

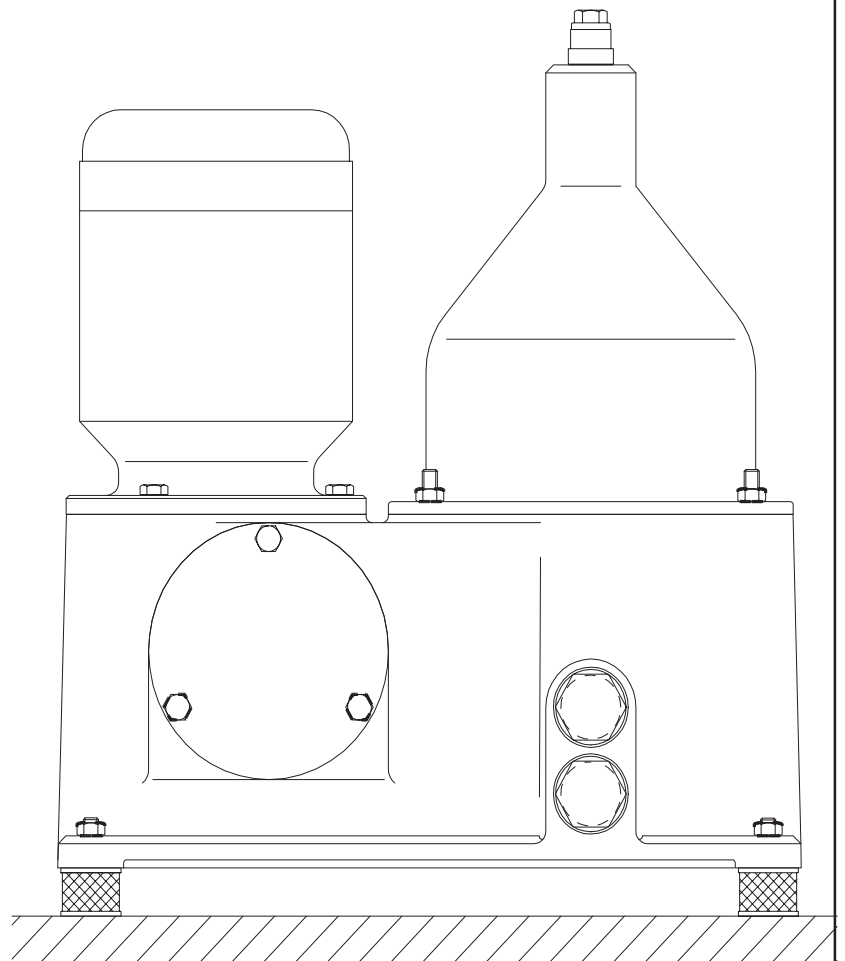
**Instruction Manual and  
Parts List**

**No. 2050-9001-000**

Edition 0200

**Centrifuge**

**Model OTC 2-02-137  
OTC 2-03-107**



Mechanical Separation  
Division



**Application:**

- Separation of liquid mixtures or
- Clarification of liquids

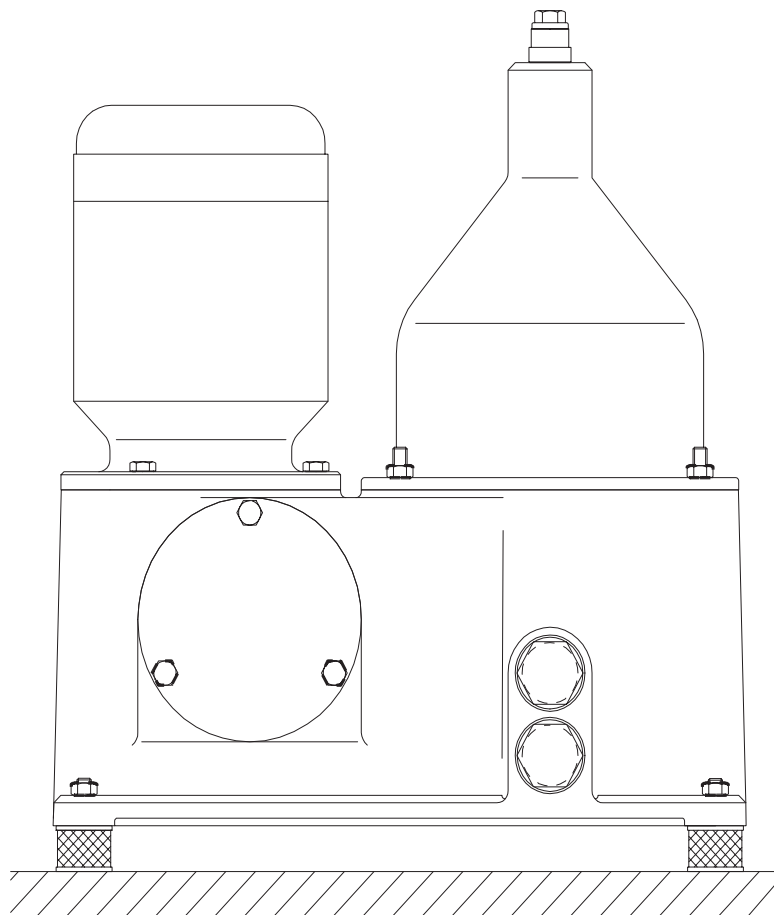


Fig. 1

Subject to modification.

Westfalia Separator AG D-59302 Oelde (F. R. Germany)			
Type	<input type="text"/>	No.	<input type="text"/>
built in	<input type="text"/>	inner $\varnothing$ of bowl mm	<input type="text"/>
Rpm of bowl			<input type="text"/>
Permissible density of product to be treated			<input type="text"/>
heavy liquid kg/dm <sup>3</sup>	<input type="text"/>	solids kg/dm <sup>3</sup>	<input type="text"/>



**In case of frequency converter operation**  
see name plate on page IV!

## Name plate – frequency converter

Westfalia Separator AG			
D-59302 Oelde (F. R. Germany)			
Type	<input type="text"/>	No.	<input type="text"/>
built in	<input type="text"/>	inner $\varnothing$ of bowl mm	<input type="text"/>
Rpm of bowl		50 Hz $\approx$	<input type="text"/>
Permissible density of product to be treated			<input type="text"/>
heavy liquid kg/dm <sup>3</sup>	<input type="text"/>	solids kg/dm <sup>3</sup>	<input type="text"/>

## For your safety



- **Strictly adhere to instructions marked with this symbol**

This avoids damage to the machine and other units.



- **Take special care when carrying out operations marked with this symbol -**

otherwise danger to life.

- **Observe accident prevention regulations**

The local safety and accident prevention regulations apply unconditionally to the operation of the separator.

- **Instruction manual**

Follow only the instructions given in this manual

- **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 Westfalia Separator service personnel or if the machine is not applied in accordance with the intended use.

Westfalia Separator AG 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 Westfalia Separator AG are not extended by the above.

<b>1</b>	<b>Safety precautions</b>	<b>1</b>
1.1	Correct usage	2
1.2	Safety stickers on the machine	2
1.3	Basic operating principles	4
1.4	Bowl speed and product	4
1.5	Operations on the separator	4
1.5.1	Assembly	5
1.5.2	Electrical appliances	6
1.5.3	Before start-up	7
1.5.4	Start-up	8
1.5.5	Shut-down and »Emergency-Off«	10
1.5.6	Maintenance and repair	11
1.6	Corrosion	13
1.7	Erosion	14
<b>2</b>	<b>Machine description</b>	<b>15</b>
2.1	Application	20
2.2	Components of the separator	20
2.3	Technical data	21
2.4	Operating principles of the separator	23
2.4.1	Operating principles of the bowl	23
2.4.2	Operating principles of the centripetal pump	24
2.4.3	Operating principles of the drive	24
2.5	The regulating ring	25
2.6	Conversion to clarifier mode - OTC 2-02-137	26
<b>3</b>	<b>Operation</b>	<b>27</b>
3.1	Technical information	28
3.1.1	Separation	28
3.1.2	General information on cleaning the bowl	28
3.1.3	Calculating the separating time	29
3.2	Before start-up	30
3.3	Starting the separator	30
3.4	Monitoring of operation	30
3.5	Shutting down the separator	31
3.6	Trouble shooting	32
3.6.1	Trouble shooting	32
<b>4</b>	<b>Installation, maintenance and repair</b>	<b>33</b>
4.1	Installation of the separator OTC 2-02-137	34
4.2	Installation of the separator OTC 2-03-107	35
4.3	Installing the separator	36
4.4	Motor	37
4.4.1	Direction of rotation of the bowl	38
4.4.2	Speed and starting time of the bowl	39
4.5	Maintenance and lubrication	40
4.5.1	Maintenance schedule	40
4.5.2	Hoses and hose pipes	42
4.5.3	Lubrication	43
4.5.4	Lubrication Chart	45
4.6	Dismantling the separator	46
4.7	Cleaning the bowl	47
4.8	Important instructions for assembling the separator	50

4.8.1	Assembling the separator .....	51
<b>5</b>	<b>Accessories .....</b>	<b>71</b>
5.1	Starter box .....	72
5.1.1	Electrical connection .....	73
5.2	Hood end switch .....	75
5.3	Frequency converter (FC) .....	76
5.3.1	A.C. design 230 VAC - 1 Ph - N - PEN .....	77
5.3.2	A.C. design 115 VAC - 1 Ph - N - PEN .....	77
5.3.3	D.C. design 24 VDC - 1 Ph - N .....	78
5.4	Transformer (option) .....	79
5.5	Inverter (option) .....	80
5.5.1	Solenoid valve (option) .....	81
<b>6</b>	<b>Parts list .....</b>	<b>83</b>
	Guide to ordering parts .....	85
	Separator, complete (OTC 2-02-137) .....	87
	Separator, complete (OTC 2-03-107) .....	91
	Set of drive parts .....	95
	Set of spare parts "bowl/hood" – 50 Hz (operation: 1 year or 8000 hours) .....	97
	Set of spare parts "bowl/hood" – 60 Hz (operation: 1 year or 8000 hours) .....	97
	Set of spare parts "drive" (operation: 2 years or 16000 hours) .....	99
	Set of tools and accessories (for maintenance and commissioning) .....	101
	3/2-way solenoid valve .....	102
<b>7</b>	<b>Appendix .....</b>	<b>103</b>
	Table of lubricating oils .....	104
	Comments on table of lubricating oils .....	105
	The health hazards involved when handling heavy oils and lube oils .....	106





## 1 Safety precautions

1.1	Correct usage .....	2
1.2	Safety stickers on the machine .....	2
1.3	Basic operating principles .....	4
1.4	Bowl speed and product .....	4
1.5	Operations on the separator .....	4
1.5.1	Assembly .....	5
1.5.2	Electrical appliances .....	6
1.5.3	Before start-up .....	7
1.5.4	Start-up .....	8
1.5.5	Shut-down and »Emergency-Off« .....	10
1.5.6	Maintenance and repair .....	11
1.6	Corrosion .....	13
1.7	Erosion .....	14



**1.1 Correct usage**

The separator is designed

- in accordance with the chemical and physical properties of the product specified by the customer and
- in accordance with the method of application of the separator agreed with Westfalia Separator AG.

In particular, products not conforming to the specifications the nameplate may not be used.

**Any mode of operation deviating herefrom is not proper and correct.**

Prior to any intended deviation from the agreed operating mode, it is therefore imperative to obtain the consent of Westfalia Separator AG.

**1.2 Safety stickers on the machine**

The following warnings must be attached to the machine as self-adhesive stickers. The stickers must always be in perfect condition.

- Clean dirty stickers.
- Replace damaged stickers.

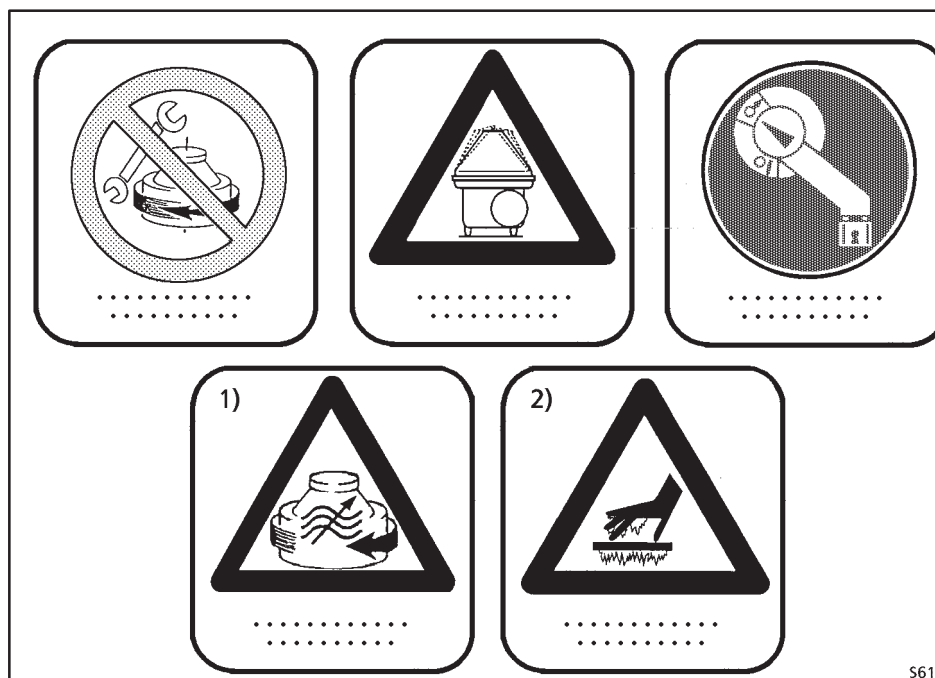


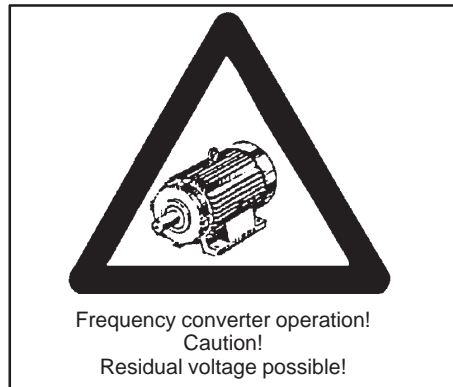
Fig. 2

- 1) Only in case of operation with frequency converter
- 2) Only in case of hot operation

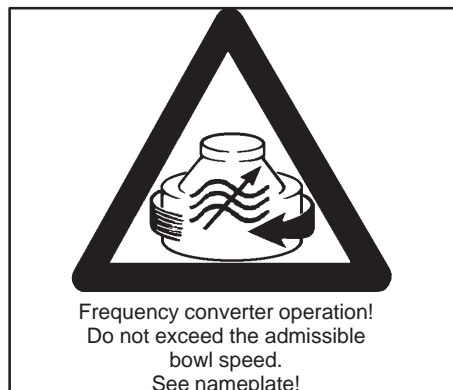


**In case of frequency converter operation**

- Attach the following safety stickers to the machine and
- make sure they are in good condition and firmly stuck.



*Fig. 3*

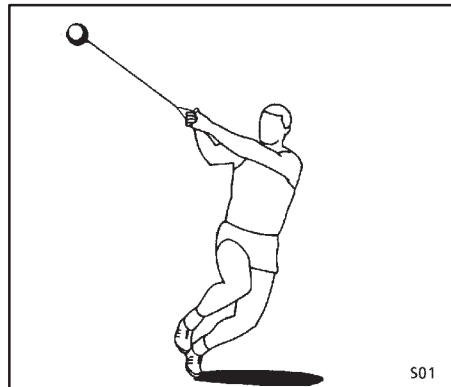


*Fig. 4*



### 1.3 Basic operating principles

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



High centrifugal forces are produced in the rotating bowl.

