

## Instruction manual

Designation	<b>Mineral oil centrifuge with self-cleaning bowl</b>
Type	<b>OSE 20-0136-067</b>
No.	<b>2064-9001-001</b>
Edition	<b>1010</b>

ORIGINAL INSTRUCTION MANUAL

Subject to modification!

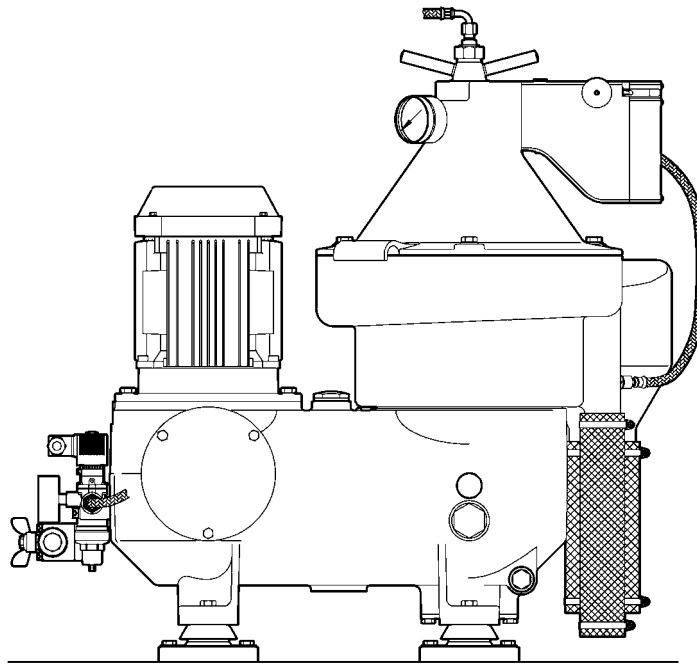
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**GEA Westfalia Separator Group GmbH**

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**GEA**

Type

S/N:

Year of manufacture

Max. admissible rated bowl speed in  $\text{min}^{-1}$

Max. admissible density in  $\text{kg}/\text{dm}^3$  of product

Heavy  
liquid  $\text{kg}/\text{dm}^3$

Solids  $\text{kg}/\text{dm}^3$

Min/max throughput  $\text{m}^3/\text{h}$

Min/max temp. of product in  $^{\circ}\text{C}$

Min/max housing pressure range in bar

*This nameplate must be filled in by the operator.  
Please transfer the data from the centrifuge nameplate.*

## For your safety



- **Take special care when carrying out operations marked with this symbol - otherwise danger to life!**



- **Strictly adhere to instructions marked with this symbol.**  
This avoids damage to the separator and other equipment.

**Note:**

- This symbol is not a safety precaution but rather a reference to information which help to better understand the separator or plant components and the processes.

- **Observe the accident prevention regulations!**

The local safety and accident prevention regulations apply unconditionally to the operation of the separator. The plant operator must ensure compliance with these regulations.

- **When operating electrical apparatus, certain parts carry dangerous voltage.**

Before working in electrical components, take adequate preventive measures according to the national provisions (in Germany in accordance with the rules and regulations of the VDE (Verein Deutscher Elektrotechnik / Association of German Electrical Engineering) or of the local electric power company.

Non-compliance with the protective measures can result in serious damage to persons or property.

Any work on electrical components may only be carried out by an authorized electrician.

- **Only qualified or authorized specialized staff may operate, maintain and repair the separator.**

Corresponding training courses take place in the manufacturer's plant or are held on site by the manufacturer.

- **Follow the instructions in the manual.**

Follow only the instructions given in this manual.

Repair and maintenance work that goes beyond the scope described in this manual may not be carried out.

- **Operate the separator only in accordance with agreed process and operating parameters**

- **Maintain the separator**  
as specified in this manual.
  
- **Carry out safety checks on the separator,**  
as described in chapter "Safety precautions" in this manual
  
- **Liability for the function of the machine passes to the owner.**

Liability for the function of the machine passes unconditionally to the owner or operator irrespective of existing warranty periods in so far as the machine is improperly maintained or serviced by persons other than GEA Westfalia Separator service personnel or if the machine is not applied in accordance with the intended use.

GEA Westfalia Separator shall not be liable for damage which occurs as a result of non-observance of the above. Warranty and liability conditions in the Conditions of Sale and Delivery of GEA Westfalia Separator are not extended by the above.

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## 1 Safety precautions

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## 1.1 Correct usage

Centrifugal separators – called separators in short – are used

- for the separation of liquid mixtures which consist of two liquids, with simultaneous removal of the solids contained in the liquids.
- for removing (clarifying) solids from a liquid.

### The separator is designed

- for a very high bowl speed.  
The admissible bowl speed depends on the chemical and physical properties of the product:
  - Temperature
  - Density of the fluid and solid components.
- for products which contain no corrosive and erosive components.  
The aggressiveness of the product influences the careful selection of the bowl material.  
Only products conforming to the specifications on the nameplate may be processed.
- in accordance with the method of application of the separator agreed with GEA Westfalia Separator. Refer to the data sheet and contractually agreements.
- in accordance with the admissible utilities (cleaning agents, lubricants, operating liquids etc.) specified in the documentation or on the data sheet.

### Intended use involves

- paying attention to the safety precautions, the instruction manual of the separator and the safety markings on the separator.
- adhering to the data on the nameplate, e.g. maximum admissible bowl speed.

Further information on the intended use of the separator such as

- agreed areas,
- density of the product
- throughput capacities
- temperatures
- pressures etc.

is given in the documentation or the data sheet furnished with the documentation.

The contractually agreed conditions agreed with GEA Westfalia Separator on the intended use of the separator must be passed on to the operating personnel by the plant operator.



**Any operating mode deviating from this is not intended use and can result in severe damage to property and persons!**

## 1.2 Non-compliance with the intended use

**Any use that deviates from the intended use is considered to be non-compliant.**

### **The separator may not be operated by:**

- Persons who have not read and understood these basic safety precautions.
- Persons who have not read and understood the instruction manual of the separator.
- Persons who have not been briefed on proper and correct operation.
- Persons who have not been adequately trained.
- Persons who have not reached the minimum age of 18 years.

### **The separator may not be operated**

- when the product fed does not conform to the specifications on the nameplate.
  - Product with excessively high density
  - Solids with excessively high density
  - Product with excessively high temperature
- when the max. admissible bowl speed has been exceeded through electrical or electronic manipulation of the drive.
- in an incomplete state of assembly, e.g.
  - required supervisory equipment is not activated or has been switched off.
  - the required safety and/or protective covers have not been installed.
- by persons who are not adequately trained.
- when the separator is operated with spare parts which do not come from GEA Westfalia Separator.



**Non-compliance with intended use can result in severe damage to property and persons!**

### 1.3 Safety markings

The safety markings (adhesive and metal plates) are attached to all separators on the hood and frame of the respective separator in such a way that they are clearly visible.

All safety markings on the separator, control system and plant components must always be in perfect condition.

- Clean dirty safety markings.
- Replace damaged safety markings.

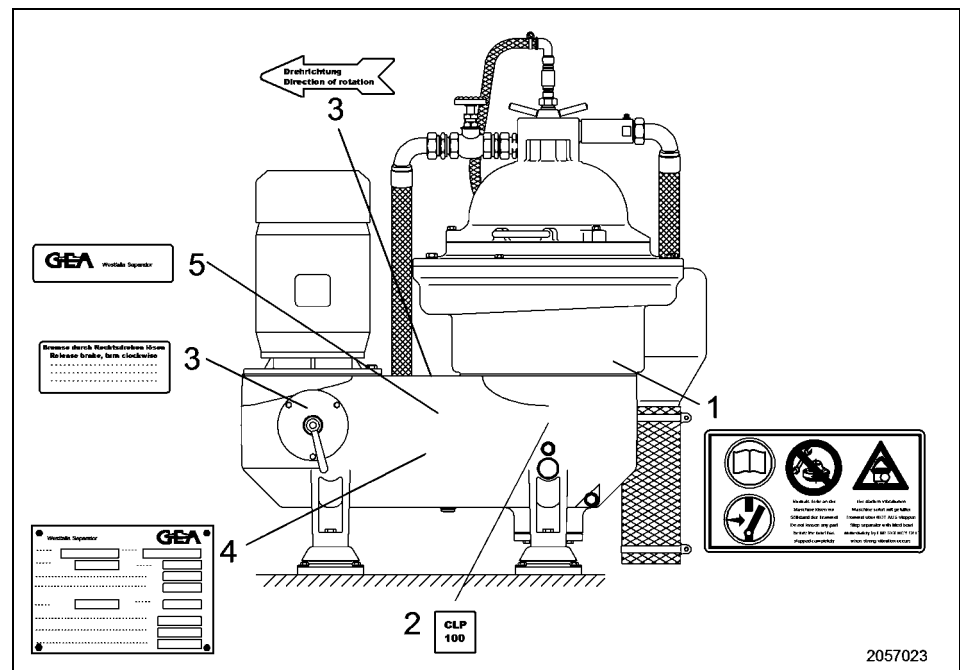


Fig. 1 Example of markings on a separator

- 1 Pictograms (safety stickers)
- 2 Oil quality
- 3 Plates
- 4 Nameplate
- 5 Maker's nameplate

The texts and part numbers of the safety markings change depending on the languages required by the customer.

### 1.3.1 Safety markings and their meaning

The following safety markings must be attached to the separator as adhesive labels.

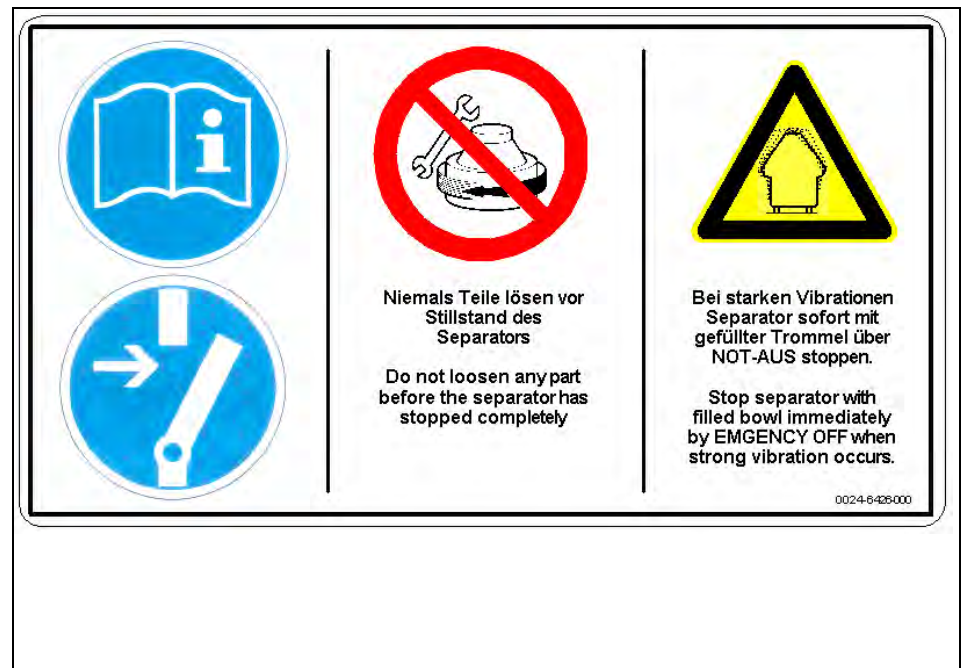


Fig. 2



Fig. 3

#### Refer to the machine documentation!

- Every person who is assigned the task of installing, operating, maintaining and repairing the machine must have read and understood the documentation.
- The documentation must be complete kept near to the machine and be readily accessible to the operators. It must be available to the operators at all times!



Fig. 4

**Before carrying out work, disconnect power to all components of the monitoring system!**

Risk of injury due to electrical voltage and unintended start-up of the separator!

**Before carrying out work on the separator and electrical plant components:**

- Make sure the separator is at a standstill.
- Switch off all electrical appliances via the main switch,
- Lock the installation to prevent it from being accidentally switched on.



Fig. 5

**Danger to life and limb through rotating machine parts!**

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

Methods of how to check standstill are described in the machine documentation.

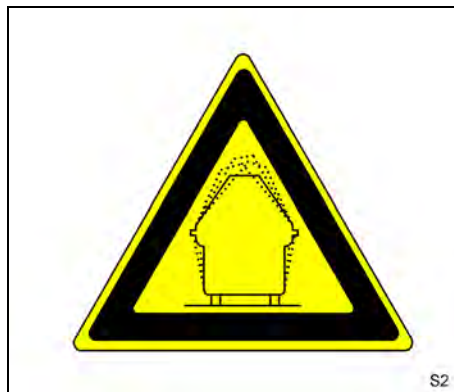


Fig. 6

**Warning of unusual noises or vibrations!**

When unusual noises or vibrations occur on the separator:

- Immediately shut down the separator with filled bowl via "emergency-off".
- **Never trigger a bowl ejection!**
- Evacuate the room.
- Do not re-enter the room until the centrifuge has come to a standstill.

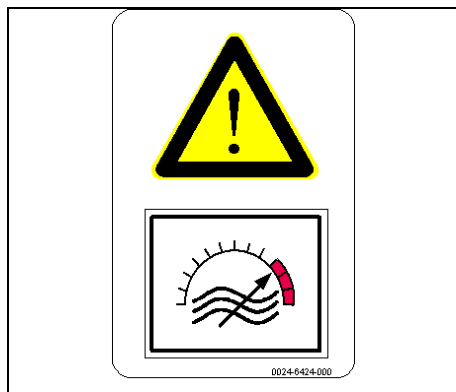


Fig. 7

**Frequency converter operation!**

- When setting the frequency converter, do not exceed the admissible bowl speed (see nameplate)

**Note:**

This adhesive plate is only used for frequency converter operation.



Fig. 8

**Warning of extreme surface temperatures!**

The surfaces of the separator and plant components can be hot!

**Note:**

This adhesive plate is only used for hot operation.



Fig. 9

**Danger due to electrical voltage!**

Non-compliance with the protective measures can result in serious damage to persons or property.

**Before working on electrical separator/plant components:**

- Switch off all electrical appliances via the main switch.

**CAUTION:**

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

- Lock the separator/plant to prevent it from being accidentally switched on.
- Take adequate preventive measures according to the national provisions (in Germany in accordance with the rules and regulations of the VDE (Verein Deutscher Elektriker / Association of German Electrical Engineers) or of the local electric power company.
- The work may only be carried out by competent persons (qualified technical specialists).

## Pictograms with warning text

Pictograms can be meaningfully supplemented as illustrated in the two following examples:

- With warning text (Voltage is also present . .),
- with signal word (ATTENTION!) and warning text.

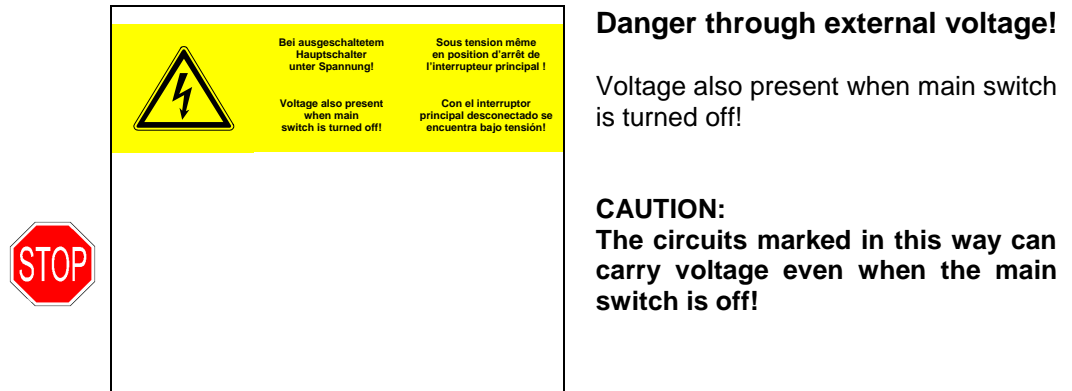


Fig. 10 Example 1

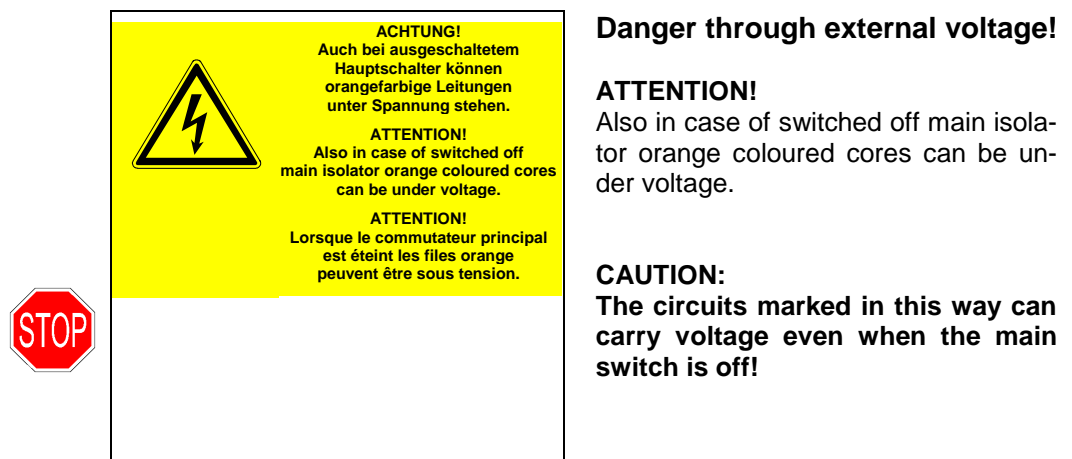


Fig. 11 Example 2

### Note:

Orange coloured leads are fitted as standard at GEA Westfalia Separator. Different colour leads can be fitted if requested by the customer!



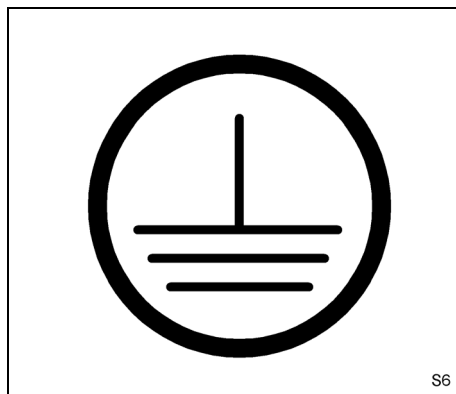


Fig. 12

### Potential equalisation (protective-earth terminal)

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

## 1.4 Basic operating principles

Separators are used for the separation of liquid mixtures or for the separation of solids out of liquids or liquid mixtures.

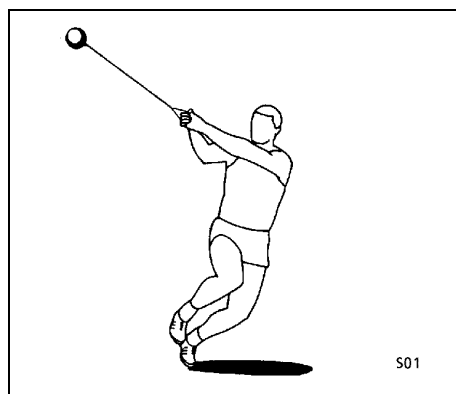


Fig. 13

High centrifugal forces are produced in the rotating bowl.

Under the influence of the centrifugal forces, separation of the liquid mixture and/or ejection of the solids particles takes place most rapidly.

The specifically heavier components are displaced to the bowl periphery, whereas the specifically lighter components are displaced towards the centre of the bowl.

The high centrifugal force is produced by very high bowl speeds. On the one hand, high bowl speeds signify high efficiency, while on the other hand, they signify high material stressing of the separator.

## 1.5 Operations on the separator

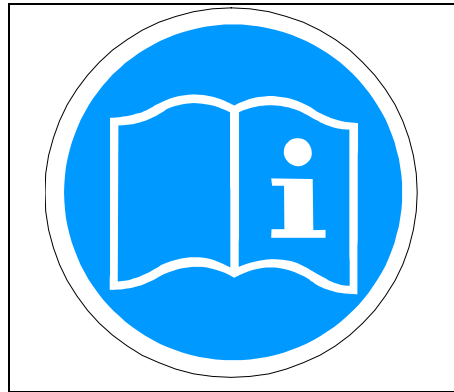


Fig. 14

The separator works reliably, provided that it is operated and maintained in accordance with our operating instructions.

Special attention must be given to:

- Assembly
- Electrical installation
- Before start-up
- Start-up
- Shut-down
- Maintenance and repair

### 1.5.1 Demands on the operating and maintenance personnel

Operating, maintaining or repairing the separator or the separator plant requires specialized knowledge.



#### **CAUTION!**

**Operating, maintenance or repair work by unqualified or unauthorized personnel can lead to operating, assembly and handling errors and severe damage to persons and property.**

**GEA Westfalia Separator accepts no liability for damage caused by unqualified or unauthorized personnel!**

For operation, maintenance and repair work, personnel may only be deployed who

- have reached a minimum age of 18 years.
- are demonstrably familiar with the state-of-the-art through briefings and training.
- are adequately qualified for performing the work and checking it.

**Electrical work may only be carried out by an authorized electrician!**

The operator of the separator or separator plant

- is responsible for the necessary skills and knowledge of the personnel.
- is responsible for briefing and training the personnel.
- must be sure that the personnel have read and understood the manuals necessary to carry out their work.

GEA Westfalia Separator offers an extensive range of training and advanced training courses. You can obtain further information from GEA Westfalia Separator or from one of the authorized representatives.

### 1.5.2 Spare part requirements



Fig. 15

- Use only genuine spare parts from GEA Westfalia Separator. The original spare parts are listed in the spare parts catalog.

The use of non-genuine parts leads to:

- safety risks,
- reduced durability of these parts,
- reduced availability of the separator and
- increased service requirement.

If a safety risk occurs when using non-original spare parts, this may have legal consequences for the responsible persons. In such cases, GEA Westfalia Separator accepts no liability or warranty claims.

### 1.5.3 Assembly

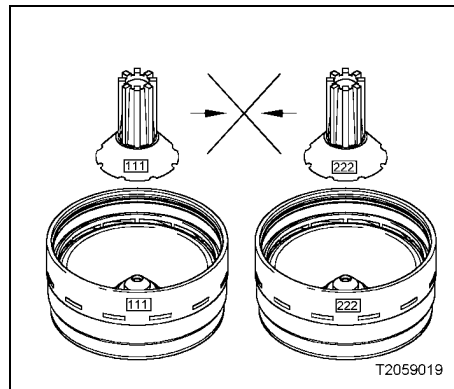


Fig. 16

- If the plant has several centrifuges, be careful not to interchange parts of different bowls since each bowl has been balanced individually.

The bowl parts are marked with the serial-number of the machine or with the last three digits of the serial-number.

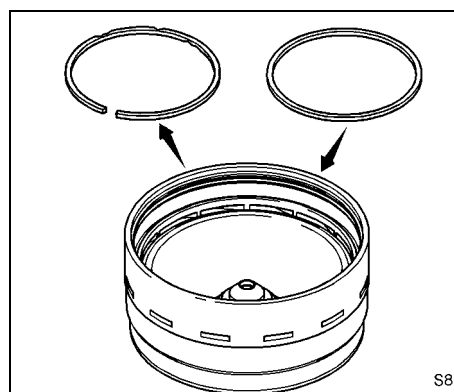


Fig. 17

- Damaged parts must be replaced immediately by new or reconditioned parts.

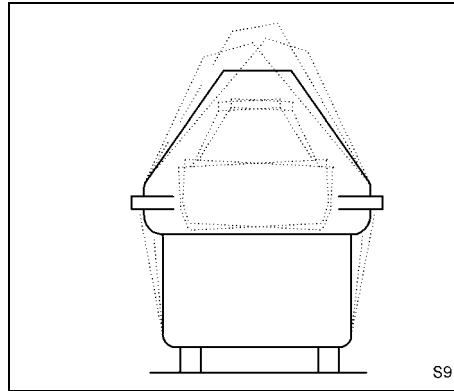


Fig. 18

**CAUTION:**

- Some bowl parts may be pre-assembled and balanced only by specialists from GEA Westfalia Separator or in workshops authorized by Westfalia Separator. Unqualified balancing can lead to dangerous operating states (vibrations) and destruction of the separator with danger to life.

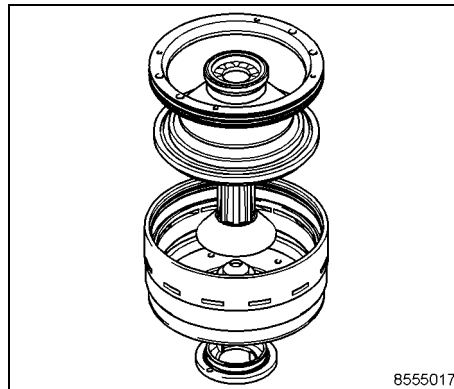


Fig. 19

- To avoid unbalance, when replacing some bowl parts like
  - Lock ring
  - Bowl top
  - Distributor
  - Bowl bottom
  - Water chamber bottom
 GEA Westfalia Separator must be consulted. These parts
  - are marked with a footnote in the separator manual (see section "Bowl").
  - are marked in the column "ETS" of the parts list with a 3 or 4.

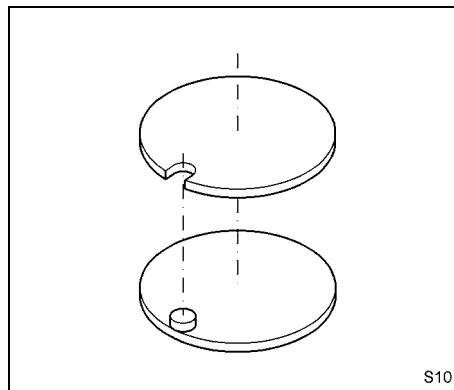


Fig. 20

- Some bowl parts are arranged in fixed positions relative to one another.
- Locking devices and alignment marks must be in perfect condition. The bowl must otherwise not be operated.



Fig. 21

- When transporting and assembling machine parts, avoid crushing and shear strain.

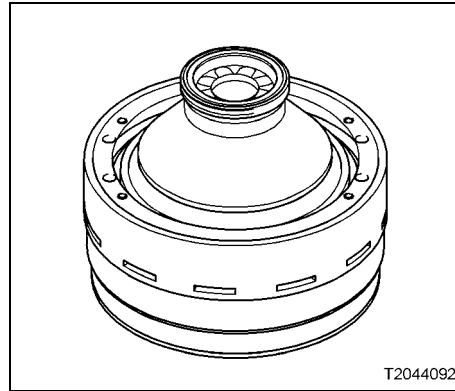


Fig. 22

- When assembling the bowl, be sure to strictly adhere to the assembly instructions in order to avoid undue imbalance.
- Before starting the bowl, be sure to fit **all** parts.

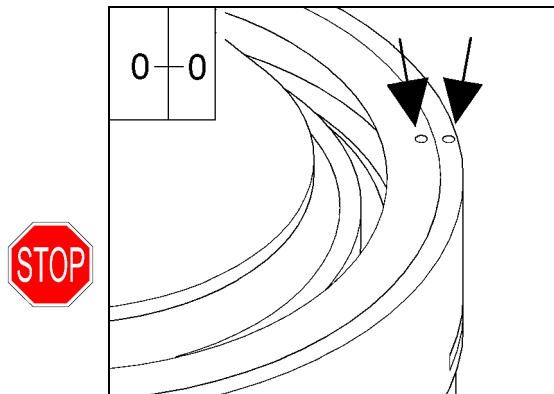


Fig. 23

- Tighten the bowl lock ring **securely**: the "O" marks on the bowl bottom or bowl top and on the lock ring must be in line with each other.
- Pay attention to the position of the marks!

**CAUTION:**  
A loose lock ring can endanger life!

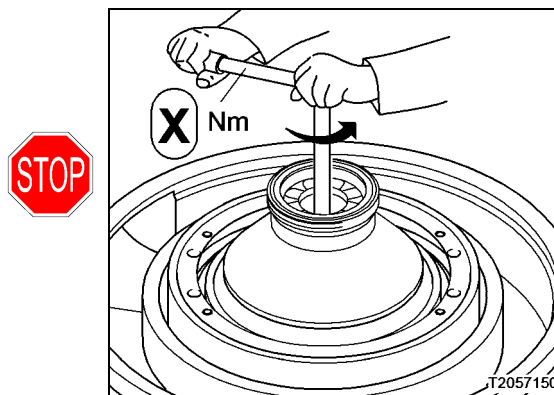


Fig. 24

- Tighten the spindle screw with the separator-specific torque (**left-hand thread**).

**CAUTION:**  
A loose spindle screw can endanger life!

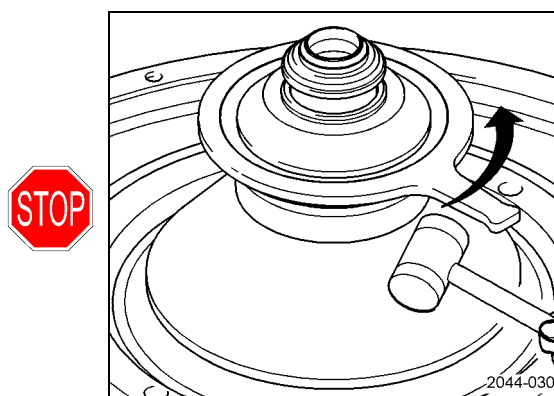


Fig. 25

- Tighten the centripetal pump chamber lock ring or cover **securely (left-hand thread)**.

**CAUTION:**  
A loose lock ring or cover can endanger life!

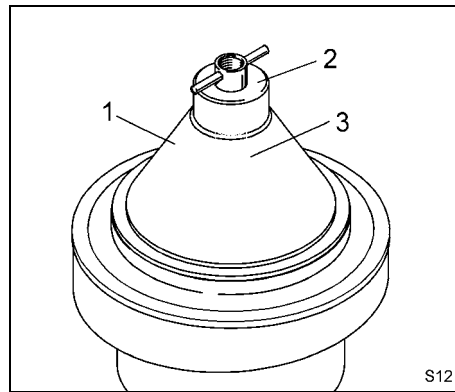


Fig. 26

- Carefully fasten hood 1, feed and discharge housing 2 and centripetal pump 3.

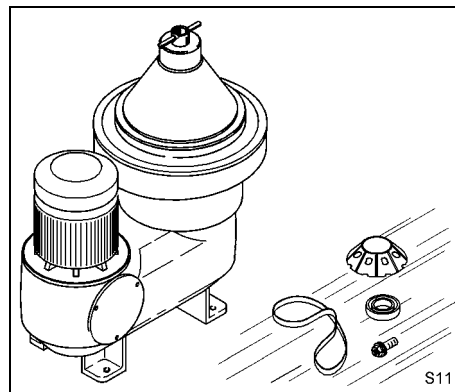


Fig. 27

- Check if the machine is completely assembled and properly installed.

### 1.5.4 Electrical installation

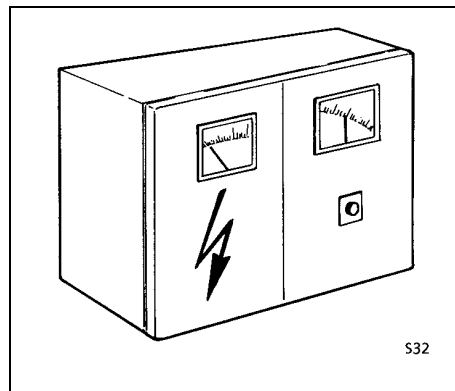


Fig. 28

- **Electrical work may only be carried out by an authorized electrician!**
- The governing accident prevention regulations apply for the electrical appliances and installations.
- Special attention must be paid to the installation guidelines of GEA Westfalia Separator.
- The frequency and voltage of the power supply must correspond to the machine specifications.

- Carry out voltage equalization.
- Observe legal regulations; e.g. in the EU:
  - Low-voltage guideline 2006/95/EC,
  - Electromagnetic compatibility 2004/108/EC,
  - Guidelines of the classification societies.

### 1.5.5 Before start-up

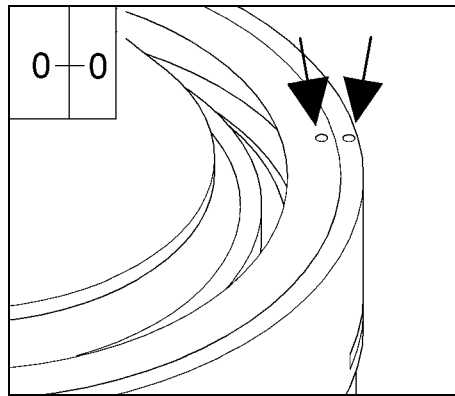


Fig. 29

- Check that the bowl lock ring has been **firmly** tightened.
- The "O" marks on bowl bottom or bowl top and on the lock ring must be aligned.

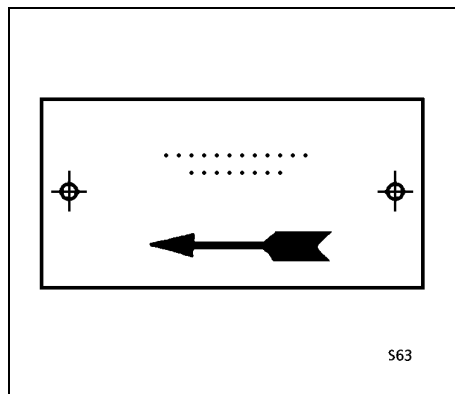


Fig. 30

- The bowl must rotate in clockwise direction (see arrow on frame or solids collector).

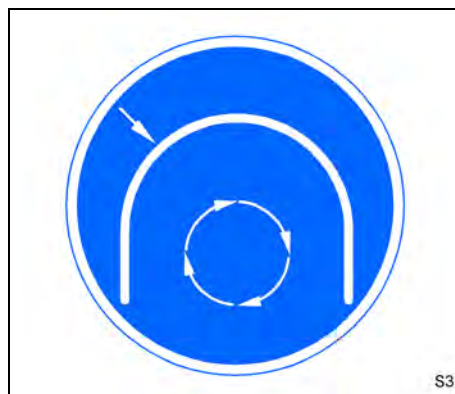


Fig. 31

- The separator may only be operated with protection devices conforming to EN 294.
- Equip solid and liquid discharges accordingly where appropriate.

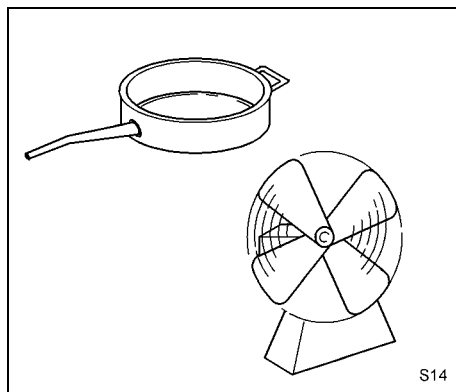


Fig. 32

- Check that the lubrication and cooling systems are serviceable.

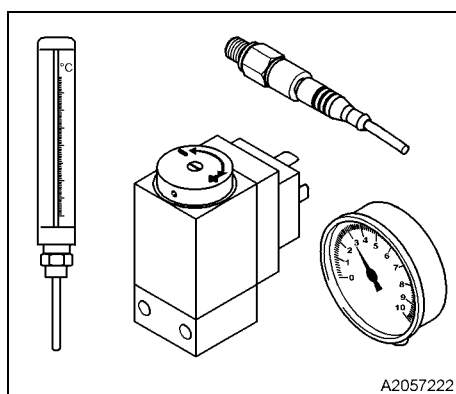


Fig. 33

- Check whether the supervisory equipment is operational and the correct limit values are adjusted.
- When hoods, concentrate collectors and vessels are pressurized, e.g. by
  - inert gas blanketing,
  - cooling,
  - steam sterilization etc.
 the pressures stated on the boiler plate must not be exceeded.

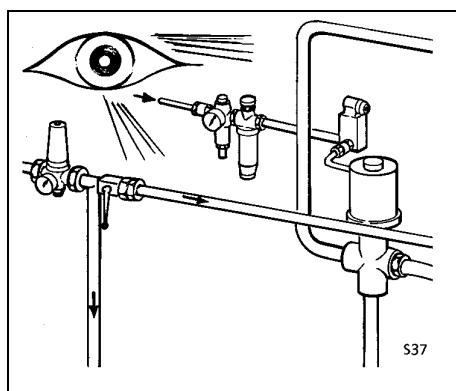


Fig. 34

- Check that the product lines are set to operation.
- Regularly check hoses for signs of ageing.
- Check sight glasses for mechanical damage.
- Damaged parts must be replaced immediately by new or reconditioned parts.



## 1.5.6 Start-up<sup>3</sup>

GEA Westfalia Separator Systems GmbH 59302 Oelde, Germany		<b>GEA</b>	
Typ	<input type="text"/>	Masch.-Nr.	<input type="text"/>
Baujahr	<input type="text"/>		
max. zulässige Trommel-Nennrehzahl in $\text{min}^{-1}$			<input type="text"/>
max. zulässige Dichte des Aufgabegutes in $\text{kg}/\text{dm}^3$			<input type="text"/>
Schwere Flüssigkeit $\text{kg}/\text{dm}^3$	<input type="text"/>	Feststoff $\text{kg}/\text{dm}^3$	<input type="text"/>
min./max. Durchsatz $\text{m}^3/\text{h}$			<input type="text"/>
min./max. Temperatur des Aufgabegutes in $^{\circ}\text{C}$			<input type="text"/>
min./max. Gehäusedruckbereich in bar			<input type="text"/>

Fig. 35

- Refer to chapter "operation".
- Note nameplate. The values for
  - bowl speed,
  - density of the heavy liquid,
  - density of the solids (centrifugally dry)
 are maximum values and must not be exceeded.



Fig. 36

- Wear ear protection.

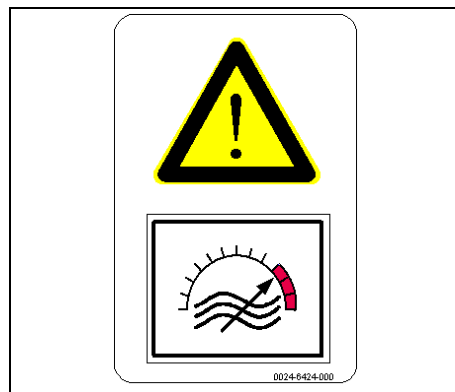


Fig. 37

### In case of frequency converter operation:

- Do not under any circumstances manipulate the frequency converter to exceed the permissible bowl speed (see nameplate).
- The separator may only be operated with an independent device for speed limiting.



Fig. 38

- Do not feed product which is categorised as explosive.
- The separator must not be used in areas where explosion protection is required.



Fig. 39

- When processing products harmful to persons, observe the pertinent safety regulations.
- Refer to the safety data sheet of the product.
- Use protective gear, e.g.
  - Protective clothing
  - Eye protection
  - Protective mask



Fig. 40

When unusual noises or vibrations occur on the separator:

- Immediately shut down the separator with filled bowl via "emergency-off".
- **Never trigger a bowl ejection!**
- Evacuate the room.
- Do not re-enter the room until the separator has come to a standstill.



Fig. 41

#### Only in case of hot operation:

- Product-contacting parts such as
  - pipes and hoses,
  - hood,
  - solids catcher
 reach temperatures over 80 °C . (176 °F).

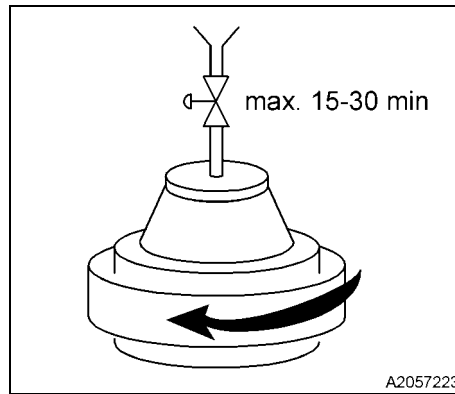


Fig. 42

- The bowl is not allowed to run without liquid supply for more than 15 – 30 minutes, as otherwise it would result in overheating of the bowl material.

### 1.5.7 Shut-down and "Emergency-Off"

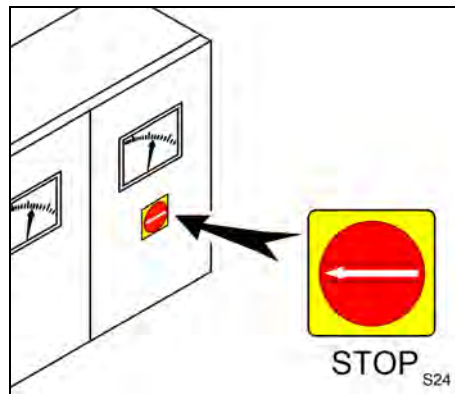


Fig. 43

- For shut-down of the separator refer to the chapter "Operation" of this manual and follow the start-up and shut-down instructions.

### 1.5.8 Voltage cutoff during operation

When the voltage is cut off for longer than one second during operation, the control system switches off automatically and the separating process is aborted.

**Important:**

- The bowl is not emptied. Product and solids remain in the bowl.
- The separator motor and product feed pump will be switched off.
- The control system switches itself back on automatically when the power returns.

#### After the power returns

- Switch on the separator motor and product feed pump.  
A closing water pulse after run-up of the separator triggers a total ejection automatically.



Fig. 44

When unusual noises or vibrations occur on the separator:

- Immediately shut down the separator with filled bowl via “emergency-off”.
- Evacuate the room.
- Do not re-enter the room until the separator has come to a standstill.

### 1.5.9 Maintenance and repair

Unfavourable operating conditions may require shorter maintenance intervals. The factors listed below are unfavourable because they either attack the separator material directly or impair the lubrication/cooling system:

- Aggressive product (chemical or physical)
- High product temperature
- Product with grease-decaying properties
- Environment: Temperature, dust, vapours

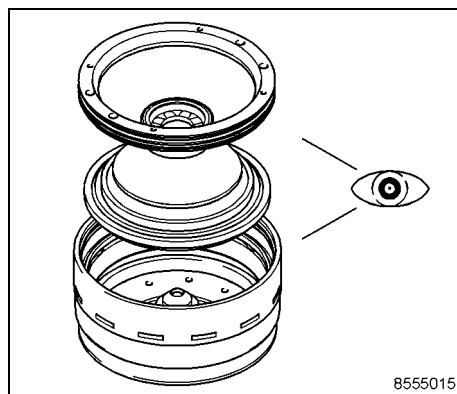


Fig. 45

Particularly high-stressed separator parts like

- Bowl lock ring,
- bowl bottom,
- bowl top and
- other bowl parts with a large outer diameter

must be checked regularly to assure safe and efficient operation.

Timely maintenance of the separator and replacement of worn or damaged machine parts is essential for safe operation of the machine.



**Use only genuine spare parts from Westfalia Separator. Otherwise, safety risks may arise (see section 1.5.2)**



**Carry out the required cleaning thoroughly. One-sided solid deposits in the bowl cause severe unbalance!**



Maintenance and repair work may only be carried out to the extent described in this instruction manual.



**Maintenance and repair work not described in this manual may only be carried out by the manufacturer or by "repair shops" authorized by the manufacturer.**

We, therefore, recommend in your own interest to have your separator inspected by our service engineers at regular intervals. These checks help to maintain the operating safety and avoid unexpected downtime.

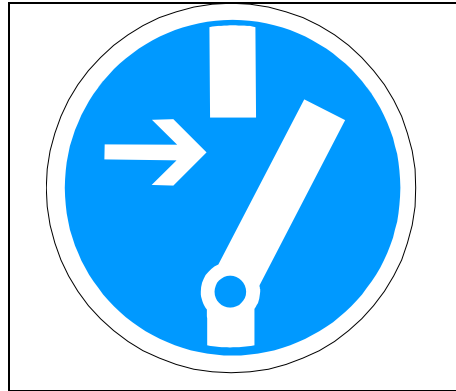


Fig. 46

**Before carrying out work on the separator and electrical plant components:**

- Make sure the separator is at a standstill.
- Switch off all electrical appliances via the main switch.
- Lock the installation to prevent it from being accidentally switched on.



Fig. 47

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

The standstill check is described in the section "bowl".



Fig. 48

- Do not climb onto or stand on the machine or parts of the machine.
- Make provision for and use a sturdy working platform.

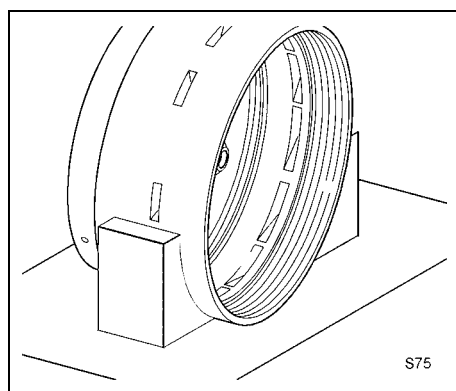


Fig. 49

- Place dismantled machine parts on a suitable base, e.g. rubber mat.
- Secure machine parts from rolling away and overturning using suitable aids!

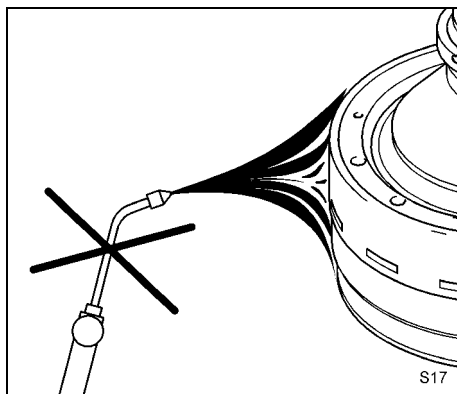


Fig. 50

- Do not heat bowl parts with the naked flame.
- Bowl parts must never be welded. This also applies for hood and solids catcher parts of steam-sterilizable separators.
- Even during cleaning the bowl parts the temperature must not exceed 100 °C (212 °F).

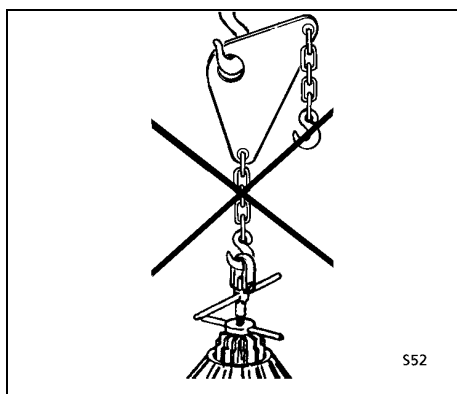


Fig. 51

- Load-carrying equipment such as
  - lifting devices for bowl or distributor,
  - chains etc.
 may only be used for their intended purpose, i.e. the work routines as described in this instruction manual.
- Do not use damaged or incomplete load carrying equipment.

- All load suspension devices have to be checked for completeness and for possible damage at least once a year.
- In addition, when using load suspension devices and hoists, the applicable legislation and safety rules have to be strictly observed.



**CAUTION: Danger to life when transporting heavy parts!**

- Do NOT step under hanging load.
- Special tools (e.g. compressing, assembly devices, pin spanners) may only be used for their intended purpose, i.e. the work routines as described in this instruction manual.
- Before using the standard and special tools supplied, check them for damage and completeness.  
Make sure that
  - all moving parts are correctly aligned and not seized.
  - that no parts are broken and that there is otherwise no damage which could affect the operation of the tool.
- Have damaged tools repaired by specialists before using them again.
  - Use only genuine spare parts from Westfalia Separator. Otherwise, the safety of the tool can be impaired.
- Keep the tools clean and keep them in a dry, safe place.  
Properly maintained and cleaned tools work more precisely and can be checked better.

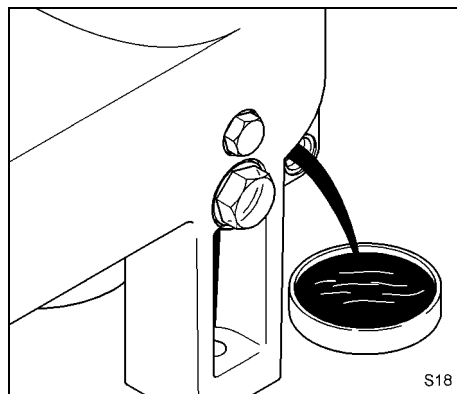


Fig. 52

- Collect dripping oil to prevent danger of slipping or product infection.
- When handling waste oils note:
  - They can be injurious to health, depending on their chemical composition.
  - Waste oil must be disposed of in accordance with local regulations.



## 1.6 Corrosion

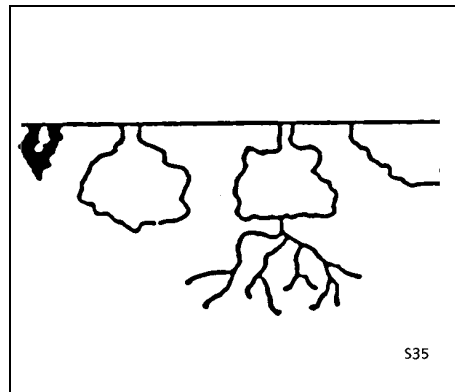
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

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

Flat-spread corrosion can usually be measured (reduction of wall thickness)

Pit- or crack-shaped corrosion cannot be measured without the risk of damage. At the initial stage pit-shaped corrosion is generally caused by chlorine ions.

Depending on the stressing of the part, pit-shaped corrosion can result in crack-shaped corrosion.



Possible formation of pit-shaped corrosion.

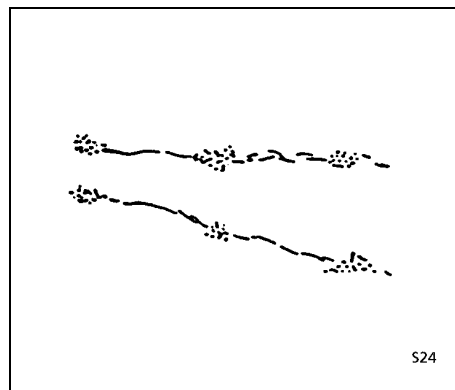
Fig. 53

Such pittings can only be investigated by a materials expert.



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

Contact your nearest Westfalia Separator representative for a thorough examination.



### Pittings

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

Such pittings should be investigated by a materials expert.

Fig. 54

## 1.7 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 solids particles
- high throughput capacities



The first signs of erosion should be carefully observed and documented. Erosion can deepen rapidly, thereby weakening the bowl material.

Contact your nearest Westfalia Separator representative for a thorough examination. Information on the nature of the damage can be provided by photos, plaster casts or lead molds.

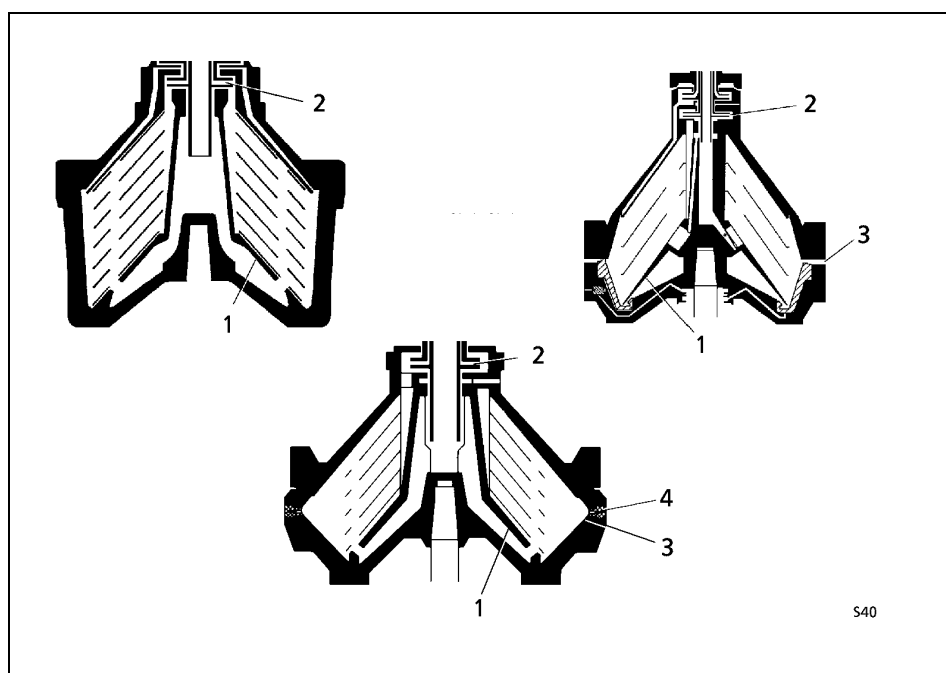


Fig. 55

The surfaces most susceptible to erosion are:

- 1) the bottom of the distributor, the rising channels and the ribs,
- 2) the centripetal pump (cavitation),
- 3) all surfaces in the area of the solids discharge ports,
- 4) the nozzles.

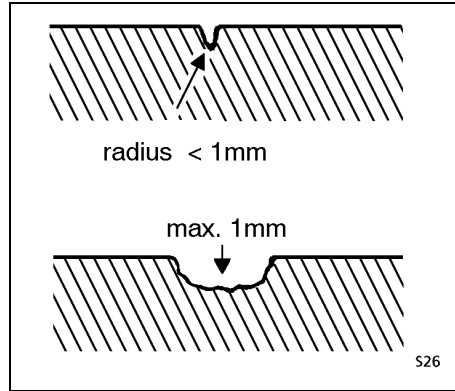


Fig. 56

Signs of erosion which you should immediately report to your nearest Westfalia Separator representative:

- The bottom of the erosion mark has a radius smaller than 1 mm (large notch effect).
- The depth of erosion mark exceeds 1 mm (0.04 inch) at the deepest point.

