separator

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

To avoid operating errors and safety risks, the instructions 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.

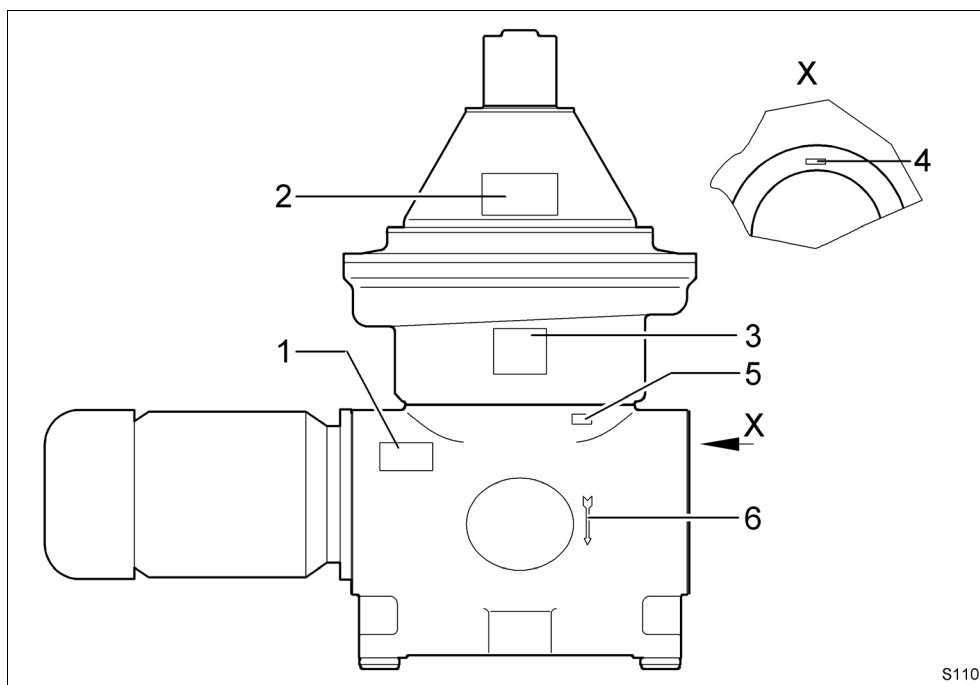


Fig. 17 Marking example of a separator with gear drive

- 1 Nameplate
- 2 Pictograms (safety stickers)
- 3 Boilerplate (necessary for separators exposed to pressure)
- 4 Plate (max. pressure for brake, if fitted)
- 5 Plate (direction of rotation of the bowl)
- 6 Decal arrow (direction of rotation of the gear)

3.15 Assembly overview

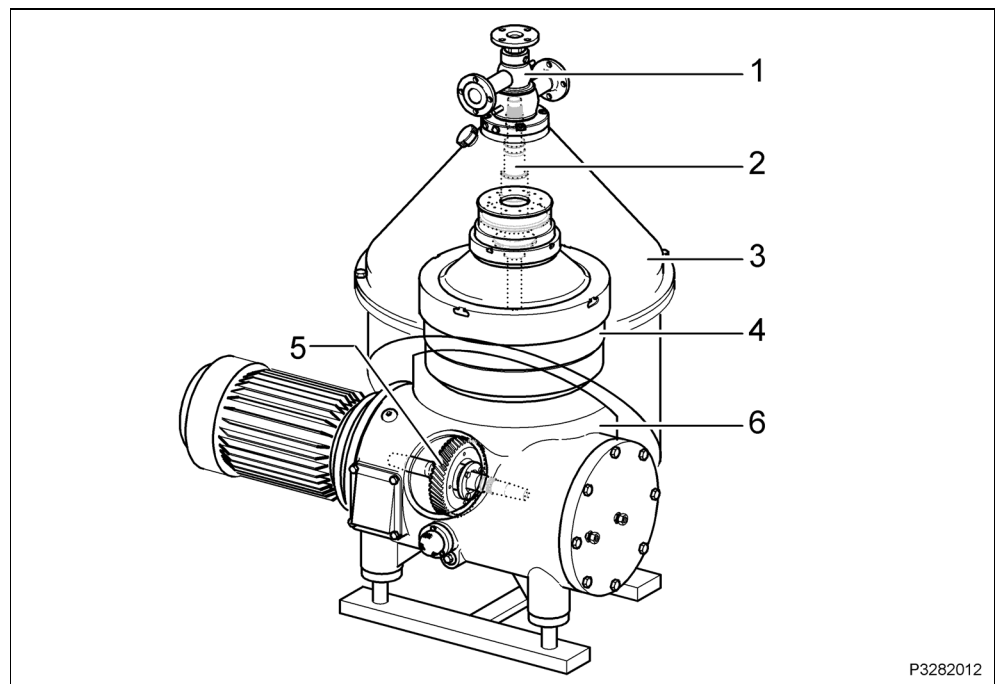


Fig. 18

- 1 Feed and discharge connections
- 2 Centripetal pump
- 3 Hood
- 4 Bowl
- 5 Drive
- 6 Housing

3.16 Operating principle of the bowl

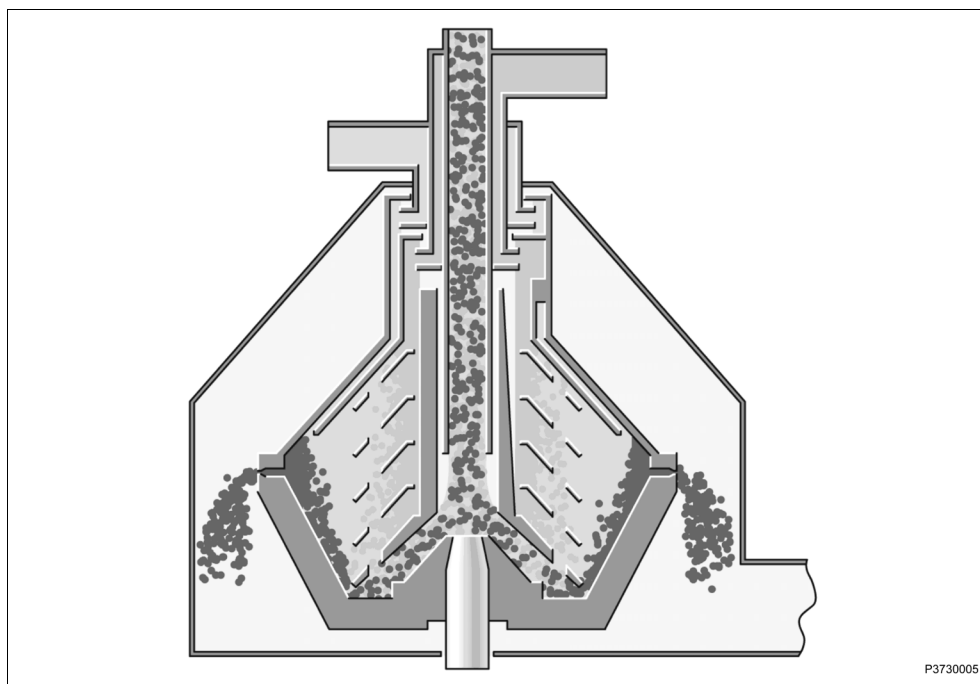


Fig. 19

The separator is equipped with a disk-type bowl with peripheral nozzles.

The product flows through the feed into the bowl and is separated in the disk stack.

The liquid phases are discharged foamfree, normally under pressure by means of centripetal pump.

The separated concentrate is discharged continuously through nozzles.

3.17 Production of quark by the normal process

The skim milk is pasteurized in accordance with the recognized heating method described below.

- Short heating process
 - Temperature: 72 °C
 - Holding time: 15 – 30 sec

Make sure in this case that temperature does not exceed 74 °C. Protein losses in the whey would result.

- High-temperature heating process
 - Temperature: 86 °C

Correct preparation of the vat milk is a prerequisite for producing perfect quark.

Pasteurized skim milk is cooled to 28 to 30 °C and passed to the renneting tanks.

A buttermaking or special soft cheese culture (low gas formation) should be used to acidify the skim milk.

The quantity of culture to add depends on the following factors:

- speed of acidification of the culture
- acidification temperature
- time the vat milk has been standing
- flavour to be achieved in the end product

The following is normally added:

- 0.5 to 1 % culture and 1 cm³ liquid rennet per 100 l vat milk
 - Rennet concentration: 1 : 10,000
- 0.5 to 1 % culture and 1 cm³ dry rennet (dissolved in 250 cm³ water) per 1,000 l vat milk
 - Rennet concentration: 1 : 100,000

The vat milk must be stirred thoroughly following the addition of rennet.

The agitators must be switched off during the approximately 16-hour acidification process of the vat milk.

The desired degree of coagulation has usually been reached after this amount of standing time. The degree of acidification of the whey is then 25 to 28 SH (pH 4.55 – 4.5).

At this degree of acidification, the curds are stirred thoroughly at a high agitator speed 15 minutes before separation starts.

The tank agitator must run at low speed for the whole separation time in order to obtain consistent dry mass in the low-fat quark. This allows a consistent product to be fed to the separator.

The separating temperature must be 28 to 30 °C.

3.18 Standard quark line (normal process)

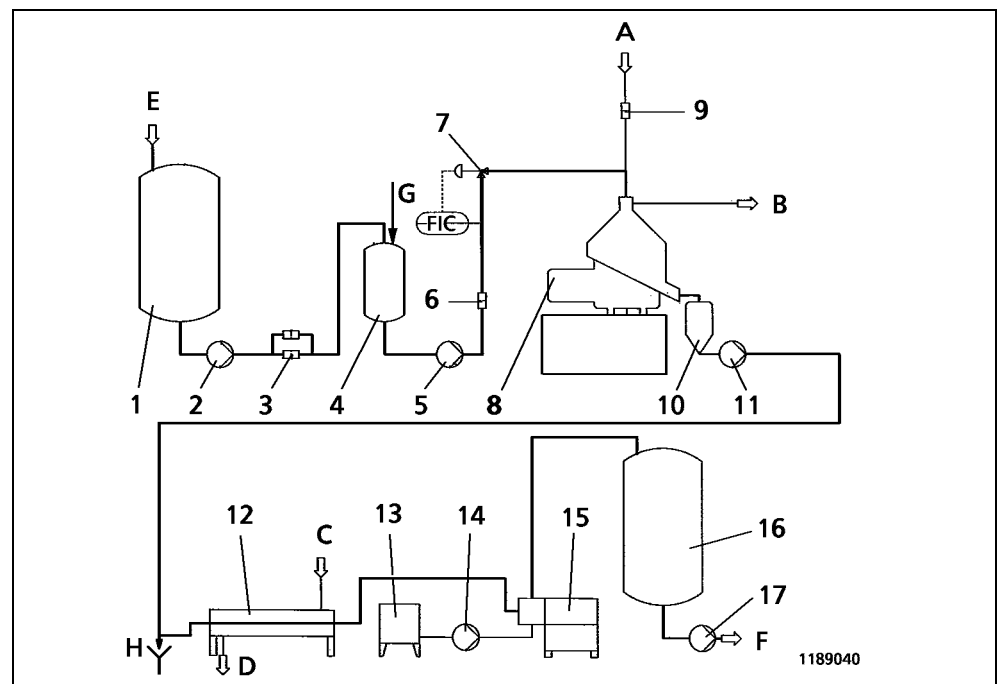


Fig. 20

Designation	Function
1 Renneting tank	Stores vat milk
2 Centrifugal pump	Pumps the vat milk to feed tank (4) via switchable tubular strainer (3).
3 Tubular strainer	Initial straining of vat milk. Coarse solid particles are retained.
4 Feed tank	Stores the pre-strained vat milk. Guarantees a constant feed to the separator.
5 Centrifugal pump	Pumps the vat milk from the feed tank to separator (8) via tubular strainer (6).
6 Tubular strainer	Second straining of vat milk (fine solid particles).
7 Feed control element	Automatically sets feed quantity via IDM and pneumatic control valve.
8 Separator	Separates milk into quark and whey.
9 Tubular strainer	Strains the safety water.
10 Quark hopper	Stores the quark for further treatment.
11 Positive-displacement pump	Pumps the quark to silo (16) via cooler (12).
12 Quark cooler	Cools the quark; cooling medium: ice-water
13 Cream tank	Stores the cream to make high-fat quark.
14 Cream pump	Pumps cream to quark mixer (15).
15 Quark mixer	Mixes quark and cream.
16 Silo	Stores the quark prior to packing.
17 Positive-displacement pump	Pumps the quark to Packing.

Cont'd Standard quark line (normal process)

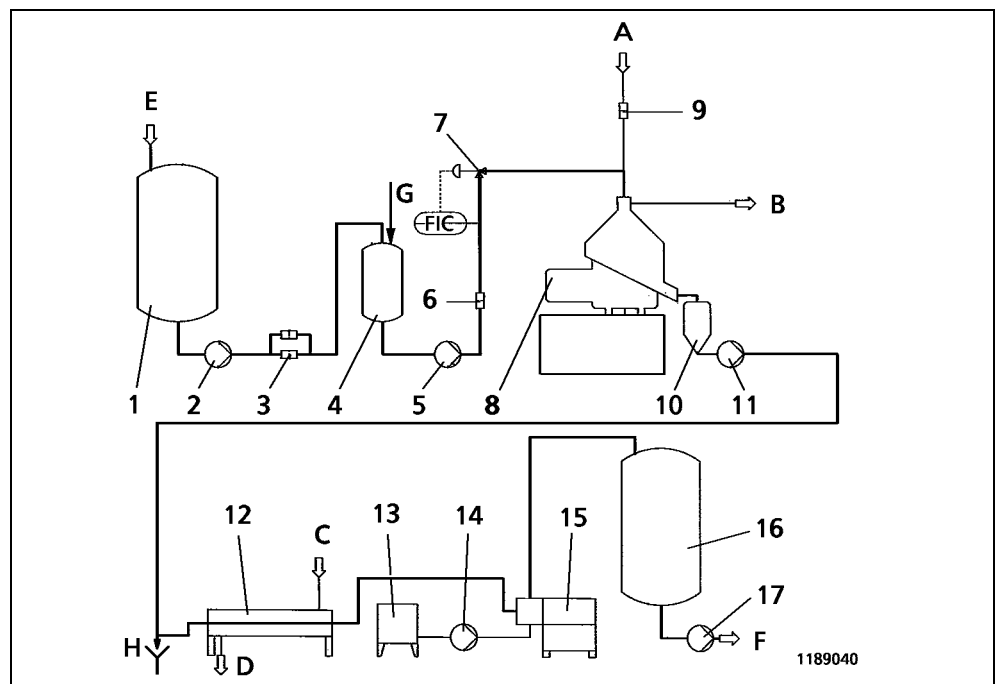


Fig. 21

- A Safety water feed
- B Whey discharge
- C Ice-water feed
- D Ice-water discharge
- E Skim milk in
- F To Packing
- G Feed for start-up water
- H Discharge for start-up water

3.19 Production of quark by the thermoprocess

In contrast to the normal process, the thermoquark process involves a different temperature/time treatment of the sweet and acidified skim milk.

This denatures the majority of the whey protein in the skim milk, allowing it to be fed to the quark as additional yield.

A higher yield of quark is achieved under the following conditions:

- the whey proteins are denatured in a high-heat treatment with the temperature held for the appropriate time.
- the whey proteins attach to the casein during acid clotting of the milk.

In the subsequent separation step, these proteins are discharged with the casein in the form of low-fat quark.

The proportion of proteins left in the whey is thus lower than with the standard method.

The skim milk is heated to 82 to 88 °C and the temperature held for 5 to 6 minutes.

The precise heating temperature depends on the following factors:

- milk quality
- time of year
- separator design

It is then cooled to renneting temperature and passed to the renneting tanks at a temperature of 27 to 30 °C.

The following is normally added:

- 0.5 to 1 % special culture and 1 to 1.5 cm³ liquid rennet per 100 l vat milk
 - Rennet concentration: 1 : 10,000
- 0.5 to 1 % special culture and 1 to 1.5 g dry rennet (dissolved in 250 cm³ water) per 1,000 l vat milk
 - Rennet concentration: 1 : 100,000

Following renneting and achievement of a pH of 4.5, the coagulated skim milk is heat-treated at 60 to 63 °C and the temperature held; it is then cooled to a separating temperature of 40 to 45 °C.

NOTE

We recommend contacting GEA Westfalia Separator before making quark by this method.

3.20 Thermoquark line

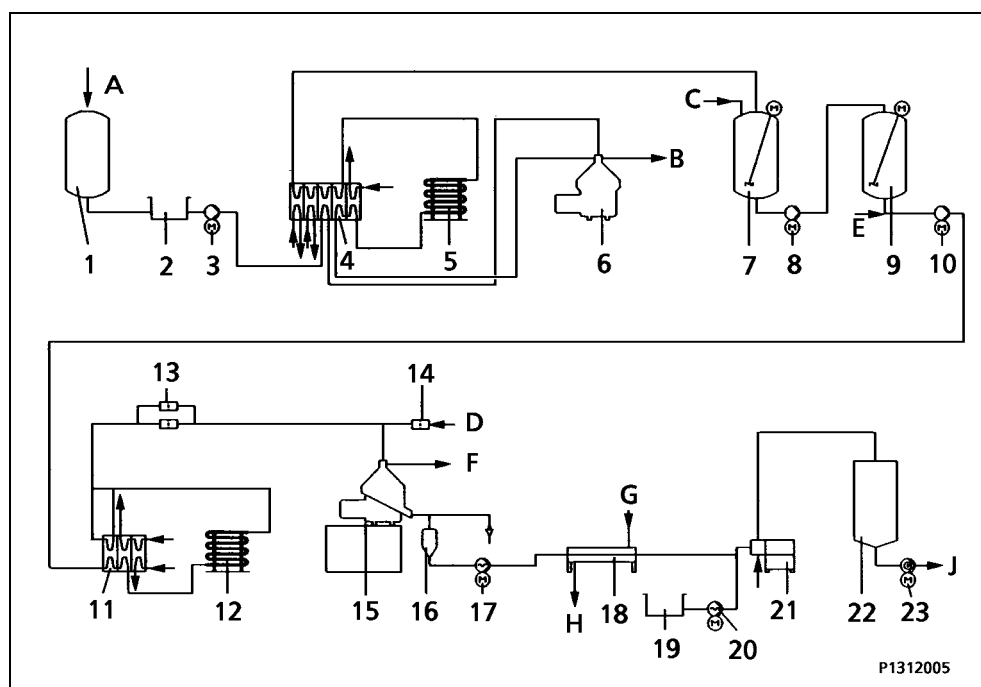


Fig. 22

Designation	Function
1 Raw milk tank	Stores vat milk
2 Feed tank	Stores the vat milk. Guarantees a constant feed to the separator.
3 Centrifugal pump	Pumps the vat milk to separator (6) via plate device (4).
4 Plate device	Heats the skim milk to 82 to 88 °C. Cools the skim milk to renneting temperature (27 to 30 °C)
5 Tubular temperature holding device	Holds skim milk at temperature (5 to 6 min.)
6 Separator	Skims the raw milk.
7 Renneting tank	Stirs the coagulated milk and guarantees a homogeneous feed to separator (15).
8 Centrifugal pump	Pumps the skim milk pumped from the renneting tank to feed tank (9).
9 Feed tank	Guarantees a consistent feed to separator (15).
10 Centrifugal pump	Pumps the skim milk from feed tank (9) to separator (15) via plate device (11), temperature holding device (12) and switchable double strainer (13).
11 Plate device	Heat-treats the skim milk at 60 to 63 °C, part of flow cooled to approx. 35 °C. The precise setting of separation temperature of 40 to 44 °C is achieved by mixing the part-flows.
12 Tubular temperature holding device	Holds skim milk at temperature (4 to 5 min.)
13 Double strainer	Pre-strains the skim milk
14 Tubular strainer	Pre-strains the safety water.
15 Separator	Separates the coagulated skim milk into whey and quark.
16 Quark hopper	Stores the quark for further treatment.

Cont'd Thermoquark line

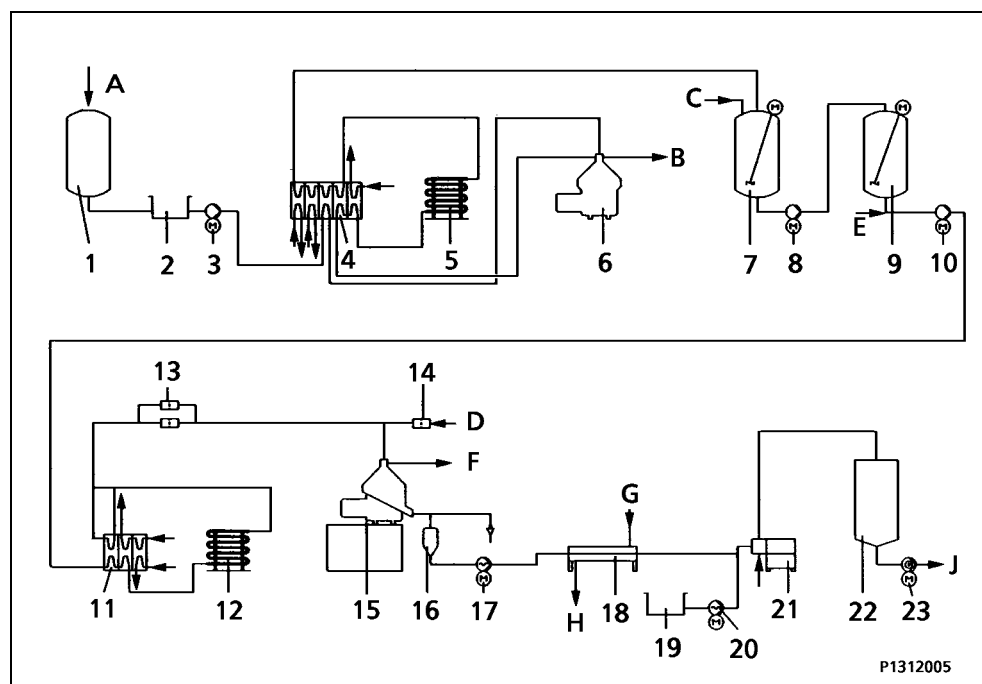


Fig. 23

Designation	Function
17 Positive-displacement pump	Pumps the quark to silo (22) via cooler (18).
18 Quark cooler	Cools the quark. Cooling medium: ice-water
19 Cream tank	Stores the cream to make high-fat quark.
20 Monopump	Pumps cream to quark mixer (21).
21 Quark mixer	Mixes quark and cream.
22 Silo	Stores the quark prior to packing.
23 Positive-displacement pump	Pumps the quark to Packing.

- A Whole milk feed
 B Cream discharge
 C Addition of culture and rennet
 D Safety water feed
 E Feed for start-up water
 F Whey discharge
 G Ice-water feed
 H Ice-water discharge
 J To Packing

3.21 Calculation of low-fat quark yield obtained by the normal process

$$Q = \frac{100 (DM_{SM} - DM_W)}{DM_{LQ} - DM_W}$$

Q Quantity of quark from the coagulated skim milk (kg)

DM_{SM} Dry mass of the coagulated skim milk (%)

DM_W Dry mass of whey (%)

DM_{LQ} Dry mass in low-fat quark (%)

Example:

Assuming:

- DM_{SM} = 8.6 %
- DM_W = 6.1 %
- DM_{LQ} = 18 %

Calculation:

$$Q = 100 \frac{8.6 - 6.1}{18 - 6.1} = 20.95 \text{ kg}$$

20.95 kg quark with a dry mass of 18 % are obtained from 100 litres of skim milk.

3.22 Calculating the skim milk required

$$SM = \frac{(DM_{SM} - DM_w)}{DM_{LQ} - DM_w}$$

SM Quantity of skim milk (kg)
DM_{SM} Dry mass of the coagulated skim milk (%)
DM_w Dry mass of whey (%)
DM_{LQ} Dry mass in low-fat quark (%)

Example

Assuming:

- DM_{SM} = 8.6 %
- DM_w = 6.1 %
- DM_{LQ} = 18 %

Calculation:

$$MM = \frac{18 - 6.1}{8.6 - 6.1} = 4.76 \text{ kg}$$

4.76 kg of skim milk are required for 1 kg quark with a dry mass of 18 %.

NOTE

The dry mass values of skim milk vary in different areas, with the result that the example quoted cannot be used generally.

Table for skim milk consumption

Table for skim milk consumption per 1 kg quark as a function of dry mass in the quark.

NOTE

The values in the table are a guide.

Dry mass in quark in % (abs. dry)	Skim milk consumption in kg per 1 kg quark (quark line, normal process)	Skim milk consumption in kg per 1 kg quark (quark line, thermoprocess)
17.0	4.19	3.79
17.5	4.38	3.98
18.0	4.76	4.37
18.5	4.85	4.45
19.0	5.05	4.65
19.5	5.23	4.83
20.0	5.43	5.03
20.5	5.62	5.22
21.0	5.80	5.40
21.5	6.02	5.62
22.0	6.20	5.80
22.5	6.38	5.98
23.0	6.57	6.17
23.5	6.76	6.36
24.0	6.98	6.58

The table shows that skim milk consumption per 1 kg quark is always dependent on the dry mass of the quark.

In addition to determining yield in theory, you should also always measure the quantity of prepared skim milk and the quantity of quark produced.

The more accurately all measurements are taken, the more the results will correlate.

3.23 Determining nozzles

The combination of nozzles to select and the diameter of the nozzle bore depend on the following factors:

- throughput capacity (milk volume fed/unit of time in l/h)
- proportion of dry mass in the coagulated skim milk.
- dry mass required in the low-fat quark.

IMPORTANT: However, it must be ensured that nozzles of identical diameter are opposite each other.

The following examples are based on quark with a solid content of 18 % abs. dry.

Examples of nozzle output

Different nozzle combinations can be selected after consulting the manufacturer.

Throughput capacity (coagulated skim milk) l/h	Nozzle output (quark) kg/h	Nozzle combination (pcs)/nozzle bore Ø in mm
8 600	1 800	12 x 0.6
9 500	2 000	8 x 0.6
		4 x 0.7
10 000	2 100	6 x 0.6
		6 x 0.7

Slight deviations from the specified values are possible since the ratio of throughput capacity to quark capacity depends on the following factors:

- solids content in the prepared skim milk for processing
- desired solids content in the quark
- enlargement of the nozzle bore due to wear

Pre-straining the coagulated skim milk

To prevent nozzle blockage, protective strainers must be installed upstream of the separator.

The mesh widths for the protective strainers depend on the discharge diameter of the nozzles used.

Please contact the manufacturer.

3.24 Installation features

Cooling

The hood and concentrate catcher are cooled with ice-water to prevent the quark settling on the walls.

- Inlet temperature: 1 °C
- Flow rate: 1,200 l/h

The cooling water first flows through the brake ring of the concentrate catcher and then the hood (switched in series).

A pressure relief valve set to 2 bar is fitted in the catcher feed line.

NOTE

The ice-water should be discharged from the hood free and under gravity.

Specified water quality for ice-water:

- Suspended matter: max. 10 mg/l
- Chlorine ions: ≤ 100 mg/l
- pH 6.5 – 7.5

Sealing water for slide-ring packing

Double-acting slide-ring packings need sealing water to ensure correct functioning. The sealing water performs the following functions:

- filling in the chamber between the bowl side slide ring and the gear-side slide ring
- dissipating friction heat
- preventing foreign substances penetrating the gear chamber

NOTICE

Frictional heat the slide-ring packings

Frictional heat can destroy the slide-ring packing.

- Prior to starting the separator, sealing water must be supplied to prevent destruction of the slide rings due to overheating.

Sealing water pressure:	$P_{min.} = 2.0$ bar $P_{max.} = 4.0$ bar
Sealing water volume:	$Q_{min.} = 180$ l/h
Sealing water temperature:	max. 60 °C at discharge
Water quality:	drinking water

The sealing water flow should be monitored by a flow monitor. The separator may only be started up when $Q_{min.}$ is exceeded.

During operation, the separator is shut down when $Q_{min.}$ is reached.

Even when a slide-ring packing is well run-in, it is normal for a little water to drip at the leakage outlet.

Sterile air system

A slight overpressure is created in the frame pot by blowing in sterile air. This prevents bacterially-contaminated foreign air from coming into contact with the quark.

See project documentation (P&ID) for design data such as the volume of sterile air and feed pressure.

Specified water quality for circulation water

The following values are specified for the quality of the circulation water:

- hardness: $\leq 12^{\circ}$ dH up to 55°C separating temperature
- hardness: $\leq 6^{\circ}$ dH above 55°C separating temperature

The different hardness values are linked by the following relationships:

- chlorine ions: ≤ 100 mg/l
- pH 6.5 – 7.5

Quark pump**IMPORTANT**

If the solids pump fails, it must be ensured that the program initiates a switch to safety water.

The reason is that only low-viscosity product flows off at the overflow of the quark hopper.

3.25 Cooling

In the case of separators with a coolable hood and solid catcher, the bowl chamber is cooled and a situation is avoided where solids stick to the walls of the hood and the catcher.

All coolable parts are of double-wall design through which a cooling medium flows. It enters the cooling chambers through a feed line. It then flows through a discharge line to a heat exchanger, for example. Here, the cooling medium is cooled down again.

Refer to the project documentation (P&ID) for rating data such as the temperature of the cooling medium, the flow rate and the maximum admissible pressure.

A pressure relief valve must be built into the feed line so that the admissible pressure is not exceeded in the cooling circuit.

3.26 Lubricating system

All bearings of the separator are splash-lubricated by immersing the worm wheel in the central oil bath.

All bearings are splashed with oil due to the spinning effect of the worm wheel.

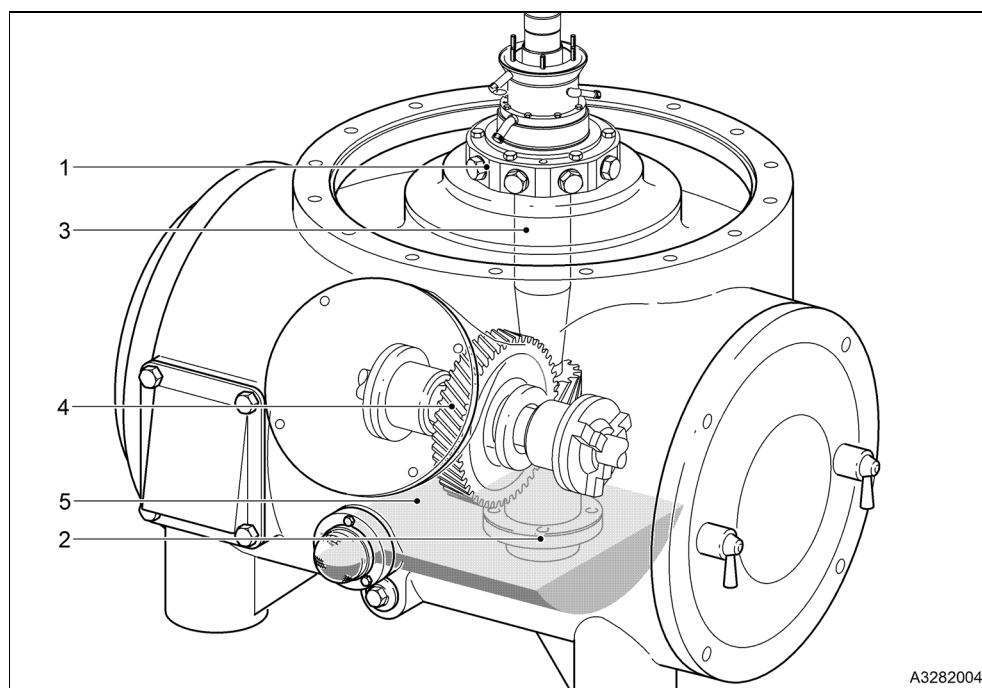


Fig. 24

- 1 Neck bearing
- 2 Bottom bearing
- 3 Worm spindle
- 4 Worm wheel
- 5 Oil bath

3.27 Disk stack compressing device

The compressing device is used to compress the disk stack to make it easier to unscrew or screw up the bowl lock ring.

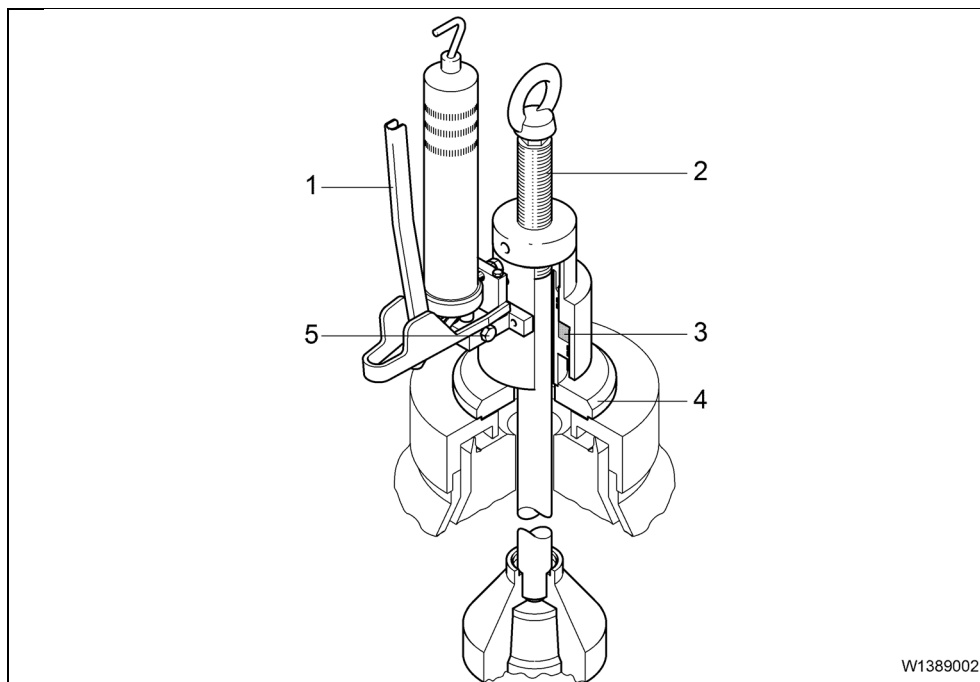


Fig. 25 Example

- 1 Pump hydraulics
- 2 Threaded rod
- 3 Pressure chamber
- 4 Disk (if fitted)
- 5 Pressure relief screw

Function

The pump hydraulics (1) press grease at a high pressure into the pressure chamber (3).

When the pressure increases in the pressure chamber (3), the piston is forced downwards.

The force of the piston movement is transmitted to the bowl top via the disk (4) and the threaded rod (2) screwed into the bowl bottom.

The disks are compressed.

The pump hydraulics (1) are relieved again via the pressure relief screw (5).

4 Technical data

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4.1 Note on technical data

The order-related technical data are specified on the data sheet included in the documentation.

4.2 Lubricating oil

As lubricating oil use only gear oils with the WS part number stated in the lubrication schedule, parts list or the data sheet.

Do not use motor vehicle or engine oils.

5 Transport and storage

5.1 Safety during transport 56

5.2 Storage instructions for separators.....56

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5.5.1 Transport separator > 250 kg kg with worm wheel gear. 63

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 unsuitable persons are deployed and unsuitable or damaged lifting gear is used.