Fig. 5

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.

### 1.4 Bowl speed and product

The max. permissible bowl speed is an important parameter when rating the separator. It depends on the chemical and physical properties of the product such as

- temperature (if higher than 100 °C or lower than 0 °C),
- density of the fluid and solid components,
- aggressiveness of the product as regards corrosion and erosion (has influence on the selection of the bowl material).

The bowl speed is determined on the basis of these parameters allowing for an adequate safety margin.

Before using a product with properties different from those stated when placing the order, it is imperative to obtain the manufacturer's approval.

### 1.5 Operations on the separator

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

Special attention must be given to:

- assembly
- starting
- shutting-down
- maintenance and servicing



### 1.5.1 Assembly

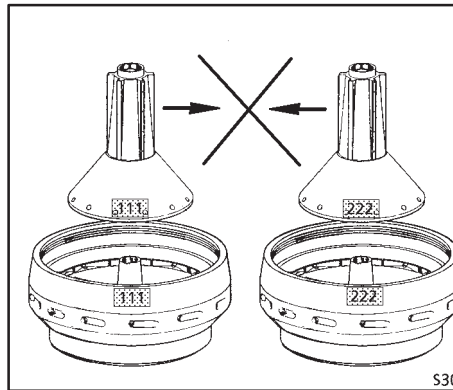


Fig. 6

- If the plant consists of several separators, make sure that parts of different separators do not get interchanged.

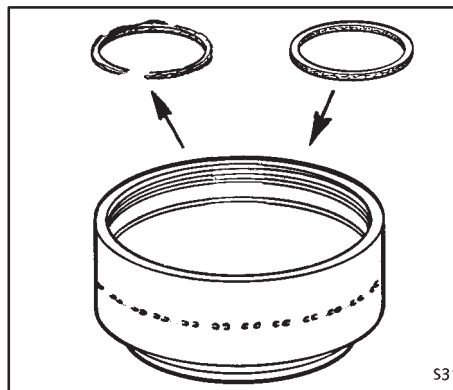


Fig. 7

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

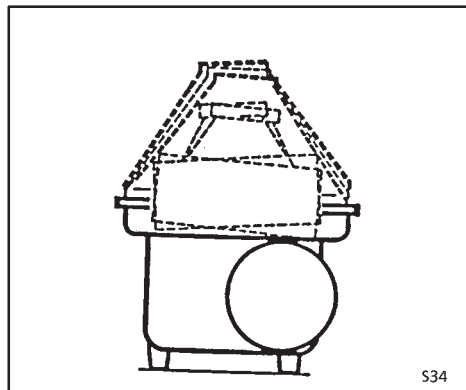


Fig. 8

- The separator must be function tested after fitting new parts.

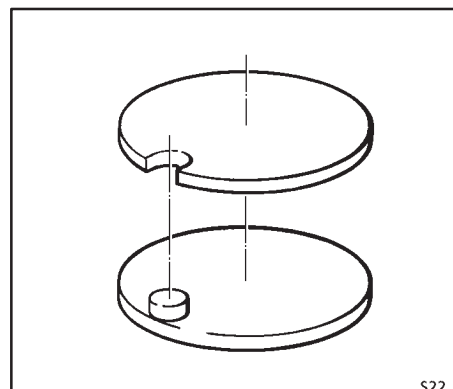


Fig. 9

- Certain separator parts must be arranged in fixed positions relative to one another.
- Locking devices and alignment marks must be in perfect position. Otherwise, the separator may not be operated.





Fig. 10

- When assembling the separator, strictly adhere to the instructions contained in the manual to avoid undue imbalance.
- The separator may only be started when all parts are fitted.
- **Firmly** tighten the bowl lock ring.

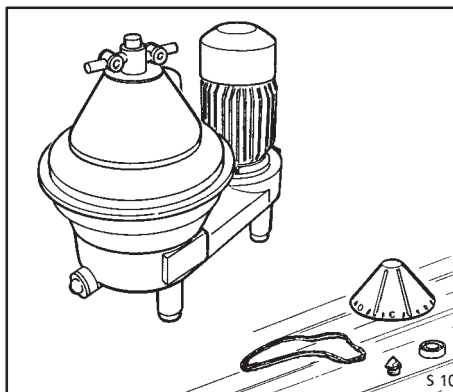


Fig. 11

- Check that the machine is completely assembled and properly installed.
- Carefully fasten the hood.

### 1.5.2 Electrical appliances

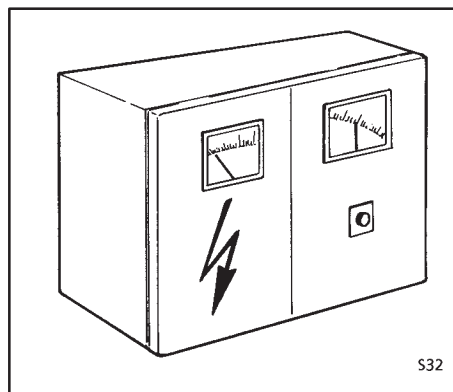


Fig. 12

- The governing accident prevention regulations apply for the electrical appliances and installations.
- The frequency and voltage of the power supply must correspond to the machine specifications.
- Carry out potential equalization.
- Observe legal regulations; e.g. in the EU:
  - Low-voltage guideline 73/23/EWG
  - Electro-magnetic compatibility 89/336/EWG.



1.5.3 Before start-up

- Check that the machine is correctly assembled.

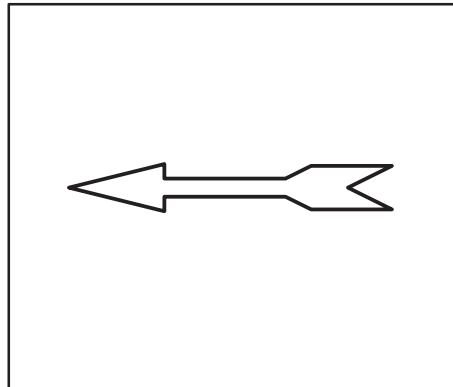


Fig. 13

- The motor must rotate in clockwise direction (see arrow!).
- See section 4.4.1.



Fig. 14

- The machine may only be operated with protective devices conforming to EN 294. Equip solid and liquid discharges accordingly.

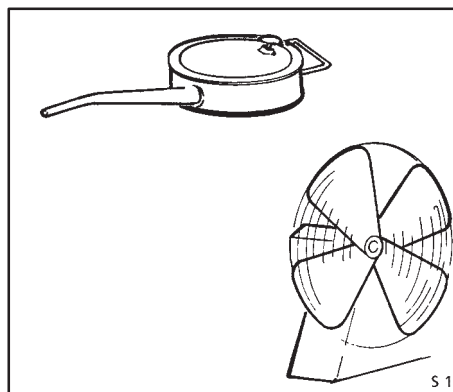


Fig. 15

- Check that the lubrication and cooling systems are serviceable.



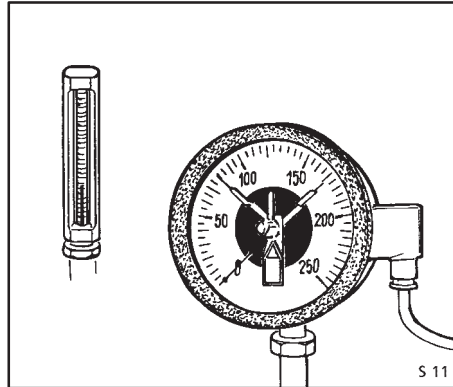


Fig. 16

- Check whether the supervisory equipment is connected and that the correct limit values are adjusted.

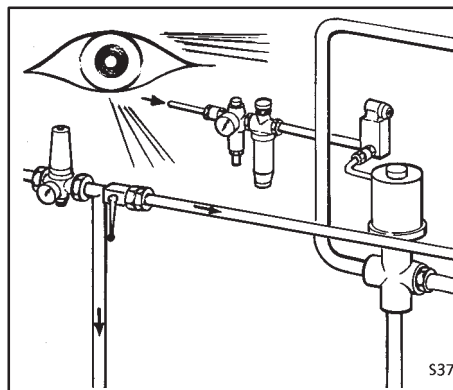


Fig. 17

- 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.

#### 1.5.4 Start-up

Nameplate	
Westfalia Separator AG D-59302 Oelde (F.R.Germany)	
Model <input type="text"/>	S/N <input type="text"/>
Year of manufacture <input type="text"/>	Ø Di in mm <input type="text"/>
Bowl speed in min <sup>-1</sup> <input type="text"/>	<input type="text"/>
Admissible density in kg/dm <sup>3</sup> of the product:	<input type="text"/>
Heavy liquid <input type="text"/>	Solids <input type="text"/>

Fig. 18

- Pay attention to section "Operation".
- Pay attention to 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. 19

- Wear ear protection.







Fig. 20

**In case of frequency converter operation**

- Do not under any circumstances manipulate the frequency converter to exceed the admissible bowl speed (see nameplate).



Fig. 21

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



Fig. 22

- When processing products harmful to persons, observe the pertinent safety regulations.
- Refer to the safety data sheet of the product.
- Wear protective clothing.



Fig. 23

- Stop the separator immediately if unusual noises or vibrations occur.





Fig. 24

**Only in case of hot operation:**

- Product-contacting parts such as
  - pipes and hoses,
  - hood,
  - bowl shell,reach temperatures over 80 °C.

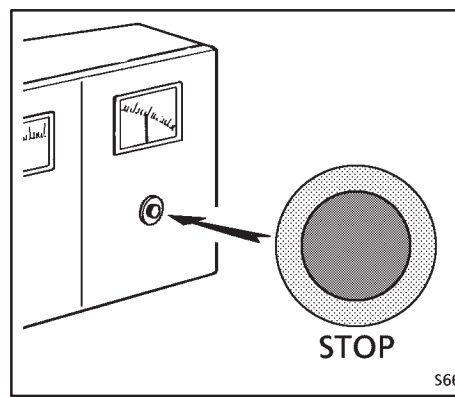
**1.5.5 Shut-down and  
»Emergency-Off«**

Fig. 25

- For shut-down refer to the chapter "operation".



### 1.5.6 Maintenance and repair

Unfavorable 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

Particularly stressed parts of the separator such as

- threaded ring,
- spindle and
- bowl shell,

must be checked on a regular basis to ensure 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.

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

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

We recommend having your separator inspected by our service engineers at regular intervals. Such inspections will keep your machine working reliably and prevent unexpected shut-downs.

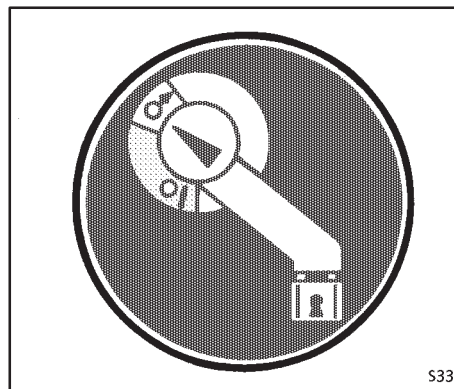


Fig. 26

Before maintenance and servicing:

- Switch off all electrical appliances via the main switch.
- Secure the installation against accidental re-starting with locking devices.



Fig. 27

- **Do not loosen any part of the separator until it has come to a standstill!**
- For checking standstill, see section 4.6.





Fig. 28

- Do not stand on the machine or parts of the machine.
- Make provision for and use sturdy working platforms.

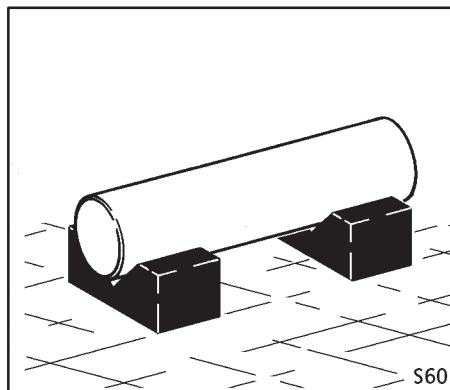


Fig. 29

- Place dismantled machine parts on suitable surfaces, e.g. on a rubber mat.
- Take steps to prevent machine parts from overturning and rolling away.

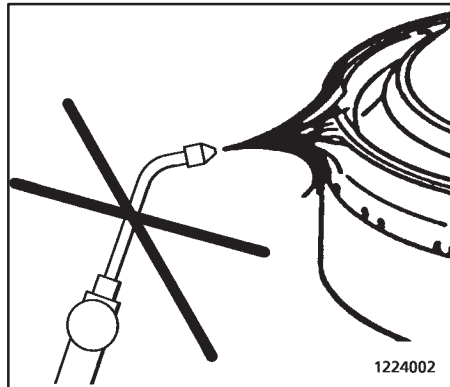


Fig. 30

- **Do not heat separator parts with a naked flame.**
- **Do not weld separator parts.**
- Even during cleaning the separator parts, the temperature must not exceed 100 °C.

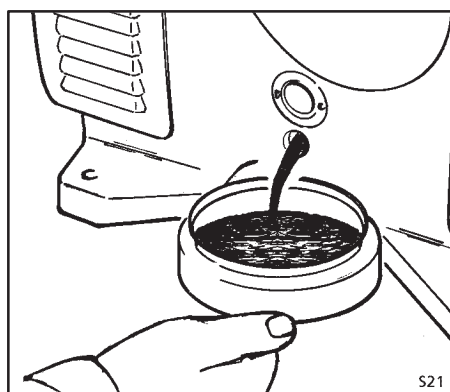


Fig. 31

- 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

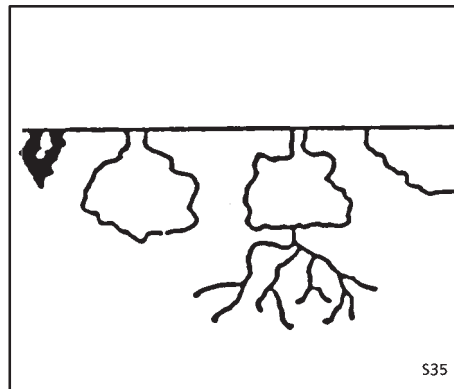
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

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.



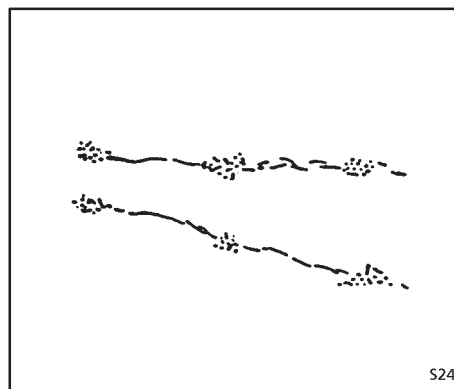
Possible formation of pit-shaped corrosion.

Fig. 32

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 AG 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. 33



## 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 solid particles
- high throughput capacities

The first signs of erosion should be carefully observed and documented. Erosion can deepen rapidly and weaken the highly stressed material.