## 1.8 The health hazards involved when handling heavy oils and lube oils

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

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

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

The health hazards for the engine room staff depend to a large extent

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

Possible **short-term** effects:

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

Possible **long-term** effects:

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

### 1.8.1 Code of practice and personal protective measures

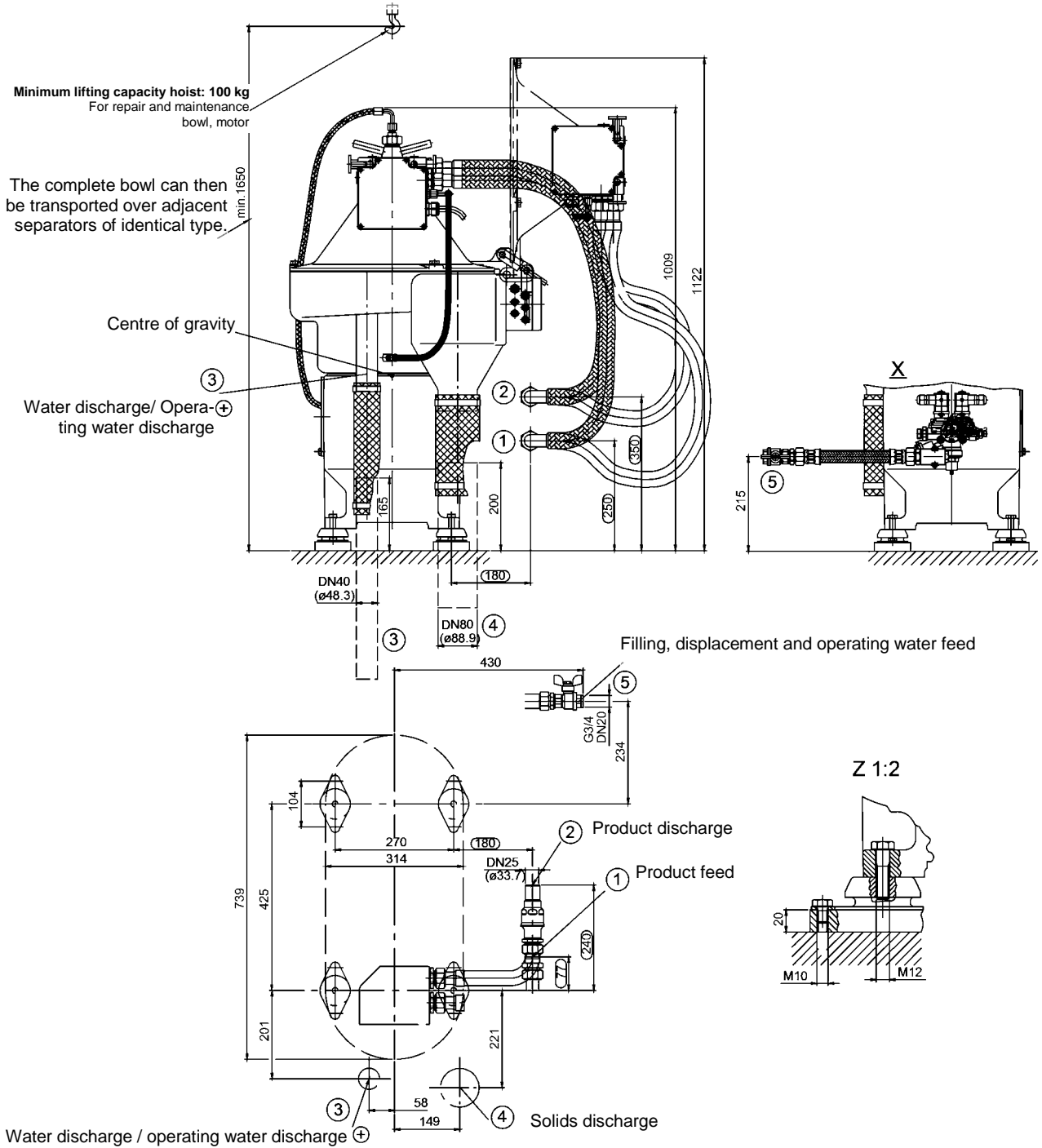
- Avoid skin contact with heavy oils or lube oils if possible!
  - Wear suitable protective gloves.
  - Apply a protective ointment to the skin (e.g. ointment no. 76), especially if no protective gloves are worn!
- Avoid breathing in oil vapours if possible!
- If possible, improve the air circulation in the room!  
Fully open the air regulation flaps in the outlets of the air supply ducts in the centrifuge and filter area.
- Wash affected areas of skin frequently and thoroughly!  
Apply protective ointment to the skin!
- Personal hygiene is of the utmost importance!
- Change dirty overalls regularly!
- Exercise special care when carrying out maintenance work on and cleaning heavy oil and lube oil centrifuges and filters!

## 2 Machine description

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2.1 Standard dimensioned drawing of the separator

- Refer to the installation guidelines for further information.



○ These dimensions **must** be adhered to!

⊕ Do **not** discharge residuals into public waters!

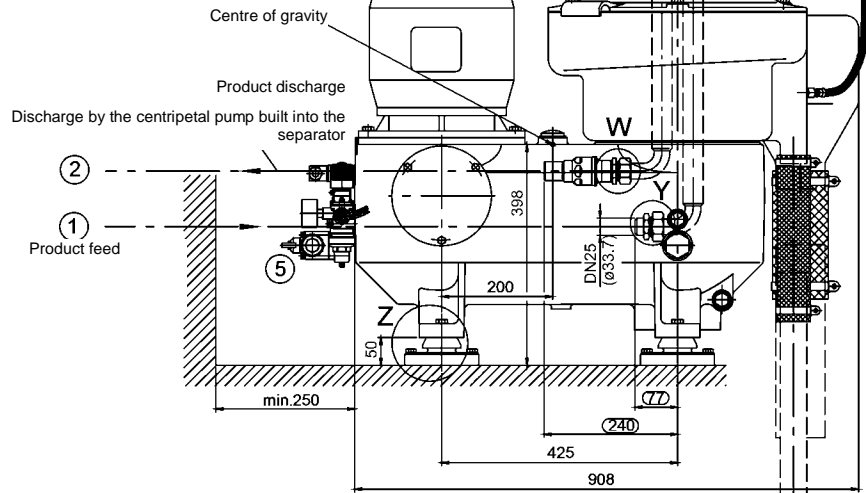
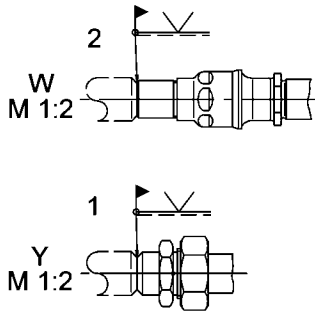
2064-4100-000-1

Fig. 57 Refer to the project-specific dimensioned drawing!

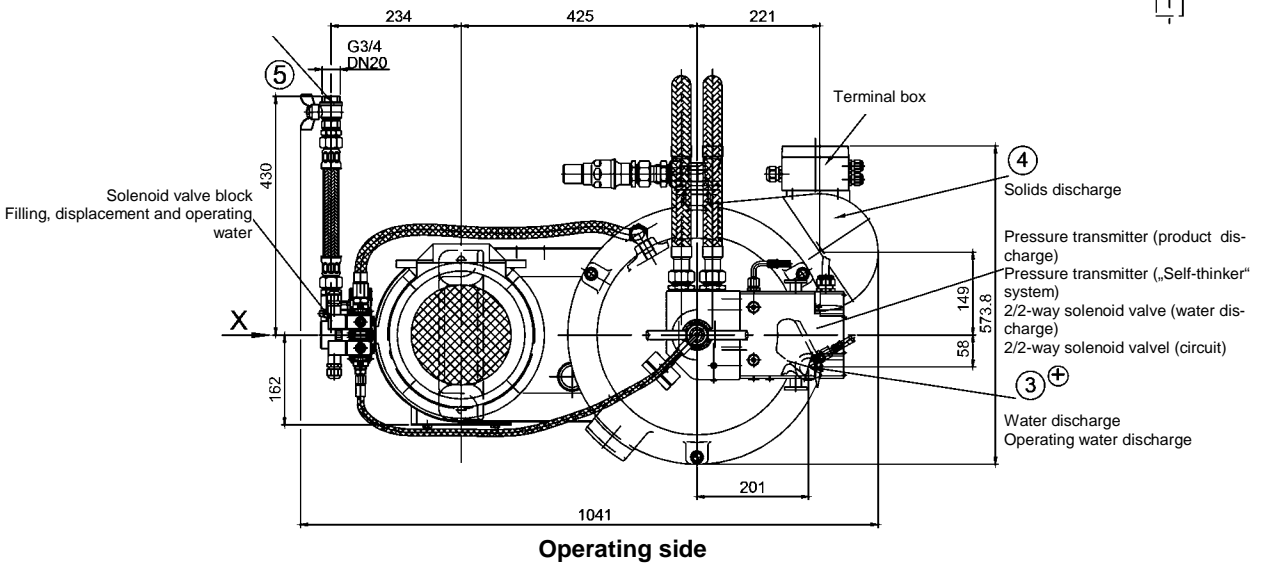
Anschlussstabelle / CONNECTIONTABLE		
	Beschreibung / DESCRIPTIONS	DN
①	Schmutzöl / DIRTY OIL	25 siehe Detail Y / SEE DETAIL
②	Reinöl / CLEAN OIL	25 siehe Detail W / SEE DETAIL
③	Schlamm-Ablauf / SLUDGE DISCHARGE	40 Schlauch / Schlauschelle / FLEXIBLE HOSE / HOSE CLIP
④	Wasser-Ablauf / WATER DISCHARGE Steuerwasser-Ablauf / OPERATING-WATER DISCHARGE	80 Schlauch / Schlauschelle / FLEXIBLE HOSE / HOSE CLIP
⑤	Steuerwasser / Füll- und Verdrängungswasser / OPERATING-WATER / FILLING AND DISPLACEMENT WATER	G 3/4 Aussengewinde / MALE

Pressure transmitter (product discharge)  
 Pressure transmitter („self-thinker“ system)  
 2/2-way solenoid valve (water discharge)  
 2/2-way solenoid valve (circuit)  
 Water detector

Socket:



Filling, displacement and operating water feed



The separator foundation must not have contact with foundations of other units (e.g. auxiliary diesel engine, pumps) to avoid damage to roller bearings.

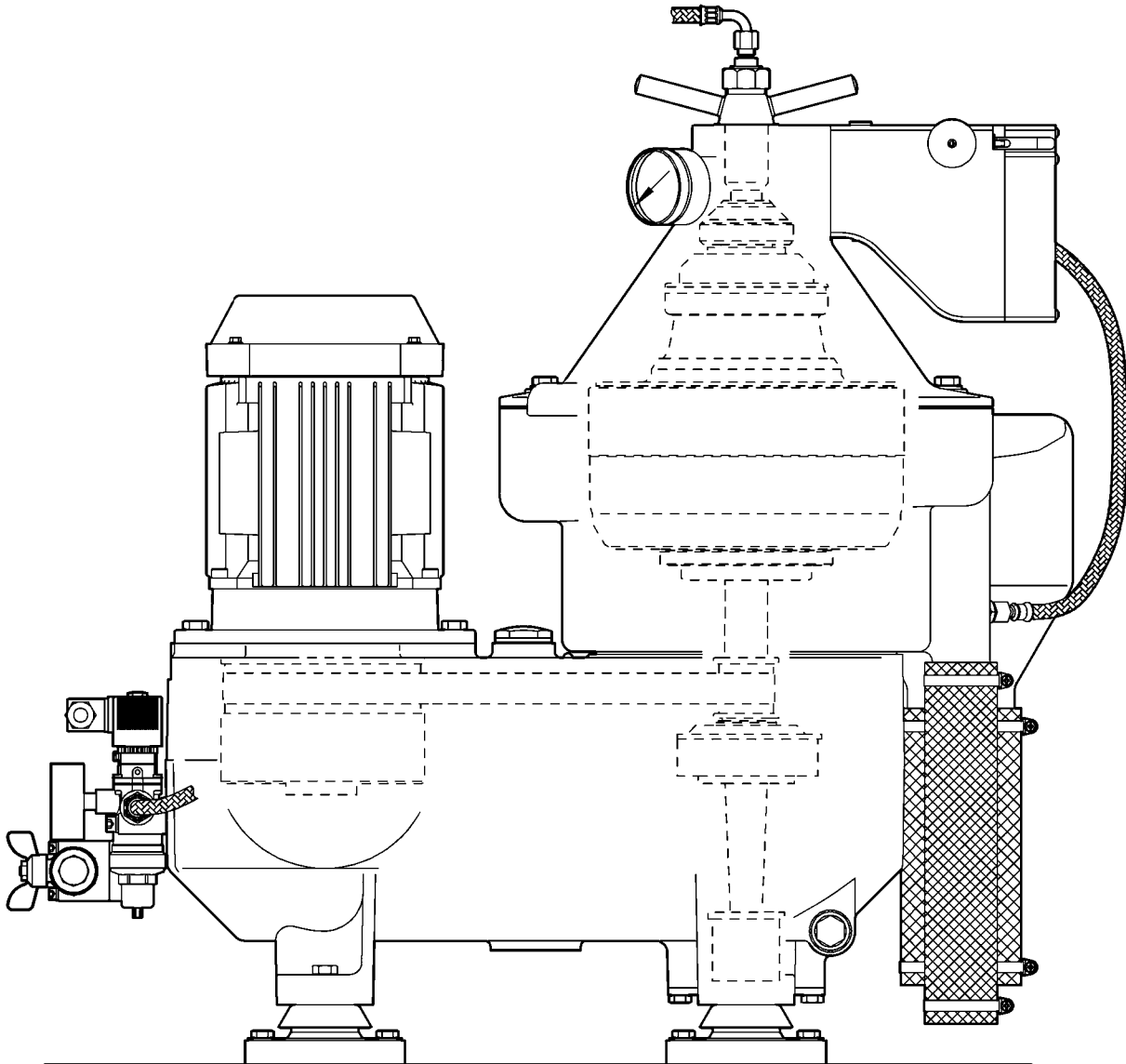
○ These dimensions **must** be adhered to!

⊕ Do **not** discharge residuals into public waters!

2064-4100-000-2

Fig. 58 Refer to the project-specific dimensioned drawing!

2.2 Section through separator



2065-1000-000-0136-0196

Fig. 59



## 2.3 General

The machine described in this manual is a high-speed centrifugal separator with self-cleaning bowl.

"Separation" means the separation of liquid mixtures which consist of two liquids, with simultaneous removal of the solids contained in the liquids.

"Clarification" is the removal of solids from a liquid.

Prerequisite for treatment technology (separation) is that the components of the product

- can be separated mechanically,
- have different densities and
- do not emulsify.

## 2.4 OSE ...-0136-...

The OSE separator ...-0136-... with **unitrol**plus-System is equipped with a self-cleaning disk bowl. It is used for clarification and purification of fuel oil (heavy oil up to a density of 1.01 g/ml).

The separator with **unitrol** plus-System has two built-in monitoring functions:

- WMS - (water content monitoring system)
- SMS (sludge space monitoring system)

### 2.4.1 Separator with water content and sludge space monitoring system (WMS and SMS) for fuel oil treatment

The simultaneous water content and sludge space monitoring systems (WMS and SMS) are used for the continuous purification of fuel oil.

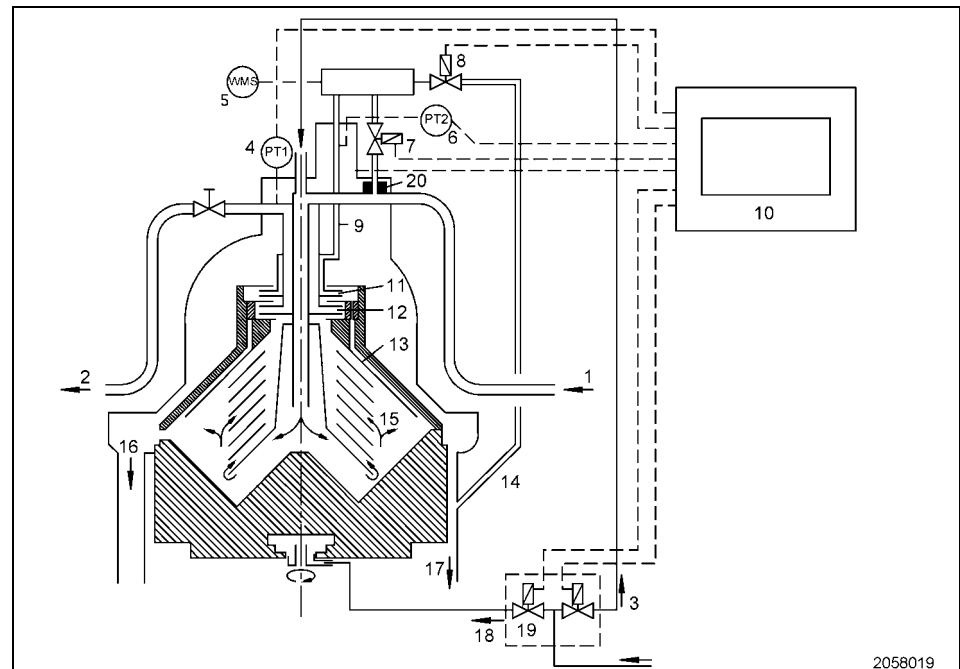


Fig. 60 Example of monitoring

- |                                    |                                 |
|------------------------------------|---------------------------------|
| 1 Dirty oil feed                   | 11 Sensing liquid pump          |
| 2 Clean oil discharge              | 12 Centripetal pump (clean oil) |
| 3 Displacement water               | 13 Separating disk              |
| 4 Pressure transmitter (clean oil) | 14 Dirty water discharge        |
| 5 Water detector:                  | 15 Solids holding space         |
| 6 Pressure transmitter             | 16 Solids discharge             |
| 7 Solenoid valve circuit           | 17 Operating water discharge    |
| 8 Solenoid valve water discharge   | 18 Operating water feed         |
| 9 Partial flow                     | 19 Solenoid valve block         |
| 10 Control and monitoring device   | 20 Throttle                     |

The fuel oil is conveyed to the separator via a separate pump.

The dirty oil feed occurs (1) through a closed line system.

The clean oil is discharged (2) under pressure by centrifugal pump (12) via the clean oil discharge.

The bowl is automatically opened and closed for desludging at full bowl speed by means of a solenoid valve (19) in the operating water line.

The partial flow (9) diverted from the bowl via the separating disk (13) and the sensing liquid pump (11) is monitored by a water detector (5) and a pressure transmitter (6).

When the water detector (5) registers water (high capacity), the solenoid valve (8) opens and the water is discharged through the dirty water outlet (14).

If the high capacity (water) changes due to oil flow (low capacity), the solenoid valve (8) closes and the solenoid valve (7) opens intermittently. The partial flow (9) is then recycled into the dirty oil feed (1).

When the sensing liquid inlet becomes blocked with water or solids accumulation in the sludge space (15), the pressure transmitter (6) sends a pulse to the control unit (10) and the automatic ejection program is initiated.

The control and monitoring unit (10) ensures unmanned operation.

## 2.5 Main components of the separator

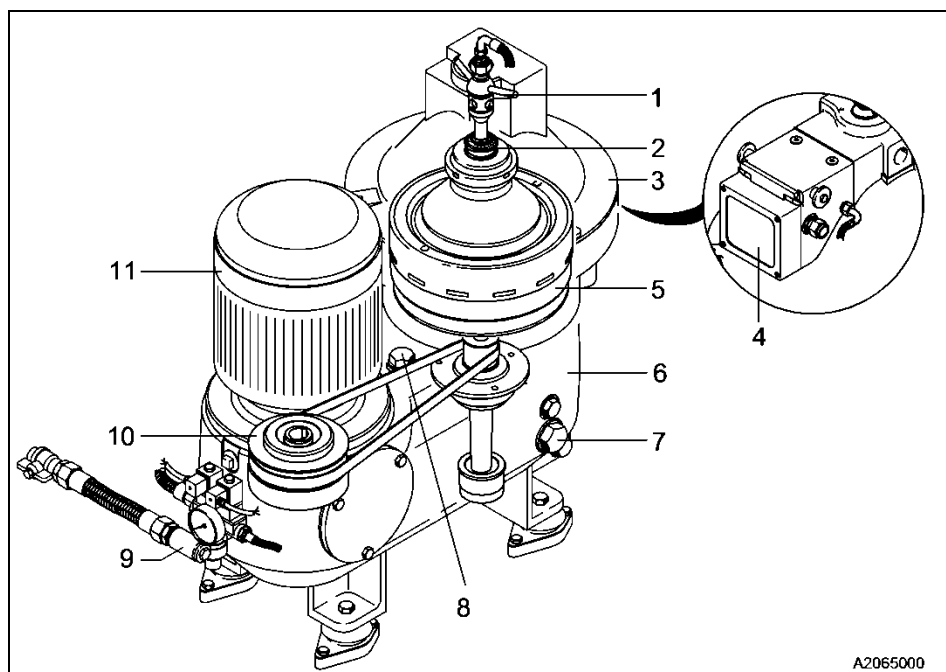


Fig. 61

Pos.	Designation	Function
1	Handle connection piece	<ul style="list-style-type: none"> <li>• connects centripetal pump and hood.</li> <li>• holds the filling and displacement water supply line.</li> </ul>
2	Centripetal pump Sensing liquid pump	See section 2.5.1
3	Hood	<ul style="list-style-type: none"> <li>• covers the rotating bowl.</li> <li>• holds the feed and discharges (see section 2.7).</li> </ul>
4	Sensor block	<ul style="list-style-type: none"> <li>• is fitted to the hood.</li> <li>• can be replaced as a complete unit.</li> <li>• contains the following parts: <ul style="list-style-type: none"> <li>– Regulating ring (see section 2.6.1)</li> <li>– Pressure transmitter (<b>unitrolplus</b> system – SMS function) (see section 2.6.1)</li> <li>– 2/2-way solenoid valve (water outlet) (see section 2.6.3)</li> <li>– 2/2-way solenoid valve (circulation) (see section 2.6.3)</li> <li>– Water detector (<b>unitrolplus</b> system – WMS function) (see section 2.6.2)</li> </ul> </li> </ul>
5	Bowl: Bowl hydraulics	See section 2.5.2 See section 2.5.3
6	Frame	<ul style="list-style-type: none"> <li>• contains the drive parts.</li> <li>• supports motor, bowl and hood.</li> </ul>

Pos.	Designation	Function
7	Sight glass	allows checking the oil level.
8	Sight glass	for checking the drive belt.
9	Solenoid valve block	See section 2.5.5
10	Drive	See section 2.5.4
11	Motor	<ul style="list-style-type: none"><li>• accelerates the separator to the required speed.</li><li>• is protected against overload during operation.</li></ul>

## 2.5.1 Centripetal pump

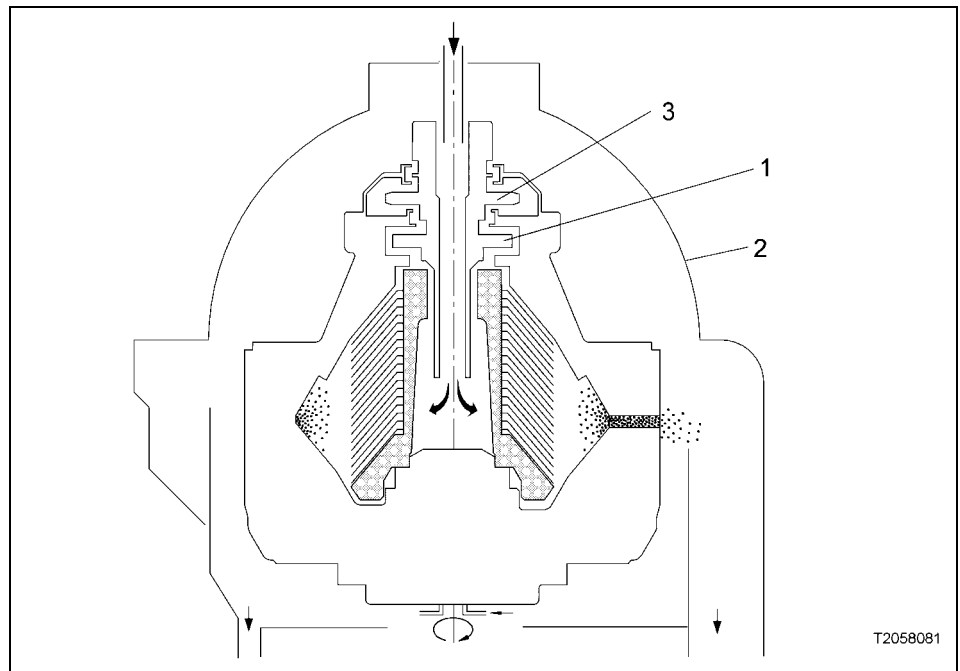
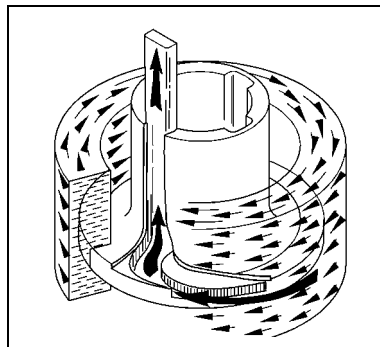


Fig. 62

Pos.	Designation	Function
------	-------------	----------

- |   |                  |   |
|---|------------------|---|
| 1 | Centripetal pump | <ul style="list-style-type: none"> <li>discharges the purified liquid under pressure.</li> <li>is firmly connected to hood 2 of the separator.</li> </ul> |
|---|------------------|---|



- The disk provided with channels dips into the liquid rotating with the bowl.
- The liquid
  - is pared off by the centripetal pump and
  - flows through its spiral channels from the outside to the inside.
 By this means the kinetic energy is converted into pressure energy which makes possible discharging the liquid under pressure.

- |   |                     |   |
|---|---------------------|---|
| 3 | Sensing liquid pump | <ul style="list-style-type: none"> <li>operates on the same principle as centripetal pump 1.</li> <li>conveys the sensing liquid to the monitoring system.</li> </ul> |
|---|---------------------|---|

## 2.5.2 Bowl

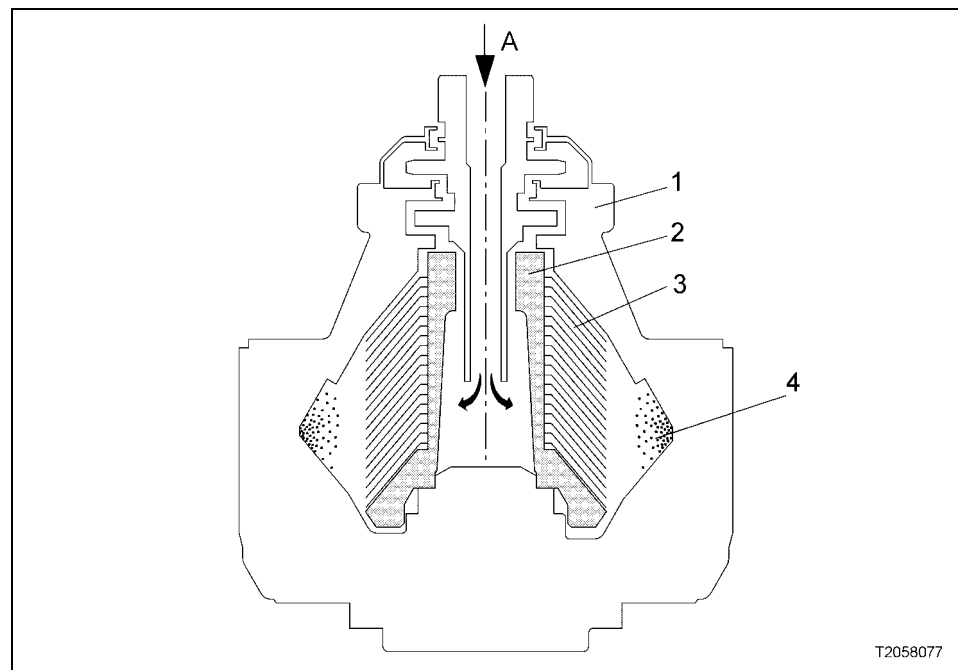


Fig. 63

Pos.	Designation	Function
1	Bowl	produces high centrifugal forces through rotation making possible separation and clarification.
2	Distributor	accelerates the product fed in through feed <b>A</b> to the rotational velocity of the bowl and then conveys it into the disk stack.
3	Disk stack	<ul style="list-style-type: none"> <li>splits the liquid mixture consisting of a light and heavy phase, e.g. oil-water, into its components.</li> <li>consists of a large number of conical disks positioned on top of one another.</li> </ul> <p>Each disk is provided with spacers so that precisely defined interspaces are formed between the individual disks.</p> <p>The smooth disk surfaces facilitate sliding of the solids and hence self-cleaning of the disks.</p>
	Separation chamber	The separation space consists of a large number of parallel chambers of low height. This produces very small radial sedimentation paths for the product.
	Solids	collect on the upper wall of each disk interspace and slide down into the solids holding space.
4	Solids holding space	collects the solids separated in the disk stack.

### 2.5.3 Bowl hydraulics

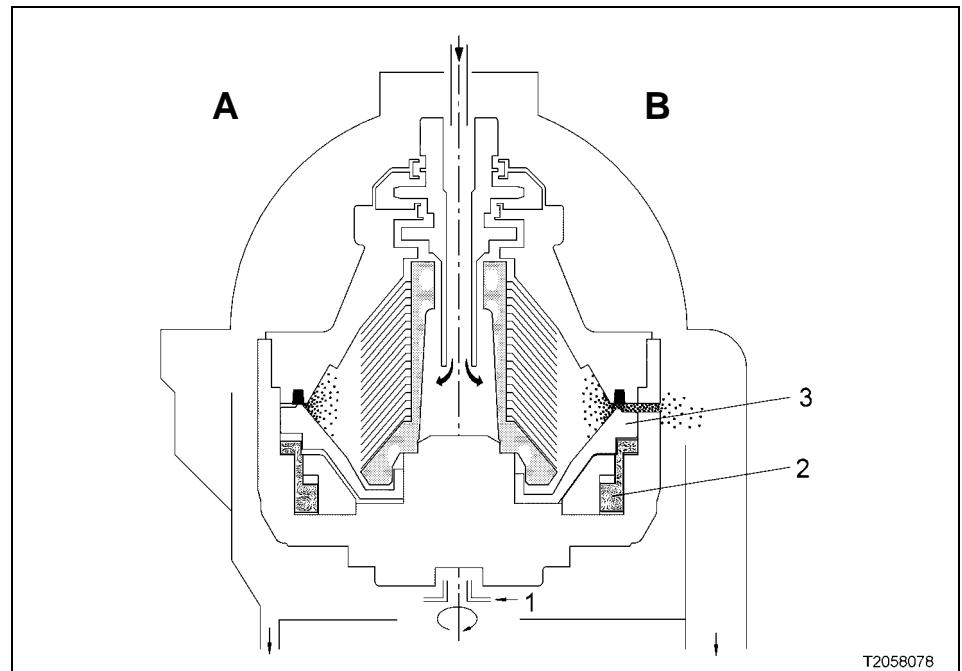


Fig. 64

- A** Separation – Bowl closed  
**B** Ejection – Bowl open

Pos.	Designation	Function
1	Operating liquid (usually water)	In the rotating bowl the incoming, rotating operating liquid generates a high centrifugal pressure. This pressure is utilised for actuating the annular piston and sliding piston which closes and opens the bowl.
2	Annular piston	<ul style="list-style-type: none"> <li>• is inside the bowl bottom,</li> <li>• rotates with the same angular velocity as the other bowl parts,</li> <li>• is axially movable.</li> </ul>
3	Sliding piston	<ul style="list-style-type: none"> <li>• is located inside the bowl bottom,</li> <li>• rotates with the same angular velocity as the other bowl parts,</li> <li>• is axially movable.</li> </ul>

### Closing the bowl (separation)

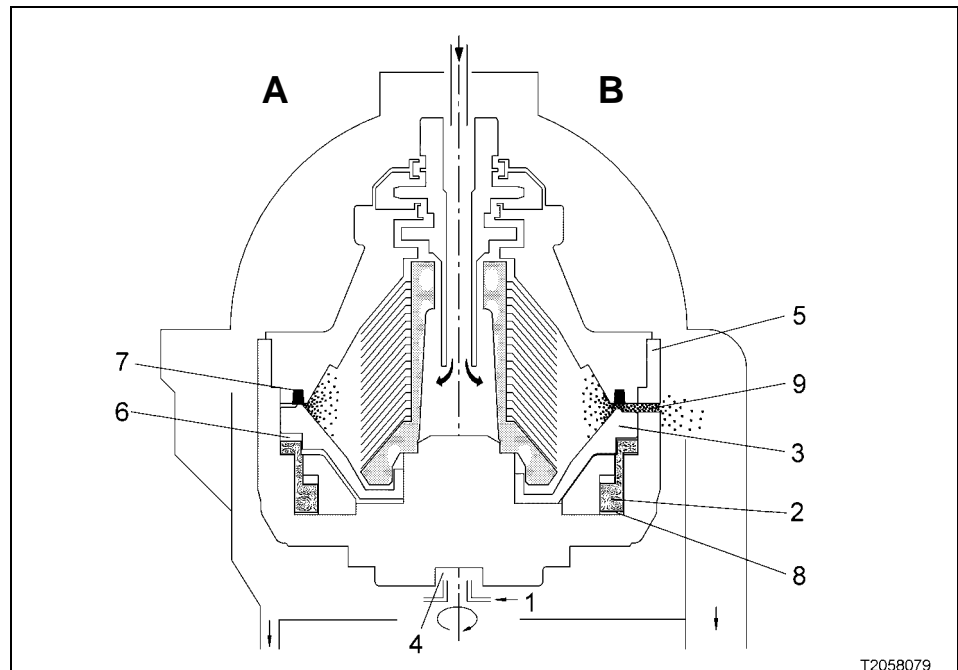


Fig. 65

- A** Separation – Bowl closed  
**B** Ejection – Bowl open

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

Pos.	Designation	Function
1	Operating liquid	<ul style="list-style-type: none"> <li>flows into the injection chamber 4 of bowl bottom 5 and</li> <li>from there through feed holes into closing chamber 6.</li> </ul> This initiates closing of the bowl.
2	Annular piston	<ul style="list-style-type: none"> <li>moves into closed position.</li> </ul>
3	Sliding piston	<ul style="list-style-type: none"> <li>is raised due to the hydrostatic pressure in closing chamber 6.</li> <li>is pressed against the gasket 7 of bowl top due to the hydrostatic pressure and</li> <li>closes the bowl.</li> </ul>



### Opening the bowl (ejection)

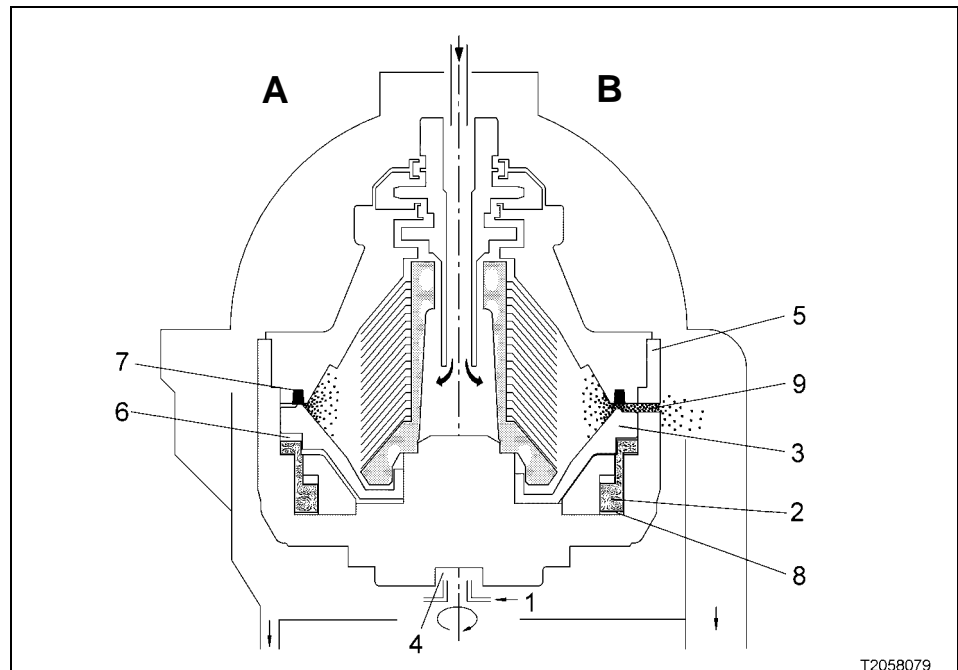


Fig. 66

- A** Separation – Bowl closed  
**B** Ejection – Bowl open

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

Pos.	Designation	Function
1	Operating liquid	<ul style="list-style-type: none"> <li>flows first into injection chamber 4 and</li> <li>from there into opening chamber 8.</li> </ul>
2	Annular piston	<ul style="list-style-type: none"> <li>rises and</li> <li>empties closing chamber 6.</li> </ul>
3	Sliding piston	<ul style="list-style-type: none"> <li>moves downwards and</li> <li>opens the ejection ports in bowl bottom 5 for the separated solids 9.</li> </ul>

## 2.5.4 Drive

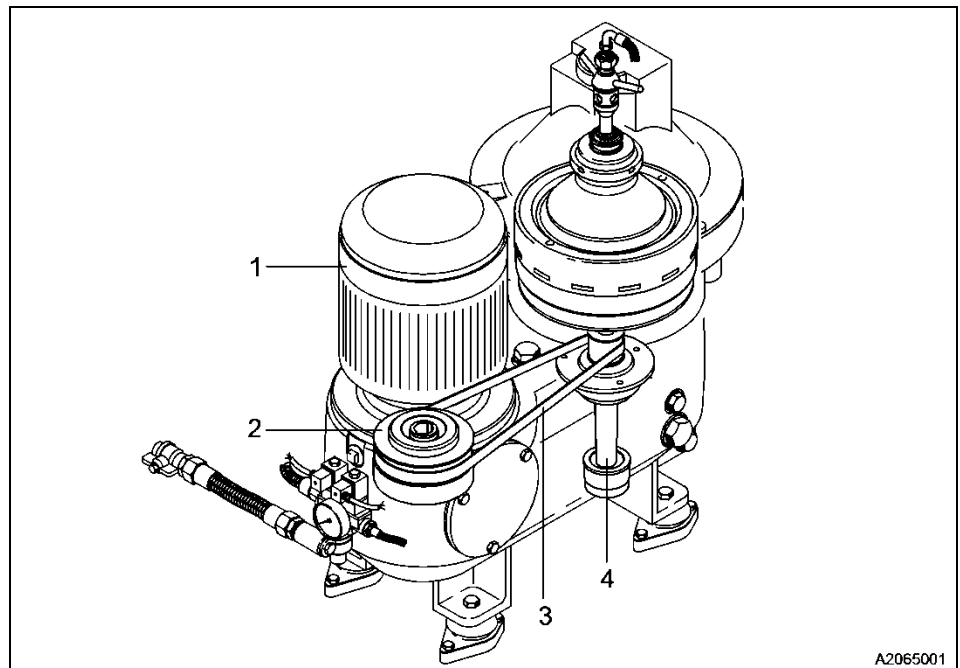


Fig. 67

Pos.	Designation	Function
1	Drive motor	drives the separator. Power transmission to the bowl spindle is via the centrifugal clutch to the motor belt pulley and via the drive belt.
2	Centrifugal clutch	<ul style="list-style-type: none"> <li>ensures power transmission between motor, drive belt and spindle.</li> <li>accelerates the bowl <b>gradually</b> to rated speed;</li> <li>is gentle on the drive belt and motor.</li> </ul> <p><b>Important!</b></p> <ul style="list-style-type: none"> <li>The driving effect of new clutch shoes will improve after several starts.</li> <li>Smoking of the centrifugal clutch during the first few starts is perfectly normal and will disappear after a short time of operation.</li> <li>Wear to the clutch shoes depends on the number of starts and the ejection frequency (see section 4.3.1).</li> </ul>
3	Drive belt	transfers the drive power of the drive motor 1 to the bowl spindle 4. Regularly check the seat and condition of the drive belt. The inspection and replacement intervals are given in the maintenance schedule (see 4.3.1).
4	Bowl spindle	supports the bowl.

### 2.5.5 Solenoid valve block

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

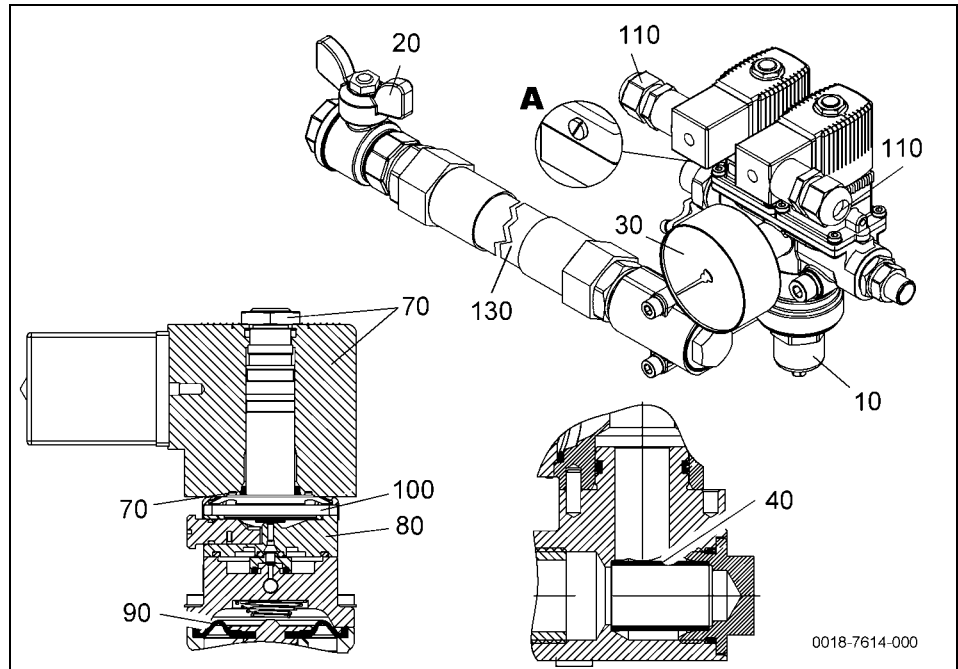


Fig. 68

- |                           |                    |
|---------------------------|--------------------|
| 10 Pressure controller    | 90 Diaphragm       |
| 20 Sleeve-type ball valve | 100 Magnet core    |
| 30 Pressure gauge         | 110 Coupler socket |
| 40 Filter insert          | 130 Hose           |
| 70 Magnet coil            |                    |
| 80 Housing                | A Manual override  |

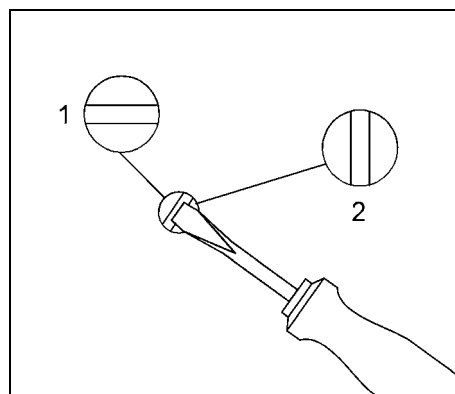


Fig. 69

#### Manual override A

The manual override can only be actuated with a screwdriver!

- 1 closed
- 2 open

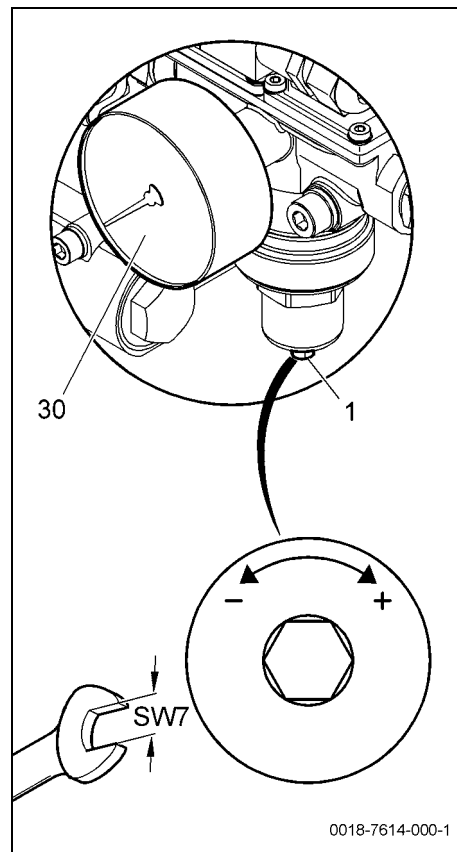


Fig. 70

### Adjusting the pressure setpoint - pressure controller 10

If necessary:

- Correct the pressure setpoint by turning the setpoint screw 1 (jaw span 7).

#### Pressure setpoint correction

- Open the operating water valve using the manual override (see Fig. 69).

*Pressure setpoint is too low.*

- Increase the pressure setpoint.
  - Turn setpoint screw *clockwise*.

*Pressure setpoint is too high.*

- Decrease the pressure setpoint.
  - Turn setpoint screw *counter-clockwise*.

The adjusted pressure setpoint is indicated on pressure gauge 30.

SW = jaw span

## Technical data



### ATTENTION:

- Note the specifications on the nameplate of the solenoid valve block and
- the installation guidelines.

Part-No.		see parts list
Operating principles		2/2-way solenoid valve NC
Material:	Gasket	EPDM
	Housing	CuZn
Solenoid valves:	Coil size	32 mm
	Nominal diameter (DN)	13 mm
	Operating voltage:	24 V DC
	Rating	8 W (per solenoid valve)
	Coupler socket	with built-in electronics, 24 V DC, LED and free-wheeling diode with fitted cable (1.5 m long)
Pressure	Medium	0 to 10 bar
	Control range	1 to 6 bar
Pressure setpoint		2 bar with open operating water solenoid valve
Temperature:	Medium	-10 to +80 °C (14 – 176 °F)

## In case of electrical faults



### CAUTION: Danger due to electrical current!

- Switch off the main switch and lock it.
- Close the main valve for operating water, filling and displacement water.



### CAUTION: Danger of injury through very hot separator parts!

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C(158 – 212 °F)).



### ATTENTION:

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

<b>Problem</b>	<b>Cause</b>	<b>Action</b>
Solenoid valve does not function.	Control unit is defective.	Contact service backup support.
	Wire break in the connecting terminal.	Replace wire.
	Connecting terminal on the connector block is loose.	Tighten the screw of the connecting terminal.
	Bad contact on the connecting terminal.	Clean or replace the contact.
	Coupler socket loose.	Tighten coupler socket.
	Magnet coil defective.	Replace the solenoid head.
	Diaphragm defective.	Replace diaphragm.

## 2.6 Supervisory equipment

The separating process is monitored and controlled by an automatic control unit. For further details, refer to the control unit manual.

### 2.6.1 Pressuretransmitter

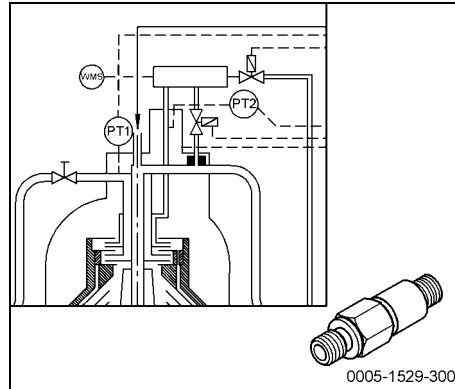


Fig. 71

Pressure transmitters **PT1** and **PT2** (Pressure Transmitter)

- are included in the standard scope of supply,
- provide alarm logging **PAH** (Pressure Alarm High) and **PAL** (Pressure Alarm Low),
- switch process-specifically in case of pressure drop or increase,
- can be software-checked for correct functionality and can be adjusted to their switching points,
- are maintenance-free.

The pressure transmitter

- **PT1** is installed in the product discharge line.
- **PT2** is installed on the **Unitrolplus-System**.

#### **Note:**

Refer to the circuit diagram in the control cabinet and the manual of the control system.

### Setting the switching points

The switching points are set at the factory using appropriate software.

Factory settings		
Product discharge line		Unitrolplus-System
Pressure transmitter PT1		Pressure transmitter PT2
PAL	PAH	PAL
1.0 bar <sup>(1)</sup>	3.0 bar <sup>(2)</sup>	0.5 bar
<p><sup>(1)</sup> The product discharge pressure on the pressure gauge (separator) must be <b>0.5 to 1 bar above the switching point.</b></p> <p><sup>(2)</sup> The product discharge pressure on the pressure gauge (separator) must be <b>0.5 to 1 bar under the switching point.</b></p>		



#### **IMPORTANT:**

- Pay special attention to order-specific settings (see operating data sheet in the order documentation)!

### Technical data

Voltage	24 V DC
Range	0 – 16 bar
Output signal	4 – 20 mA
Pressure connection	G 1/4in outer (O-ring seal)
Tightening torque Pressure connection	max. 25 Nm
Connector plug	M 12 x 1; 5-pole
Cable	PUR-2 core, 1.5 m Cable box M 12 x 1; 5-pole Pin1-, white; Pin4+, black
Enclosure	IP 67
Working temperature :	-40 to +125 °C (-40 to +257 °F)
Medium temperature	

### 2.6.2 Water detector

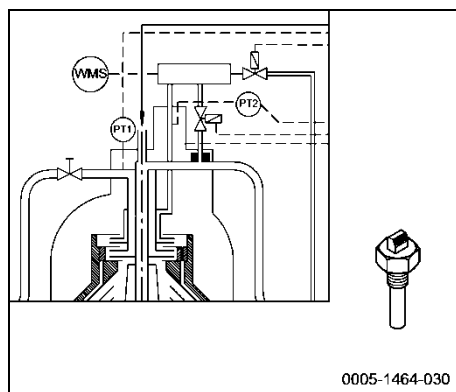


Fig. 72

The **WMS** water detector (WMS sensor)

- is included in the standard equipment,
- is built into the **unitrol**plus-System,
- monitors the partial flow that is discharged from the bowl via the separating disk and the sensing liquid pump.
- can be checked for functionality using appropriate software.

#### **Note:**

Refer to the terminal connection plan in the control cabinet and the manual of the control system.

### Setting the switching points

The switching points are preset for the specific area of application (HFL or LO) at the factory.



**Technical data**

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

### 2.6.3 Solenoid valve

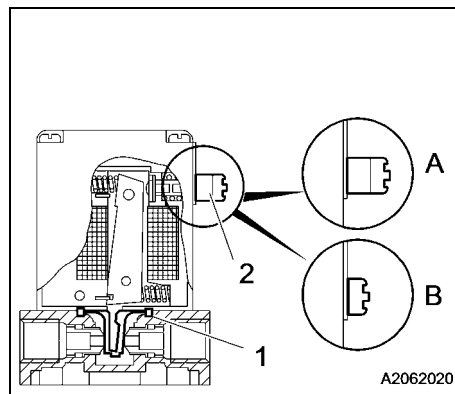


Fig. 73

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

#### Main components:

- 1 Diaphragm
- 2 Emergency locking manual override

A Operating mode

B Emergency manual override

- Note:** The emergency manual override (2)
- is secured against accidental activation: see operating status (A).
  - can be pressed and turned through 90°: see emergency manual override (B).

#### Technical data

Part-No.	see parts list
Operating principles	2/2-way valve normally closed
Nominal width	3 mm
Gasket material	FKM
Material	CuZn
Line connection	G-1/4 sleeve
Voltage	24 V
Kind of current	DC (direct current)
Rating	8 W

#### In case of electrical faults



#### CAUTION: Danger due to electrical current!

- Switch off the main switch and lock it.
- Close the main valve for operating water, filling and displacement water.



#### CAUTION: Danger of injury through very hot separator parts!

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C (158 – 212 °F)).



#### IMPORTANT:

- Refer to the instruction manual and nameplate of the solenoid valve.
- Direct intervention in the solenoid valve may only be done by authorised specialists and with suitable tools!

<b>Problem</b>	<b>Cause</b>	<b>Action</b>
Valve does not function.	Control unit is defective.	Contact service backup support.
	Wire break in the connecting terminal.	Replace wire.
	Connecting terminal on the connector block is loose.	Tighten the screw of the connecting terminal.
	Bad contact on the connecting terminal.	Clean or replace the contact.
	Magnet coil defective.	Replace the solenoid head.
	Diaphragm defective.	Replace diaphragm.

### 2.6.4 Vibration monitoring (Option)

The separator is protected against inadmissibly high vibrations by means of an electronic vibration monitoring system.