Therefore, pay attention to the following points during transport:

- Assign only qualified personnel with the task of transporting the centrifuge.
- Use approved and intact lifting gear and hoists for transport.
- Use only suitable hoists with adequate lifting capacity.
- Remove the bowl whenever transporting the centrifuge.

5.2 Storage instructions for separators

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: +5 to +50 °C (41 to 122 °F)
- dry
- dust-protected
- light-protected
- vibration-free

Storing bowl parts

- Dismantle the bowl and clean the bowl parts.
- Take out and clean the gaskets.
- Dry and grease the bowl parts.
- Fit the gaskets, assemble the bowl and store it in a protected place, see chapter "Storage and transport / Storage instructions for separators".

Storing drive parts

- Treat drive parts with slushing oil.
- Protect the drive spindle and motor against dust with a suitable packing.
- Store the drive parts vibration-free.
- Store the drive parts dry and frost-free, see chapter "Storage and transport / Storage instructions for separators".

Storing sealing rings and drive belts

- Store the sealing rings and drive belt in a cool and dry location.
- Use suitable packing to protect the sealing rings and drive belt from dust and light and to thereby prevent them from becoming brittle.
- Note the storage date on the packing.

Storing the control system

- Store the control unit and accessories , see chapter "Storage and transport / Storage instructions for separators".
- Use suitable packing to protect the control system and accessories from dust and high heat.
- In the case of extreme cold, connect the control cabinet heating separately to an external energy source to avoid damage.

Preserving the centrifuge

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

Required material:

- Slushing oil, e.g., SHELL Ensis Fluid E
- Grease, e.g. lubricating grease, see the chapter "Maintenance / Lubrication schedule".
- Dry rags
- Collecting vessel for lubricating oil

Necessary preservation work

- Clean hood, frame and motor.
- Drain the lubricating oil.
- Fill the oil pan with slushing oil up to the middle of the sight glass.
- Start up the separator and let it run until all the drive parts are wetted with slushing oil.
- Remove the bowl.
- Dismantle, clean and rub a suitable protective agent into the bowl.
- Take out the gaskets, clean it and fit it again.
- Assemble the bowl and store it in a protected place.
- Manually apply slushing oil to the upper spindle end and cover with a protective hood.
- Mount and screw on the hood.
- Remove the drive belt.
- Close the shut-off elements for water and check for leak-tightness. If shut-off elements are found to leak, disconnect the water feed lines in order to prevent damage from dripping water.
- Dry-clean and apply grease to bright machine parts.

IMPORTANT: Store the separator in a vibration-free location in order to prevent damage during storage caused by vibrations at standstill.

Storage after delivery

If the separator is not stored immediately after delivery, it must be stored in the original transport packaging.

When stored under correct conditions, all separator parts are adequately protected for maximum one year.

Storage during an extend period of standstill

Always carefully transport the separator and its individual components to avoid damage.

The storage location must be cool but frost-free, dry, dust-free and protected from exposure to light.

The storage temperatures must be $> 5\text{ }^{\circ}\text{C}$ ($41\text{ }^{\circ}\text{F}$) and $< 50\text{ }^{\circ}\text{C}$ ($122\text{ }^{\circ}\text{F}$).

Carry out a final check before putting the centrifuge into storage.

All parts must be in perfect condition when put into storage. The packaging must be appropriate and in perfect condition.

Perform a regular check of all preserved parts every 6 months. If required, renew the preservation.

Preparing the separator for putting back into operation

If the separator has not been in operation for longer than 12 months, all gaskets have to be replaced.

The bearings, including motor bearings, must be checked and replaced if necessary.

If the bowl has not been in operation for longer than 6 months, all gaskets must be replaced and slide-ring packings, if fitted, must be checked and replaced if necessary.

5.3 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.

- Inspect slings for damage before each 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 slingers and individuals 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.

Load suspension equipment for transport of 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.

- Hood
- Bowl
- Solids vessel
- Drive
- etc.

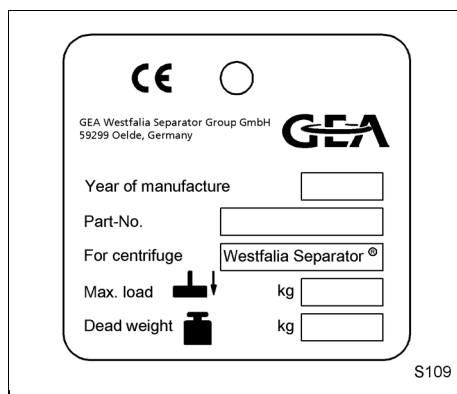
Load suspension equipment for repair of centrifuge

Load suspension devices and slings needed for removing or fitting the hood, the bowl, the solid vessel and the drive are included in the special tools supplied.

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.

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. 26

- If tools from the set of tools supplied are available for lifting during maintenance or repair work on the centrifuge, they must be used.
- When heavy parts have to be moved, take special care to avoid injuries.
- 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".

5.4 Using lifting eye bolts or lifting eye nuts as load carrying equipment

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-carrying equipment in lifting mode.
- Only trained specialists are authorized to mount lifting eye bolts or lifting eye nuts.

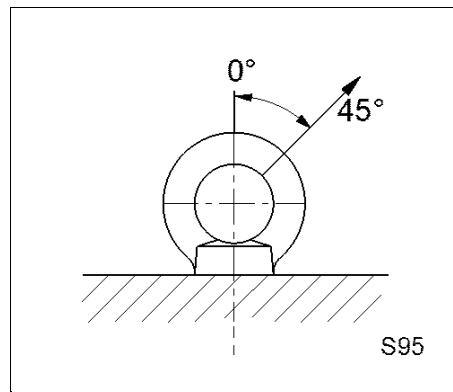


Fig. 27

- Mount lifting eye bolts or lifting eye nuts only as illustrated.
- Screw in lifting eye bolts or lifting eye nuts completely.
 - If this is not possible, screw the eye bolt or ring nut in by at least $1 \times d$ (= thread diameter).
- 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.

5.5 Transport in the transport packaging

Always secure the goods to be transported in a suitable way against slipping and tilting.

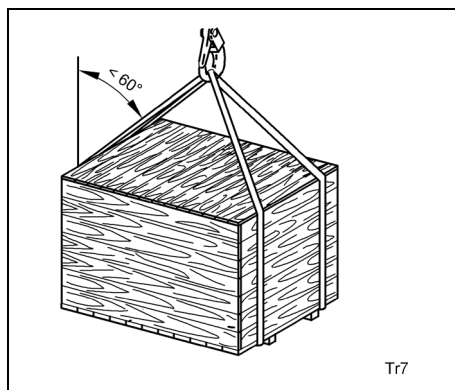


Fig. 28

- When transporting the separator in a transport packaging, use only suitable vehicles or suitable cranes.
- Ensure an even pressure distribution on the bottom plate.

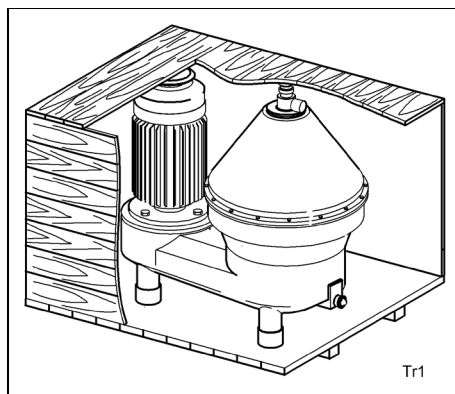


Fig. 29

Packaging examples for separators. e.g. separators with belt drive.

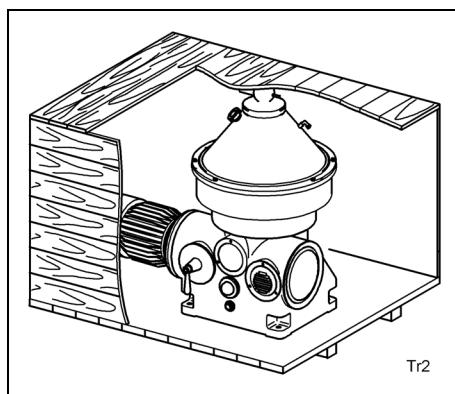


Fig. 30

Packaging examples for separators. e.g. separators with toothed gearing.

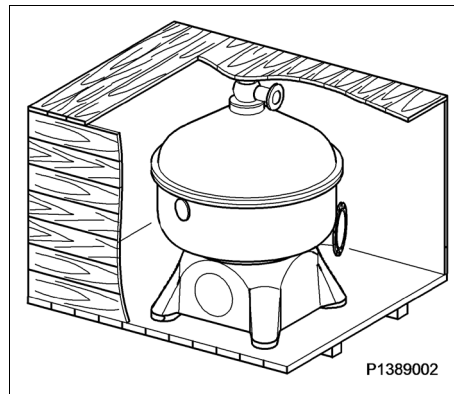


Fig. 31

Packaging examples for a separator with direct drive.

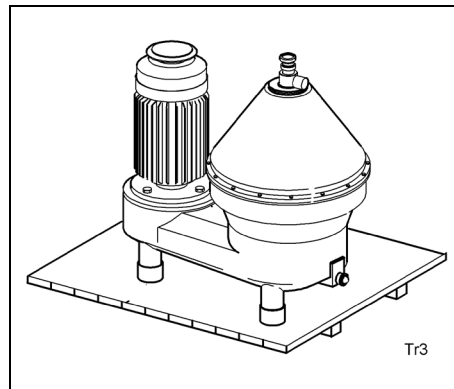


Fig. 32

After removing the side walls, the filler material and all enclosed parts, the bottom plate of the transport packaging can be used as a pallet for transporting the separator with a fork-lift truck.

- Ensure an even pressure distribution on the bottom plate.

5.5.1 Transport separator > 250 kg with worm wheel gear.

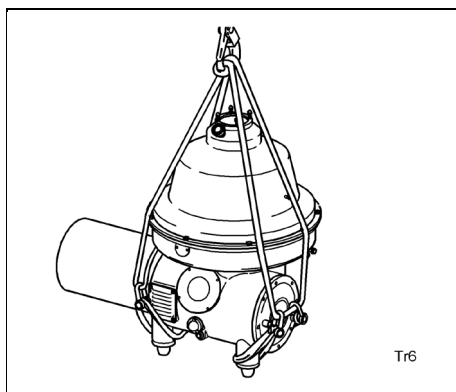


WARNING

Danger of injury through overturning of the separator during transport

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

- Transport only by briefed and assigned persons.
- Pay attention to the weight specifications in the separator documentation.
- Comply with the instructions for safe transportation.
- Secure separators adequately against slipping and tilting.



Example for the correct fastening of a separator larger than 250 kg with worm wheel gear.

Fig. 33

6 Assembly and installation

6.1	Safety during assembly and installation	66
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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.

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 consumables cannot occur.
- Ensure uniform feed rates.
- Ensure uniform feed concentration.

6.4 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.
- Do not fit a shut-off element in the frame discharge.

- Do not connect the discharge to a piping system. This is to allow the process water and the cleaning liquid to discharge freely into a sewer or sludge tank, e. g. via a funnel.

Ignoring this instruction will lead to water getting into the inside of the top part of the frame and braking the bowl. Alternatively, water will get into the gear housing and cause damage to the gear.

6.4.1 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.

Size	Motion absorption [mm]		Adjusting forces [N/mm]	
	axial	lateral	axial	lateral
Up to DN 15	± 6	± 3	50	50
DN 20 to DN 40	± 10	± 5	100	100
DN 50 to DN 100	± 10	± 5	100	200
DN 125 to DN 200	± 15	± 5	200	400

6.5 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.

Demands on 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.
- Good workplace lighting is required to detect potential hazards early and to prevent accidents.
 - Avoid or minimize disturbing glare of any kind.

6.5.1 Requirements for protective devices

- Design protective devices in accordance with the applicable standards so that hazardous areas cannot be reached with the upper and lower limbs.
- 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.

6.6 Securing the foundation frame

Depending on local conditions, the foundation frame is welded to a steel foundation or cast in a concrete foundation. The necessary fastening materials are supplied to suit the order.

- Transport the foundation frame to the installation site with a suitable hoist and load suspension devices. For the correct installation of the load suspension devices, see chapter "Assembly and installation / safe use of eye bolts or ring nuts as 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.

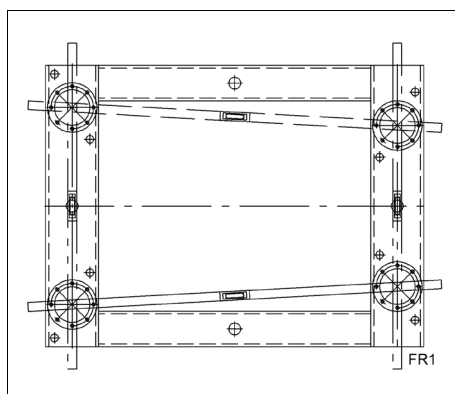


Fig. 34

- Align the foundation frame with the aid of a spirit level and feeler gauge.
- Place the spirit level alternately lengthwise and crosswise on the raised blocks.

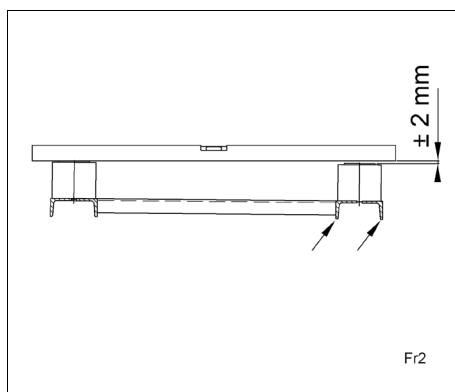


Fig. 35

IMPORTANT: The permissible deviation in each direction is max. ± 2 mm.

- If necessary, place shims under the U-profile of the foundation frame and firmly tighten the fastening screws.

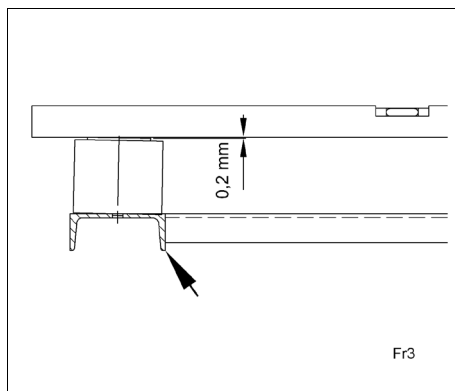


Fig. 36

IMPORTANT: The permissible misalignment of a raised block surface is max. 0.2 mm in each direction.

- If necessary, place shims under the U-profile of the foundation frame and firmly tighten the fastening screws.

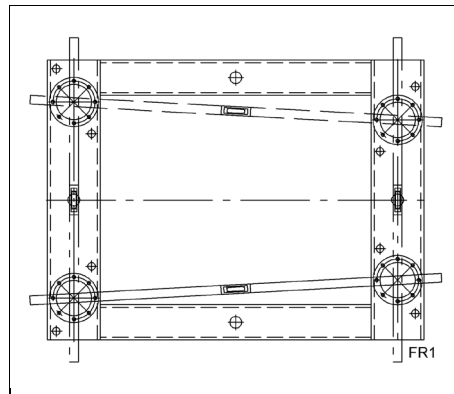


Fig. 37

- Finally, check the corrections carried out again.
- In addition, check the position of the top surfaces of all four raised blocks. For this purpose, use a spirit level / straight edge and feeler gauge.

6.7 Installing the separator

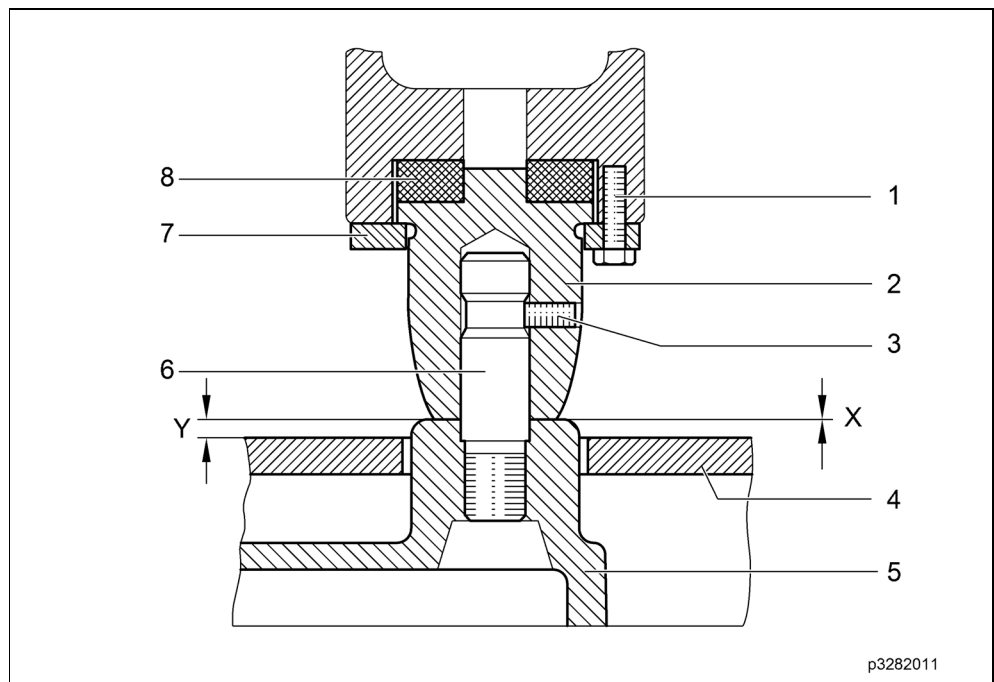


Fig. 38

- Embed the foundation frame (5) into the base (**dimension Y**) as illustrated in the dimensioned drawing.
- Fit foundation frame (5), see chapter "Assembly and installation / Fastening the foundation frame".
- Screw bolts (6) into the four mounting blocks of foundation frame (5) as far as they will go.
- By means of flanges (7) and screws (1), fasten feet (2) with fitted-on rubber cushions (8) to the separator frame.
- Lift the separator onto the bolts of the foundation frame.
 - **IMPORTANT:** Check that dimension **X = 0**.
- Tighten threaded pins (3) using a pin spanner.

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 Connecting the control unit

Connecting the electrical system

- Comply with the local regulations for electrical systems and equipment.
- The frequency and voltage of the power supply must correspond to the circuit diagram.
- Install equipotential bonding.
- Observe statutory regulations, e.g. EC Directives in the EU.

Main switch on the control cabinet

Precise information on the position of the main switch on the control cabinet can be found on the circuit diagram.

The control cabinet is installed according to the specifications of the plant operator. The position of the control cabinet with the main switch must therefore be taken from the operating manual of the operating company.

Positioning the EMERGENCY STOP button

EMERGENCY STOP buttons are located on the control cabinet.

Precise information on the position of the EMERGENCY STOP buttons can be found on the circuit diagram.

The control cabinet is installed according to 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.

Additional EMERGENCY STOP switches must be installed on site if the control cabinet is not installed in the direct machine environment.

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.

6.10 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

7 Settings

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7.1 Set throughput capacity

- Adjust the throughput capacity with water prior to production.
- Do not exceed or fall below the throughput capacity as per order.
 - Changes only in consultation with the machine manufacturer.
 - Refer to the P&ID.
- Feed the machine with rated capacity.
 - The discharges of the heavy and light phases must be open completely.



WARNING

Danger of acid and alkali burns

After cleaning, the surfaces of the centrifuge and pipes are very hot. Hot lye and acid residues can still be in the centrifuge and the pipes. When working on the centrifuge, burns and chemical burns can occur.

- 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.

- Throttle the heavy phase discharge until bowl overflow occurs.
 - The bowl overflow can be checked at the solid discharge of the solid catcher.
- Reduce the displayed pressure of the heavy phase by approx. 0.5 – 1 bar. This corresponds to the maximum working pressure during production.

Observe the counterpressures of apparatus downstream, see P&ID.

If permanent bowl overflow is detected, check the seals in the centripetal pump chamber cover and on the centripetal pumps for damage.

7.1.1 Mathematical nozzle capacity

Reference values for the max. nozzle output with water are:

Nozzle diameter [mm]	Nozzle output per nozzle [l/h]	Total nozzle output [l/h]
0.5	104	The total nozzle output is a product of multiplying by the number of nozzles.
0.6	150	
0.7	204	
0.8	267	
0.9	338	

Other nozzle outputs after consulting the manufacturer.

Start-up and shut-down quantity

The start-up and shut-down volume corresponds to the maximum nozzle output at maximum bowl speed.

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 trained 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.

When commissioning, observe the following points:

- Assign only trained and authorized specialist with 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 ensuring that necessary tests are carried out properly.

Carry out the following tests before every commissioning of the centrifuge, and eliminate all the faults found:

- Check that all screwed connections are tight.
- Check the "0"-marks on the bowl parts.
 - The "0" marks must be aligned.
- Test 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.

8.2 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.

8.3 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

Life threatening danger because of quickly rotating machine parts.

Danger of severe injuries caused by body parts being pulled into the machine or by the ejection of machine parts or product remnants.

- Do not remove any parts of the machine until the bowl is at a stand-still.
- Wait for the fluids to empty, see data sheet.
- Secure the unit against unintentional activation.
- Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
- First check and make sure that all of the machine components are at a stand-still, see the chapter "Repair / stand-still control of the rotating machine components".

8.4 Checking the direction of rotation of the bowl

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

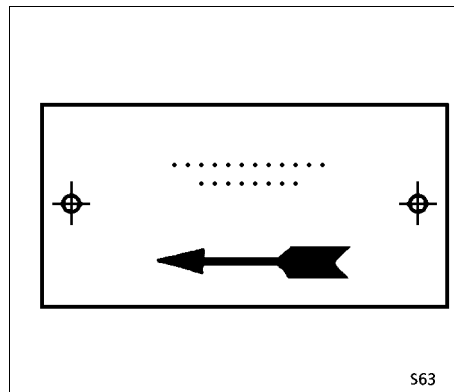


Fig. 39

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.

8.5 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.

8.6 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

Documents

Centrifuge manual is available.	
Data sheet according to EN 12547 is available.	
Spare parts list is available.	
Instruction manuals for optional auxiliary equipment are available, e.g.	
- Control / monitoring	
- Automatic lubricating system (if available)	
- Motor	
P&ID is available.	
Order-specific dimensioned drawing 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.	
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.	
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).	
The required volume and quality of start-up liquid is available.	
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).	
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.	
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.	

8.7 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.
- 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.

8.8 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 bearings 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 to slightly above the oil level mark. For the oil sort, see chapter "Maintenance / Lubrication schedule" and for oil quantity the separate data sheet.
- In the case of separators 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".

- 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 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".

8.9 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.

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. 40

- Wear ear protection.

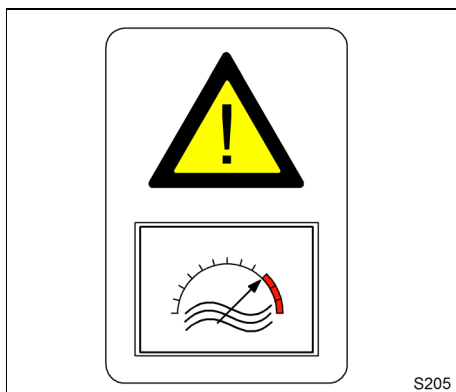


Fig. 41

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. 42

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.

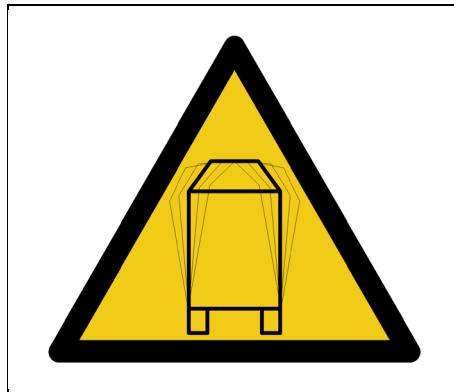


Fig. 43

- 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.

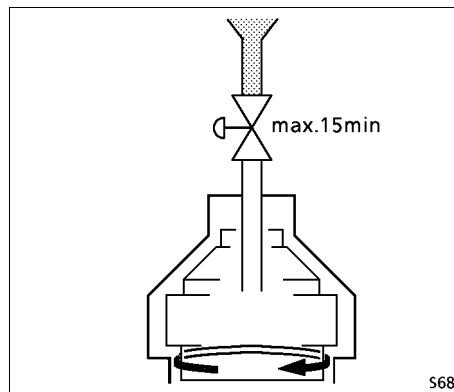


Fig. 44

- The bowl is not allowed to run without liquid supply for more than 15 minutes, as otherwise it would result in overheating of the bowl material.

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 liquids corrode the sight glass material and can damage it. Discharging hot liquids can cause skin burns.

- When sight glasses are used in pipes and on machines, do not exceed the permitted pressures.
- Check sight glasses in the supply lines and discharge lines on the machine for wear, see chapter Maintenance/ Maintenance schedule.
- 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.

9.8.1 Damage to the nozzles

In the case of excessively high temperatures and excessively high concentrations of acid during CIP, the soldered joint between the nozzle stone and the nozzle holder may be chemically eroded and the bore of the nozzle stone prematurely washed out.

NOTICE

Damage to nozzles from CIP

The use of highly concentrated acids in CIP can damage the nozzles.

- Subject the condition of the nozzles to a visual inspection after every cleaning cycle.
 - Check the nozzles for blockage.
 - Check the condition of the soldered joint.
- Replace nozzles with a damaged soldered joint immediately.

NOTICE

Damage to the nozzles caused by using water with insufficient electrical conductivity

The use of water with a low electrical conductivity (such as demineralised water, osmosis water, condensate etc.), wear processes on the carbide of the nozzles can be greatly accelerated.

- When using water qualities of high purities, consult the manufacturer's factory to select a suitable nozzle material.
 - e.g. use nozzles made from solid material.
- Replace damaged nozzles immediately.

9.9 Before 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.
 - Only feed product which conforms to the specifications on the nameplate.
- Pay attention to the safety precautions for operation.
- Check the following points:
 - The machine has been correctly assembled.
 - The correct regulating ring (if present) has been fitted, see separate data sheet.
 - The screws for fastening the hood and the feed and discharge housing are tightened securely.
 - The connection piece on the centripetal pump is tightened.
 - Sufficient oil has been filled in. If an external lubricating unit is installed, refer to the separate manual.
 - Valves in the discharge lines are open.
 - The nozzles on the bowl are open. Water comes out of all the nozzles in a closed jet.
- Open manual shut-off valves in supply lines for:
 - Start-up liquid
 - Sealing liquid
 - Slide-ring packing
 - Cooling water
 - Hood flushing
 - Control air
 - Blanketing media
- Fill siphons (if applicable)
- Check whether the specified pressures are indicated on the respective pressure gauges.
 - Control air
- Adjust the program times on the control unit according to the operating conditions , see control unit manual.

9.10 Starting the separator

- Switch on main switch on control unit (position I).
 - The LED "control unit ON" flashes to signal that the control unit is ready for operation.
- Switch on motor.
- Switch over from water to product.
 - Actuate < separation > button on the control unit.
- Set the discharge for the light phase (operating pressure).
- Check operating pressure during production and adjust it in line with feed capacity.

9.11 Set product

Set the constant pressure valve in the whey line to approx. 0.5 bar below the overflow limit of the centripetal pump.

The discharging whey must be clear and should not contain any undissolved protein substances.

If it still contains protein substances, reduce the throughput capacity or select a different nozzle combination.

During operation, check discharge concentration from time to time.

A uniform concentration of low-fat quark is possible only when throughput capacity and solids content in the feed remain constant.

State of concentrate and whey

State	Remedy
Concentrate too thin	Increase throughput capacity or screw in smaller nozzles.
Concentrate too thick and discharging whey turbid	Reduce throughput capacity or screw in larger nozzles.

NOTE If there is a sudden increase in discharge concentration, one or more nozzles are blocked.

In this case, no chemical cleaning may be carried out after separation.

The separator must be shut down and cleaned by hand.

9.12 Carry out CIP cleaning

CIP (cleaning in place) can be performed at operating speed under certain conditions, e.g. for hygienic reasons.

The plant operator makes the decision on this. During the CIP cycle, cleaning liquids are circulated through the centrifuge and pipelines. The process control is manual or automatic.

Pay attention to the points below during CIP cleaning:

- Make sure that no CIP liquid enters the product.
- Do not exceed the maximum admissible pressures for all components fitted in the CIP circuit such as sight glasses, compensators etc.
- Note the max. pressure specification on the fittings.
- Do not integrate sight glass units installed in the piping system in CIP circuits or expose them to pressure.
- Examine sight glasses in product lines regularly for damage and wear.
- Use only cleaning agents recommended by GEA Westfalia Separator or the cleaning agent manufacturer. The responsibility for using suitable cleaning agents lies with the plant operator.
- Comply with the specifications by GEA Westfalia Separator for the admissible concentrations for cleaning agents.:

In the case of excessively high temperatures and excessively high concentrations of acid during CIP, the soldered joint between the nozzle stone and the nozzle holder may be chemically eroded and the bore of the nozzle stone prematurely washed out.

NOTICE

Damage to nozzles from CIP

The use of highly concentrated acids in CIP can damage the nozzles.

- Subject the condition of the nozzles to a visual inspection after every cleaning cycle.
 - Check the nozzles for blockage.
 - Check the condition of the soldered joint.
- Replace nozzles with a damaged soldered joint immediately.

Caustic (e.g. sodium hydroxide solution):

- Concentration max. 2.0 %
- Temperature max. 80°C
- Reaction time max. 1 h

Acid (e.g. nitric acid, phosphorous acid):

IMPORTANT: Do not use any sulphuric acid:

- Concentration max. 0.5 - 1.0 %
- Temperature max. 50°C - 55°C (temperatures above 55 °C result in damage to the nozzles!)
- Reaction time max. 1/2 h
- **IMPORTANT:** Only chemically pure acids may be used. Whether the use of technical acids is possible must be clarified with GEA Westfalia Separator on a case-by-case basis.
- **IMPORTANT:** Do not use cleaning agents containing halide (e.g. chlorides, fluorides). The latter can also attack components of stainless materials.

- CIP media must be flushed out after the respective cleaning steps (e.g. with water).
- Collect discharging cleaning agents and dispose of them in a proper manner.
- Comply with the local regulations on handling acids and caustics.

**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 safety gear, e.g. safety goggles, safety gloves, protective overalls or protective suits.
- Take special care.
- Observe the plant operator's SOPs on handling acids and caustic alkalis as well as 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.

If hood chamber, concentrate catcher and bowl outer surfaces are to be cleaned by overflowing cleaning liquid.

- Throttle the valve in the discharge line or, in the case of separators equipped with double centripetal pumps, throttle at least one phase. This forces liquid overflow.

The cleaning effect depends on the factors below:

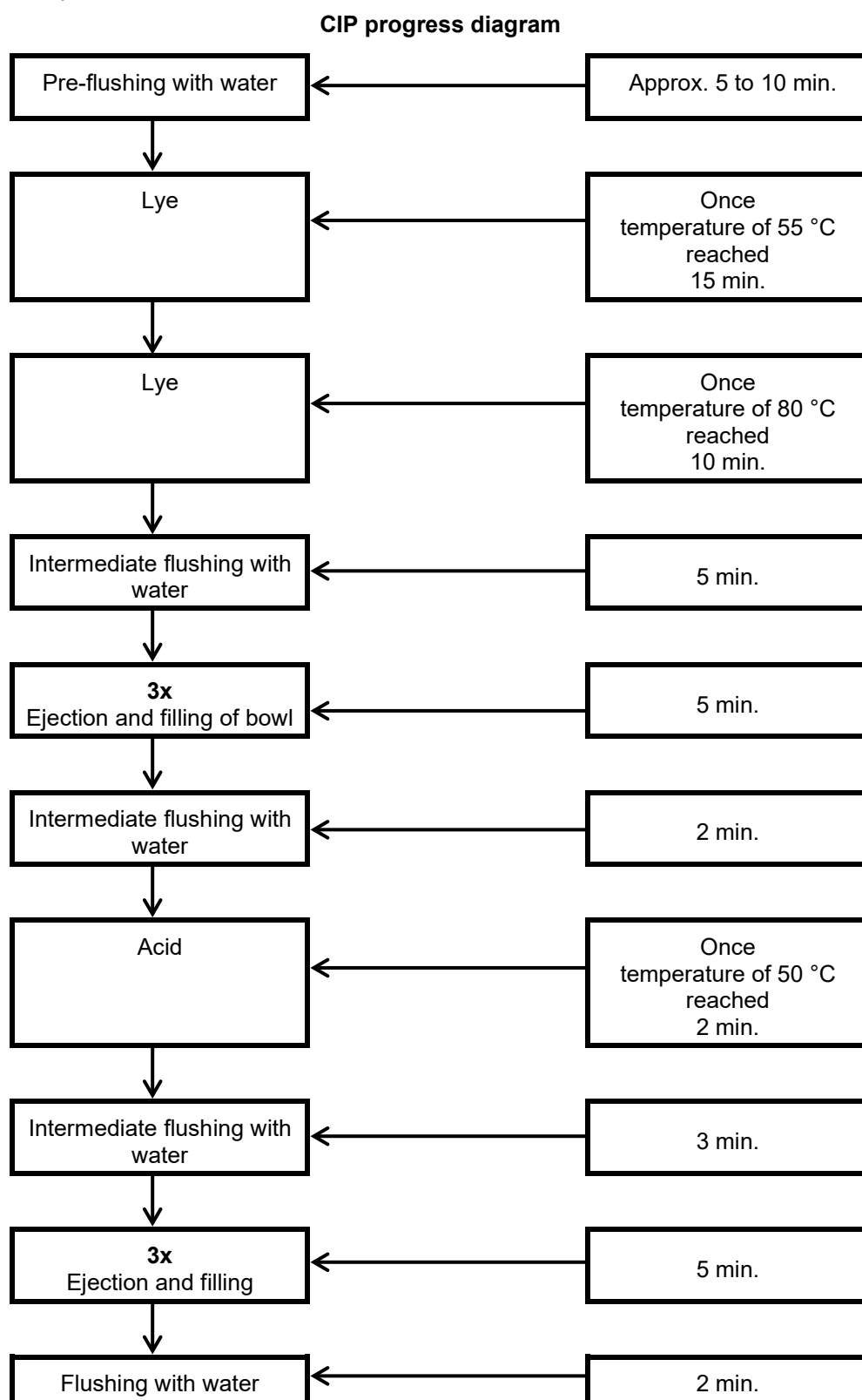
- Product
- Cleaning agents and their concentration
- The duration and temperature of CIP.

IMPORTANT:

- For optimum cleaning results, close cooperation is required between the plant operator, the cleaning agent manufacturer and GEA Westfalia Separator.
- The plant operator must check the effectiveness of the cleaning process, even if cleaning agents and cleaning process were recommended by GEA Westfalia Separator.
- The plant operator must adapt the cleaning process to the special conditions of the product.

9.13 CIP progress diagram

Example



Subject to technical modifications.

9.14 Shutting down the separator

- Clean the unit with water.
 - Not required if the a chemical cleaning has occurred after production.
- Close the product intake and disconnect the product pump. Simultaneously supply shut-down liquid to the machine.
- Switch off the motor.
- Wait for the bowl to come to a standstill.