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

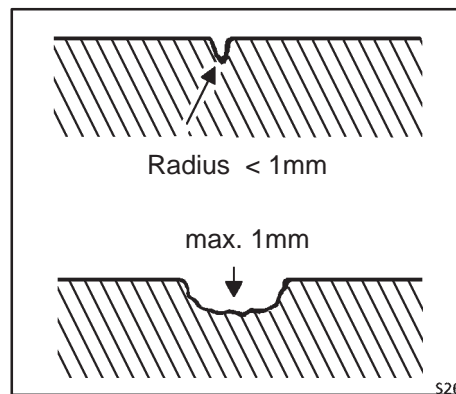


Fig. 34

Signs of erosion which you should immediately report to your local representative:

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

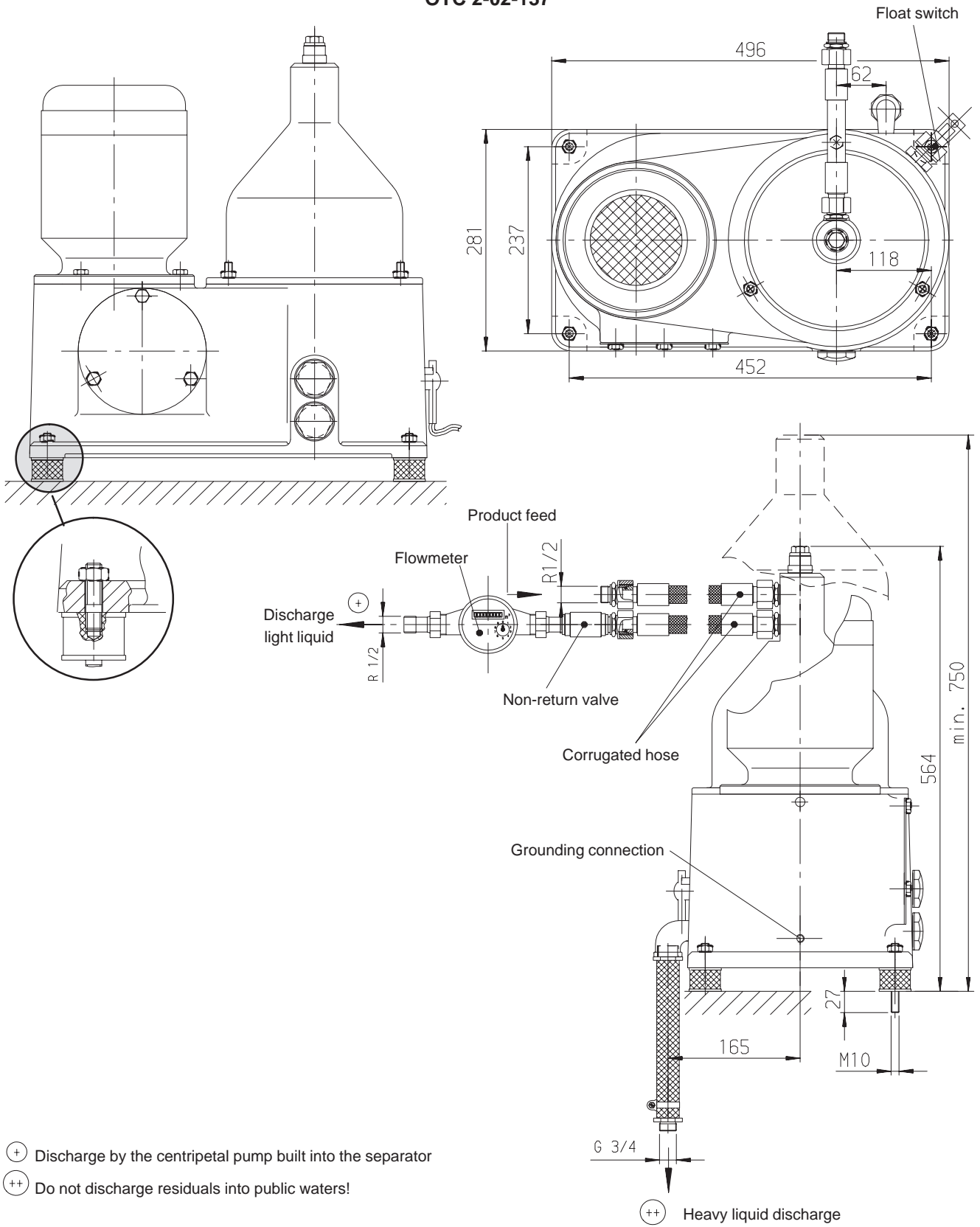


## 2 Machine description

2.1	Application .....	20
2.2	Components of the separator .....	20
2.3	Technical data .....	21
2.4	Operating principles of the separator .....	23
2.4.1	Operating principles of the bowl .....	23
2.4.2	Operating principles of the centripetal pump .....	24
2.4.3	Operating principles of the drive .....	24
2.5	The regulating ring .....	25
2.6	Conversion to clarifier mode - OTC 2-02-137 .....	26



OTC 2-02-137



- ⊕ Discharge by the centripetal pump built into the separator
- ⊕⊕ Do not discharge residuals into public waters!

⊕⊕ Heavy liquid discharge

2050-4100-000

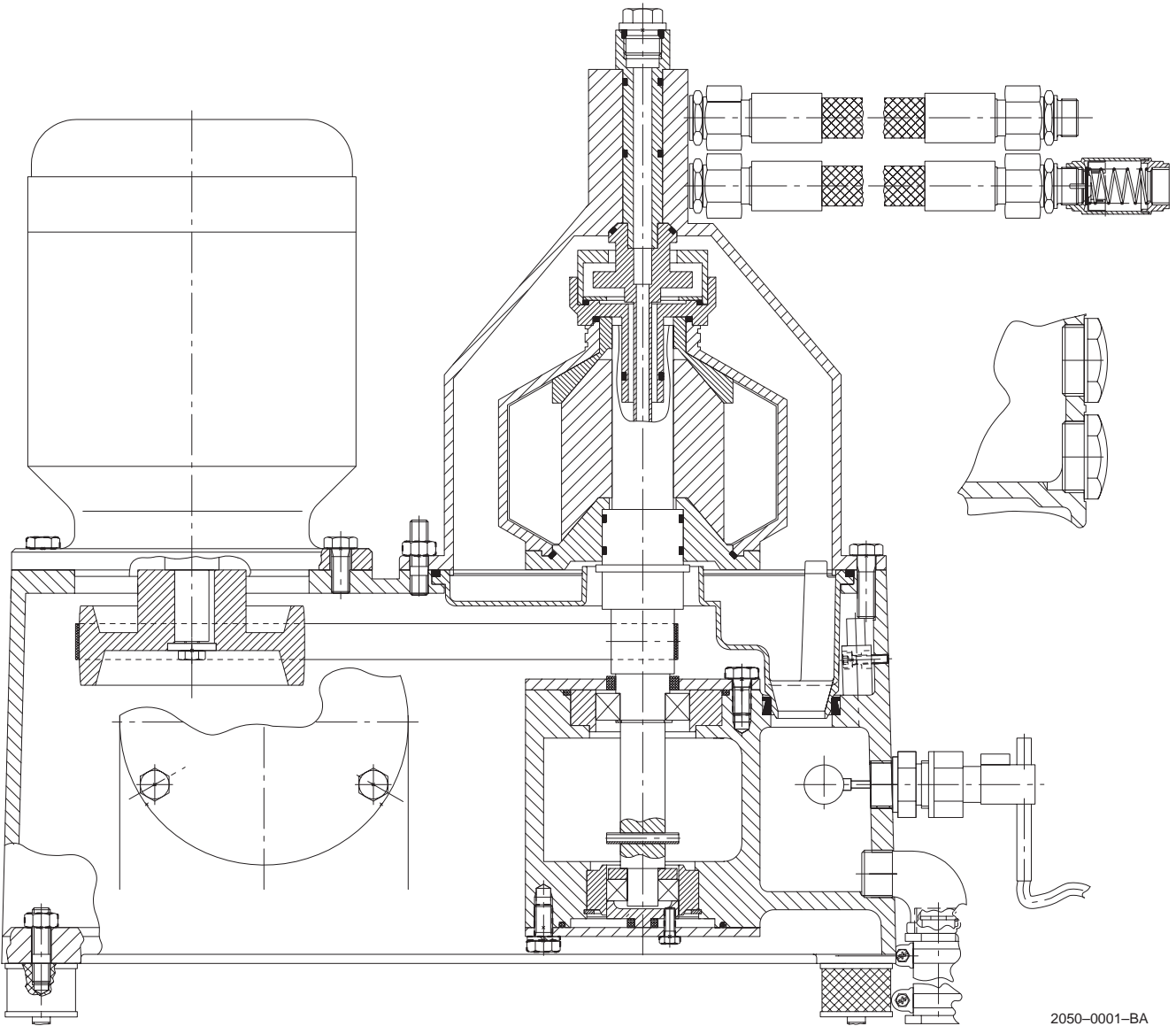
**Subject to modification!**

Fig. 35 - Dimensioned drawing





OTC 2-02-137



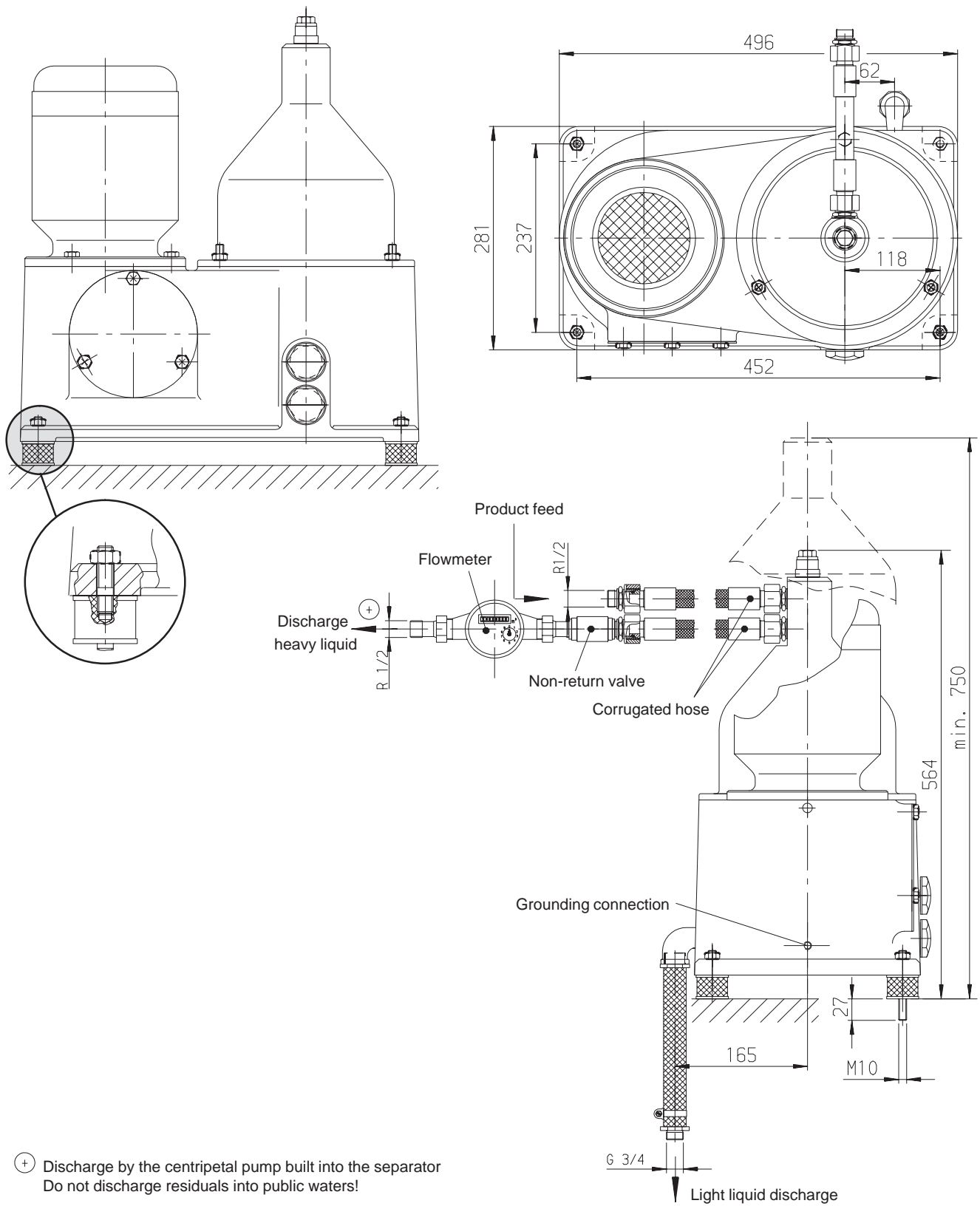
2050-0001-BA

Fig. 36 - Section through separator

**Subject to modification!**



OTC 2-03-107



⊕ Discharge by the centripetal pump built into the separator  
Do not discharge residuals into public waters!

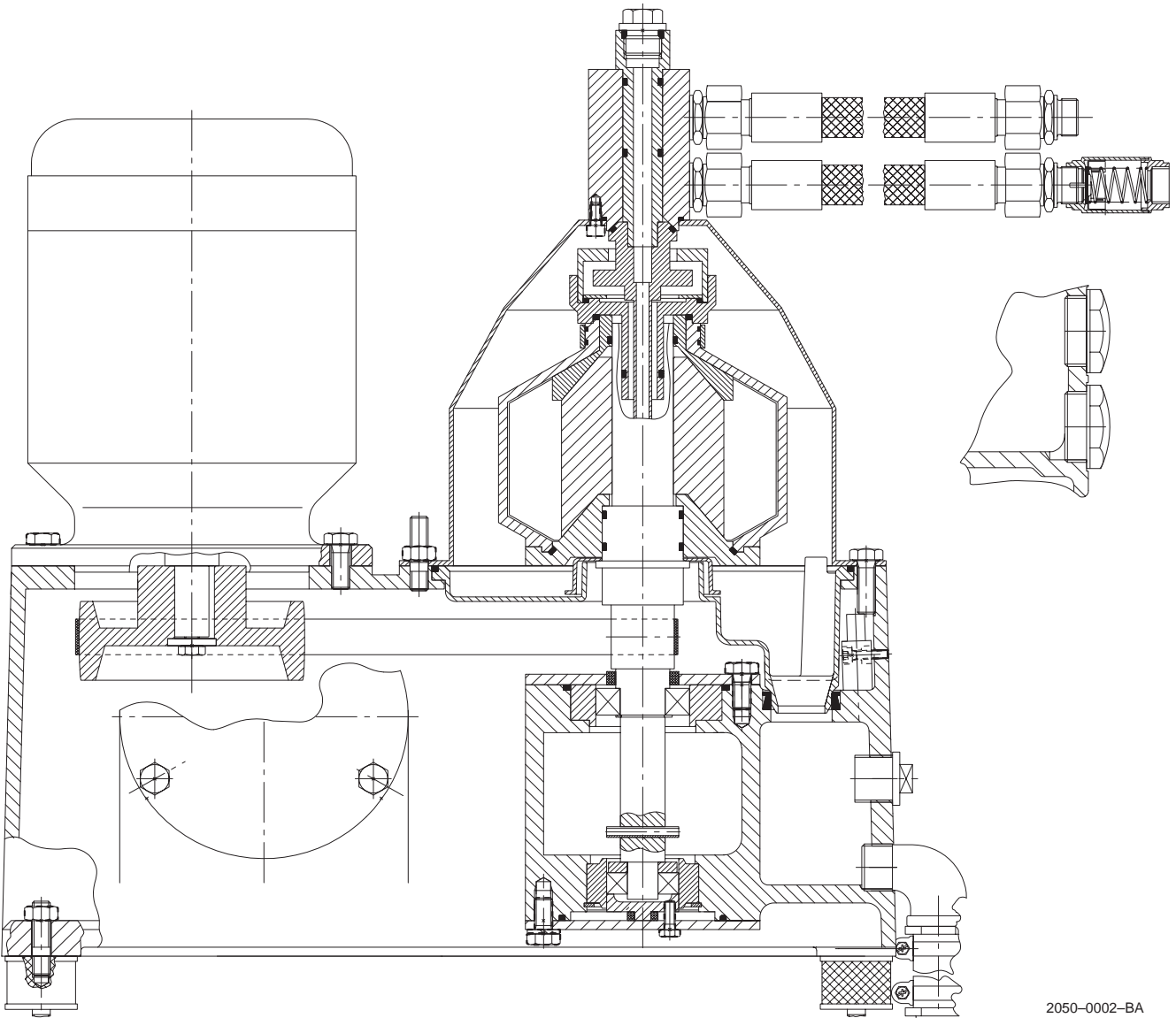
2050-4100-010

Fig. 37 - Dimensioned drawing

**Subject to modification!**



OTC 2-03-107



2050-0002-BA

Fig. 38 - Section through separator

**Subject to modification!**



The machine described in this manual is a high speed centrifuge with solid-wall, disk-type bowl briefly called „separator”.