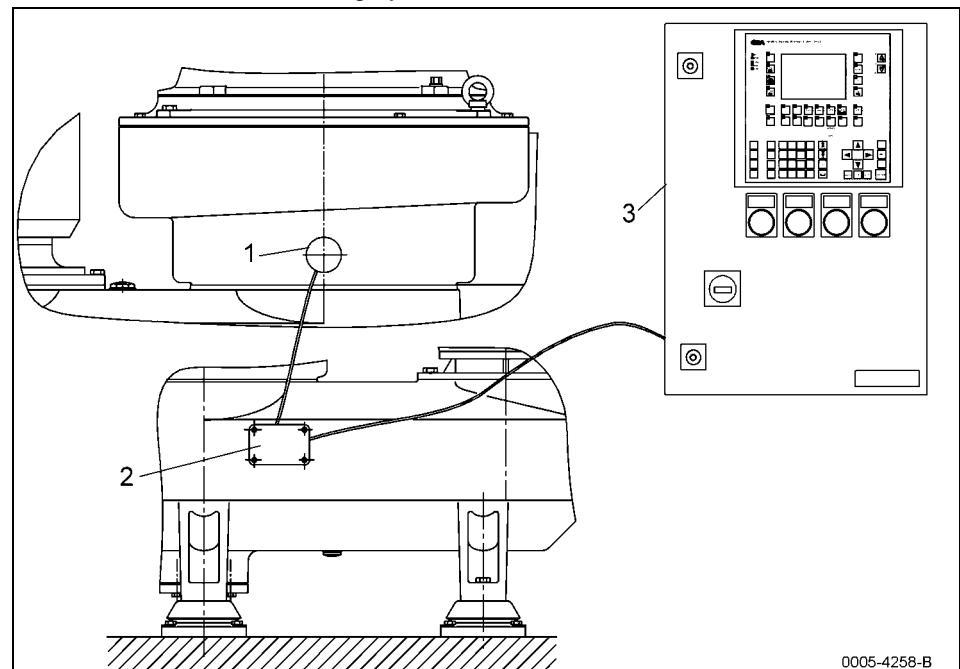


Fig. 74 Installation example

Pos.	Designation	Function
1	Vibration pick-up	<ul style="list-style-type: none"> <li>• is installed at the upper part of the frame.</li> <li>• converts the separator vibrations into electric signals.</li> </ul>
2	Terminal box	<ul style="list-style-type: none"> <li>• is mounted at the lower part of the frame.</li> </ul>
3	Vibration monitoring unit	<ul style="list-style-type: none"> <li>• is installed in the control cabinet.</li> <li>• evaluates the signals coming from the vibration pickup.</li> </ul>

The evaluation of the signal – depending on the version – takes place in the control cabinet, on the control unit or directly on the vibration pickup.

When the limit value or values are exceeded, an alarm and follow-up measures are triggered and the separator motor switches off automatically.

The operating status can be read off on the control unit.



#### ATTENTION!

Pay attention to the following instructions and plans:

- instruction manual of the vibration monitoring system
- instruction manual of the control unit
- terminal allocation in the terminal diagram of the control cabinet
- circuit diagram

## 2.6.5 Speed monitoring

Speed monitoring device

- displays bowl speed.  
Speed deviations of up to 5 % are permissible.
- monitors speed drop as well as excess of speed and starting time.

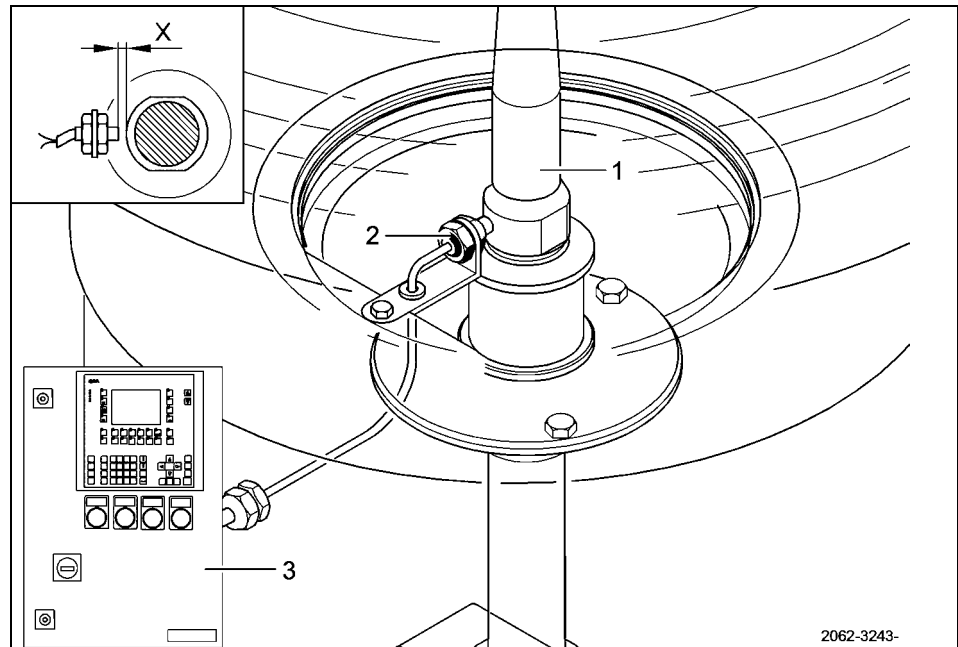


Fig. 75

Pos.	Designation	Function
1	Spindle	<ul style="list-style-type: none"> <li>• rotates and generates speed pulses at proximity switch 2.</li> </ul>
2	Proximity switch	<ul style="list-style-type: none"> <li>• transmits the pulses triggered from the spindle to control unit 3.</li> </ul>
		<p><b>ATTENTION!</b> Align the proximity switch as illustrated. The distance <b>X</b> between the spindle and the proximity switch must be <b>2.5 mm</b>.</p>
3	Control unit	<ul style="list-style-type: none"> <li>• evaluates the speed pulses.</li> <li>• triggers an alarm if the bowl speed is too low or too high.</li> <li>• initiates a shut-down process if the bowl speed is too low or too high.</li> <li>• indicates the current bowl speed and</li> <li>• permits setting of limit values.</li> </ul>



### ATTENTION!

Pay attention to the terminal allocation in the terminal diagram of the refer to the instruction manual of the control unit.

## 2.7 Product feed line and product discharge line

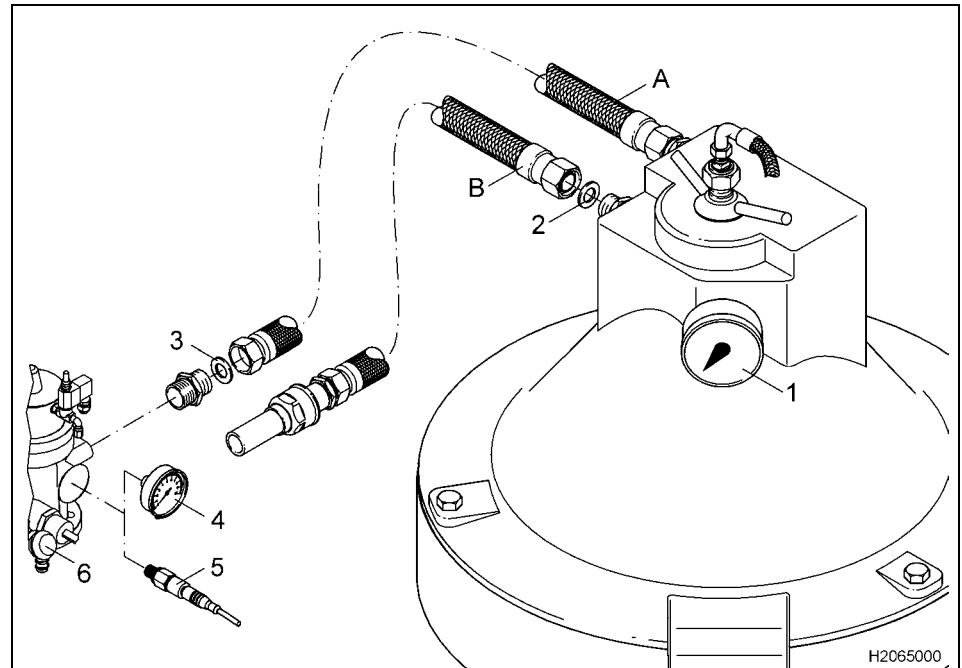


Fig. 76

The separator is adapted to local conditions for throughput capacity and line pressure by means of orifice plates installed in product feed line A and product discharge line B (see section 4.2).

### 2.7.1 Throughput monitoring (product feed line A)

The effective throughput capacity of the separator is stated on the project dependent data sheet.

The inner diameters of the orifice plates required for the different throughput capacities can be read from the following table:

Flowmeter – Scale: 0 – 10	
Throughput capacity [l/h]	Inner diameter of orifice plate [mm]
1 000 – 1 400	6
1 400 – 2 200	8
2 200 – 3 300	10
3 300 – 4 800	12
4 800 – 7 000	14
7 000 – 13 000	no orifice plate

#### When using a D10 control unit

- During commissioning mark the respective scale area on flowmeter 4 (see Fig. 76 with the sticker supplied).

### When using an E10 control unit

The effective throughput capacity is displaced on the control unit via the pressure transmitter 5.

Throughput values deviating between the actual value and the setpoint value can be adapted in the control unit.

### 2.7.2 Throughput determination (product feed line A) - only for control D10

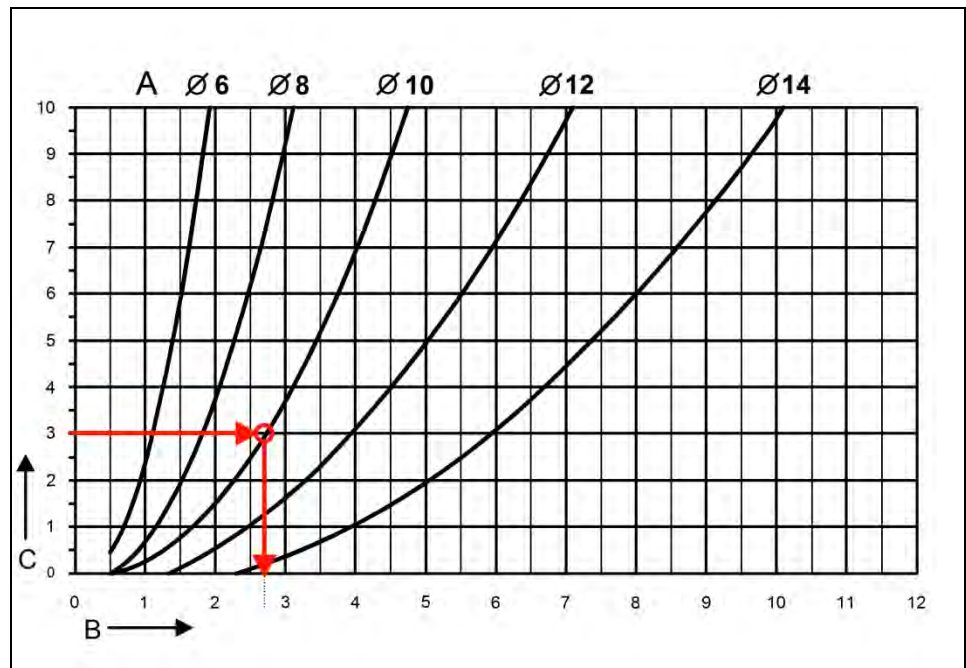


Fig. 77 Diagram for determining the throughput rate

- A** Inner diameter of orifice plate (mm)
- B** Throughput capacity (x 1000 l/h)
- C** Scale area of flowmeter

The throughput capacity of the separator (volume of product to be treated fed by unit of time) can be determined with the aid of the diagram.

### 3/2-way valve with flow indicator 4

Procedure:

- Read the value on the scale of flowmeter 4 (see Fig. 76).  
e.g. **3**
- From the value read from the scale (e.g. 3) draw a line up to the curve of the inner diameter of the built-in orifice plate A (e.g. Ø 10).
- Read the throughput rate B appearing vertically below:  
e.g. **2.7** (= 2 700 l/h)

The precision in throughput determination depends on the following characteristics of the product to be processed:

- Viscosity
- Temperature
- Density

The parameters mentioned here can lead to inexact determination of the throughput rate.

### 2.7.3 Pressure monitoring (product discharge line B)

The pressure in the discharge line is displayed on pressure gauge 1 (see Fig. 76).

- Note factory adjusted switch points (see section 2.6.1).

The inner diameters of the orifice plates required for the different throughput capacities can be read from the following table:

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



## 2.8 Technical data

### Subject to modification!


The order-specific process data are given on the operating data sheet included in the documentation.

<b>Bowl</b>	
Solids holding space (total)	1.5 dm <sup>3</sup>
Speed – for densities of the product up to 1.01 kg/dm <sup>3</sup> (at 15 °C) and – for densities of the separated solids up to 1.4 kg/dm <sup>3</sup>	12 000 min <sup>-1</sup> (see name-plate)
Speed for higher densities	contact the factory
Starting time	approx. 2 – 4 min
Run-down time (after switching off the motor <b>with</b> drive belt))	45 min
Run-down time ( <b>without</b> drive belts, i.e. in the case of torn, jumped off or defective drive belt)	90 min

<b>Centripetal pump</b>	
Output (depending on medium)	max. 10 000 l/h
Pressure head	1 – 2 bar

<b>Operating water</b>	
Qty.	min. 1 800 l/h
Pressure (with open valve)	2 – 3 bar

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

Normal separating temperature of the product	
DO	20 °C (68 °F)
MDO	40 °C (104 °F)
LO	90 °C (194 °F)
LO HD	95 °C (203 °F)
HFO	98 °C (208 °F)
	Due to the large number of products to be treated, it is not possible to specify an exact separating temperature of the product in this manual. The exact separating temperature of the product (in °C) is stated in the order-specific data sheet.

Motor		
Power rating	50 Hz	7.5 kW
	60 Hz	8.6 kW
Speed	50 Hz	3 000 RPM
	60 Hz	3 600 RPM
Design	IM V1	
Enclosure	IP 55	

Drive	50/60 Hz
Oil filling	approx. 2.5 l
	Oil quality, see section 4.3.3

Product feed pump	
Pump unit (gear or screw pump)	
Output	depending on plant rating
Suction height	max. 0.4 bar
Pressure head	2 bar

Weights	
Separator (with motor, without bowl)	240 kg
Bowl	70 kg
Motor	53 kg

### 3 Operation

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### 3.1 Technical information

Take note of the following sections:

#### 3.1.1 Separating with the unitrolplus system

The separator with **unitrol** plus-System has two built-in monitoring functions:

- water content monitoring system - **WMS**
- sludge space monitoring system - **SMS**

#### Procedure:

- Select the desired operating mode on the control unit.
- Set the separating time on the control unit.
- Start the separator (see 3.2).

#### 3.1.2 General information on bowl ejection

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

The time at which the ejection is triggered is

- determined by the preset separating time  
or
- by the solids level in the bowl,  
if:
  - **SMS** was selected on the control unit,
  - the sludge space is full before the separating time has elapsed.

For determining the separating time see 3.5.

#### Sequence of an ejection (example without "Filling")

1.	Separating time has elapsed.
2.	Product feed valve is closed.
3.	Displacement water displaces the fuel oil to the clean oil side.
4.	Operating water opens and closes the bowl hydraulically at full bowl speed.
5.	Waiting time for speed recovery.
6.	Product valve is opened.
7.	Separating time resumes.

#### Displacement

- When separating, the loss of feed liquid unavoidable during ejection can be reduced to a minimum by displacing the feed liquid with water before sludge ejection takes place (especially important when processing valuable feed liquid).
- The duration of displacement water supply is given in the *timer overview* (see control unit manual).

- If the displacement time is **too long**, water will discharge through the light liquid outlet.
- If the displacement time is **too short**, part of the product remains in the bowl and is lost during desludging.

### Flush ejection

If the solids can't be completely ejected,

- due to an excessively long dwell time in the bowl or
  - are stuck too firmly on the wall of the solids holding space due to the solids properties,
- either the separating time must be shortened or
  - a flush ejection must be carried out after the total ejection by filling the bowl with water or product and emptying it again.

### Program control

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

## 3.2 Before start-up



### Note:

- Safety precautions in chapter 1.
- Instruction manual of the corresponding control unit.
- Instructions “Settings and malfunctions”
- Instruction manuals for other auxiliary equipment
- Process-related deviations are possible (refer to the order-specific operating data sheet!)

### 3.2.1 Before the first start-up – after maintenance and repair



#### ATTENTION!

**In order not to endanger the operating safety of the separator, keep to the recommended maintenance intervals.**

If the bowl has been out of operation for **longer than 6 months** (e.g. due to a long standstill period or storage),

- check all bowl parts as specified in the maintenance schedule (table “Maintenance after 4000 operating hours or after 6 months at the latest”).
- Replace if necessary.

If the separator has been out of operation for **longer than 12 months** (e.g. due to a long standstill period or storage),

- check all separator parts in accordance with the maintenance schedule (table “Maintenance after 8000 operating hours or after 1 year at the latest”),
- replace if necessary.

#### Ensure that

- the sight glass in the frame for observing the drive belt is clean.
- the sight glass in the frame for observing the oil level is clean.
- the drive chamber is filled with oil in accordance with section 4.3.3.
- the bowl height is correct (see section 4.7.1).
- the bowl can be rotated by hand.
- the machine is correctly assembled.
  - Tighten the bowl top **securely (left-hand thread)**.
  - Tighten the spindle screw with the separator-specific torque **(left-hand thread)**.
  - Tighten the centripetal pump chamber lock ring **securely (left-hand thread)**.
- the hood is correctly mounted (see 4.5).
- the handle connection piece is tightly bolted to the centripetal pump (see 4.5).
- the hoses and hose pipes are undamaged and connected (see section 4.3.2).

- the feed and discharge lines are connected (see 4.5).
- the supervisory equipment is complete, mechanically and electrically functional.
- the product and supply lines are ready-for-operation.
  - Pay attention to the air and water pressures (see order-specific operating data sheet).
- the product heating devices are ready for operation (option).
  - Pay attention to the volumes, pressure and temperature (see order-specific operating data sheet).
- the plant components such as valves, water pressure reducer, compressed air control unit etc. are operational.
- the motor is correctly connected (see 4.1.3).
- the motor is correctly mounted.

**Important!**

- Check the remaining plant components such as hose pipes, sight glasses for signs of aging and mechanical damage.
- Damaged plant components must be replaced immediately by new parts.

### 3.2.2 Before every start-up

#### Ensure that

- the sight glass in the frame for observing the drive belt is clean.
- the sight glass in the frame for observing the oil level is clean.
- the drive chamber is filled with oil in accordance with section 4.3.3.
- the machine is correctly assembled.
  - Tighten the bowl top **securely (left-hand thread)**.
  - Tighten the spindle screw with the separator-specific torque **(left-hand thread)**.
  - Tighten the centripetal pump chamber lock ring **securely (left-hand thread)**.
- the hood is correctly mounted (see 4.5).
- the handle connection piece is tightly bolted to the centripetal pump (see 4.5).
- the hoses and hose pipes are undamaged and connected (see section 4.3.2).
- the feed and discharge lines are connected (see 4.5).
- the supervisory equipment is complete, mechanically and electrically functional.
- the product and supply lines are ready-for-operation.
  - Pay attention to the air and water pressures (see order-specific operating data sheet).
- the product heating devices are ready for operation (option).
  - Pay attention to the volumes, pressure and temperature (see order-specific operating data sheet).
- the plant components such as valves, water pressure reducer, compressed air control unit etc. are operational.
- the motor is correctly mounted.

#### Important!

- Check the remaining plant components such as hose pipes, sight glasses for signs of aging and mechanical damage.
- Damaged plant components must be replaced immediately by new parts.



### 3.3 Starting the separator

- See section 3.2.1 or 3.2.2
- Switch on the control unit.
- Switch on the separator motor.  
Compare the starting current and starting time with the diagram (section 4.1.3) until the bowl reaches the speed specified on the separator nameplate.

**Note:**

The run-up phase of the separator motor is signalled by *slow* flashing of the LED in the "Status Separator" key.



**ATTENTION! Before the first start-up – after maintenance and repair work on the separator -**

- **Check the direction of rotation of the bowl.**

The bowl must rotate in clockwise direction when looked at from above.

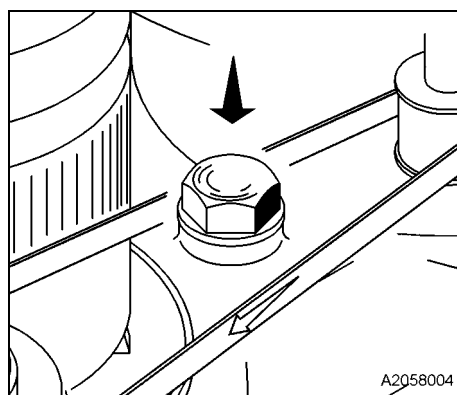


Fig. 78

The direction of rotation of the bowl is correct when the drive belt rotates clockwise (check through the sight glass in the frame).

When the direction of rotation is incorrect the motor connections must be reversed by an authorised specialist.

- Switch on the product feed pump (option).
  - Ensure that the product feed valves to the suction and pressure side are open!

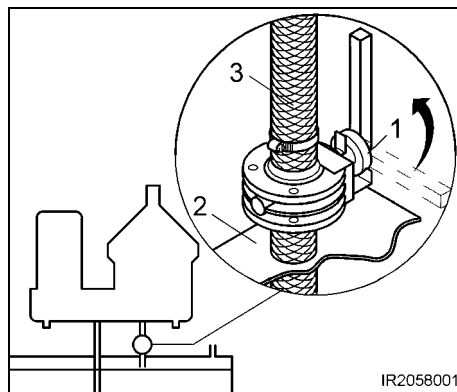


**ATTENTION! Before the first start-up – after maintenance and repair work on the product feed pump -**

- **Check the direction of rotation of the product feed pump.**

The direction of rotation of the product feed pump is correct when the fan wheel of the pump motor rotates clockwise.

- Put the preheater in operation (option).  
Pre-conditions :
  - Steam or thermal oil feed and discharge valves are open!
  - Electric preheater is switched on!
- Open the product discharge valve in the product discharge line (option).



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

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

Fig. 79

- Start the program.
  - Pre-conditions:
    - Continuous lighting of the LED in the “Status Separator” button.
    - The specified separating temperature has been reached.
    - The solids tank has been released (level switch **LSHH**). The solids tank is empty.
- After the product feed valve has automatically opened.
  - Set the backpressure in the product discharge line to approx. 1.5 to 2.5 bar (see order-specific operating data sheet).
  - Adjust the desired throughput capacity; while doing so, maintain the backpressure in the product discharge line in the specified area.



**ATTENTION!**

- Check the discharges for solids and dirty water; there must be no oil flow during the separating process!

### 3.4 Monitoring of operation

The machine is monitored largely by the separator control.

**Operations to be carried out regularly:**

- On your daily round, especially during the first 1500 operating hours, pay attention to the following:
  - Oil level
  - Temperatures
  - Pressures
  - Leakage
  - Vibrations
  - Current consumption
  - Starting time
  - Hoses and hose pipes
  - Pipe joints
- *Keep to the maintenance schedule (see 4.3.1)!*

- Inspection

We, therefore, recommend in your own interest to have your separator inspected by our service engineers **once a year**. These checks help to

- maintain the operating safety of the machine and
- avoid unscheduled downtime.

Important!

- Regularly check plant components such as hose pipes, sight glasses for signs of aging and mechanical damage.
- Damaged plant components must be replaced immediately by new parts.

### 3.5 Setting the separation time

When using time-dependent automatic control programs, accurate setting of the separation time (time between ejection cycles) is only possible if the throughput capacity and solids loading in the feed remain constant. If this is not the case, it may be necessary to correct the settings during operation.

The separating time depends on

- the preselected operating mode (partial or total ejection mode),
- the solids loading in the feed,
- the consistency of the solids,
- the effective solids space volume in the bowl,
- the separator throughput.

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

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

Product	Total ejection	Partial ejection
HFO	max. 2 h	max. 1 h
MDO	max. 2 h	max. 1 h
DO	max. 4 h	max. 2 h
LO mild	max. 4 h	max. 2 h
LO HD	max. 2 h	max. 1 h

#### 3.5.1 Mathematical calculation

**Example for mathematical calculation of the separating time:**

<b>Given:</b>	Solids content <sup>(1)</sup>	<b>p</b> = 0.05 %
	Solids holding space volume	<b>V</b> = 1.5 l
	Solids holding space given 75 % utilisation	<b>V'</b> = 1.13 l
	Throughput capacity <sup>(1)</sup>	<b>V°</b> = 2 000 l/h
<b>Wanted:</b>	Separating time	<b>t</b> = ? min

The separating time to be set is calculated as follows:

$$t = \frac{V'}{V^\circ \cdot p} \cdot 60 \cdot 100 = \frac{1.13}{2\,000 \cdot 0.05} \cdot 6\,000 = 57.8 \text{ min} = 1.1 \text{ h}$$

<sup>(1)</sup> Solids content and throughput capacity must be determined on site or taken from the order specification.

### 3.6 Ejecting the bowl

#### Automatic operation

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

#### Manual operation (in the case of unscheduled shut-down)

- Close the product feed line.
  - Close the product feed valve manually.
- Eject the bowl:
  - Open the operating liquid valve using the manual override for **approx. 2 – 3 seconds**.
- Speed recovery
  - Wait for approx. 20 – 30 seconds.
- New separating operation
  - Open the product feed valve manually.

### 3.7 Shutting down the separator

#### Automatic operation

- End the separation program with the key "Process STOP".
  - Two total ejections are performed automatically.

#### Manual operation (in the case of unscheduled shut-down)

- Switch off the preheater (option).
  - Continue to feed product for a few minutes since the preheater continues to heat for a short time.
- Close the product feed line.
  - Close the product feed valve manually.
- Displacement:
  - Open the displacement water valve using the manual override. (The bowl contents are displaced without loss by opening the displacement water valve).
- Eject the bowl:
  - Open the operating liquid valve using the manual override for **approx. 2 – 3 seconds**.
- Speed recovery
  - Wait for approx. 20 – 30 seconds.

- Switch off the product feed pump (option).
  - The product feed pump continues to run (timer 23)!
  - The LED in the "FEED" button shows the post-run phase by *slow* flashing.
  - The control valves for thermal oil and steam preheater close automatically.



#### ATTENTION!

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

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

All heaters (e.g. steam-fired, thermal oil, electric heaters) must be manually shut down.

Manual shut-down of the product feed pump must be carried out delayed.

- Close the product feed valve in the suction side of the product feed pump (option).
- Switch the separator motor off.
- Close the discharges.
- Close the supply lines such as heating steam, water, compressed air lines with hand valves.



#### CAUTION: Danger to life through high-speed rotating separator parts!

- Do not loosen any part of the separator before the bowl has come to a standstill.
  - The run-down time of the bowl is **45 minutes** after switching off the motor.
  - Bowl standstill is indicated by standstill of the drive belt.

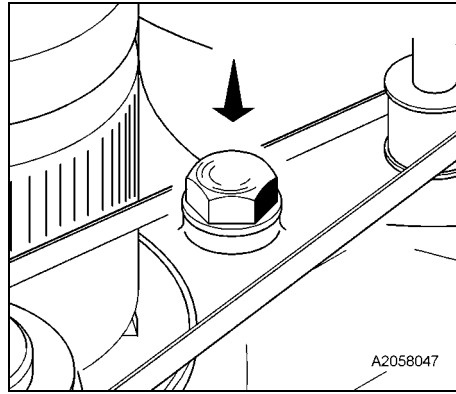


Fig. 80

**Standstill of drive belt**

- Shine a torch through the frame sight glass.
- Visually check that the drive belt is no longer moving.

**When the sight glass is turbid:**

- Unscrew the sight glass,
- shine a torch through the sight glass opening in the frame!



**CAUTION: Danger of injury through rotating drive belt!**

- Check ONLY visually that the drive belt is no longer moving.
  - Do NOT touch the drive belt through the sight glass opening in the frame!
- Clean the sight glass and screw it back in.



**CAUTION: Danger to life through high-speed rotating separator parts!**

**In the case of torn or defective drive belts or if the belts have come off:**

- Do not loosen any part of the separator before the bowl has come to a standstill.
- **Be sure to observe** the run-down time of **90 minutes** until dismantling the separator!

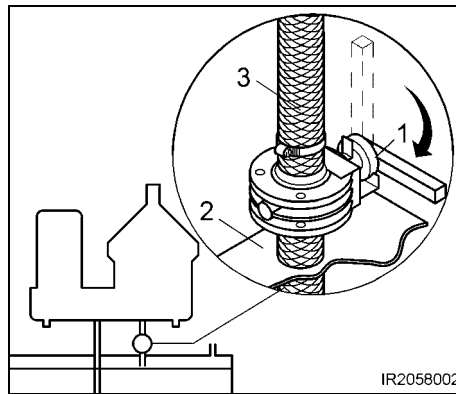


Fig. 81

**ATTENTION!**

**Only after standstill of the bowl,**

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

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

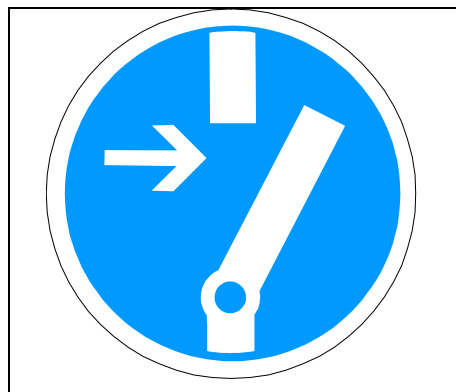


Fig. 82

**Risk of injury due to electrical voltage and unintended start-up of the separator!**

**Before carrying out work on the separator and electrical plant components:**

- Switch off all electrical appliances via the main switch.
- Lock the installation to prevent it from being accidentally switched on.



**CAUTION: Danger of injury through very hot separator parts!**

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C (158 – 212 °F)).

### 3.7.1 Shut-down “Emergency-Off”

In a hazardous situation (unusual noises or vibrations) or in the case of damage to the separator or plant components (e.g. burst hoses), a *manual* quick shut-down of the installation can be carried out.

Depending on the version, the control cabinet is equipped with:

- a main switch (yellow-red) with integrated “Emergency-Off” function and additional connection for an external “Emergency-Off”-switch (example 1),
- an “Emergency-Off” switch (yellow-red), a main switch (grey-black) and additional connection for an external “Emergency-Off”-switch (example 2) or
- an “Emergency-Off” switch (yellow-red), a main switch (grey-black) and additional connection, via approved “Emergency-Off” relay for several “Emergency-Off”-switches (example 2).

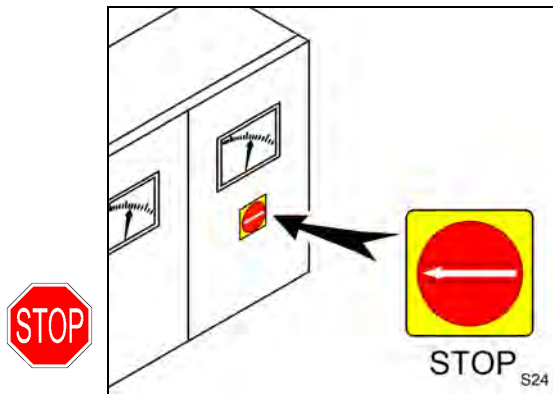


Fig. 83 Example 1

**Main switch (yellow-red) with integrated “Emergency-Off” function**

- Actuate the main switch with “Emergency-Off” function.
  - The complete control unit is de-energised.
  - No bowl ejection is performed.
- **CAUTION! Evacuate the room.**
- Do not re-enter the room until the separator has come to a standstill.

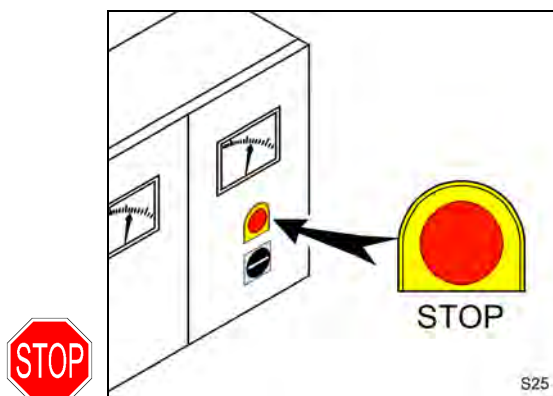


Fig. 84 Example 2

**“Emergency-Off”-switch (yellow-red) and main switch (grey-black)**

- Actuate the “Emergency-Off switch.
  - The complete drives of the control unit are de-energised.
  - The separator is shut down in a controlled manner with two total ejections.
- **CAUTION! Evacuate the room.**
- Do not re-enter the room until the separator has come to a standstill.



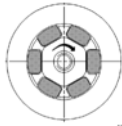

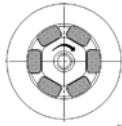
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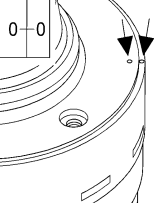


### 3.8 Trouble shooting

The following tables are an aid for locating and eliminating faults.

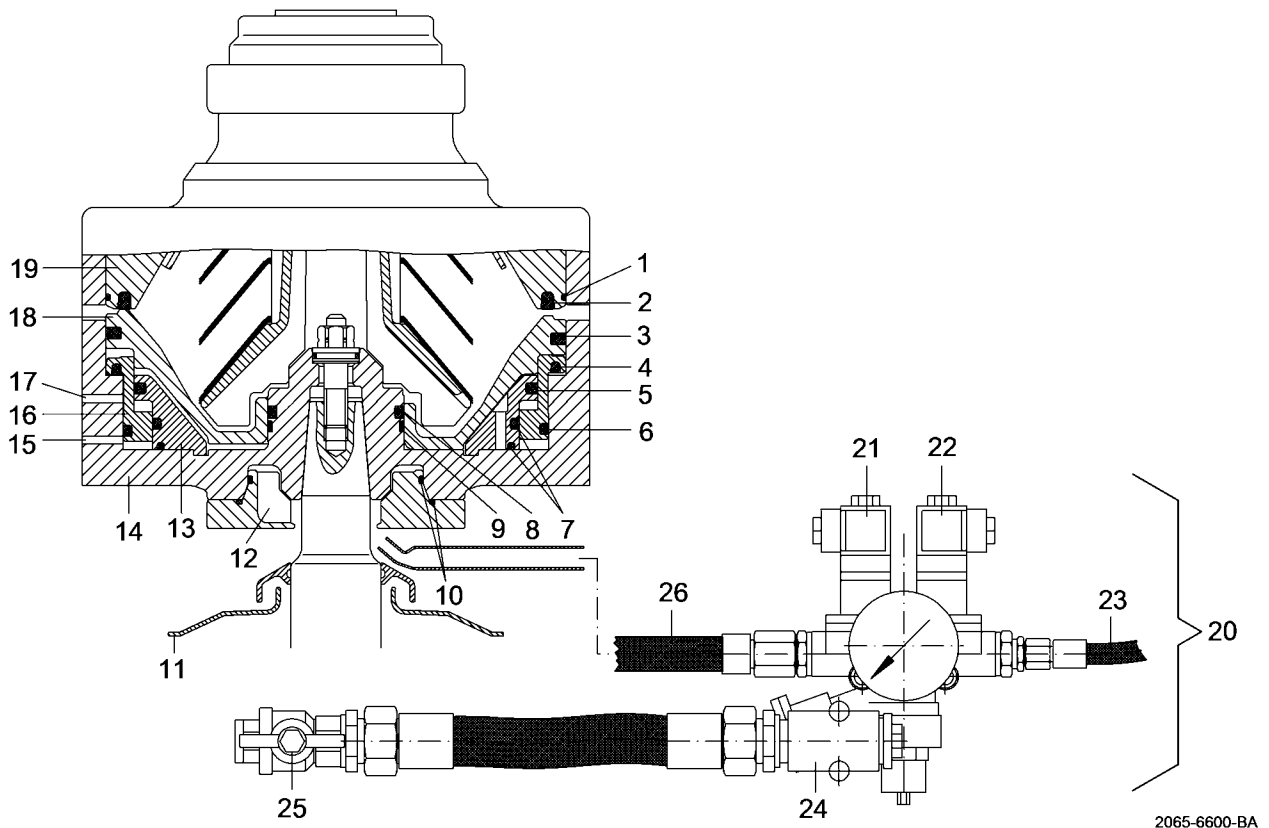
If assembly operations have to be carried out refer to the section "Maintenance and Repair".

#### 3.8.1 Trouble shooting

Failure	Possible causes	Action
The bowl does not come up to rated speed or takes too long to do so.	Oil has run down the spindle onto the drive belt; the drive belt is slipping on the bowl spindle.	<ul style="list-style-type: none"> <li>• Clean belt contact surface of the spindle and clutch pulley.</li> <li>• Replace the drive belt.</li> </ul>
	Motor is incorrectly connected.	<ul style="list-style-type: none"> <li>• Check connection.</li> </ul>
	Insufficient number of clutch shoes.	<ul style="list-style-type: none"> <li>• Increase the number of clutch shoes.</li> <li>• Make sure that the clutch shoes are evenly spaced.</li> </ul> 
	Drive belt has stretched and is slipping on the bowl spindle.	<ul style="list-style-type: none"> <li>• Replace drive belt.</li> </ul>
	Drive belt has not been fitted correctly.	<ul style="list-style-type: none"> <li>• Check position of drive belt on centrifugal clutch and bowl spindle.</li> </ul>
	Liquid or dirt has collected in the upper section of frame and is braking the bowl.	<ul style="list-style-type: none"> <li>• Check operating water discharge: Liquid must flow off freely.</li> <li>• Clean inside of upper section of frame.</li> </ul>
The bowl speed drops during operation.	Friction surfaces of clutch shoes are oily.	<ul style="list-style-type: none"> <li>• Wipe dry friction surfaces.</li> <li>• <b>ATTENTION: Do not use benzene, trichlorethylene or any other solvent!</b></li> </ul> 
	Drive belt has stretched and is slipping on the bowl spindle.	<ul style="list-style-type: none"> <li>• Replace the drive belt.</li> </ul>
	The motor speed drops during operation.	<ul style="list-style-type: none"> <li>• Check motor and line voltage.</li> </ul>
The bowl reaches the rated speed too fast (in less than 1.5 minutes). The starting current of the motor is hence inadmissibly high. ( $I_{max} > 2 \times I_N$ ).	Too many clutch shoes are used.	<ul style="list-style-type: none"> <li>• Reduce the number of clutch shoes.</li> <li>• Make sure that the clutch shoes are evenly spaced.</li> </ul> 

Failure	Possible causes	Action
Uneven run of the centrifuge.	Bowl is out of balance for the following reasons:	<b>For pos. 1 - 4:</b> <ul style="list-style-type: none"> <li>• Shut down separator.</li> <li>• Close the product feed and discharge.</li> </ul>  <b>CAUTION:</b> <ul style="list-style-type: none"> <li>• <b>Bowl must not be emptied</b> as otherwise the vibrations occurring during shut-down will intensify.</li> </ul> If bowl leaks, <ul style="list-style-type: none"> <li>• Completely open the water supply.</li> </ul>
	1. The separated dirt has deposited unevenly in the bowl.	<ul style="list-style-type: none"> <li>• Clean bowl.</li> </ul>
	2. Bowl has not been correctly assembled or parts of different bowls (if plant has several separators) have been interchanged.	<ul style="list-style-type: none"> <li>• Assemble bowl properly.</li> </ul>
	3. The tension in the disk stack has slackened:	 <b>CAUTION: A loose bowl top can endanger life!</b>  <ul style="list-style-type: none"> <li>• The O marks of the bowl bottom and the bowl top must be aligned.</li> </ul>
	– The bowl top is not screwed on until O mark alignment.	<ul style="list-style-type: none"> <li>• Check number of disks; add a spare disk if necessary.</li> <li>• Send bowl to factory for repair.</li> </ul>  <b>CAUTION: Do not carry out your own repairs!</b> <b>Do not weld or solder</b> as this would weaken the bowl!
	– Insufficient number of disks.	<ul style="list-style-type: none"> <li>• Replace damaged bearings.</li> </ul>  <b>ATTENTION!</b> Use only the ball bearings specified in the parts list.
	Ball bearings are worn.	

## 3.8.2 Bowl faults

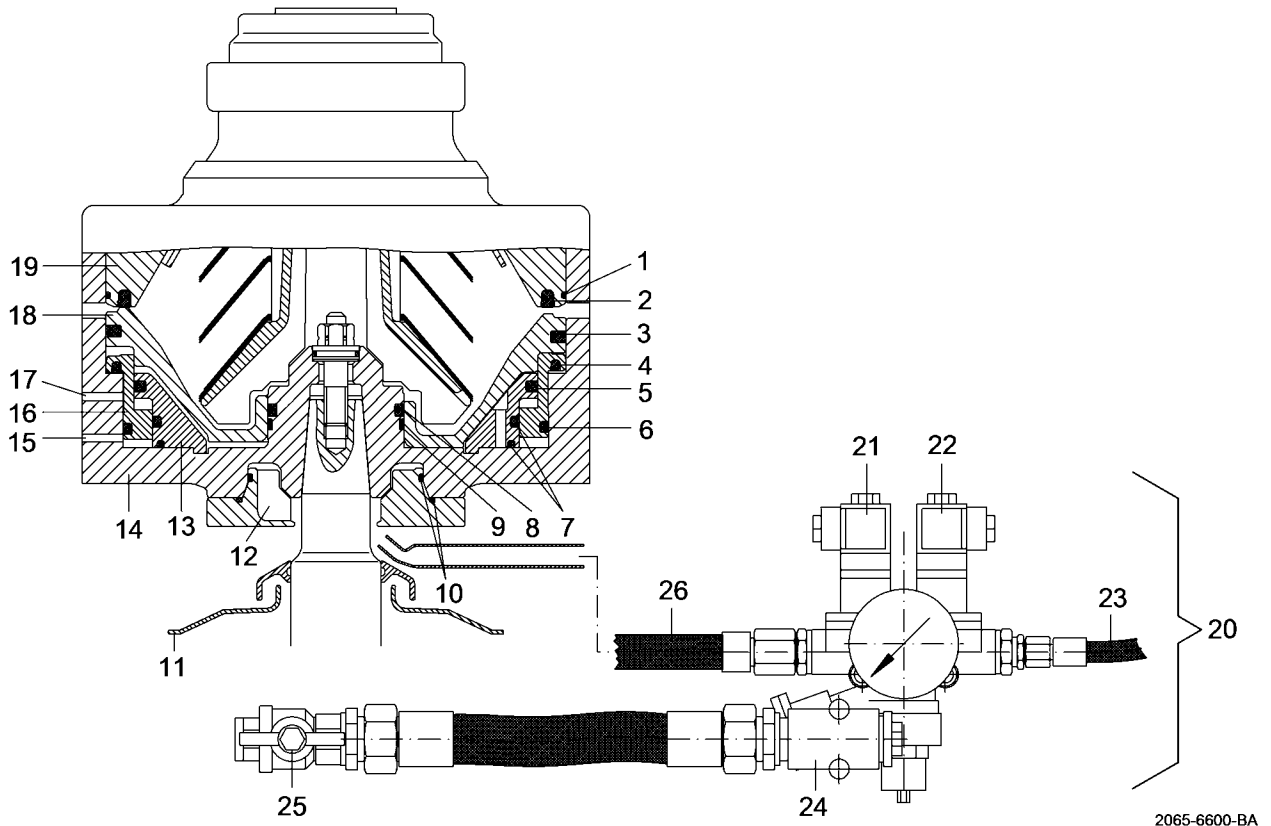


2065-6600-BA

Fig. 85 Bowl and operating water feeding system

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

Failure	Possible causes	Action
The bowl does not close.  <b>ATTENTION:</b> – Product flows out of the solids discharge. – Current consumption is too high.	<b>Operating water</b>	
	Control unit is defective or Motor is not correctly set.	<ul style="list-style-type: none"> <li>• Check the control unit.</li> <li>• Check or reset program parameters. (See control unit documentation.)</li> </ul>
	Closing water pulse too short.	<ul style="list-style-type: none"> <li>• Set 1 seconds (see also control unit documentation).</li> </ul>
	Strainer 24 in the operating, filling and displacement water line is dirty.	<ul style="list-style-type: none"> <li>• Close shut-off cock 25.</li> <li>• Clean strainer 24 (see 4.4.4).</li> </ul>
	The operating water capacity is too low.	<ul style="list-style-type: none"> <li>• Check line pressure, increase if necessary.</li> </ul> <p><b>Operating water data:</b></p> <ul style="list-style-type: none"> <li>– Pressure 2 – 3 bar (with open valve)</li> <li>– Volume flow min. 1 800 l/h (gauge the capacity by litres) <math>\cong</math> 1.0 l in 3 secs</li> </ul>
	The operating water line 26 has become constricted due to dirt accumulation or damage. Insufficient operating water is entering the injection chamber.	<ul style="list-style-type: none"> <li>• Clean or replace operating water line 26.</li> </ul>
	The operating water solenoid valve 21 does not open properly.	<ul style="list-style-type: none"> <li>• Check solenoid valve 21 and replace if necessary.</li> </ul>
	<b>Bowl hydraulics</b>	
	Bowl hydraulic system is soiled. or	<ul style="list-style-type: none"> <li>• Remove hood and dismantle and clean the bowl (see section 4.4.1 and 4.4.2).</li> <li>• <b>Thoroughly</b> clean all bores.</li> </ul>
	Gaskets and piston guide ring are damaged or	<ul style="list-style-type: none"> <li>• Replace all sealing elements. Use set of spare parts "bowl/hood" (see list of spare parts).</li> </ul> <p><b>Important: Time-consuming installation!</b></p> <ul style="list-style-type: none"> <li>• Change polyamide gasket 5 only when it is damaged (see section 4.4.9).</li> </ul>
Sealing rim of sliding piston 18 is damaged.	<ul style="list-style-type: none"> <li>• Lightly remachine the sealing surface of the sliding piston – <b>max. 1 mm!</b> – see section 4.4.10) or</li> <li>• send in the sliding piston for repair.</li> </ul>	



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Fig. 86 Bowl and operating water feeding system

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

Failure	Possible causes	Action
The bowl does not open or not properly	<b>Operating water</b>	
	Control unit is defective or Motor is not correctly set.	<ul style="list-style-type: none"> <li>• Check the control unit.</li> <li>• Check or reset program parameters. (See control unit documentation.)</li> </ul>
	Time for opening water too short.	<ul style="list-style-type: none"> <li>• Set 3 – 4 seconds (see also control unit documentation).</li> </ul>
	Strainer 24 in the operating, filling and displacement water line is dirty.	<ul style="list-style-type: none"> <li>• Close shut-off cock 25.</li> <li>• Clean strainer 24 (see 4.4.4).</li> </ul>
	The operating water capacity is too low.	<ul style="list-style-type: none"> <li>• Check line pressure, increase if necessary.</li> </ul> <p><b>Operating water data:</b></p> <ul style="list-style-type: none"> <li>– Pressure 2 – 3 bar (with open valve)</li> <li>– Volume flow min. 1 800 l/h (gauge the capacity by litres) <math>\cong</math> 1.0 l in 3 secs</li> </ul>
	The operating water line 26 has become constricted due to dirt accumulation or damage. Insufficient operating water is entering the injection chamber.	<ul style="list-style-type: none"> <li>• Clean or replace operating water line 26.</li> </ul>
	The operating water solenoid valve 21 does not open properly.	<ul style="list-style-type: none"> <li>• Check solenoid valve 21 and replace if necessary.</li> </ul>
	<b>Bowl hydraulics</b>	
	Bowl hydraulic system is soiled or	<ul style="list-style-type: none"> <li>• Remove hood and</li> <li>• dismantle and clean the bowl (see section 4.4.1 and 4.4.2).</li> <li>• <b>Thoroughly</b> clean all bores. <ul style="list-style-type: none"> <li>– Thoroughly check outlet bore 17 and clean if necessary.</li> </ul> </li> </ul>
	Gaskets and piston guide ring are damaged.	<ul style="list-style-type: none"> <li>• Replace all sealing elements. Use set of spare parts "bowl/hood" (see list of spare parts).</li> </ul> <p><b>Important: Time-consuming installation!</b></p> <ul style="list-style-type: none"> <li>• Change polyamide gasket 5 only when it is damaged (see section 4.4.9).</li> <li>• Thoroughly check polyamide gasket 5 for proper location in its groove.</li> </ul>

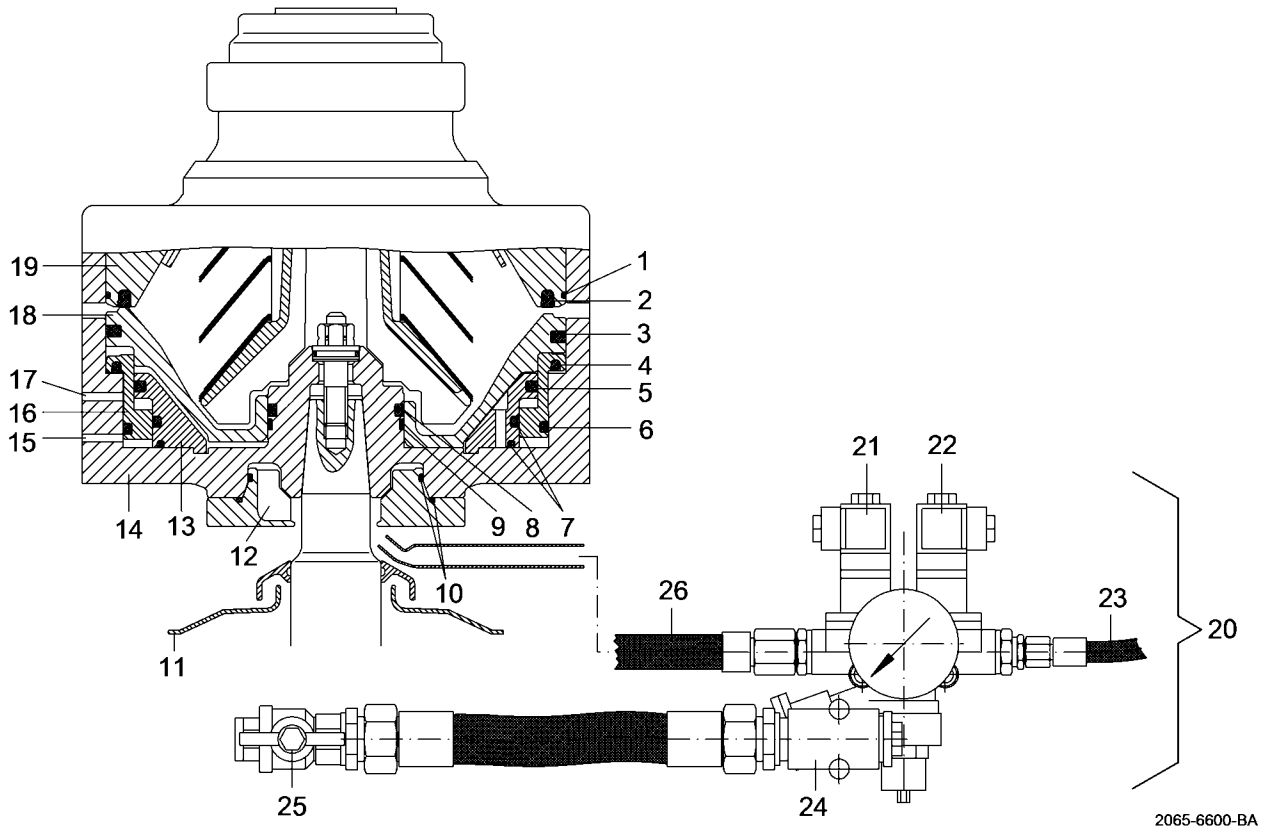


Fig. 87 Bowl and operating water feeding system

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



Failure	Possible causes	Action
The bowl does not empty completely. Solids remain in the bowl.	The operating water capacity is too low.	<ul style="list-style-type: none"> <li>• Check line pressure, increase if necessary.</li> </ul> <p><b>Operating water data:</b></p> <ul style="list-style-type: none"> <li>– Pressure 2 – 3 bar (with open valve)</li> <li>– Volume flow min. 1 800 l/h (gauge the capacity by litres) <math>\cong</math> 1.0 l in 3 secs</li> </ul>
	The separating time has been set too long with the result that the solids content is too high.	<ul style="list-style-type: none"> <li>• Shorten the separating time (see section 3.5).</li> </ul>
The bowl opens during separation.	Closing water pulse is too short. – Closing water evaporates.	<ul style="list-style-type: none"> <li>• Readjust the closing water impulse (see control unit documentation).</li> </ul>
	Closing water pulse is too long. – Closing water impulse opens the bowl.	