DANGER

Life threatening danger because of quickly rotating machine parts

Danger of severe injuries caused by body parts being pulled into the machine or by the ejection of machine parts or product remnants.

- Do not remove any parts of the machine until the bowl is at a stand-still.
- Wait for the fluids to empty, see data sheet.
- Secure the unit against unintentional activation.
- Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
- Check and ensure that all machine parts are at a standstill, see chapter "Servicing / standstill check of rotating machine parts".

9.15 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.

9.16 Shutting down nozzle separators via EMERGENCY STOP

EMERGENCY STOP restores functional safety in an emergency or hazardous situation.

It ensures that processes are stopped and all moving parts are brought to a standstill 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 system (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 manual of the operating company. After EMERGENCY-STOP has triggered, the centrifuge runs down to standstill.

Procedure after EMERGENCY STOP triggered

- The product feed valve is closed.
- The shut-down liquid valve is opened.
 - The liquid volume depends on machine size (bowl size), nozzle diameter and bowl speed. The correct liquid volume is regulated by the machine control.
 - The operating company is responsible for providing a sufficient amount of shut-down liquid.
 - If necessary, guide the shut-down liquid to a suitable place, e.g. sewer, by switching over in the separator discharge.
- The valve in the separator discharge for the liquid phase is opened.
- 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 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****Life threatening danger because of quickly rotating machine parts**

Danger of severe injuries caused by body parts being pulled into the machine or by the ejection of machine parts or product remnants.

- Do not remove any parts of the machine until the bowl is at a stand-still.
- Wait for the fluids to empty, see data sheet.
- Secure the unit against unintentional activation.
- Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
- First check and make sure that all of the machine components are at a stand-still, see the chapter "Repair / stand-still control of the rotating machine components".

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.

9.17 Required shut-down liquid volume in the case of power failure

- Feed the required shut-down liquid volume to the bowl during run-down of the separator to keep the bowl filled.

The minimum feed capacity corresponds to the max. nozzle output at max. bowl speed.

The provision of shut-down liquid normally necessitates a high-tank installation to realize a suitable feed rate to the separator through the free slope. Other possibilities of continuing to supply shut-down liquid during a power outage must be discussed on a case-to-case basis.

This can, for example, be realized by taking water from extinguishing water lines, emergency power generators for feed pumps or motor-driven pumps.

These measures can lead to a reduction of the shut-down liquid volume stored in the high tank or possibly eliminate it completely.

10 Trouble shooting

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10.1 Safety when eliminating operating malfunctions

Faults during troubleshooting can endanger the operating safety of the centrifuge. 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 malfunction correction with care.
- When safety devices on the centrifuge/installation respond, stop operating the centrifuge/installation until the cause has been identified and remedied.
- Make sure that persons are not put at risk by 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.
- Switch off the main switch and secure against reactivation before carrying out any work for troubleshooting.
- Dismantled centrifuge parts must only be placed on an even, non-slip surface (e.g. a rubber mat or wooden pallet).
- Dismantled centrifuge parts must be secured by suitable means to prevent them from falling over or rolling away (e.g. with wooden wedges or squared timber).
- Never weld the bowl, hood or solids catcher.
- Do not machine the bowl, hood and solid catcher.
- Do not stand or sit on the centrifuge or attachments.
- Before re-starting, ensure that there is no unbalance due to fouling. Open and clean the bowl prior to start-up.
- Balancing of the bowl may be carried out only by trained GEA Westfalia Separator staff or by specialist workshops authorised by Westfalia Separator.
- After carrying out maintenance and repair work on centrifuges, reattach all protective devices and check the safety devices.

10.2 Faults on the bowl

Fault	Possible cause	Action	Target group
Separator running unevenly (vibration)	Bowl is out of balance, one or more nozzles blocked.	➤ Shut down separator with full bowl immediately.	Op
		➤ Dismantle and clean bowl before putting it back into operation.	Sworker
	Bowl is not correctly assembled or parts of different bowls have been interchanged.	➤ Assemble bowl as per user information.	Sworker
	The tension in the disk stack has slackened.	➤ Check disk compression.	Sworker
	Bowl is out of balance as a result of damage.	➤ Send the bowl to the factory for repair.	Authorized workshop
Bowl speed drops during operation.	The bowl leaks.	➤ Check bowl gaskets.	Sworker
Motor current too high.	Nozzles are damaged.	➤ Shut down separator with full bowl immediately.	Op
		➤ Check nozzles before restarting.	Sworker
	Nozzles with too large a diameter fitted.	➤ Fit nozzles with a smaller diameter.	Sworker
	Nozzles incorrectly aligned.	➤ Check alignment of nozzles.	Sworker

Op = Operator / Sworker = Skilled worker / Tspec = Trained specialist

10.3 Separating function

Fault	Possible cause	Action	Target group
Turbid clear phase.	Nozzles with too small a diameter fitted.	➤ Fit nozzles with a larger diameter.	Sworker
	Clarification surface overloaded.	➤ Check feed capacity and/or solids concentration in the feed	Op
	Disk stack soiled.	➤ Clean separator via CIP or manually.	Op
Ejected solids contain too much liquid.	Nozzles with too large a diameter fitted.	➤ Fit nozzles with a smaller diameter.	Sworker
	Nozzles are damaged.	➤ Shut down separator with full bowl immediately.	Op
		➤ Check nozzles before restarting.	Sworker

Op = Operator / Sworker = Skilled worker / Tspec = Trained specialist

10.4 Production of quark

Fault	Possible cause	Action	Target group
Insufficient concentration	Feed capacity too low.	➤ Increase feed capacity.	Op
	The diameter of the nozzle bore is too large.	➤ Fit nozzles with a smaller diameter.	Skilled
	Nozzle gaskets damaged, see spare parts catalogue (bowl).	➤ Replace gaskets, see chapter entitled "Servicing".	Skilled
	Gaskets for sealing the segmental insert damaged.	➤ Replace gaskets, see chapter entitled "Servicing".	Skilled
Whey is not clean	Feed capacity too high.	➤ Adjust feed capacity.	Op
	Nozzles blocked; solids content of quark increased as a result.	➤ Clean the bowl by hand.	Skilled
	Disk gap and rising holes in disk insert blocked.	➤ Clean bowl with CIP.	Op

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

10.5 Faults on drive

Fault	Possible cause	Action	Target group
The bowl does not come up to rated speed or takes too long to do so.	Motor is incorrectly connected.	➤ Check connection.	Tspec
	Motor control wrongly adjusted.	➤ Check motor control	Tspec
	The fluid clutch does not contain enough oil. (when fitted)	➤ Top up oil.	Skilled
	The worm wheel or the clutch are not mounted correctly.	➤ Check the assembly of the power transmitting parts.	Skilled
The bowl accelerates too fast to the rated speed.	Motor control wrongly adjusted.	➤ Check motor control.	Tspec
	The fluid clutch contains too much oil. (when fitted)	➤ Drain the oil.	Skilled
The bowl speed drops during operation.	Motor speed drops during operation.	➤ Check motor and line voltage.	Tspec
	The fluid clutch does not contain enough oil. (when fitted)	➤ Top up oil.	Skilled
	Clutch defective.	➤ Check clutch	Skilled
Separator runs unevenly (vibration).	Vibration isolators in drive are fatigued.	➤ Replace vibration isolators	Skilled
	Bearings are defective.	➤ Replace bearings.	Skilled
	Toothing of worm and worm wheel worn.	➤ Check worm and worm wheel.	Skilled
Loud noise develops during operation	Bearings are defective.	➤ Replace bearings.	Skilled
	Toothing of worm and worm wheel worn.	➤ Check worm and worm wheel.	Skilled

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

10.6 Faults on the product feed line

Fault	Possible cause	Action	Target group
The bowl does not come up to rated speed or takes too long to do so.	Quantity of start-up liquid too great.	➤ Reduce quantity of start-up liquid.	Op
Motor current too high.	Feed output too high.	➤ Adjust feed capacity.	Op
Loud noise develops during operation.	Centripetal pump not in optimum working range.	➤ Adapt centripetal pump pressure	Op

Op = Operator / Sworker = Skilled worker / Tspec = Trained specialist

10.7 Faults space around the bowl

Fault	Possible cause	Action	Target group
The bowl does not come up to rated speed or takes too long to do so.	Rotating bowl parts grind.	➤ Check the assembly of the separator and the space around the bowl.	Sworker
	Discharges for separator media closed.	➤ Check discharges for separator media.	Sworker
Motor current too high.	Rotating bowl parts grind.	➤ Check the assembly of the separator and the space around the bowl.	Sworker
	Discharges for separator media closed.	➤ Check discharges for separator media.	Sworker

Op = Operator / Sworker = Skilled worker / Tspec = Trained specialist

10.8 Faults on the disk stack compressing device

Fault	Possible cause	Action	Target group
There is no pressure build-up.	The pressure relief screw is not screwed in.	➤ Tighten pressure relief screw.	Tspec
	The grease cartridge contains too little grease.	➤ Replace the grease cartridge.	Tspec
	The piston has travelled too far out of the hydraulic cylinder.	➤ Loosen the pressure relief screw. ➤ Press the piston back into the hydraulic cylinder. Let piston protrude by min. 3 mm. ➤ Tighten pressure relief screw.	Tspec
Grease discharges through the stroke limiting valve.	The piston stroke is too large.	➤ Screw in threaded rod all the way.	Tspec
		➤ Screw on threaded ring further.	Tspec

Op = Operator / Sworker = Skilled worker / Tspec = Trained specialist

NOTE: Diagram of the disk stack compressing device with designation of the parts, see chapter "Description / Disk stack compressing device".

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 and Services”.

Before all maintenance and servicing:

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



Fig. 45

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



Fig. 46

- Wait for the bowl to 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. 47

- Do not start maintenance work until all machine parts have adequately cooled down.
 - The cooling time depends on the product processed and the machine size and can take several hours.
- 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

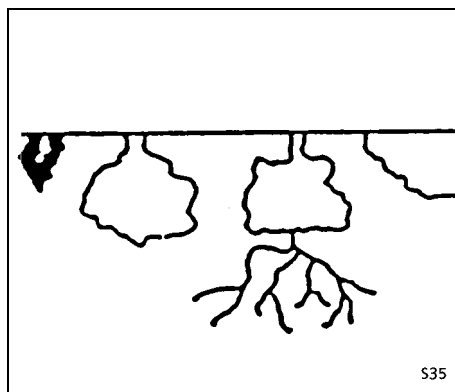
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and they merit special attention.

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. 48

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.

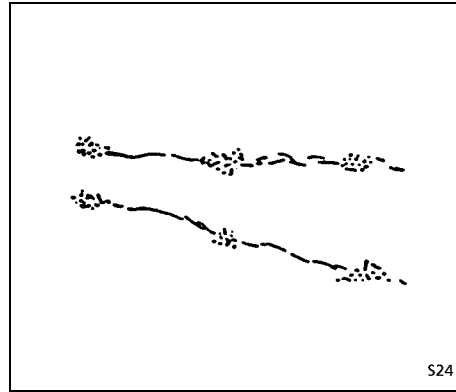


Fig. 49

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.

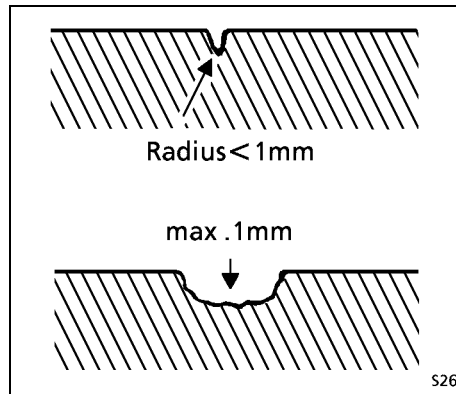


Fig. 50

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.

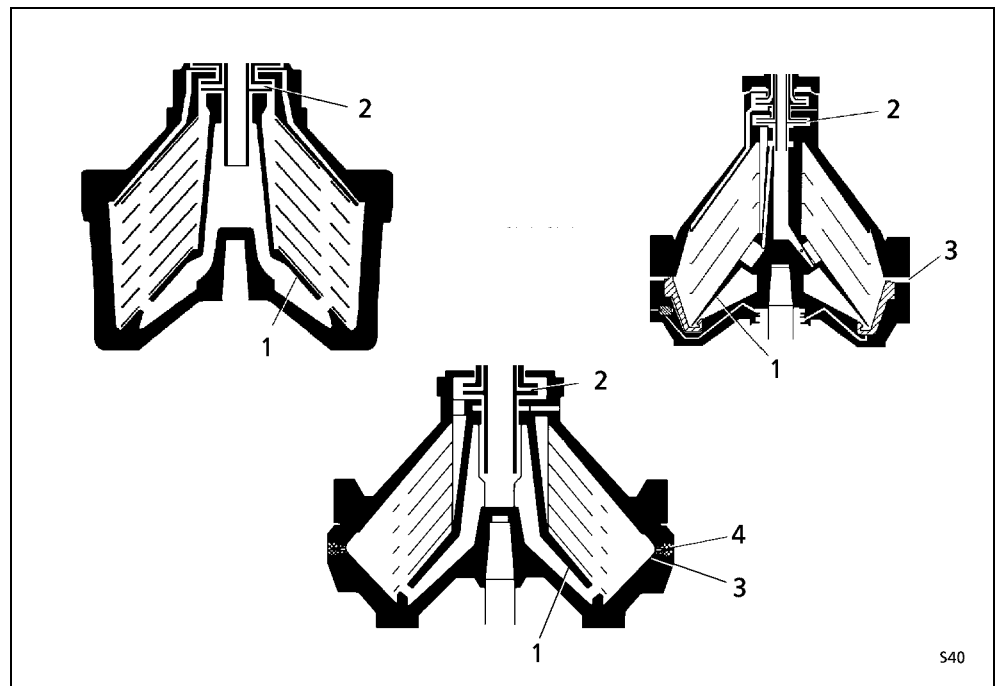


Fig. 51 The surfaces most susceptible to erosion are:

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

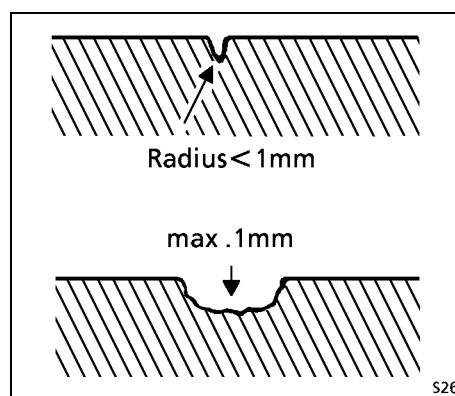


Fig. 52

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 "Technical data" or the separate data sheet for information on lubricating oils and lubrication technique.

11.5 Handling hoods



CAUTION

Risk of injury when lifting the hood

There is a risk of injury when lifting or transporting the hood by means of unsuitable load lifting gear.

- Use load suspension devices such as lifting devices for bowl and hood for their intended purpose, see chapter "Transport and storage / Using load suspension devices safely".
- Do not use damaged or incomplete load carrying equipment.

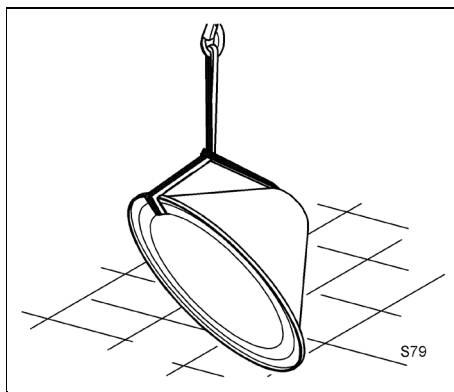


Fig. 53

Notes on turning round the hood:

- Unintended swinging or overturning of the hood must be prevented.
- Use the carrying straps as illustrated.
- The minimum lifting capacity of the carrying strap must be double as high as the weight of the hood even under consideration of the application conditions.

11.6 Handling instructions for W.S.F. Assembly grease

Product information

W.S.F. Assembly 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 assembly grease (e.g. W.S.F. assembly 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 at sliding piston
- On frame
 - Screwed connections on spindle bearing housing
 - Hub elements / worm wheel shaft – motor shaft
 - All screwed connections
 - Screwed connections for hood solid catcher
 - Centripetal pump, product connection, feed tube, ring
 - Spring pistons on neck bearing bridges
 - Threads on pipe joints
 - Thread of the 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.

Example:

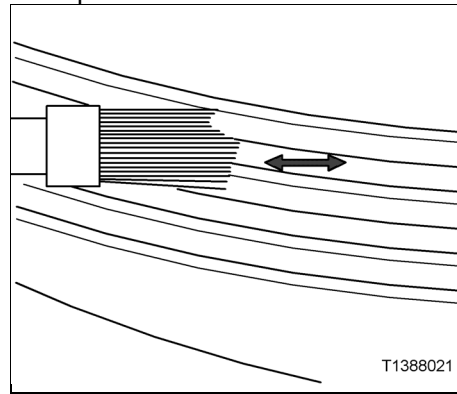


Fig. 54

- 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.

11.7 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:

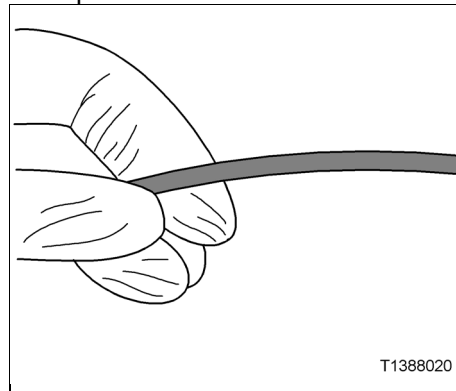


Fig. 55

- 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.

11.8 Lubrication schedule

Lubricant	Lubrication interval	Lubricant qty.	Lubrication point	Operator
W.S.F. Assembly grease 0015-0119-000 / 1 kg 0015-0119-010 / 100 g (with NSF-H1 certificate)	as required	apply thin coat	Bowl lock ring, gaskets, all threads, fittings and contact surfaces as well as manually operated parts like brake bolts, valves, tools etc.	Op Sworker Tspec
Silicon sealing grease 0015-0117-030/ 100 g (with NSF-H1 certificate)	as required	apply thin coat	All EPDM gaskets (If applicable)	Op Sworker Tspec
as per manufacturer specs on motor name-plate	accord. to manufact. instruct.	accord. to manufact. instruct.	Motor bearings	Op
Lubricating oil See spare part catalog	See maintenance schedule	See data sheet.	With oil pan or external lubricating oil unit depending on design	Sworker Tspec
Roller bearing grease 0015-0121-000 / 1 kg	as required	apply thin coat	Neck bearing springs, spring pistons and pressure surface of the clutch shoe backup. (If applicable)	Tspec
Roller bearing grease 0015-0135-000 / 400 g cartridge	as required	Replacement of the complete grease cartridge	Hydraulics for bowl compressing device	Tspec
Clutch oil 0015-0050-090 / 5 l	See maintenance schedule	In accordance with specs in the documentation	Fluid clutch (If applicable)	Tspec
Lubricating oil 0015-0027-010 / 1 l (with NSF-H1 certificate)	as required	In accordance with specs in the documentation	Annular piston / annular valve (If applicable)	Tspec
Slushing oil SHELL Ensis Fluid E or equivalent	in case of de-commissioning	In accordance with specs in the documentation	Gear chamber	Tspec

Op = Operator / Sworker = Skilled worker / 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 shall accept no liability or warranty 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.

11.9 Maintenance schedule for separators with a remote monitoring system (option)

The remote monitoring system is not part of the standard scope of delivery of the separator. To be able to utilize the benefits of a condition monitoring system, it must be ordered from GEA Westfalia Separator and the separator must be equipped accordingly.

A preventive maintenance strategy can be applied by the condition monitoring system from GEA Westfalia Separator. The latter offers the possibility of constant fusing of data of defined parameters that have a direct influence on the availability of the installation.

In conjunction with regular preventive maintenance intervals, the condition monitoring system ensures condition-oriented repair and maintenance. The early identification of wear and long-term trends provides important information in advance so that both parties have the possibility of defining the best solutions with respect to safety, availability of the plant and cost control.

Condition monitoring also gives the opportunity to choose a proactive service approach and provides valuable information for the root cause analysis.

A customized maintenance program forms the basis of the service level agreement to achieve maximum reliability, availability, safety, cost control and efficiency of the centrifuge installation. It ensures maintenance of the maximum installation value and the continuous application of state-of-the-art technology. In this way, additional benefits and budget safeguards are optimized.

The needs and expectations of the plant operator determine the degree of participation of GEA Westfalia Separator in the service and maintenance work.

Independently from the condition monitoring, some checks set out in the service level agreement must be carried out daily by the plant operator or persons commissioned by him:

- Check installation and process parameters.
- Observe vibration and noises.
- Check the oil level in the oil tank.
- Check oil circulation.

In the case of separators with mechanical seals:

- Check the slide-ring packings for leakage.

In the case of nozzle separators:

- **Check the nozzles for blockage.**

If a fault or damage is detected during checking:

- Do not start the separator or, if it is rotating, shut it down immediately
- Remedy the faults before re-starting.
- Replace damaged elements immediately.
- Avoid safety risks.

In the event of problems and feedback:

- Use the tools and the training offerings from GEA Westfalia Separator.

For further information, contact your local GEA Westfalia Separator branch.

11.10 Maintenance schedule

This maintenance schedule is applicable to separators from GEA Westfalia Separator which are not provided with a remote monitoring system and for which no service level agreement has been concluded.

Basic information on maintenance

If a fault or damage is detected during checking:

- Remedy the faults before re-starting.
- Replace damaged elements immediately.
- Avoid safety risks.

Maintenance instructions for all separator types.

Not all instructions listed are applicable for every separator.

- Follow the instructions only when the relevant part is fitted.
- In the case of problems consult GEA Westfalia Separator.
- Make use of training offers.

Daily maintenance tasks		
Machine component	Action	Executor
Bowl	➤ Check the condition of the nozzles (if fitted).	Op
Sight glasses	➤ Check sight glasses for contamination, damage and wear.	Op
Drive	➤ Check the oil level.	Op
Separator	➤ Check all discharge lines for clogging. ➤ Check safety markings for damage and cleanliness.	Op
Separator	➤ Check separator and peripherals for leakage.	Sworke

Op = Operator| Sworke = Skilled worker| Tspec = Trained specialist

Maintenance work whenever dismantling		
Machine component	Action	Executor
Load suspension devices, standard tools, special tools	➤ Check load suspension devices for wear or damage.	Sworker
Feedstock connection (incl. centripetal pump and feed tube)	➤ Check sealing elements.	Sworker
Bowl	➤ Check sealing elements. ➤ Thoroughly clean removed parts and check for wear, damage, erosion and corrosion. ➤ Check wear inserts for firm seating and wear. ➤ Apply lubricants to bowl parts (e.g. lock rings, guide surfaces, threads, contact surfaces). ➤ Check disc pressure during installation. ➤ Check operating water bores for soiling. ➤ Check nozzle wear (if fitted).	Sworker
Bowl and spindle	➤ Clean, dry and check cones.	Tspec
Drive	➤ Check coupling elements for wear.	Sworker
Separator	➤ Check wear insert for wear.	Tspec
Separator	➤ Clean the inside of feed and discharge systems, hood, upper section of frame, and solids catcher. ➤ Check feed and discharge systems, hood, upper section of frame, and solids catcher for startup marks, elution, cracks or cuts	Sworker

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance work after commissioning or fitting of new disk stacks (every month for 3 months)		
Machine component	Action	Executor
Disk-stack compression	➤ Check disk stack compression.	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance work after the first 250 operating hours, after 6 weeks at the latest		
Machine component	Action	Executor
Oil lubrication (only for helical gear drives)	➤ First oil change after commissioning or when installing new gear wheels. ➤ Check drive chamber or oil tank and sight glass(es) for visible damage, clean thoroughly and dry. ➤ Replace oil filter (if fitted).	Sworker
Bowl	➤ Check and clean bowl valves.	Sworker
Operating water connection	➤ Check the strainers in the operating water connection (pressure reducer) and clean.	Sworker

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance work every 1000 operating hours, after 6 months at the latest		
Machine component	Action	Executor
Drive (only for helical gear drives)	➤ Oil change: for mineral oil or food grade oil. For synthetic oil: twice the change interval than for mineral oil. ➤ Check drive chamber or oil tank and sight glass(es) for visible damage, clean and dry. ➤ Replace oil filter (if fitted).	Sworker

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance every 3 000 operating hours/ after 1 year at the latest		
Machine component	Action	Executor
Load suspension devices, standard tools, special tools	➤ Have load carrying gear checked by an authorized specialist in accordance with the relevant standards and guidelines of the national associations of the country of operation.	Tspec
Feed/drainage system	➤ Check pressure gauge(s) for damage, display and functionality.	Op
Operating water connection	➤ Check the strainers in the operating water connection (pressure reducer) and clean.	Sworker
Feedstock connection (incl. centripetal pump and feed tube)	➤ Renew sealing elements.	Sworker
Bowl	➤ Remove bowl and clean and check everything thoroughly (for erosion, corrosion, cracks and damage). ➤ Replace screws and wedge-shaped lock washers (if fitted) of the closing chamber bottom. ➤ Disk stack: spot check. ➤ Replace the sealing elements of the bowl.	Tspec
Bowl and spindle	➤ Clean, dry and check cones.	Tspec
Drive	➤ Check gear wear.	Sworker
Drive (all drives except helical gear drives)	➤ Oil change: for mineral oil or food grade oil. For synthetic oil: twice the change interval than for mineral oil. ➤ Check drive chamber or oil tank and sight glass(es) for visible damage, clean and dry. ➤ Replace oil filter (if fitted).	Sworker
Separator	➤ Have the separator assessed while in operation by an authorised specialist.	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance every 6 000 operating hours/ after 2 year at the latest		
Machine component	Action	Executor
Drive	➤ Replace roller bearings and sealing elements of the drive or install replacement unit (disconnection of the motor only by a trained electrician). ➤ Check bearing seats if no replacement unit is inserted. ➤ Check the cable connection on the motor. ➤ Replace seal or diaphragm in the protective hood of the frame. ➤ Replace clutch elements. ➤ Replace the drive belt. ➤ Replace spring piston, neck bearing springs or rubber-metal bush of the neck bearing bridge. ➤ Check neck bearing pressure ring. ➤ Replace rubber-metal cushions of drive.	Tspec
Separator	➤ Have the dismantled separator assessed by an authorised specialist. ➤ Check nominal speed and direction of rotation. ➤ Check the bowl height.	Tspec
Safety devices	➤ Check the safety devices for functionality.	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance every 12 000 operating hours/ after 4 year at the latest		
Machine component	Action	Executor
Bowl	➤ Replace wear inserts.	Tspec
Drive	➤ Replace rubber-metal bush including bolts and rings of the drive. ➤ Replace neck bearing pressure ring.	Tspec
Drive (only for helical gear drives)	➤ Oil change of fluid clutch.	Sworker
Frame	➤ Replace Usit rings in the connection solids catcher/frame	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance every 48 000 operating hours/ after 6 year at the latest		
Machine component	Action	Executor
Frame	➤ Replace dampening elements of the feet.	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Maintenance work on the drive motor according to manufacturer specifications		
Machine component	Action	Executor
Drive motor	➤ Grease the motor roller bearings (Note motor nameplate). ➤ Replace roller bearing, sealing elements and lubricants according to manufacturer specifications.	Tspec

Op = Operator| Sworker = Skilled worker| Tspec = Trained specialist

Supplement:

- Keep to the specified maintenance intervals even if the operating hours have not been reached.
- The maintenance intervals specified are for standard applications.
- The intervals are more frequent when the load increases. The points listed here-under are among increased load conditions.
 - special environmental conditions
 - special products
 - Hot operating conditions
- Replace damaged elements immediately.

11.11 Checking oil level and topping up if necessary

- Check oil level and oil circulation daily through the sight glass.
- From time to time, undo oil drain screw and check whether the oil contains water.

If the oil is a milky colour, change the oil immediately and locate the cause of the emulsification.

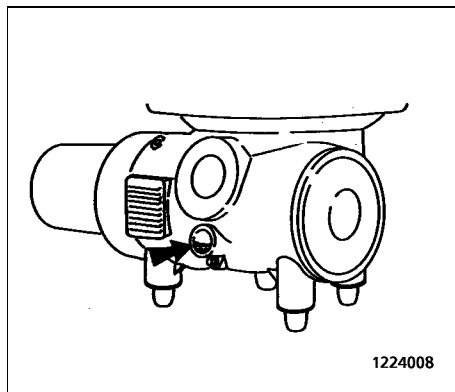


Fig. 56

- Top up oil.
 - Remove gear sight glass and open gear chamber.
 - Fill the gear chamber with oil. For filling volume and quality of oil, see data sheet.
- Check the oil level.
 - Minimum oil level: oil level just over the centre of the sight glass
 - Maximum oil level: oil level up to upper third of sight glass

IMPORTANT: the oil level must never drop below the centre of the sight glass during operation.

11.12 Oil change

The operating hours up to the first oil change and the subsequent oil change intervals are specified in the "Maintenance Schedule".

Change the oil at the latest as specified in the "Maintenance schedule", even if the operating hours specified for an oil change have not been reached by then.

At every oil change, clean the lubricating oil chamber and the sight glass, see chapter entitled "Cleaning frame chamber" and "Cleaning sight glasses".

Changing oil

- Switch off the centrifuge and wait for the run-out time according to the data sheet for the bowl to come to a stop.
- Check whether bowl is stationary.
 - See section entitled "Servicing / Visual inspection of circulation on machines with gear".

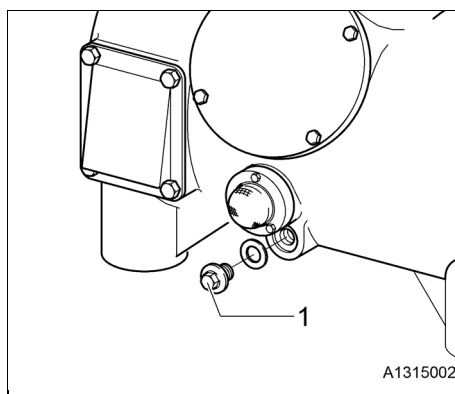


Fig. 57

- Put an oil collecting pan underneath.
- Unscrew oil drain screw (1).
- Drain oil into collecting pan and dispose of in accordance with local regulations.

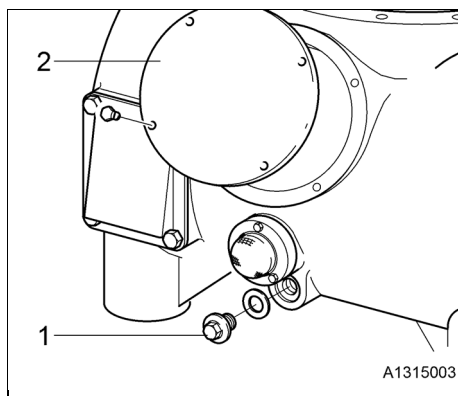


Fig. 58

- Unscrew gear sight glass (2).
- Clean gear chamber and sight glass, see section entitled "Clean frame chamber" and "Clean sight glasses".
- Clean oil drain screw (1).
- Screw oil drain screw (1) into the frame with a new seal and tighten up.
- Fill oil through the opening in the gear sight glass.
 - For volume and quality of oil, see data sheet.
- Put on the gear sight glass and screw tight.

- Check oil level, see chapter entitled "Maintenance / Check oil level".

11.13 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

11.14 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.

Check all sight glasses in the supply lines and discharge lines as well as in the vicinity of the machine for wear (see chapter Maintenance/ Maintenance schedule). Further information can be found in the applicable standards for sight glass panes for pressure load.

Take the following actions in the event of product-related wear and reduction of the sight glass thickness by 10 %:

- Do not use the separator.
- Replace sight glass and / or sight glass housing immediately.
- Pay attention to the manufacturer's instruction manual.

11.15 Cleaning the bowl manually

The solid-wall bowl only needs cleaning manually if the type of product and volume of separated solids necessitate this. The necessary cleaning intervals must be determined by trial and error.

The operator is responsible for adhering to the cleaning intervals. GEA Westfalia Separator shall not be liable for damage which occurs as a result of non-compliance with the cleaning intervals.

11.15.1 Permitted concentrations of cleaning agents

Use only cleaning agents recommended by GEA Westfalia Separator or the cleaning agent manufacturer. The responsibility for using suitable cleaning agents lies with the plant operator.

Comply with the following specifications issued by GEA Westfalia Separator on the permitted concentrations for cleaning agents:

Caustic (e.g. sodium hydroxide solution):

- Concentration max. 2.0 %
- Temperature max. 80°C
- Reaction time max. 1 h

Acid (e.g. nitric acid, phosphorous acid):

IMPORTANT: Do not use any sulphuric acid

- Concentration max. 1.0 %
- Temperature max. 70°C
- Reaction time max. 1/2 h

IMPORTANT: Only chemically pure acids may be used. Whether the use of technical acids is possible must be clarified with GEA Westfalia Separator on a case-by-case basis.

Do not use cleaning agents containing halide (e.g. chlorides, fluorides). The latter can also attack components of stainless materials.

11.15.2 Carrying out bowl cleaning

NOTICE

Damage due to unsuitable cleaning agents and tools

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

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

Cleaning the bowl after production

After the end of the separating process with product, the bowl must be adequately flushed, e.g. with water.

NOTE: This cleaning process is all the more important the longer the separator is not put into operation after the product run.

Cleaning the bowl lock ring

In order for bowl lock rings not to seize, remove and clean them and grease the threads every 4 weeks.

- For lubricating grease, see chapter "Maintenance / lubrication schedule".

The interval can be adapted based on experience gained.

Dismantling and cleaning the bowl

The bowl must be stripped down at least every three months to clean the inner parts.

Carry out bowl cleaning as described below

- Dismantle the bowl and other parts that come in contact with product and clean with the aid of tools or by hand using cleaning agent.
- Flush with water after cleaning to remove cleaning agent residues.
- Clean bowl parts thoroughly and remove burrs.
- Remove the gaskets from the bowl parts.
- Clean grooves and gaskets to prevent corrosion in the grooves.
- Replace damaged or heavily swollen gaskets with new genuine parts from GEA Westfalia Separator.
- Grease guide surfaces and threads of bowl parts after drying.
- Oil the spindle cone and the inside of the bowl hub and clean and dry with a smooth rag.
- The upper section of the frame and the hood must be cleaned before fitting the bowl.
- When the bowl has been cleaned and the bowl parts are dry, re-assemble and install the bowl, see chapter "Maintenance".
- If the bowl is not re-assembled immediately, protect the bowl parts against dust and dirt and put them into storage, see chapter "Transport and storage".

11.16 Checking nozzles

If CIP is run during operation, the nozzles must be checked after each cleaning cycle. In the case of excessively high temperatures and excessively high concentrations of acid, the soldered joint between the nozzle stone and the nozzle holder can be chemically eroded and the bore of the nozzle stone prematurely washed out.

To prevent hazards at the bowl and stop production downtime, observe the points below.