## 2.1 Application

The separator is applied for

- the separation of liquid mixtures or
- the clarification of liquids.

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

„Clarification” means 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.

## 2.2 Components of the separator

The separator comprises:

- Frame
- Hood
- Drive
- Solid-wall disk-type bowl
- Centripetal pump
- Motor



2.3 Technical data

Subject to modification!

<b>Bowl</b>	
Sludge space	0.75 l
Total volume	1.2 l
Speed - for densities of the product up to 1.05 kg/dm <sup>3</sup> (at 15 °C) and - for densities of the separated solids up to 1.4 kg/dm <sup>3</sup>	10 000 rpm
Speed for higher densities	consult the factory
Starting time	10 – 15 sec

<b>Centripetal pump</b>	
Output (depending on medium)	up to max. 1 400 l/h
Pressure head (depending on output)	up to max. 1.0 bar

<b>Line connections</b>	<b>OTC 2-02-</b>	<b>OTC 2-03-</b>
Product feed	R 1/2 in	R 1/2 in
Heavy liquid discharge	R 3/4 in	R 1/2 in
Light liquid discharge	R 1/2 in	R 3/4 in

<b>Max. separating temperature</b>	100 °C / 212 °F
------------------------------------	-----------------

<b>Motor</b>	
Power	1.1 kW
Speed at 50 Hz	3 000 rpm
Speed at 60 Hz	3 600 rpm
Design	IM V1
Enclosure	IP 55

<b>Drive</b>	50/60 Hz
Oil filling	approx. 1.3 l
	For oil quality see section 4.5.3



<b>Weight</b>	
Separator (with motor and bowl)	60 kg

### **Capacity**

The capacity of the separator depends on the

- viscosity
- temperature
- density
- impurity loading
- water content and
- required degree of purity of the product.

**You will find further data in the sales documents.**



## 2.4 Operating principles of General the separator

The separator bowl determines the field of application for which the separator is used. The general operating principle of a separator is explained first before describing the bowl in greater detail.

Liquid mixtures or liquid-solid mixtures can be separated

- in the gravity field of a settling tank or
- in the centrifugal field of a separator

provided that the product components have different densities.

Since the centrifugal field of a separator is considerably more effective than the gravity field of a settling tank, separation in a separator is a great deal faster than separation in a settling tank.

### 2.4.1 Operating principles of the bowl

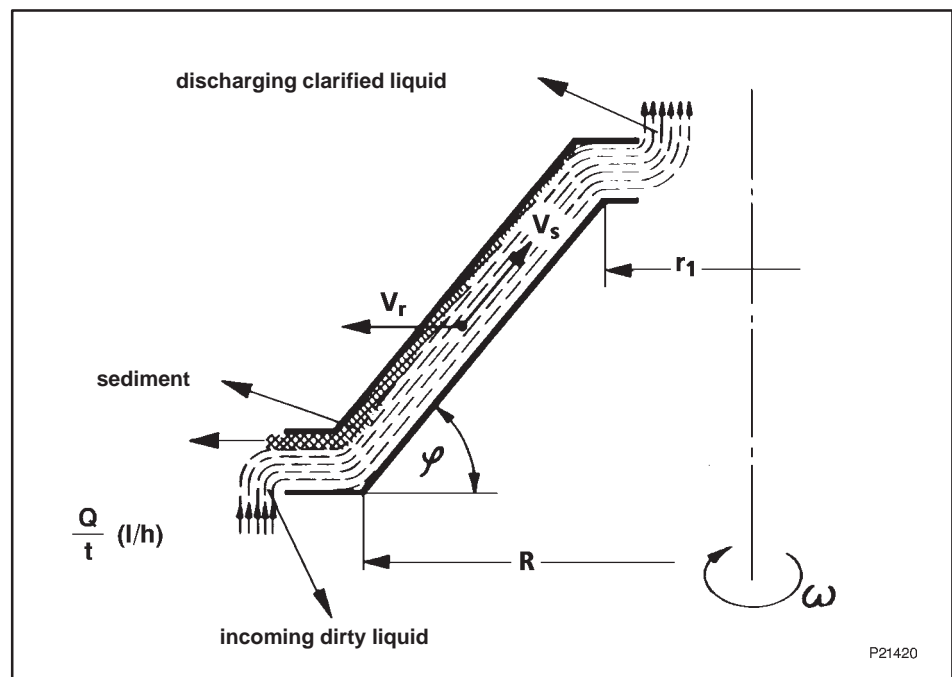


Fig. 39

Splitting up a liquid mixture made up of a light and heavy phase, e.g. oil-water, into its components takes place in the bowl in a disk stack.

The disk stack consists of a large number of conical disks placed on top of each other. Each disk is provided with spacers creating precisely defined narrow interspaces between the disks.

The whole centrifugation space therefore consists of many parallel individual spaces of low height. This means very small radial sedimentation paths for the product.

The solids

- collect on the upper wall of each interspace and
- slide down into the solids holding space.  
The smooth disk surfaces help the solids slide down easily, cleaning the disks at the same time.

The components of the liquid mixture (light and heavy phase) are separated in the centrifugation space.



### 2.4.2 Operating principles of the centripetal pump

The centripetal pump discharges the separated liquid under pressure. The operating principle of the centripetal pump is comparable to that of a centrifugal pump.

In the case of the centrifugal pump

- the impeller fitted with curved blades rotates in a stationary housing;
- the liquid to be conveyed flows from the center to the periphery through the blade channels.

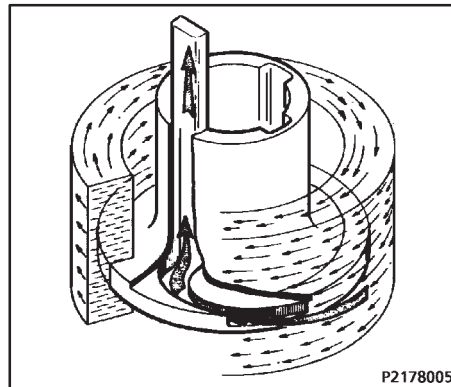


Fig. 40

The opposite is the case with the centripetal pump:

- it is firmly connected to the separator hood;
- Its disk provided with channels dips into the liquid rotating with the bowl.

The liquid is "peeled off" by the centripetal pump and flows through the channels from the periphery to the centre. By this means, the kinetic energy is converted to pressure energy allowing discharge of the liquid under pressure.

The depth of immersion of the centripetal pump in the liquid is shallow when the backpressure is low; however, it can be deepened by throttling the valve in the discharge line. This makes it possible to achieve

- a good liquid seal,
- absence of air and foam
- higher backpressure.

### 2.4.3 Operating principles of the drive

The separator is driven by a standard motor, design IM V1. Power is transmitted to the bowl spindle via the motor flat belt pulley and the drive belt.





## 2.5 The regulating ring

### Purpose of the regulating ring

Efficient separation of a liquid mixture is only possible when the bowl is adjusted to the density difference between the oil and water.

To accomplish this, select and fit a regulating ring from the furnished set of regulating rings (with different inner diameters) whose inner diameter corresponds to the difference in density between the two liquid components.

### Selection of the regulating rings for OTC 2-02-

Density of the oil at 20 °C kg/dm <sup>3</sup>	Inner diameter of the regulating ring mm
0.80 to 0.84	36
0.84 to 0.90	41
0.90 to 0.93	44

### Selection of the regulating rings for OTC 2-03-

Density of the oil at 20 °C kg/dm <sup>3</sup>	Inner diameter of the regulating ring mm
0.84 to 0.88	44
0.88 to 0.92	41



## 2.6 Conversion to clarifier mode - OTC 2-02-137

Depending on the application, the separator OTC 2-02-137 can be assembled to operate as purifier or clarifier.

Conversion of the purifier to a clarifier and vice versa is accomplished in a few simple steps (see diagram).

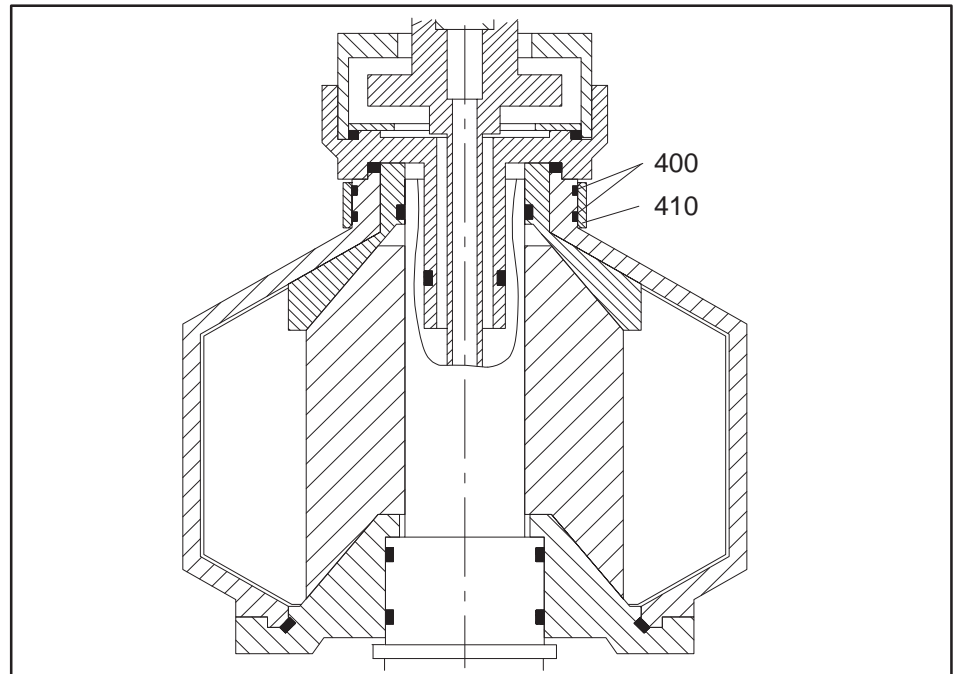


Fig. 41 - Conversion parts for clarifier operating mode

Pos.	Part-No.	Qty.	Designation
400	0007-2539-750	2	Gasket
410	2050-6631-000	1	Lock ring



- Refer to section 4.8.1, diagrams 103 and 104.



## 3 Operation

3.1	Technical information .....	28
3.1.1	Separation .....	28
3.1.2	General information on cleaning the bowl .....	28
3.1.3	Calculating the separating time .....	29
3.2	Before start-up .....	30
3.3	Starting the separator .....	30
3.4	Monitoring of operation .....	30
3.5	Shutting down the separator .....	31
3.6	Trouble shooting .....	32
3.6.1	Trouble shooting .....	32



**3.1 Technical information** Take note of the following sections:

**3.1.1 Separation**

The best separation efficiency is attained with a low viscosity of the product to be separated.

In the case of deviating products

- see sales documents or
- consult the factory.

**Water seal (only for OTC 2-02-)**

- The water seal which prevents light phase from discharging through the water discharge must be maintained during separation.

**3.1.2 General information on cleaning the bowl**

**When must the bowl be cleaned?**

The cleaning intervals depend on the nature of the solids and the product.

The intervals between the cleaning cycles (separating time) can be determined by experiment as follows:



**Before beginning the test the solids holding space must be emptied of solids.**

- Adjust the separator
  - to the desired throughput capacity and
  - feed a given product volume for a given time (3 or 5 hours - depending on the solids loading of the product).
- Shut down separator.
- Remove the bowl shell.
- The solids volume accumulated in the solids holding space will enable you to judge at what intervals cleaning is necessary. It should be noted that you must not wait until the solids holding space is completely full as otherwise the separating efficiency will deteriorate.
- When product with a different solids loading is to be separated, it is recommended to repeat the test after cleaning the bowl.
- Excessively long separating times are only possible when the solids loading of the product is low.



### 3.1.3 Calculating the separating time

Calculating the separating time between the cleaning cycles is only possible when the solids loading in the product remains constant.

#### Example for calculating the separating time:

<b>Given:</b>	Test separating time	$t_V = 3$ hrs
	Solids volume accumulation during the test separating time	$V_F = 0.1$ l
	Sludge space volume	$V = 0.75$ l
<b>Wanted:</b>	Max. separating time	$t_{max} = ?$ hrs.

The maximum separating time is calculated as follows:

$$\begin{aligned} t_{max} &= \frac{t_V \times V}{V_F} \\ &= \frac{3 \times 0.75}{0.1} \\ &= 22.5 \text{ hours} \end{aligned}$$



*Note:*

In this example, a cleaning interval of **20 hours** is required to achieve a uniform product quality.



### 3.2 Before start-up



- **Note:**

- Safety precautions in chapter 1.
- Only feed product conforming to the specifications on the nameplate.

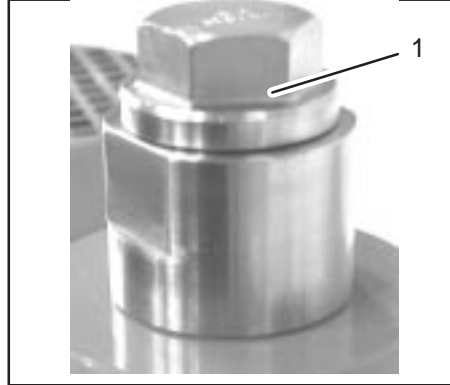


Fig. 42

- **Only for OTC 2-02- (water seal)**

The bowl must be filled with water (approx. 1 litre). To do this:

- Unscrew screw plug 1.
- Fill in approx. 1 litre of water with the beaker.
- Screw in screw plug 1 again (**right-hand thread**).

- **Check that**

- the machine is correctly assembled.
- the hoses and hose pipes are connected and not damaged (4.5.2).
- the screws for fastening the hood are tight.
- the hex head screws on the cover sheet at the lower section of the frame are tight.
- the feed and discharge lines are connected.
- the drive chamber is filled with oil as described in section 4.5.3.

### 3.3 Starting the separator

- See section 3.2.
- Switch on the motor.
- Open the feed and discharge lines.

### 3.4 Monitoring of operation

- 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
- Pay attention to section 4.5.1.