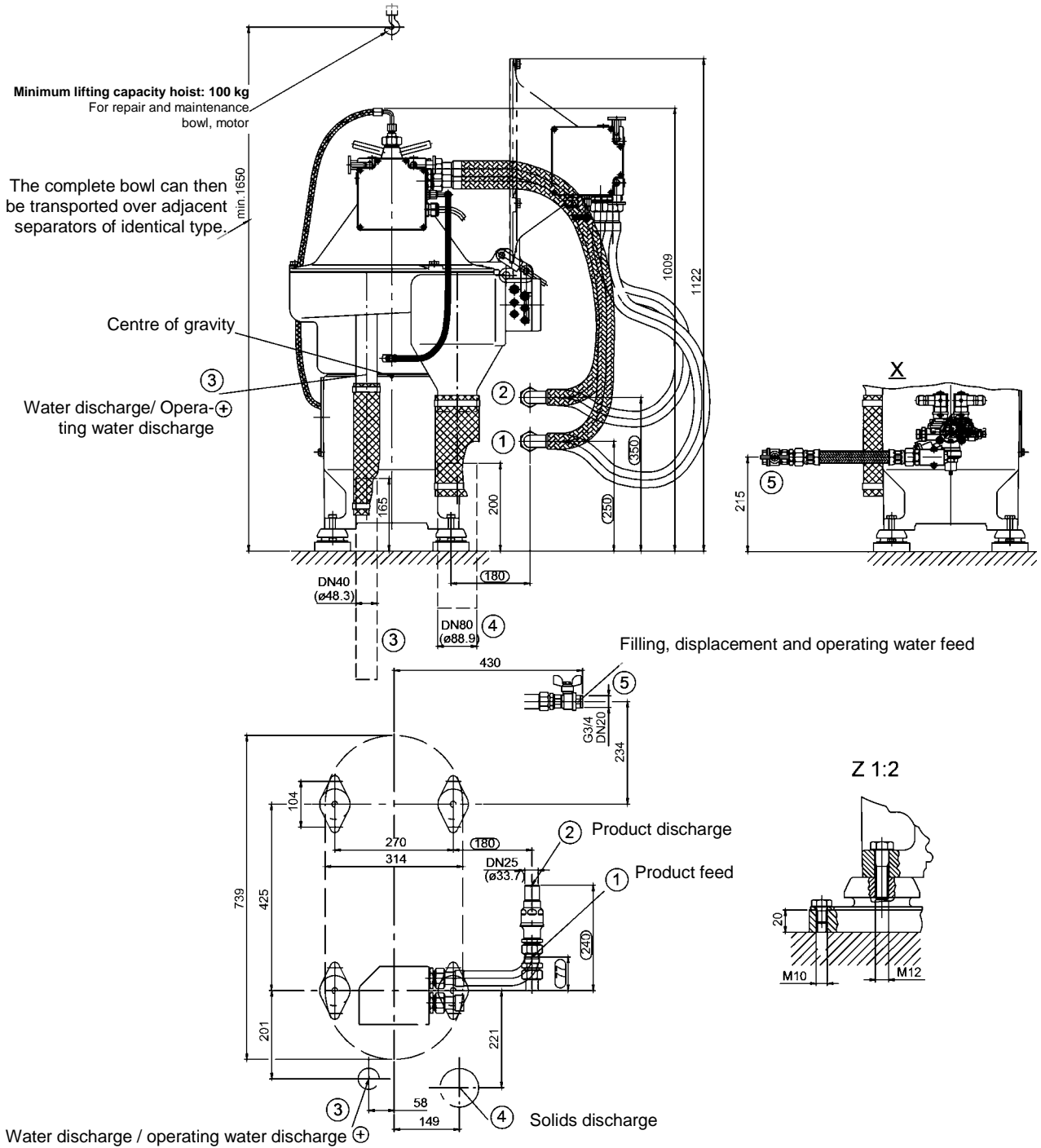
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### 4.1 Installation of the separator

- Refer to the installation guidelines for further information.



⊖ These dimensions **must** be adhered to!

⊕ Do **not** discharge residuals into public waters!

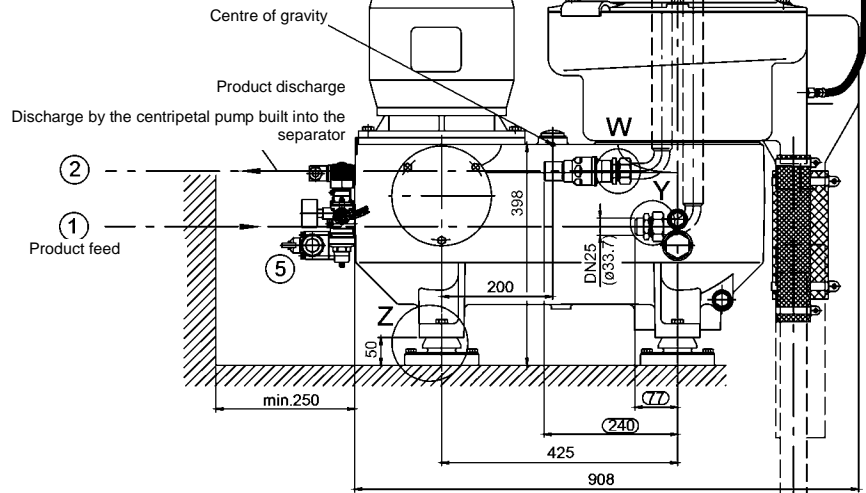
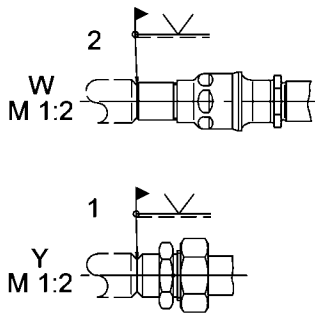
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Fig. 88 Refer to the project-specific dimensioned drawing!

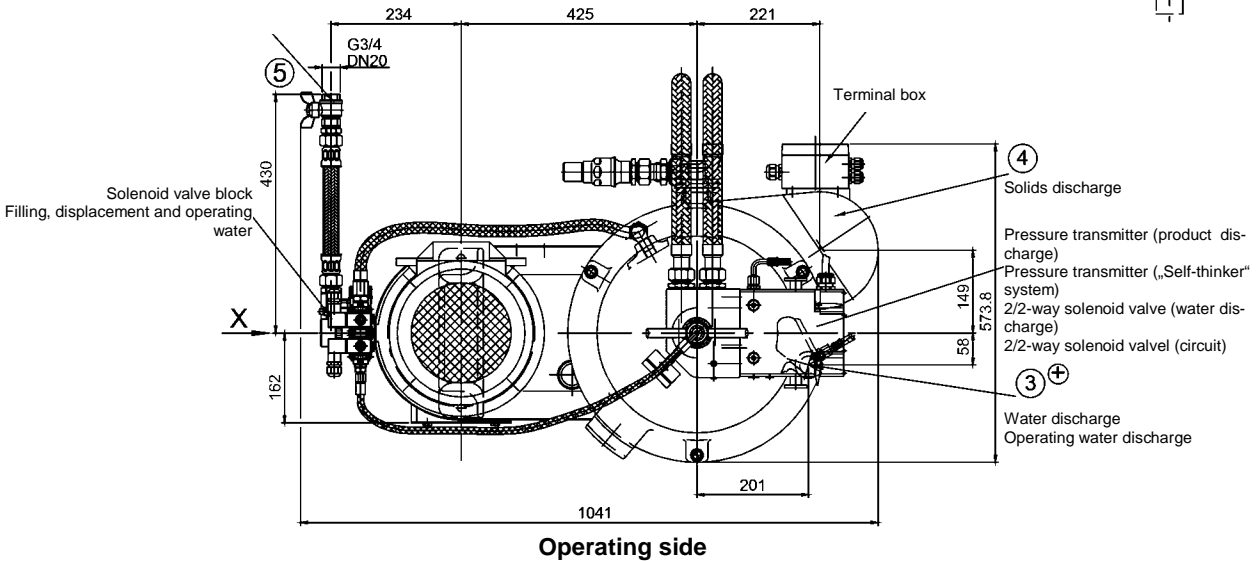
Anschlussstabelle / CONNECTIONTABLE		
	Beschreibung / DESCRIPTIONS	DN
①	Schmutzöl / DIRTY OIL	25 siehe Detail Y / SEE DETAIL
②	Reinöl / CLEAN OIL	25 siehe Detail W / SEE DETAIL
③	Schlamm-Ablauf / SLUDGE DISCHARGE	40 Schlauch / Schlauschelle / FLEXIBLE HOSE / HOSE CLIP
④	Wasser-Ablauf / WATER DISCHARGE Steuerwasser-Ablauf / OPERATING-WATER DISCHARGE	80 Schlauch / Schlauschelle / FLEXIBLE HOSE / HOSE CLIP
⑤	Steuerwasser / Füll- und Verdrängungswasser / OPERATING-WATER / FILLING AND DISPLACEMENT WATER	G 3/4 Aussengewinde / MALE

Pressure transmitter (product discharge)  
 Pressure transmitter („self-thinker“ system)  
 2/2-way solenoid valve (water discharge)  
 2/2-way solenoid valve (circuit)  
 Water detector

Socket:



Filling, displacement and operating water feed



**The separator foundation must not have contact with foundations of other units (e.g. auxiliary diesel engine, pumps) to avoid damage to roller bearings.**

- These dimensions **must** be adhered to!
- ⊕ Do **not** discharge residuals into public waters!

2064-4100-000-2

Fig. 89 Refer to the proect-specific dimensioned drawing!

### 4.1.1 Transporting the separator



- **CAUTION: Use appropriate lifting devices to prevent accidents!**  
– Be sure to use suitably rated, intact hoists for transport and installation.



- **CAUTION: Danger to life under hoists!**  
– Do NOT step under hanging load.



- Always transport the separator **without** installed bowl!
- For special tools, see section 4.14 or parts list.

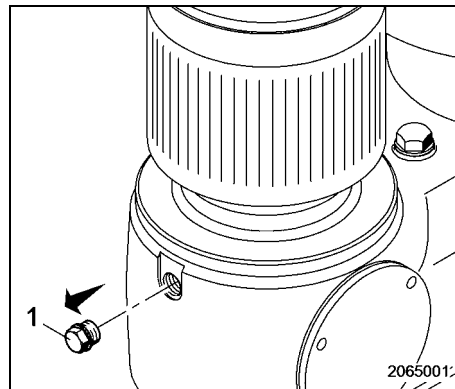


Fig. 90

- Unscrew the screw plug 1 from the lower part of the frame.

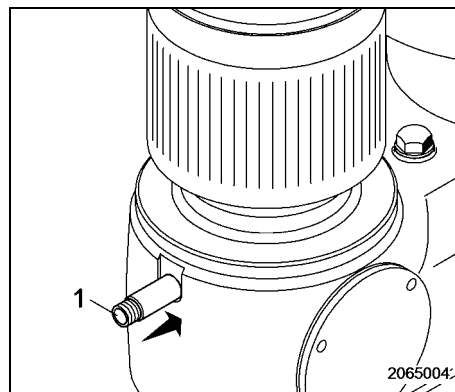


Fig. 91

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

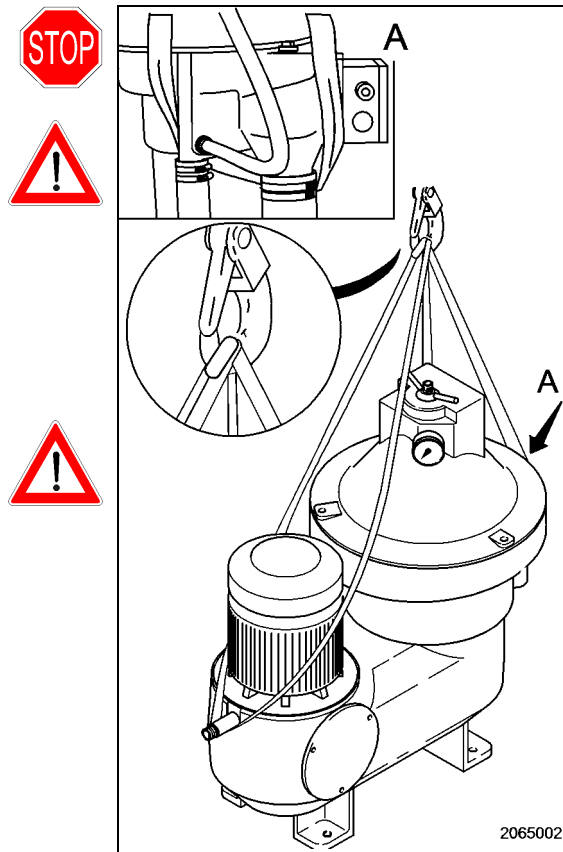


Fig. 92

- **CAUTION!** Do not use the eye bolt of the motor to suspend the separator.

- **ATTENTION:** Do not damage any machine attachment parts when fastening the ropes.

- Attach the transport ropes
  - to the machine A as illustrated,
  - around the double nipple and
  - hang them into the load hook of the hoist as illustrated.

- **ATTENTION:** Prevent the ropes from slipping!

- Wind one piece of rope twice round the hook (see detail).

- Make sure the machine touches down gently.

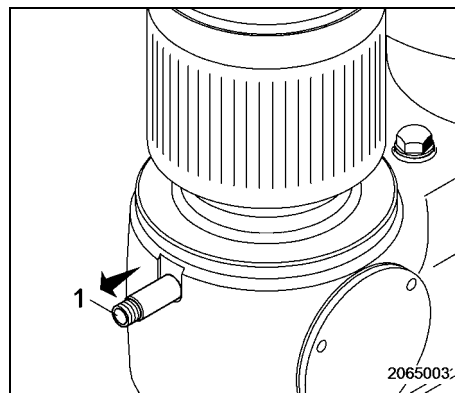


Fig. 93

- Unscrew double nipple 1

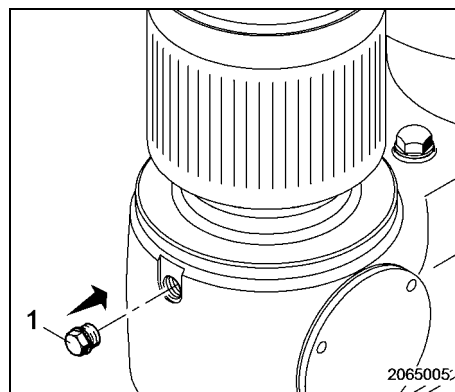


Fig. 94

- Screw in the screw plug 1.

### 4.1.2 Installing the separator

- Before installing the separator make sure that
  - sufficient space is available for operating and dismantling the machine.
  - the foundation is not connected to foundations of other vibrating units to avoid the transfer of vibrations.

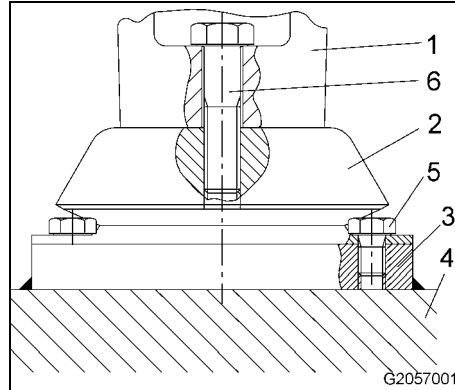


Fig. 95

- Align separator 1 with feet 2 and plates 3 on foundation 4.
- Tack plates 3.
- Unscrew screws 5.
- Lift separator with feet (see section 4.1.1).
- Weld plates 3 to foundation 4.
- Place the separator on plates 3 and bolt **tight** with hexagon nuts 5.
- Screw **tight** hex head screws 6.



4.1.3 Motor

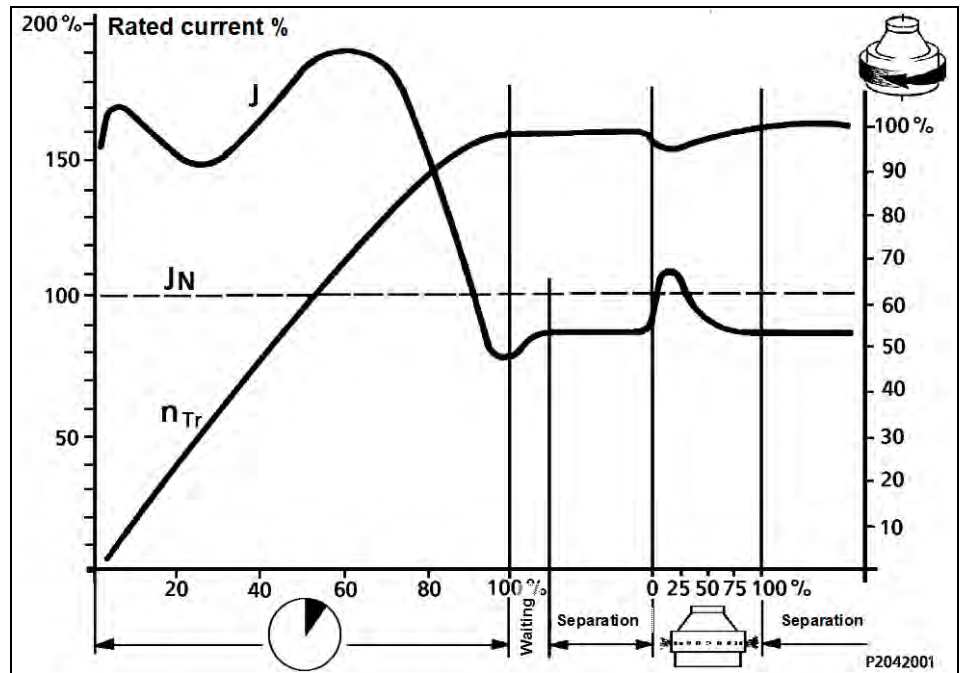
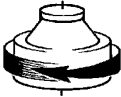

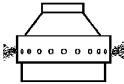


Fig. 96 Start-up diagram (current and speed characteristics) – example

 rpm	 min	 s	kW		De- sign IM V 1	Enclou- re * IP 55 ISO- class F *	at	
			50 Hz	60 Hz			50 Hz rpm	60 Hz rpm
see name- plate	approx. 2 – 4	3	7.5	8.6			3 000	3 600

\* WS standard

The separator is driven by a three-phase AC motor via a centrifugal clutch and the drive belt.

The specified motor ratings are minimum values which are based on the increased starting current. Since the current consumption of the motor drops after start-up, overloading of the motor during operation is not possible.

The starting time depends on the

- flywheel effect of the bowl,
- number of clutch shoes used,
- condition of the clutch shoes.

The starting current can peak at about 1.8 - 2 times the rated current (see start-up diagram). This is to be considered when selecting switches, lead-in wires and fuses.

The motor

- can be started direct online (WS standard) or via a motor control for star-delta switching (Ex-zone).

- is protected against overheating by thermal overload releases or a PTC thermistor as sole protection.  
(As WS standard, the motor is protected against overheating by three PTC thermistors).
- can be equipped with a frequency converter if requested by the customer.

When using thermal overload releases, the motor has to be protected as follows:

- during operation by a release set to the rated current and
- during start-up by a second release set to 1.8 - 2 times the rated current.  
The release set to the rated current must be bridged during start-up.



**Note:**

- The temperature feelers must be connected to a commercial tripping device.
- External voltage higher than 2.5 volts must not be applied to the connection terminals of the temperature feelers.
- When testing for continuity, use an ohmmeter and not a test lamp.

**Electrical connection**



**CAUTION: Danger to life and limb through electric current!**  
**There might be residual voltage!**

**In the case of motors with space heaters, residual voltages in the motor terminal box are possible despite switched off main switch.**

**Prior to working on the motor:**

- Refer to the motor nameplate.
- Refer to the motor instruction manual.
- Take adequate preventive measures according to the national provisions (in Germany in accordance with the rules and regulations of the VDE (Association of German Electrical Engineers) or of the local electric power company.
- **Any work on the motor may be carried out by an authorized electrician only.**

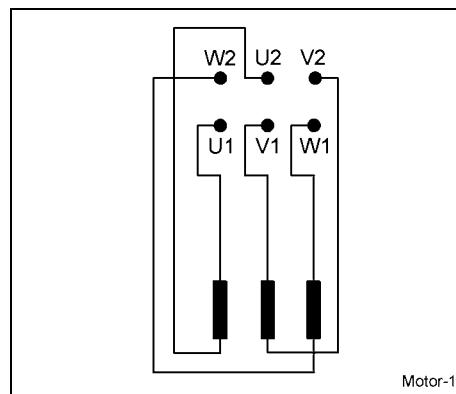


Fig. 97 Connection schematic

- Connect the motor.  
Refer to the motor instruction manual.

The terminal board in the terminal box can be connected in star or delta.



- **Check correct switching of the motor (star or delta).**  
Refer to the motor instruction manual.

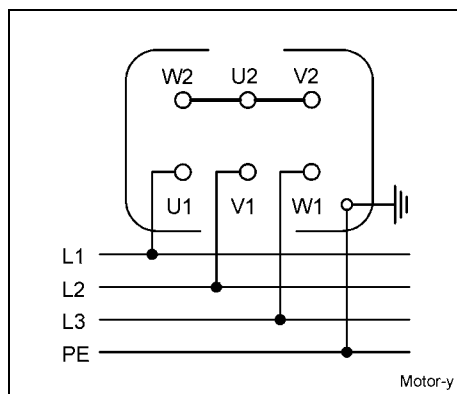


Fig. 98

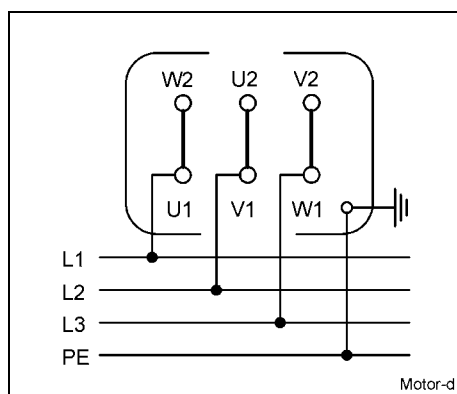
**Star switching (example)**

Fig. 99

**Delta switching (example)****IMPORTANT:**

- In the case of additional electrical components, PTC thermistors or space heaters, refer to the motor manual.

**Shipboard operation**

- When operating the machine on board of ship, pay attention to the installation guidelines issued by the respective classification societies.
- When using ship wiring cables, cable entry must be by means of marine-type glands.

#### 4.1.4 Direction of rotation of the bowl

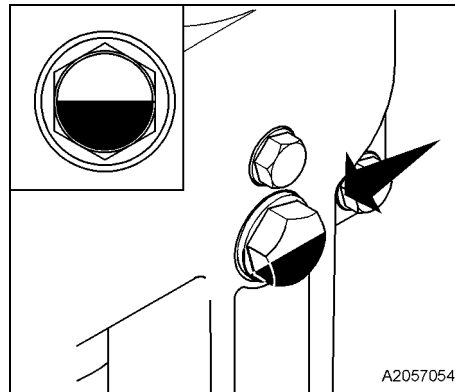


Fig. 100

**Provided that:**

– The drive chamber is filled with oil up to the half way mark on the sight glass.

- Switch on motor.



**The bowl must rotate in clockwise direction when looked at from above.**

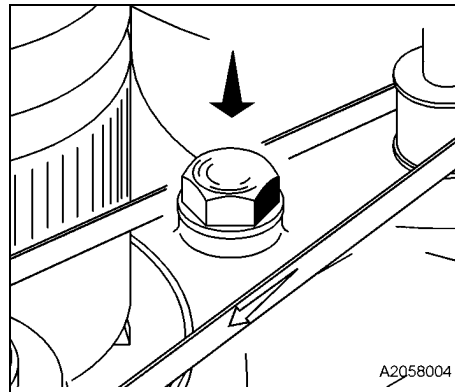


Fig. 101

The direction of rotation of the bowl is correct when the drive belt rotates clockwise (check through the sight glass in the frame).

When the direction of rotation is incorrect the motor connections must be reversed by an authorised specialist.

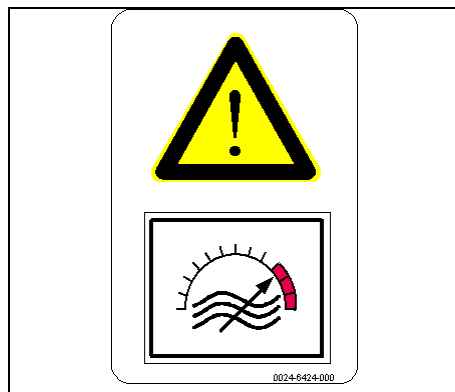


Fig. 102

**In case of frequency converter operation:**

- **Before working on the motor, note that residual voltage may be present!**
- In this connection:
  - Read the documentation supplied by the frequency converter manufacturer.
  - Have protective measures implemented by suitably qualified personnel.

### 4.1.5 Speed and starting time of the bowl

<b>Speed</b> – for densities of the product up to max. 1.01 kg/dm <sup>3</sup> and – for densities of the separated solids up to max. 1.4 kg/dm <sup>3</sup>	see name-plate
<b>Starting time</b>	approx. 2 – 4 min

The bowl speed has been rated so as to ensure the operating safety of the separator.

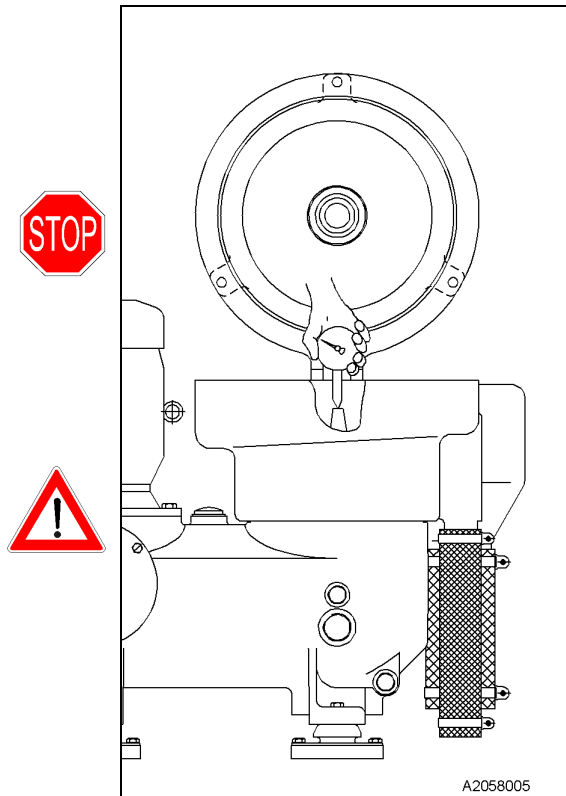


Fig. 103

#### Before the first start-up

- Check spindle speed (= bowl speed) with a hand tachometer before fitting the bowl.

#### CAUTION! Risk of injury through rotating spindle.

- Keep a safe distance away from the rotating spindle.
- Do not wear long, open hair or wide, loose clothing!
- Wear a hairnet!
- **IMPORTANT: Do not exceed the maximum spindle running time of 1 minute!**
- Speed deviations of up to 5 % are permissible.

**In case of frequency converter operation:**

The frequency converter is equipped with a reliable frequency limitation to prevent operation at inadmissibly high bowl speeds.

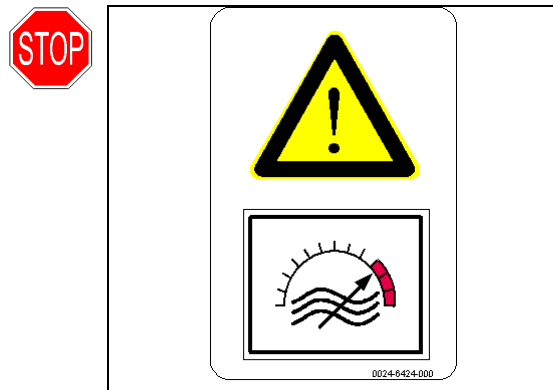


Fig. 104

**CAUTION!**

- Operate the separator with frequency converter, speed monitoring device and hardware-controlled speed shut-off device.
- Do not under any circumstances manipulate the frequency converter to exceed the permissible bowl speed (see nameplate)!
- Check from time to time that
  - the bowl speed (see nameplate) and
  - motor frequency (see nameplate and frequency converter display!) coincide with the separator speed.

## 4.2 Fitting orifice plates, flow indicator, pressure transmitter

A set of orifice plates (with different inner diameters) and a set of commissioning parts are supplied with the separator.

- The set of orifice plates is fastened to the separator hood.
- The set of commissioning parts comprises the flow indicator 4 or the pressure transmitter 5.

By installing an orifice plate the separator throughput can be monitored.

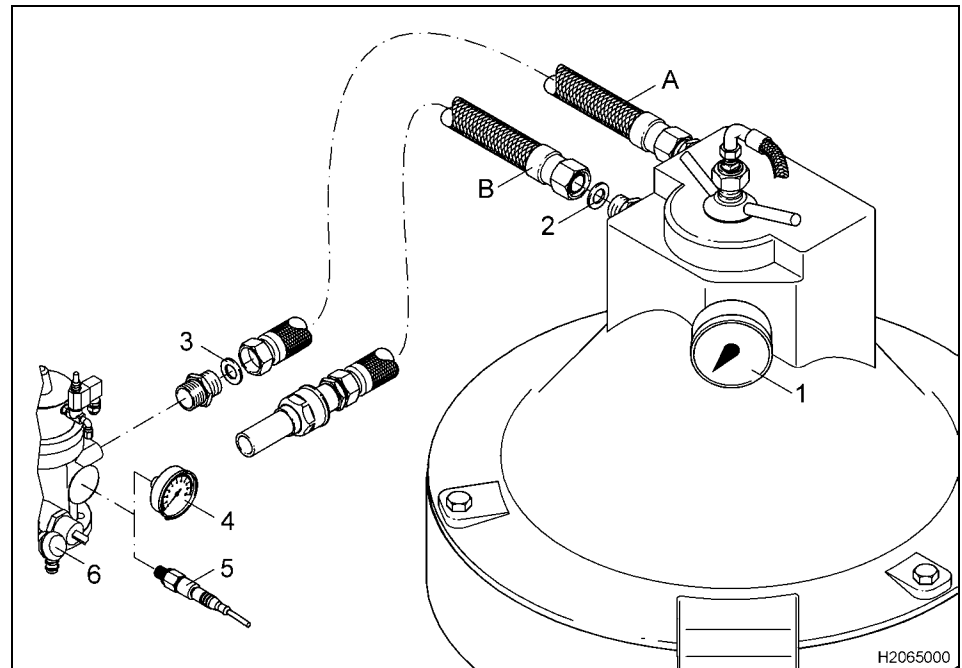


Fig. 105

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



**ATTENTION!** Before starting up the separator check that the following parts are installed:

### Orifice plates 2 and 3

- Select the orifice plates from the set of plates supplied, according to the required throughput capacity (see section 2.7).
- Install orifice plate 3 in product feed line A (see chapter 4.2.1).
- Install orifice plate 2 in product feed line B (see chapter 4.2.1).

### Flow indicator 4 (option – for control **D10**)

- Remove the plug from the corresponding hole of 3/2-way valve 6.
- Secure the thread of flowmeter 4 with Loctite 245.
- Install flowmeter 4 into 3/2-way valve 6.

**Pressure transmitter 5** (option – for control **E40**)

- Remove the plug from the corresponding hole of 3/2-way valve 6.
- Fit pressure transmitter 5 in the 3/2-way valve 6 and connect to the control unit in accordance with the order-specific circuit diagram. The circuit diagram is kept inside the control cabinet.

**4.2.1 Installing the orifice plates**

Installation of the orifice plates is explained here for product feed line B for example.

**Required material:**

- Open ended wrench
- Lubricating grease

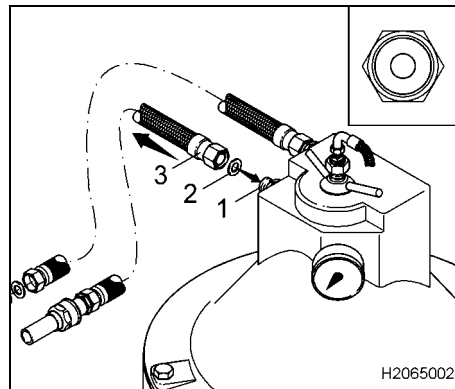


Fig. 106

- Unscrew corrugated hose 3.
- Insert the selected orifice plate 2 into connection piece 1 and press in evenly, by hand.

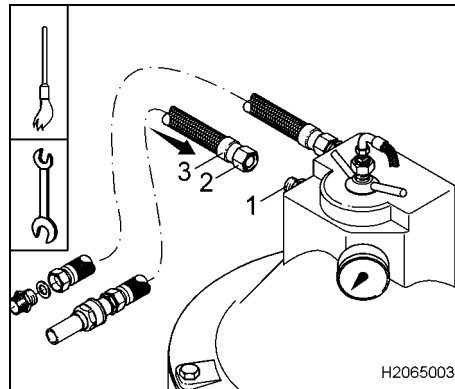


Fig. 107

- Slightly grease the threaded area of connection piece 1
- Insert corrugated hose 3 and firmly tighten with hexagon nut 2.



### 4.3 Maintenance and lubrication



- Special care must be taken when performing maintenance and lubrication operations.  
Conscientiously performed maintenance and lubrication operations improve the service life of the separator.
- In the case of accessories (motor, product pump, preheater, solenoid valve block etc.) the manufacturer's maintenance and lubrication instructions must be observed.
- Maintenance and repair work may be carried out only by persons
  - who are demonstrably familiar with the state-of-the-art through briefings and training.
  - who are adequately qualified for performing the work and checking it.
- Electrical work may only be carried out by an authorized electrician!
- **Use only genuine spare parts from Westfalia Separator.**

Westfalia Separator®  
**genuineparts**

#### 4.3.1 Maintenance schedule



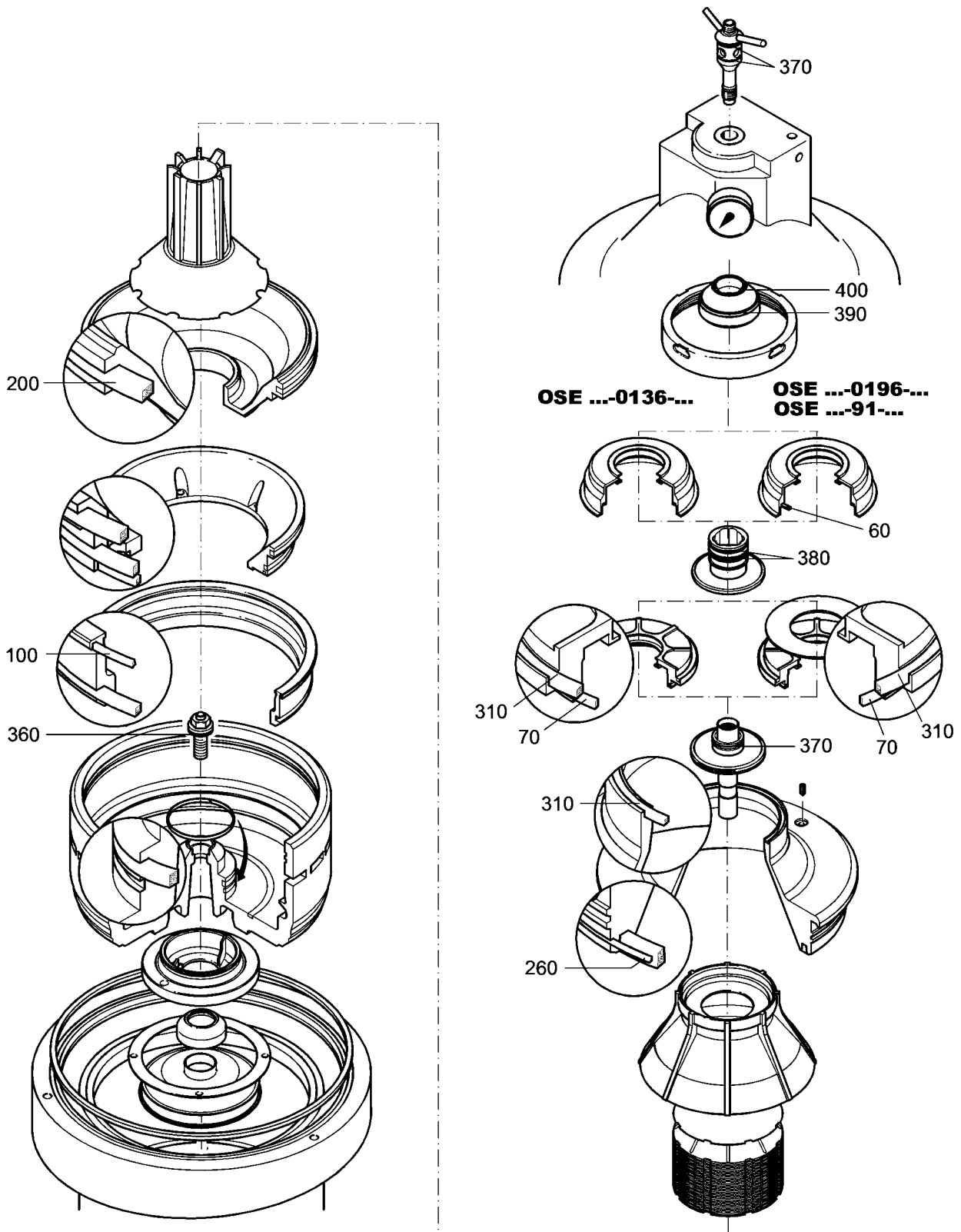
##### ATTENTION!

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

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

#### To assure correct functioning and operating safety,

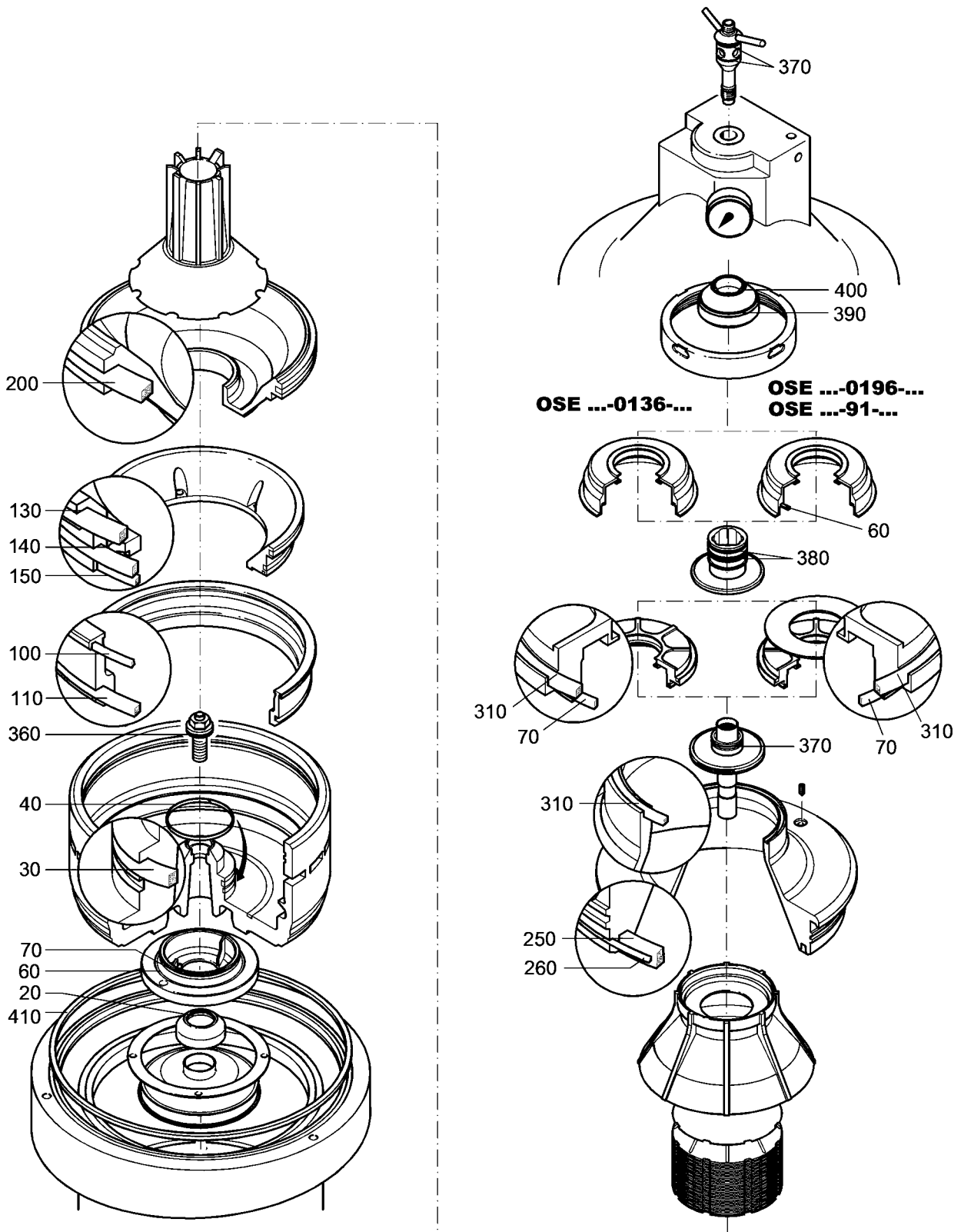
- in case of non-routine shut-down, see section 3.7 - manual operation.
- Pay attention to the following points during servicing:
  - Oil level
  - Temperatures
  - Pressures
  - Leakage
  - Vibrations
  - Current consumption
  - Starting time
  - Hoses and hose pipes (see 4.3.2)
  - Pipe joints
- Before every assembly, grease the main components of the bowl at guide and contact surfaces (see section 4.3.4 - lubrication schedule).
- in the case of frequent starting and stopping of the separator, shaft-driven alternator operation and in power plants, the condition of the clutch shoes must be checked more often than stated in this schedule. It is not possible to state a definitive time. We recommend checking the clutch shoes after 1000 operating hours or after 2 months at the latest.
- We recommend having the separator checked by a WS service specialist once a **year**.



2065-9902-000-6M


Fig. 108 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

<b>Commissioning date:</b> (to be filled in by user)	
<b>Maintenance work</b>	<b>Remark</b>
<ul style="list-style-type: none"> <li>– After 4000 operating hours – after 6 months at the latest</li> <li>– After 12,000 operating hours – after 1 ½ years at the latest</li> <li>– After 20,000 operating hours – after 2 ½ years at the latest</li> <li>– After 28,000 operating hours – after 3 ½ years at the latest</li> <li>– After 36,000 operating hours – after 4 ½ years at the latest</li> <li>– After 44,000 operating hours – after 5 ½ years at the latest</li> </ul>	
Bowl inspection	<ul style="list-style-type: none"> <li>• Dismantle bowl and centripetal pump.</li> <li>• Clean the bowl and centripetal pump parts and check for corrosion and erosion.</li> <li>• Clean all holes, nozzles and chambers of the hydraulic system.</li> <li>• The cones of bowl and spindle must be clean and dry when fitting.</li> </ul>
Replace gaskets (see accompanying illustration).	<ul style="list-style-type: none"> <li>• Use set of spare parts "bowl/hood" (Operation: 1 year or 8,000 hours). See spare parts list.</li> </ul> <p><b>Important: Time-consuming installation!</b> Only replace polyamide gasket 100 if damaged (see section 4.4.9)!</p>
Check the motor. Re-lubricate motor bearings (if required)	<ul style="list-style-type: none"> <li>• See instructions of motor manufacturer</li> </ul>
<b>When using mineral oil:</b> Oil change and thorough cleaning of the drive chamber	<ul style="list-style-type: none"> <li>• See section 4.3.3 - oil quality and oil change.</li> </ul>
Clean the strainer and pipe in the operating liquid feed system on the self-cleaning separator.	<ul style="list-style-type: none"> <li>• See section 4.4.4.</li> </ul>
Carefully clean the holes in the non-return valve in the water feed and rinse with water. Check the functionality of the non-return valve.	<ul style="list-style-type: none"> <li>• See section 4.5.</li> </ul>
Carefully clean the water detector (if installed) with a soft cloth, use diesel oil if necessary.	
Clean the sight glass/glasses in the frame for observation of the drive belt.	
Check the hoses and hose pipes and replace when necessary.	
Clean the filter in the suction line of the product feed pump (option).	



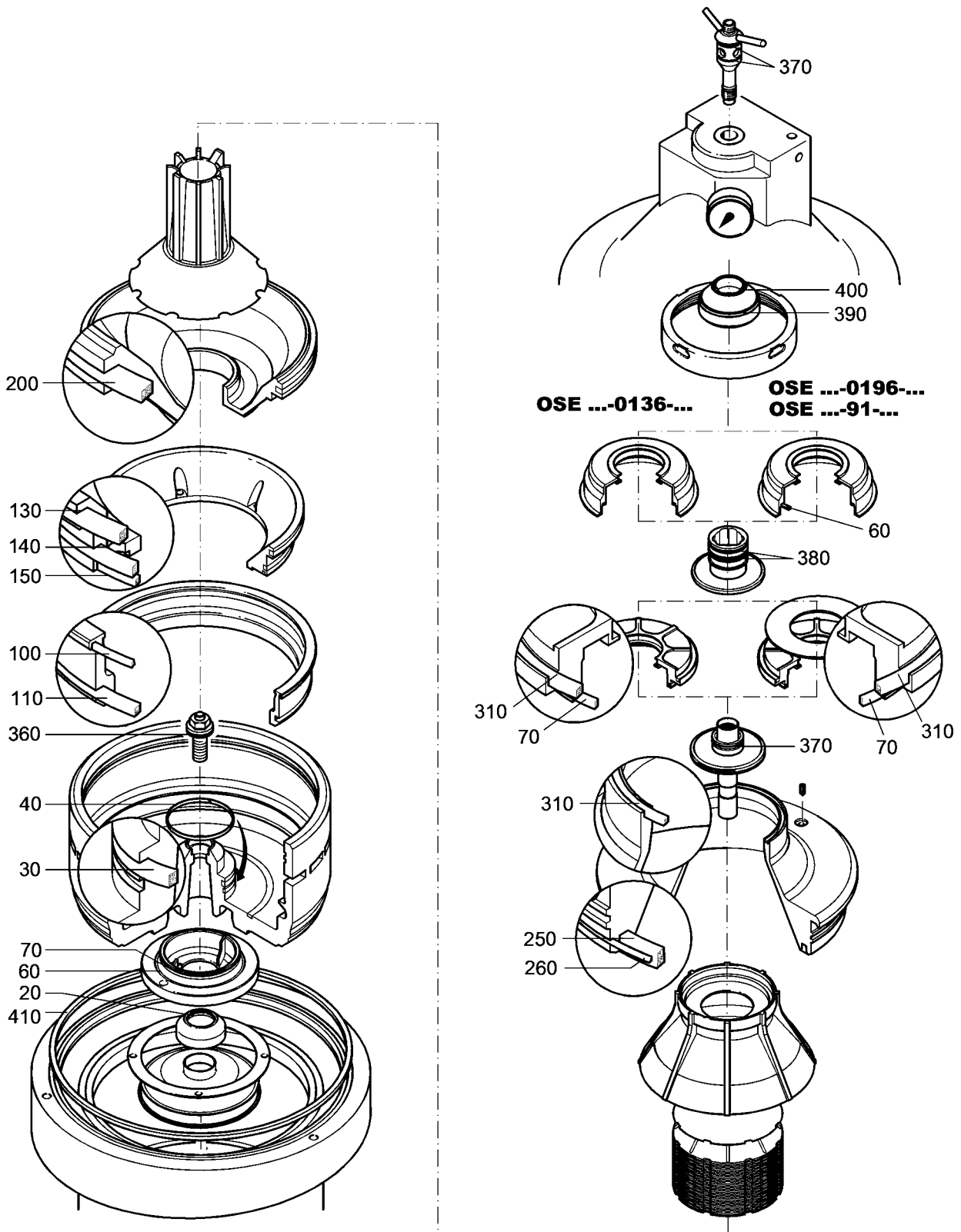
2065-9902-000-1J

Fig. 109 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

Maintenance work	Remark
<ul style="list-style-type: none"> <li>– After 8000 operating hours – after 1 year at the latest</li> <li>– After 24,000 operating hours – after 3 years at the latest</li> <li>– After 40,000 operating hours – after 5 years at the latest</li> </ul>	
Bowl inspection	<ul style="list-style-type: none"> <li>• Dismantle bowl and centripetal pump.</li> <li>• Clean the bowl and centripetal pump parts and check for corrosion and erosion.</li> <li>• Clean all holes, nozzles and chambers of the hydraulic system.</li> <li>• The cones of bowl and spindle must be clean and dry when fitting.</li> </ul>
Replace gaskets and piston guide ring (see adjacent figure).	<ul style="list-style-type: none"> <li>• Use set of spare parts "bowl/hood" (Operation: 1 year or 8000 hours). See parts list.</li> </ul> <p><b>Important: Time-consuming installation!</b> Change the polyamide gasket only when it is damaged (see section 4.4.9).</p>
Clean the inside of the upper section of frame.	<ul style="list-style-type: none"> <li>• Remove bowl.</li> </ul>
Replace gaskets.	<ul style="list-style-type: none"> <li>• Use set of spare parts "drive" (Operation: 1 year or 8000 hours). See parts list.</li> </ul>
Replace the drive belt.	
Replace grooved ball bearings and angular contact ball bearings of spindle.	
Replace vibration absorber.	
Check grooved ball bearings of centrifugal clutch and replace if necessary.	<ul style="list-style-type: none"> <li>• Use set of spare parts "drive" (Operation: 2 years or 16,000 hours). See parts list.</li> </ul>
Check thickness of the clutch shoes (1) and replace when  h smaller than 18 mm. New condition of clutch shoe h = 26 mm	
Check the motor. Re-lubricate motor bearings (if required)	<ul style="list-style-type: none"> <li>• See instructions of motor manufacturer</li> </ul>
Oil change and thorough cleaning of the drive chamber	When using mineral oil <sup>(2)</sup> When using synthetic oil <sup>(2)</sup>
Check the bowl height.	<ul style="list-style-type: none"> <li>• See section 4.7.1.</li> </ul>
<b>In case of direct current:</b> Check the spindle speed (bowl).	<ul style="list-style-type: none"> <li>• Check only after motor or drive replacement.</li> <li>• See section 4.1.5.</li> </ul>
Check the starting time.	<ul style="list-style-type: none"> <li>• See section 4.1.5.</li> </ul>
Clean the strainer and pipe in the operating liquid feed system on the self-cleaning separator.	<ul style="list-style-type: none"> <li>• See section 4.4.4</li> </ul>
Carefully clean the holes in the non-return valve in the water feed and rinse with water. Check the functionality of the non-return valve.	<ul style="list-style-type: none"> <li>• See section 4.5.</li> </ul>
Carefully clean the water detector (if provided) with a soft cloth, use diesel oil if necessary.	
Clean the sight glass(es) in the frame for observing the drive belt.	
Check the hoses and hose pipes and replace when necessary.	
Check that vibration absorbers are fully functional (option).	
Clean the filter in the suction line of the product feed pump (option).	


(1) In the case of frequent starting and stopping of the separator, shaft-driven alternator operation and power plants shorter maintenance intervals are required. It is not possible to state a definitive time. We recommend checking the clutch shoes after 1,000 operating hours or after 2 months at the latest.

(2) See section 4.3.3 - Oil quality and oil change



2065-9902-000-1J

Fig. 110 Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

Maintenance work	Remark
<ul style="list-style-type: none"> <li>– After 16,000 operating hours – after 2 years at the latest</li> <li>– After 32,000 operating hours – after 4 years at the latest</li> <li>– After 48,000 operating hours – after 6 years at the latest</li> </ul>	
Bowl inspection	<ul style="list-style-type: none"> <li>• Dismantle bowl and centripetal pump.</li> <li>• Clean the bowl and centripetal pump parts and check for corrosion and erosion.</li> <li>• Clean all holes, nozzles and chambers of the hydraulic system.</li> <li>• The cones of bowl and spindle must be clean and dry when fitting.</li> </ul>
Replace gaskets, piston guide ring and guide strips (see adjacent figure).	<ul style="list-style-type: none"> <li>• Use set of spare parts "bowl/hood" (Operation: 1 year or 8000 hours). See parts list.</li> </ul> <p><b>Important: Time-consuming installation!</b> Change the polyamide gasket only when it is damaged (see section 4.4.9).</p>
Clean the inside of the upper section of frame.	<ul style="list-style-type: none"> <li>• Remove bowl.</li> </ul>
Replace gaskets.	<ul style="list-style-type: none"> <li>• Use set of spare parts "drive" (Operation: 2 years or 16,000 hours). See parts list.</li> </ul>
Replace the drive belt.	
Replace grooved ball bearings and angular contact ball bearings of spindle.	
Replace vibration absorber.	
Replace grooved ball bearings of centrifugal clutch.	
Check thickness of the clutch shoes (1) and replace when  h smaller than 18 mm. New condition of clutch shoe h = 26 mm	
Check the motor. Re-lubricate motor bearings (if required)	<ul style="list-style-type: none"> <li>• See instructions of motor manufacturer</li> </ul>
Oil change and thorough cleaning of the drive chamber	<p>When using mineral oil <sup>(2)</sup></p> <p>When using synthetic oil <sup>(2)</sup></p>
Check the bowl height.	<ul style="list-style-type: none"> <li>• See section 4.7.1.</li> </ul>
<b>In case of direct current:</b> Check the spindle speed (bowl).	<ul style="list-style-type: none"> <li>• Check only after motor or drive replacement.</li> <li>• See section 4.1.5.</li> </ul>
<b>In case of three-phase current:</b> Check the spindle speed (bowl).	<ul style="list-style-type: none"> <li>• Check only after drive replacement.</li> <li>• See section 4.1.5.</li> </ul>
Check the starting time.	<ul style="list-style-type: none"> <li>• See section 4.1.5.</li> </ul>
Clean the strainer and pipe in the operating liquid feed system on the self-cleaning separator.	<ul style="list-style-type: none"> <li>• See section 4.4.4</li> </ul>
Carefully clean the holes in the non-return valve in the operating water feed. Check the functionality of the non-return valve.	<ul style="list-style-type: none"> <li>• See section 4.5.</li> </ul>
Carefully clean the water detector (if provided) with a soft cloth, use diesel oil if necessary.	
Clean the sight glass(es) in the frame for observing the drive belt.	
Check the hoses and hose pipes and replace when necessary.	
Check that vibration absorbers are fully functional (option).	
Clean the filter in the suction line of the product feed pump (option).	

(1) In the case of frequent starting and stopping of the separator, shaft-driven alternator operation and power plants shorter maintenance intervals are required. It is not possible to state a definitive time. We recommend checking the clutch shoes after 1,000 operating hours or after 2 months at the latest.

(2) See section 4.3.3 - Oil quality and oil change

**Maintenance work**

– After 48,000 operating hours – after 6 years at the latest

Equip the separator with new vibration isolators.  
We recommend having the separator checked by a WS service engineer.

**4.3.2 Hoses and hose pipes**

Replace hose pipes when an inspection reveals one or more of the following defects:

- Damage of the outer layer down to the fabric (e. g. chafe marks, cuts or cracks).
- Leaky spots.
- Damage to or deformation of the hose fittings.
  - Slight surface damage is not a reason for replacement.
- The hose becomes dislodged from the fitting.
- Corrosion of the fitting diminishing function and strength.