- After each cleaning cycle, subject the nozzles to a visual inspection for blockage and to see the condition of the soldered joint.
- Replace nozzles with a damaged soldered joint.

11.17 Note on cleaning work on disks

If disks are dismantled in connection with servicing / manual cleaning and are stacked on one another outside the distributor, it must be ensured that the conical disk surfaces do not slide into each other.

- In order to avoid damage to disks, stack the disks on top of one another individually and centrally.

11.18 Servicing fluid clutch

Service work on the fluid clutch may only be performed by persons authorized to do so, see maintenance schedule.

Follow the instructions of the fluid clutch manufacturer.

Oil volume in the clutch

The fluid clutch must accelerate the bowl to operating speed within the specified time, see times quoted in the separate data sheet.

If the start-up time deviates from the details in the data sheet, the oil volume in the fluid clutch may be incorrect, see table below.

Impact of oil volume in the fluid clutch

Not enough oil	Too much oil
Start-up time of bowl too long.	Start-up time of bowl too short.
Slippage too great.	Motor load too high.
Clutch temperature too high.	

The volume of oil required to fill the first time can be found in the technical data sheet for the centrifuge. Alternatively, see the operating instructions from the manufacturer of the fluid clutch. The correct filling volume is reached when current consumption peaks at 1.8 to 2 times the rated motor current during centrifuge start-up.

Oil change interval

The oil in the fluid clutch must be changed after approx. 5,000 operating hours.

The oil change should ideally be carried out when the separator is being serviced when the drive bearings have to be replaced.

See "Lubrication schedule" for the specified oil quality.

11.18.1 Checking oil level and topping up if necessary

Checking oil level

The oil level of the fluid clutch should be checked as outlined below.

- Before commissioning the centrifuge
- Every time oil is re-filled.
- Once a month to establish oil losses.

IMPORTANT: check oil level only with clutch cold.

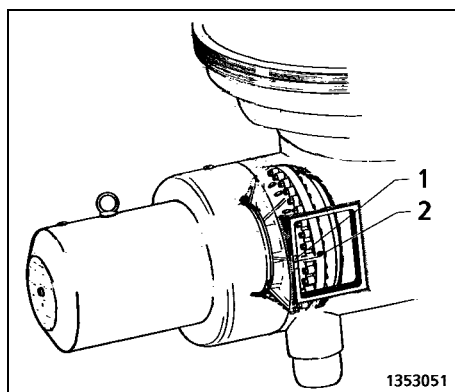


Fig. 59

Brand new separator:
the mark on oil level indicator plate (1)
and the lower edge of bore (2) must be a-
ligned.
The oil level is then up to the lower edge
of bore (2).

IMPORTANT: if a replacement clutch is
fitted, the existing oil level indicator plate
is no longer valid.
Re-adjust the oil level indicator plate as
described in the chapter entitled "Separa-
tor with replacement clutch".

The oil level plate gives an indication as to the required oil filling.

Checking oil level (initial clutch)

The separator still has the original clutch fitted at the factory:

- remove the ventilation grille so that the oil level indicator plate behind it can be seen.
- Turn the fluid clutch until threaded plug (2) can be unscrewed without oil flowing out.
- Unscrew threaded plug with a pin spanner.
- Turn the clutch until
 - the lower edge of the threaded plug bore and
 - the mark on the oil level indicator plate are aligned (6.2).

In this position, the oil is just about to overflow.

If this is not the case, top up oil and check the start-up current in accordance with the chapter entitled "Topping up oil".

Checking oil level (replacement clutch)

The centrifuge has been given a replacement clutch.

If the clutch is replaced, then the original oil level indicator plate is no longer valid!

The correct filling volume is reached when current consumption peaks at 1.8 to 2 times the rated motor current during separator start-up.

If an exact measurement of current is not possible, then the oil level can be checked by measuring the speed of the worm wheel shaft.

At rated centrifuge motor load, speed should be as follows:

- 50 Hz - approx. 1,455 rpm
- 60 Hz - approx. 1,745 rpm

If start-up current or speed are much higher than these figures, then there is too much oil in the clutch.

If they are much lower than these figures, then there is not enough oil in the clutch.

- Once the correct volume of oil has been established, the oil level indicator plate must be re-set accordingly.

Filling oil

The oil must be filled before the clutch is fitted.

For filling volume, see technical data sheet for the centrifuge or the manufacturer's operating instructions for the clutch.

- Firmly screw in the screw plug with a new seal.

The correct filling volume is reached when current consumption peaks at 1.8 to 2 times the rated motor current during separator start-up.

- Remove the ventilation grille so that the oil level indicator plate can be seen.
- Turn the fluid clutch until threaded plug (2) can be unscrewed without oil flowing out.
- Unscrew threaded plug (2) using a pin spanner.
- Top up oil through the bore, for example using a commercially-available funnel and hose.
- Firmly screw in the screw plug with a new seal.
- Screw on the ventilation grille.

Type of oil

The fluid clutch is filled with "Dampfturbinenöl TDL 32" (steam turbine oil TDL 32) which has been tried and tested by GEA Westfalia Separator - for part number, see lubrication schedule.

This oil complies with the following specification which deviates to some extent from DIN:

Specification of the steam turbine oil tried and tested by GEA Westfalia Separator

Designation	Lubricating oil TDL 32 – DIN 51515 (Steam turbine oil with active ingredients to increase corrosion protection and resistance to ageing)
Kinematic viscosity	32 ± 3.2 mm ² /s (cSt) at 40 °C
Density / 15 °C	max. 0.900 g/ml
Pour point	≤ 9 °C
Flash point	≥ 210 °C to Cleveland
Corrosive effect	
on copper	Degree of corrosion 2 to DIN 51759 - 100 A3
on steel	Degree of corrosion 0 - A to DIN 51585
Ageing characteristics	Increase in neutralization number after 1,000 h maximum 2.0 mg KOH/g oil to DIN 51587

A branded oil which meets this requirement is **Shell Turbo Oil T 32** which is recommended by GEA Westfalia Separator.

IMPORTANT: other branded TDL 32 steam turbine oils may only be used if they comply with the above specification which deviates from DIN 51515.

Each separator is supplied with enough TDL 32 steam turbine oil for one filling.

11.19 Cleaning the gear chamber

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

- When the oil is drained, open the housing cover on the side.
- 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.

11.20 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".

Protect the spindle and bearings using appropriate measures to prevent the penetration of cleaning liquid, e.g. with a container or plastic foil hood.

- Never expose the centrifuge to a direct water jet. It must be cleaned by hand with a sponge or cloth.

11.21 Lubricating the bowl parts

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

IMPORTANT! Use only lubricants tested by GEA Westfalia Separator for use on separators.

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 assembly grease (e.g. W.S.F. assembly 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.
- Ensure that the greased surfaces are free from sand and filings as otherwise the surfaces can become scored.
- When cleaning, check the threads, contact and guide surfaces for impact marks.
 - Impact marks can lead to seizing.

11.22 Eliminating blockage of the solid vessel

The solids vessel on the concentrate collector can block:

All start-up or shut-down processes and cleaning procedures are especially critical in this respect. Blockage can also occur during running production.

When such blockage of the solids vessel occurs, the following steps must be carried out:



DANGER

Life threatening danger because of quickly rotating machine parts.

Danger of severe injuries caused by body parts being pulled into the machine or by the ejection of machine parts or product remnants.

- Do not remove any parts of the machine until the bowl is at a stand-still.
- Wait for the fluids to empty, see data sheet.
- Secure the unit against unintentional activation.
- Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
- Check and ensure that all machine parts are at a standstill, see chapter "Servicing / standstill check of rotating machine parts".



WARNING

Danger of suffocation through hazardous materials

Depending on the product used, there is a risk of suffocation when opening the centrifuge.

- Wear personal protective gear.
- Take special care.
- Observe regulations on product contact.
- Switch off the installation in accordance with the installations.
- Relieve the pressure from all lines affected by the assembly.
- Loosen the screw clutch of the solids pump and empty the solids vessel as far as possible.
- Open the inspection cover and remove the blockage from above.
 - For this purpose, use a suitable tool since the vessel may contain caustic substances.
- Once the work is finished, carefully close and firmly tighten all screwed connections.

11.23 Checking the disk pressure

When new disk stacks are fitted, the disk pressure decreases during the first months of operation because the disk stack is still settling.

NOTICE

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 fitting 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 reliability of the centrifuge depend on maintenance work being carried out properly.

Maintenance work carried out incorrectly can result in damage to the centrifuge parts. This can result in personal injury and material damage when operating the centrifuge.

- Centrifuges may only be operated by persons who are qualified to carry out these tasks. These persons include, for example, trained experts from GEA Westfalia Separator and specialist personnel trained and authorised (certified) by GEA Westfalia Separator.
- Dismantled centrifuge parts must only be placed on an even, non-slip surface (e.g. a rubber mat or wooden pallet).
- Dismantled centrifuge parts must be secured by suitable means to prevent them from falling over or rolling away (e.g. with wooden wedges or squared timber).
- Never weld the bowl, hood or solids catcher.
- Do not machine the bowl, hood and solid catcher.
- Do not stand or sit on the centrifuge or attachments.
- Following maintenance and repair work on centrifuges, mount all protective devices again and check the safety equipment.

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 as per DIN EN ISO 4014 / 4017
 - Hex socket screws to DIN EN ISO 4762
- Clearance holes to DIN EN 20273 (average)
- Lubrication state thread and contact surfaces greased
- Torque wrench with scatter of $\pm 10\%$
- Material combinations:
 - Steel-steel
 - Stainless steel - stainless steel

IMPORTANT: Screws/bolts whose torque deviates from this table are marked with the relevant torque in the instruction 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 Connection points with several screws

- Tighten screws crosswise
- Subsequently check all screws in series (not crosswise) and retighten

12.7.3 Screw tightening torques in inch-pound (inlb)

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

$$M_{\text{inlb}} = M_{\text{Nm}} \times 8.85$$

Example:

M_{inlb}	=	Wanted (screw tightening torques in “inch-pound”)
M_{Nm}	=	50 (screw tightening torques in “Newtonmeter”)
M_{inlb}	=	50 Nm x 8.85
Mainlb	=	442.5 inlb

12.7.4 Using self-locking nuts safely

Self-locking nuts or self-locking cap nuts are used at certain points on the machine for fastening flanges, hoods and vessels.

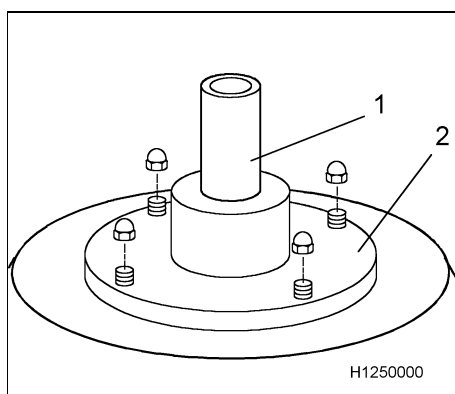


Fig. 60 Example of use

During dismantling, self-locking nuts or cap nuts must be unscrewed and disposed of.

IMPORTANT:

Make sure that self-locking nuts or cap nuts are not used again.

Whenever assembling, use new self-locking nuts or cap nuts.

Protruding studs may cause injuries or get damaged by adjoining machine parts. For this reason, protective measures must be taken, e.g. mounting protective caps.

12.8 Tools

12.8.1 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.

12.8.2 Standard tools

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

12.8.3 Special tools

The scope, type and number of the special tools are specified in the order-specific parts list. Commercially available tools are not supplied.

12.9 Standstill check of the rotating machine parts

The centrifuge has machine parts that rotate at high speed.



DANGER

Life threatening danger because of quickly rotating machine parts.

Danger of severe injuries caused by body parts being pulled into the machine or by the ejection of machine parts or product remnants.

- Do not remove any parts of the machine until the bowl is at a stand-still.
- Wait for the fluids to empty, see data sheet.
- Secure the unit against unintentional activation.
- Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
- First check and make sure that all of the machine components are at a stand-still, see the chapter "Repair / stand-still control of the rotating machine components".

Use several options for checking standstill.

It must always be reckoned with that the first used standstill indication will provide false information because, for example, the electronics have failed or the belt or gear in the drive is defective.

Observing the motor fan alone is not a reliable method of checking standstill. The motor or its fan can be at standstill while the separator bowl is still rotating.

Depending on the model, there are various possibilities of checking whether the rotating machine parts are at standstill.

- Electric speed indicator.
- Revolution indicator or sight glass on the gear cover of centrifuges with a toothed gear.
- Visual speed check of the drive motor.
- Noise check.
- Vibration check.
- Wait until the run-down time has elapsed, see data sheet.
- Visual speed check by opening the inspection ports on hood and frame
- Visual check by removing the gear cover or opening the port in the drive housing on the bowl side.

12.9.1 Revolution visual check on machines with toothed gearing.

Only when one is convinced that the separator is at a standstill must the following check for additional security be carried out.

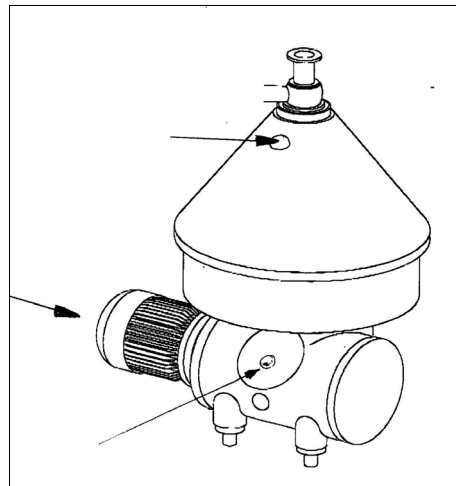
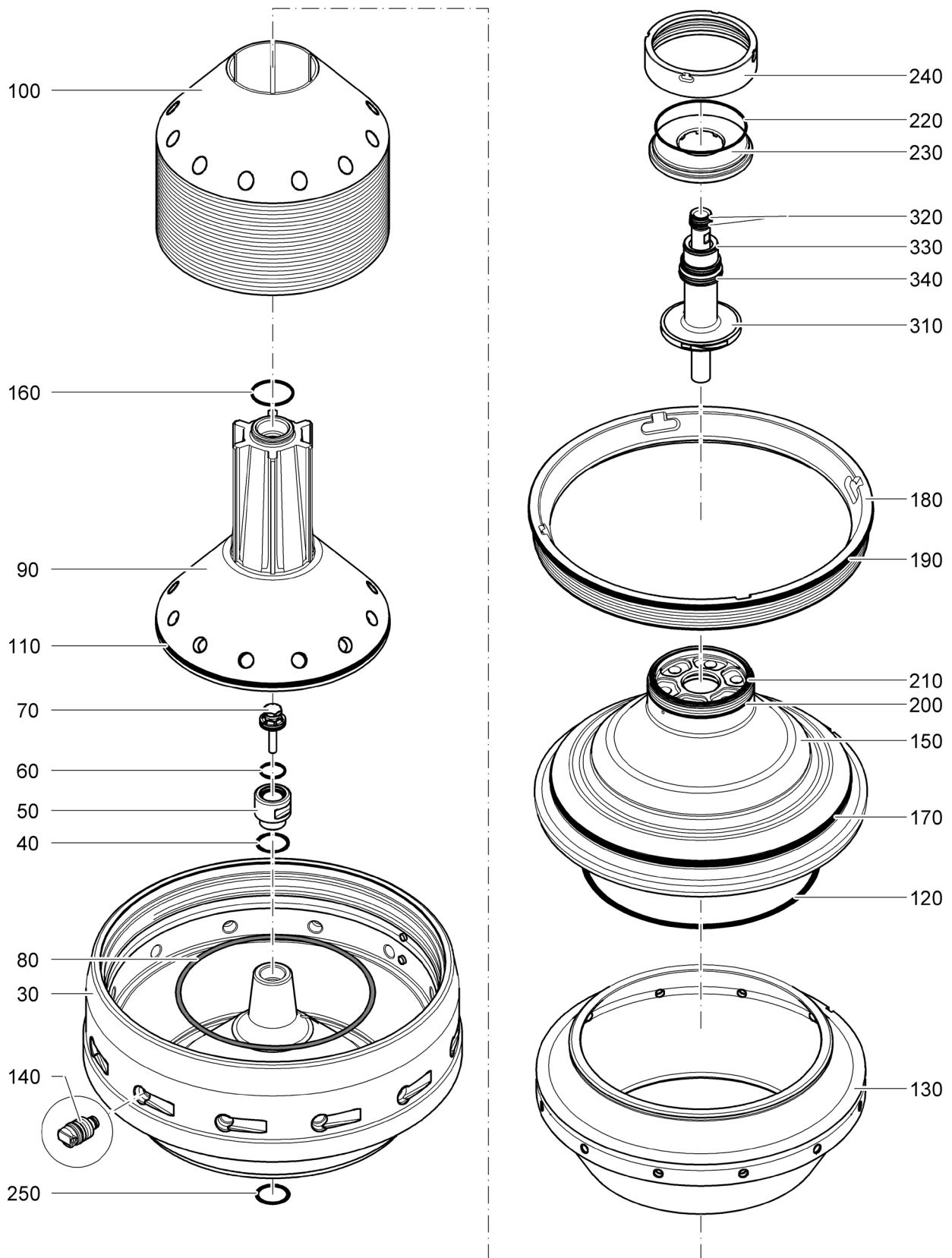


Fig. 61 Example

- You can observe whether the machine is at a standstill at the points marked with the arrows.

12.10 Bowl overview

Exploded view of the bowl



T1312009

Fig. 62

30	Bowl bottom *
40	Gasket
50	Threaded sleeve
60	Gasket
70	Spindle screw
80	Gasket
90	Distributor *
110	Gasket
120	Gasket
130	Segmental insert *
140	Nozzle
150	Bowl top *
160	Gasket
170	Gasket
180	Lock ring *
190	Gasket
200	Gasket
210	Gasket
220	Gasket
230	Centripetal pump chamber cover
240	Lock ring
250	Gasket
310	Centripetal pump
320	Gaskets
330	Gasket
340	Gasket

* After replacing this part, the complete bowl must be rebalanced.

12.11 Dismantling the feed and discharge connections



DANGER

Risk of death from machine parts rotating at high-speed

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 process can take several hours.

- Check and ensure that all machine components are at a standstill, see section entitled "Maintenance / Standstill check of the rotating machine parts".

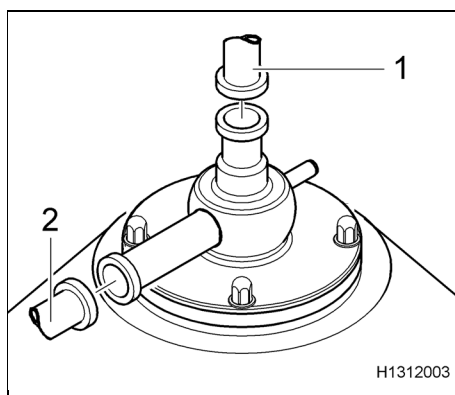


Fig. 63

- Disconnect feed line (1) and discharge line (2).

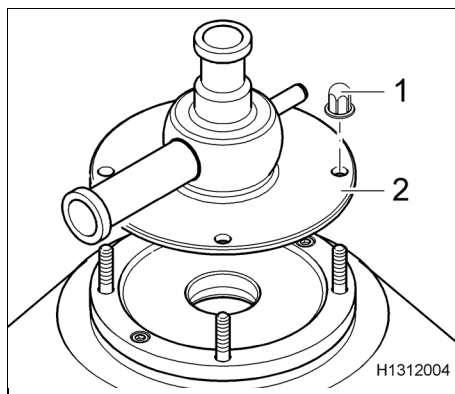


Fig. 64

- Unscrew the cap nuts (1) of the discharge.
- Remove discharge (2).

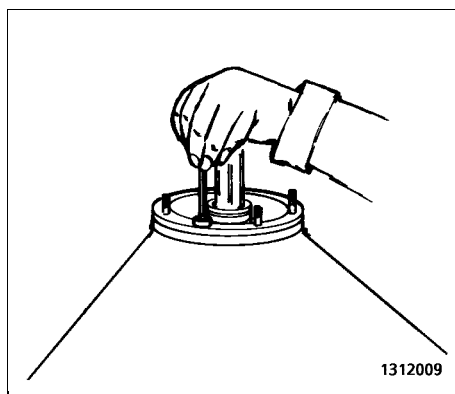


Fig. 65

- Undo the Allen screws in the ring.

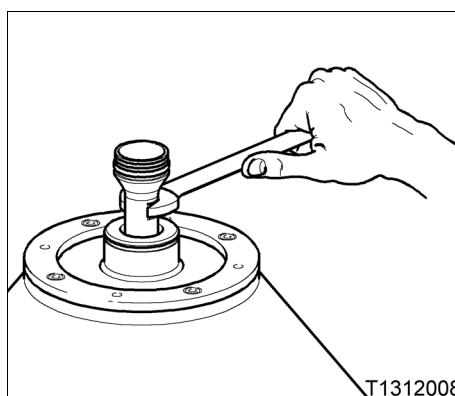


Fig. 66

- Unscrew the centripetal pump from the ring (**left-hand thread**).

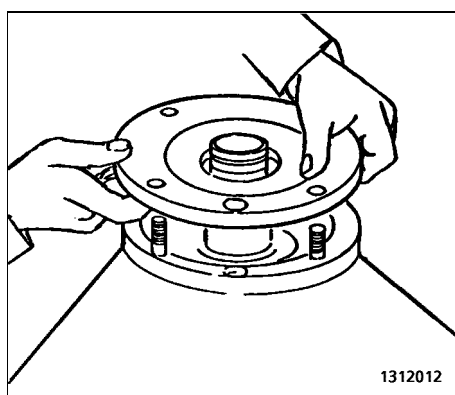


Fig. 67

- Remove ring.

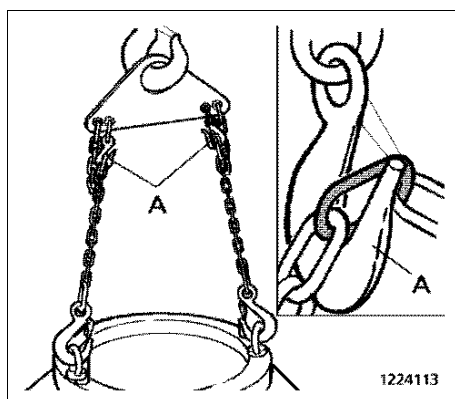


Fig. 68

- Screw on the two ring nuts.
- Suspend the lifter from the eye bolts.
- Hang the shortened chains in second hook (A).

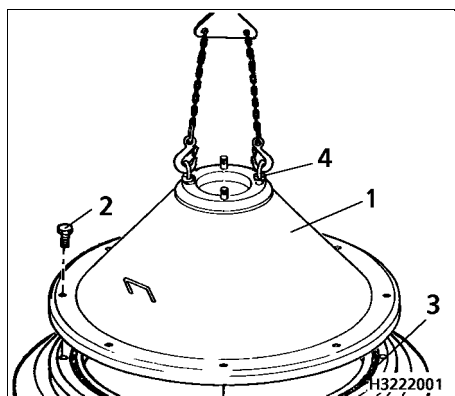


Fig. 69

- Disconnect the ice-water line.
- Unscrew the screws (2) for fastening hood (1).
- Lift off hood 1 by means of the hoist.

12.12 Dismantling the bowl



WARNING

Danger of injury due to components falling down.

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.
- Before dismantling the bowl, ensure that the bowl and assembly jig are 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.
- Adhere to the removal and fitting order described.
- Set down and mount dismantled bowl parts on suitable surfaces, e.g. rubber, wood etc.
- Secure separator parts with suitable means against overturning and rolling away.
- Parts put together must be completely dismantled from each other.
- Handle the parts with care.

IMPORTANT:

- Use only suitable hoists and load suspension devices.
- Always use complete tools and use them only for the intended application, see separate spare parts catalog "Set of tools".



CAUTION

Danger of injury due to burrs flaking off the lock ring wrench.

When hammering on the lock ring wrench, burrs can break off and injure persons.

- Wear protective goggles and gloves.
- Remove burrs in good time.

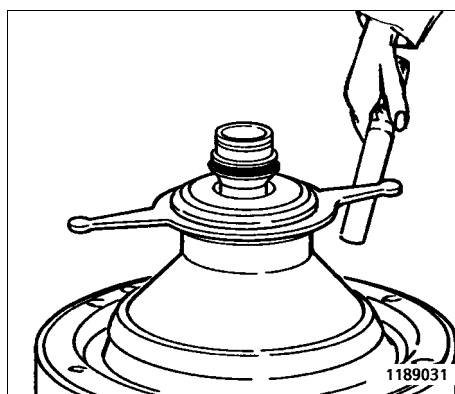


Fig. 70

- Loosen the lock ring.
 - Strike the mallet several times against the handle of the annular wrench (**left-hand thread**).
 - Remove the lock ring.

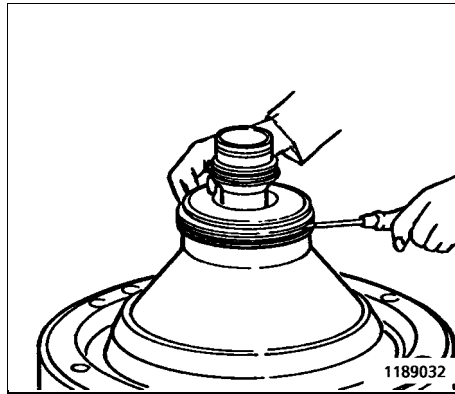


Fig. 71

- Loosen the centripetal pump chamber cover from the bowl top and remove it.

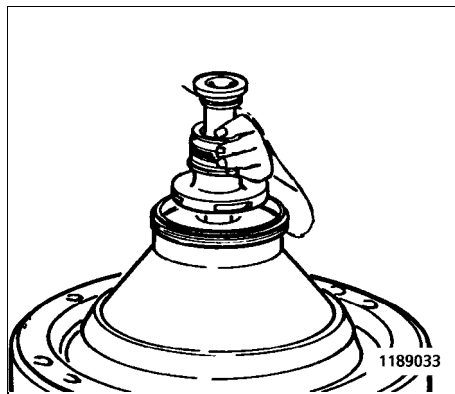


Fig. 72

- Remove the centripetal pump.

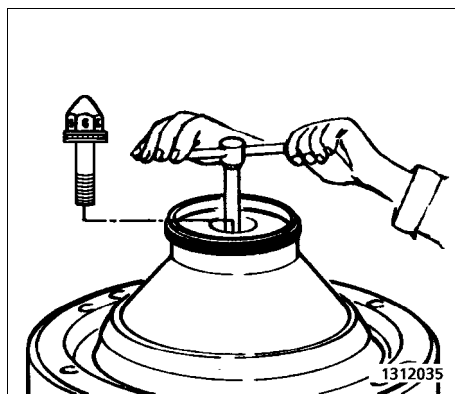


Fig. 73

- Unscrew spindle screw with the socket wrench (**right-hand thread**).

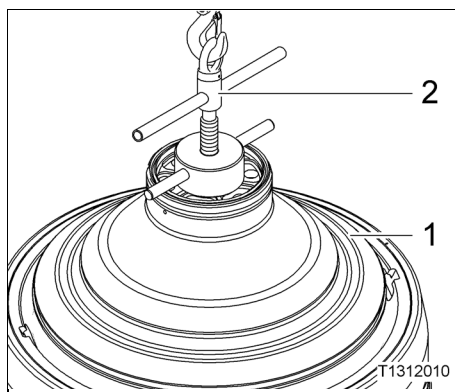


Fig. 74

- Force the bowl (1) off the cone of the worm spindle (2) by turning the lifting device (2) clockwise.
- Lift the bowl (1) out of the frame and put it down on a rubber mat or wooden pallet for further dismantling.

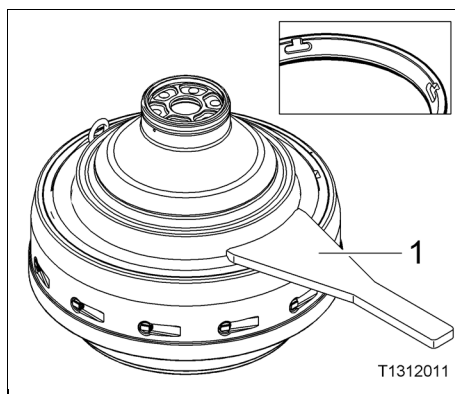


Fig. 75

- Position ring spanner (1) in the bowl lock ring.

Assembling the disk stack compressing device

To make the bowl lock ring easier to release, pressure on the bowl lock ring is reduced with the aid of the disk stack compressing device. The hydraulic disk stack compressing device transfers the pressure to the disk stack. If no pressure can be built up with the pump hydraulics (41.1), the piston and cylinder are too far apart. For this reason, piston and cylinder of the pump hydraulics must first be brought into their original position.

The distance between the pump hydraulics (41.1) and disk (41.4) must be **min. 3 mm**.

- Loosen pressure relief screw (11) of pump hydraulics (41.1) by two turns.
- Press the pump lever down as far as it will go.
- Screw on threaded ring (41.3) down to thread end and compress the pump hydraulics.
- Close the pressure relief screw (11).

NOTICE

Damage to threads on bowl and compressing device

An excessively high pressure results in damage to the threads on the bowl and compressing device.

- Operate the compressing device only with the admissible pressure, see data sheet.
- Screw the threaded bolt into the bowl bottom as far as it will go.

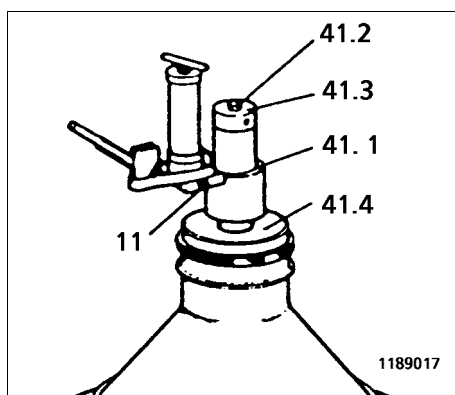


Fig. 76

Assembling the disk stack compressing device

- Place disk (41.4) on the bowl top.
- Screw threaded bolt (41.2) into the bowl bottom as far as it will go.
- Insert pump hydraulics (41.1) in the centring recess of disk (41.4).
- Screw on threaded ring (41.3) until its upper edge is flush with the start of the thread of bolt (41.2).

Compressing the disk stack

- Apply pressure gradually to the disk stack until the disk pressure has been reached, see data sheet.

- Each pressure increase should be approx. 50 bar.

**CAUTION****Danger of injury due to burrs flaking off the lock ring wrench.**

When hammering on the lock ring wrench, burrs can break off and injure persons.

- Wear protective goggles and gloves.
- Remove burrs in good time.

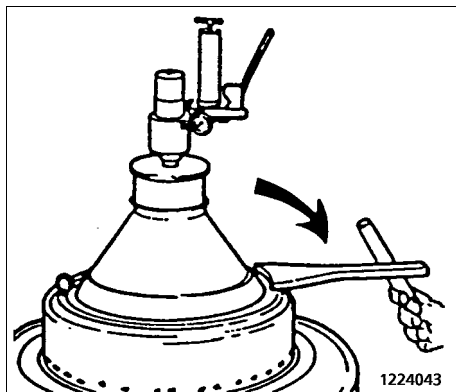


Fig. 77

- Loosen the bowl lock ring.
 - Hammer against the handle of the ring spanner with the mallet (**left-hand thread**).

If the lock ring is jammed tight, loosening can be facilitated by heating the upper part of the bowl bottom with steam or hot water. Do not use any other sources of heat, e.g. blow torch or welding torch.

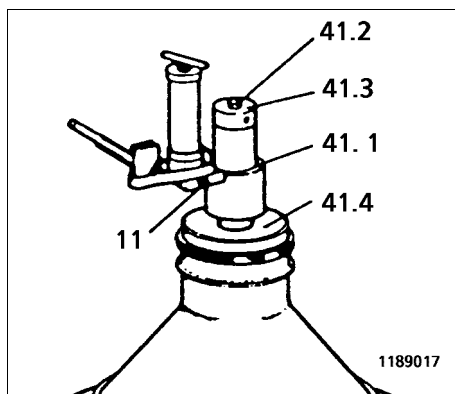


Fig. 78

Dismantling the disk stack compressing device

- Move the pump lever down as far as it will go to prevent it from jumping back.
- Loosen pressure relief screw (11) of the pump hydraulics.
- Unscrew threaded ring (41.3).
- Lift off pump hydraulics (41.1) and disk (41.4).
- Unscrew bolt (41.2).
- Unscrew the bowl lock ring (**left-hand thread**).

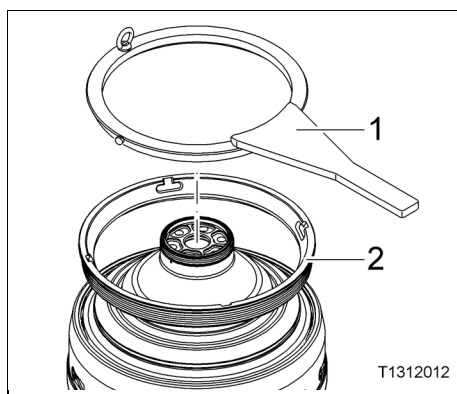


Fig. 79

- Lift ring spanner (1) by hand off bowl lock ring (2).
 - Lift off bowl lock ring (2) by hand.
- IMPORTANT:** Danger of squashing, wear protective gloves.

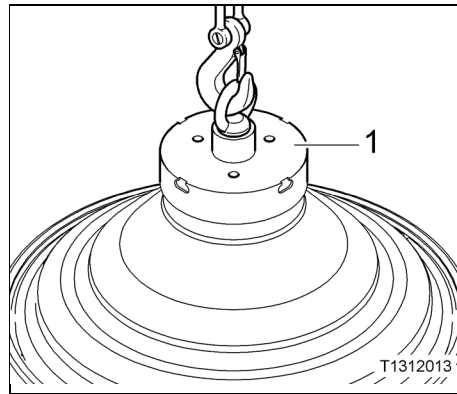


Fig. 80

- Screw on lifting device (1).
- Lift the bowl top off the bowl bottom with lifting device (1).

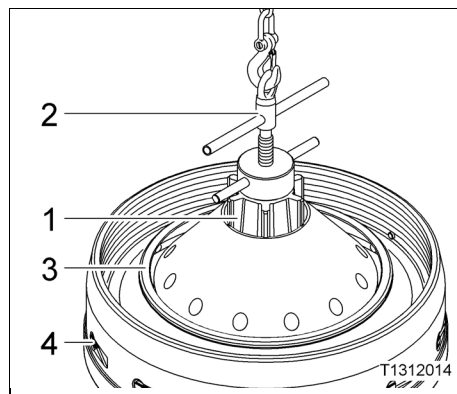


Fig. 81

- Lift the distributor (1) and disk stack out of the bowl bottom using a hoist (2).

IMPORTANT: The nozzles must remain fitted as otherwise the segmental insert will be raised as well.