**3.5 Shutting down the separator**

- Close feed and discharge lines.
- Switch off the motor.
- After switching off the motor, wait for **approx. 10 minutes** until the separator is at a standstill!
- **Do not loosen any part of the machine until it has come to a standstill!**



**3.6 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".

**3.6.1 Trouble shooting**

Fault	Possible causes	Remedies
The bowl does not come up to rated speed or takes too long to do so.	Oil has dripped down the spindle onto the drive belt.	Degrease belt, belt contact surface of spindle and the flat belt pulley.
	Motor is incorrectly connected.	Check connection.
	Drive belt has stretched and is sliding on the bowl spindle.	Replace drive belt.
	Drive belt has not been correctly fitted.	Check the position of the drive belt on flat belt pulley and spindle.
	Dirt has accumulated in the hood causing braking of the bowl.	Clean the separator.
The bowl speed drops during operation.	The motor speed drops during operation.	Check motor and line voltage.
Uneven run of the centrifuge.	Bowl is out of balance for the following reasons:  1. The separated dirt has deposited unevenly in the bowl.  2. Bowl is not correctly assembled.  3. Bowl parts are damaged.	<b>For pos. 1 - 3:</b> • Shut down separator. • Close feed and discharge lines.
		Clean bowl.
		Assemble bowl properly.
	Ball bearings are worn.	Replace damaged bearings. <b>ATTENTION!</b> As spindle bearings use only the ball bearings specified in the parts list.



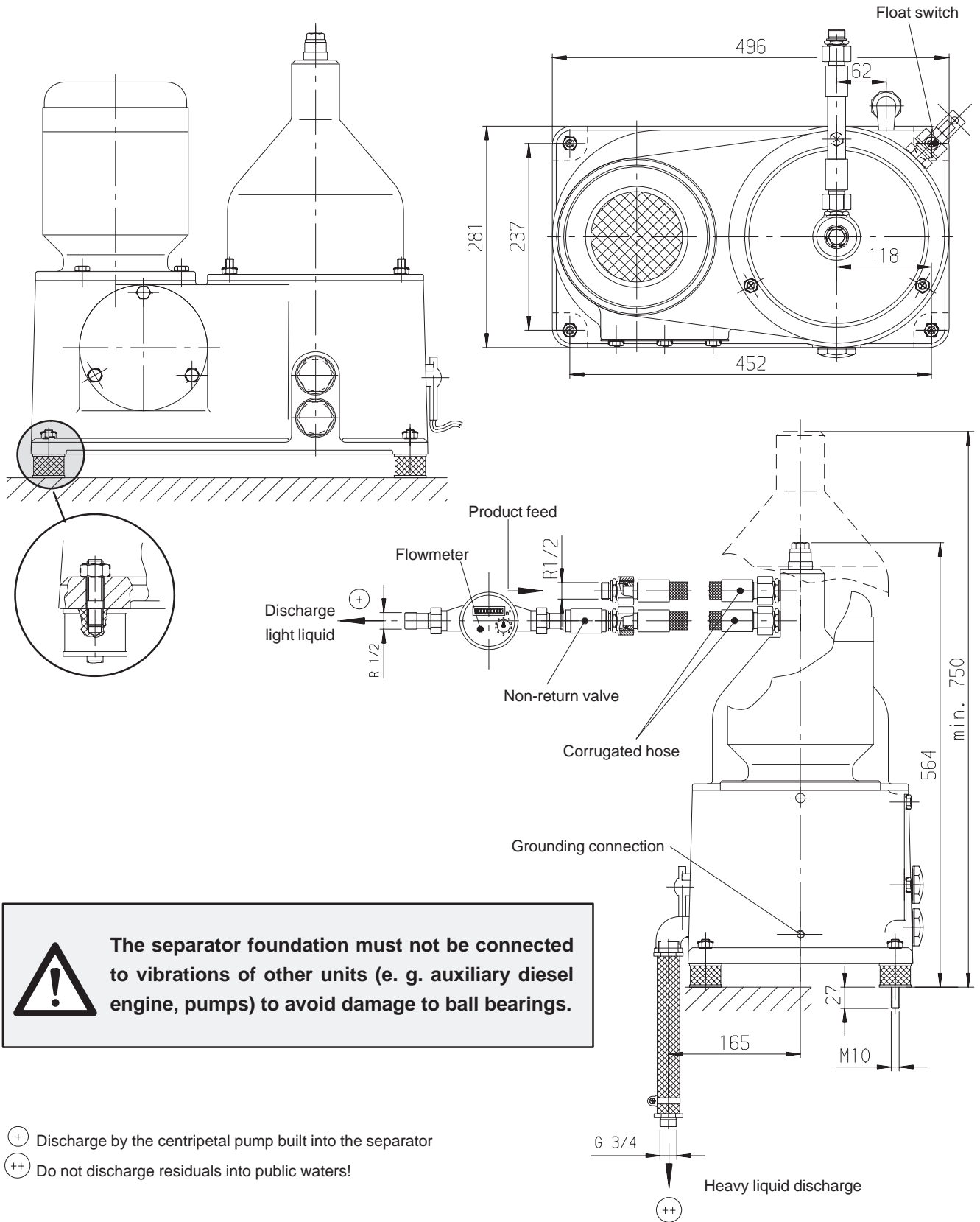


## 4 Installation, maintenance and repair

4.1	Installation of the separator OTC 2-02-137 .....	34
4.2	Installation of the separator OTC 2-03-107 .....	35
4.3	Installing the separator .....	36
4.4	Motor .....	37
4.4.1	Direction of rotation of the bowl .....	38
4.4.2	Speed and starting time of the bowl .....	39
4.5	Maintenance and lubrication .....	40
4.5.1	Maintenance schedule .....	40
4.5.2	Hoses and hose pipes .....	42
4.5.3	Lubrication .....	43
4.5.4	Lubrication Chart .....	45
4.6	Dismantling the separator .....	46
4.7	Cleaning the bowl .....	47
4.8	Important instructions for assembling the separator .....	50
4.8.1	Assembling the separator .....	51



4.1 Installation of the separator OTC 2-02-137



**⚠ The separator foundation must not be connected to vibrations of other units (e. g. auxiliary diesel engine, pumps) to avoid damage to ball bearings.**

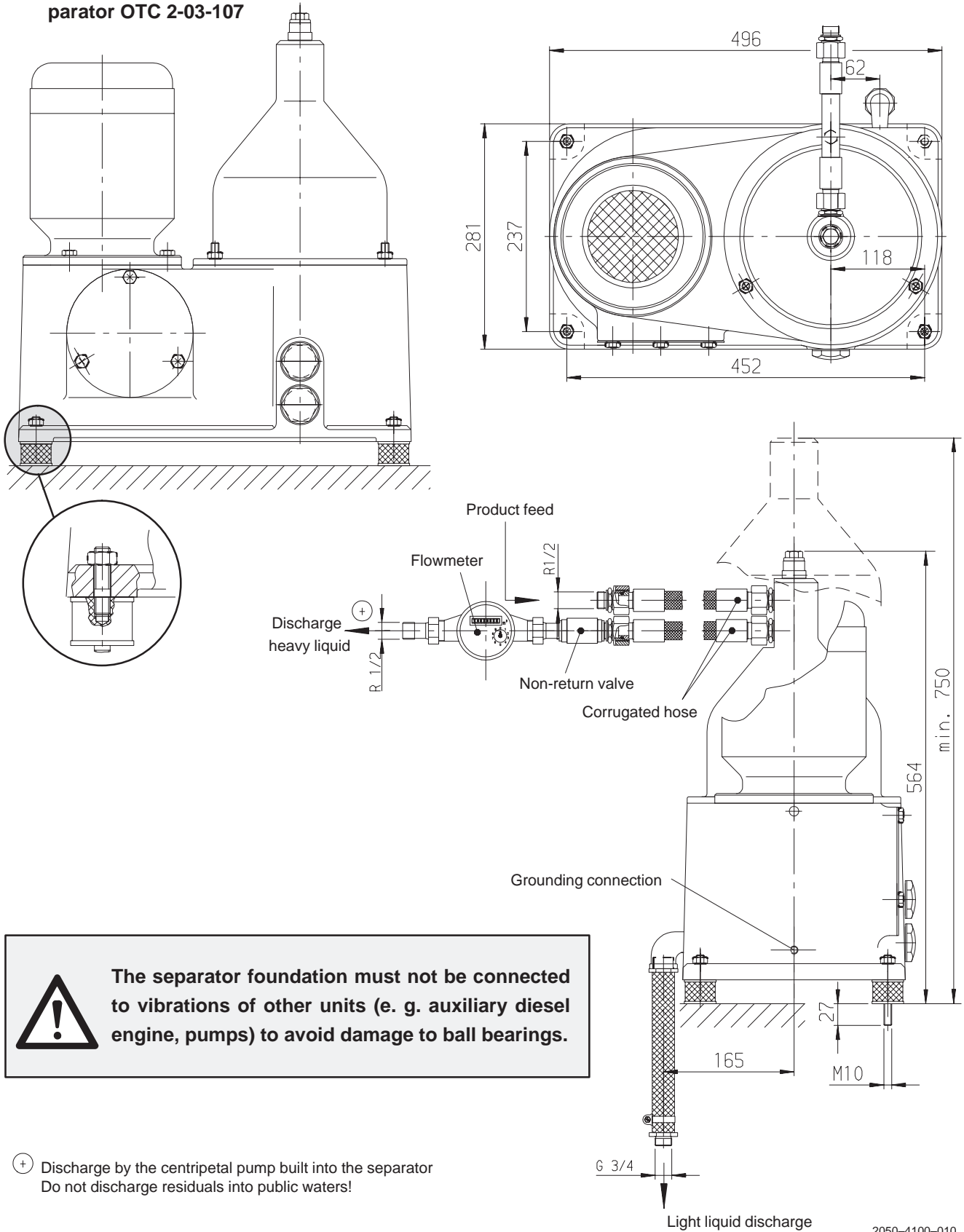
- (+) Discharge by the centripetal pump built into the separator
- (++) Do not discharge residuals into public waters!

Fig. 43 - Dimensioned drawing OTC 2-02-137

2050-4100-000  
**Subject to modification!**



4.2 Installation of the separator OTC 2-03-107



2050-4100-010

Fig. 44 - Dimensioned drawing OTC 2-03-107

Subject to modification!



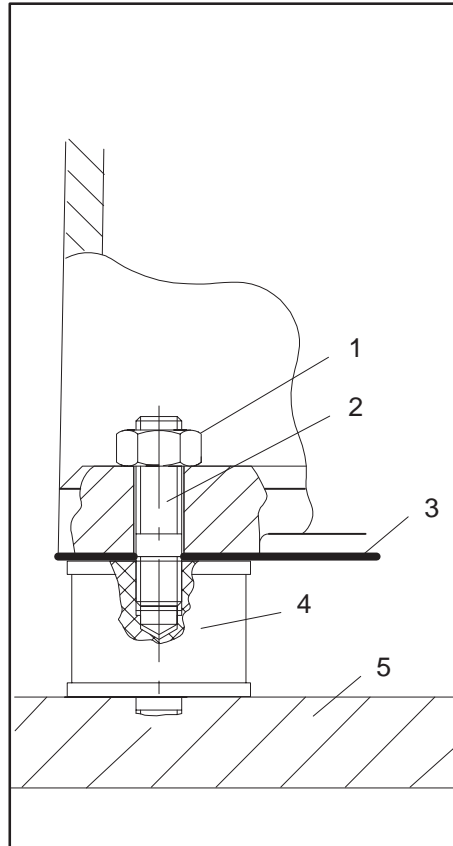
**4.3 Installing the separator**

Prior to installing the separator, make sure that

- sufficient room 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.



**To avoid accidents, fit the guard (protection against contact with rotating parts) beneath the separator as shown in the installation proposal!**



- Screw rubber-metal cushion 4 into foundation 5.
- Screw studs 2 into rubber-metal cushions 4.
- Mount the protective plate 3 over the studs.
- Place the separator on the protective plate and
- **firmly** bolt with hexagon nuts 1.

*Fig. 45 - Installation proposal*



#### 4.4 Motor

The separator is driven by a three-phase AC motor.

Motor Part-No.	Power	Voltage	Frequency	Motor connection	Rated current
5889-7420-129	1.1 kW	220 - 240 V	50 Hz	Delta	4.3 A
		380 - 420 V	50 Hz	Star	2.5 A
	1.3 kW	440 - 480 V	60 Hz	Star	2.5 A
5889-7420-139	1.1 kW	380 - 420 V	50 Hz	Delta	2.5 A
		660 - 690 V	50 Hz	Star	1.5 A
	1.3 kW	440 - 480 V	60 Hz	Delta	2.5 A
5889-7420-179	1.1 kW	220 V	60 Hz	Delta	4.7 A
	1.3 kW	460 V	60 Hz	Star	2.5 A



#### Fuse protection by the customer

The customer must provide for adequate motor fuse protection as specified in the electro documentation.

#### Shipboard operation

- When used on board of ships, the installation guidelines of the corresponding classification societies must be followed.
- When using ship wiring cables, cable entry must be via marine-type cable glands.



#### 4.4.1 Direction of rotation of the bowl



The motor must not be switched on before the drive chamber has been filled with oil (see section 4.5.3).



Fig. 46



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

If the direction of rotation is incorrect, have two lead-in wires interchanged by a qualified electrician.

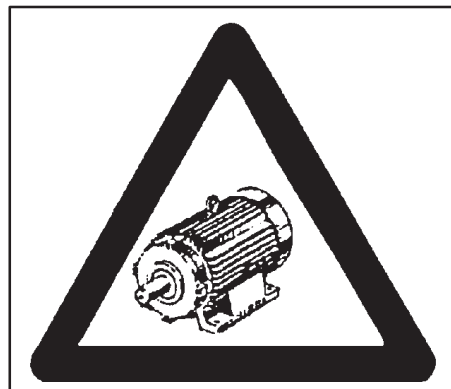


Fig. 47

**In case of frequency converter operation**

- Before working on the motor, bear in mind that residual voltage may be present.
- With this in mind,
  - refer to the documentation of the frequency converter.
  - have suitable protective measures implemented by qualified personnel.



**4.4.2 Speed and starting time of the bowl**

<b>Speed</b> - for densities of the product up to max. 1.05 kg/dm <sup>3</sup> and - for densities of the separated solids up to max. 1.4 kg/dm <sup>3</sup>		See nameplate
<b>Starting time</b>	Direct on-line starting	10 – 15 sec
	Frequency converter operation	90 sec

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

If the densities exceed those stated above, check with the factory.

**In case of frequency converter operation**

The frequency converter has a reliable frequency limiting facility to prevent running the machine at inadmissibly high bowl speeds.



Fig. 48

- The separator may not be operated without frequency converter.
- Do not under any circumstances manipulate the frequency converter to exceed the admissible bowl speed (see nameplate).
- Check from time to time that
  - the bowl speed (see nameplate) and
  - the motor frequency (see nameplate and frequency converter display!) coincides with the speed of the separator.