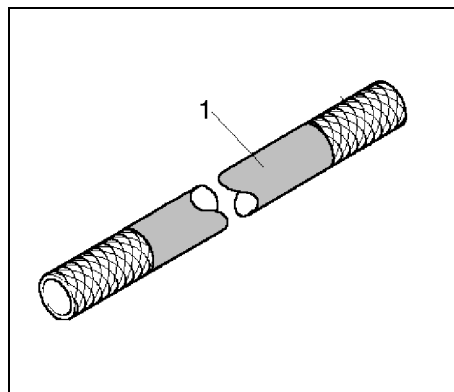


Fig. 111

**Protective hose 1**

- Fit the protective hoses at all contact points to the separator.
- Adapt the length of the protective hose.



### 4.3.3 Lubrication

The spindle bearings are splash-lubricated from a central oil bath.

#### MOTOR BEARINGS

For re-greasing the motor bearings, refer to the instructions of the motor manufacturer.

#### OIL QUALITY (mineral oil)

The mineral gear oil tested by Westfalia Separator with the designation "Separator lube oil CLP 100" meets the requirements and should preferably be used.

Designation according to DIN 51502	<b>CLP 100</b>
Designation as per ISO 3498	CC 100
Viscosity class	SAE 30
Viscosity (at 40 °C/104 °F)	100 ± 10 mm <sup>2</sup> /s (cSt)
Part Number	0015-0003-080 (2.5 litres)
Dispose of the oil as per instructions of the oil manufacturer.	



The viscosity class SAE 30 covers a larger viscosity range than specified here. However, only oils with the viscosity range specified here may be used.

#### OIL QUALITY (synthetic oil)

Use the synthetic lube oil tested by Westfalia Separator AG!

Viscosity class (ISO)	VG 68
Viscosity – at 40 °C (104 °F) – at 100 °C (212 °F)	65 mm <sup>2</sup> /s
	10,4 mm <sup>2</sup> /s
Viscosity index (VI)	147
Density (at 15 °C/59 °F)	0.857 g/ml
based on	Polyalphaolefin
Part Number	0015-0020-010 (1 litre)
Dispose of the oil as per instructions of the oil manufacturer.	

**OIL QUANTITY**



**IMPORTANT:** Do not forget to top up the oil in good time!

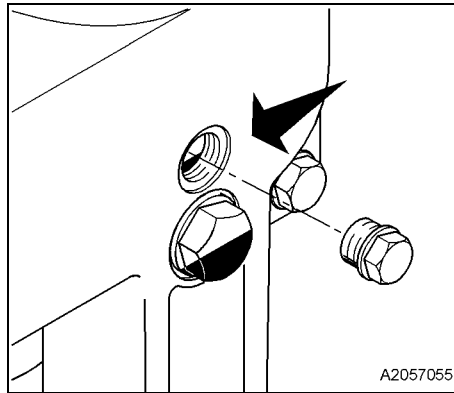


Fig. 112

**Filling in oil**

Fill the drive with oil before commissioning the separator.

- Unscrew the screw plug and fill in oil through the charge hole.

**Filling quantity** approx. 2.5 litres

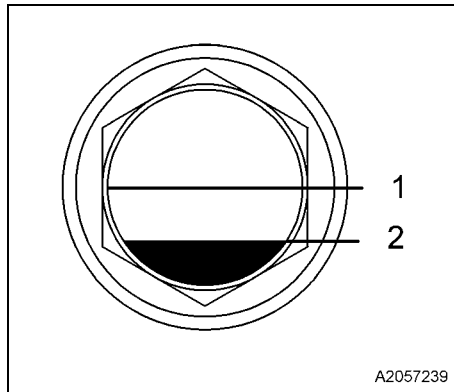


Fig. 113

**Oil level**

**IMPORTANT:**

- Check the oil level only when the separator is at standstill.
- The oil level must never drop below the lower third of the sight glass during operation.

- 1 Maximum oil level
- 2 Minimum oil level

<b>Minimum oil level</b> (at separator standstill)	approx. up to lower third of sight glass
<b>Maximum oil level</b> (at separator standstill)	up to middle of sight glass

**OIL CHECK**

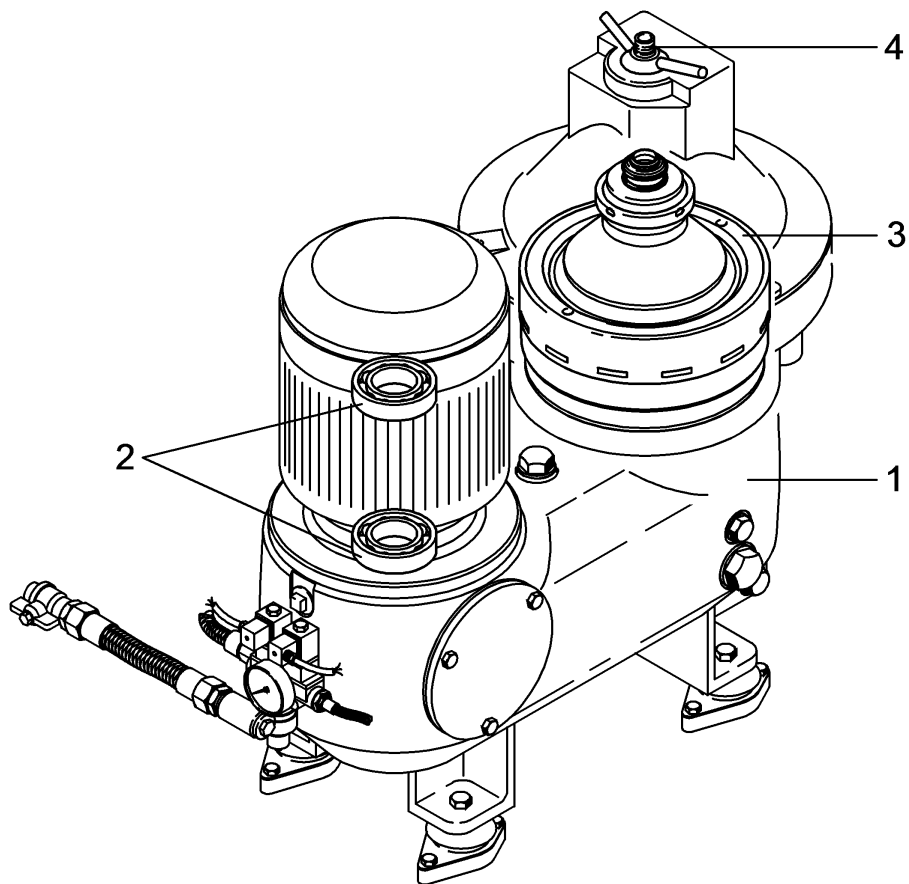
- Check the oil level every week!
- From time to time undo the oil drain screw and check whether there is water in the oil bath. When the oil exhibits a milky colouring (emulsification), the oil must be changed immediately.

**OIL CHANGE**

- Change oil after about
  - 4000 operating hours or 6 months at the latest (mineral oil).
  - 8000 operating hours or 1 year at the latest (synthetic oil).
- Clean sight glass.

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### 4.3.4 Lubrication Chart



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















Fig. 114 Lubrication schedule

Lubricating point	Lubricant		Lubrication frequency		Amount of lubricant	Lubrication point
	Designation	Designation	after operating hours	per year		
1	Lube oil (mineral)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">CLP 100</div> DIN 51502	4 000	2 x	2 500 cm <sup>3</sup>	Drive chamber
		CC 100 ISO 3498				
	Lube oil (synthetic)	ISO VG 68	8 000	1 x	2 500 cm <sup>3</sup>	Drive chamber
2	according to instructions of motor manufacturer					Motor bearings
3	Lubricating grease	see parts list	as required	2 x	apply sparingly	Threads and sliding surfaces of bowl
4				1 x		Threads of fittings



- Check oil level regularly through sight glass.
- Manual lubrication
- **Refer to lube oil table** (see section 4.3.5):

4.3.5 Table of lubricating oils

 Lubricating oil table for separators in onshore and shipboard operation				Lubricating oil sorts suggested by some firms															
				Manufacturer	Designation	Viscosity at 40 °C (104 °F) mm <sup>2</sup> /s (cSt)													
Separator		Lube oil		 BLASIA 100 RADULA 100 DIESEL GAMMA 30	100														
Type	Oil filling	Symbol (Designation according to DIN 51502)	Viscosity  Kinematic viscosity at 40 °C (104 °F)  mm <sup>2</sup> /s (cSt)																
	I			 ATLANTA MARINE 30 DISOLA M 3015 MONTANOL HK 100	105 100														
				 ENERGOL GR-XP 100 ENERGOL DL-MP 30	100 114														
				 HYSPIN AWS 100 ALPHA ZN 100 MARINE HEAVY	100 99														
BTC 3	1.3		90 to 110	0015-0003-080 (2.5 l)	 GST OIL 100 NL Gear Compound 100 Veritas Marine Oil R&O 30 DELO 3000 Marine Oil 30	100 108 104													
CTC 1					 ATLANTA MARINE 30 DISOLA M 3015 TURBINE T 100	105 95													
CTC 3					 EXX-MAR XP NUTO H 100 SPARTAN EP 100	110 100													
MTC 3						 HARMONY 100 VERITAS 30	95 110												
OTC 2							 HIDRAOIL HD 70	95											
OTC 3					 MOBILGARD 312	106													
WTC 2						 GADINIA 30 ROTELLA MX SAE 30	104 105												
OSE 5	1					90 to 110	0015-0003-080 (2.5 l)	 HYDRA WAY HMA 100 LOAD WAY EP 100	100										
								 DORO AR SAE 30 TARO XD SAE 30	119 105										
CSD 1								1.3		90 to 110	0015-0003-080 (2.5 l)								
OSD 2																			
SD 1																			
SSD 2																			
TSD 2																			
	2.5											90 to 110	0015-0003-080 (2.5 l)						
ESD 18																			
GSC 15																			
OSD 6																			
OSD 18																			
WSD 8																			
WSD 18	3.7		90 to 110	0015-0003-080 (2.5 l)															
OSE 10																			
OSE 20																			
														5.0		90 to 110	0015-0003-080 (2.5 l)		
GSC 25																			
OSD 20																			
OSD 25																			
OSD 30																			
OSD 35																			
SD 30																			
WSD 35																			
OSE 40																			
OSD 50	5.0					90 to 110	0015-0003-080 (2.5 l)												
OSD 60																			
OSD 80																			
SD 50																			
WSD 60																			
OSE 80																			

#### 4.3.6 Comments on table of lubricating oils for separators from GEA Westfalia Separator

Faultless functioning of separators very much depends on the proper type of lubricating oil used, since a high grade oil, selected to meet all service requirements, will minimize the wear, thus extending the service life and increasing the operating safety.

For the lubrication of our separators we recommend to use the oils specified by us since continuous quality checks are performed by GEA Westfalia Separator. Oils proposed from some firms are not subjected to these tests.

Therefore, GEA Westfalia Separator cannot give a performance guarantee for those oils.

Be sure to select only **high grade** solvent refined products.

The specified oil types meet the requirements according to DIN. Under unfavourable operating conditions, e.g. high temperatures, the quality of the oils may be insufficient so that more efficient oils, e.g. synthetic oils, must be used. If necessary, consult GEA Westfalia Separator.

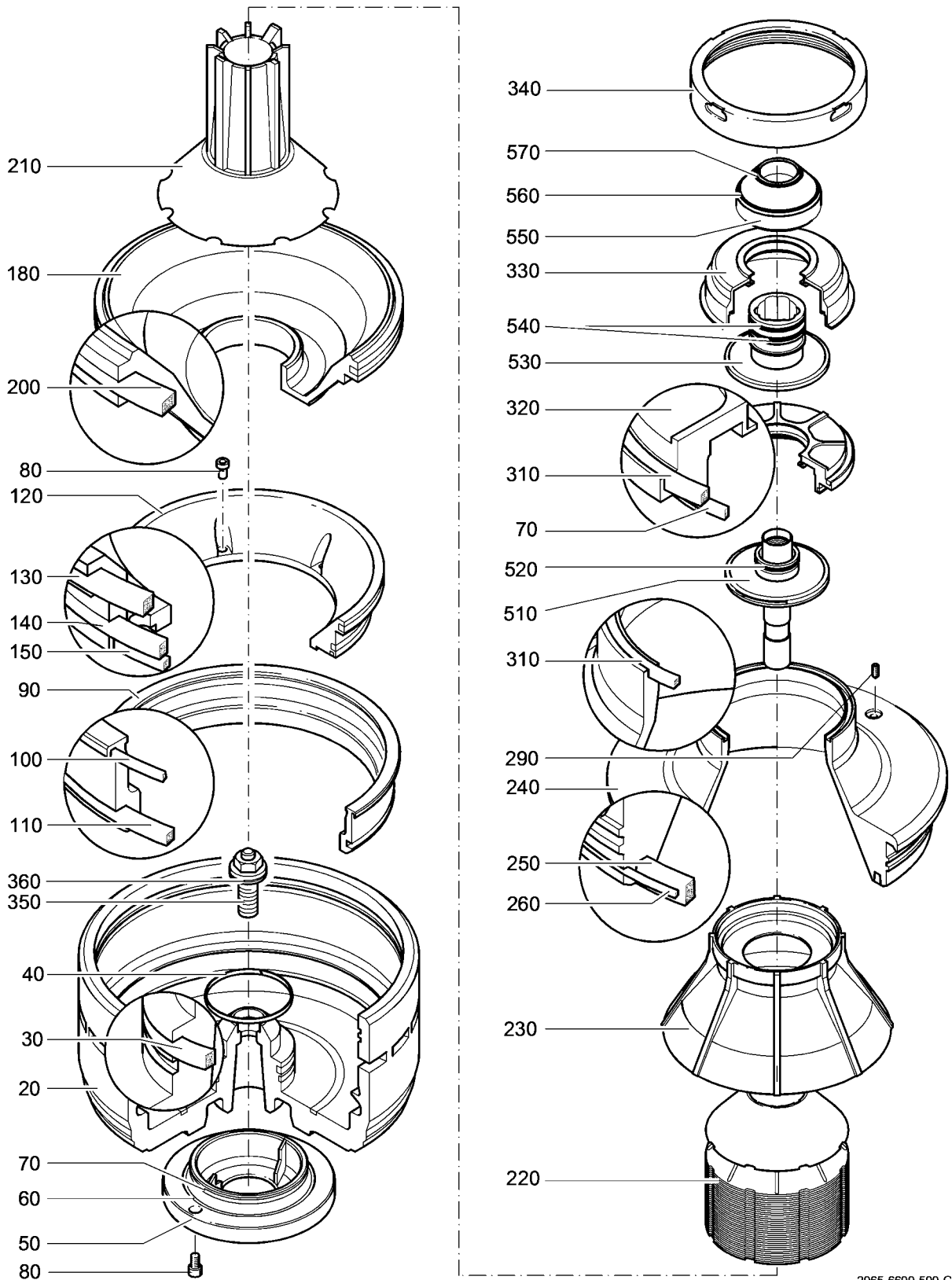
For the different separator types and oil types the viscosity ranges are specified in the table of lubricating oils.

The operating temperature of the separator exceeds normally 80 °C (176 °F). At those temperatures some oils age quickly, so that they have to be changed prematurely.

Be sure not to use lubricating oils with viscosities lower than those specified in the table. Due to the possibility of the oil film breaking down, oil of too low a viscosity will give insufficient lubrication, resulting in increased wear. However, oils with a slightly higher viscosity than specified may be used.

Bear in mind that the viscosity groups SAE 30, 40 and 50 (SAE = **S**ociety of **A**utomotive **E**ngineers) cover larger viscosity ranges and be sure to select lubricating oils with viscosities not lower than the minimum values of the viscosity ranges restricted for the different separator types.

### 4.4 Bowl



2065-6600-500-Gr

Fig. 115 Exploded view of the bowl and centrifugal pump



Pos.	Designation	Dimensions
20	(1) Bowl bottom, compl.	
30	Gasket	
40	Piston guide ring	
50	(2) Water chamber bottom	
60	Gasket	
70	Gasket	
80	Allen screw	ISO 4762 – M 8 x 16 – A4-80
90	Annular piston	
100	Gasket	
110	Gasket	
120	Closing chamber bottom	
130	Gasket	
140	Gasket	
150	Gasket	
180	Sliding piston	
200	Gasket	
210	(1) Distributor	
220	Disk stack, complete	
230	Separating disk	
240	(1) Bowl top	
250	Gasket	
260	Gasket	
290	Threaded pin	ISO 4026 - M 10 x 10 -1.4571
310	Gasket	
320	Centripetal pump chamber cover	
330	Centripetal pump chamber cover	
340	Lock ring	
350	Spindle screw:	
360	Gasket	
510	Centripetal pump, compl.	
520	Gasket	
530	Sensing liquid pump	
540	Gasket	
550	Spacer ring	
560	Gasket	
570	Gasket	

- (1) **IMPORTANT:** This part can only be replaced by a WS service specialist!  
The complete bowl must be re-balanced in one of our authorized workshops or in the manufacturer's plant.
- (2) **IMPORTANT:** This part can only be replaced by a WS service specialist!  
A vibration check must be carried out on the machine by a WS service specialist.

#### 4.4.1 Dismantling the bowl

- Switch off the main switch and lock it.



**CAUTION: Danger to life through high-speed rotating separator parts!**

- Do not loosen any part of the separator before the bowl has come to a standstill.
  - The run-down time of the bowl is **45 minutes** after switching off the motor.
  - Bowl standstill is indicated by standstill of the drive belt.

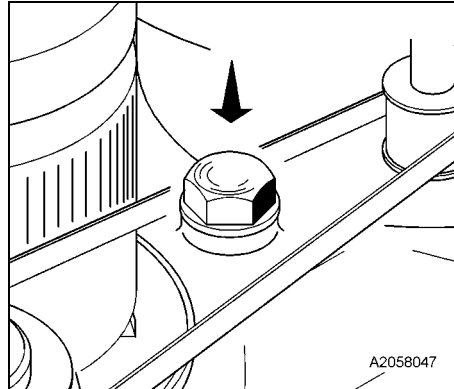


Fig. 116

**Standstill of drive belt**

- Shine a torch through the frame sight glass..
- Visually check that the drive belt is no longer moving.

**When the sight glass is turbid:**

- Unscrew the sight glass,
- shine a torch through the sight glass opening in the frame!



**CAUTION: Danger of injury through rotating drive belt!**

- Check **ONLY** visually that the drive belt is no longer moving.
  - Do **NOT** touch the drive belt through the sight glass opening in the frame!
- Clean the sight glass and screw it back in.



**CAUTION: Danger to life through high-speed rotating separator parts!**

**In the case of torn or defective drive belts or if the belts have come off:**

- Do not loosen any part of the separator before the bowl has come to a standstill.
- **Be sure to observe** the run-down time of **90 minutes** until dismantling the separator!



**CAUTION: Danger of injury through very hot separator parts!**

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C(158 – 212 °F)).



**CAUTION: Danger to life and limb through electric current!**

**There might be residual voltage!**

**In the case of motors with space heaters, residual voltages in the motor terminal box are possible despite switched off main switch.**

**Prior to working on the motor:**

- Refer to the motor nameplate.
- Refer to the motor instruction manual.
- Take adequate preventive measures according to the national provisions (in Germany in accordance with the rules and regulations of the VDE (Verband Deutscher Elektrotechnik/ Association of German Electrical Engineering) or of the local electric power company.
- **Any work on the motor may be carried out by an authorized electrician only.**

- Avoid damage to bowl parts when fitting and removing by
  - precise positioning,
  - no diagonal pull!
  - selecting the low lifting speed of the hoist.



**CAUTION: Use appropriate lifting devices to prevent accidents!**

- Use suitably rated, intact hoists.



**CAUTION: Danger to life when transporting heavy parts!**

- Do NOT step under hanging load.



**CAUTION: Avoid accidents by using undamaged, complete tools!**

- Use tools only for their intended use!
  - For special tools, see section 4.14 or spare parts catalog.
  - For standard tools, see section 4.13.

- Do not use force when removing or fitting parts.

- Treat all bowl parts
  - gently.
  - Always set them down on a rubber mat or a wooden pallet.



**CAUTION: Danger of imbalance!**

If an installation is equipped with several separators:

- Do not interchange parts from different bowls.  
The bowl parts are marked with the serial number of the machine or the last three digits of the serial number.

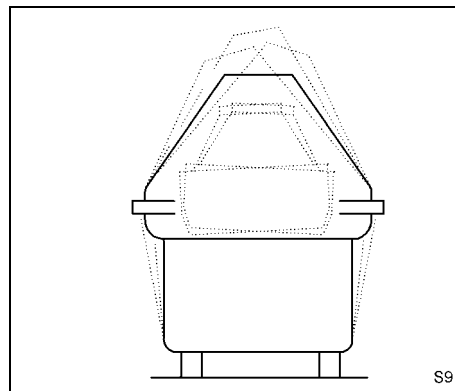


Fig. 117

**CAUTION:**

- Certain bowl parts (see sect. 4.4) may be pre-assembled and balanced only by specialists from Westfalia Separator or in workshops authorized by Westfalia Separator. Unqualified balancing can lead to dangerous operating states (vibrations) and destruction of the separator with danger to life.

### Hinging up the hood

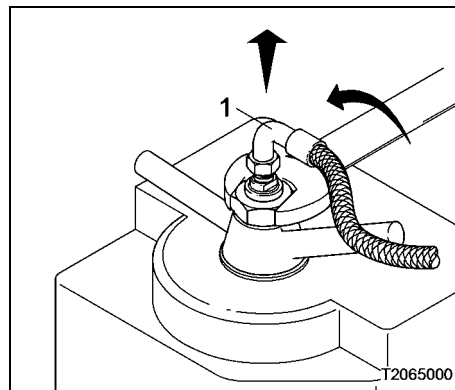


Fig. 118

- Unscrew filling and displacement water line 1.

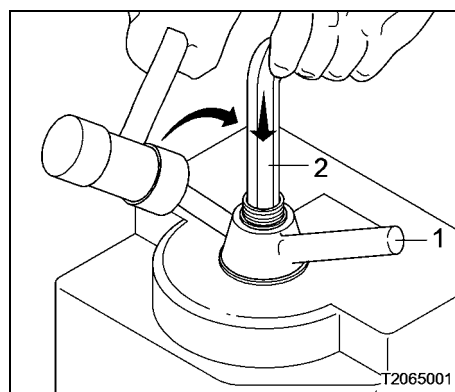


Fig. 119

- Unscrew handle connection piece 1 by lightly hammering with a mallet (left-hand thread); at the same time
- hold the centripetal pump with offset screwdriver 2.

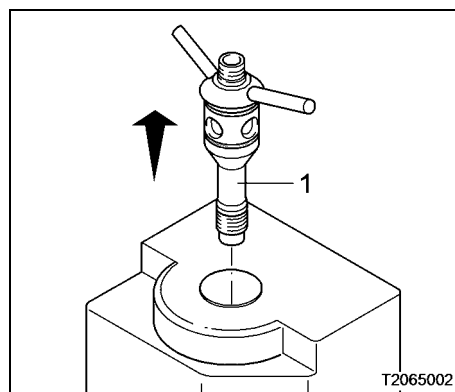


Fig. 120

- Remove handle connection piece 1.

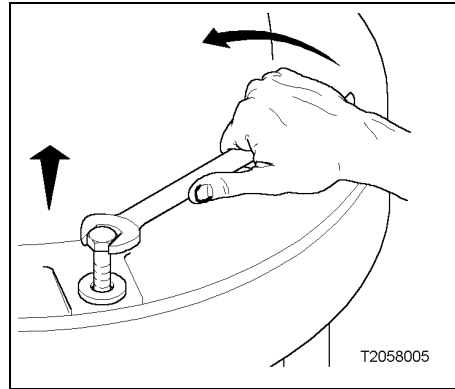


Fig. 121

- Unscrew three hex head screws with their washers.

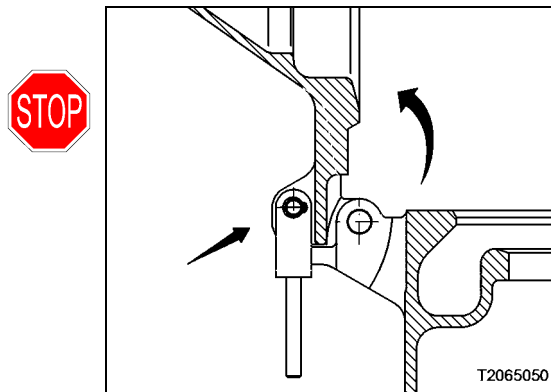


Fig. 122

- Hinge up the hood.

**CAUTION: Danger of injury by incorrect hinging up of the hood!**

- The stirrup must register properly.

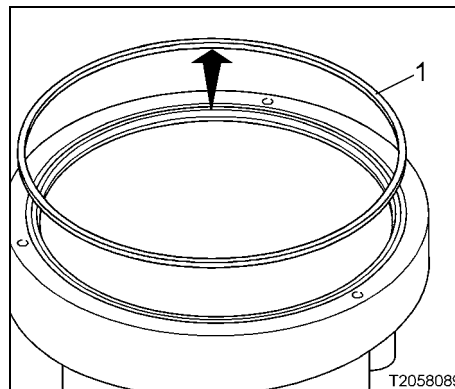


Fig. 123

**If necessary (see section 4.3.1):**

- Take gasket 1 out of the upper section of the frame.

## Removing the centripetal pump

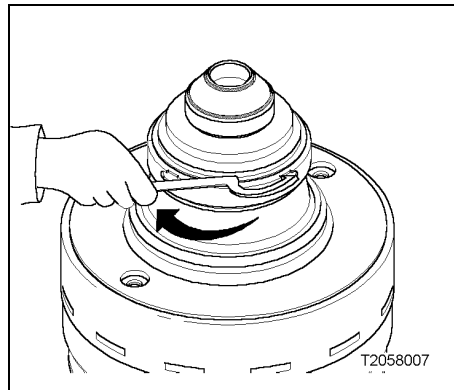


Fig. 124

### Required special tool

– Double hook wrench

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

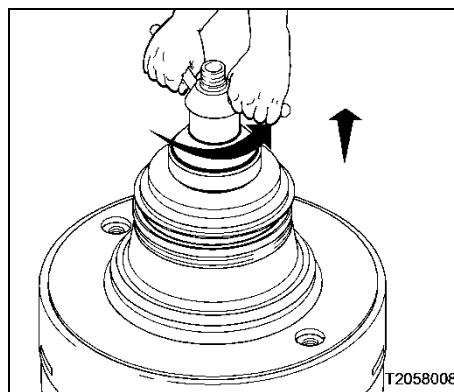


Fig. 125

- Screw handle connection piece into the centripetal pump (**left-hand thread**).

- Remove the complete centripetal pump together with the centripetal pump chamber covers.

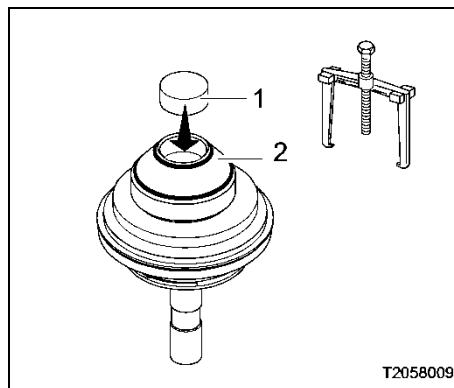


Fig. 126

### Required special tool

– Pressure piece 1

- Insert pressure piece 1 into spacer ring 2.
- Pull off spacer ring 2 with fitted gaskets with the aid of a commercial puller.

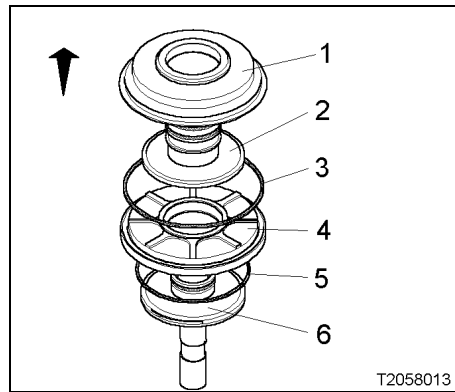


Fig. 127

- Remove the following **parts if necessary**:
  - centripetal pump chamber cover 1,
  - sensing liquid pump 2 with inserted gaskets,
  - centripetal pump chamber cover 4 with gaskets 3 and 5,
  - centripetal pump 6 with inserted gasket.

**Lifting out the bowl**

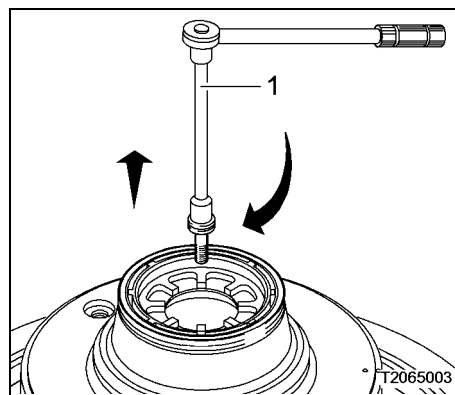


Fig. 128

**Required special tool**

- Socket wrench 1
- Unscrew the spindle screw (with inserted gasket) with socket wrench 1 and a commercially available ratchet wrench (**left-hand thread**) and remove it.

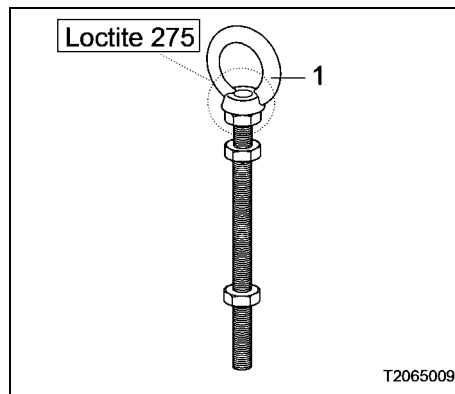


Fig. 129

**Required special tool**

- Eye bolt 1
- Bolt unit 1 comprises ring nut, hexagon nuts, and bolt.
- CAUTION: Avoid accidents by using undamaged and complete tools!**
- The ring nut and the upper hexagon nut must always be screwed into the bolt and be secured with Loctite 275.

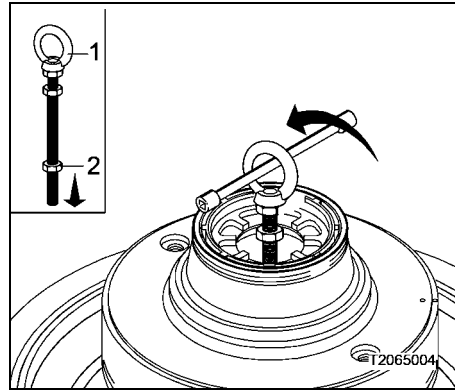


Fig. 130

- Unscrew hexagon nut 2.
- Screw eye bolt 1 into the bowl bottom.
- Press off the bowl from the spindle cone by **at least 10 mm**.

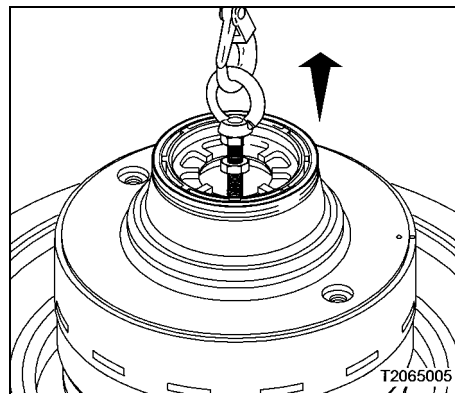


Fig. 131

- **CAUTION: Danger to life when transporting heavy parts!**
  - Do NOT step under hanging load.
- Lift the bowl out of the frame with the aid of a hoist.
- Set the bowl down on a rubber mat or a wooden pallet for further dismantling.

### Compressing the disk stack

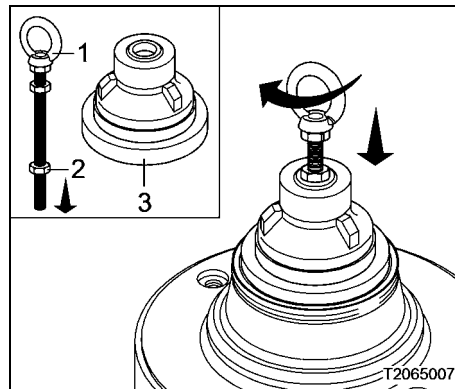


Fig. 132

#### Required special tools

Compressing device

- Eye bolt 1
- Bell-shaped piece 3

- Grease the contact surface of bell-shaped piece 3 (see chapter 4.3.4).
- Place bell-shaped piece 3 on the bowl top.
- Unscrew hexagon nut 2
- Screw eye bolt 1 into the bowl bottom.



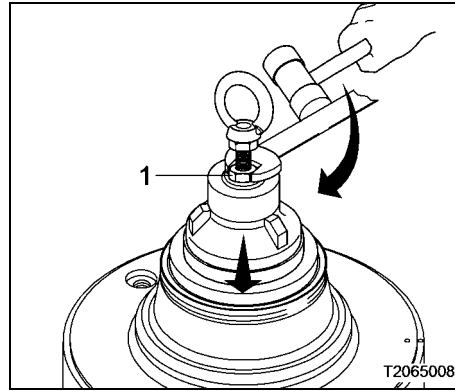


Fig. 133

- Compress the disk stack **firmly**.
  - Screw tight hexagon nut 1.

### Lifting off the bowl top

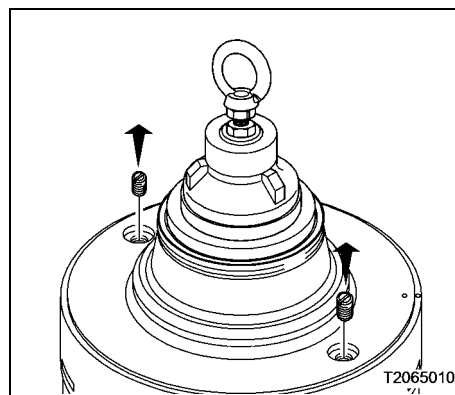


Fig. 134

- Unscrew two threaded pins out of the bowl top with a screwdriver.

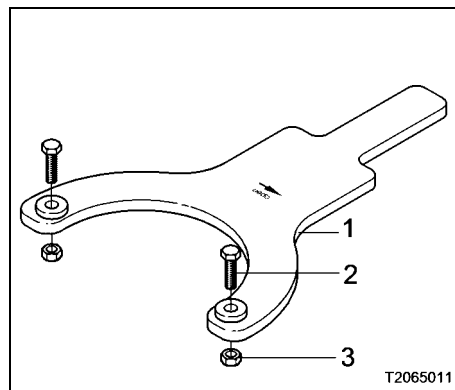


Fig. 135

### Required special tool

- ring spanner 1

- Remove two hexagon nuts 3 from hex head screws 2.

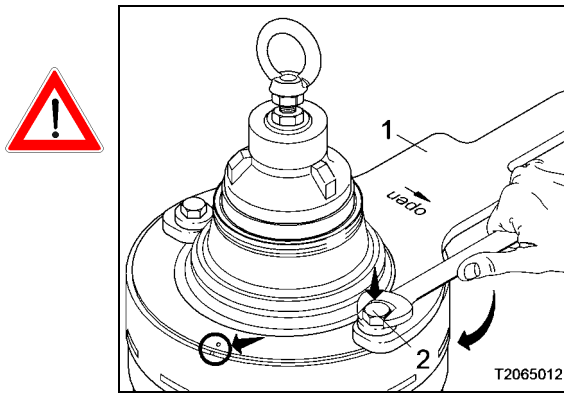


Fig. 136

**Important:**

- The O-marks of the bowl top and of the bowl bottom must be visible.
  - Do NOT hide them under ring spanner 1!
- The arrow and the "open" mark must show upwards.
- Bolt ring spanner 1 to the bowl top.
- Screw in two hex head screws 2 of the ring spanner and **tighten firmly**.

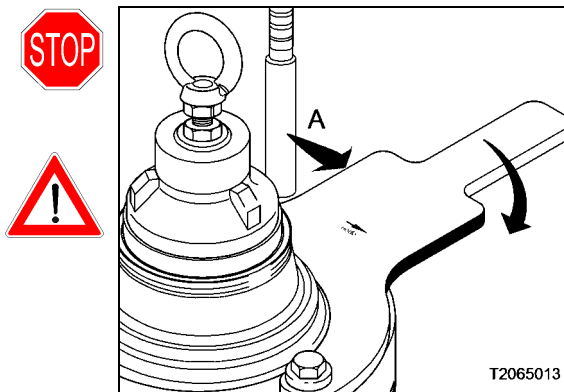


Fig. 137

- **CAUTION: Danger of injury through rotating lever!**
  - Be careful when working in the area around the lever.
- **ATTENTION:** Pay attention to the point of impact A!
- Strike open the bowl top with a mallet (**left-hand thread**) and unscrew it.

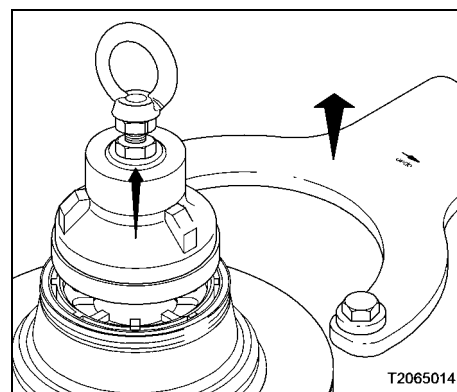


Fig. 138

- Remove eye bolt, bell-shaped piece, and ring spanner.

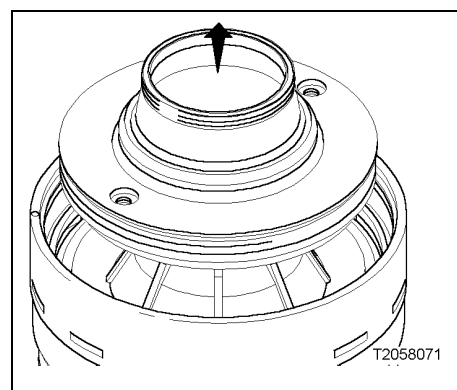


Fig. 139

- Lift off the bowl top with fitted gaskets by hand.

### Removing the separating disk

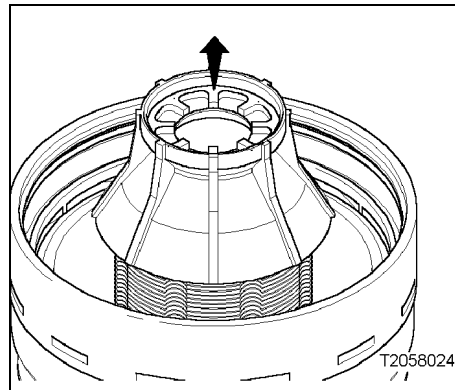


Fig. 140

- Remove the Separating disk from the distributor neck.

### Removing the disk stack and the distributor

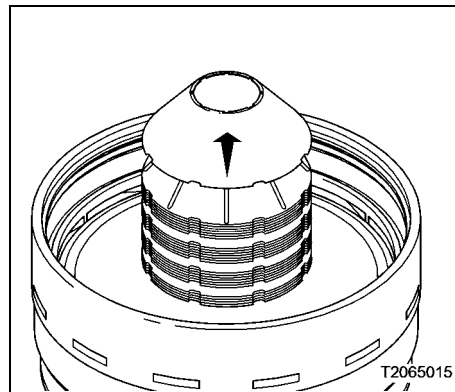


Fig. 141

- Remove the disks out of the distributor, one by one or group-wise.

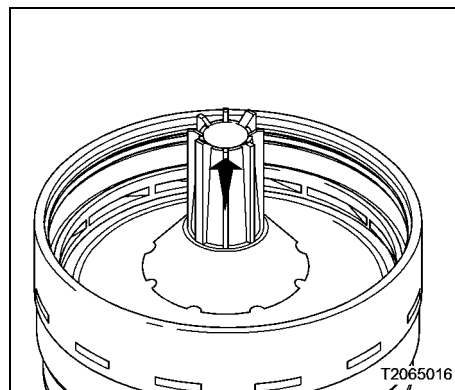


Fig. 142

- Remove the distributor.

### Removing the sliding piston

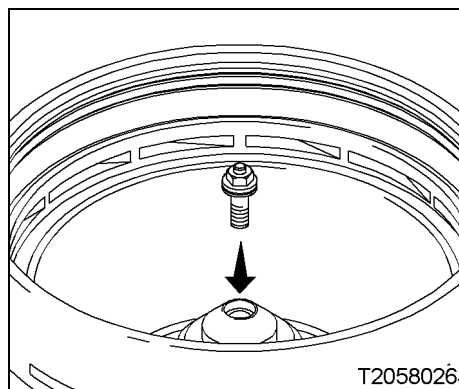


Fig. 143

- Insert the spindle screw into the hub.

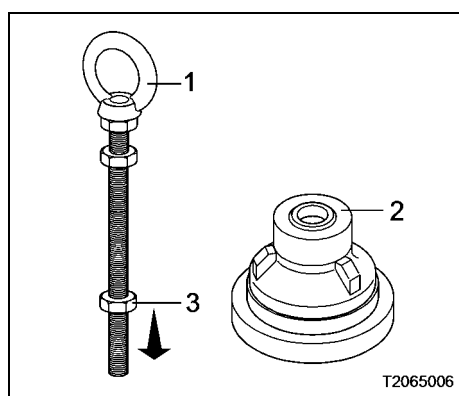


Fig. 144

### Required special tools

- Eye bolt 1
  - Bell-shaped piece 2
- Unscrew hexagon nut 3

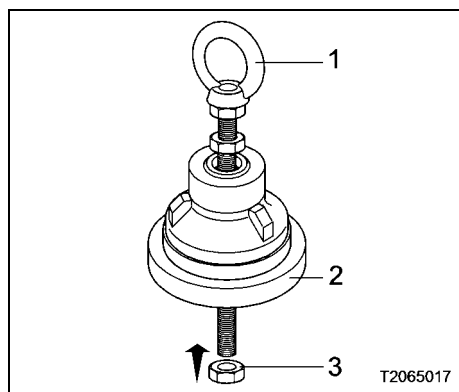


Fig. 145

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

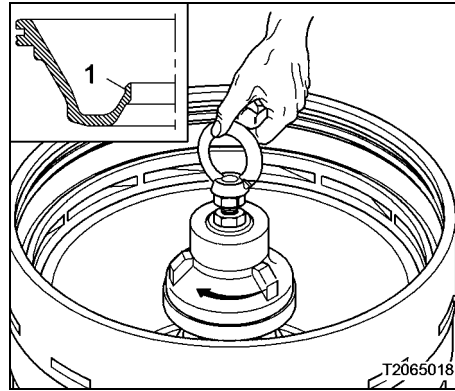


Fig. 146

- Grease the thread of sliding piston 1 (see chapter 4.3.4).
- Screw the bell-shaped piece with fitted eye bolt into the thread of the sliding piston.

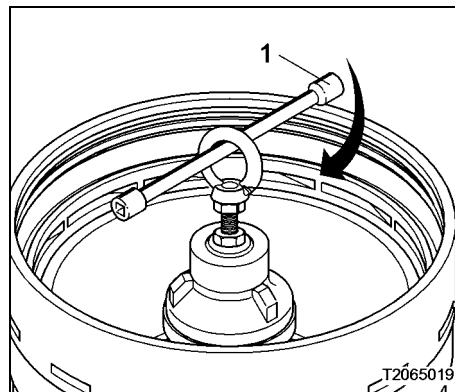


Fig. 147

#### Required special tool

– Socket wrench 1

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

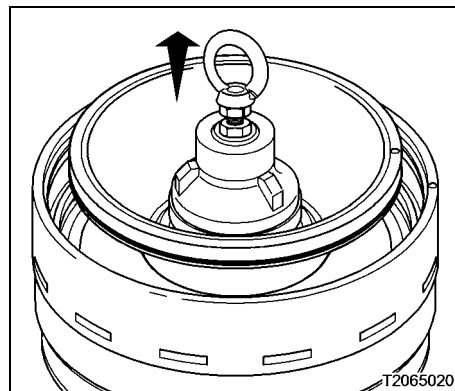


Fig. 148

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

## Removing the annular piston and the closing chamber bottom

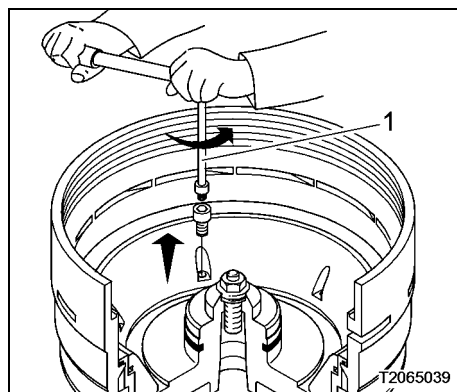


Fig. 149

### Required special tool

- Socket wrench 1

- Unscrew the Allen screws holding the bowl bottom and the closing-chamber bottom together.

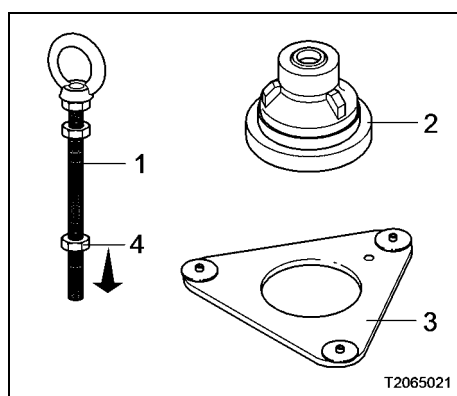


Fig. 150

### Required special tools

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

- Unscrew hexagon nut 4

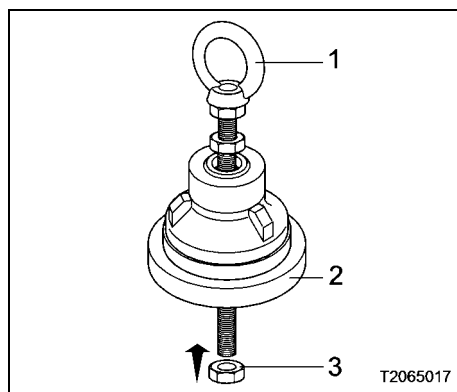


Fig. 151

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

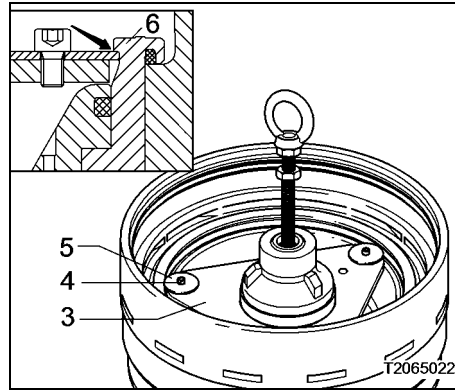


Fig. 152

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

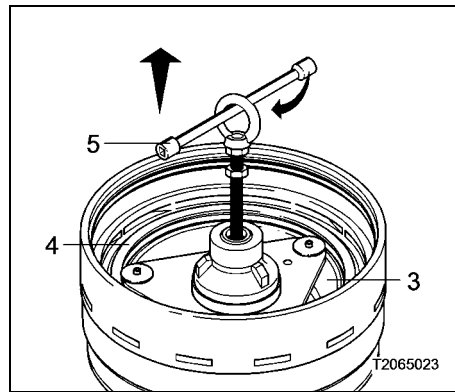


Fig. 153

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

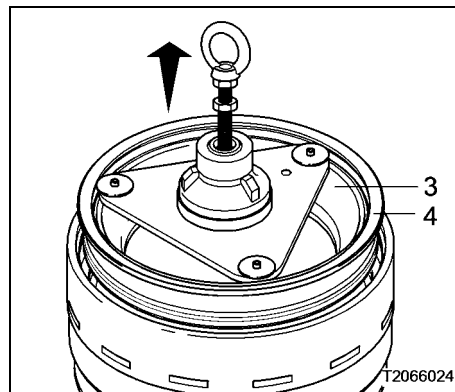


Fig. 154

- Remove closing chamber bottom 3 and annular piston 4 (with fitted gaskets) with the bell-shaped piece and the eye bolt.
- Remove the bell-shaped piece and the eye bolt.

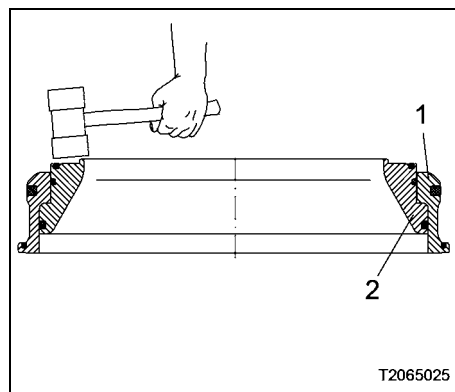


Fig. 155

- Separate annular piston 1 from closing chamber bottom 2 by tapping with a mallet – as illustrated.

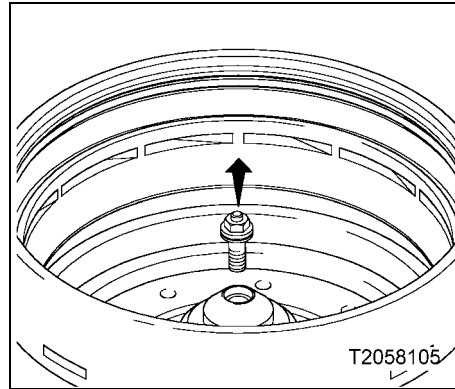


Fig. 156

- Unscrew spindle screw 1.

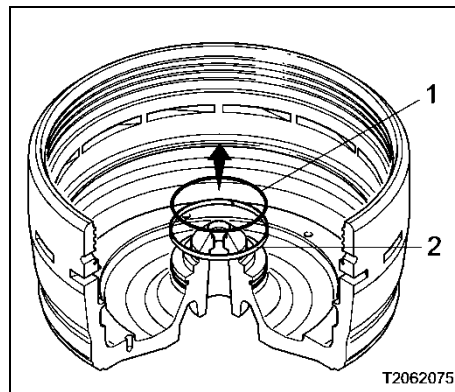


Fig. 157

**If necessary:**

- Remove gasket 1 and piston guide ring 2.



### Removing the water chamber bottom

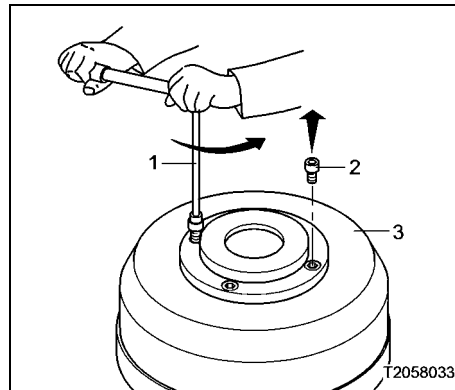


Fig. 158

#### Required special tool

– Socket wrench 1

- Turn bow bottom through 180° (upside down).
- Unscrew four Allen screws 2 from water chamber bottom 3.

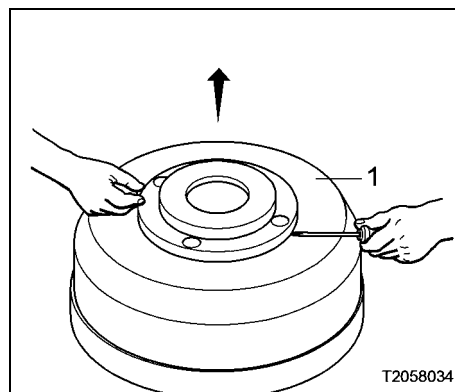


Fig. 159

- Force off water chamber bottom 1 with a screwdriver and remove it with inserted gaskets.

#### 4.4.2 Cleaning the bowl

It is generally not necessary to dismantle self-cleaning bowls for cleaning after separation unless

- the nature of the product makes it necessary,
  - the separator is to be shut down for a lengthy period (see section 4.9).
- Dismantle and clean the bowl for checking from time to time. See section 4.3.1 - Maintenance schedule.
  - Use only a cleaning agent that is approved for the field of application!



- **Do not use acid or chloric cleaning agents.**  
Chlorine attacks stainless steel parts.

- Dissolve dried scale with citric acid.



- **For cleaning the individual disks and bowl parts**  
**Do not use metal scrapers and metal brushes!**

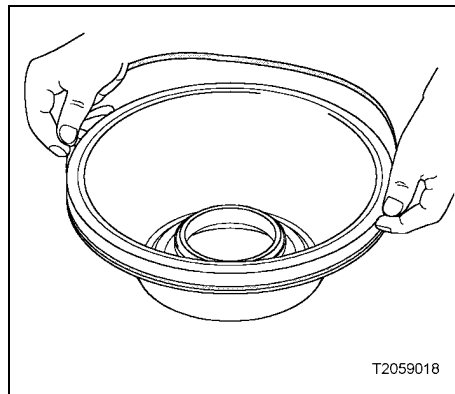


Fig. 160

- Take the gaskets out of the bowl parts.
- Clean the grooves and gaskets to avoid corrosion in the grooves.
- Replace damaged, very swollen, hardened or brittle gaskets **immediately**.

- Clean the small holes for the feed and discharge of the operating liquid **with particular care** to ensure trouble-free bowl ejections.

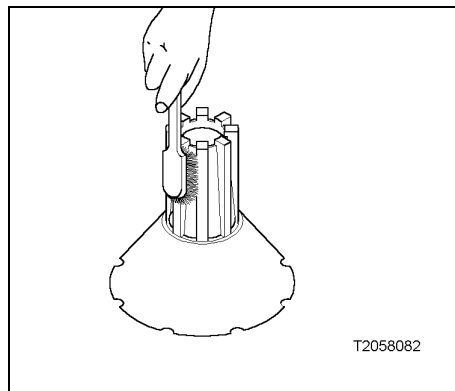


Fig. 161

- Clean the distributor between the ribs with the brush on the inside and outside.  
When the distributor neck is very dirty, the feed clogs which can cause overflow.