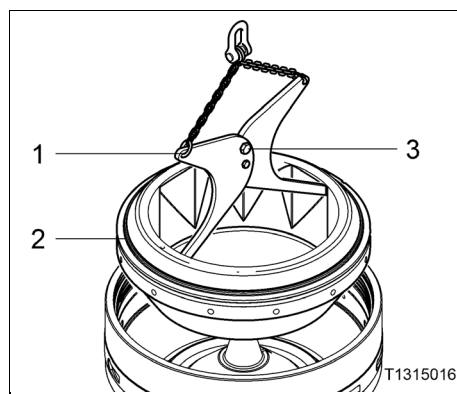


Fig. 82

- Unscrew the nozzles from the bowl bottom, see section entitled "Dismantling nozzles".
- Remove segmental insert (2) from bowl bottom using lifting device (1).
 - To do so, adjust the wings of the lifting device to fit inside the nozzle bores.
 - Then insert locking screw (3) to secure the position. This is the only way to ensure that the segmental insert can be lifted out without slipping.

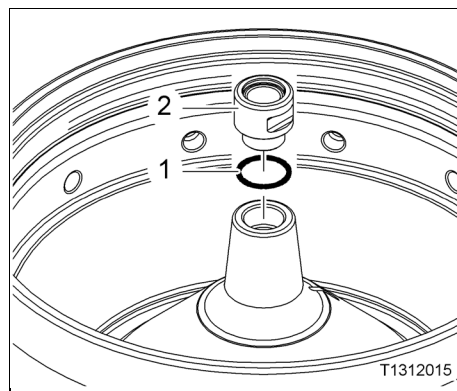


Fig. 83

- Unscrew sleeve (2) with a wrench.
- Remove gasket (2).

12.13 Turning the bowl bottom

Turning over the bowl bottom is done for the following reasons:

- Better discharge when flushing out with water
- Cleaning the cone
- No work under suspended loads.
- Fitting new gaskets.

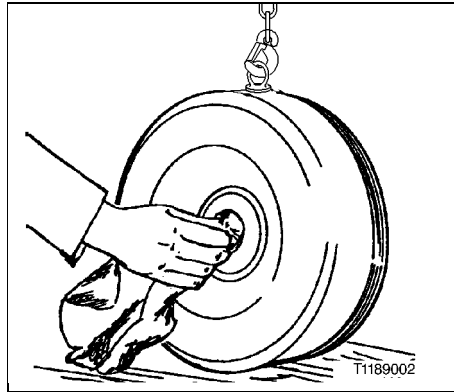


Fig. 84

- Screw the eye bolt into one of the nozzle bores as far as it will go.
- Turn the bowl bottom using the hoist.

12.13.1 Removing the nozzles

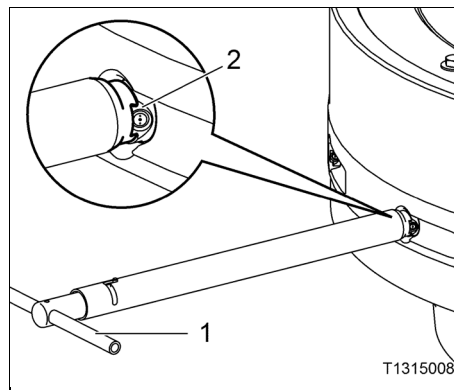


Fig. 85

- Push nozzle wrench (1) onto the swallowtail guide of the nozzle (2).

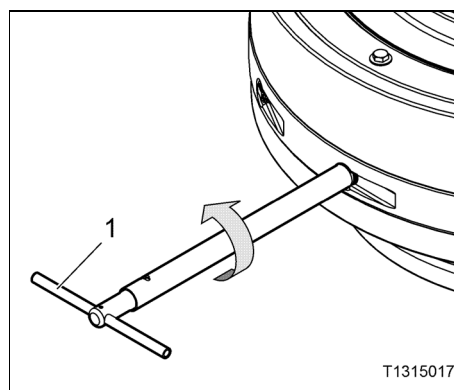


Fig. 86

- Unscrew the nozzle with nozzle wrench (1) (**right-hand thread**).

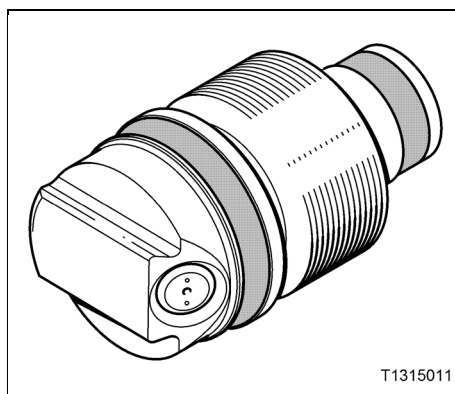


Fig. 87

- Clean the nozzles.
- Examine the nozzles for damage or wear, check nozzle stone and soldering for corrosion, replace if necessary.
- Check gaskets and replace if necessary.

12.14 Fitting nozzles

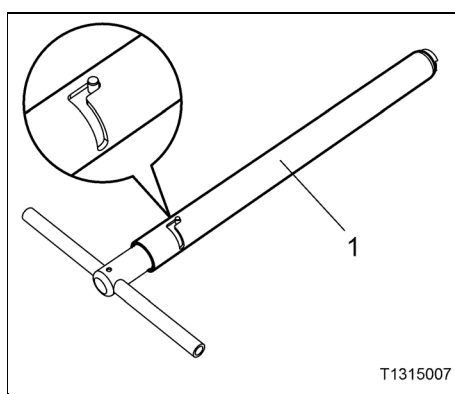


Fig. 88

- Turn sleeve (1) of the nozzle wrench and draw it back.

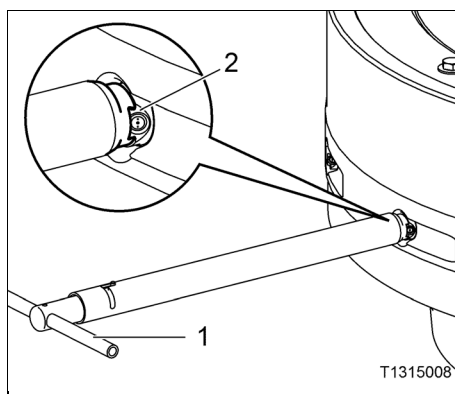


Fig. 89

- Push nozzle wrench (1) onto the swallowtail guide of the nozzle (2).

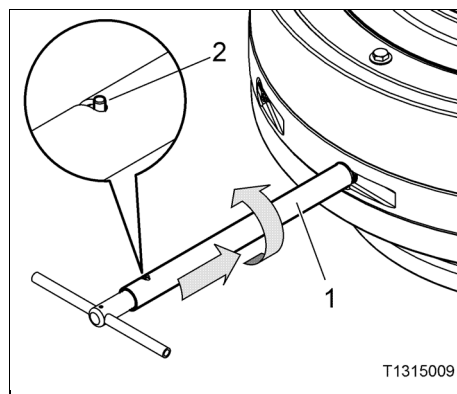


Fig. 90

- Push sleeve (1) of the nozzle wrench over the swallowtail guide and turn until bolt (2) reaches its stop.
- Maintain the position of sleeve (1) in relation to the nozzle wrench until the nozzle is secure in the bottom and cannot drop out.

NOTICE

Damage to the nozzles if incorrectly fitted.

The front face of the nozzles must be flush with the outer wall of the bowl bottom. The nozzles may not be screwed in deeper than specified and never as far as they will go.

The consequence would be damage to the nozzle seat and severe splashing of the discharging product during operation.

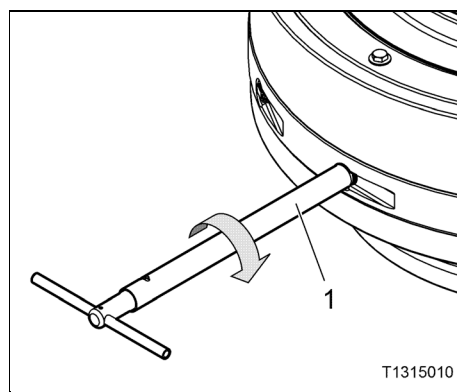


Fig. 91

- Do not screw in nozzles as far as they will go.
- Screw in the nozzle until the following conditions are met:
 - swallowtail guide is horizontal;
 - front face of nozzle is flush with outer wall of bowl bottom;
 - outlet bore of nozzle faces backwards, against the direction of rotation.

- Proceed as above with all nozzles.

12.15 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.
- Some bowl parts must be arranged in fixed positions relative to one another. Pay attention to the locking devices and marks.
 - 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".

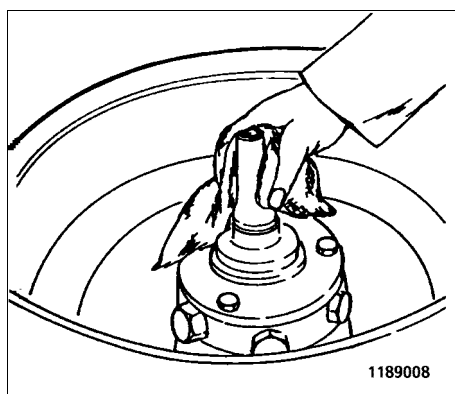


Fig. 92

- Clean the conical part of the spindle with a cloth and rub dry.

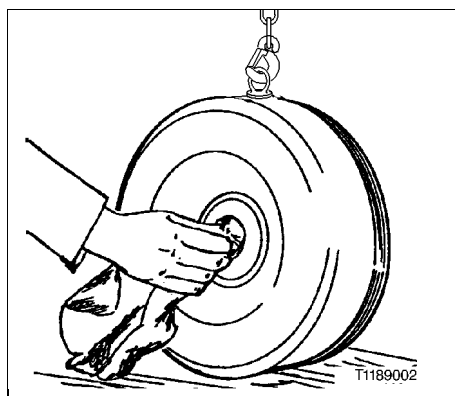


Fig. 93

Turn the bowl bottom:

- screw the eye bolt into a nozzle bore as far as it will go.
- Turn the bowl bottom using the hoist.
- Clean the inside of the bowl hub with a cleaning rag to ensure the cone bears properly.
- Do not grease cone parts.
- check the seal in the hub and replace if necessary.

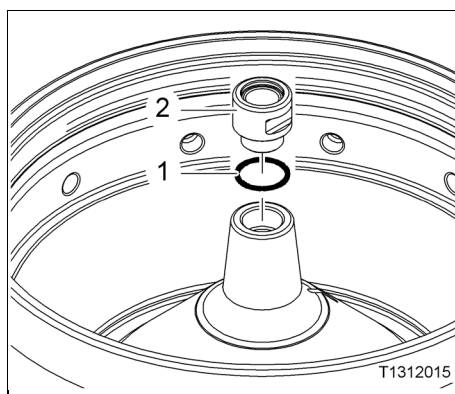


Fig. 94

- Screw in sleeve (2) with fitted gasket (1).

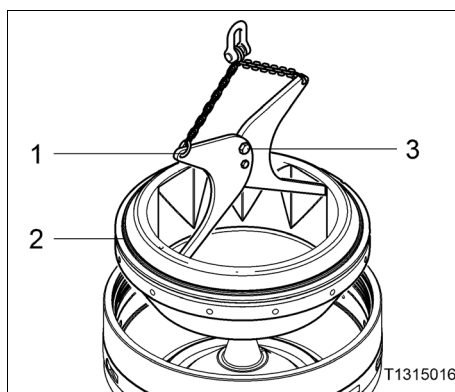


Fig. 95

- Insert the gasket in the groove of the bowl bottom.
- Fit the segmental insert in the bowl bottom with the aid of a hoist.
 - Note locking screw (3).

Tool: lifting device

- For more precise locking, fit three nozzles offset by 120°.

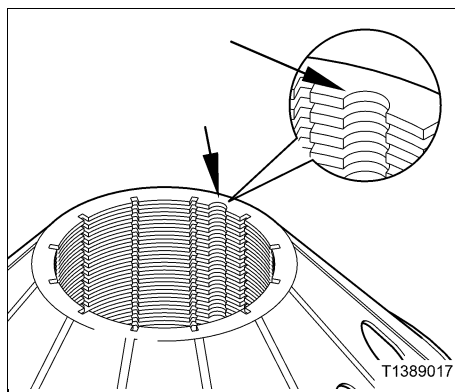


Fig. 96

Fitting disks with stack groove:

- Mount numbered disks always in ascending order on the distributor (if numbering present).
 - Begin with No. 1.
 - The stack grooves (arrow) of all disks must be aligned.

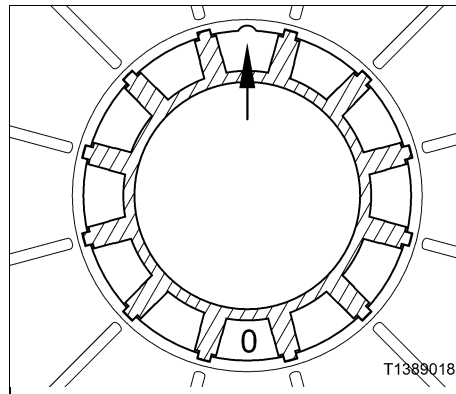


Fig. 97

Position of stack groove, example A

The "O" mark is between two ribs at the distributor.
The stack groove must be located exactly opposite the "O" mark.

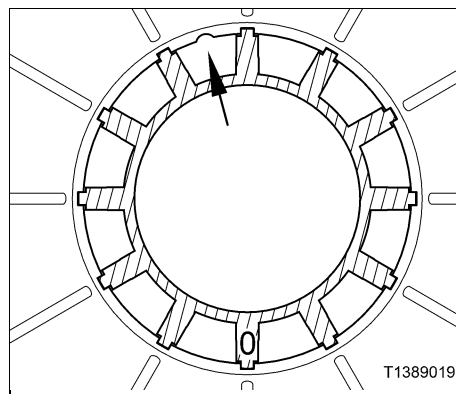


Fig. 98

Position of stack groove, example B:

The "O" mark is on one rib at the distributor.
The stack groove must be located roughly opposite the "O" mark.

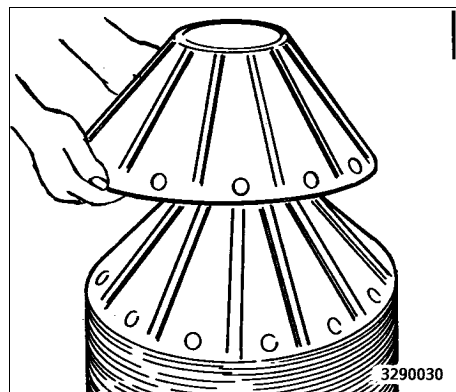


Fig. 99

Fitting disks without stack groove:

- Mount numbered disks always in ascending order on the distributor (if numbering present).
- Begin with No. 1.

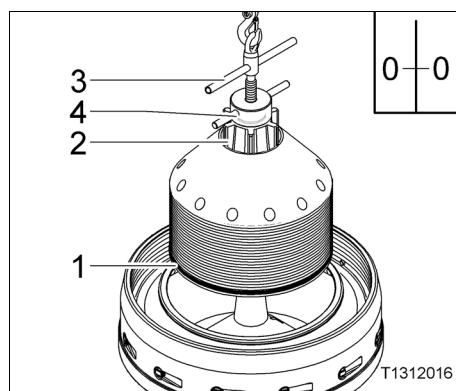


Fig. 100

- Insert gaskets (1) and (4) in the grooves of the distributor.
- Install the distributor (2) and disk stack in the bowl bottom using the lifting device (3).
- Make sure that the locking piece of the distributor engages in the groove of the bowl bottom.
 - Carefully lower the distributor and move left and right until the distributor can be felt to engage.

The "O" marks on both parts must be aligned.

NOTICE**Damage to the disks from too low a disk stack pressure**

Fitted gaskets compensate part of the compression pressure of the disk stack. If the disks are not adequately compressed, this can lead to damage, e.g. cracks, in the disks.

- Remove the gaskets in the bowl top and bowl lock ring before compressing the disks.

The gaskets are refitted before the final compression step.

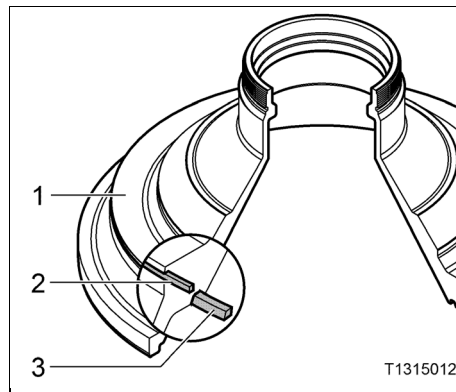


Fig. 101

- Remove gaskets (2) and (3) in bowl top (1).

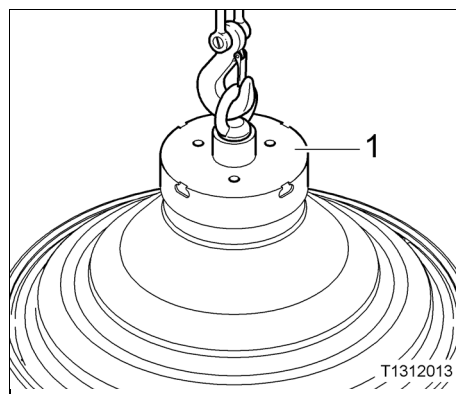


Fig. 102

Installing the bowl top

- Clean and grease thread, contact and guide surfaces on the bowl bottom and bowl top, see the chapter entitled "Maintenance".
- Place bowl top on bowl bottom with the aid of lifting device (1).
 - Make sure that the locking cam of the bowl bottom engages in the groove of the bowl top.
 - The "O" marks on both parts must be aligned.

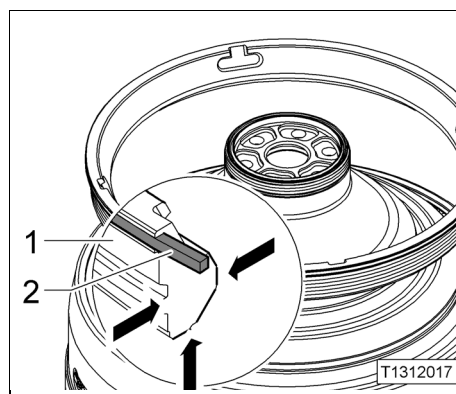


Fig. 103

- Remove gasket (2) from bowl lock ring (1).
- Check the thread as well as the contact and guide surfaces (arrows) for damage, and grease them, see the chapter entitled "Maintenance / Lubrication schedule".

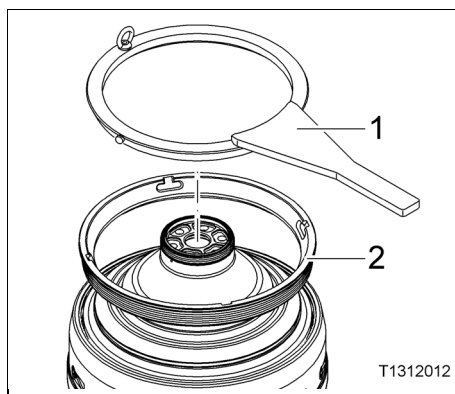


Fig. 104

- Then place the bowl lock ring (2) on the bowl bottom by hand.
- Attach ring spanner (1) and first screw in the bowl lock ring as far as possible by hand (**left-hand thread**).

Assembling the disk stack compressing device

The hydraulic disk stack compressing device transfers the pressure to the disk stack. If no pressure can be built up with the pump hydraulics (41.1), the piston and cylinder are too far apart. For this reason, piston and cylinder of the pump hydraulics must first be brought into their original position.

The distance between the pump hydraulics (41.1) and disk (41.4) must be **min. 3 mm**.

- Loosen pressure relief screw (11) of pump hydraulics (41.1) by two turns.
- Press the pump lever down as far as it will go.
- Screw on threaded ring (41.3) down to thread end and compress the pump hydraulics.
- Close the pressure relief screw (11).

NOTICE

Damage to threads on bowl and compressing device

An excessively high pressure results in damage to the threads on the bowl and compressing device.

- Operate the compressing device only with the admissible pressure, see data sheet.
- Screw the threaded bolt into the bowl bottom as far as it will go.

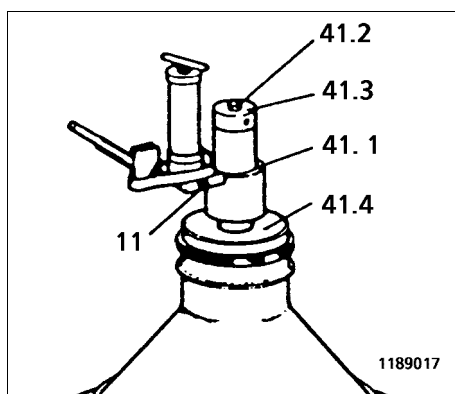


Fig. 105

Assembling the disk stack compressing device

- Place disk (41.4) on the bowl top.
- Screw the bolt (41.2) into the bowl bottom as far as it will go.
- Insert pump hydraulics (41.1) in the centring recess of disk (41.4).
- Screw on threaded ring (41.3) until its upper edge is flush with the start of the thread of bolt (41.2).

Compressing disks

IMPORTANT: When compressing the disk stack, make sure that the arresting piece of the bowl bottom snaps into the groove of the bowl top and that the bowl top does not become twisted when lowered.

- Push down the lever of the pump and compress the disk stack, reading off the pressure on the pressure gauge.
- Step 1 Transfer pressure of 50 bar to the disk stack.
- Step 2 Screw the bowl lock ring by hand using the pin spanner (**left-hand thread**).
- Step 3 Increase pressure by 50 bar.
- Step 4 Tighten up the bowl lock ring by hand using the pin spanner.
- Repeat steps 3 and 4 until the specified disk pressure, approx. 250 - 300 bar, is reached - see data sheet.

If the 0 marks are in line, even though the specified pressure has not yet been reached, add reserve disks or use thicker disks.

When the specified disk pressure has been reached, the "0" mark on the bowl lock ring must be approx. 10 - 20 mm ahead of the "0" mark on the bowl bottom.

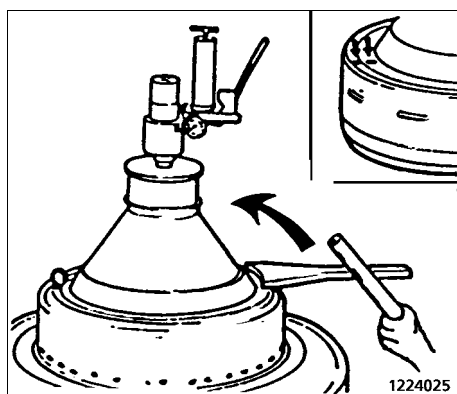


CAUTION

Danger of injury due to burrs flaking off the lock ring wrench.

When hammering on the lock ring wrench, burrs can break off and injure persons.

- Wear protective goggles and gloves.
- Remove burrs in good time.



- Knock the bowl until the "0" marks line up. (**Left-hand thread**).

Fig. 106

IMPORTANT:

If the disk pressure is not achieved on the compression device and grease escapes from the stroke limiting bore, the following faults may apply:

- threaded bolt (41.2) has not been screwed far enough into the bowl bottom.
- The piston and the cylinder of the pump hydraulics are too far apart.

To remedy faults on the compressing device, see the chapter entitled "Assembling the disk compressing device".

Preparing final disk compression

Pre-condition:

the compression process has been completed correctly, the "0" mark of the bowl lock ring is approx. 10 - 20 mm ahead of the "0" mark of the bowl bottom at maximum disk pressure.

- Turn bowl lock ring back.
- Release the pressure in the compression device with the lever on the pressure relief screw pressed down.

- Dismantle the compression device, see chapter entitled "Dismantling the disk stack compressing device".

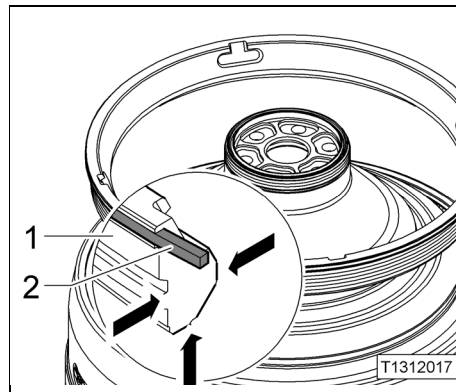


Fig. 107

- Unscrew bowl lock ring (1) and put gasket (2) back in.

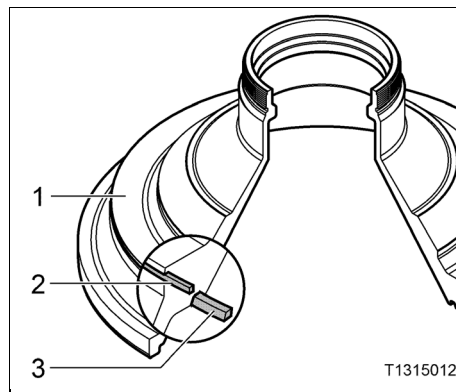


Fig. 108

- Lift off bowl top (1).
- Refit gaskets (2) and (3).

- Put on bowl top and screw in bowl lock ring as far as it will go by hand using the pin spanner.
- Assemble the compression device, see chapter entitled "Assembling the disk stack compressing device".
- Close the pressure relief screw for the compression device and perform the final compression step. See chapter entitled "Compressing disks".

**CAUTION****Danger of injury due to burrs flaking off the lock ring wrench.**

When hammering on the lock ring wrench, burrs can break off and injure persons.

- Wear protective goggles and gloves.
- Remove burrs in good time.

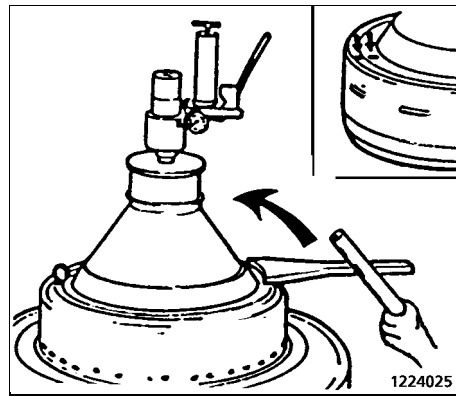


Fig. 109

- Tighten the bowl lock ring by hammering against the handle of the pin spanner with the mallet until the "0" marks are aligned (**left-hand thread**).

IMPORTANT:

In the case of newly fitted disk stacks, the disk stack compression can be lost due to settling of the disks.

- Check disk pressure at least once every 4 weeks in the first 3 months.

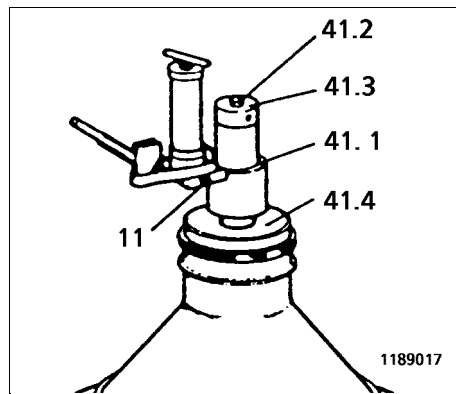


Fig. 110

Dismantling the compressing device:

- Move the pump lever down as far as it will go to prevent it from jumping back.
- Loosen the pressure relief screw (11).
- Unscrew threaded ring (41.3).
- Remove pump hydraulics (41.1) with disk (41.4).
- Unscrew bolt (41.2).

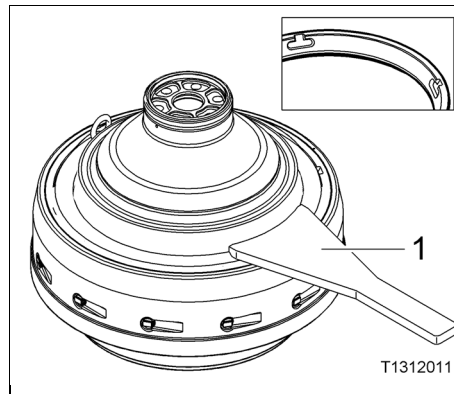


Fig. 111

- Remove ring spanner (1).

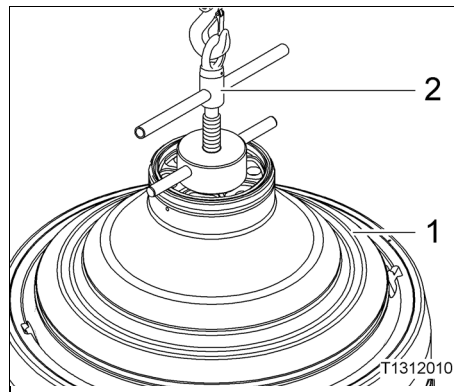


Fig. 112

- Screw lifting device (2) into the bowl (**left-hand thread**).
- Carefully set the bowl (1) down on the spindle in the frame using a hoist.

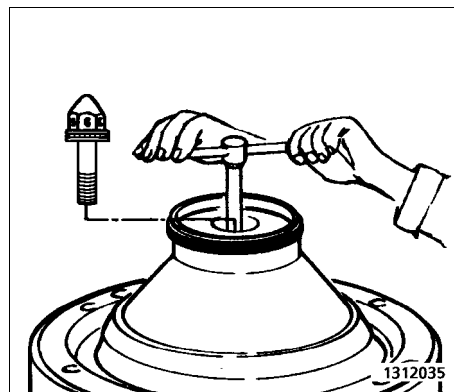


Fig. 113

- Check the gasket for the spindle bolt and replace if necessary.
- Insert the spindle screw in the pin spanner and screw firmly into the spindle (**right-hand thread**).

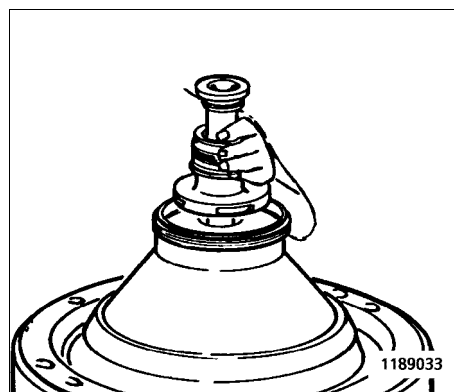


Fig. 114

- Insert the gaskets in the bowl top in the gasket grooves.
- Mount the centripetal pump.

**CAUTION****Danger of injury due to burrs flaking off the lock ring wrench.**

When hammering on the lock ring wrench, burrs can break off and injure persons.

- Wear protective goggles and gloves.
- Remove burrs in good time.

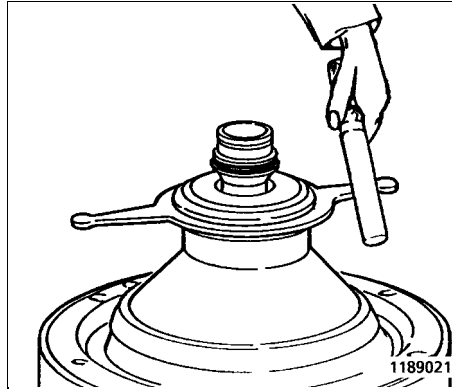


Fig. 115

- Clean and grease the threads on the bowl top and in the lock ring, see chapter entitled "Maintenance".
- Insert gasket into the centripetal pump chamber cover.
- Screw on the lock ring by hand and tighten it by hammering against the handle of the ring spanner (**left-hand thread**).
- Check to see if the bowl can be turned by hand.

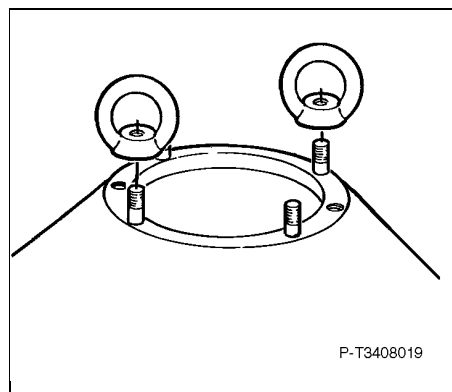
12.16 Assembling the feed and discharge connections

Fig. 116

- Screw two ring nuts opposite each other onto the studs of the hood.

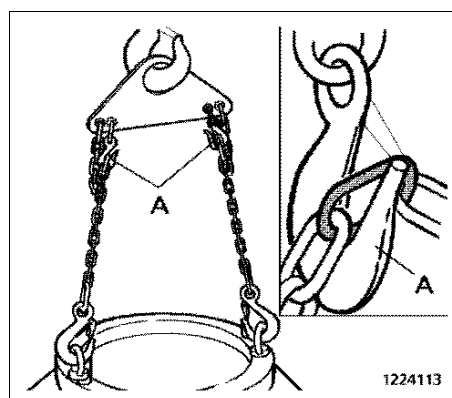


Fig. 117

- Shorten the chains of the lifting device. Ensure that the chain link is crosswise in the hook (A).

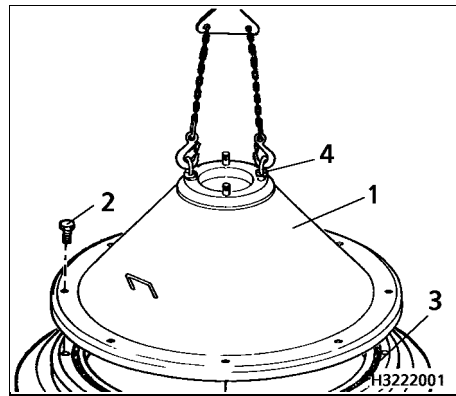


Fig. 118

- Fit the gasket (3).
- Mount hood (1) on the concentrate collector with the aid of the hoist.
- Bolt hood to concentrate catcher using bolts (2).
- Connect the ice-water line.

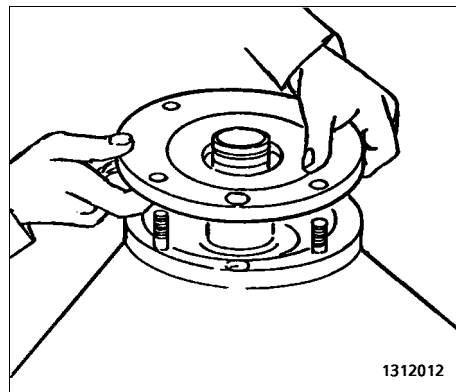


Fig. 119

- Place the ring on the hood so that both holes for the Allen screws in the ring are positioned over the respective threaded bores in the hood.
- Do **not** tighten up the bolts.

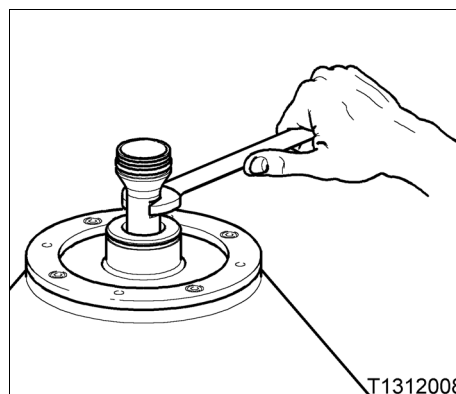


Fig. 120

- Check the seals on the centripetal pump and replace if necessary.
- Screw the centripetal pump into the ring by hand and tighten as far as it will go (**left-hand thread**).