4.5 Maintenance and lubrication

4.5.1 Maintenance schedule

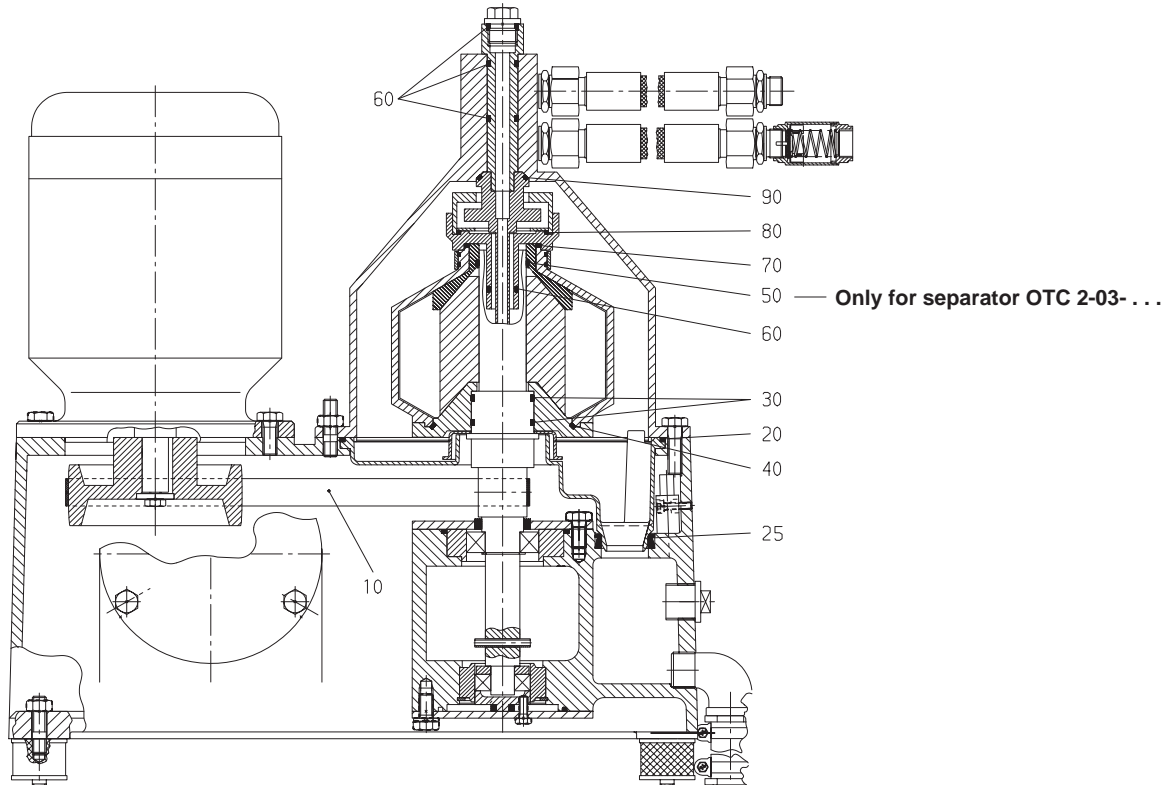


Fig. 49 - Set of spare parts "bowl/hood" (operation: 1 year or 8000 hours)

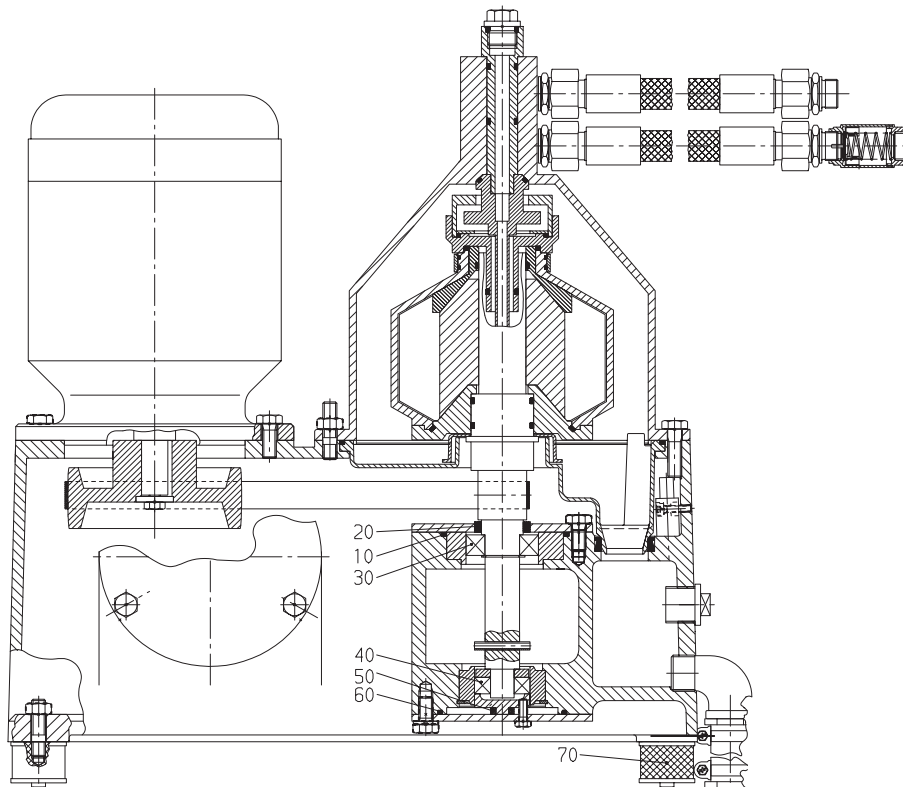



Fig. 50 - Set of spare parts "drive" (operation: 2 years or 16000 hours).





Maintenance <sup>①</sup>		Operations	Remark
		<b>To assure correct functioning and operating safety,</b> • pay attention to the following points during servicing: - Oil level      - Pressures      - Vibrations      - Starting time - Temperatures      - Leakage      - Current consumption      - Hoses and hose pipes • after dismantling, grease the contact and guide surfaces of the main components of the bowl. <sup>②</sup>	
after operating hours	at the latest after		
when required - product-dependent		Clean bowl parts (see section 4.7).	 Check bowl parts for corrosion.
4 000 12 000 20 000 28 000 36 000 44 000	6 months 1 1/2 years 2 1/2 years 3 1/2 years 4 1/2 years 5 1/2 years	Renew the following gaskets (see fig. 49): Pos. 30, 40, 50, 60, 70, 80, 90	<ul style="list-style-type: none"> <li>Use set of spares "bowl/hood" (operation: 1 year or 8 000 hours). See section <i>Parts list</i>.</li> </ul>
8 000 24 000 40 000	1 year 3 years 5 years	Renew gaskets (see fig. 49).	<ul style="list-style-type: none"> <li>Use set of spares "bowl/hood" (operation: 1 year or 8 000 hours). See section <i>Parts list</i>.</li> </ul>
		Replace drive belt 10 (see fig. 49).	
		Check grooved ball bearing 30 and 40 (see fig. 50).	
		Oil change	when using mineral oil <sup>③</sup>
16 000 32 000 48 000	2 years 4 years 6 years	Renew gaskets (see fig. 49).	<ul style="list-style-type: none"> <li>Use set of spares "bowl/hood" (operation: 1 year or 8 000 hours). See section <i>Parts list</i>.</li> </ul>
		Replace drive belt 10 (see fig. 49).	
		Renew gaskets 10, 50, 60 (see fig. 50).	<ul style="list-style-type: none"> <li>Use set of spares "drive" (operation: 2 years or 16 000 hours). See section <i>Parts list</i>.</li> </ul>
		Renew sealing ring 20 (see fig. 50).	
		Replace grooved ball bearing 30 and 40 (see fig. 50).	
		Renew rubber-metal cushions 70 (see fig. 50).	
		Oil change	when using mineral oil <sup>③</sup>
Oil change	when using synthetic oil <sup>③</sup>		
48 000	6 years	<b>We recommend having the machines checked by a WS service engineer.</b>	

**Legend:**

① = We recommend keeping to these maintenance intervals.

② = see section 4.5.4 - Lubrication schedule

③ = see section 4.5.3 - Oil quality



#### 4.5.2 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 becoming dislodged from the fitting.
- Corrosion of the fitting diminishing function and strength.



### 4.5.3 Lubrication

The spindle bearings are lubricated from a central oil bath.

#### OIL QUALITY (mineral oil)

The mineral gear oil tested by Westfalia Separator AG 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>
Viscosity class	SAE 30
Viscosity (at 40 °C)	100 ± 10 mm <sup>2</sup> /s (cSt)
Part-No.	0015-0003-080



The viscosity class SAE 30 covers a larger viscosity range than stated here. However, the oils used for the lubrication of the separator may only have the viscosity stated here.

EP oils (oils with high-pressure additives) may only be used if they have no corrosive effect on copper base alloys (see attached table of lubricants).

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



Do not use mineral motor vehicle or engine oils.

#### OIL QUALITY (Synthetic oil)

Use the synthetic lube oil tested by Westfalia Separator AG!

Designation according to ISO	Mobil SHC 626
Viscosity class	ISO-VG 68
Viscosity	
- (at 40 °C)	65 mm <sup>2</sup> /s
- at 100 °C	10.4 mm <sup>2</sup> /s
Viscosity index (VI)	147
Density (at 15 °C)	0.857 g/ml
based on	Polyalphaolefin
Part-No.	-
Dispose of the oil as per instructions of the oil manufacturer.	



Do not use synthetic motor vehicle or engine oils.



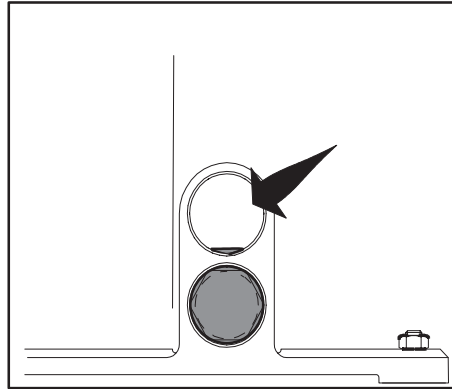


Fig. 51

**OIL FILL, OIL LEVEL**

Before the first start-up of the centrifuge

- Fill the drive chamber with oil through the oil fill hole.

Quantity	approx. 1.3 l
Oil level - standstill	Lower edge of oil fill hole
Oil level - operation	Visible oil movements in the sight glass of the oil fill hole

**OIL CHECK**

- Check the oil level every week!
- From time to time undo oil drain screw and check whether the oil bath contains water. If the oil shows a milky colouring (emulsification), change the oil immediately.

**OIL CHANGE**

- Change oil after approximately
  - 8000 operating hours at at the latest after 1 year (mineral oil).
  - 16000 operating hours or at the latest after 2 years (synthetic oil).
- Clean sight glass.



4.5.4 Lubrication Chart

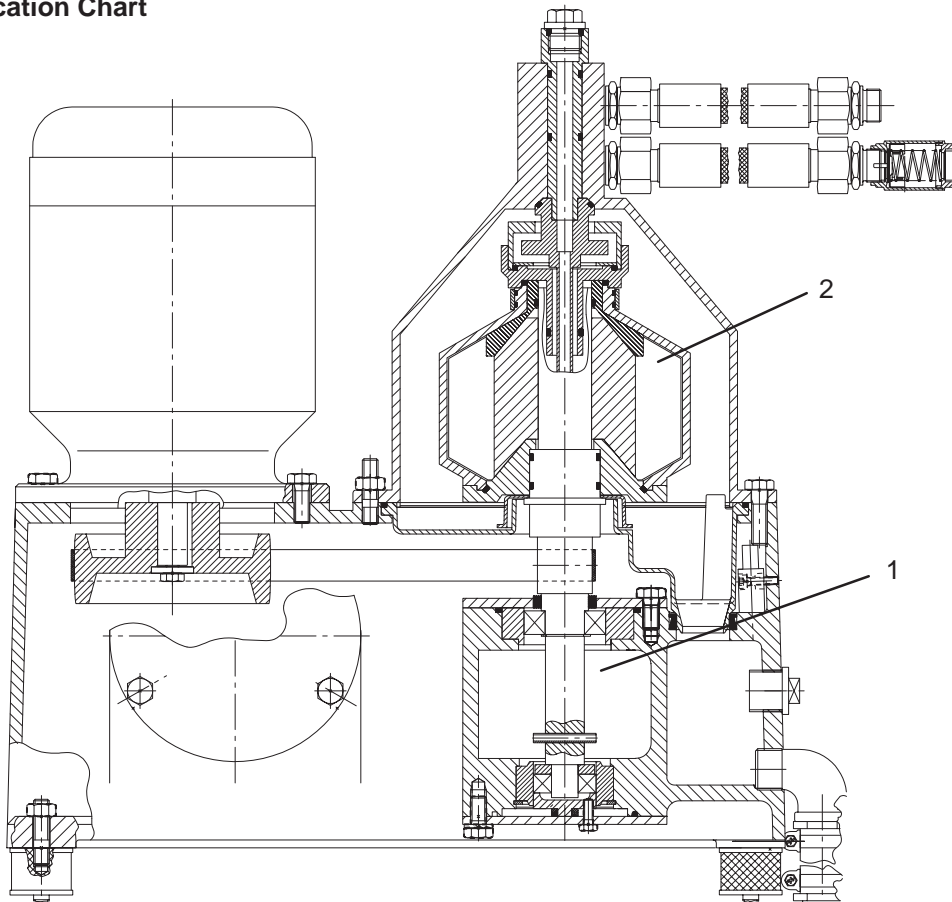





Fig. 52 - Lubrication schedule

Lubricating point	Lubricant		Lubrication interval	Amount of lubricant	Lubrication point
	Designation	Designation			
1	Gear and circulation oil CLP 100 - DIN 51517 (mineral)	 DIN 51502	after 8 000 operating hours or at the latest after 1 year	1 300 cm <sup>3</sup>	Drive chamber
1	Gear and circulation oil DIN 51519 (synthetic)	Mobil SHC 626 ISO VG 68	after 16 000 operating hours or at the latest after 2 years	1 300 cm <sup>3</sup>	Drive chamber
2		 <sup>1</sup> DIN 51502	before each assembly		Gaskets, threads and sliding surfaces

<sup>1</sup>  Mixture of roller bearing grease and molybdenum disulfide paste (ratio 4 : 1)



- Check oil level regularly through sight glass.
- Manual lubrication



#### 4.6 Dismantling the separator



- Switch off the main switch and secure against re-starting with locking devices.
- After switching off the motor, wait for **approx. 10 minutes** until the separator is at a standstill!
- **To prevent accidents, do not loosen any parts before the separator has come to a standstill!**
- Handle all separator parts with care; always put them on a rubber mat or wooden pallet.
- For tools see chapter *Parts list*.
- For removal, proceed in the reverse order to fitting (see section 4.8.1).



#### 4.7 Cleaning the bowl

- The bowl has to be cleaned:
  - after each shut-down and
  - when the sludge space is filled with dirt.

##### Cleaning the solids holding space

- For tools see chapter *Parts list*.

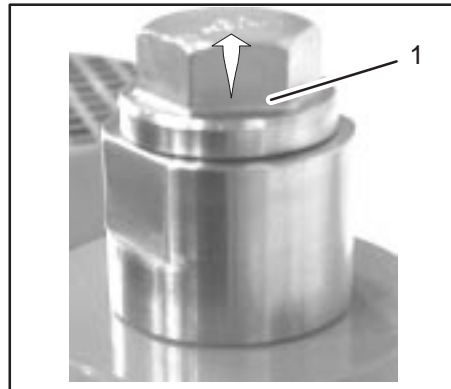


Fig. 53

- Unscrew screw plug 1 (**right-hand thread**).

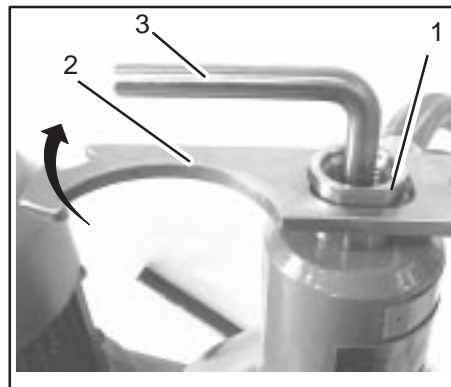


Fig. 54

- Loosen handle connection piece 1:
  - by turning hook wrench 2 clock-wise and
  - holding socket wrench 3.



Fig. 55

- Take out handle connection piece 1.