- Apply a **thin** coat of grease to the guide surfaces and threads of the bowl parts after drying (see 4.3.4 Lubrication schedule).



- **Reassemble the bowl immediately after cleaning!**

### 4.4.3 Cleaning the frame



**CAUTION: Danger to life through electrical components!**

- Never rinse off the motor with a direct water jet.
- Use only a cleaning agent that is approved for the field of application!



**ATTENTION!**

- **Do not use acid or chloric cleaning agents.**  
Chlorine attacks stainless steel parts.
- Dissolve dried scale with citric acid.
- Clean the inside of the upper section of the frame from time to time:  
To do this:
  - Refer to the *maintenance schedule* (section 4.3.1),
  - dismantle the bowl (section 4.4.1).

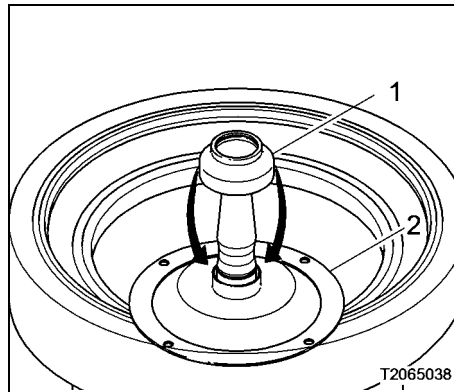


Fig. 162

**ATTENTION: Escaping cleaning liquid!**

When the bowl has been removed, **no cleaning liquid** must spill onto the drive belt via the spindle.

- Make sure that protective cap 2 and spindle cap 1 with inserted gasket are installed.

### 4.4.4 Cleaning the strainer and the operating water feeding system

- The strainer and the operating water feeding system must be cleaned depending on the quality of the operating water and overall load. See section 4.3.1 *Maintenance schedule*
- Use citric acid in case of furring.
- Thoroughly clean the parts with water.

### Replacing or cleaning the filter element



**CAUTION: Danger due to electrical current!**

- Switch off the main switch and lock it.
- Close the main valve for operating water, filling and displacement water.



**CAUTION: Danger of injury through very hot separator parts!**

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C (158 – 212 °F)).

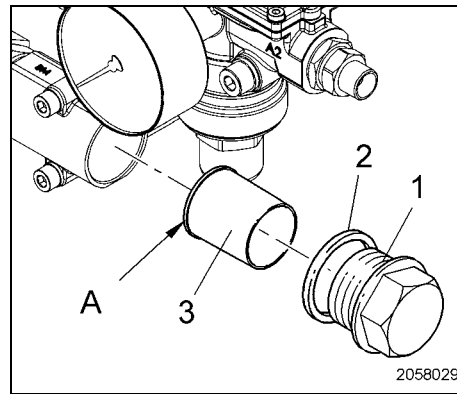


Fig. 163

- Undo screw 1 (jaw span 22) with fitted gasket 2.
- Remove filter element 3.
- Clean or replace filter element 3.
  - Use citric acid in case of furring.
  - Thoroughly clean the parts with water.



- Fit the cleaned or new filter element 3.  
**IMPORTANT: Cooper strip to the inside!**
- Firmly screw in screw 1 with fitted gasket 2 so that it seals well.

#### 4.4.5 Cleaning the motor



- CAUTION: Danger to life through electrical components!**
- Never rinse off the motor with a direct water jet.
  - Keep the motor clean as specified in the manual.

**4.4.6 Important instructions for assembling the bowl**



**CAUTION: Danger of imbalance!**

When the bowl has not been correctly assembled or is inadequately cleaned, forces can be produced in the high-speed rotating bowl which endanger the operating safety of the separator!

Therefore, the cleaning instructions (section 4.4.2) and assembling instructions (section 4.4.7) must be exactly followed.

Pay particular attention to the following:



**ATTENTION!**

- Before assembling the bowl, check to be sure that the guide and contact surfaces of the bowl are clean.
- Grease the guide surfaces as specified in the lubrication schedule (see 4.3.4).

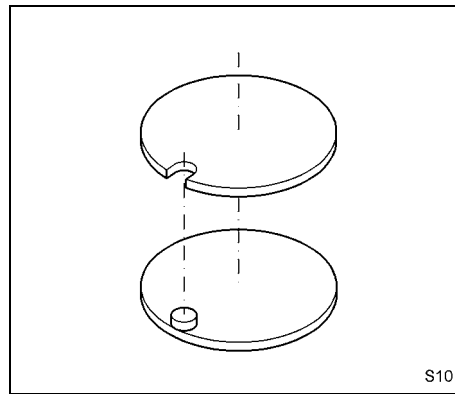


Fig. 164

- Some bowl parts are arranged in fixed positions relative to one another.
  - Locking devices and alignment marks must be in perfect condition.
- IMPORTANT:**  
The bowl must otherwise not be operated.

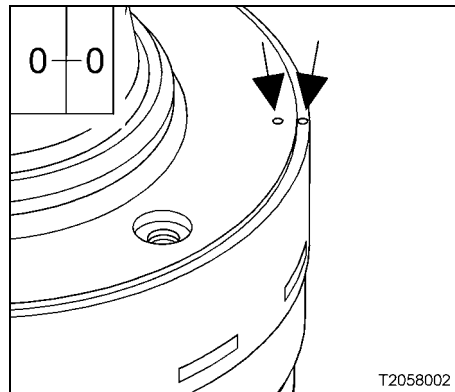


Fig. 165

- When fitting the bowl parts, make sure that the "O" marks on all parts are aligned.  
(Only then will the parts fit correctly over arresting pins and guide ribs).

- Avoid damage to bowl parts when fitting and removing by
  - precise positioning,
  - no diagonal pull!
  - selecting the low lifting speed of the hoist.



**CAUTION: Use appropriate lifting devices to prevent accidents!**

- Use suitably rated, intact hoists.



**CAUTION: Danger to life when transporting heavy parts!**

- Do NOT step under hanging load.



**CAUTION: Avoid accidents by using undamaged, complete tools!**

- Use tools only for their intended use!
  - For special tools, see section 4.14 or spare parts catalog.
  - For standard tools, see section 4.13.
- Do not use force when removing or fitting parts.

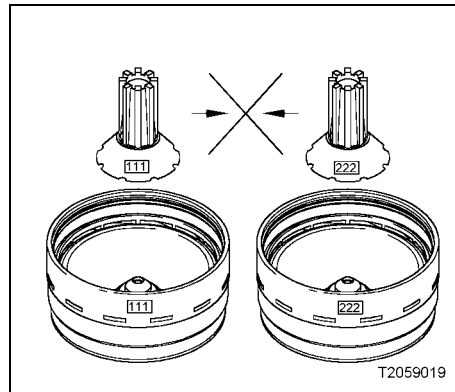


Fig. 166

**CAUTION: Danger of imbalance!**

- If the plant has several separators, be sure not to interchange parts of different bowls.
 

The parts are marked

  - with the serial number or
  - the last three digits of the serial number.

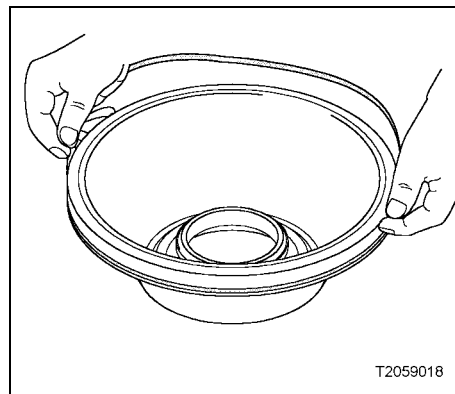


Fig. 167

- Thoroughly clean the gasket grooves of the individual bowl parts and apply a **thin** coat of grease.
- After fitting check that
  - the gaskets are not twisted,
  - the gaskets are evenly positioned in the groove.

#### 4.4.7 Assembling the bowl

- Pay special attention to sections “Safety”, 4.4.2 and 4.4.6
- For dimensions of the parts see 4.4 - exploded view.

##### Installing the water chamber bottom

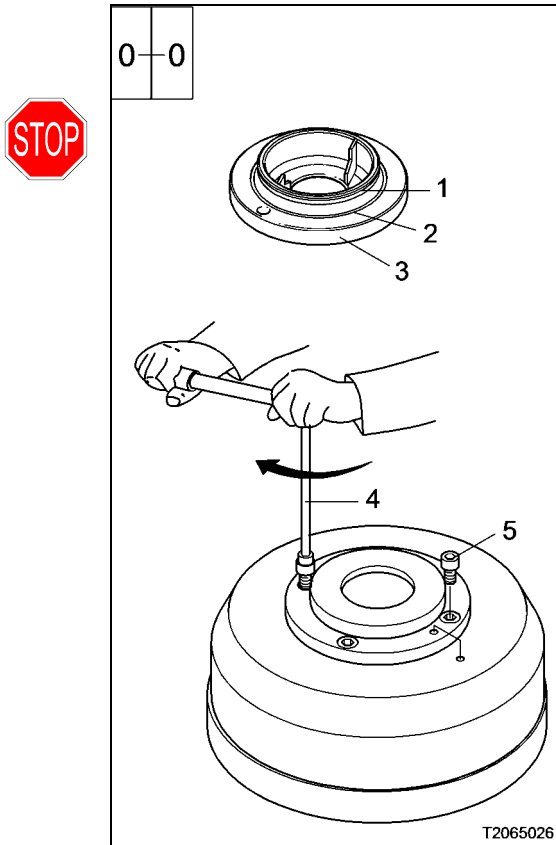


Fig. 168

##### Required special tool

– Socket wrench 4

- Insert gaskets 1 and 2 in the grooves of the water chamber bottom.
- Turn bowl bottom through 180° (upside down).
- Place water chamber bottom 3 on the bowl bottom.
  - The O marks of the bowl bottom and the water chamber bottom must be aligned.
- Screw in the four Allen screws 5 holding the water chamber bottom and bowl bottom together **tight**.  
**Torque: 25 Nm**

##### Installing the annular piston and the closing chamber bottom

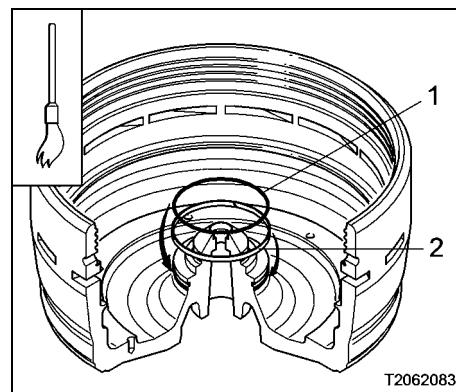


Fig. 169

- Grease guide surfaces as specified in the lubrication schedule (see 4.3.4).
- Insert gasket 1 and piston guide ring 2 into the grooves of the bowl bottom.

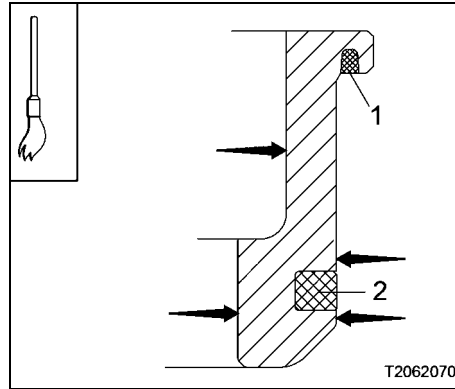


Fig. 170

- For replacing the polyamide gasket 1 see section 4.4.9.
- Place gasket 2 into the groove of the annular piston and press in evenly and **firmly**.
- Grease guide surfaces as specified in the lubrication schedule (see 4.3.4).

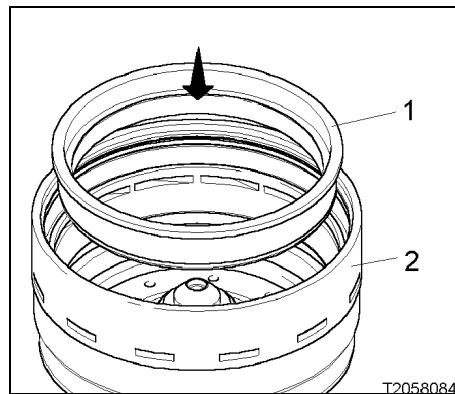


Fig. 171

- Insert annular piston 1 into bowl bottom 2.

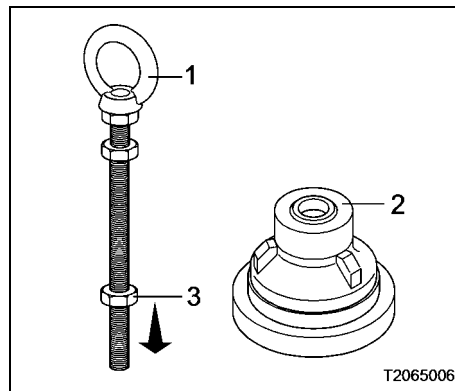


Fig. 172

**Required special tools**

Compressing device

- Eye bolt 1
- Bell-shaped piece 2

- Unscrew hexagon nut 3.

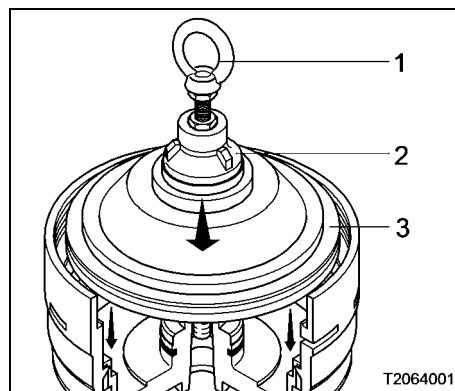


Fig. 173

- Turn sliding piston 3 through 180° (upside down).
- Place sliding piston 3, bell-shaped piece 2 and eye bolt 1 on the annular piston.



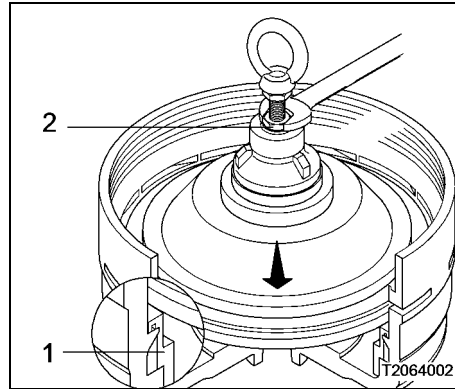


Fig. 174

- Press the annular piston 1 into the bowl bottom by turning hexagon nut 2 clockwise with the wrench.
- Remove special tools and sliding piston.

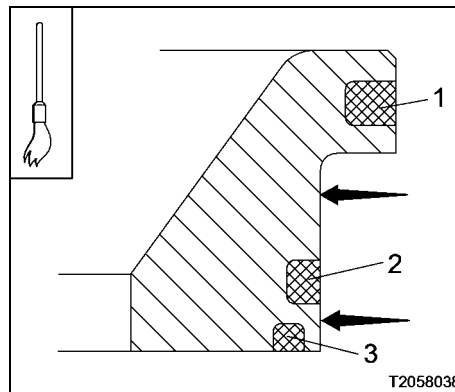


Fig. 175

- Insert gaskets 1 and 3 in the grooves of the closing chamber bottom.
- Grease guide surfaces as specified in the lubrication schedule (see 4.3.4).

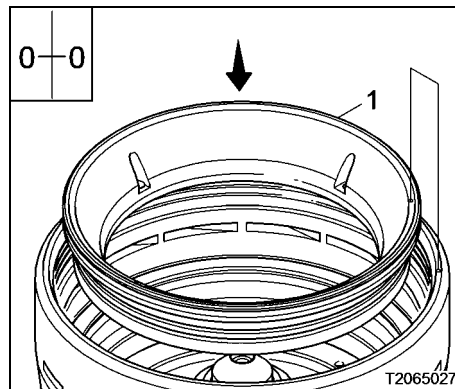


Fig. 176

- Insert closing chamber bottom 1 into the annular piston.
  - The O marks of the closing chamber bottom and the bowl bottom must be aligned.

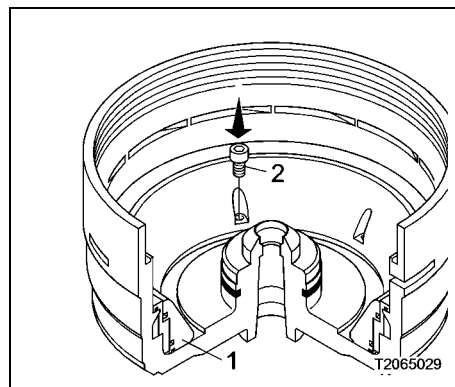


Fig. 177

- Fasten closing chamber bottom 1 onto the bowl bottom by tightening Allen screws 2 crosswise.

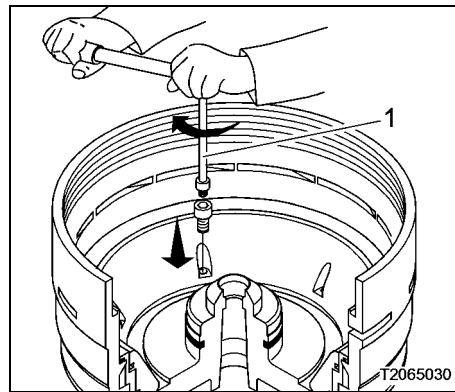


Fig. 178

**Required special tool**

– Socket wrench 1

- Screw **tight** the Allen screws holding the closing chamber bottom and the bowl bottom together.

**Torque: 25 Nm**

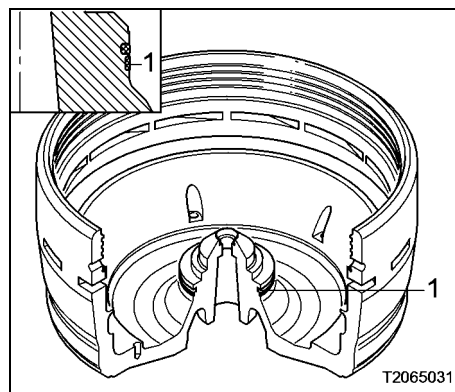


Fig. 179

- Make sure that piston guide ring 1 is **firmly** located in the groove.

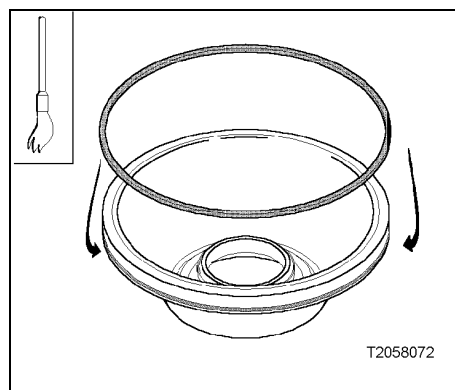
**Installing the sliding piston**

Fig. 180

- Insert the gasket in the groove of the sliding piston.
- Grease guide surfaces as specified in the lubrication schedule (see 4.3.4).

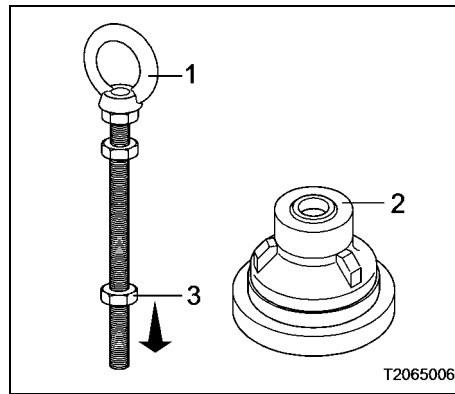


Fig. 181

**Required special tools**

Compressing device

- Eye bolt 1
- Bell-shaped piece 2

- Unscrew hexagon nut 3

Bolt unit 1 comprises ring nut, hexagon nuts, and bolt.

**CAUTION: Avoid accidents by using undamaged and complete tools!**

- The ring nut and the upper hexagon nut must always be screwed into the bolt and be secured with Loctite 275.

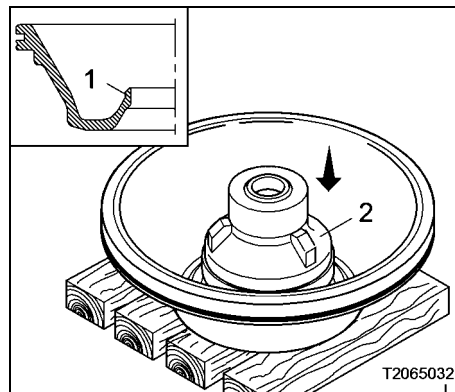


Fig. 182

- Grease thread 1 of the sliding piston (see chapter 4.3.4).
- Screw bell-shaped piece 2 into the thread of the sliding piston.

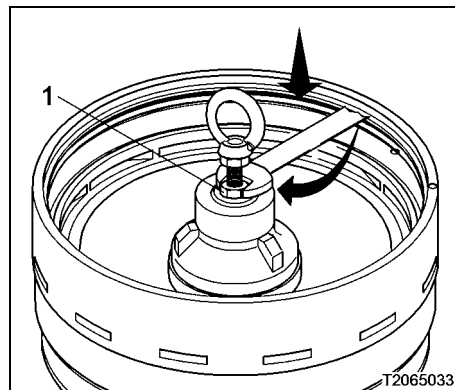


Fig. 183

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

### Installing the distributor and the disk stack

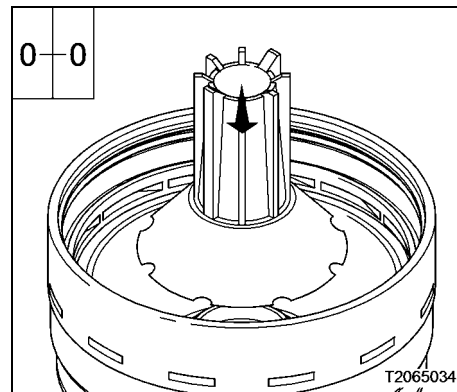


Fig. 184

- Insert the distributor into the sliding piston.
  - Pay attention to correct positioning.
  - The "O" marks must be aligned.

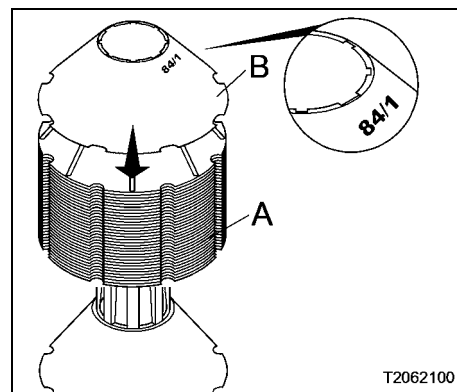


Fig. 185

#### **ATTENTION: Pay attention for correct total number of disks!**

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

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

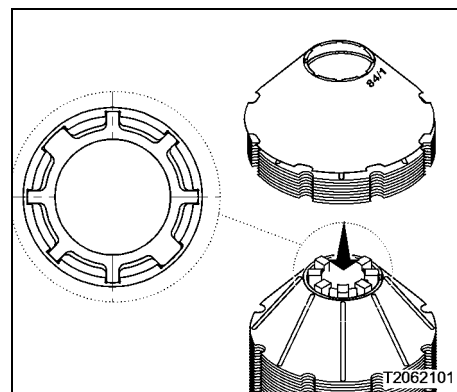


Fig. 186

#### **ATTENTION: The last disks must be properly located in the guide ribs of the distributor!**

- Carefully stack the disks on the distributor neck, one by one or group-wise .

### Fitting the separating disk

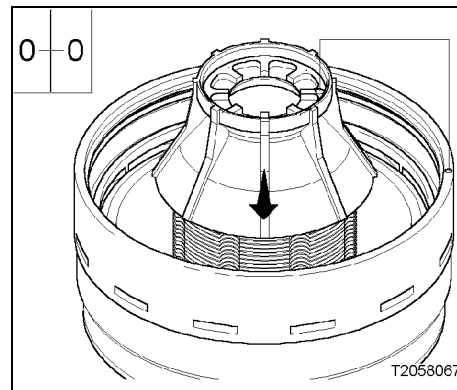


Fig. 187

- Mount the separating disk.
  - Pay attention to correct positioning!
  - The "O" marks must be aligned.

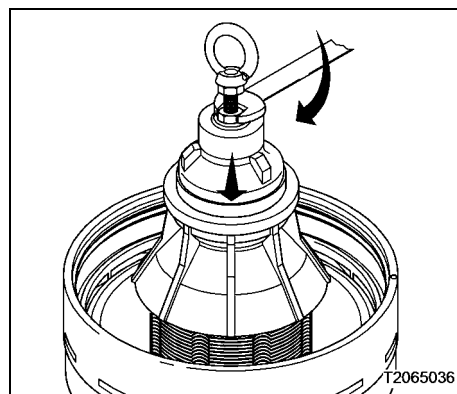


Fig. 188

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

### Installing the bowl top

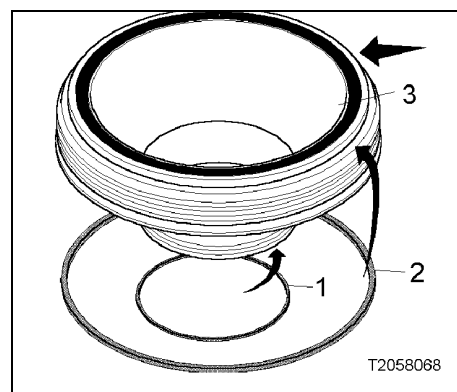


Fig. 189

- Thoroughly clean the grooves for gaskets 1 and 2 in the bowl top.
- Check gaskets 1 and 2:
  - replace when damaged,
  - install if missing.
- Check the inserted gasket 3.
  - replace when damaged,
  - For replacing the polyamide gasket 3 see section 4.4.8.

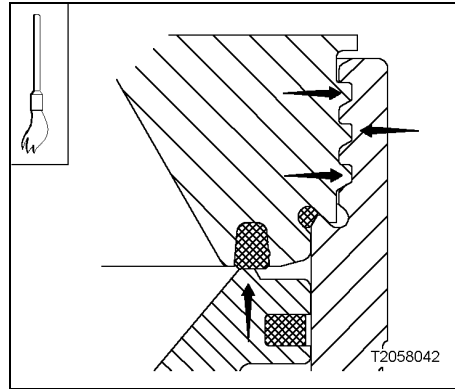


Fig. 190

**ATTENTION: Prevent seizing of threads!**

- The following parts must be carefully cleaned, wiped dry and greased in accordance with the lubrication schedule (see 4.3.4).
  - threads and guide surfaces of bowl bottom and bowl top
  - contact surfaces of bowl top and sliding piston

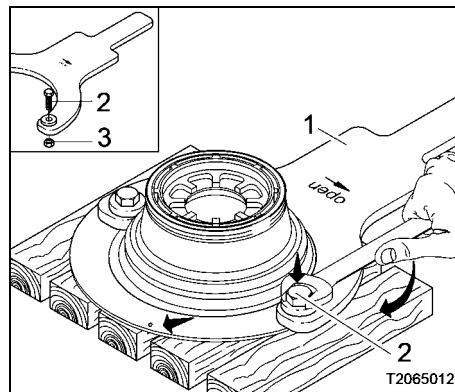


Fig. 191

**Required special tool**

- ring spanner 1

- Remove two hexagon nuts 3 from hex head screws 2.

**Important:**

- If threaded pins are screwed into the bowl top, undo them with a screwdriver.
- The O mark of the bowl top must be visible.
  - Do NOT hide them under ring spanner 1!
- The arrow and the "open" mark must show upwards.

- Bolt ring spanner 1 to the bowl top.
  - Screw in two hex head screws 2 of the ring spanner and **tighten firmly**.

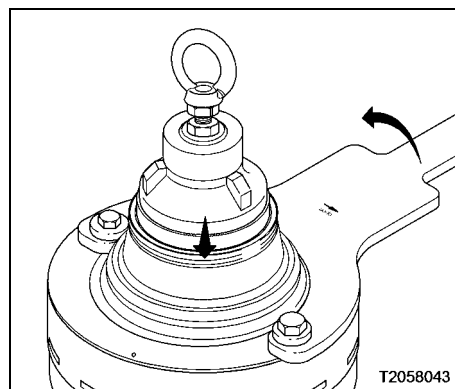


Fig. 192

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

### Compressing the disk stack

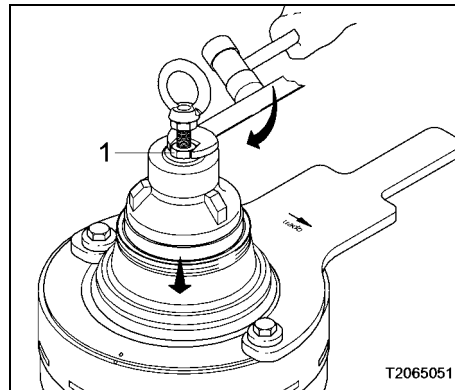


Fig. 193

- Compress the disk stack **firmly**.
  - Screw tight hexagon nut 1.

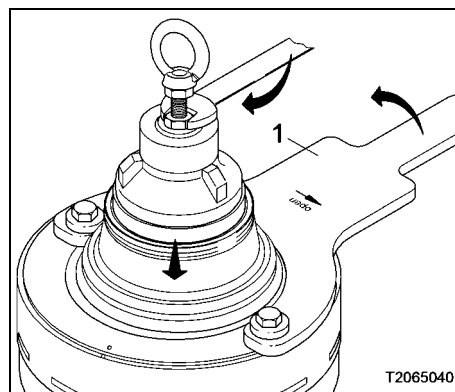


Fig. 194

- Compress the disk stack again and
- Screw in the bowl top using the ring spanner (**left-hand thread**).

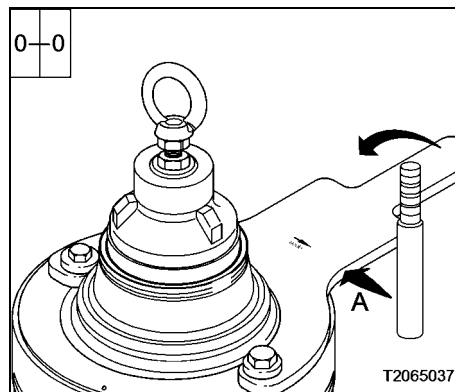


Fig. 195

- **CAUTION: Danger of injury through rotating lever!**
  - Be careful when working in the area around the lever.

- **ATTENTION:** Pay attention to the point of impact A!

**CAUTION:**  
A loose bowl top can endanger life!

- Strike the bowl top with a mallet until the "O" mark is reached (**left-hand thread**).

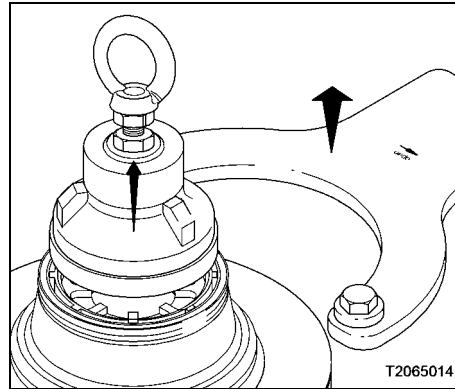


Fig. 196

- Remove eye bolt, bell-shaped piece, and ring spanner.

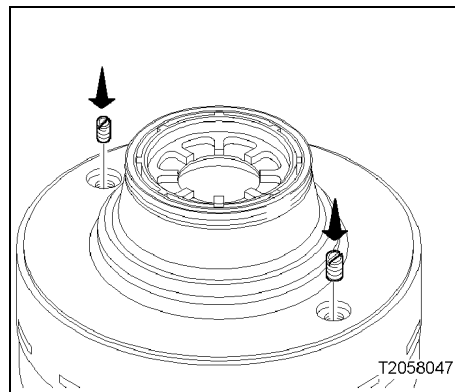


Fig. 197

- Screw in two threaded pins using a screwdriver.

### Installing the complete bowl and the centripetal pump

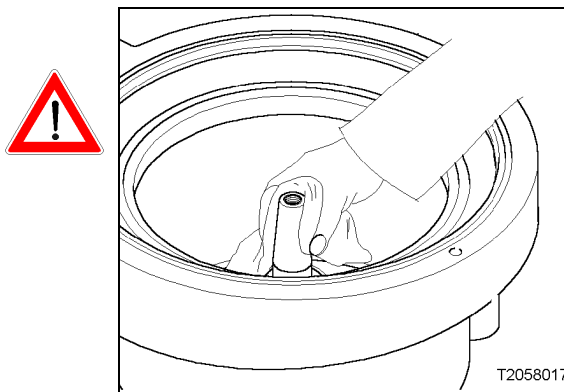


Fig. 198

- Clean and wipe dry the spindle cone with a suitable cloth.  
**ATTENTION: Do not grease the conical parts!**



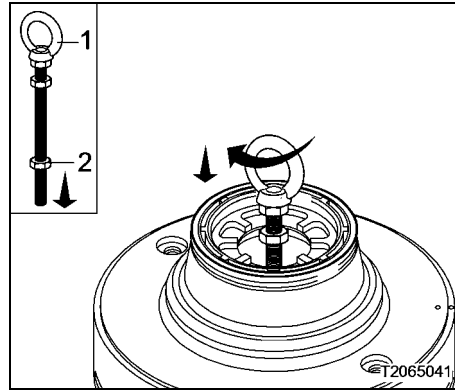


Fig. 199

**Required special tool**

– Eye bolt 1

- Unscrew hexagon nut 2
- Screw eye bolt 1 into the bowl bottom.

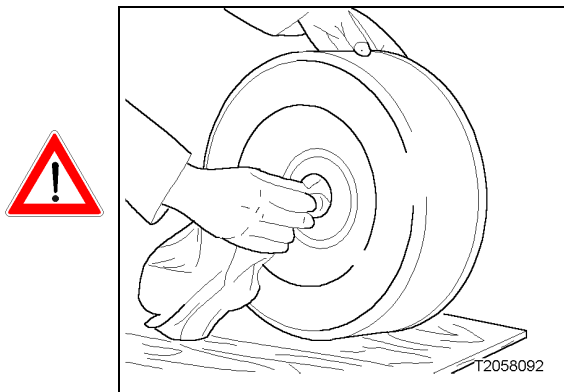


Fig. 200

- Turn bowl through 90° (opposite the fitting position).
- Clean the bowl hub with a suitable cloth.

**ATTENTION: Do not grease the bowl hub!**

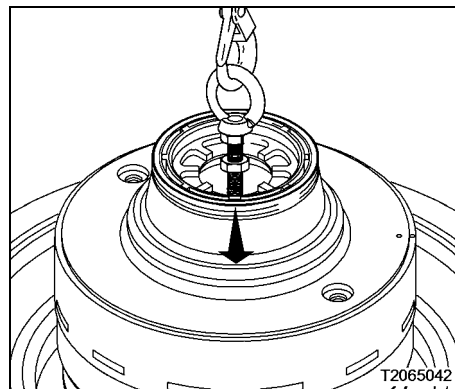


Fig. 201

**CAUTION: Danger to life when transporting heavy parts!**

- Do NOT step under hanging load.
- **Carefully** place the bowl using eye bolt and hoist on the spindle cone.
- Unscrew the eye bolt from the bowl bottom and remove the hoist.

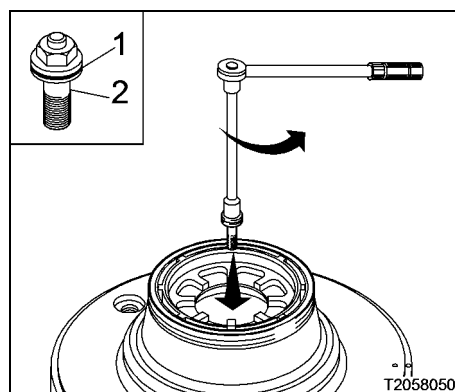


Fig. 202

**Required tools**

– Socket wrench  
– Torque wrench

- Provide spindle screw 2 with gasket 1.
- Put spindle screw into socket wrench and screw in (**left-hand thread**).

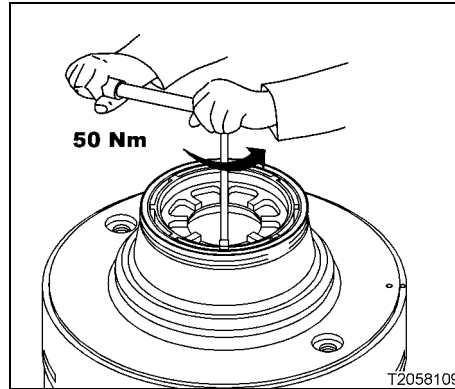


Fig. 203

**CAUTION:**  
A loose spindle screw can endanger life!

- Tighten spindle screw.  
**Torque: 50 Nm**

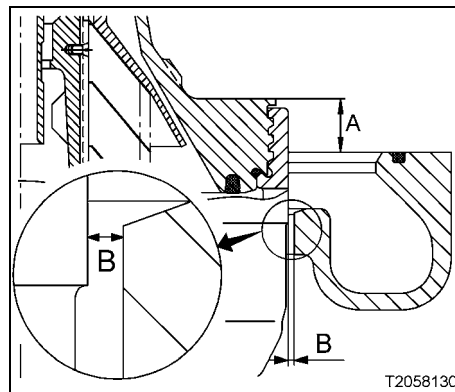


Fig. 204

- Check that the spindle and bowl are **centric**.  
The control dimension **B**  
– is  $4 \pm 1.5$  mm  
– between the bowl and the upper section of the frame.
- Pay attention to bowl height **A** (see section 4.7.1).

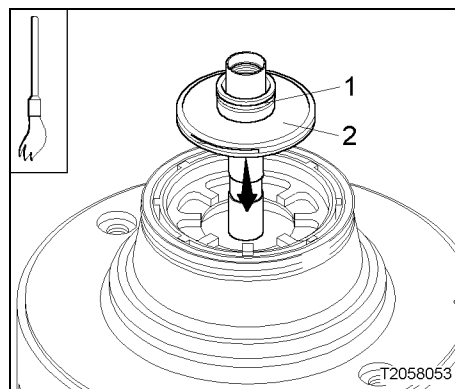


Fig. 205

- Insert gasket 1 in the centripetal pump groove.
- **Lightly** grease threads and contact surfaces of the centripetal pump.
- Install centripetal pump 2.

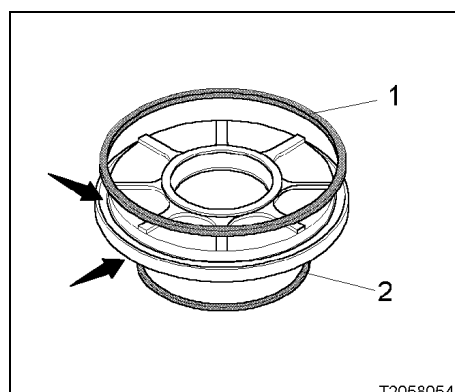


Fig. 206

- Insert gaskets 1 and 2 in the grooves of the centripetal pump chamber cover.

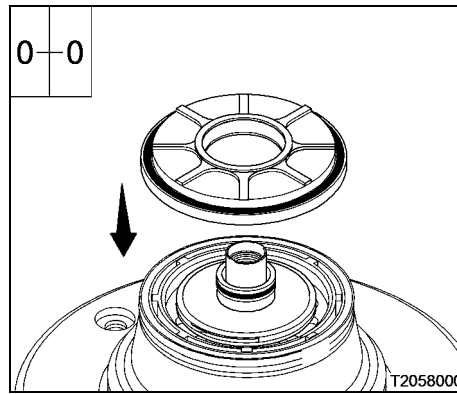


Fig. 207

- Mount the centripetal pump chamber cover with fitted gaskets.
  - The “O” marks of the centripetal pump chamber cover and the bowl top must be aligned.

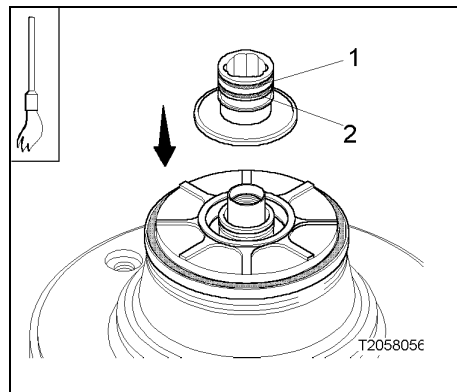


Fig. 208

- Insert gaskets 1 and 2 in the sensing liquid pump grooves.
- Grease guide surfaces.
- Install sensing liquid pump.

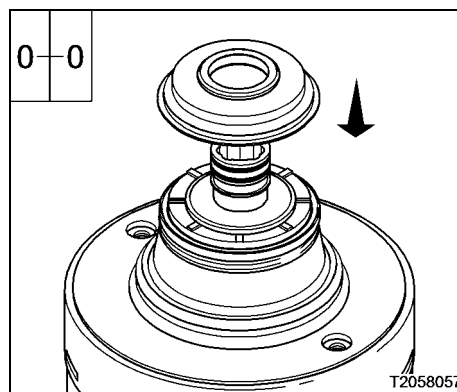


Fig. 209

- Mount the centripetal pump chamber cover.
  - The “O” marks of the centripetal pump chamber cover and the bowl top must be aligned.

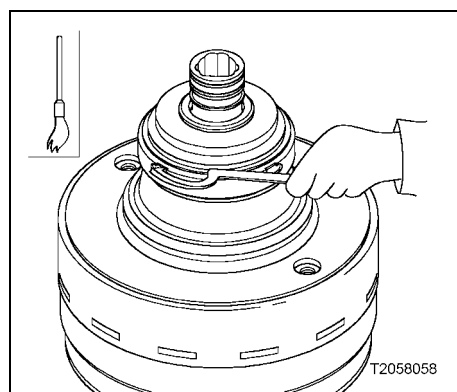


Fig. 210

**Required special tool**

- Double hook wrench

- Grease the threads on the bowl top and on the centripetal pump chamber lock ring as specified in the Lubrication schedule (see 4.3.4).

**CAUTION:**

**A loose centripetal pump chamber lock ring can endanger life!**

- Screw tight the centripetal pump chamber lock ring using the double hook wrench (**left-hand thread**).

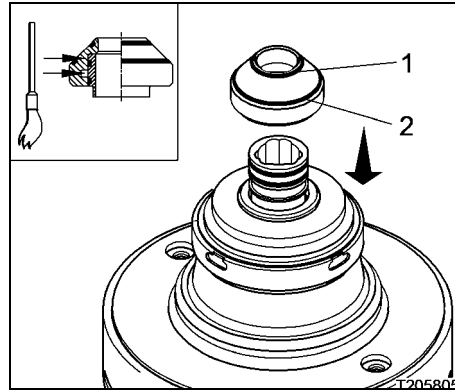


Fig. 211

- Insert gaskets 1 and 2 in spacer ring.
- Grease the guide surfaces of the centripetal pump as specified in the lubrication schedule (see 4.3.4).
- Fit spacer ring.



- Pay attention to section 4.7.1.

#### 4.4.8 Replacing the polyamide gasket (bowl top)

- For standard tools, see section 4.13.

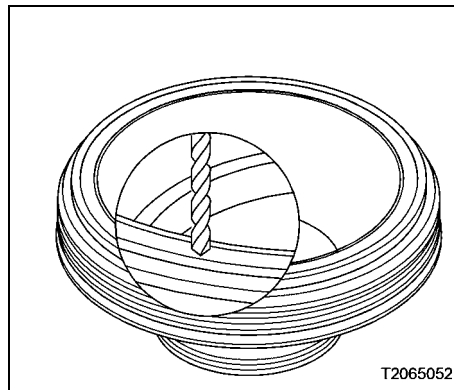


Fig. 212

#### REMOVAL

##### ATTENTION: Sensitive bowl part!

– Do NOT damage the bowl top groove when drilling!

- Drill through the damaged polyamide gasket twice **centrically and vertically**.
  - with a 2 mm drill bit
  - at a distance of approx. 50 to 60 mm.

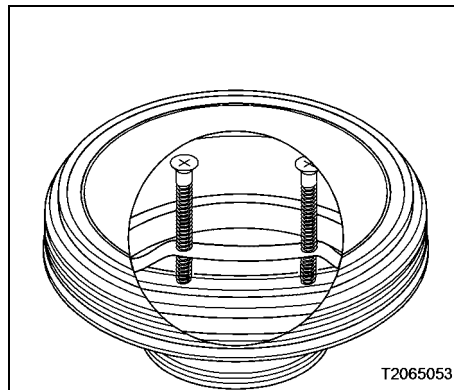


Fig. 213

##### ATTENTION: Sensitive bowl part!

– Do NOT damage the bowl top groove when screwing in!

- Screw two wooden screws in the holes in the polyamide gasket.
- Force off the old polyamide gasket with the wood screws and
- lever it bit by bit out of the groove using a screwdriver.

#### Note:

If the polyamide gasket can't be removed, repeat this procedure.

#### FITTING

- Thoroughly clean and dry the groove.
- Heat the gasket in approx. 80 °C (176 °F) water for 5 minutes.
- Wipe dry the gasket.

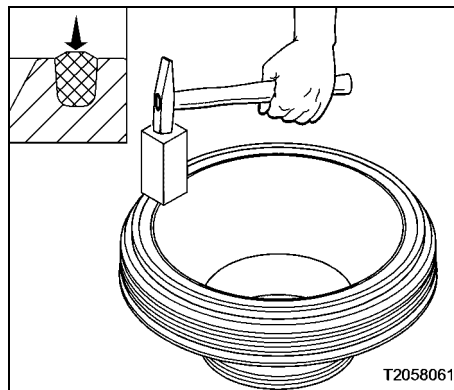


Fig. 214

- Fit the gasket into the groove of the bowl top (with the narrow side facing the bowl top).
- Place on a smooth wooden block.
- hammer the gasket evenly into the groove.

- Assemble the bowl and centripetal pump and fit in the separator (see section 4.4.7 "Assembling the bowl").
- Close the hood (see section 4.5 "Closing the hood").
- Start the separator (see section 3.3 "*Starting the separator*").



**ATTENTION! Do not start the program!  
Only after a running time of 30 minutes**

- **Start the program.**

This running time must be adhered to so that the polyamide gasket is pressed properly into the bowl top.

If the separator is switched off by the program,

- switch on the separator motor by pressing the start key.
- Compare the starting current and starting time with the diagram (section 4.1.3) until the bowl reaches the speed specified on the separator nameplate.

**Note:**

The run-up phase of the separator motor is signalled by *slow* flashing of the LED in the "Status Separator" key.

#### 4.4.9 Replacing the polyamide gasket (bowl top)

**Important: Time-consuming installation!**

Change the polyamide gasket only when it is damaged.

- For standard tools, see section 4.13.

#### REMOVAL

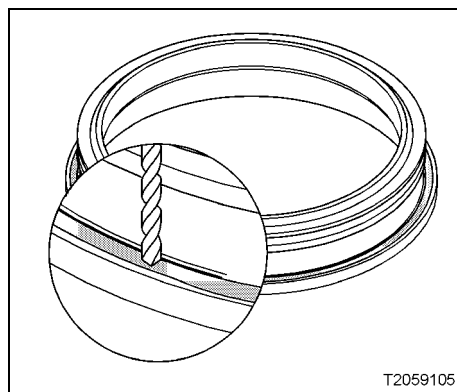


Fig. 215

**ATTENTION: Sensitive bowl part!**

– Do NOT damage the ring piston groove when drilling!

- Drill through the damaged polyamide gasket twice **centrically and vertically**.
  - with a 2 mm drill bit
  - at a distance of approx. 50 to 60 mm.

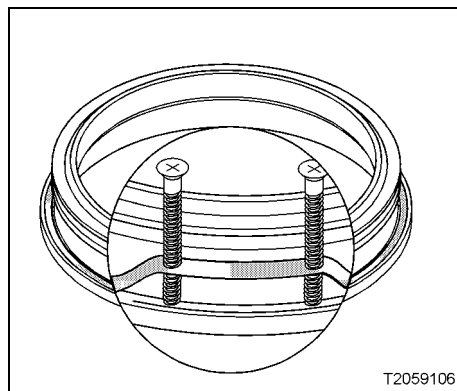


Fig. 216

**ATTENTION: Sensitive bowl part!**

– Do NOT damage the ring piston groove when screwing in!

- Screw two wooden screws in the holes in the polyamide gasket.
- Force off the old polyamide gasket with the wood screws and
- lever it bit by bit out of the groove using a screwdriver.

**Note:**

If the polyamide gasket can't be removed, repeat this procedure.

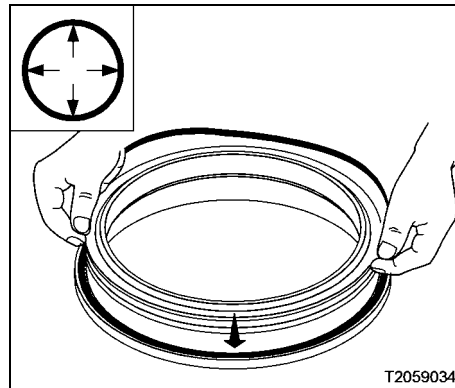
**FITTING**

Fig. 217

- Thoroughly clean and dry the groove.
- Heat the new polyamide gasket in approx. 80 °C (176 °F) water for 5 minutes.
- Wipe the gasket dry and press it evenly and firmly into the groove, at four opposite points

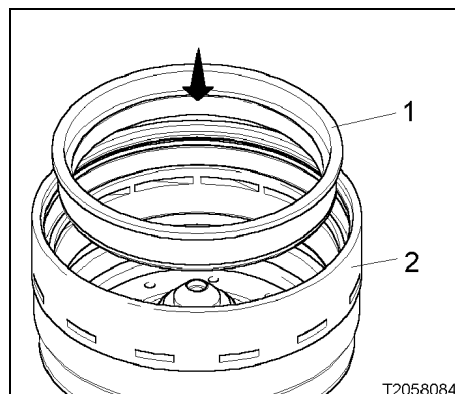


Fig. 218

- Insert annular piston 1 into bowl bottom 2.

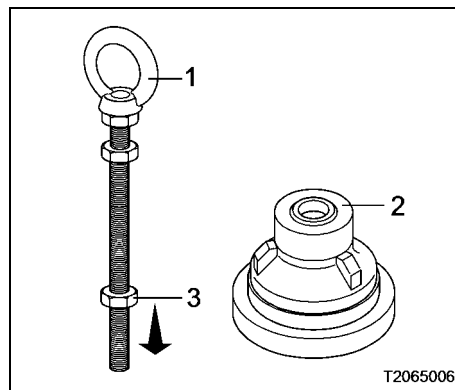


Fig. 219

**Required special tools**

Compressing device

- Eye bolt 1
- Bell-shaped piece 2

- Unscrew hexagon nut 3.



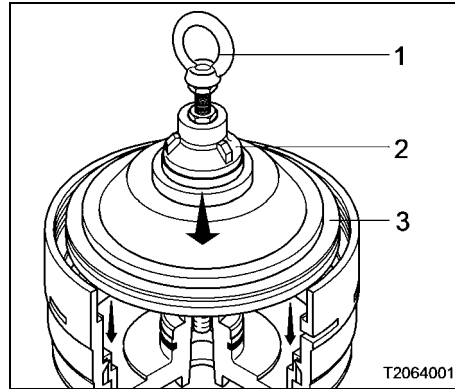


Fig. 220

- Turn sliding piston 3 through 180° (upside down).
- Place sliding piston 3, bell-shaped piece 2 and eye bolt 1 on the annular piston.

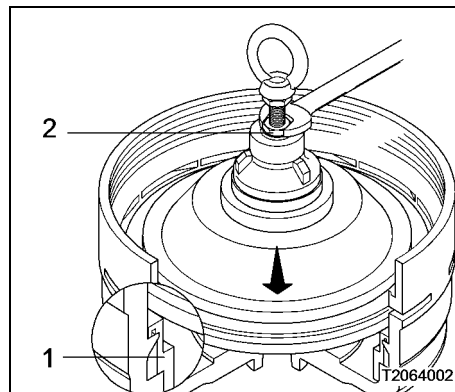


Fig. 221

- Press the annular piston 1 into the bowl bottom by turning hexagon nut 2 clockwise with the wrench.
- Remove special tools and sliding piston.

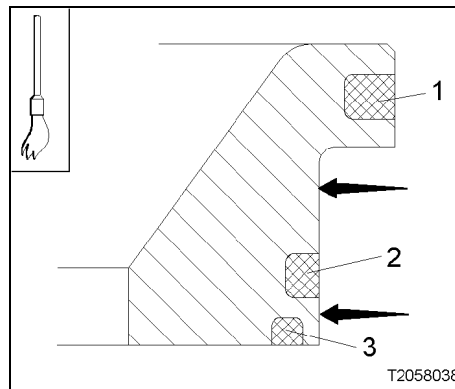


Fig. 222

- Insert gaskets 1 and 3 in the grooves of the closing chamber bottom.
- Grease guide surfaces as specified in the lubrication schedule (see 4.3.4).

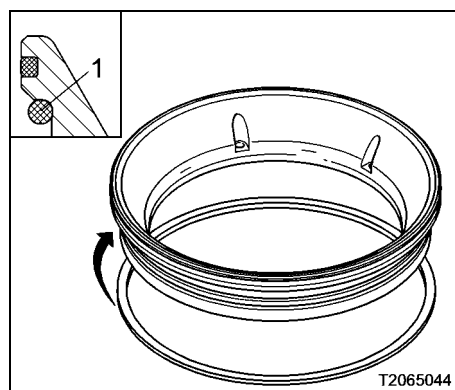


Fig. 223

- Clamp mounting ring 1 under the rim of the closing chamber bottom.