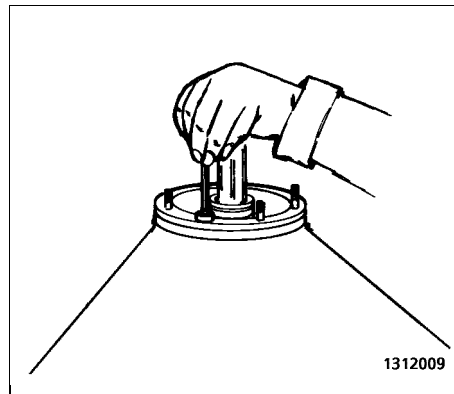
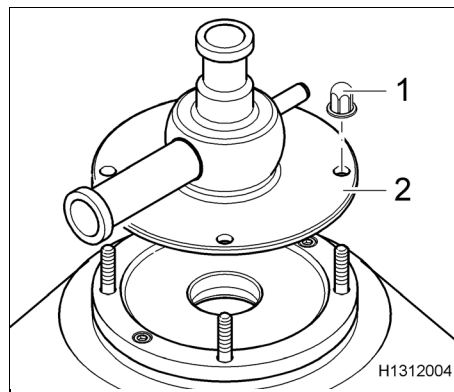


Fig. 121

- Screw the two Allen screws into the hood.



- Mount discharge (2) and bolt tight with cap nuts (1) and seals.

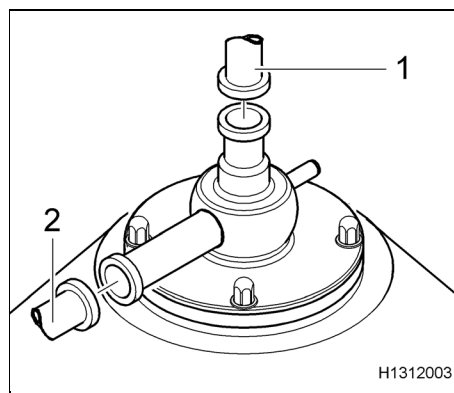


Fig. 122

- Connect feed line (1) and discharge line (2) and tighten firmly.



Danger to life through loose machine parts

Loose machine parts are flung around during operation and lead to serious injury.

- Do not loosen connecting parts (discharge/connecting ring) when fitting the lines.

12.17 Removing nozzles with mounted hood

When the separator is in the assembled state, the nozzles can be reached through an opening in the hood. A special tool from the tool kit is used to dismantle the nozzles.

Conditions

- The hood is mounted.
- The machine is switched off and the bowl is at a standstill, see chapter entitled "Standstill check of the rotating machine parts".

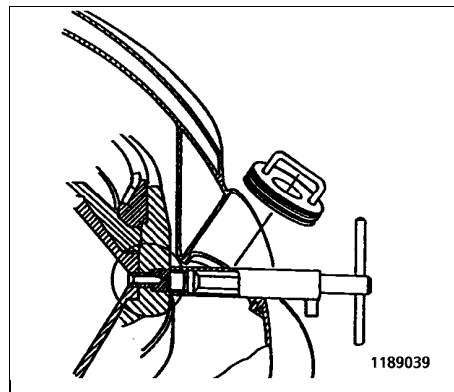


Fig. 123

- Unscrew the cover for the sight glass on the hood.

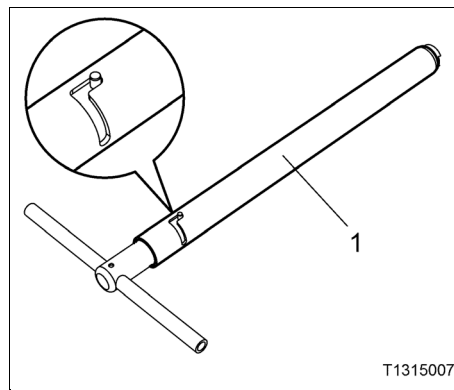


Fig. 124

- Draw back sleeve (1) of the nozzle wrench until bolt (2) is at the stop.

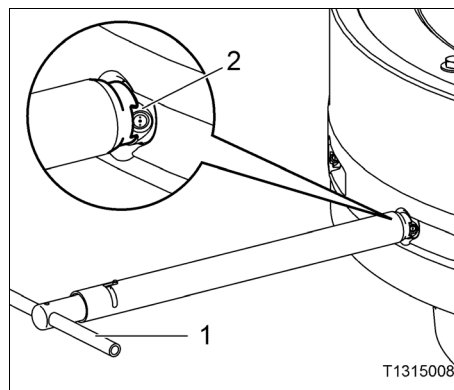


Fig. 125

- Push nozzle wrench (1) into the swallowtail guide of nozzle (2).

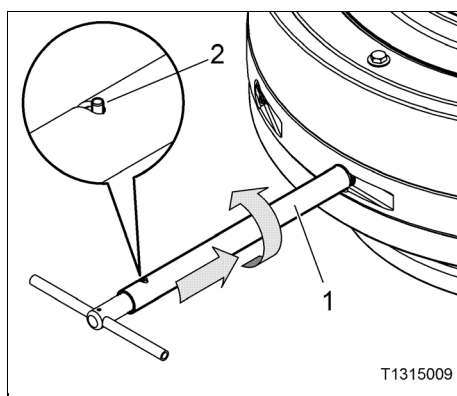


Fig. 126

- Push sleeve (1) of the nozzle wrench over the swallowtail guide and turn until bolt (2) reaches its stop.

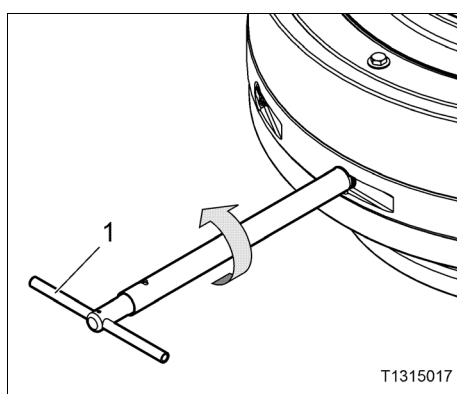


Fig. 127

- Unscrew the nozzle with nozzle wrench (1) (**right-hand thread**).

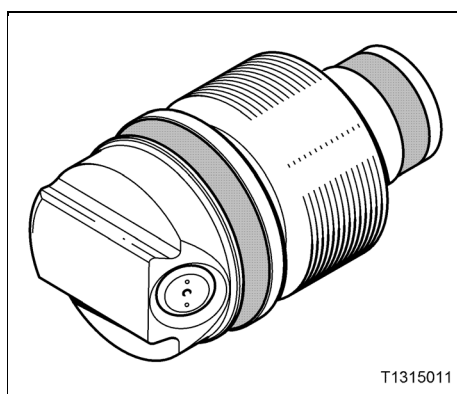


Fig. 128

- Clean the nozzles and check for damage or wear, replacing if necessary.
- Check gaskets and replace if necessary.

12.17.1 Fitting nozzles with mounted hood

Before the nozzles are fitted again, the separator can be started up briefly and supplied with water to flush the nozzle bores clear.

- Close the cover in the hood.
- Switch on the separator.
- Open the water supply and flush the bowl for a few minutes.
- Switch off the separator and wait until the bowl is at a standstill, see chapter entitled "Standstill check of the rotating machine parts".

Preconditions for fitting the nozzles

- Bowl is at a standstill.
- Nozzle bores are clear and clean.
- Nozzle gaskets are undamaged or new.
- Tool: nozzle wrench

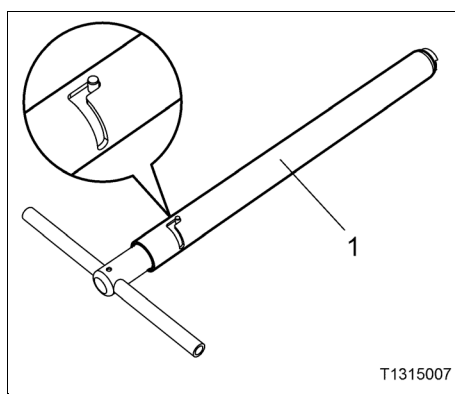


Fig. 129

- Turn sleeve (1) of the nozzle wrench and draw it back.
- Push the nozzle into the swallowtail guide.
- Push sleeve (1) of the nozzle wrench over the swallowtail guide and turn until the bolt reaches its stop.

NOTICE

Damage to the nozzles if incorrectly fitted.

The front face of the nozzles must be flush with the outer wall of the bowl bottom. The nozzles may not be screwed in deeper than specified and never as far as they will go.

The consequence would be damage to the nozzle seat and severe splashing of the discharging product during operation.

- Do not screw in nozzles as far as they will go.
- Screw in the nozzle until the following conditions are met:
 - swallowtail guide is horizontal;
 - front face of nozzle is flush with outer wall of bowl bottom;
 - outlet bore of nozzle faces backwards - against the direction of rotation.
- Proceed as above with all nozzles.
- Close the cover on the hood.

12.18 Aligning the concentrate collector

It is not usually necessary to dismantle the concentrate collector.

If the concentrate collector does have to be dismantled for particular reasons, however, it must be centred in relation to the bowl spindle when being fitted.

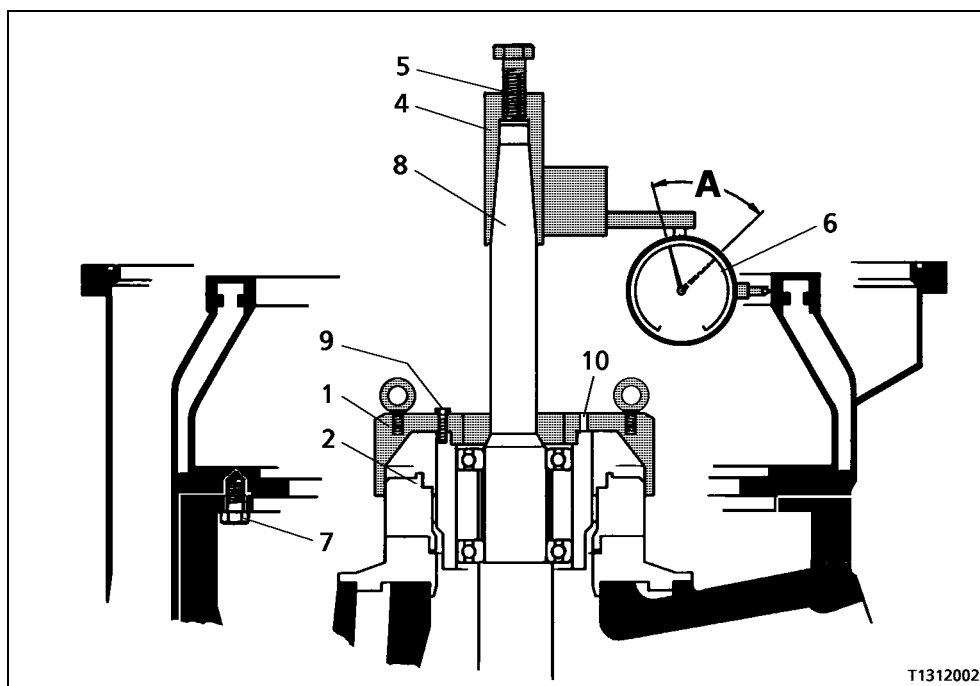
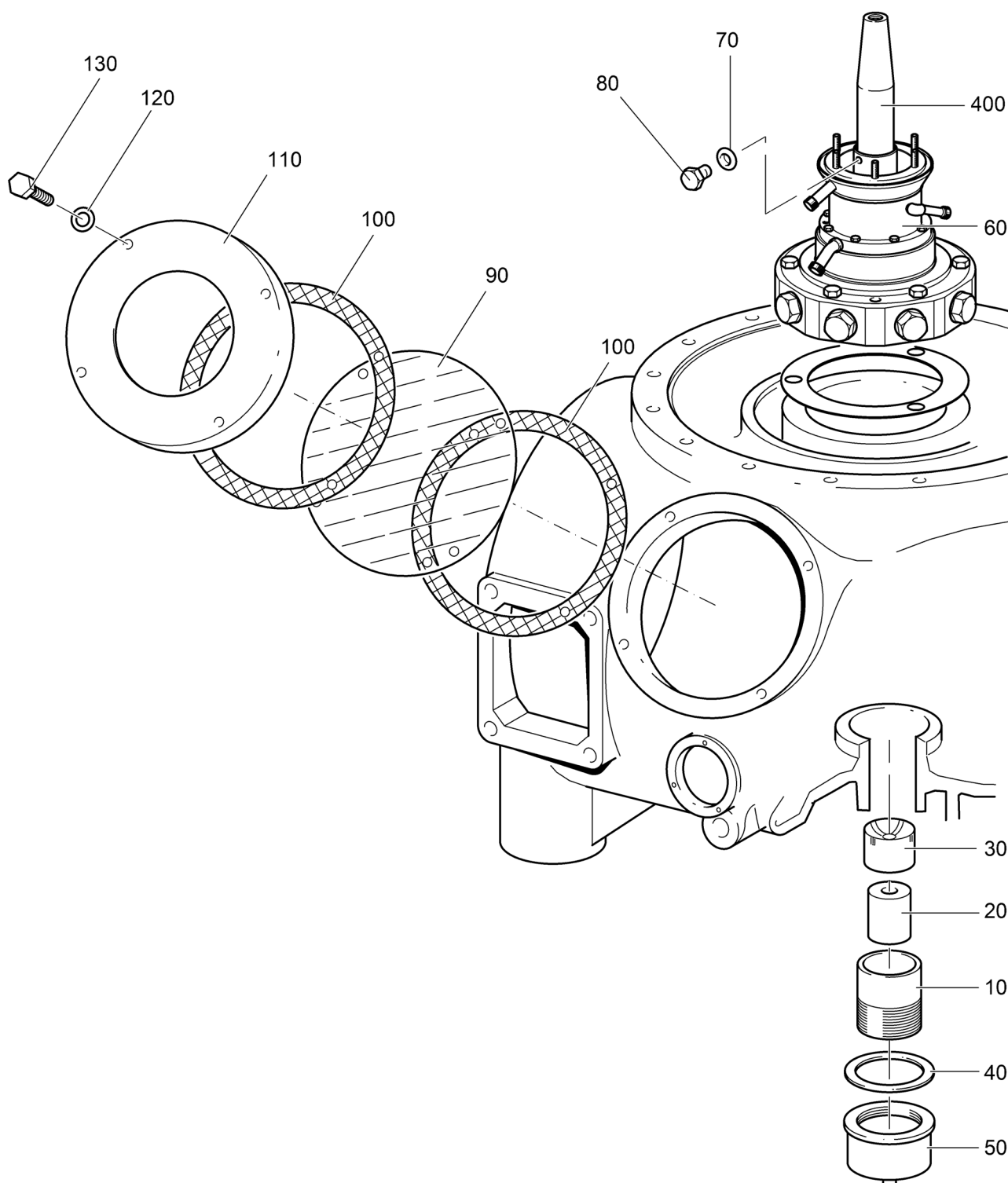


Fig. 130

- Unscrew the threaded plug from neck bearing bridge (2).
- Fasten centring ring (1) on the neck bearing bridge using (9).
- Fit sleeve (4) on spindle (8).
- Unscrew puller screw (5) until the sleeve bears on the spindle cone.
- Fasten dial gauge (6) to sleeve (4).
- Undo bolts (7) using the spanner for the concentrate collector.
- Align the concentrate collector so that dimension "A" deviates by **no more than 0.4 mm** around the entire circumference of the concentrate collector.
- Tighten bolts (7) and measure again, correcting if necessary.
- Remove dial gauge (6).
- Remove sleeve (4) by tightening puller screw (5).
- Screw screws (9) into the pull-off bores (10).
- Remove centring ring (1) by tightening screws (9).
- Screw the threaded plug into neck bearing bridge (2) and tighten evenly cross-wise.

12.19 Overview of drive - vertical gear parts

Exploded view of the drive



A1315004

Fig. 131

- 10 Bottom bearing threaded piece
- 20 Sleeve
- 30 Bottom bearing pressure piece
- 40 Seal
- 50 Bottom bearing cap
- 60 Neck bearing bridge with slide-ring packing
- 70 Seal
- 80 Hex head screw
- 90 Sight glass disk
- 100 Seal
- 110 Ring
- 120 Washer
- 130 Hex head screw
- 400 Spindle

12.20 Dismantling vertical gear parts

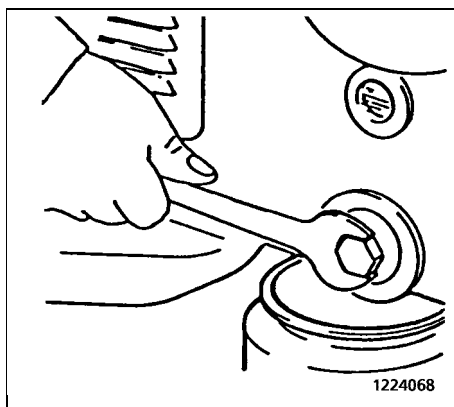


Fig. 132

- Remove the bowl, see chapter entitled "Servicing / Removing the bowl".
- Loosen oil drain screw.
- Drain the oil into an oil pan and dispose of it in a proper manner.

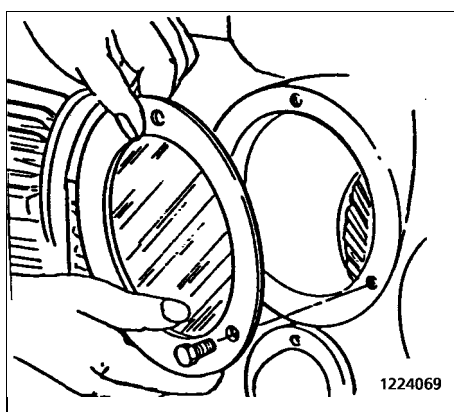


Fig. 133

- Remove screws.
- Take off gear sight glass.

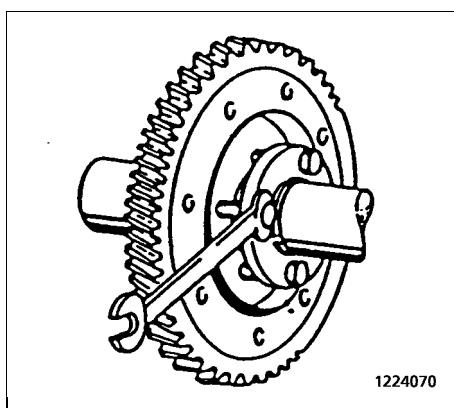


Fig. 134

- Loosen the screws in the clamp plates of the worm wheel.

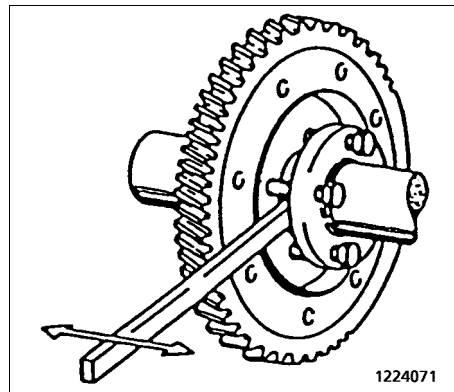


Fig. 135

- Slacken clamp plates until the worm wheel can be moved on worm wheel shaft.
- Push worm wheel on the worm wheel shaft to the clutch side.

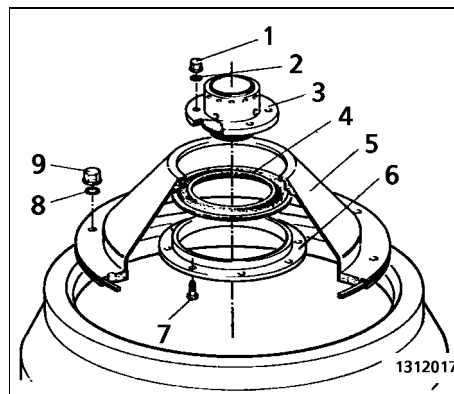


Fig. 136

- Unscrew cap nuts (1).
- Remove gaskets (2).
- Remove operating-water feed (3).
- Unscrew cap nuts (9).
- Remove gaskets (8).

If sleeve (4) is porous or cracked, it must be replaced.

- Replace sleeve (4).
 - Unscrew screws (7).
 - Force off ring (6) with hex head screws M 8.
 - Take out seal (4) downwards.

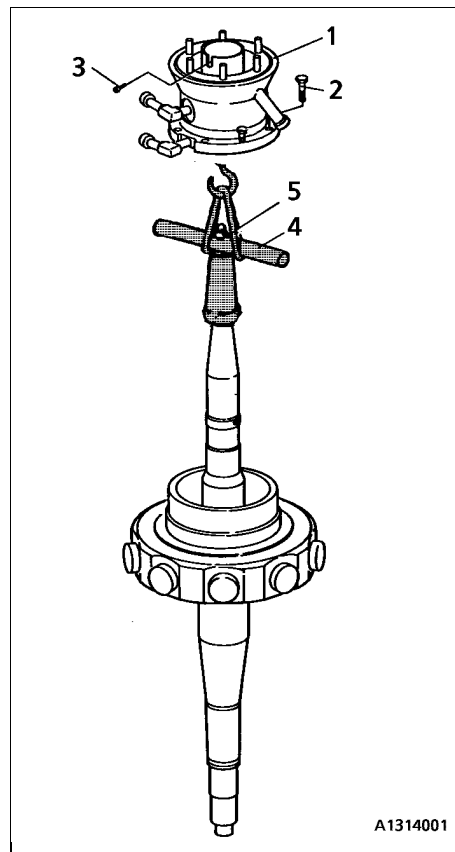


Fig. 137

Remove the following connections:

- slide-ring packing for sealing water feed
 - slide-ring packing for sealing water discharge
 - leak discharge line
 - frame pot for sterile air
- Remove sealing cartridge (1).
 - Unscrew screw (3) from sleeve/spindle.
 - Unscrew screws (2).
 - Push sealing cartridge (1) off the neck bearing bridge with hex head screws M 8.
 - Lift out the spindle.
 - Fasten spindle lifter (4) to the spindle with the aid of bowl spindle screw (5).
 - Lift out spindle together with neck bearing bridge with the aid of the hoist.

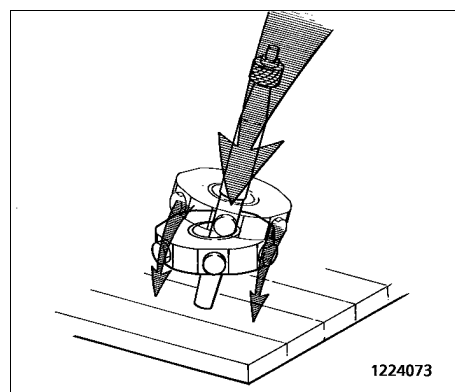


Fig. 138

- Remove the neck bearing bridge from the spindle.
 - Knock the spindle on a wooden surface until the neck bearing bridge comes loose.
- Dismantle the neck bearing bridge, see chapter entitled "Dismantling the neck bearing bridge".

12.20.1 Dismantling the worm spindle

Dismantling of the worm spindle is described in the chapter "Servicing / Removing the vertical gear parts".

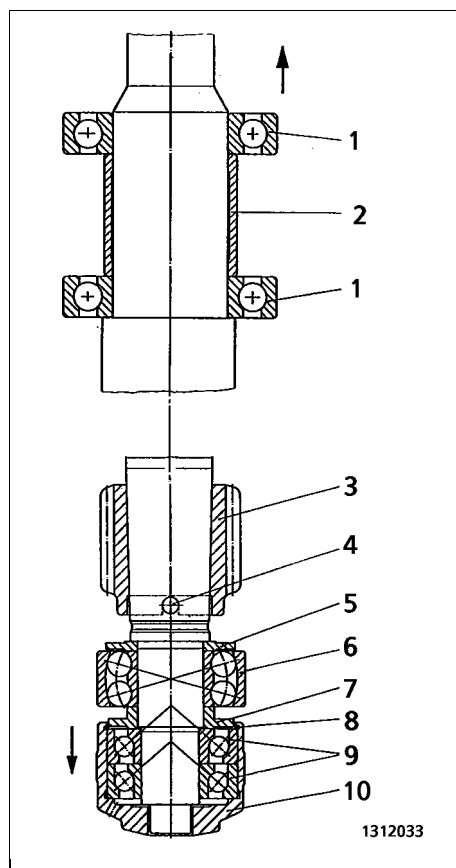


Fig. 139

- Pull off the following components using a commercially available puller:
 - ball bearing protection ring (7)
 - angular contact ball bearing (9)
 - bottom bearing pressure housing (10)
 - ball bearing protection ring (5)
 - pendulum ball bearing (6)
- Drive out cylindrical notched pin (4).
- Pull off worm (3).
- Pull off grooved ball bearing (1) and sleeve (2).
- Press snap ring (8) out of the groove of bottom bearing housing (10).
- Remove angular contact ball bearing (9) from bottom bearing pressure housing (10).

12.20.2 Dismantling the neck bearing bridge

Dismantling of the neck bearing bridge is described in the chapter "Servicing / Removing the vertical gear parts".

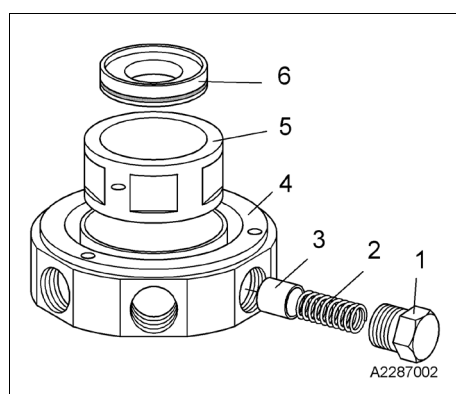


Fig. 140

- Dismantle threaded plug (3), spring (2) and spring piston (1).
- Lift out neck bearing pressure ring (5) from neck bearing bridge (4).
- Force counter-ring (6) with gasket out of neck bearing pressure ring (5).
- Check all components for damage or wear, replacing them if necessary.

12.20.3 Dismantling the bottom bearing

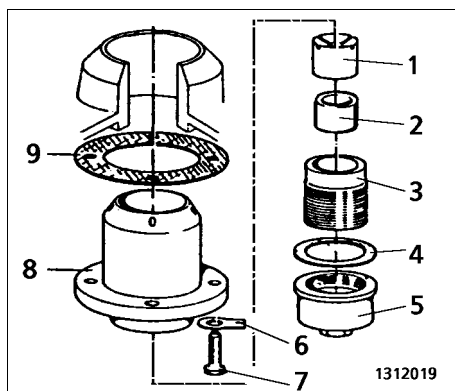


Fig. 141

- Unscrew bottom bearing cap (5) and take off gasket (4).
- Unscrew bottom bearing threaded piece (3) with spring column (2) and bottom bearing pressure piece (1).

When bottom bearing housing (8) has to be renewed:

- Straighten tab washers (6).
- Unscrew the screws (7).
- Screw two screws (7) into the tapholes of the bottom bearing housing (8).
- Force the bottom bearing housing (8) downwards by tightening the two screws (7).

12.21 Dismantling horizontal gear parts

Dismantling of the horizontal gear parts is described below. A distinction is made between two drive variants when dismantling the motor and the clutch:

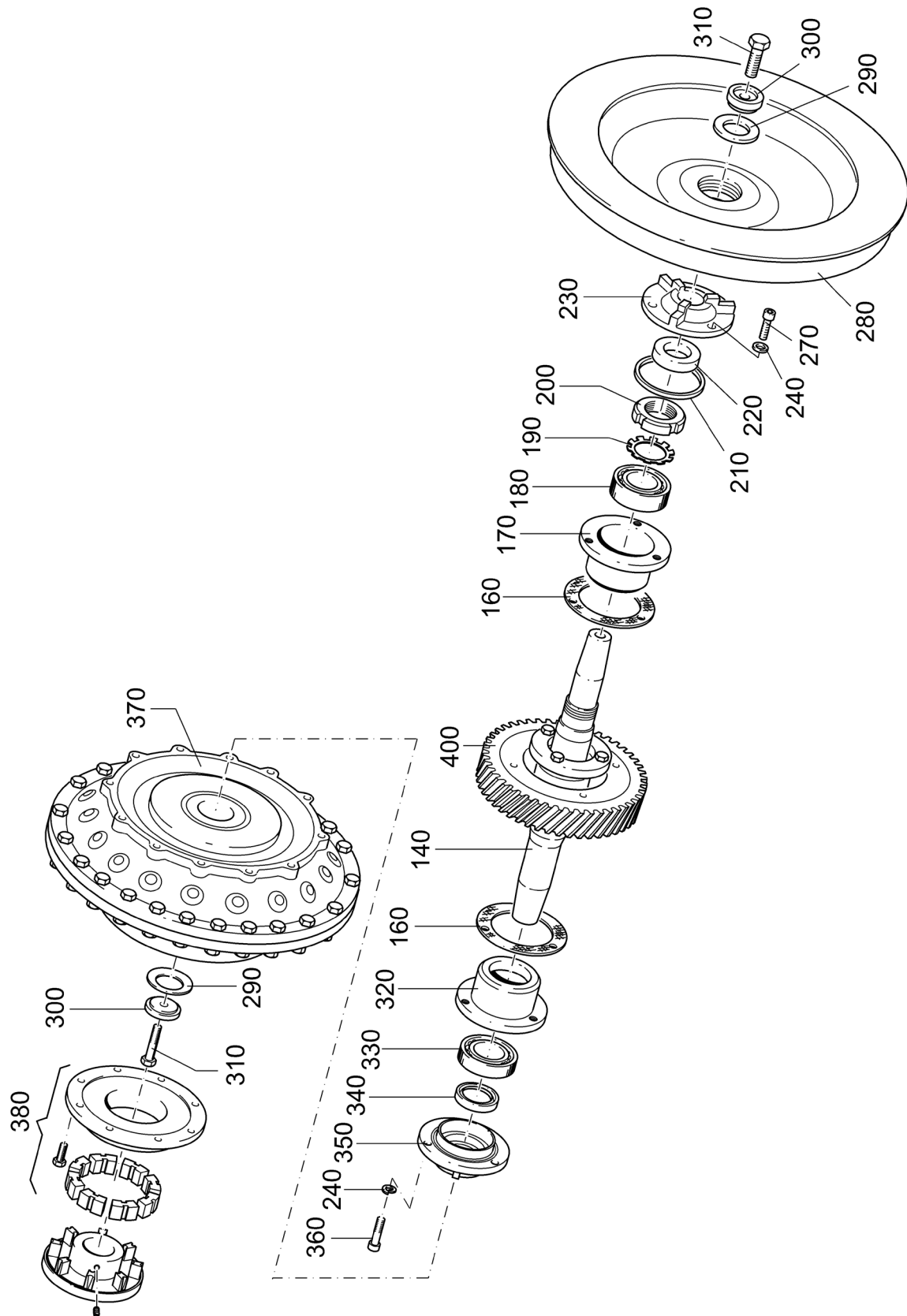
- drive with fluid clutch (variant 1)
- drive with rigid clutch and frequency converter (variant 2)

All other gear parts are dismantled in the same way for both variants.

Work on electrical cables may only be carried out by a qualified electrician in observance of local safety regulations.

12.22 Drive overview - horizontal gear parts (variant 1)

Exploded view of the drive



A1315000

Fig. 142 Drive with fluid clutch

- 140 Worm wheel shaft
- 160 Seal
- 170 Bearing housing
- 180 Angular contact ball bearing
- 190 Tab washer
- 200 Grooved nut
- 210 Gasket
- 220 Shaft seal ring
- 230 Bearing cover
- 240 Lock washer
- 250 Washer
- 260 Allen screw
- 270 Allen screw
- 280 Brake pulley
- 290 Cup spring
- 300 Centering disk
- 310 Hex head screw
- 320 Bearing housing
- 330 Grooved ball bearing
- 340 Shaft seal ring
- 350 Bearing cover
- 360 Allen screw
- 370 Fluid clutch
- 380 Set of clutch connecting parts
- 400 Worm wheel

12.22.1 Dismantling motor (variant 1)

Drive with fluid clutch



Risks from electric 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 disconnected by authorized personnel.
- Work only on deenergised leads.

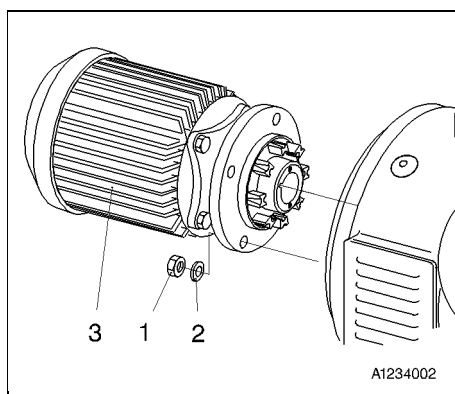


Fig. 143

- Remove motor protective hood.
- Suspend the motor in a suitable hoist.
- Take up the slack on the rope.
- Unscrew hexagon nuts (1).
- Remove lock washers (2).
- Remove the motor together with the clutch.
- Put the motor down on a suitable surface, e.g. a wooden pallet.

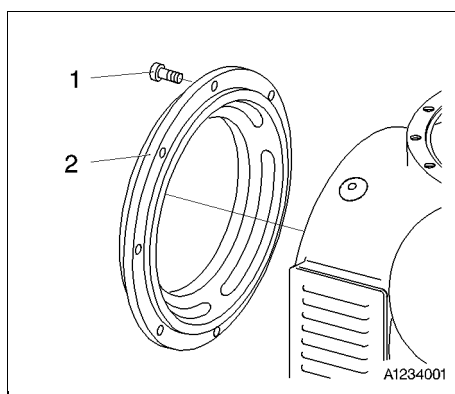


Fig. 144

- Unscrew screws (1).
- Remove intermediate flange (2).

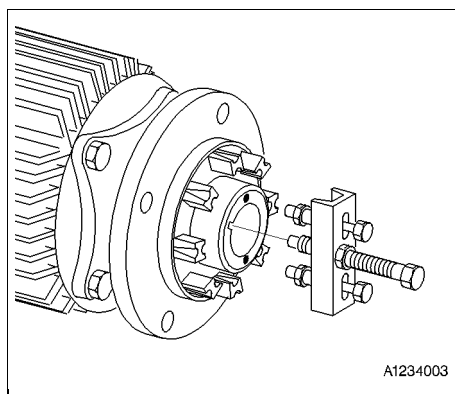


Fig. 145

- Withdraw claw hub from motor shaft end using pulling device.