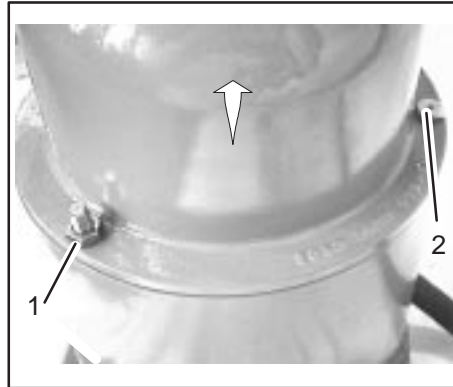


Fig. 56

- Unscrew hexagon nuts 1 and hex head screw 2.
- Lift off hood.



Fig. 57

- Arrest bottom with hook wrench 1 and hexagon nut 2.  
To do this:
  - Place hook wrench 1 over a stud in the lower section of the frame and register it in a groove in the bottom.
- Undo threaded ring 4 with mounted centripetal pump 6 and centripetal pump chamber cover 5 using hook wrench 3 (**left-hand thread**) and screw on by hand by one turn.

*Tools:*

Two hook wrenches

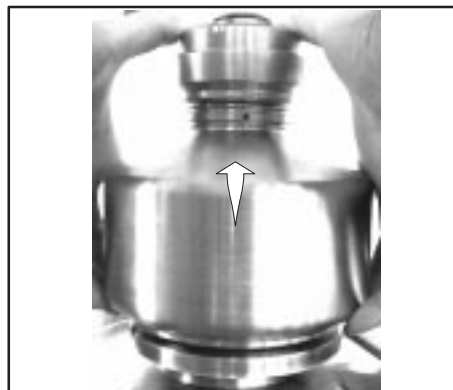


Fig. 58

- Press bowl shell against the threaded ring.  
The liquid contents flow off into the discharge channel.

**CAUTION!**

**Parts and liquid can be hot!**

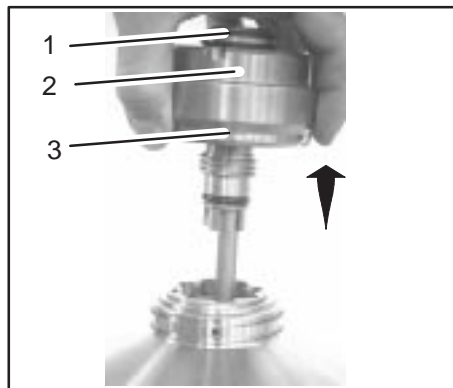


Fig. 59

- Unscrew threaded ring 3 with mounted centripetal pump 1 and centripetal pump chamber cover 2.

**When necessary after further dismantling of the parts:**

- Clean centripetal pump 1 and centripetal pump chamber cover 2.





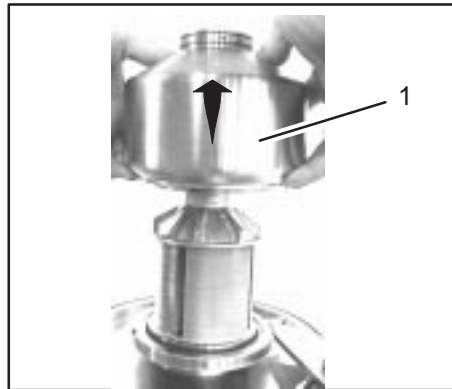


Fig. 60

- Lift off bowl shell 1.
- Carefully clean bowl shell 1 with wooden, plastic or copper scraper.

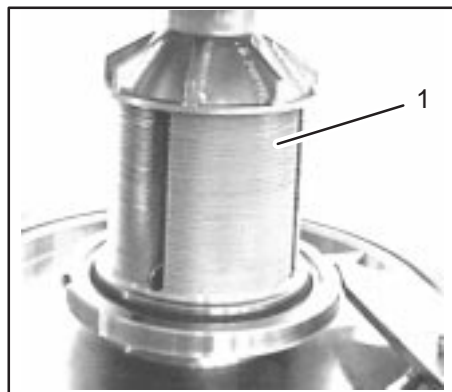


Fig. 61

**If the disk stack is very soiled:**

- Clean disk stack 1.

- After cleaning the bowl, assemble the bowl in reverse order.



#### 4.8 Important instructions for assembling the se- parator



#### Caution: Danger of imbalance!

If the bowl is not correctly assembled or properly cleaned, forces can occur in the high-speed rotating bowl which endanger the operating safety of the separator!

Therefore, the instructions for cleaning (section 4.7) and assembly (section 4.8.1) must be followed exactly.



#### Note:

- Before assembling the bowl, make sure that the guide and contact surfaces of the separator parts are clean.
- Grease guide surfaces as specified in the lubrication schedule.
- Avoid damaging the separator parts when fitting and removing by
  - exact positioning,
  - avoiding diagonal pull!
- Do not use force to fit or remove parts.
- Before fitting the gaskets, check gasket grooves and gaskets for cleanness and wear.
- After fitting check that
  - the gaskets are not twisted,
  - the gaskets are evenly stretched around the grooves.
- Handle all bowl parts with care.
- If the plant consists of several separators, make sure that parts of different bowls do not get interchanged.  
The parts are marked with
  - the serial number or
  - the last three digits of the serial number



4.8.1 Assembling the separator

- For tools see section *Parts list*.
- For lubrication schedule see section 4.5.4.

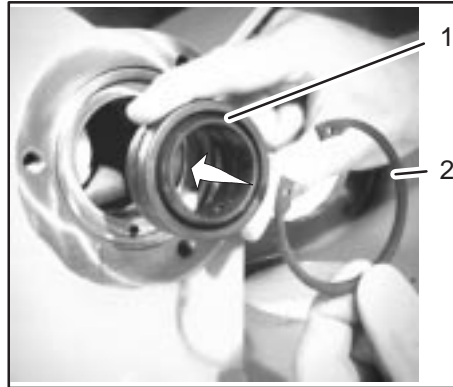


Fig. 62

- Turn lower section of frame through 90°.
- Fit pivoting bearing 1 and retaining ring 2.

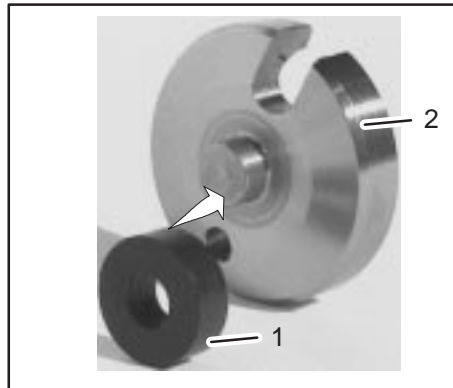


Fig. 63

- Place gasket 1 on the shoulder of bottom bearing pressure piece 2.

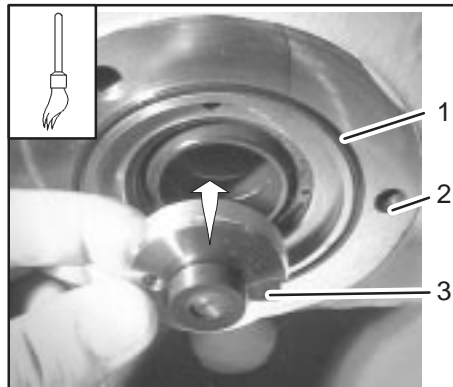


Fig. 64

- Insert gasket 1 in the groove.
- Put bottom bearing pressure piece 3 with inserted gasket into the pivoting bearing.

**The recesses in bottom bearing pressure piece 3 must point to hole 2.**

- Grease gasket 1 as per lubrication schedule.



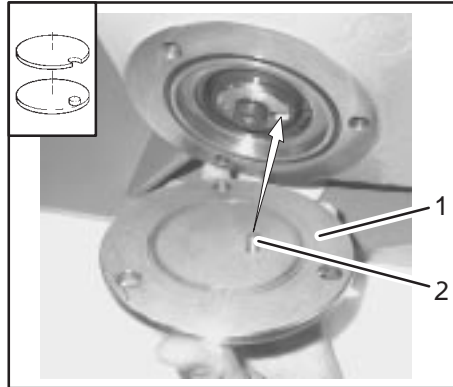


Fig. 65

- Mount bearing cover 1.
- Pay attention to correct positioning!

*Note:*

Hex head screw 2 is glued in with Loctite 275.

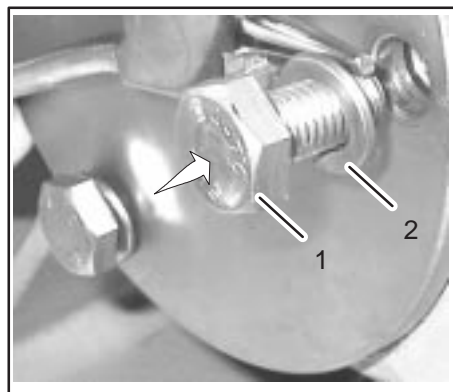


Fig. 66

- Screw hex head screws 1 with lock washers 2 into the bearing cover.

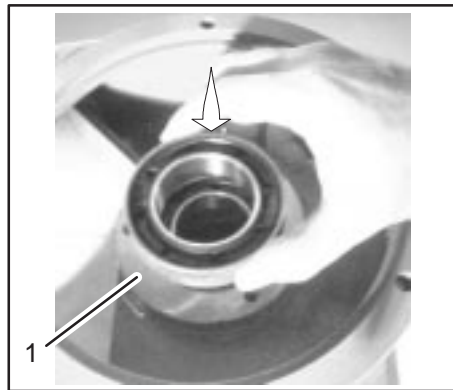


Fig. 67

- Turn lower section of frame through 90°.
- Carefully fit rubber-metal cushion 1.

**The inner protruding pipe shoulder must be directed downwards!**

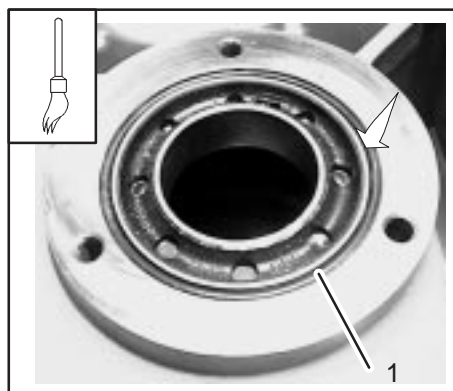


Fig. 68

- Insert gasket 1 in the groove.
- Grease gasket as specified in the lubrication schedule.



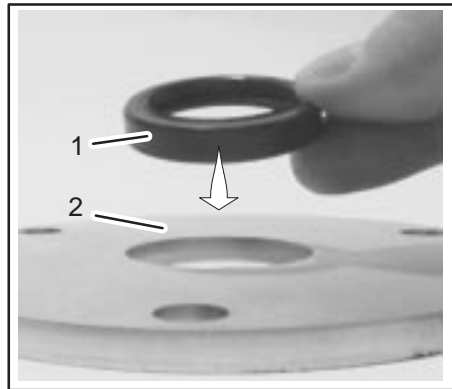


Fig. 69

- Fit sealing ring 1 in bearing cover 2.

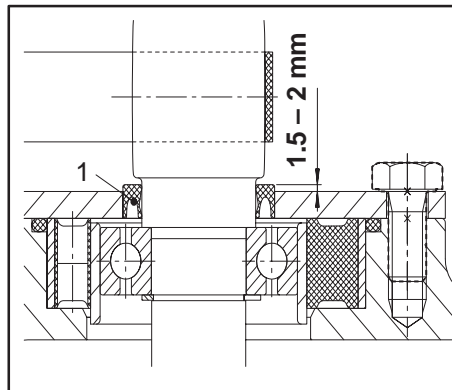


Fig. 70

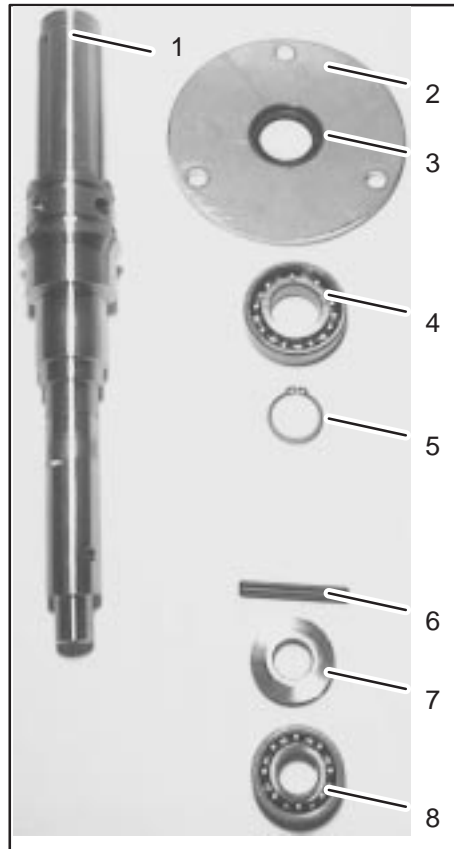
- The fitted sealing ring must protrude above the top of the bearing cover by **1.5 - 2 mm**.

- When fitting the drive parts
  - Thoroughly clean the drive chamber.
  - Check spindle ball bearings.



**Use only the ball bearings specified in the parts list.**





- Assemble spindle 1:
  - Fit onto spindle 1 :
  - bearing cover 2 with fitted lip seal 3
  - grooved ball bearing 4
  - retaining ring 5
  - dowel pin 6
  - ball bearing protection ring 7
  - grooved ball bearing 8

Fig. 71

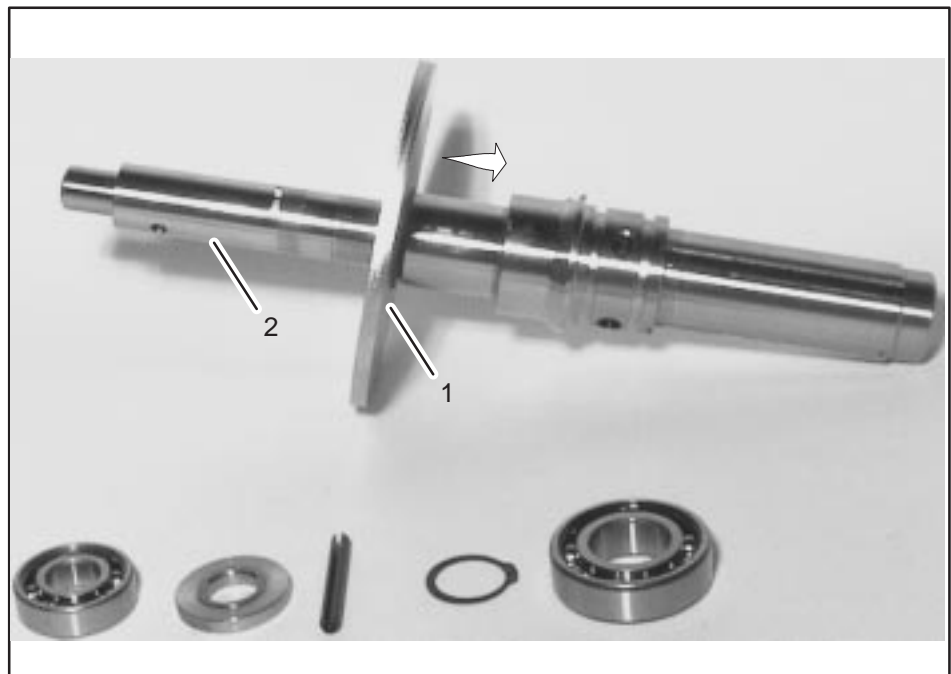


Fig. 72

- Place bearing cover 1 with fitted sealing ring on spindle 2.
- The protruding lip seal must point to the centre of the spindle (see Fig. 70).