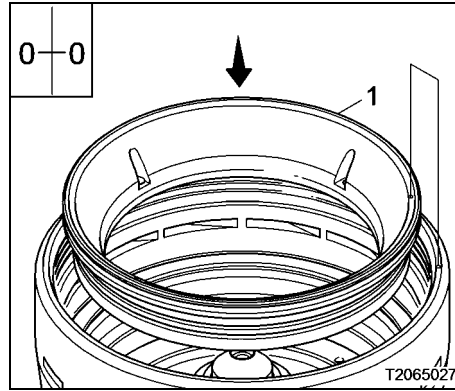


Fig. 224

- Insert closing chamber bottom 1 into the annular piston.
  - The O marks of the closing chamber bottom and the bowl bottom must be aligned.

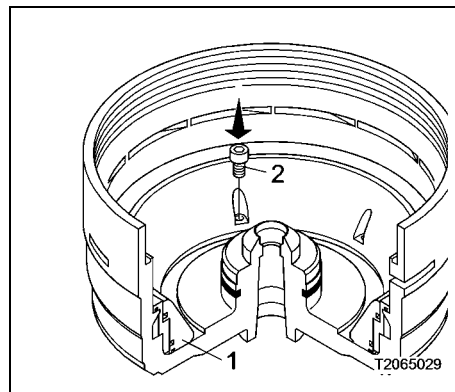


Fig. 225

- Fasten closing chamber bottom 1 onto the bowl bottom by tightening Allen screws 2 crosswise.

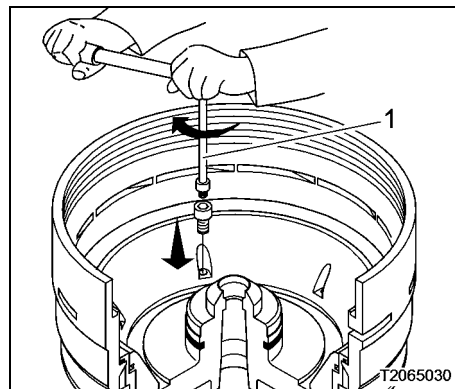


Fig. 226

#### Required special tool

- Socket wrench 1

- Screw **tight** the Allen screws holding the closing chamber bottom and the bowl bottom together.  
**Torque: 25 Nm**

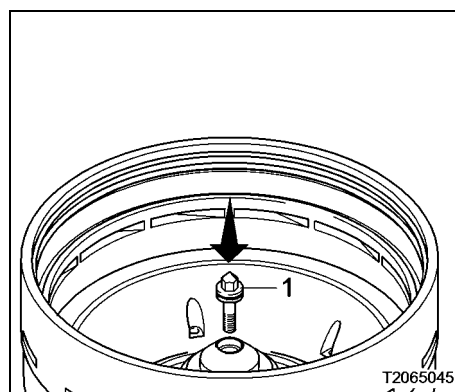


Fig. 227

- Insert spindle screw 1 into the hub.

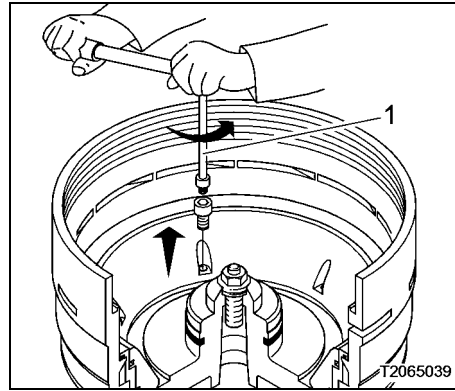


Fig. 228

- Unscrew the Allen screws holding the bowl bottom and the closing-chamber bottom together.

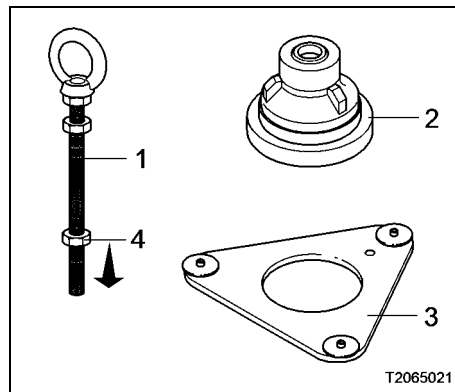


Fig. 229

#### Required special tools

- Eye bolt 1
- Bell-shaped piece 2
- Assembling device 3
- Unscrew hexagon nut 4.

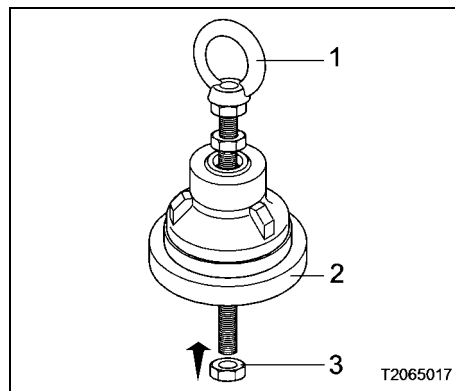


Fig. 230

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

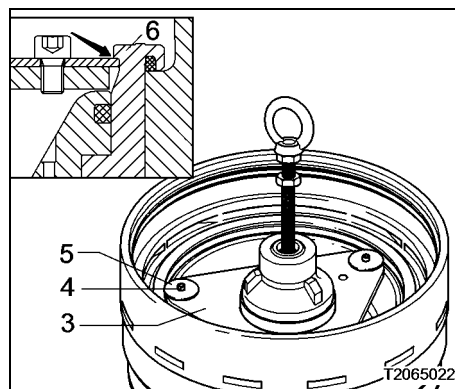


Fig. 231

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

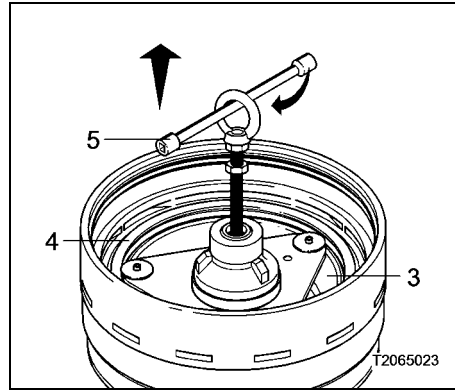


Fig. 232

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

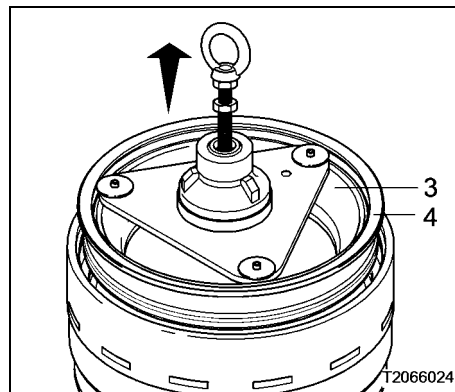


Fig. 233

- Remove closing chamber bottom 3 and annular piston 4 (with fitted gas-kets) with the bell-shaped piece and the eye bolt.
- Remove the bell-shaped piece and the eye bolt.

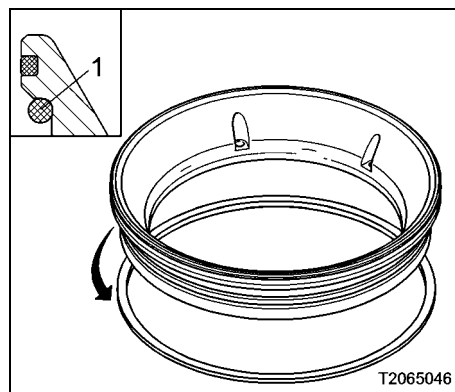
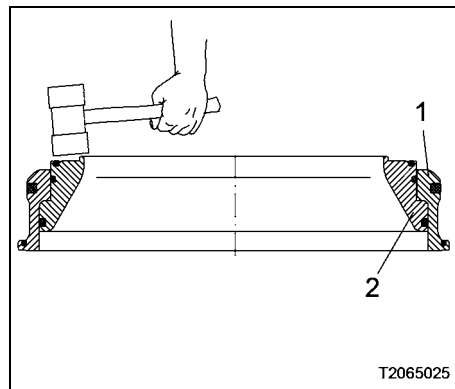


Fig. 234

- Separate annular piston 1 from closing chamber bottom 2 by tapping with a mallet – as illustrated.
- Remove the mounting ring.

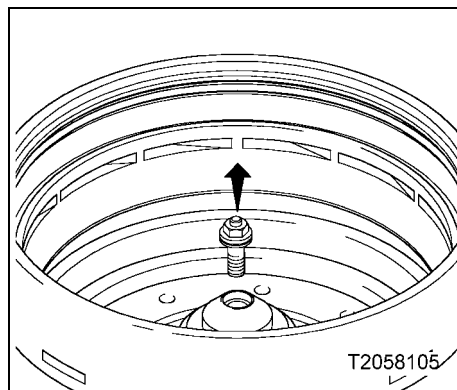


Fig. 235

- Unscrew the spindle screw.

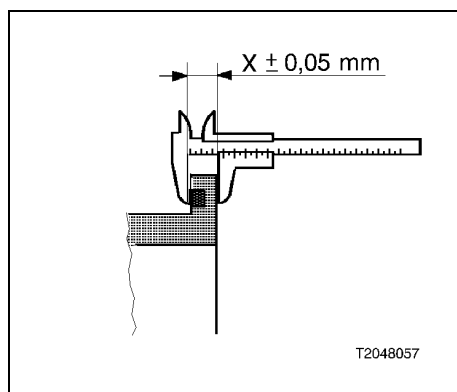


Fig. 236

- By carrying out **several measurements** around the entire circumference of the annular piston, check that the polyamide gasket is seated **parallel** in the groove.

### 4.4.10 Reworking the sliding piston

The bowl seal consists of

- the sealing surface A of the sliding piston (Fig. 237) (Sealing surface A as delivered 2 mm high) and
- the polyamide gasket B of the bowl top (Fig. 239).

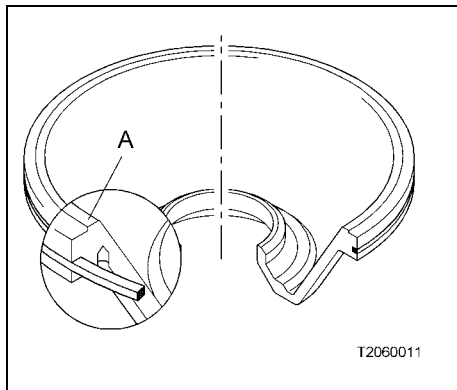


Fig. 237

When worn, the sealing surface A of the sliding piston can be remachined **up to max. 0.5 mm** several times before it has to be replaced.

**When the first erosion marks (0.2 mm deep) are detected, i.e. as soon as the bowl starts to leak:**

- Remachine the sealing surface of the sliding piston.

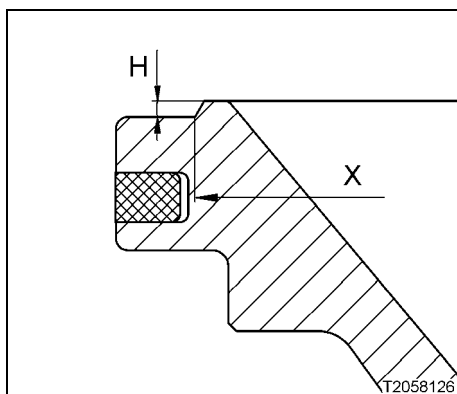


Fig. 238

- When remachining, make sure that
  - the sealing surface is machined cleanly and
  - shoulder H at diameter X is still at **least 1.5 mm high.**

Standard parameters for remachining the sealing surface	
Surface quality	Ra 2 µm (Rz 12.5 µm)
Tool	Hard metal steel of ISO quality M 30 or K 20
Speed	55 min <sup>-1</sup>
Cutting depth	max. 0.15 mm
Forward feed	max. 0.1 mm/revolution

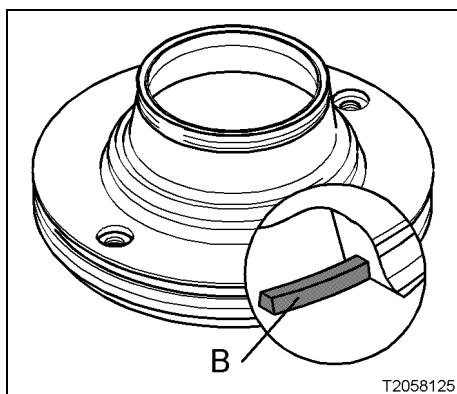


Fig. 239

#### After facing

- fit a new polyamide gasket B into the bowl top (see section 4.4.8)!

## 4.5 Closing the hood

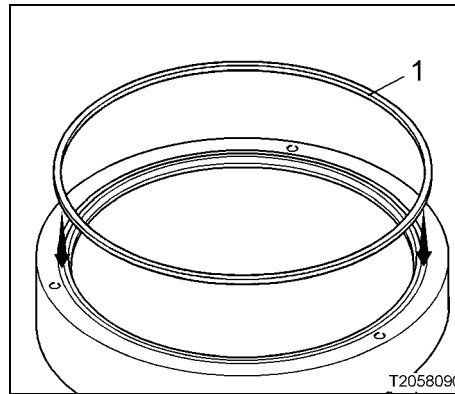


Fig. 240

**If the gasket has been removed to keep to the service intervals:**

- insert a new gasket 1 in the groove of the upper part of the frame.

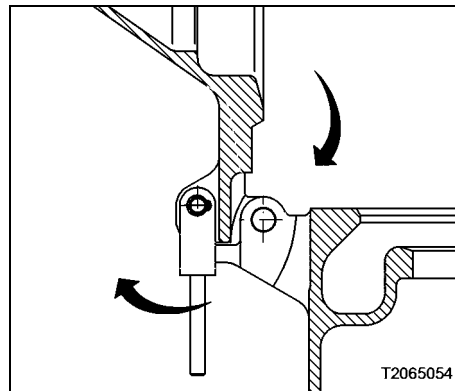


Fig. 241

**CAUTION: Danger of injury!**

- Unlock the shackle.
- Carefully close the hood.

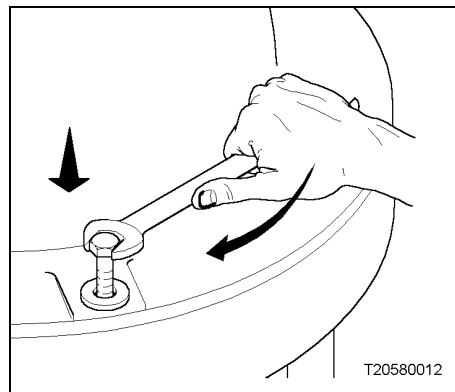


Fig. 242

- Screw in three hex head screws (M 12 x 30) with washers.

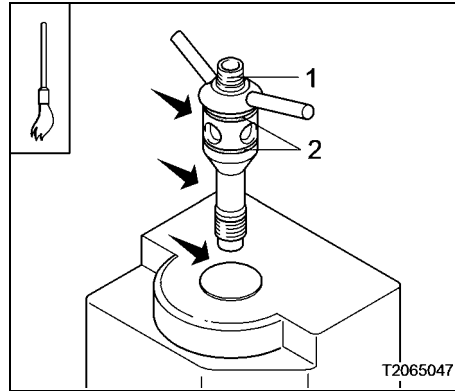


Fig. 243

**If the gaskets 2 have been removed to keep to the service intervals:**

- Provide handle connection piece 1 with new gaskets 2.
- Apply a **thin** coat of grease to the guide surfaces and threads of the handle connection piece as specified in the lubrication schedule (see 4.3.4).

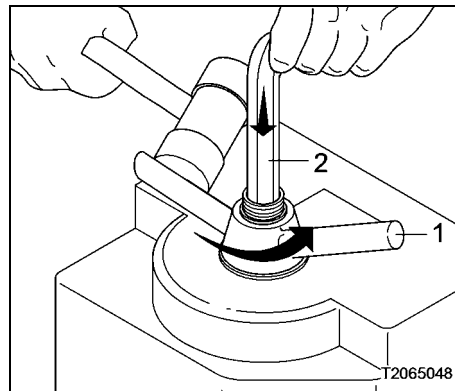


Fig. 244

**Required special tool**

– Offset screwdriver 2

- Introduce handle connection piece 1 into the hood.
- Hold the centripetal pump with the offset screwdriver and tighten it by lightly hammering the handle connection piece with a mallet (**left-hand thread**).

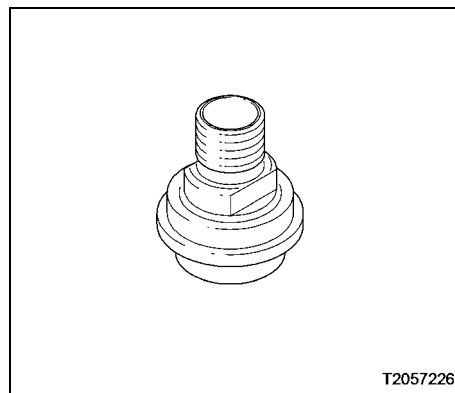


Fig. 245

- Carefully clean the holes in the non-return valve and
- rinse with water.
- Check the functionality of the non-return valve.

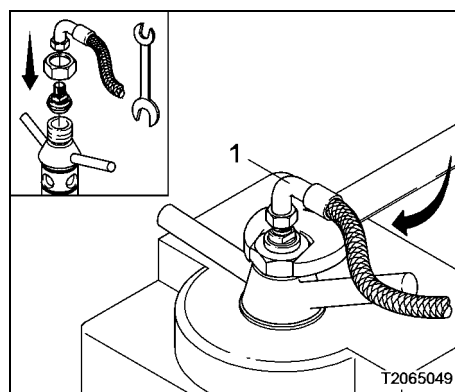


Fig. 246

- Assemble the filling and displacement water line 1 and connect it.



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4.6 Drive

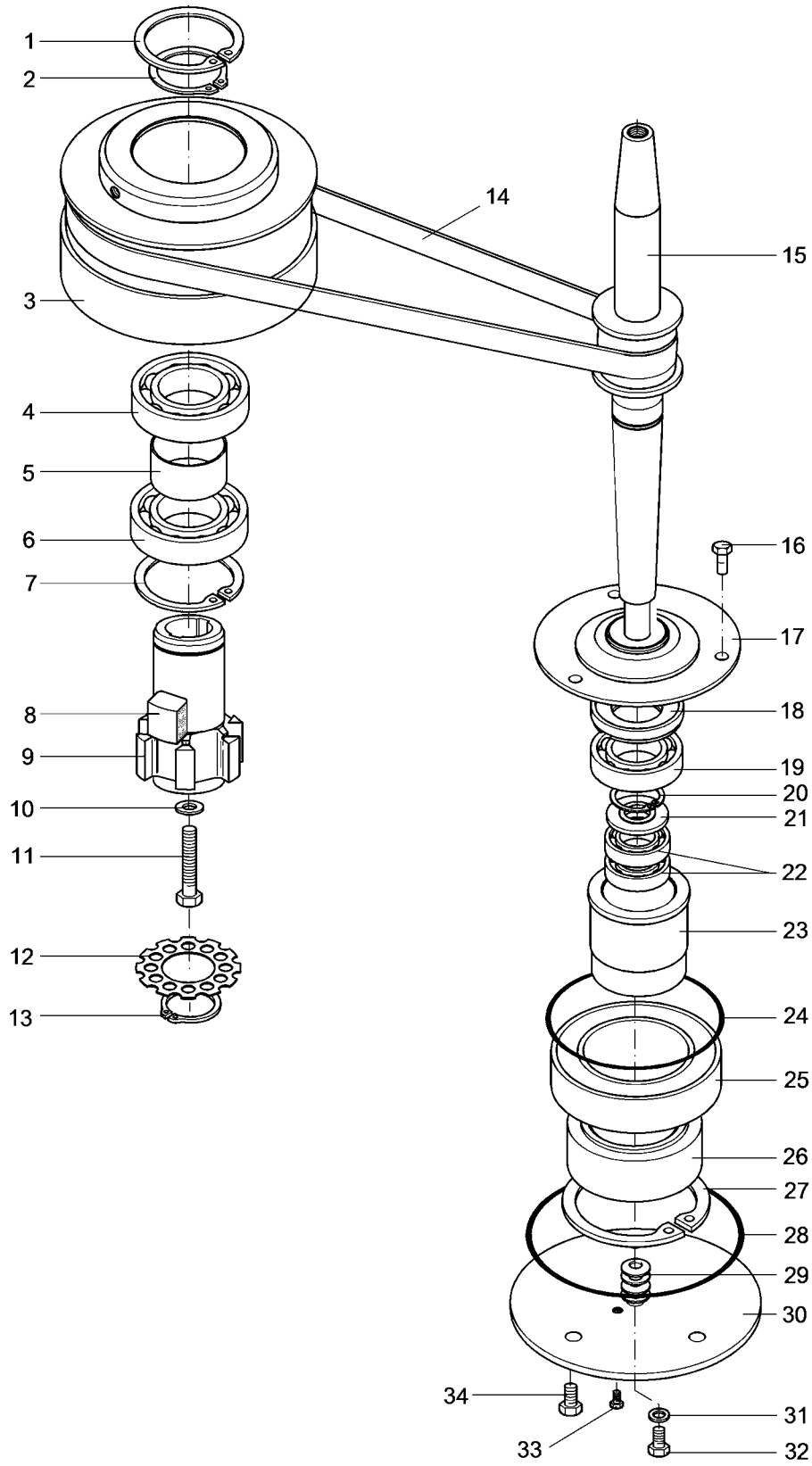


Fig. 247 Exploded view of the drive

A2064000-Antrieb

Pos.	Designation	Dimensions
1	Retaining ring	95 x 3
2	Retaining ring	60 x 2
3	Clutch pulley	
4	Grooved ball bearing	
5	Spacer bush	
6	Grooved ball bearing	
7	Retaining ring	95 x 3
8	Clutch driver	
9	Clutch shoe	
10	Washer	13 x 33 x 3
11	Hex head screw	M 11 x 60
12	Washer	
13	Retaining ring	60 x 2
14	Drive belt	
15	Spindle	
16	Hex head screw	M 10 x 20
17	Bearing cover	
18	Bearing cover	
19	Grooved ball bearing	
20	Retaining ring	35 x 1,5
21	Ball bearing protection ring	
22	Angular contact ball bearing	
23	Bearing sleeve	
24	Gasket	
25	Rubber-metal cushion	
26	Pivoting bearing	
27	Retaining ring	90 x 3
28	Gasket	
29	Cup spring	
30	Bearing cover	
31	Washer	
32	Hex head screw (This hex head screw is glued in with Loctite 275.)	M 12 x 18
33	Hex head screw (This hex head screw is glued in with Loctite 275.)	M 6 x 16
34	Hex head screw	M 10 x 20

#### 4.6.1 Important instructions for fitting and removing the drive

- Switch off the main switch and lock it.



**CAUTION: Danger to life through high-speed rotating separator parts!**

- Do not loosen any part of the separator before the bowl has come to a standstill.
  - The run-down time of the bowl is **45 minutes** after switching off the motor.
  - Bowl standstill is indicated by standstill of the drive belt.

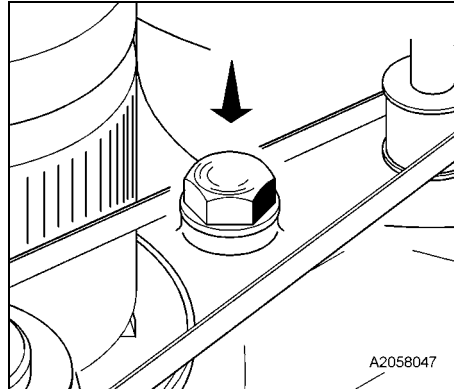


Fig. 248

**Standstill of drive belt**

- Shine a torch through the frame sight glass.
- Visually check that the drive belt is no longer moving.

**When the sight glass is turbid:**

- Unscrew the sight glass,
- shine a torch through the sight glass opening in the frame!



**CAUTION: Danger of injury through rotating drive belt!**

- Check **ONLY** visually that the drive belt is no longer moving.
  - Do **NOT** touch the drive belt through the sight glass opening in the frame!
- Clean the sight glass and screw it back in.



**CAUTION: Danger to life through high-speed rotating separator parts!**

**In the case of torn or defective drive belts or if the belts have come off:**

- Do not loosen any part of the separator before the bowl has come to a standstill.
- **Be sure to observe** the run-down time of **90 minutes** until dismantling the separator!



**CAUTION: Danger of injury through very hot separator parts!**

When carrying out maintenance work, there is a danger of injury through hot separator parts (separating temperatures of 70 to 100 °C(158 – 212 °F)).



**CAUTION: Danger to life and limb through electric current!**

**There might be residual voltage!**

**In the case of motors with space heaters, residual voltages in the motor terminal box are possible despite switched off main switch.**

**Prior to working on the motor:**

- Refer to the motor nameplate.
- Refer to the motor instruction manual.
- Take adequate preventive measures according to the national provisions (in Germany in accordance with the rules and regulations of the VDE (Verband Deutscher Elektrotechnik/ Association of German Electrical Engineering) or of the local electric power company.
- **Any work on the motor may be carried out by an authorized electrician only.**

- Avoid damage to drive parts when fitting and removing by
  - precise positioning,
  - no diagonal pull!
  - selecting the low lifting speed of the hoist.

**CAUTION: Use appropriate lifting devices to prevent accidents!**

- Use suitably rated, intact hoists.

**CAUTION: Danger to life when transporting heavy parts!**

- Do NOT step under hanging load.

**CAUTION: Avoid accidents by using undamaged, complete tools!**

- Use tools only for their intended use!
  - For special tools, see section 4.14 or spare parts catalog.
  - For standard tools, see section 4.13.
- Do not use force when removing or fitting parts.
- Treat all drive parts
  - gently.
  - Always set them down on a rubber mat or a wooden pallet.

**ATTENTION: Before fitting the drive parts**

- Thoroughly clean and dry the drive chamber.  
Use only a cleaning agent that is approved for the field of application!
- Check the ball bearings of the spindle and centrifugal clutch.  
Use only the ball bearings specified in the parts list!

**ATTENTION: To avoid bearing damage,**

- **always** operate the separator with installed bowl!

## 4.6.2 Removing the drive belt and spindle assembly

- Pay special attention to section 4.6.1.

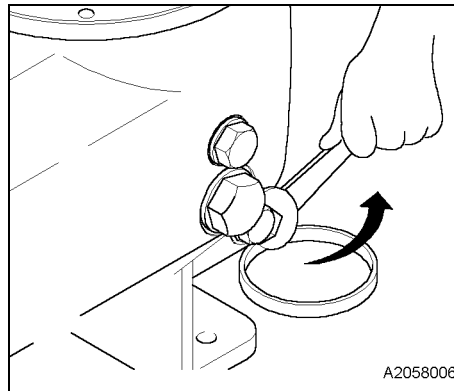


Fig. 249

- Undo the oil drain screw and
- Drain the oil into an oil pan (approx. 2.5 l).

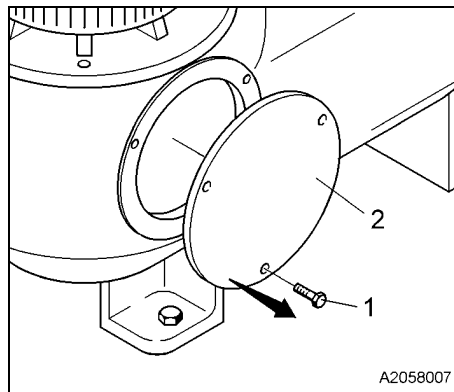


Fig. 250

- Undo three hex head screws 1.
- Take off cover 2.

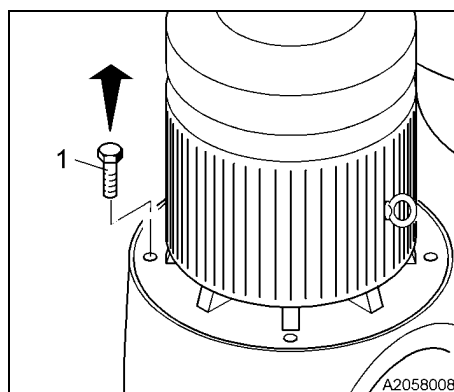


Fig. 251

- Unscrew four hex head screws 1.

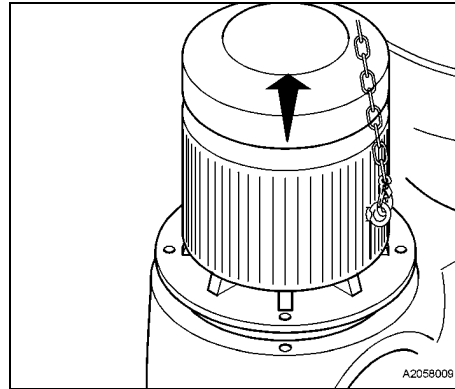


Fig. 252

- Pull the motor out of the flange guide by means of the hoist (approx. 5 mm).
  - Drive belt is slackened!

**ATTENTION!**

- Pull the drive belt off the clutch pulley (centrifugal clutch) downwards.

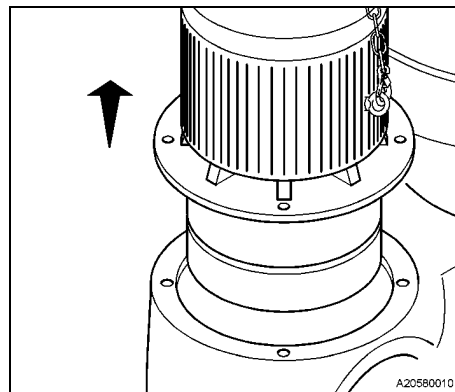


Fig. 253

- Lift the motor with centrifugal clutch out of the lower section of frame.

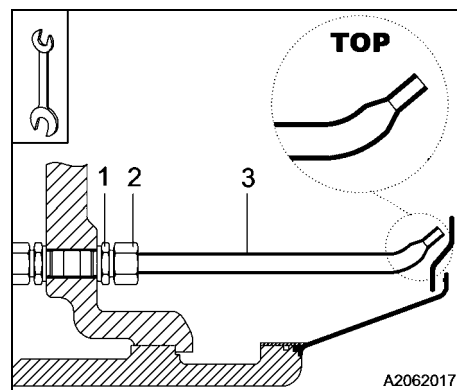


Fig. 254

**Remove the operating water feeding device in the upper section of frame:**

- Undo nut 2.
- Take off pipe 3.

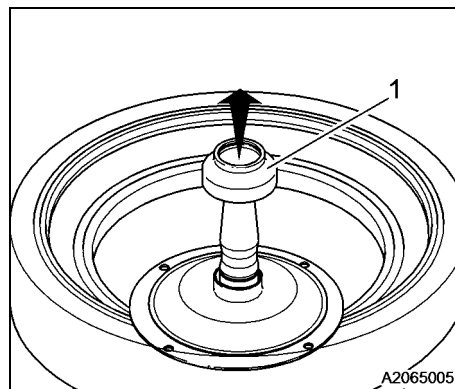


Fig. 255

- Remove spindle cap 1 with fitted gasket.

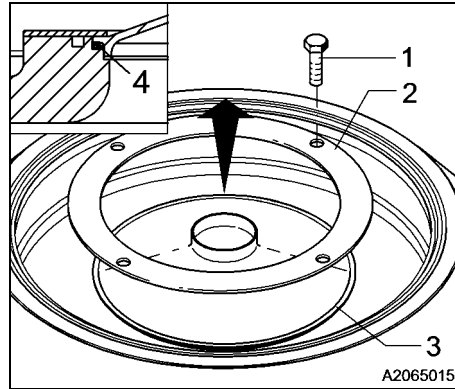


Fig. 256

- Unscrew four hex head screws 1.
- Remove ring 2 and protective cap 3 with inserted gasket 4.

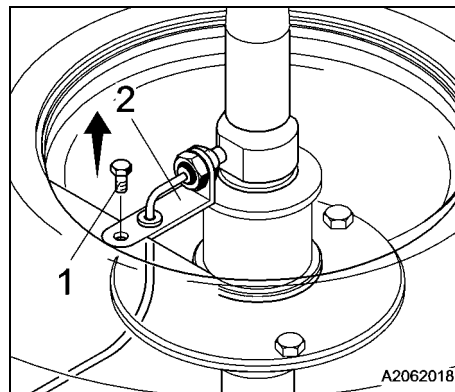


Fig. 257

#### Removing the speed monitoring device:

- Unscrew hex head screw 1.
- Take off speed monitoring device 2 and lay it down in the lower section of frame.

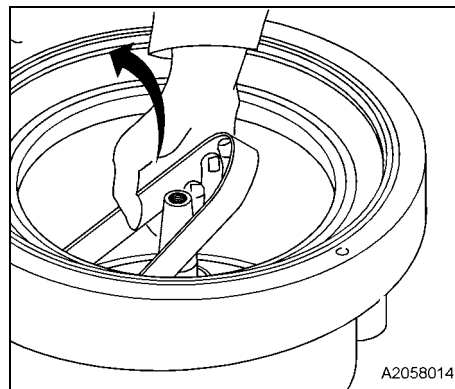


Fig. 258

- Take the drive belt out of the lower section of frame.

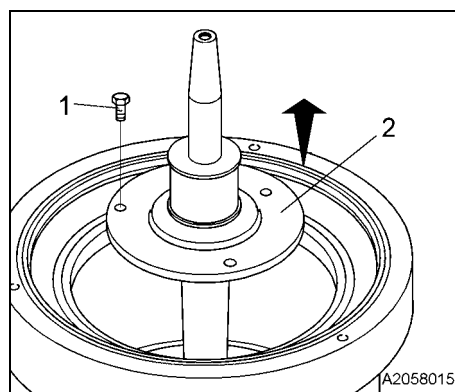


Fig. 259

- Undo three hex head screws 1.
- Unscrew spindle assembly 2 from the lower part of the frame. (For dismantling the spindle assembly, see section 4.6.3.)

#### **Note:**

If the vibration absorber is also pulled out of the lower section of the frame:

- Loosen it from the spindle assembly by striking the spindle on a wooden base.



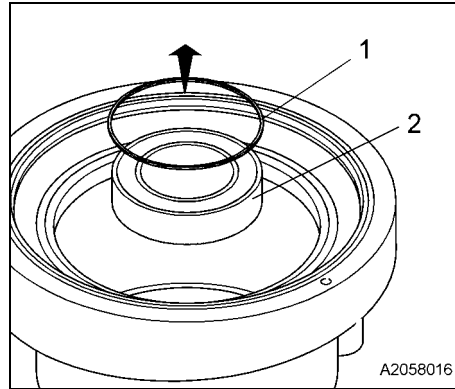


Fig. 260

- Remove from the lower part of frame:
  - Gasket 1
  - Rubber-metal cushion 2

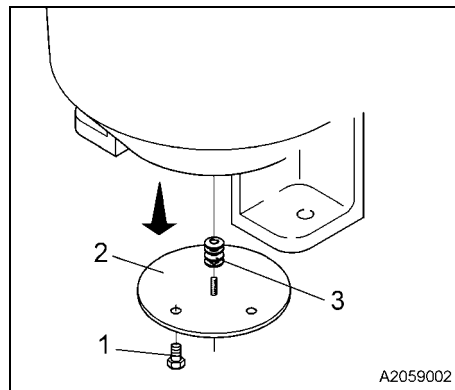


Fig. 261

**If necessary:**

- Undo three hex head screws 1.
- remove bearing cover 2 with sealed hex head screws, disk and cup springs 3 from the lower part of the frame.

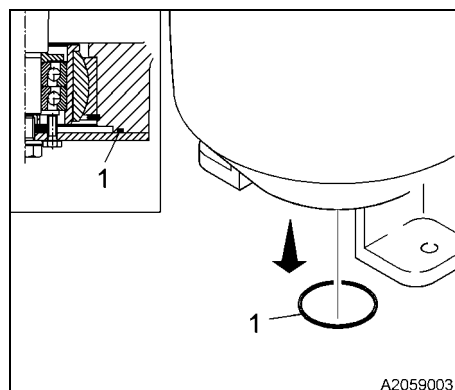


Fig. 262

**If necessary:**

- Take out gasket 1.

### 4.6.3 Dismantling the spindle assembly

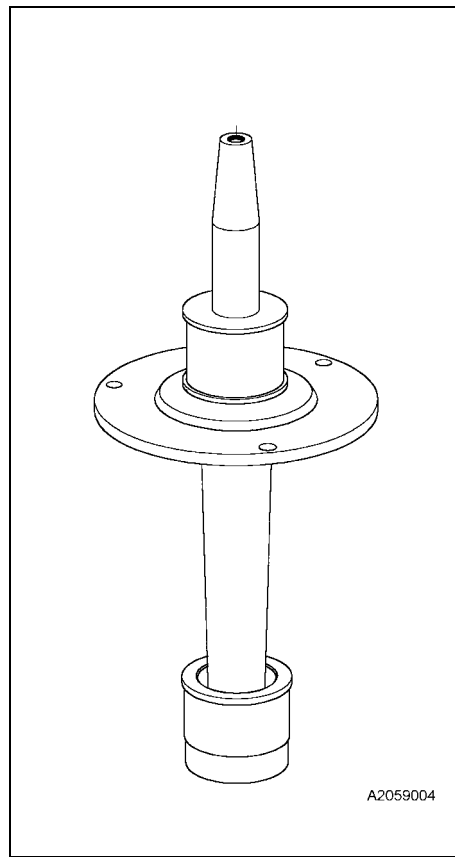


Fig. 263

#### Spindle assembly

##### Required tools:

- Pulling device
- Open ended wrench
- Pliers with outer snap jaws

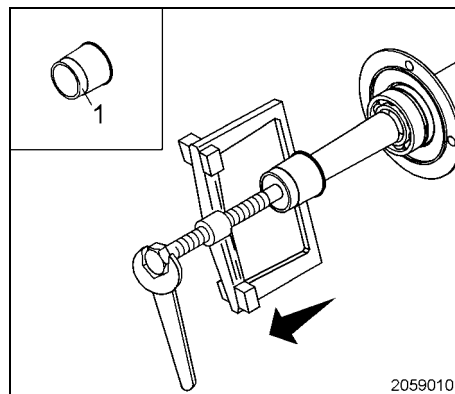


Fig. 264

- Detach the bearing sleeve 1 from the spindle.

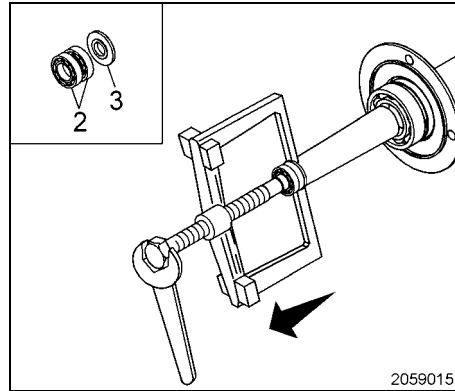


Fig. 265

- Pull off from the spindle:
  - Angular contact ball bearing 2:
  - Ball bearing protection ring 3

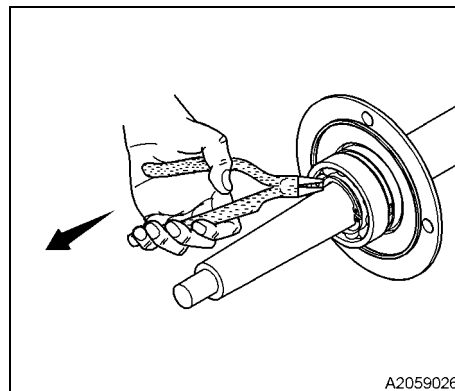


Fig. 266

- Remove the retaining ring.

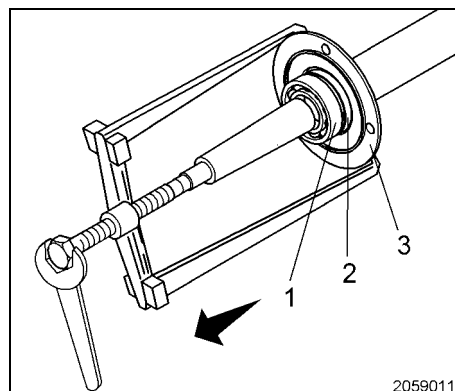


Fig. 267

- Pull off from the spindle:
  - Grooved ball bearing 1
  - bearing cover 2
  - bearing cover 3

#### 4.6.4 Dismantling the centrifugal clutch

- Pay special attention to section 4.6.1.

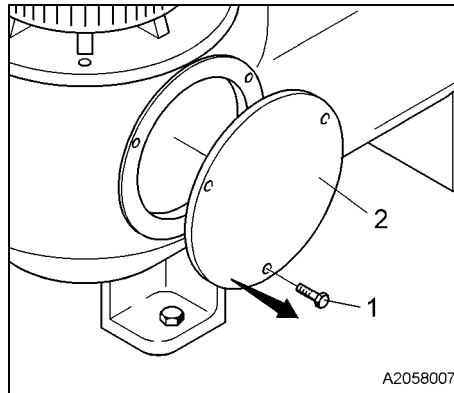


Fig. 268

- Undo three hex head screws 1.
- Take off cover 2.

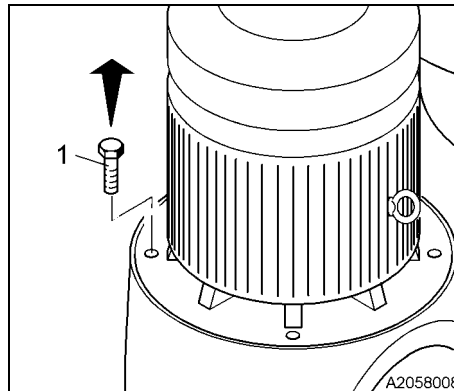


Fig. 269

- Unscrew four hex head screws 1.

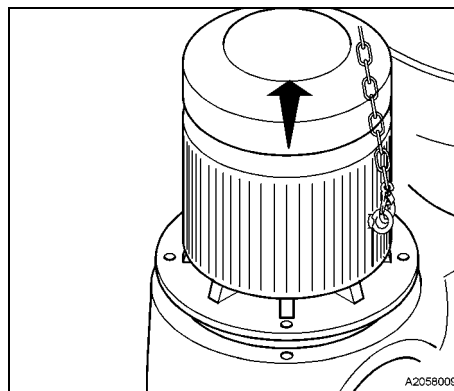


Fig. 270

- Pull the motor out of the flange guide by means of the hoist (approx. 5 mm).
  - Drive belt is slackened!

#### ATTENTION!

- Pull the drive belt off the clutch pulley (centrifugal clutch) downwards.

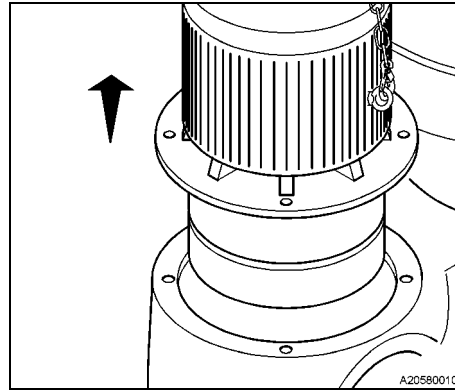


Fig. 271

- **CAUTION: Danger to life when transporting heavy parts!**  
– Do NOT step under hanging load.
- Lift the motor with fluid clutch out of the lower section of the frame.

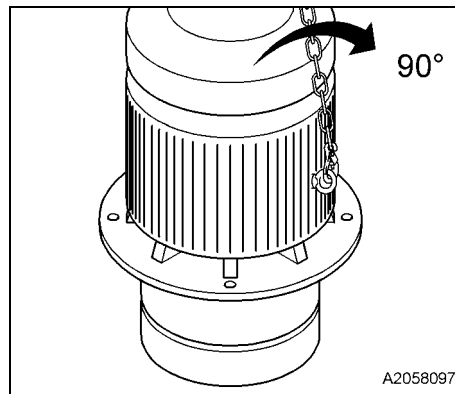


Fig. 272

- Turn the motor together with the centrifugal clutch 90° (upside down) with the aid of the hoist.
- **CAUTION: Secure from rolling away and overturning using suitable aids!**

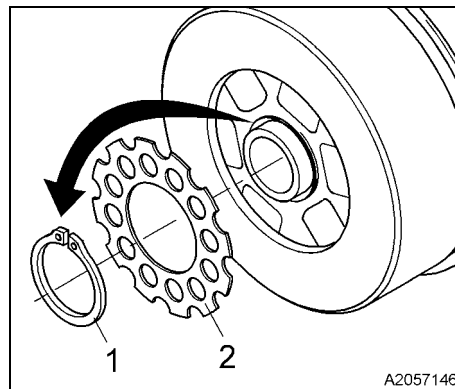


Fig. 273

- Undo retaining ring 1.
- Take off disk 2.

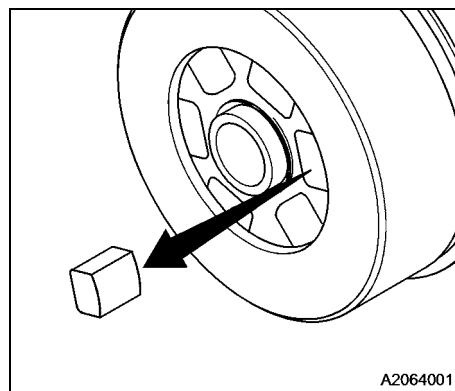


Fig. 274

- Pull the clutch shoes out of the clutch driver.

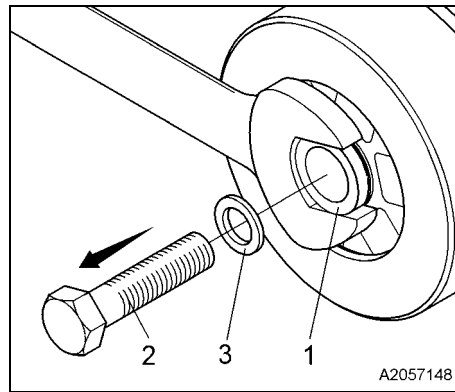


Fig. 275

- Arrest the clutch driver 1 with an open-ended wrench.
- Unscrew hex head screw 2 from the motor shaft end.
- Take off disk 3.

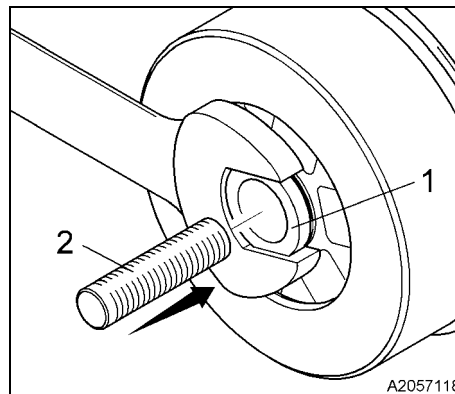


Fig. 276

**Required special tool:**

- Threaded pin 2 = M 12 x 40

- Arrest the clutch driver 1 with an open-ended wrench.

**ATTENTION! For protecting the motor shaft end:**

- Screw threaded pin 2 into the thread of the motor shaft end.

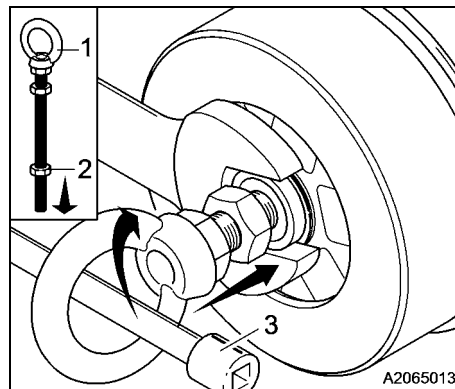


Fig. 277

**Required special tools:**

- Eye bolt 1
- Socket wrench 3

- Unscrew hexagon nut 2
- Screw eye bolt 1 into the clutch driver.
- Arrest the clutch driver with an open-ended wrench.
- Force the centrifugal clutch off the motor shaft end by turning the eye bolt **clockwise**.

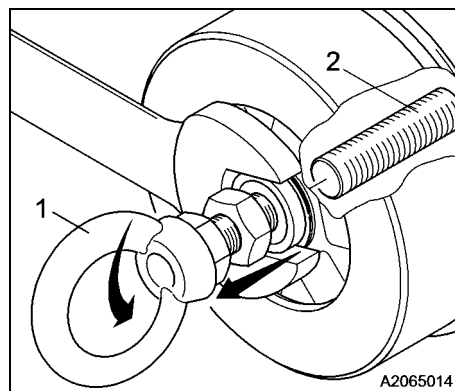


Fig. 278

- Remove eye bolt 1 from the clutch driver and threaded pin 2 from the motor shaft end.

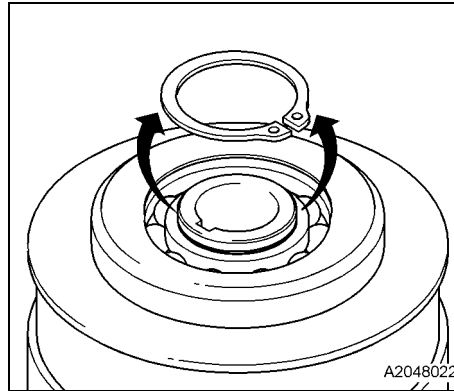


Fig. 279

- **CAUTION: Danger to life when transporting heavy parts!**  
– Do NOT step under hanging load.
- Place the clutch pulley and clutch driver on a wooden base using transport ropes and hoist.
- **CAUTION: Secure from rolling away and overturning using suitable aids!**
- Take the retaining ring out of the clutch driver groove.

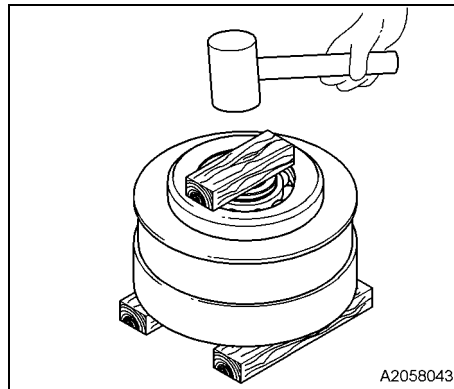


Fig. 280

- Position wooden block.
- Drive the clutch driver downwards by means of light hammer blows.
- Loosen the clutch driver from the seat of the two ball bearings.

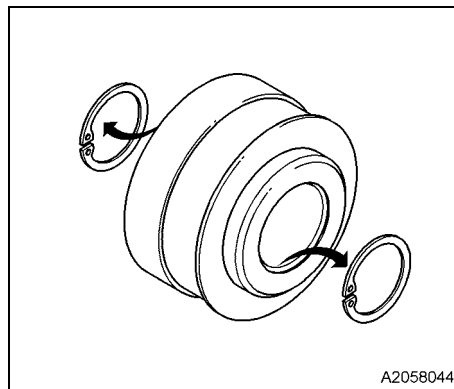


Fig. 281

- Turn the clutch pulley through 90° (opposite the fitting position) with the aid of the hoist.
- **CAUTION: Secure from rolling away and overturning using suitable aids!**
- Take the retaining rings out of the clutch drum grooves.

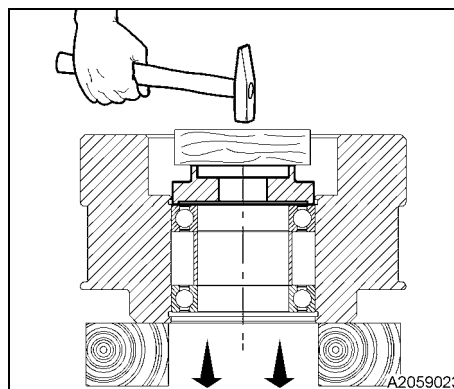


Fig. 282

#### Required tools

- Disk (Ø 86 – 94 mm)
- Wooden block
- Hammer

- Turn the clutch pulley through 180° and
- place it on wooden supports as shown.
- Drive the grooved ball bearing and spacer bush out of the clutch pulley.

### 4.6.5 Fitting the spindle assembly

- Pay special attention to section 4.6.1.
- For dimensions of the parts see 4.6 - exploded view.

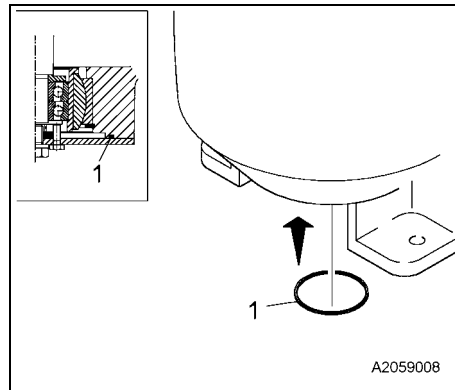


Fig. 283

**If necessary:**

- Insert gasket 1 in the groove in the lower section of frame.

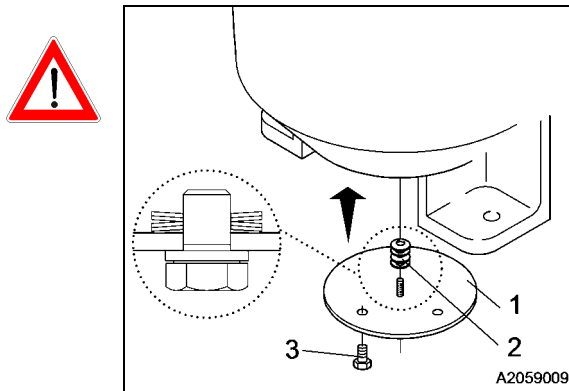


Fig. 284

**If necessary:**

**ATTENTION: Pay attention to the correct fitting position of the cup springs!**

- Fit bearing cover 1 (with sealed hex head screws and washer) with cup springs 2 and bolt tight with hex head screws 3.