12.22.2 Dismantling clutch (variant 1)

Drive with fluid clutch

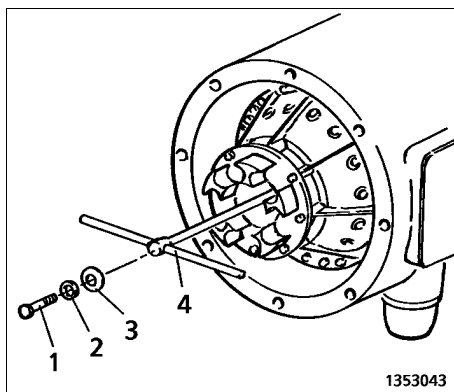


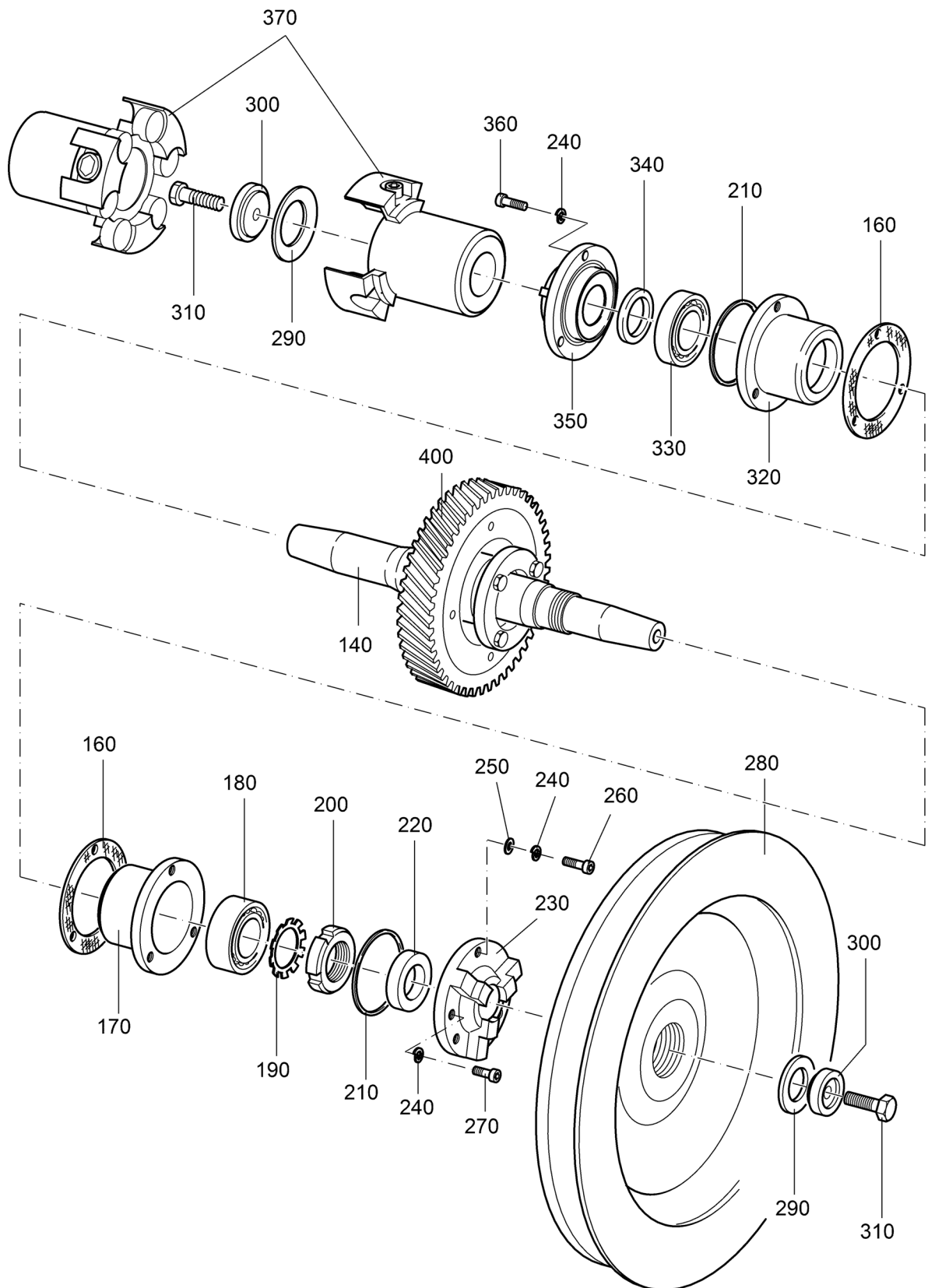
Fig. 146

After removing the motor:

- loosen screw (1) using torque wrench.
 - **IMPORTANT:** note tension of cup spring (3).
- Unscrew screw (1).
- Remove washer (2) and cup spring (3).
- Pull the coupling off the cone of the worm wheel shaft with pulling device (4).

12.23 Drive overview - horizontal gear parts (variant 2)

Exploded view of the drive



A1315006

Fig. 147 Drive with rigid clutch and frequency converter

- 140 Worm wheel shaft
- 160 Seal
- 170 Bearing housing:
- 180 Angular contact ball bearing
- 190 Tab washer
- 200 Grooved nut
- 210 Gasket
- 220 Shaft seal ring
- 230 Bearing cover
- 240 Lock washer
- 250 Washer
- 260 Allen screw
- 270 Allen screw
- 280 Brake pulley
- 290 Cup spring
- 300 Centering disk
- 310 Hex head screw
- 320 Bearing housing
- 330 Grooved ball bearing
- 340 Shaft seal ring
- 350 Bearing cover
- 360 Allen screw
- 370 Coupling
- 400 Worm wheel

12.23.1 Dismantling motor (variant 2)

Drive with rigid clutch and frequency converter

**DANGER**

Risks from electric 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 disconnected by authorized personnel.
- Work only on deenergised leads.

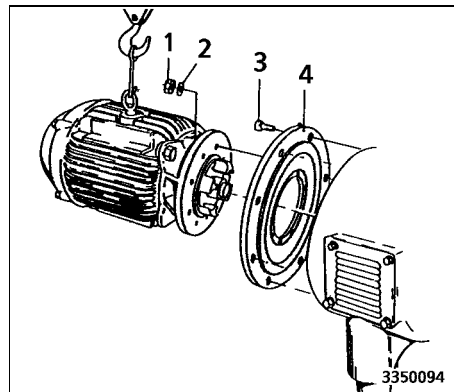


Fig. 148

If intermediate flange (4) has to be removed:

- unscrew screws (3).
- Remove intermediate flange (4).

- Remove motor protective hood.
- Suspend the motor in a suitable hoist.
- Take up the slack on the rope.
- Unscrew hexagon nuts (1).
- Remove lock washers (2).
- Remove the motor together with the clutch.
- Put the motor down on a suitable surface, e.g. a wooden pallet.

12.23.2 Dismantling clutch (variant 2)

Drive with rigid clutch and frequency converter

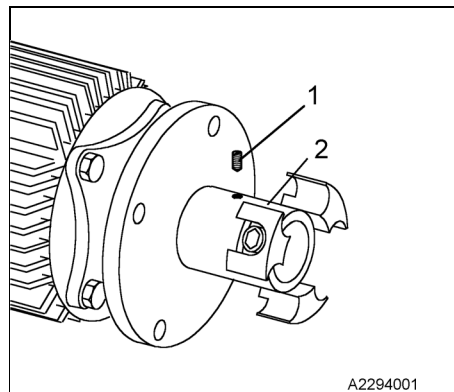


Fig. 149

After removing the motor:

- unscrew threaded pin (1) of the clutch from the motor shaft.
- Pull off clutch (2) with a commercially-available pulling device.

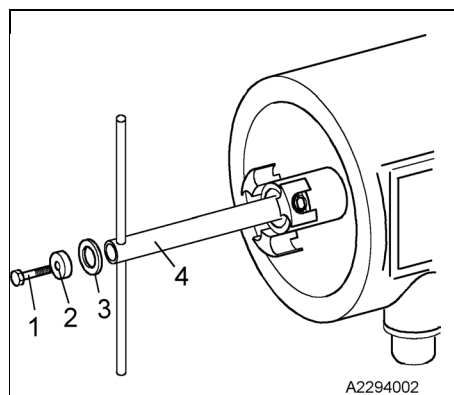


Fig. 150

- Loosen screw (1) using torque wrench.
- Note tension of cup spring (3).
- Unscrew screw (1), washer (2) and cup spring (3).
- Pull the clutch off the cone of the worm wheel shaft with pulling device (4).

12.23.3 Removing the worm wheel

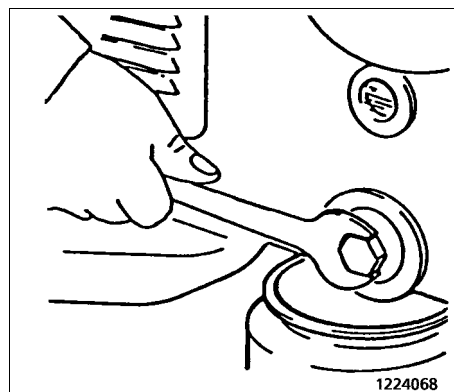


Fig. 151

- Loosen oil drain screw.
- Drain oil into oil pan.

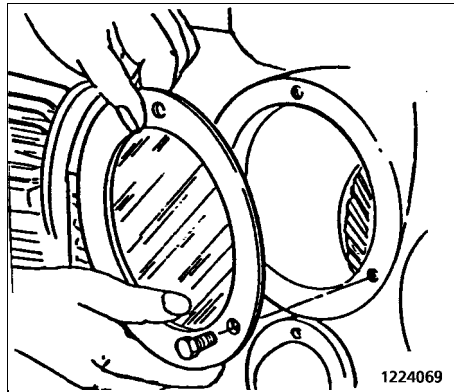


Fig. 152

- Unscrew screws from gear sight glass.
- Remove sight glass.

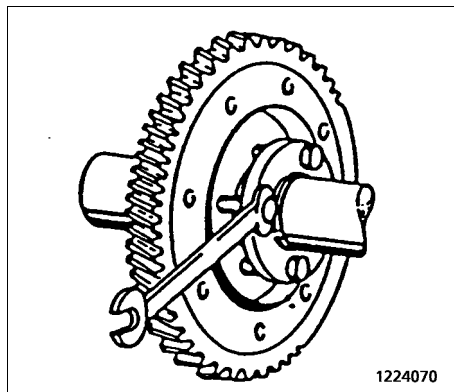


Fig. 153

- Loosen hex head screws in clamp plates of worm wheel.

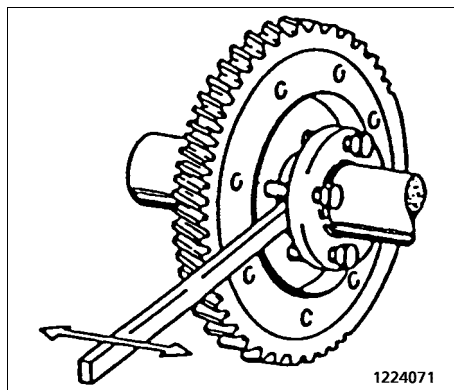


Fig. 154

- Slacken clamp plates until the worm wheel can be moved on worm wheel shaft.
- Push worm wheel on the worm wheel shaft to the clutch side.

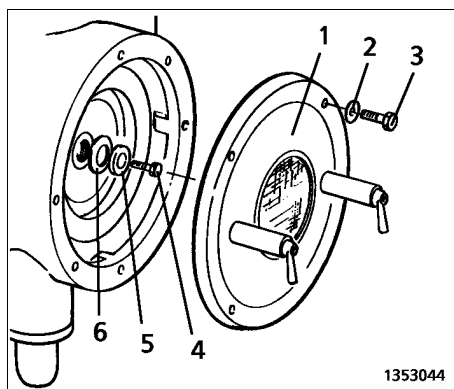


Fig. 155

- Unscrew screws (3) and washers (2) and then remove fan cover (1).
- Unscrew screw (4) from the worm wheel shaft.
- Note tension of cup springs.
- Remove centring disk (5) and cup spring (6).

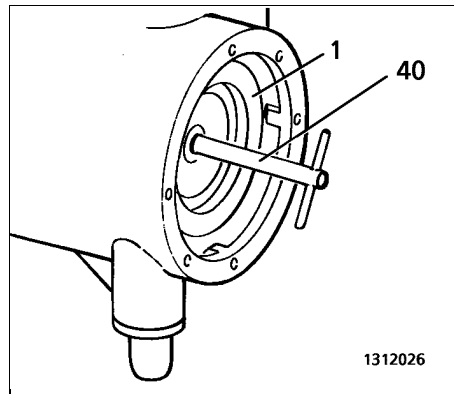


Fig. 156

- Force brake pulley (1) off the cone of the worm wheel shaft with pulling device (40).

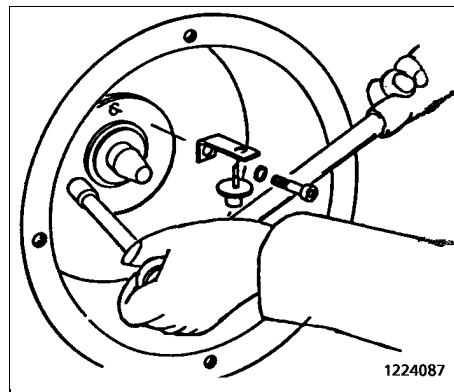


Fig. 157

- Unscrew Allen screws from bearing cover.
- Remove holder with proximity switch.

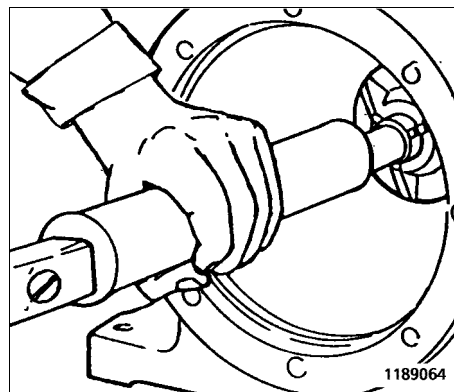


Fig. 158

- Place on wooden block.
- Drive out worm wheel shaft towards brake side including ball bearing, nut and bearing cover until the ball bearing has been loosened from the seat on the motor side.

- Pull out the worm wheel shaft by hand.
 - As you do this, hold the worm wheel shaft steady so as not to damage the teeth.
- Take worm wheel with clamp plates out of the gear housing.

12.23.4 Dismantling the grooved ball bearing (motor-side)

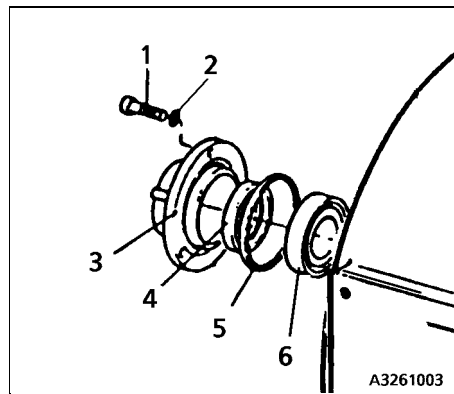


Fig. 159

- Unscrew hex head screws (1).
- Remove lock washers (2).
- Remove bearing cover (3) together with sealing ring (4) and gasket (5).
- Drive out the ball bearing (6) from the gear chamber with a brass mandrel and light hammer blows on the inner ring of the ball bearing.

12.23.5 Dismantling the angular contact ball bearing (brake-side)

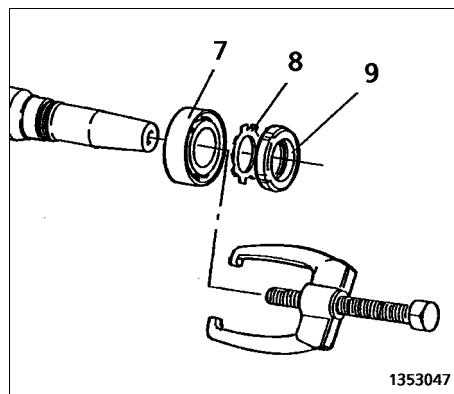


Fig. 160

- Bend tab of washer (8) out of groove of nut (9).
- Loosen and unscrew grooved nut using the pivoted hook wrench.
- Remove tab washer (8).
- Withdraw angular contact ball bearing (7) from the worm wheel shaft using a commercial pulling device.

12.23.6 Replacing slide-ring packing

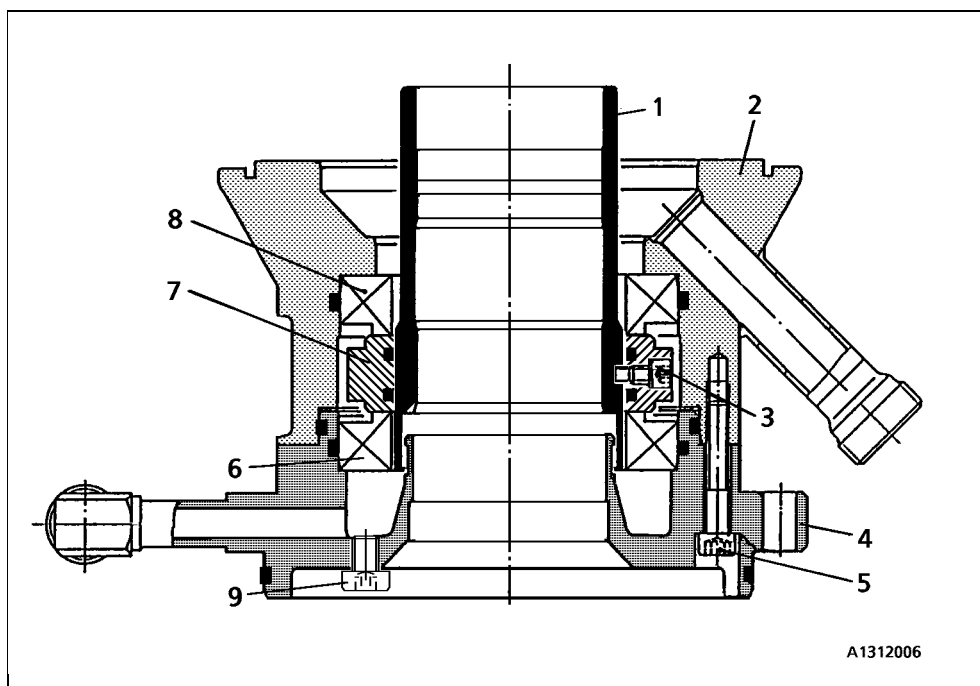


Fig. 161

The slide-ring packing consists of the following items.

- 3 Allen screw
- 6 Slide ring
- 7 Counter-ring
- 8 Slide ring

Dismantling of the slide-ring packing cartridge is described in the chapter entitled "Servicing / Removing vertical gear parts".

- Unscrew screws (5) and pull slide-ring housing (4) off slide-ring housing cover (2).
 - Upper slide ring (8) remains in slide-ring housing cover (2).
 - Lower slide ring (6) remains in slide-ring housing (4).
- Lift out sleeve (1) with counter-ring (7).
- Unscrew screw (3).
- Unscrew screws (9).

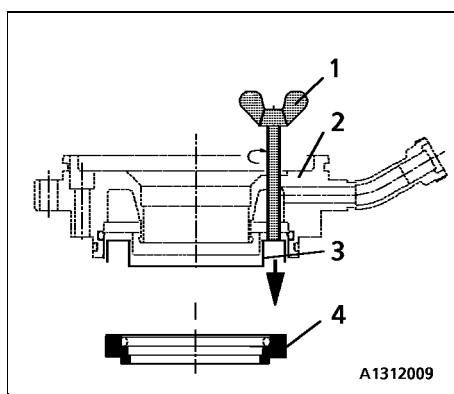


Fig. 162

- Lift out slide ring (4) by hand.
- Screw three wing screws (1) into the puller holes.
- Tighten the wing screws (1) evenly and push the slide ring cage (3) out of the slide ring housing (2).

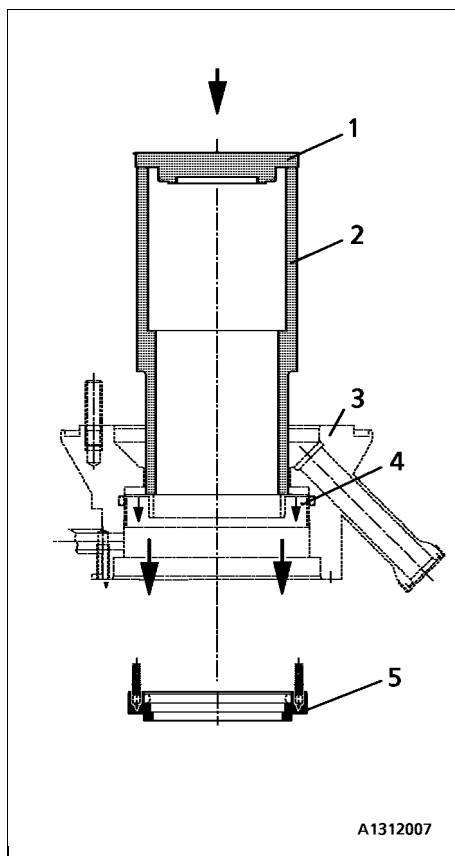


Fig. 163

- Lift out the slide ring (5) by hand.
- Insert the sleeve (2) with the small outer diameter into the slide ring housing cover (3).
- Fit disk (1).
- Press out the slide ring cage by hammering on disk (1).

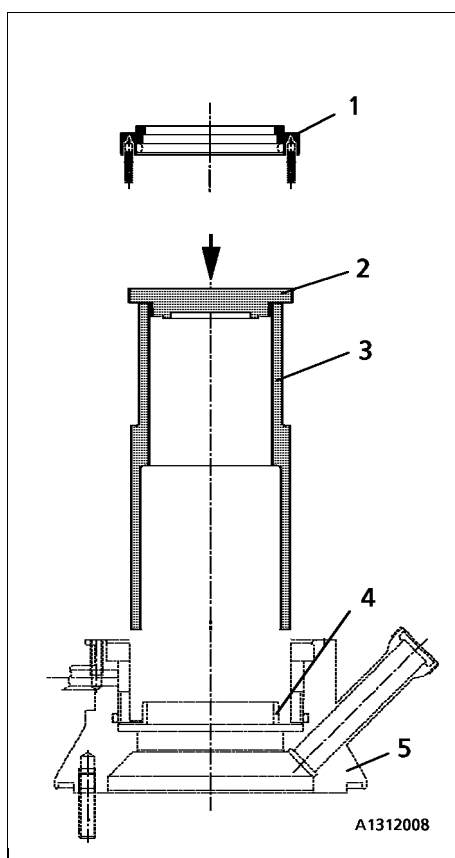


Fig. 164

Fitting:

- When assembling:
 - Make sure that the parts are absolutely clean.
 - Replace gaskets.
 - be careful not to damage sealing surfaces and gaskets.
- Fit the sleeve (3) with the large outer diameter into the slide ring cage (4).
- Put disk (2) on sleeve (3).
- Press slide ring cage (4) into the slide ring cover (5) by hammering on disk (2).
- Fit slide ring (1) by hand in the slide ring cage.

IMPORTANT: the slide ring must move easily in the axial direction.

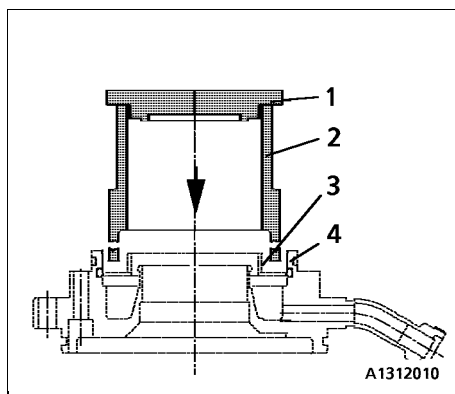


Fig. 165

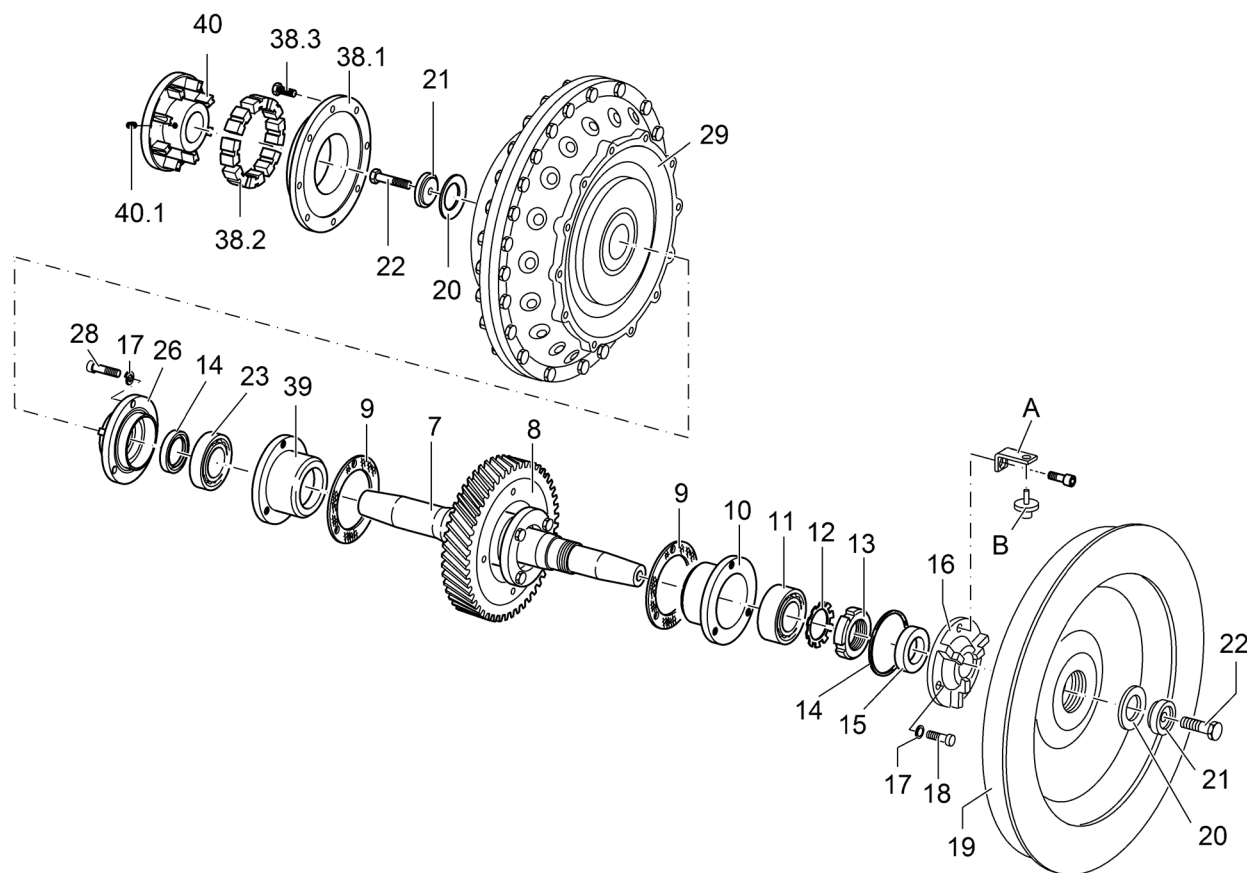
- Fit sleeve (2) with the large outer diameter on slide-ring cage (3).
- Mount disk (1).
- Press slide ring cage (3) onto disk (1) by hammering on disk (1).
- Fit the slide ring in slide-ring housing (4) by hand.

IMPORTANT: the slide ring must move easily in the axial direction.

- Replace all seals in the counter-ring.
- Bolt the counter-ring to the sleeve and mount in the slide ring housing.

12.24 Fitting horizontal gear parts (variant 1)

Drive with fluid clutch



A1315012

Fig. 166

IMPORTANT: For operating safety reasons, replace the ball bearings of the worm wheel shaft in accordance with the specification in the maintenance schedule.

- Draw angular contact ball bearing (11) onto worm wheel shaft (7). Make sure that the filling groove of the bearing faces out towards the bearing cover.
- Fit tab washer (12).
- Bolt tight grooved nut (13).
 - Bend one tab of the washer into a groove of the nut. Ensure that the tab does not extend beyond the outer diameter of the nut.
- Fit grooved ball bearing (23) in bearing housing (39) on the clutch side.
- Position bearing cover (26) and tighten with screws (28).
- Install worm wheel with clamp plates (8) into the gear housing so that the screw heads of the clamp plate point towards the brake side.

NOTICE

Unbalanced worm wheels can lead to an inadmissible vibration behavior and increased running noise.

The worm wheel has been balanced in the factory as complete assembly. To avoid unbalance, the clamp plates and the toothed rim must, therefore, not be twisted on the wheel body and component parts must not be replaced individually. Inadmissible vibration behaviour can cause premature wear to the worm wheel and worm.

- Fitting a new complete worm wheel

NOTICE**Premature wear to the worm wheel or worm or worm spindle**

If the worm or worm spindle has to be replaced, it can be assumed that the condition of the worm wheel is likewise not perfect. The new worm spindle would wear prematurely.

- When installing a new worm spindle, the worm wheel must be replaced at the same time.
- Introduce the worm wheel shaft (7) into the separator frame from the brake side, and slide on the worm wheel.
- Place a hard wooden block against the worm wheel shaft and tap it lightly with a hammer until the angular contact ball bearing (11) is tightly seated in the housing.
- Install bearing cover (16) with inserted sealing ring (15) and gasket (14).
- Bolt together bearing cover and bracket (A) for proximity switch (B) using Allen screws (18) with lock washers (17) underneath.
 - Torque: **45 Nm**.

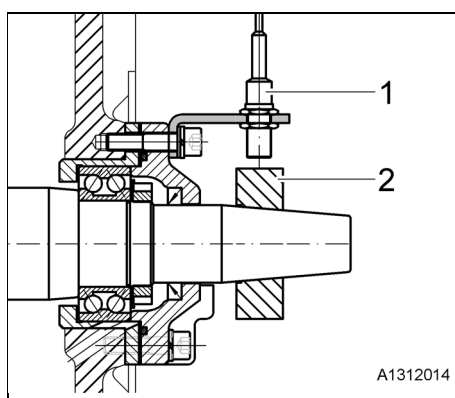


Fig. 167

- Readjust proximity switch (1) with the aid of adjusting ring (2).

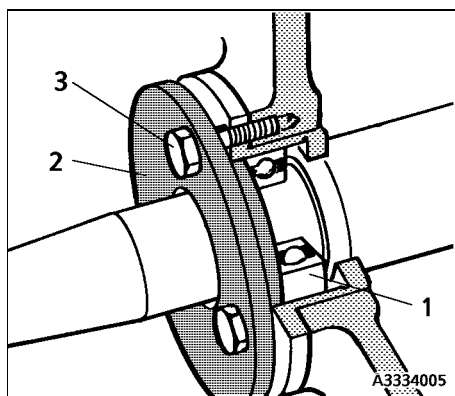
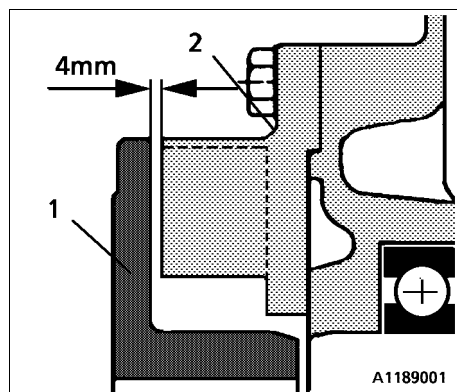


Fig. 168

- Remove bearing cover (26).
- Fit grooved ball bearing (1) (clutch side) in the bearing housing.
- Draw grooved ball bearing (1) evenly against the collar of the worm wheel shaft using assembling device (2) and screws (3).
- Unscrew screws (3).
- Remove mounting tool (2).

- Replace bearing cover (26) including shaft seal rings (25) and gasket (14) and tighten evenly using screws (28) with lock washers (17) underneath.
- Before installing fluid clutch (29) and brake pulley (19):
 - apply a thin film of grease to the tapered ends of the worm wheel shaft, then clean and wipe dry with a rag.
 - Likewise clean the inside of the hubs of the fluid clutch and brake pulley carefully.
- Slide the fluid clutch and brake pulley onto the shaft ends and screw tight with screws (22), centring washers (21) and cup springs (20).
 - Torque: **150 Nm**

- **IMPORTANT:** Before assembling the motor, check the gap between claw hub (1) and fluid clutch (2).
- The gap must be 4 mm.



The gap must always be checked when the following parts are replaced:

- motor
- claw hub
- fluid clutch
- worm wheel shaft

Fig. 169

If the gap between claw hub (1) and fluid clutch (2) has to be adjusted, proceed as described below.

- Move claw hub (1) on the motor shaft until a dimension of 4 mm is achieved.
- Redrill the hole in the motor shaft and fix the claw hub in position using a threaded pin.

Finally

- Screw on the motor with hex nuts and lock washers.
- Remove the hoist.



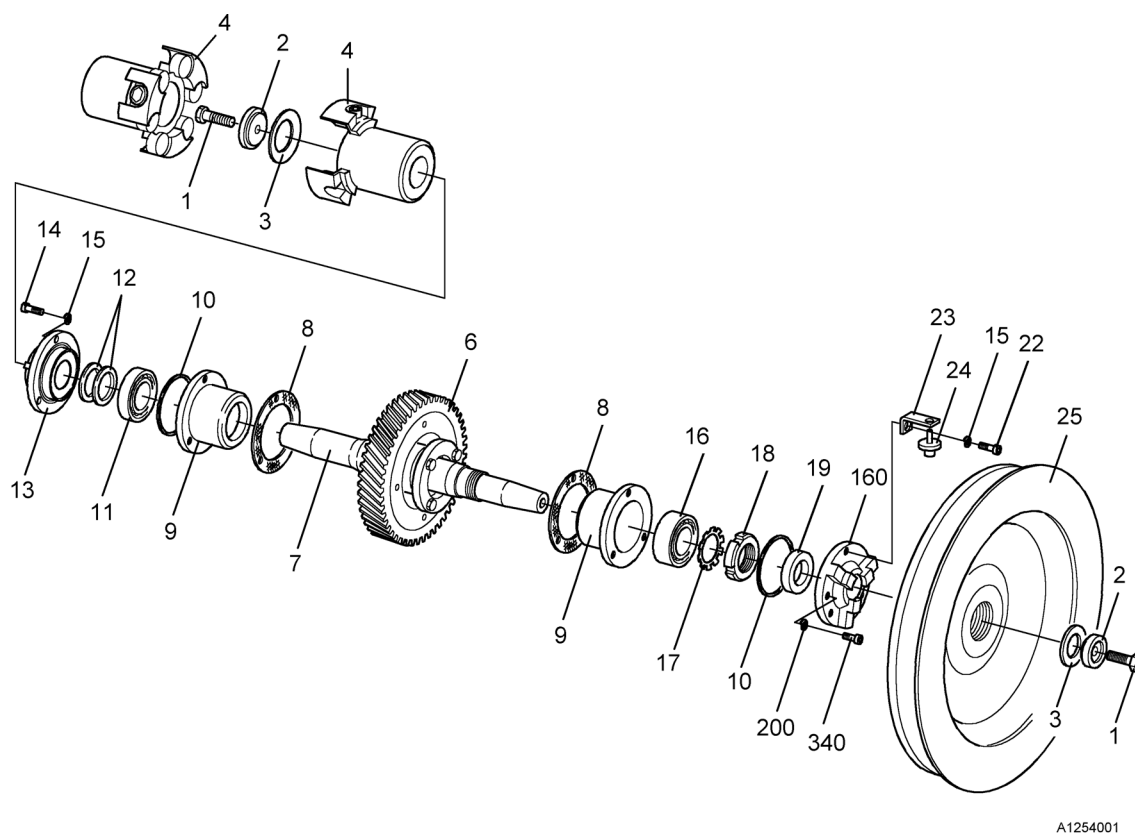
Risks from electric current

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 deenergised leads.
- Top up gear oil, see chapter entitled "Maintenance / Checking oil level and topping up oil".
- Check the direction of rotation of the bowl, see section entitled "Commissioning / Checking direction of rotation of bowl".
- When using new gear parts (worm wheel, worm), allow the separator to run for approx. one hour without bowl.
- During running-in, switch the motor on and off several times.