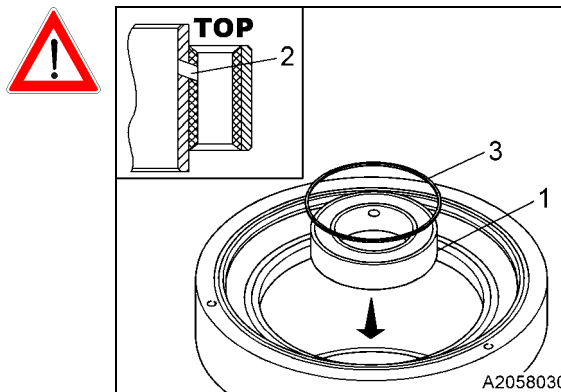


Fig. 285

**ATTENTION: Pay attention to the correct fitting position of the rubber-metal cushion!**

– The two opposite **inner** holes 2 of the rubber-metal cushion **must be directed upwards**.

- Fit rubber-metal cushion 1.
- Insert gasket 3 in the groove in the lower section of frame.



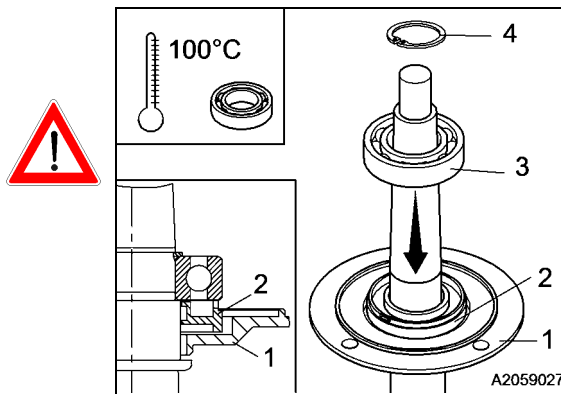


Fig. 286

- Turn spindle through 180° (upside down).

**ATTENTION: Pay attention to the correct fitting position of the bearing cover!**

- Mount bearing covers 1 and 2.
- Heat grooved ball bearing 3 in oil up to 100 °C (212 °F) and slip it onto the spindle.
- Insert retaining ring 4 in the spindle groove.

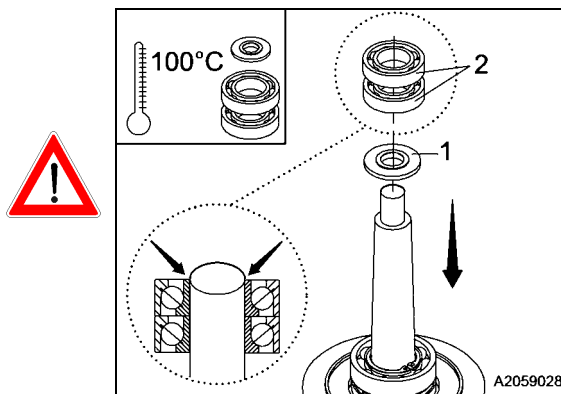


Fig. 287

- Heat ball bearing protection ring 1 and angular contact ball bearings 2 in oil up to 100 °C (212 °F).

**ATTENTION: Bearing damage is caused by incorrect fitting!**

- When fitting angular contact ball bearings 2 on the spindle, make sure that the **narrow rim** of the ball bearing inner ring faces **upwards**.
- Slide ball bearing protection ring 1 and angular contact ball bearings 2 onto the spindle.

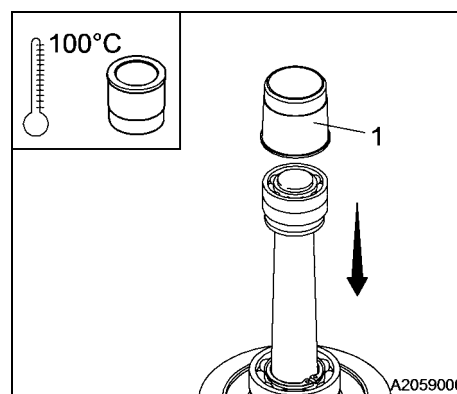


Fig. 288

- Heat bearing sleeve 1 in oil up to 100 °C (212 °F).
- **Important!** Before fitting bearing sleeve 1, make sure that the installed angular contact ball bearing has cooled down to room temperature.
- Slide bearing bush 1 over the angular contact ball bearings and the ball bearing protection ring.

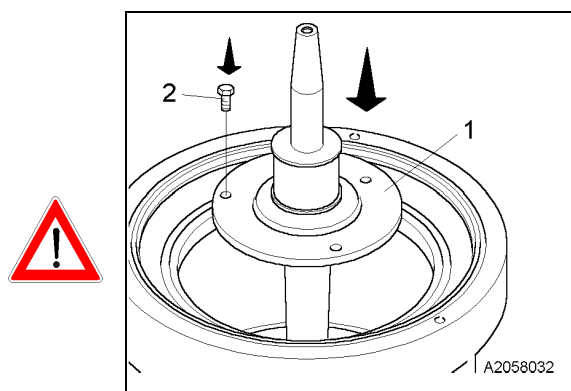


Fig. 289

- Install the assembled spindle assembly 1 in the lower part of the frame.
  - Pay attention to correct positioning!

**ATTENTION: Pay attention to the correct fitting position of the spindle!**

- The holes in the bearing cover must be aligned with the holes in the lower section of the frame.
- Bolt tight spindle with the three hex head screws 2.

#### 4.6.6 Fitting the centrifugal clutch

- Pay special attention to section 4.6.1.
- For dimensions of the parts see 4.6 - exploded view.

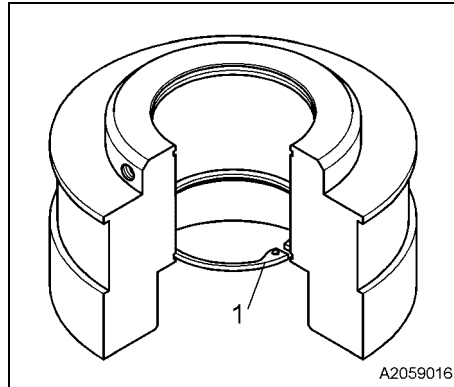


Fig. 290

- Clean the clutch pulley.
- Insert retaining ring 1 in the lower groove.
- Check that retaining ring 1 is correctly fitted.

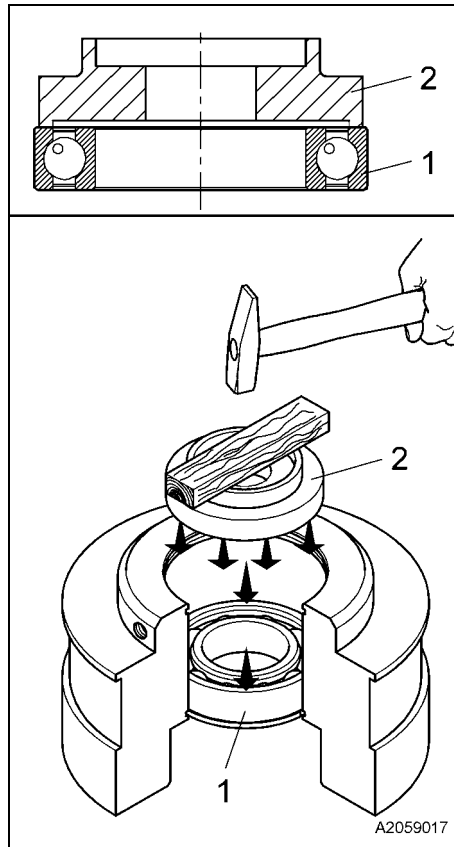


Fig. 291

#### Required tools:

- Disk 2 (Ø 86 – 94 mm)
- Wooden block
- Hammer

#### ATTENTION: Bearing damage is caused by incorrect fitting!

- Disk 2 may only contact the **outer ring** of grooved ball bearing 1!

- **Carefully** drive the first grooved ball bearing 1 with disk 2 up to the retaining ring.

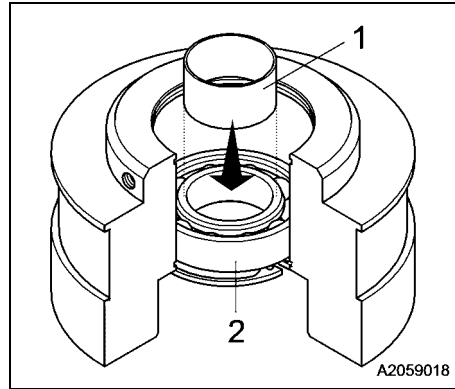


Fig. 292

**ATTENTION: Bearing damage is caused by incorrect fitting!**

– Distance bush 1 may only contact the inner ring of grooved ball bearing 2!

- Place distance bush on the ball bearing **inner ring**.

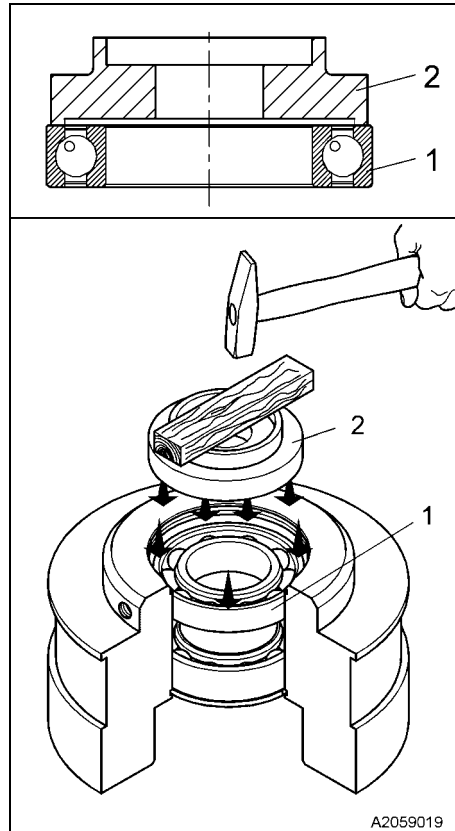


Fig. 293

**ATTENTION: Bearing damage is caused by incorrect fitting!**

– Disk 2 may only contact the **outer ring** of grooved ball bearing 1!

- **Carefully** drive the second grooved ball bearing 1 with a suitable disk 2 up to the distance sleeve.

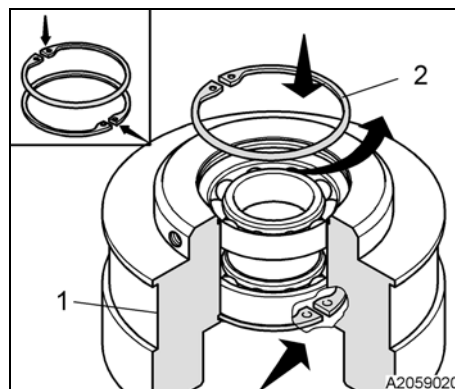


Fig. 294

**CAUTION: Danger of imbalance by incorrect fitting!**

- Insert retaining ring 2 **180° offset** relative to retaining ring 1 in the upper groove.

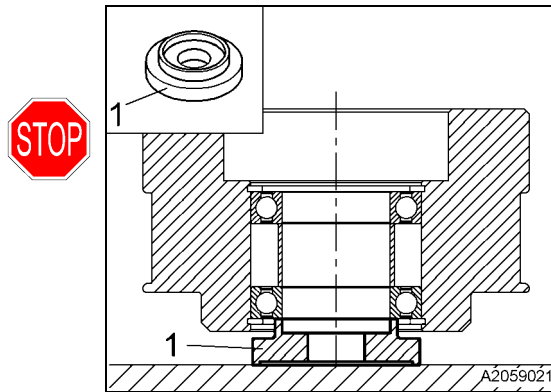


Fig. 295

**Required tool:**

- Disk 1 (Ø 61 – 69 mm)

- **CAUTION: Danger to life when transporting heavy parts!**
  - Do NOT step under hanging load.
- Turn clutch pulley with fitted grooved ball bearings through 180°.

**ATTENTION: Bearing damage is caused by incorrect fitting!**

- Disk 1 may only contact the **inner ring** of the grooved ball bearing!
- Place the ball bearing **inner ring** on disk 1.

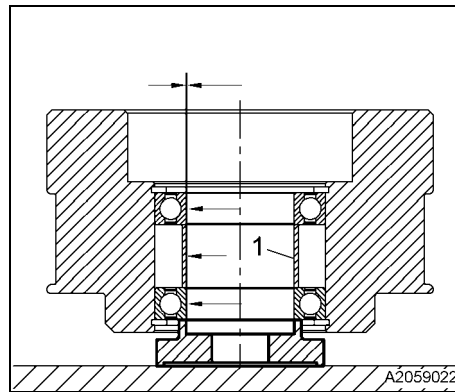


Fig. 296

**ATTENTION: Pay attention to the correct fitting position of the distance bush!**

- Distance bush 1 must be flush with the **inner rings** of the grooved ball bearings.

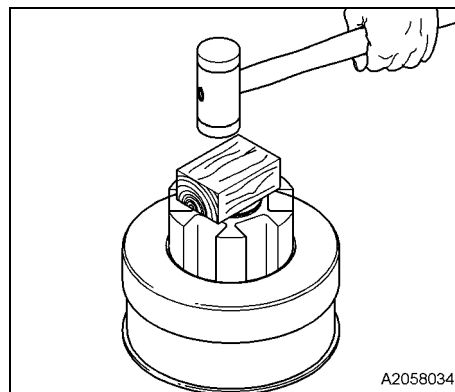


Fig. 297

**Required tools:**

- Wooden block
- Rubber hammer

- **Carefully** hammer the clutch driver into the grooved ball bearing with light blows.

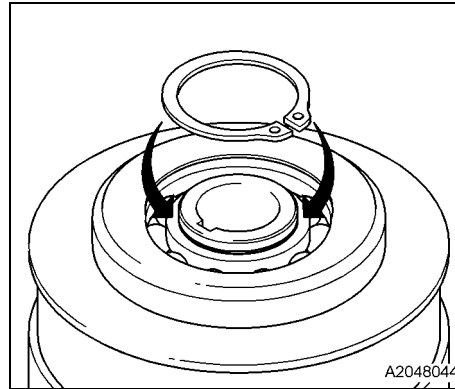


Fig. 298

- Turn the clutch pulley through 180°.
- Fit the retaining ring in the groove of the clutch driver.

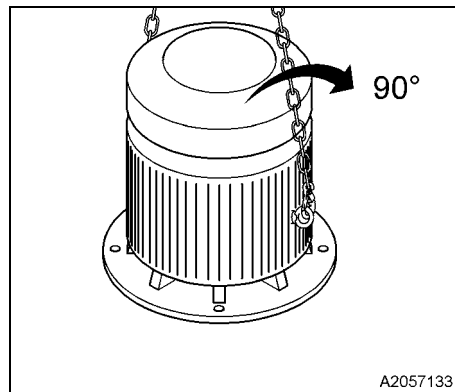


Fig. 299

- **CAUTION: Danger to life when transporting heavy parts!**  
– Do NOT step under hanging load.
- Turn the motor through 90° with the aid of the hoist.
- **CAUTION: Secure from rolling away and overturning using suitable aids!**



#### Required tools:

- ring spanner 2
- Hex head screw 3 (M 10 x 200)
- Hexagon nut 4 (M 10)

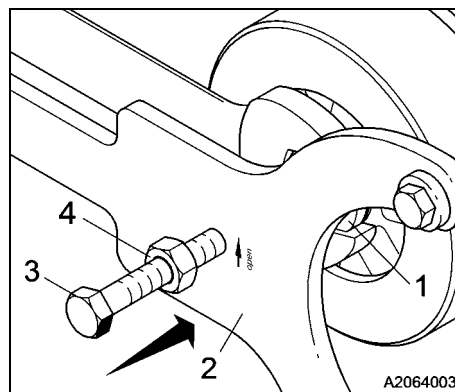


Fig. 300

- **ATTENTION:** Pay attention to the feather key groove.
- Fit the assembled centrifugal clutch on the motor shaft end.
- Arrest the clutch driver 1 with an open-ended wrench.
- Insert ring spanner 2 - as shown - and
- Screw hex head screw 3 with hexagon nut 4 into the motor shaft end.

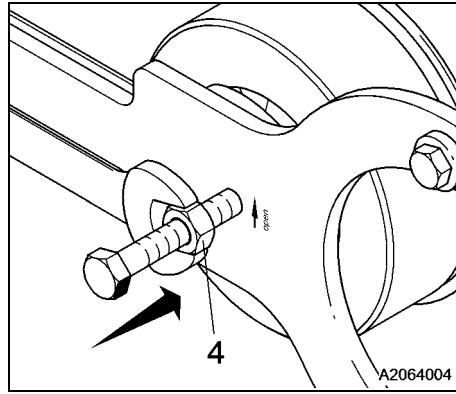


Fig. 301

- Pull the centrifugal clutch onto the motor shaft end as far as it will go, by turning hexagon nut 4 with a second open-ended wrench.

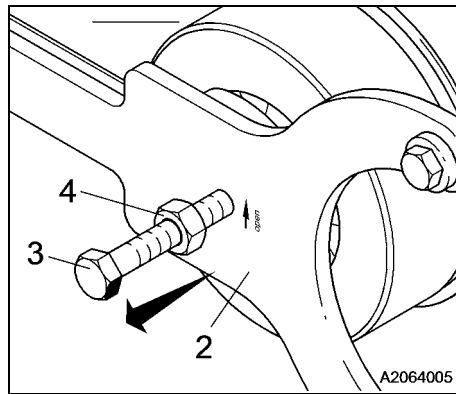


Fig. 302

- Undo hex head screw 3 together with hexagon nut 4 and
- detach ring spanner 2.

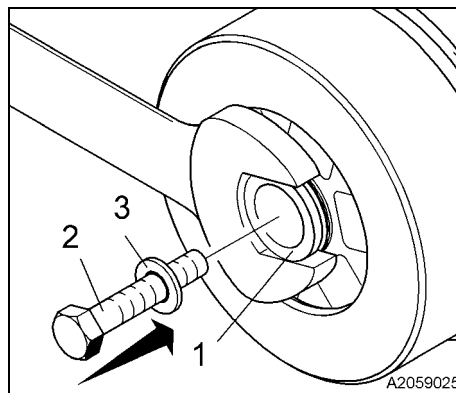


Fig. 303

**With driver 1 arrested:**

- Provide hex head screw 2 (M 12 x 60) with washer 3 and thread it into the motor shaft end.

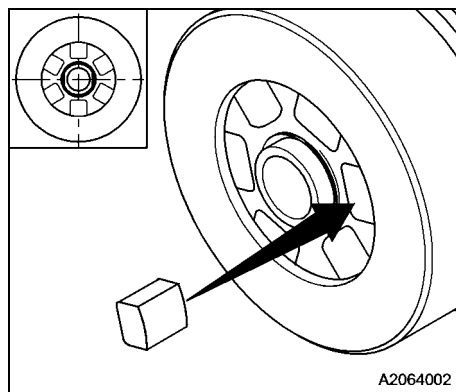


Fig. 304

**CAUTION: Danger of imbalance!**

- Be sure to replace **all** clutch shoes simultaneously!  
Never replace individual clutch shoes.
- Make sure that the clutch shoes are evenly spaced!
- Fit clutch shoes.

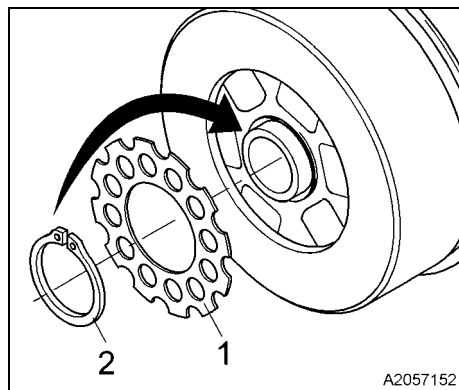


Fig. 305

- Insert disk 2.
- Fit the retaining ring 1 in the groove of the clutch driver.

#### 4.6.7 Fitting the motor

- Pay special attention to section 4.6.1.

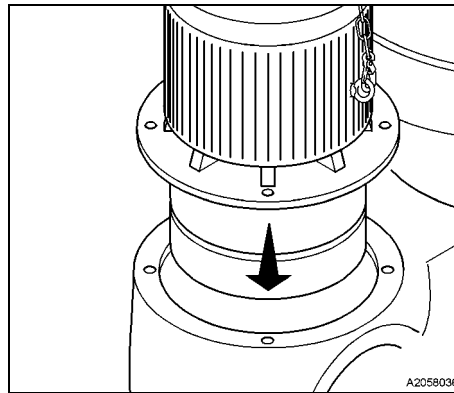


Fig. 306

- **Carefully** place the motor with pre-assembled centrifugal clutch on lower section of frame by means of a hoist.
  - Do not yet let the motor flange lock into the frame opening.

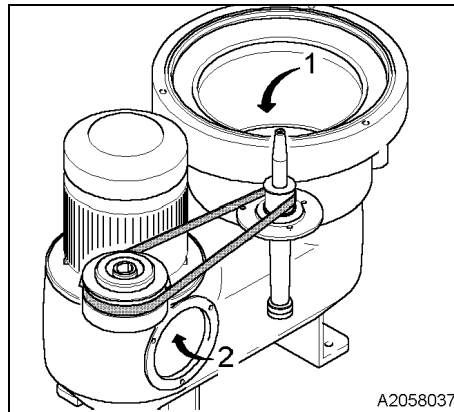


Fig. 307

#### ATTENTION:

- Degrease the belt contact surfaces of the spindle and clutch drum.
- Fit the drive belt:
  - through upper section of frame opening 1 and
  - through brake housing opening 2 (centrifugal clutch).
- Pay attention to correct seating of the drive belt on clutch pulley and spindle pulley.

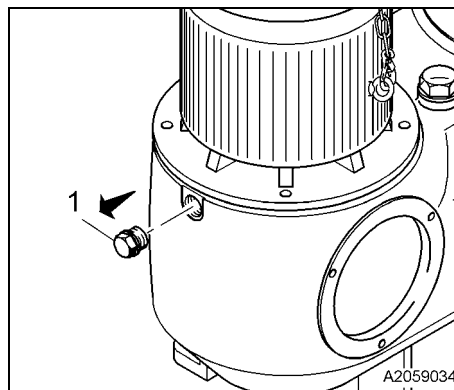


Fig. 308

- Unscrew the screw plug 1 from the lower part of the frame.



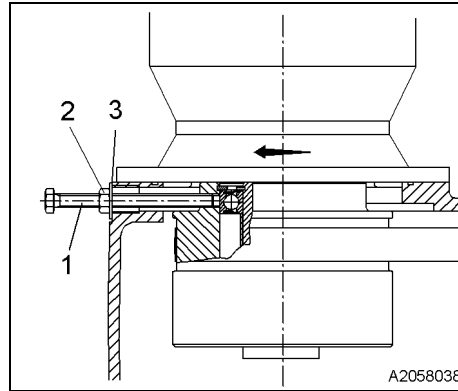


Fig. 309

- Screw hex head screw 1 (M 10 x 200) with hexagon nut 2 and washer 3 through the frame bore into the tap hole of the centrifugal clutch.
- **ATTENTION: To avoid damage to the grooved ball bearing:**
  - do **not** screw in hex head screw 1 all the way.
- Tension the drive belt by turning hex head nut 2 **clockwise** until the motor flange locks into the frame opening.

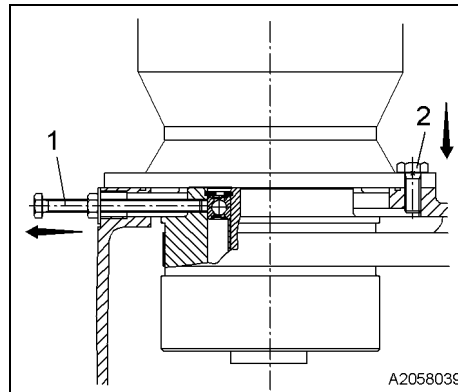


Fig. 310

- Fasten the motor with four hex head screws 2 (M 12 x 30).
- Unscrew hex head screw 1 (with hexagon nut and washer) from the centrifugal clutch.

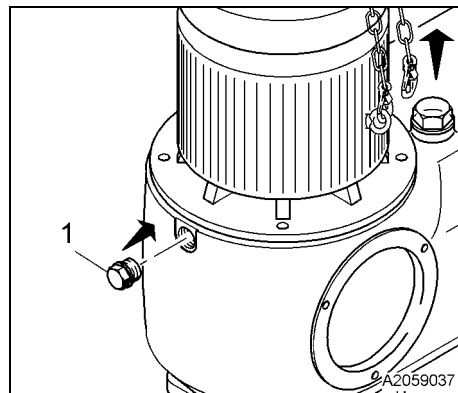


Fig. 311

- Screw in the screw plug 1.
- Remove the hoist.

**Note:**

Due to the design concept used, the spindle is at an inclined angle relative to the opposite side of the motor when the drive belt has not been fitted or tensioned (see Fig. 312, pos. 2).

The spindle is pulled into the centric axis when the belt is tensioned (see Fig. 312, pos. 1).

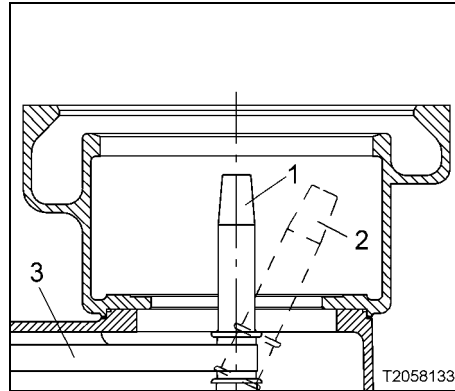


Fig. 312

- **Check**
  - that the spindle 1 can be turned easily.
  - whether the spindle 3 has been pulled into the centric axis by tensioning the drive belt 3 (see Fig. 204).

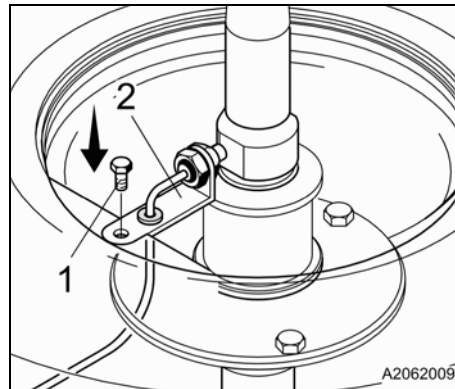


Fig. 313

#### Installing the speed monitoring device:

- Place speed monitoring device 2 on the lower section of frame and
- fasten with hex head screw 1.

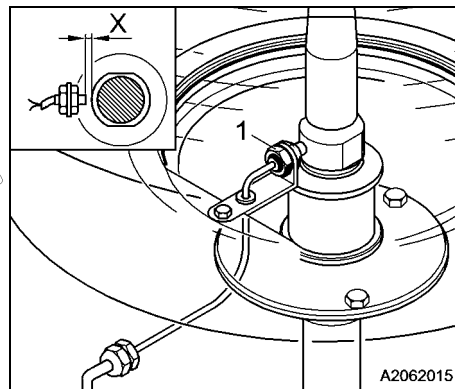


Fig. 314

- Align proximity switch 1 as illustrated.

#### ATTENTION!

The distance **X** between the spindle and the proximity switch must be **2.5 mm**.

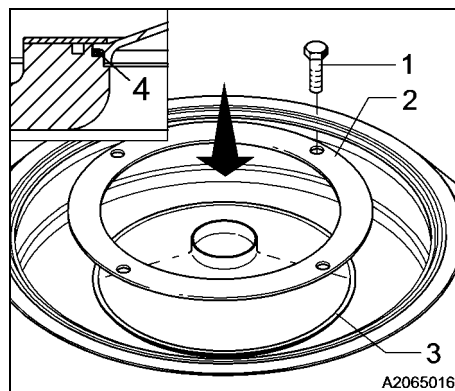


Fig. 315

- Insert protective cap 3 with fitted gasket 4 and ring 2
- bolt tight with four hex head screws 1 (M 8 x 12).

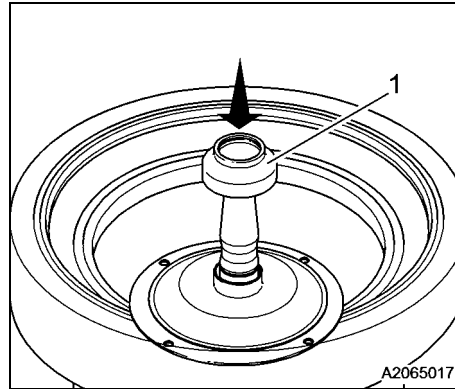


Fig. 316

- Place spindle cap 1 with fitted gasket on the spindle.
- Pay attention to correct positioning!

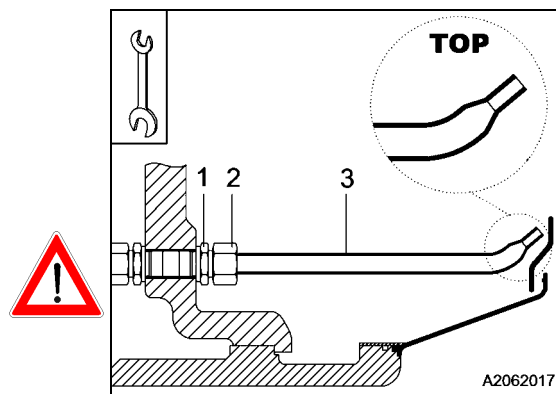


Fig. 317

**Fitting the operating water feeding device in the upper section of frame:**

- Slide nut 2 over pipe 3.
- Fit pipe with nit into the screwed connection 1 and slide on as far as it will go.

**ATTENTION: The narrow end of the pipe must be directed upwards!**

- Tighten nut 2 firmly.

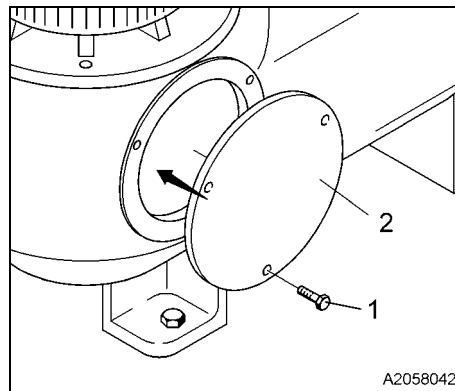


Fig. 318

- Fit cover 2 to the lower section of the frame with three hex head screws 1 (M 8 x 20).

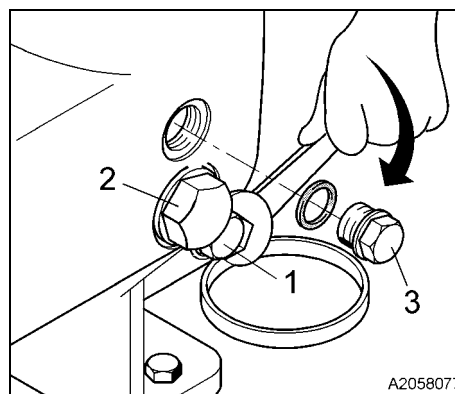


Fig. 319

- Screw in oil drain screw 1 with fitted gasket.
- Screw in the sight glass 2.
- Fill in oil as described in section 4.3.3 and
- Screw in plug 3 with gasket.



**Danger to life and limb through electric current!**

- Have the motor connected by an authorized electrician!

## 4.7 Height adjustment

For reasons of operating reliability, adjustment of

- bowl height
  - and centripetal pump play
- must be performed with particular care.

### 4.7.1 Bowl height



**ATTENTION:** The bowl height must not be adjusted on this separator!  
The bowl height may only be measured with fitted and tightened drive belt!

A bowl height check is necessary, e.g.

- after replacing the drive parts,
- after fitting another bowl,
- after fitting a different centripetal pump,
- as soon as the centripetal pump exhibits grinding marks.

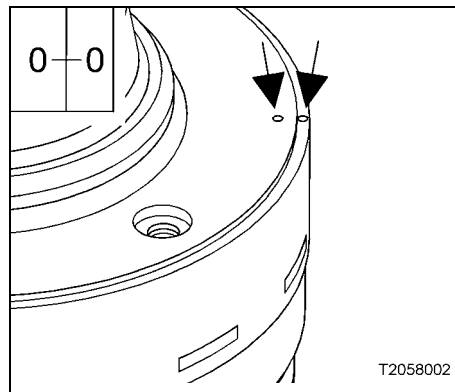


Fig. 320

**CAUTION:**  
A loose bowl top can endanger life!

- Tighten the bowl top **firmly**.
  - The O marks of the bowl bottom and the bowl top must be aligned.

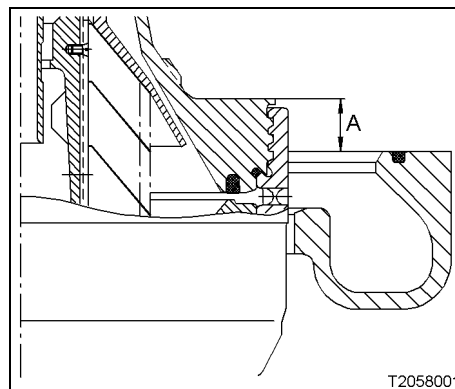


Fig. 321

The control dimension **A**  
– is **25 ±2 mm**  
– between upper edge of bowl top and upper section of frame.

If it does prove necessary to readjust the bowl height, consult the factory.

### 4.7.2 Centripetal pump clearance

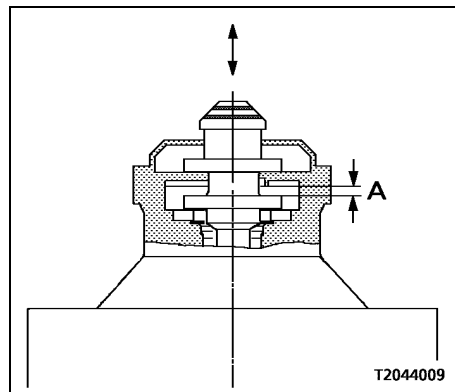


Fig. 322

- Move the centripetal pump axially to and fro in the centripetal pump chamber.
- Measure the total clearance **A** (approx. 10 Mm).
- Close the hood.
- **Check:**
  - Is the hood correctly seated on the frame rim?
  - Are the hood screws tightened **firmly**?

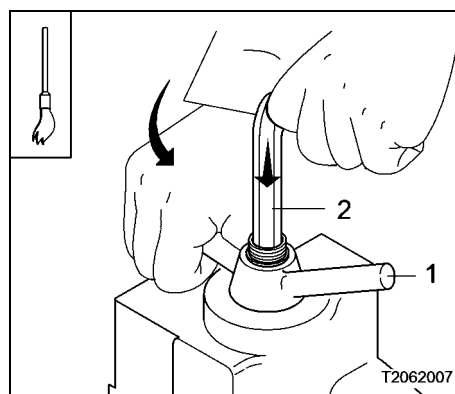


Fig. 323

- Lightly apply a thin coat of lubricant to the threads of the centripetal pump as specified in the lubrication schedule.
- Fit handle connection piece 1 into the centripetal pump.
- Hold the centripetal pump with offset screwdriver 2.
- Screw handle connection piece into the centripetal pump as far as it will go (**left-hand thread**).

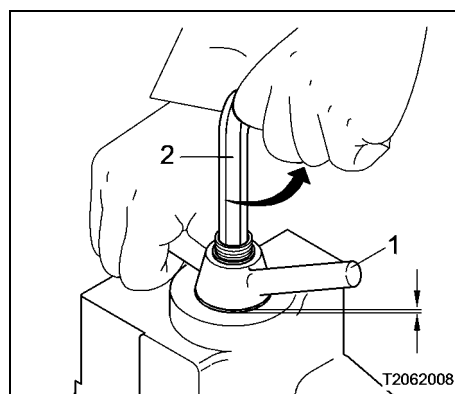


Fig. 324

- Hold the handle connection piece 1.
- Turn the offset screwdriver 2 until the handle connection piece is raised slightly from the hood (approx. 0.5 mm).

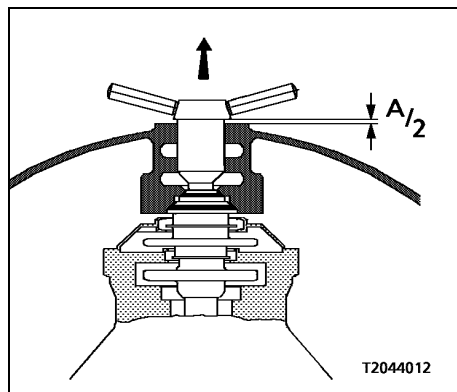


Fig. 325

- Raise the handle connection piece to its maximum.
- Measure the axial clearance.  
 $A/2 = 4 - 6 \text{ mm}$

## 4.8 Final checks after assembling the separator

### Before starting the separator

Perform the following checks after assembling and before starting the separator depending on the scope of the repair work:

Checks	Section
1. Bowl height	4.7.1
2. Oil level in drive chamber	4.3.3
3. Direction of rotation of the bowl	4.1.4
4. Bowl speed	4.1.5
5. Starting time of bowl / current consumption	4.1.5
6. Running characteristics of the separator	3.8.1
7. Suction line of the product pump (if installed) for leakage	

### When starting the separator

Perform the following checks after carrying out repairs:

Checks	Section
1. Temperature of product	
2. Observe discharges for water, solids and oil to see if the bowl is operating correctly.	3.3

## 4.9 Before a long-term shut-down of the separator

- Disconnect all electrical connections.
- Thoroughly clean the separator (see section 4.4.2, 4.4.3 and 4.4.4).
- Dry and grease the clean bowl parts and all unvarnished machine parts to avoid corrosion damage.
- Store the clean, greased bowl in a dry place until reuse.
- Store the gaskets in a cool, dry, dust-free dark room to prevent them from becoming brittle.
- Check if the shut-off valves for water leak.
- If necessary, disconnect the water lines to prevent damage by dripping water.

### 4.9.1 Preserving the separator

- Drain the lube oil completely.  
Observe the local regulations on disposal of the lubricating oil.
- Fill the drive chamber with a slushing oil, e.g. Shell oil S.7294 (SAE 30/SAE 50), to the middle of the sight glass.
- Let the separator run **without bowl** for approx. 1 minute to make sure that all drive parts are coated with slushing oil.



**CAUTION!****Risk of injury through rotating separator parts.**

- Keep a safe distance away from the rotating spindle.
- After switching off the separator, wait until the spindle has stopped rotating.
- Take off the drive belt.

**4.9.2 Preserving the motor**

- Follow the instructions of the motor manufacturer.

## 4.10 Storage



### ATTENTION!

Improper and incorrect storage of the separator and control unit can damage or destroy their components.

**Store accessories like spare parts, tools, lubricants properly!**

### Note:

Gaskets, hoses and hosepipes, for example, change their physical properties in unfavourable storage conditions. This can result in a shorter service life. They can be rendered useless due to excessive hardening, softening, permanent deformation, flaking, cracks or other surface damage.



### IMPORTANT:

- **Outdoor exposure is not admissible!**

### 4.10.1 After delivery

If the separator and control unit are not installed immediately after delivery,

- store the separator and control unit in the original transport packaging.  
Recommended storage temperature: + 5 to +50 °C (41 – 122 °F)



### IMPORTANT:

A storage time of **more than 12 months** of the separator and control unit is only possible after consulting the manufacturer.

### 4.10.2 Separator

The following procedure applies

- for storing the separator before commissioning and
- for storing the separator before a prolonged standstill period.



### IMPORTANT:

- **Store the separator with dismantled bowl!**

- Store the clean, greased bowl in a dry place.
- Store the gaskets in a cool, dry, frost-free, dust-free dark room to prevent them from becoming brittle.  
Recommended storage temperature: + 5 to +50 °C (41 - 122 °F)
- The separator with dismantled bowl must be stored dry and free from vibrations.  
(Vibrations during standstill can cause bearing damage!).
- Protect the drive spindle and motor from dust.
- Store all other separator parts dry and frost-free.

### 4.10.3 Control system

- The control unit and accessories must be stored dry, dust-free, vibration and frost-free.
- Protect from excessive heat!

Recommended storage temperature: + 5 to + 45 °C (41 – 113 °F)

#### 4.11 Before restarting

**Before re-starting, the operator must ensure**

- that all separators and plant components have been function-checked by competent personnel (qualified specialists).
- that the maintenance intervals are adhered to.
- that the separator is assembled *correctly* by competent persons.

#### Note:



If the bowl has been out of operation for **longer than 6 months** (e.g. due to a long standstill period or storage),

- check all bowl parts as specified in the maintenance schedule (table “Maintenance after 4000 operating hours or after 6 months at the latest”).
- Replace if necessary.



If the separator has been out of operation for **longer than 12 months** (e.g. due to a long standstill period or storage),

- check all separator parts in accordance with the maintenance schedule (table “Maintenance after 8000 operating hours or after 1 year at the latest”).
- Replace if necessary.

#### Procedure:

- Drain the slushing oil.  
Observe the local regulations on disposal of the slushing oil.
- Remove the grease from all unpainted machine parts.



- Check gaskets.  
Replace damaged, very swollen, hardened or brittle gaskets **immediately**.

- Assemble the bowl (see section 4.4.7).



- Check the ball bearings of the spindle and centrifugal clutch (if applicable).  
When damaged, replace the ball bearings **immediately** !



- Fit drive belt (see section 4.6.5 or 4.6.7).  
When damaged, replace the drive belt **immediately** !

- Assemble the separator **correctly**.
- Fill the drive chamber with the specified lube oil as specified in section 4.3.3.

## 4.12 Disposal



When the equipment is no more useful or the separator has reached the end of its service life, the operator is responsible for **appropriate, environmentally friendly** disposal of its components and materials such as

- metal,
- caoutchouc and rubber
- plastics,
- glass,
- gear and lube oils on a mineral-oil basis,
- synthetic gear and lube oils,
- cleaning liquids,
- electric and electronic apparatus.



### ENVIRONMENTAL PROTECTION!

**Be sure to adhere to applicable environment-protection legislation!**

More information on disposal matters can be obtained from local authorities.

### 4.12.1 Gear and lubricating oils

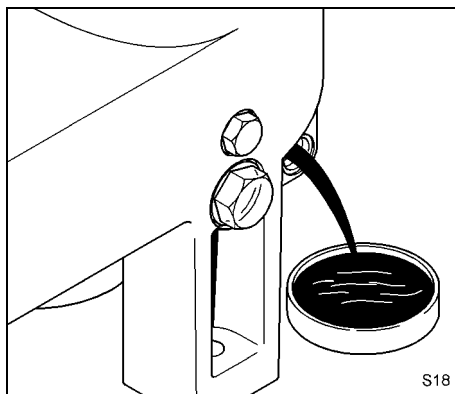


Fig. 326

Replacement and disposal of waste oils recovered during the oil changes and maintenance work must be carried out carefully.

- Collect dripping oil to prevent danger of slipping or product infection.
- They can be injurious to health, depending on their chemical composition.
- Waste oil must be disposed of in accordance with local regulations.

**Note:**

**Special attention must be paid to the directive issued by the operator on handling waste oils and the local regulations.**

### 4.12.2 Cleaning liquids

Only those cleaning agents may be used that are specified in the overall documentation (see data sheet).



**CAUTION: Danger of chemical burns!**

The cleaning agents can be acids and caustics which, if used carelessly, can cause severe damage to persons.

**Note:**

Pay particular attention to the directive issued by the operator on handling the cleaning agents used and the local disposal regulations.

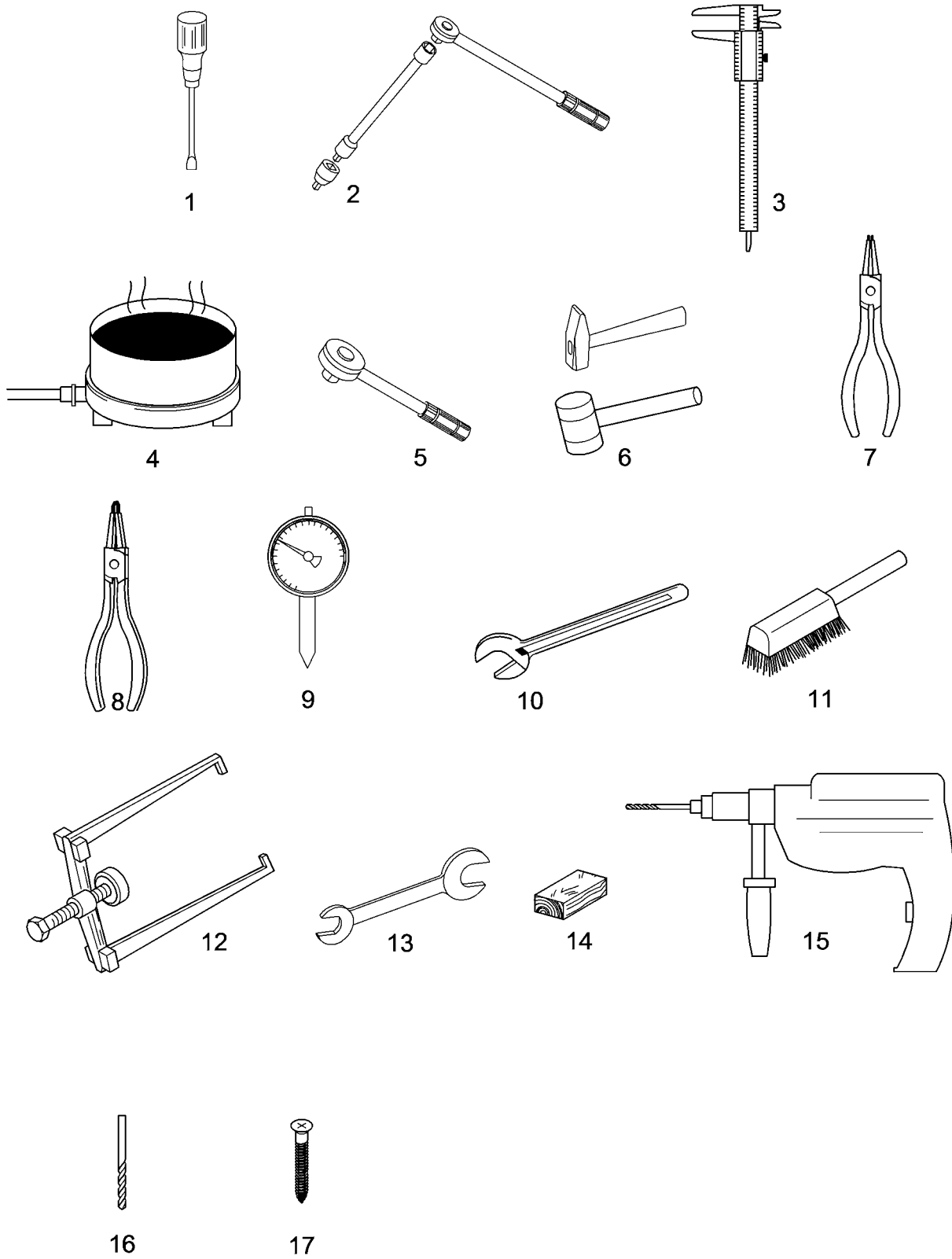
### 4.12.3 Separator

Before disposing of the separator

- Drain the gear oil and dispose of it properly in accordance with section 4.12.1.
- Dismantle the separator, remove any lubricant sticking to separator parts and dispose of them separately or recycle them where appropriate.

4.13 Standard tools

are commercially available tools to be supplied by the customer.



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Fig. 327

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

4.14 Special tools

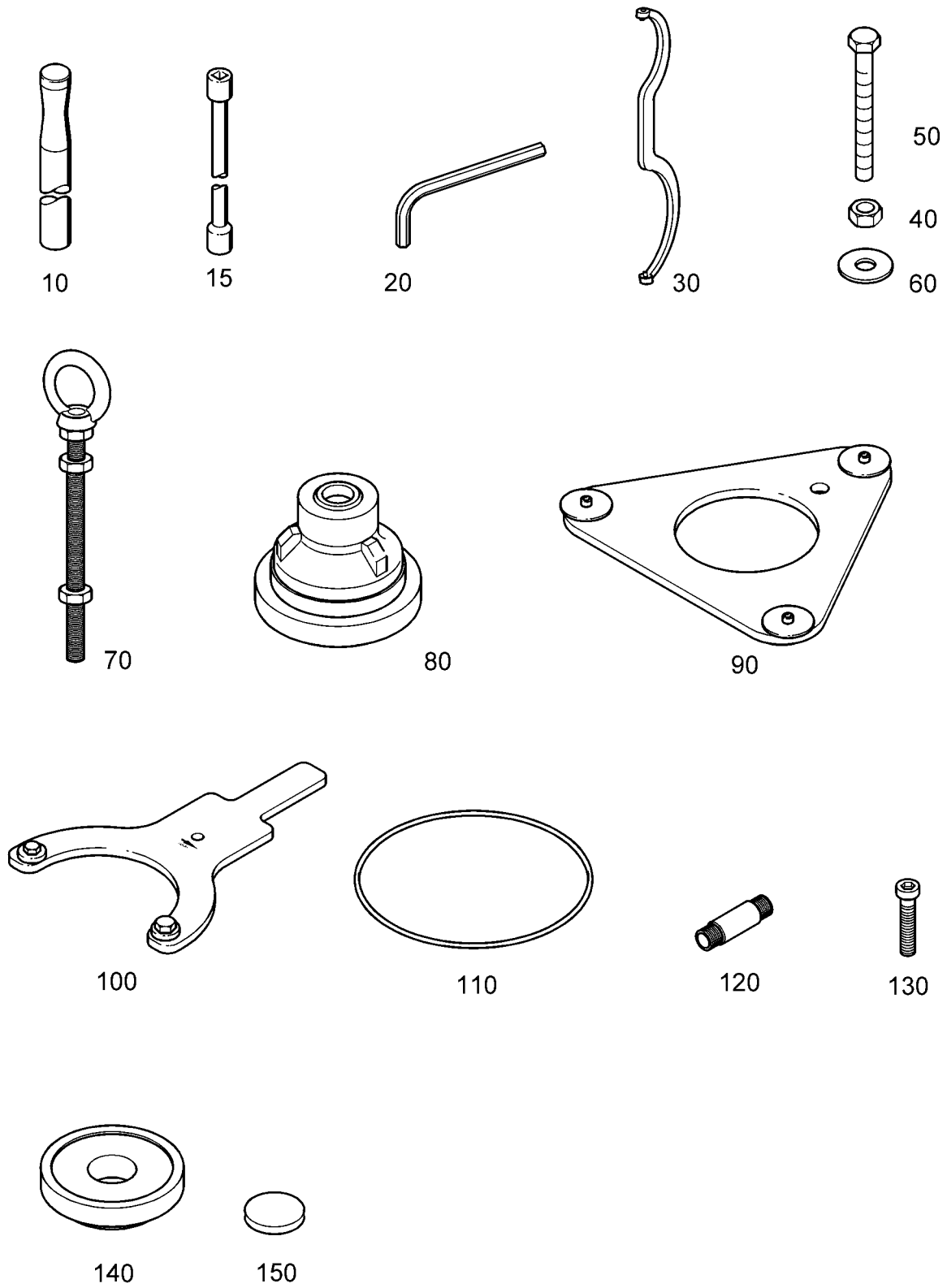


Fig. 328

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- **Special tools are provided by the manufacturer.**
- **For the delivery of special tools, the packing list supplied with the separator is applicable.**

Pos.	Designation
10	Mallet
15	Complete socket wrench (spindle screw)
20	Offset screwdriver (centripetal pump)
30	Double hook wrench (centripetal pump chamber lock ring)
40	Hexagon nut M 10 (centrifugal clutch)
50	Hex head screw M 10 x 200 (centrifugal clutch)
60	Disk 11 x 27 x 2 (centrifugal clutch)
70	Eye bolt, complete (bowl / centrifugal clutch))
80	Bell-shaped piece (bowl top / disk stack / sliding piston)
90	Assembling device, complete (closing chamber bottom / annular piston)
100	Ring spanner (bowl top)
110	Mounting ring (annular piston)
120	Double nipple (transporting the separator)
130	Threaded pin M 12 x 40 (centrifugal clutch)
140	Disk (centrifugal clutch)
150	Pressure piece (centripetal pump)

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**5 Spare parts**

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## 5.1 Spare part requirements



Fig. 329

- **Use only genuine spare parts from GEA Westfalia Separator. The original spare parts are listed in the spare parts catalog.**

The use of non-genuine parts leads to:

- safety risks,
- reduced durability of these parts,
- reduced availability of the separator and
- increased service requirement.

If a safety risk occurs when using non-original spare parts, this may have legal consequences for the responsible persons. In such cases, GEA Westfalia Separator accepts no liability or warranty claims.

## 5.2 Guide to ordering spare parts

A rapid and correct supply of spare parts can only be guaranteed if your order includes the following details:

- Separator model            see name-plate  
e.g. OSE 20-0136-067
- Serial-No.                    see name-plate  
e.g. 9000-223
- Designation                see order-specific parts catalog  
e.g. frame
- Part Number                see order-specific parts catalog  
e.g. 2050-1100-020  
The part number is also marked on almost all the individual parts.

Only when ordering spare parts for bowls:

- Bowl S/N                    If this differs from the serial number.  
The bowl serial number is engraved on the bowl lock ring, bowl bottom and bowl top.

Only required when ordering spare parts for pump and pump connection parts:

- Model and number of pump    see pump nameplate

The information provided must be complete to avoid incorrect deliveries.

### Available sets of spare parts

The following sets of spare parts are available depending on the respective technical maintenance intervals:

- Set of spare parts “bowl and hood” for operation of 1 year or 8000 hours
- Set of spare parts “Drive” for operation of 1 year or 8000 hours
- Set of spare parts “Drive” for operation of 2 years or 16,000 hours

The maintenance schedule forms the systematic maintenance basis for the use of these sets of spare parts.

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