12.25 Fitting horizontal gear parts (variant 2)

Drive with rigid clutch and frequency converter



A1254001

Fig. 170

IMPORTANT: For operating safety reasons, replace the ball bearings of the worm wheel shaft in accordance with the specification in the maintenance schedule.

- Fit angular contact ball bearing (16) onto the worm wheel shaft. Make sure that the filling groove of the bearing faces outwards to the bearing cover.
- Fit tab washer (17).
- Bolt tight grooved nut (18).
 - Bend one tab of the washer into a groove of the nut. Ensure that the tab does not extend beyond the outer diameter of the nut.
- Fit grooved ball bearing (11) in bearing housing (9) on the clutch side.
- Position bearing cover (13) and tighten with screws (14) and lock washers (15).
- Install worm wheel with clamp plates (6) in gear housing so that the screw heads of the clamp plate point towards the brake side.

NOTICE

Unbalanced worm wheels can lead to an inadmissible vibration behavior and increased running noise.

The worm wheel has been balanced in the factory as complete assembly. To avoid unbalance, the clamp plates and the toothed rim must, therefore, not be twisted on the wheel body and component parts must not be replaced individually. Inadmissible vibration behaviour can cause premature wear to the worm wheel and worm.

- Fitting a new complete worm wheel

NOTICE**Premature wear to the worm wheel or worm or worm spindle**

If the worm or worm spindle has to be replaced, it can be assumed that the condition of the worm wheel is likewise not perfect. The new worm spindle would wear prematurely.

- When installing a new worm spindle, the worm wheel must be replaced at the same time.
- Introduce the worm wheel shaft (7) into the separator frame from the brake side, and slide on the worm wheel.
- Place a hard wooden block against the worm wheel shaft and tap it lightly with a hammer until the angular contact ball bearing (16) is tightly seated in the housing.
- Install bearing cover (160) with inserted sealing ring (19) and gasket (10).
- Bolt bearing cover and holder (23) of proximity switch (24) together by means of Allen screws (22) and Allen screws (340) and lock washers (200).
 - Torque: **45 Nm**.

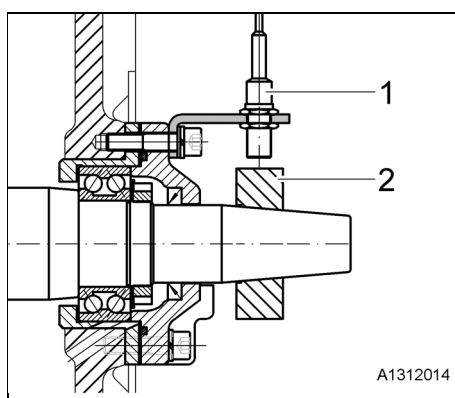


Fig. 171

- Readjust proximity switch (1) with the aid of adjusting ring (2).

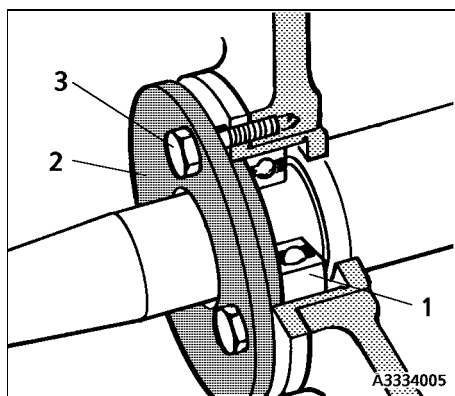


Fig. 172

- Fit grooved ball bearing (1) (coupling side) into the bearing housing.
- Fit grooved ball bearing (1) evenly against the collar of the worm wheel shaft using assembling device (2) and hex head screws (3).
- Unscrew screws (3).
- Remove mounting tool (2).

- Replace bearing cover (13) including felt rings (12) and gasket (10) and tighten evenly with hex head screws (14) (lock washers (15) placed underneath).
- Push the worm wheel towards the brake side until it rests against the collar of the worm wheel shaft. This will ensure that the toothed rim is in the correct position relative to the worm.

- Fasten worm wheel (6) securely to worm wheel shaft (7) by tightening the screws in the two clamp plates evenly and cross-wise.
 - Torque: **45 Nm**
- Before installing the clutch and the brake pulley:
 - apply a thin film of grease to the tapered ends of the worm wheel shaft, then clean and wipe dry with a rag.
 - Clean the inside of the hubs of the clutch and brake pulley carefully.
- Place cup spring (3) and washer (2) under screw (1) and tighten with a torque wrench.
 - Torque: **150 Nm**
 - This clamps the clutch and brake pulley firmly to the worm wheel shaft.

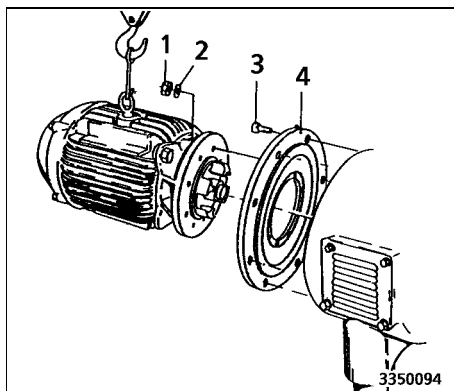


Fig. 173

- Fit intermediate flange (4).
- Screw in screws (3) and tighten.
- Suspend a suitable hoist in the eye bolt.
- Lift the motor together with the clutch and guide the clutch halves into one another.

- **IMPORTANT:** before assembling the motor, check the gap between the two clutch halves.
 - The gap must be 8^{+1} mm.

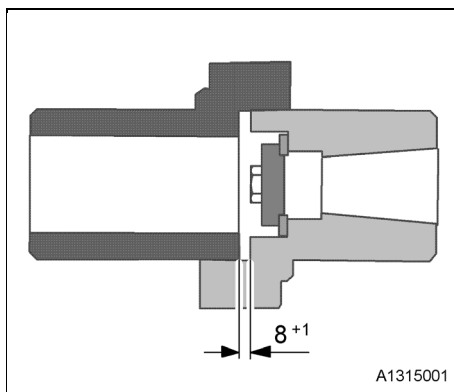


Fig. 174

The gap must always be checked when the following parts are replaced:

- motor
- clutch
- worm wheel shaft

If the gap between the two clutch halves has to be adjusted, proceed as described below.

- Move clutch half on the motor shaft until a dimension of 8^{+1} mm is achieved.
- Redrill the hole in the motor shaft and fix the clutch half in position using a threaded pin.

Finally

- Screw on the motor with hex nuts and lock washers.
- Remove the hoist.

**DANGER****Risks from electric 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 deenergised leads.
- Top up gear oil, see chapter entitled "Maintenance / Checking oil level and topping up oil".
- Check the direction of rotation of the bowl, see section entitled "Commissioning / Checking direction of rotation of bowl".
- When using new gear parts (worm wheel, worm), allow the separator to run for approx. one hour without bowl.
- During running-in, switch the motor on and off several times.

12.26 Fitting the vertical gear parts

For re-assembly of the vertical gear parts proceed in reverse order of removal. Special attention should be paid to the following points:

NOTICE**Premature wear to the worm spindle**

If the worm spindle has to be replaced, it can be assumed that the condition of the worm wheel is likewise not perfect. The new worm spindle would wear prematurely.

- When installing a new worm spindle, the worm wheel must be replaced at the same time.

- Thoroughly clean the bowl (see chapter "Cleaning")
- Check condition of the ball bearings on the spindle.

NOTICE**Destruction of the bearing**

Faulty mounting will inevitably result in irreparable damage to the bearings. The angular contact ball bearings may be loaded axially in one direction only.

- The two angular contact ball bearings must always be replaced together.
- Use only the ball bearings specified in the spare parts catalog.
 - Precision grooved ball bearings, quality class P6
 - Angular contact ball bearings for fitting in pairs

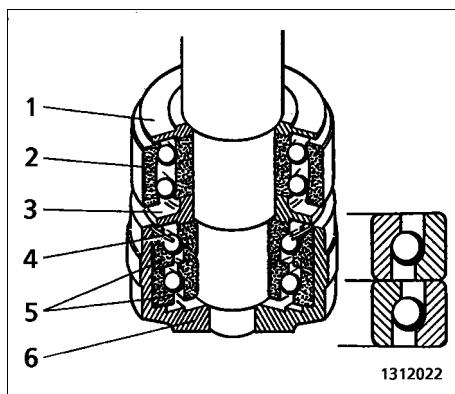


Fig. 175

IMPORTANT!

- They must be fitted so that the broad shoulder of the bearing inner rings is on top.

For fitting proceed as follows:

- Slide the heated angular contact ball bearings (5) onto the spindle.
- Slip snap ring (4) over the ball bearings.
- Let ball bearings cool down.
- Slide bottom bearing pressure housing (6) over the ball bearings.
- Press snap ring (4) into the groove of the bottom bearing pressure housing.

- The worm spindle with fitted ball bearings must be able to be fitted on the upper end of the spindle without hammering and be moved axially by hand. If this is not the case, smooth the inside of the bottom bearing housing with a fine emery cloth.
- When installing a new worm, the worm wheel complete must be replaced at the same time.
- When fitting the neck bearing bridge complete, make sure the gaskets do not get damaged.

IMPORTANT! After fitting the vertical gear parts, the height of the fitted bowl must be checked and re-adjusted if necessary, see chapter "Servicing / Adjusting the bowl height".

12.26.1 Assembling the neck bearing bridge

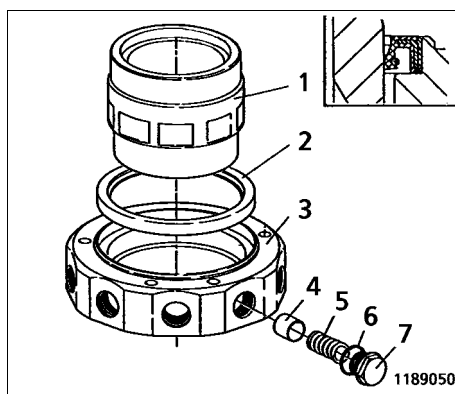


Fig. 176

- Insert radial packing ring (2) in the neck bearing bridge.
 - **IMPORTANT!** Position of the sealing lip, see small diagram.
- Fit pressure ring (1) in the neck bearing bridge.
 - **IMPORTANT!** The recesses in the pressure ring (1) must be aligned with the bores in the neck bearing bridge.
- Fit neck bearing springs (5) into the spring pistons.
- Thoroughly grease spring pistons (4).
- Screw the threaded plugs (7) together with gaskets (6), neck bearing springs (5) and spring pistons (4) into the tapholes of the neck bearing bridge until the pressure ring (1) is guided.

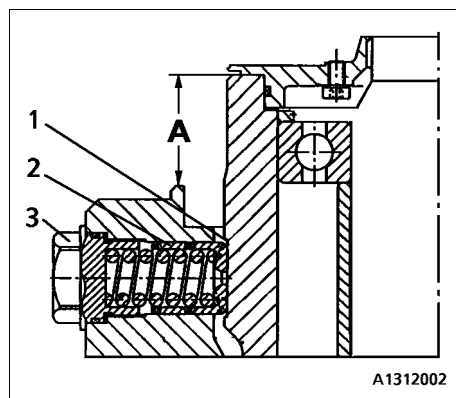


Fig. 177

- Align pressure ring (1) so that the dimension between the upper edge of the neck bearing bridge and upper edge of the pressure ring is **A=41.5 mm**.
- Tighten threaded plugs (3) uniformly and crosswise.

12.27 Bowl height

The bowl height is correctly adjusted at the factory before the separator is shipped.

12.27.1 Checking the bowl height

Check and, if necessary, readjust the bowl height:

- before the first start of the separator.
- After re-assembling the vertical gear parts.
- after exchanging the bowl,

Pre-conditions for correct pre-setting of the bowl height:

- The bowl is closed properly.
- The "0" marks on the bowl lock ring and the bowl bottom are aligned.
- The hood is correctly positioned on the solids catcher.
- The fastening screws of the hood are tight.

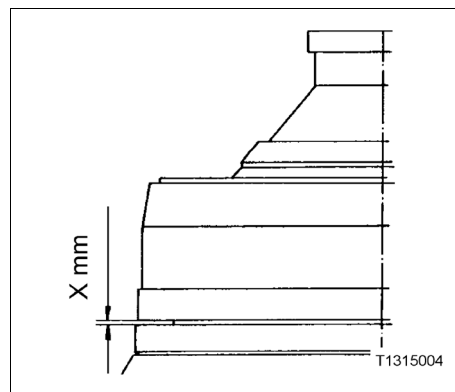


Fig. 178

- Check the bowl height.
 - The bowl height is set correctly when the gap between the concentrate catcher and the bowl bottom is **X = 2 mm**.
 - If the distance deviates from the specified dimension, the bowl must be re-adjusted.
- Note the play in height for the centripetal pump.
 - Play in height: min. 2 – 3 mm
 - In the event of deviations, contact GEA Westfalia Separator.

12.27.2 Adjusting bowl height

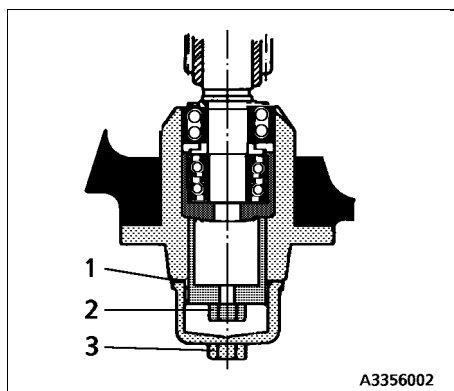


Fig. 179

- Unscrew bottom bearing cap (3).
- Remove gasket (1).
- Adjust bowl height by turning bottom bearing threaded piece (2).
 - One revolution $\approx$ 2 mm
 - Turn the bottom bearing threaded piece clockwise when the bowl is too low.
 - Turn the bottom bearing threaded piece counterclockwise when the bowl is too high.
- Then screw bottom bearing cap (3) with fitted gasket (1) on firmly.
 - Make sure that the bottom bearing threaded piece does not rotate as you do so.

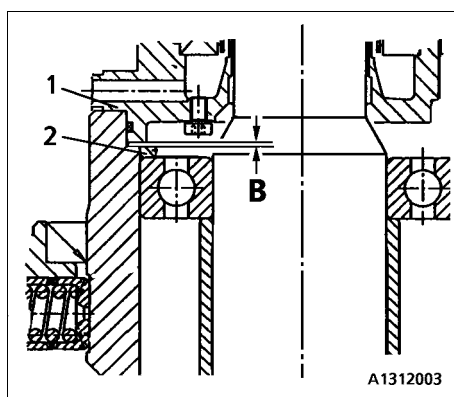


Fig. 180

- Each time the bowl has been lowered or raised
 - check distance **dimension B** between slide-ring cover (1) and spacer ring (2).
 - Dimension (B) must be 0.5 to 1 mm.

Deviations

Distance less than 0.5 mm	Distance greater than 1 mm
➤ Machine off the ring corresponding to the deviation.	➤ Weld cams onto ring (2) (120° offset) corresponding to the deviation. ➤ Alternatively: order a new spacer ring from the factory. - Quote the dimension of the required height.

IMPORTANT: The cams of the spacer ring must be directed towards the neck bearing during assembly.

12.28 Repairing the fluid clutch

As a rule, the fluid clutch is sent to the manufacturer for repair. This ensures that the clutch is correctly repaired.

On request, a spare clutch can be put at your disposal.

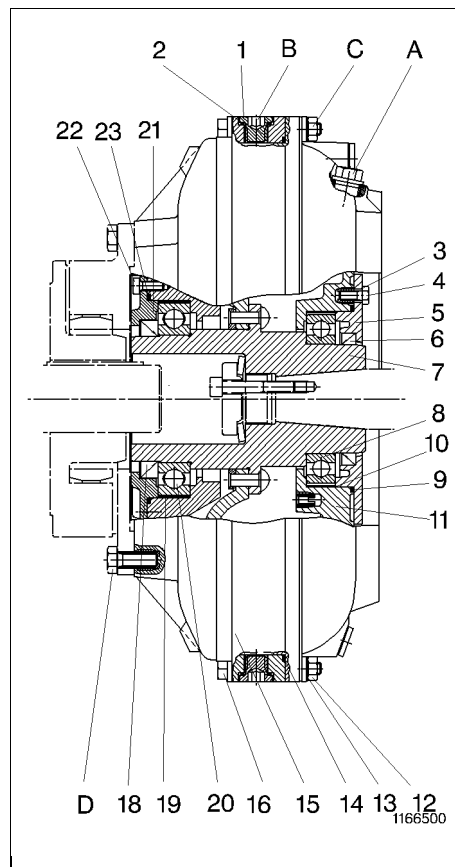


Fig. 181

If, in exceptional circumstances, you dismantle the clutch on site, we recommend that you first check only shaft seal rings (6) and (18) and replace them if necessary.

12.28.1 Dismantling the fluid clutch

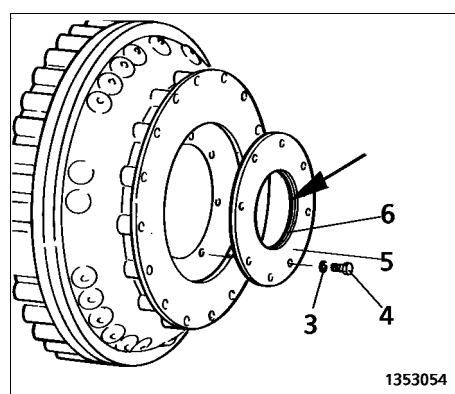


Fig. 182

- Unscrew screws (4) with lock washers (3).
- Remove shaft seal ring cover (5).
- Force out shaft seal ring (6) using a screwdriver.
- Replace the shaft seal ring if its sealing lip is no longer soft and pliable.

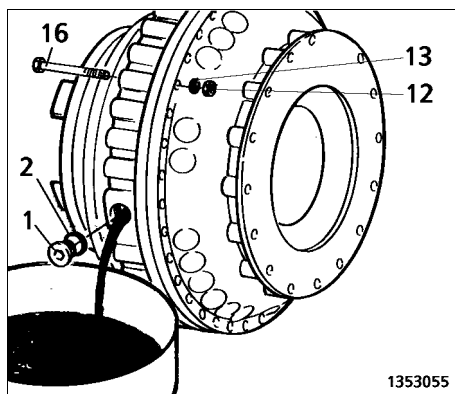


Fig. 183

- Unscrew threaded plug (1) together with gasket (2).
- Drain the oil.
- Unscrew hexagon nuts (12).
- Take out screws (16) and lock washers (13).

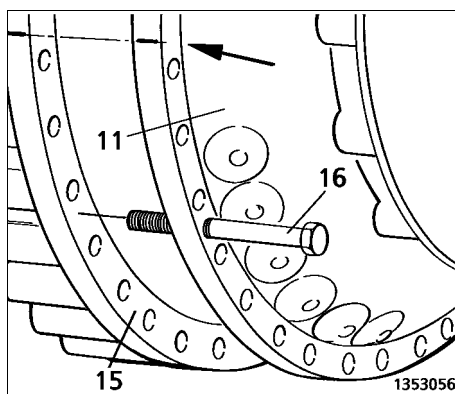


Fig. 184

- Screw two screws (16) into the tapholes of primary wheel (11).
- Force primary wheel (11) off clutch casing (15).
- The primary and secondary wheel remain together.
- Before dismantling them, mark clutch casing (15) and primary wheel (11), see arrow.

IMPORTANT: do not offset in relation to one another when refitting - risk of imbalance.

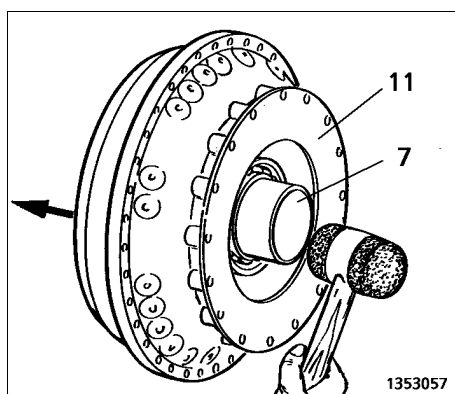


Fig. 185

- Separate primary wheel (11) from secondary wheel (7) by tapping a rubber hammer against the hub of secondary wheel (7).
- Ball bearing (8) remains in primary wheel (11).

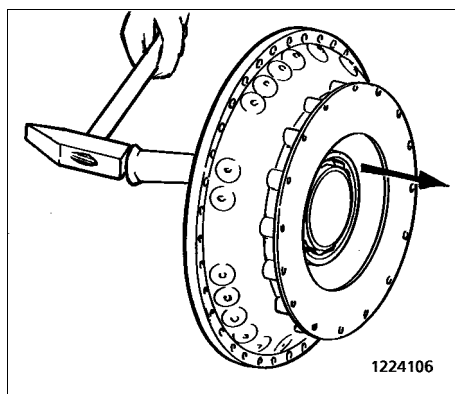


Fig. 186

- Use a mandrel and hammer to drive ball bearing (8) out of primary wheel (11).

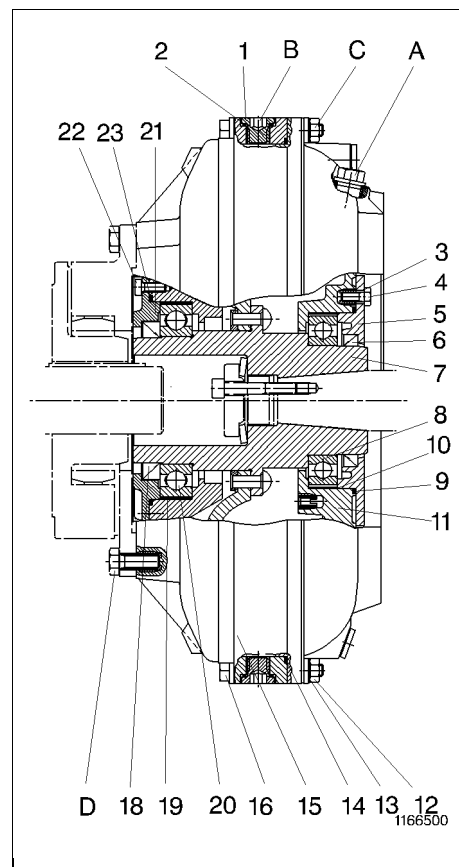


Fig. 187

- Unscrew screws (22) with lock washers.
- Remove shaft seal ring cover (21).
- Force out shaft seal ring (18) using a screwdriver.
- Replace the shaft seal ring if its sealing lip is no longer soft and pliable.
- Use a mandrel and hammer to drive ball bearing (20) out of the clutch casing.

12.28.2 Assembling fluid clutch

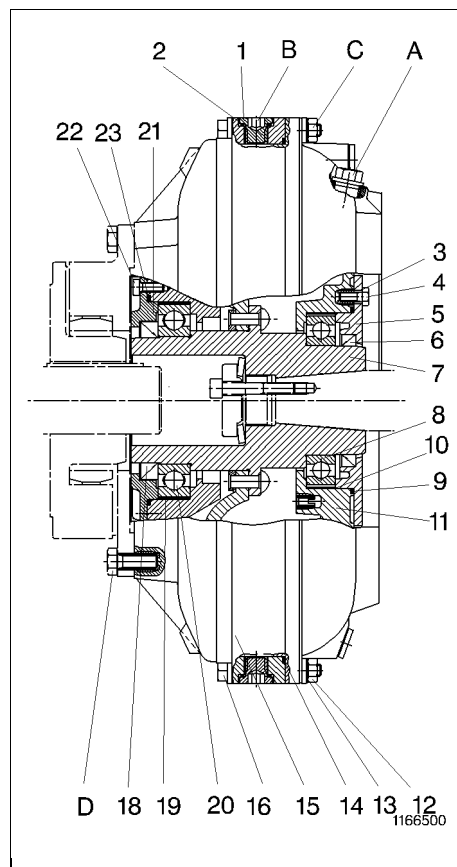


Fig. 188

➤ To reassemble the fluid clutch, proceed in reverse order of dismantling. The following should be kept in mind.

Torques:

- A = 150 Nm
- B = 95 Nm
- C = 46 Nm
- D = 80 Nm

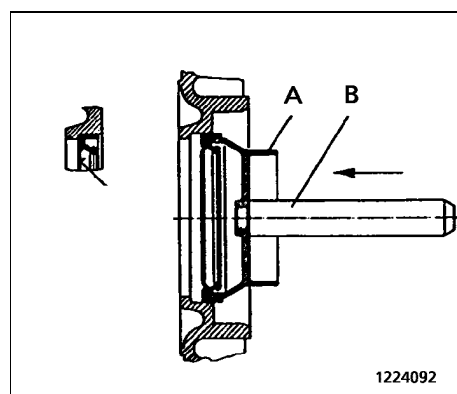


Fig. 189

- Moisten shaft seal rings.
- Screw bolt (B) into disk (A) and position it in front of the shaft seal ring.
- Press shaft seal ring (18) into shaft seal ring cover (21) by lightly tapping on bolt (B).
- Screw bolt (B) into the other side of disk (A) and press shaft seal ring (6) into shaft seal ring cover (5) in the same way.

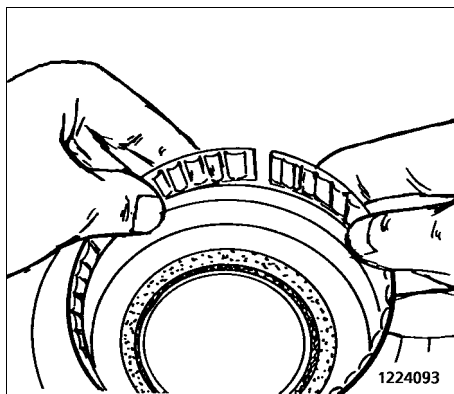


Fig. 190

- Insert spacer ring (19) in clutch casing (15).
- Insert spacer ring (10) in primary wheel (11).

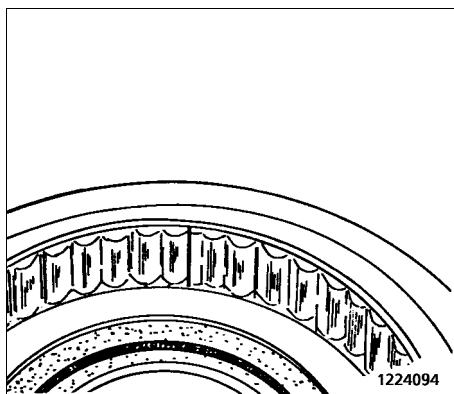


Fig. 191

IMPORTANT: the bevelled edges of the rings must snap into the grooves. This is the only way to ensure that the spacer rings cannot move axially.

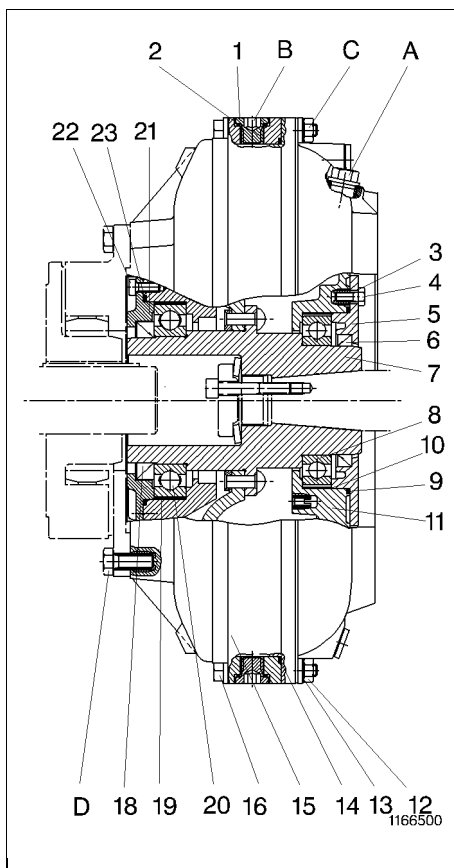


Fig. 192

- Press ball bearing (20) into the clutch casing and ball bearing (8) into the primary wheel.
- Check whether the ball bearings pressed into the spacer rings have an absolutely tight fit. If this is not the case, the spacer rings have to be replaced.
- Insert gasket (9) in the groove of the primary wheel.
- Fasten shaft seal ring cover (5) to the primary wheel with screws (4) and lock washers.
- Insert gasket (23) in the groove of the clutch casing.
- Fasten shaft seal ring cover (21) to the clutch casing with screws (22) and lock washers.
- Press secondary hub with secondary wheel (7) into the clutch casing.
- The running surfaces of the shaft seal rings must be undamaged and perfectly smooth, otherwise leaks may occur.
- Insert gasket (14).

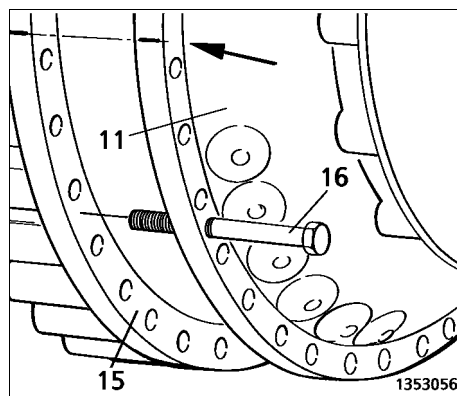


Fig. 193

- Press the primary wheel onto the secondary hub so that the marks on primary wheel (11) and clutch casing (15) are aligned.
- Bolt both parts together.

Following assembly, the fluid clutch needs balancing. Only task persons authorized by GEA Westfalia Separator with this.

- Fill the clutch with oil, see chapter entitled "Maintenance / Servicing fluid clutch".
- Fit fluid clutch, see chapter entitled "Assembling horizontal gear parts".

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 Requirements for the storage room

The storage room must meet the following requirements:

- cool, 15 – 25 °C
- dry, approx. 65 % relative humidity (perspiration water formation must be prevented)
- dark (avoid direct sunlight and UV radiation)
- dust-free
- moderately ventilated
- free from aggressive media (e.g. salts, acids, lyes, solvents)

13.5 Prior to a long-term shut-down

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.

- Clean the centrifuge bowl and frame thoroughly, see chapter "Maintenance / Cleaning the bowl and upper part of the frame".
- Remove the bowl from the spindle, see chapter "Servicing / Removing the bowl".
- Oil the upper spindle end by hand and cover it with a neck bearing protection cap or plastic foil bag.
- Remove the bowl, see chapter "Servicing / Removing the bowl").
- Remove all gaskets.
- Clean, wipe dry and grease all bowl parts and all unvarnished machine parts.
- Clean the gaskets and re-fit. When putting the machine back into operation after longer than one year, all gaskets must be replaced.
- Re-assemble the bowl, see chapter "Servicing / Assembling the bowl").
- Store the covered bowl in a protected and dry place.
- 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.

13.6 Notes on long-time storage of the centrifuge and individual rotors

The centrifuge/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.

13.6.1 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 maintenance instructions for paint, see spare parts catalog.

13.6.2 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.
- Spray on corrosion protection wax.
- Check and, when necessary, touch up the corrosion protection once a month.

13.6.3 Preserving the centrifuge

- Switch off and shut down the centrifuge.
- Wait until the bowl has come to a standstill.



DANGER

Life threatening danger because of quickly 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 remove any parts of the machine until the bowl is at a stand-still.
 - Wait for the fluids to empty, see data sheet.
 - Secure the unit against unintentional activation.
 - Work may begin when all of the components have cooled to room temperature. Depending on the application and product temperature, the cooling process can take several hours.
 - First check and make sure that all of the machine components are at a stand-still, see the chapter "Repair / stand-still control of the rotating machine components".
-
- Remove and clean the feed and discharge connections.
 - Dismantle and clean the feed and discharge assembly fittings.
 - Remove the centrifuge hood.
 - Remove, dismantle and clean the bowl, see chapter "Servicing / dismantling the bowl".
 - Remove the sealing elements, clean and re-fit.
 - Rub suitable protection agents into the bowl parts.
 - Re-assemble the bowl and store protected against vibrations and damage.
 - Drain the lubricating oil and dispose of it properly.
 - Fill the gear oil with a slushing oil up to the middle of the sight glass, see lubrication schedule.
 - Start up the centrifuge **without bowl** and shut it down again when the operating speed is reached.
 - A **short** start-up of the centrifuge is adequate to wet bearing and drive parts. Slushing oil is **not** lubricating oil.
 - Observe the start-up procedure in the chapter "Operation".
 - Drain the slushing oil out of the gear chamber completely.
 - Rub slushing oil by hand into the upper end of the spindle and put a neck bearing protection cap or plastic foil bag over the spindle.
 - Put the centrifuge hood back on the solids catcher and mount the feed and discharge assembly fittings.

13.6.4 Preserving the bowl

When the bowl is to be put in storage, the bowl must be removed and preserved.

- Remove and dismantle the bowl, see chapter "Servicing / Removing the bowl".
- Remove the gaskets.
- Thoroughly clean the bowl parts, including the gasket grooves.
- Protect all bowl parts with Valvoline Tectyl 506-WD or an equivalent product.
- Pack the bowl parts in airtight foil and store in a suitable container, e.g. in a wooden case.

13.7 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 applicable local disposal regulations.
- Comply with environmental protection legislation.
- Have electrical connections disconnected by qualified personnel, e.g. electricians and high voltage electrician.

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 caustic and acid residues can still be in the centrifuge and the pipelines. When working on the centrifuge, contact with the caustics and acids can cause burns.

- Wear acid-resistant safety gear, e.g. safety goggles, safety gloves, protective overalls or protective suits.
- Take special care.
- Observe the plant operator's SOPs on handling acids and caustic alkalis as well as local disposal regulations.
- Comply with 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.

13.7.1 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.

13.7.2 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. 194



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 Notes on ordering spare parts

A spare parts catalog is part of the documentation of the centrifuge. It contains all spare parts, wear parts and operating materials.

Spare part kits are available for many machines which are customized to the maintenance intervals in the maintenance schedule of the centrifuge. e.g.

- Set of spare parts (I) for an operating time of 2500 hours.
- Set of spare parts (II) for an operating time of 5000 hours.
- Set of spare parts (III) for an operating time of 10000 hours.

Rapid and correct supply of spare parts can only be guaranteed if your order contains the following details:

- Centrifuge type: see nameplate
- Serial number: see nameplate
- Bowl serial number (can differ from the machine serial number, see spare parts catalog).
- Designation: see spare parts catalogue
- Part number: see spare parts catalog.

The part number is sometimes engraved on the individual parts.

Information required for ordering third-party components:

All specifications on the nameplate of the subcontractor, e.g. pump type and pump number.

14.3 Storing wear parts and operating materials

Pay attention to the following for storing wear parts and operating materials.

14.3.1 Gaskets 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 (+15 to max. +25 °C)
- Dry (less than 60 % relative air humidity)
- Dust-free (as possible)
- Dark, no direct solar radiation or bright artificial light (if necessary, paint the windows red or orange).
- Moderately ventilated, draft-free (if necessary wrap up the parts or pack them in antistatic foils or bags made of paper, polyethylene or polyamides).

Environmental requirements:

- Not in the vicinity of heat sources.
- Not together with solvents, fuels, lubricants, acids, disinfectants etc.

Method of storage:

- 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).

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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