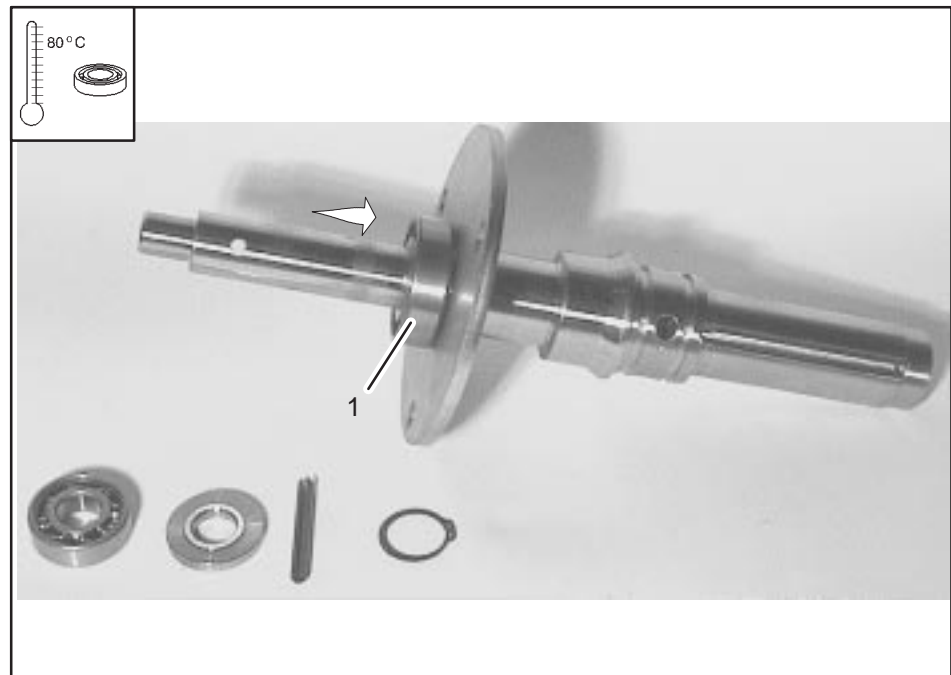


Fig. 73

- Heat grooved ball bearings 1
  - in oil to 80 °C and
  - slide them onto the spindle.

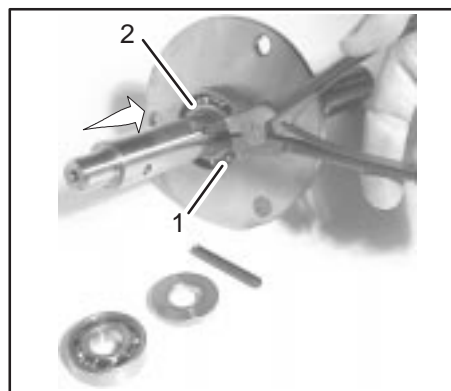


Fig. 74

- Fit retaining ring 1 and
- lock grooved ball bearing 2 with retaining ring 1.



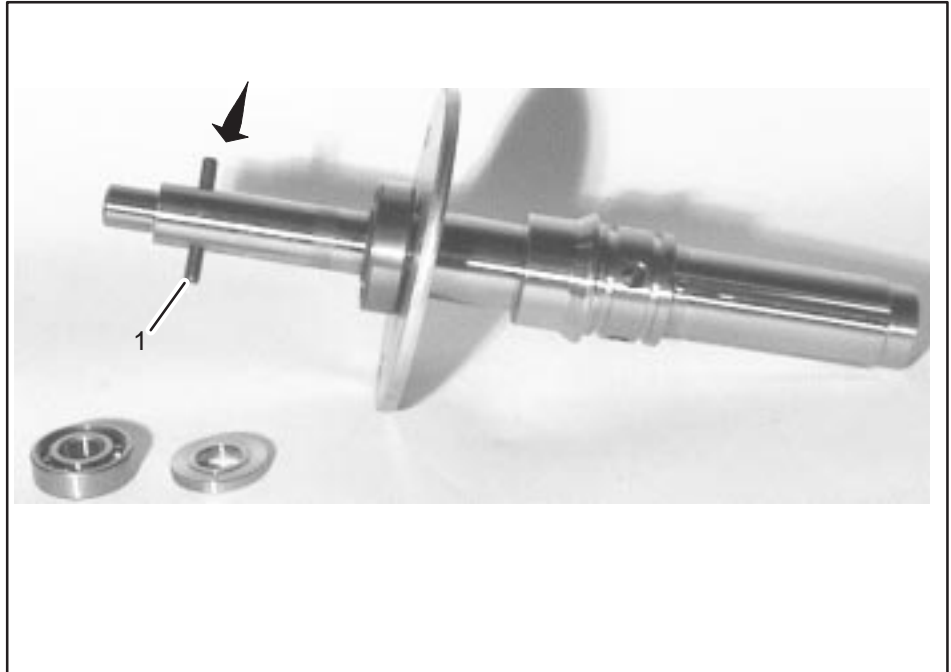


Fig. 75

- Fit dowel pin 1.



Fig. 76

- Mount ball bearing protection ring 1.





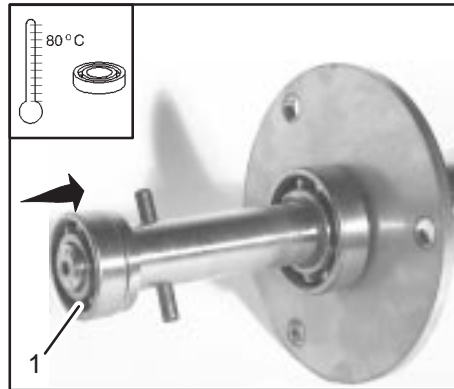


Fig. 77

- Heat grooved ball bearings 1
  - in oil to 80 °C and
  - slide them onto the spindle.



Fig. 78

- Carefully fit assembled spindle into the pivoting bearing and rubber-metal cushion.

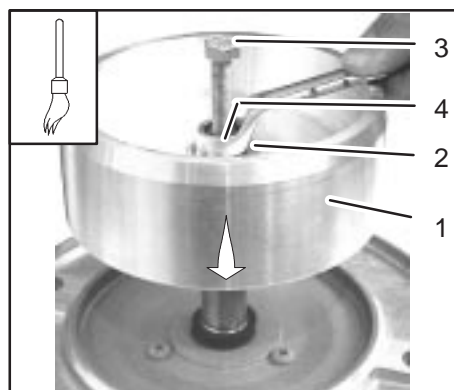


Fig. 79

- Turn motor through 180° .
- Mount flat belt pulley 1 and washer 2 with hex head screw 3 and nut 4 on the motor shaft end.
- Pay attention to feather key groove.



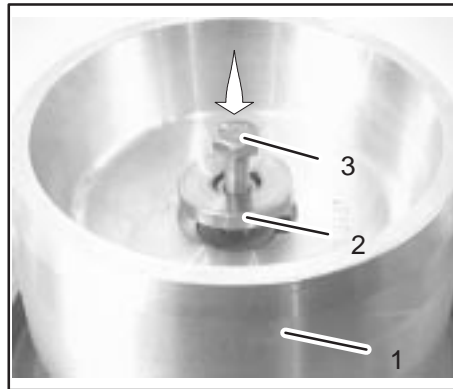


Fig. 80

- Screw tight flat belt pulley 1 with washer 2 and hex head screw 3.

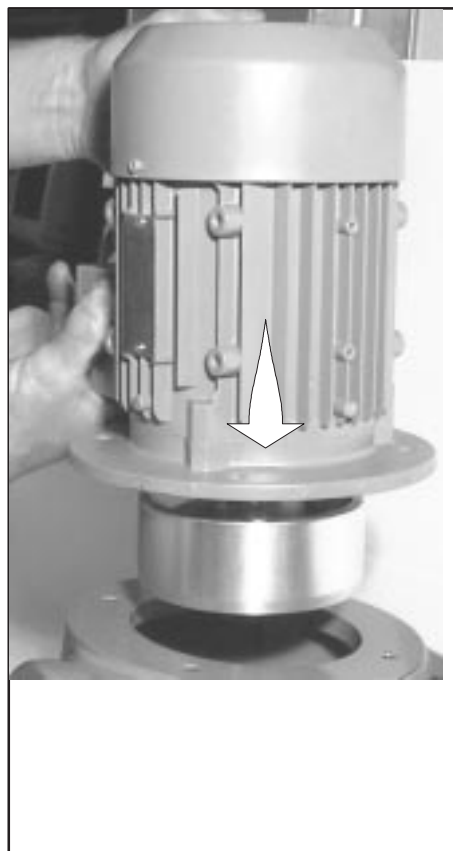


Fig. 81

- **Carefully** place motor with fitted flat belt pulley on the lower section of frame.
- Do not yet register motor flange in the opening in the lower section of the frame.

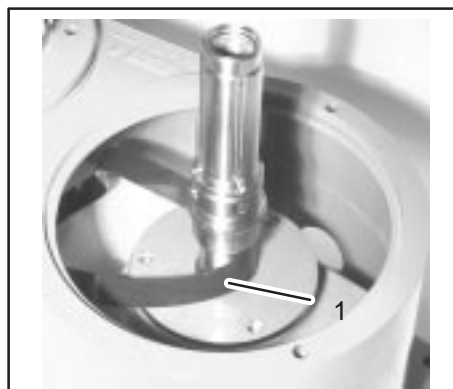


Fig. 82

- Degrease belt contact surfaces of spindle and flat belt pulley.
- Place the drive belt on the spindle and flat belt pulley through the openings in the lower section of the frame.



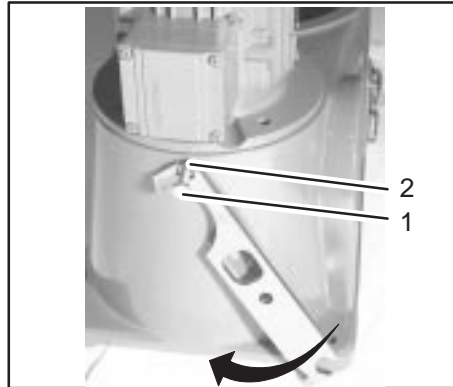


Fig. 83

- Screw hex head screw 1 with hexagon nut 2 through the frame hole into the taphole of the flat belt pulley.
- Tension the drive belt by turning hexagon nut 2 **clockwise** until the motor flange is locked in place in the opening in the lower section of the frame.

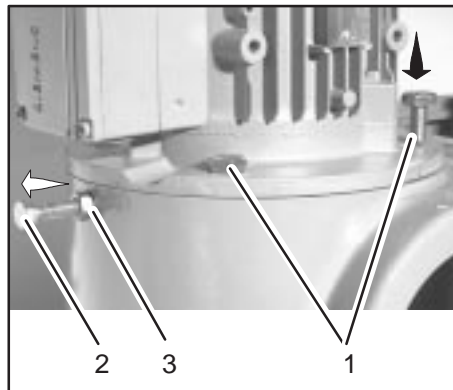


Fig. 84

- Secure the motor using hex head screws 1.
- Unscrew hex head screw 2 with hexagon nut 3 from the flat belt pulley.

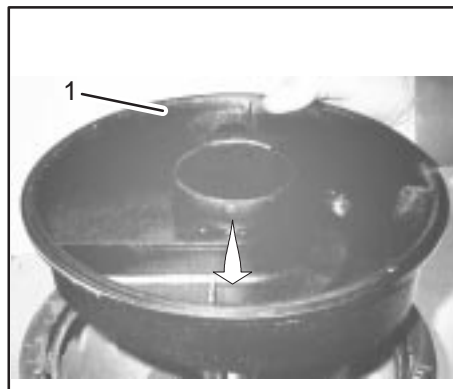


Fig. 85

- Place discharge channel 1 in the lower section of frame and

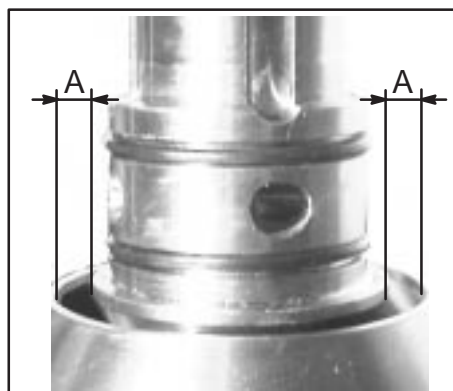
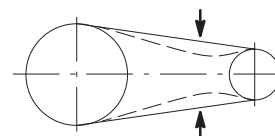


Fig. 86

- check that the spindle is centric (dimension  $A \approx$  dimension  $A$ ).

If the spindle is offset relative to the motor,

- stretch the drive belts by repeatedly pressing them together.



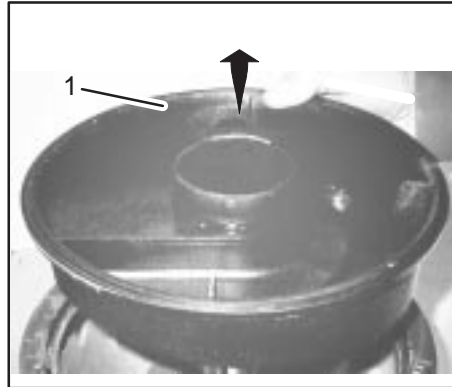


Fig. 87

- Take out discharge channel 1.

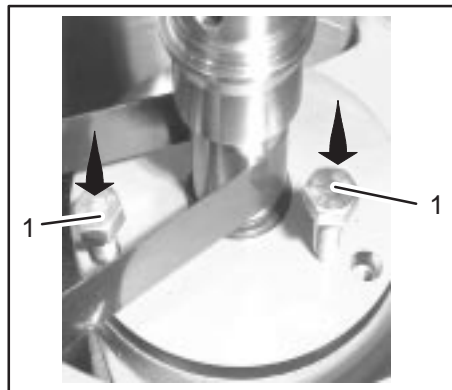


Fig. 88

- Screw tight bearing cover with hex head screws 1.
- Check that the spindle can be **easily** rotated.

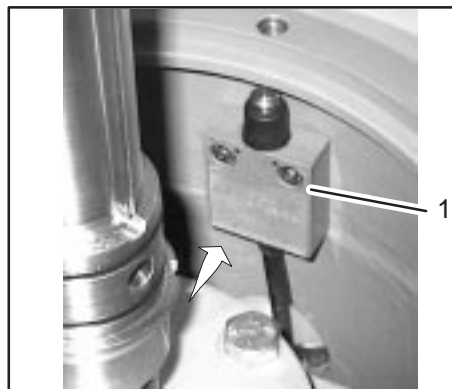


Fig. 89

- Fit hood end switch 1 in the lower section of frame.

*Note:*

The cylindrical screws of the hood end switch are glued in with Loctite 275.

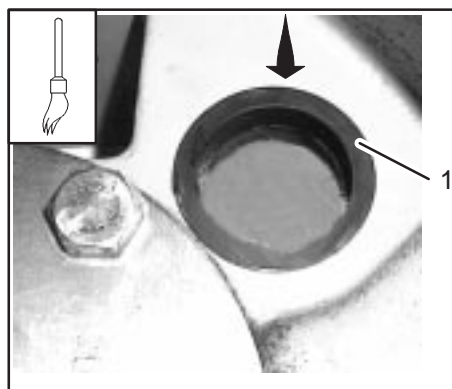


Fig. 90

- Insert gasket 1 in the bore.
- Grease gasket as specified in the lubrication schedule.



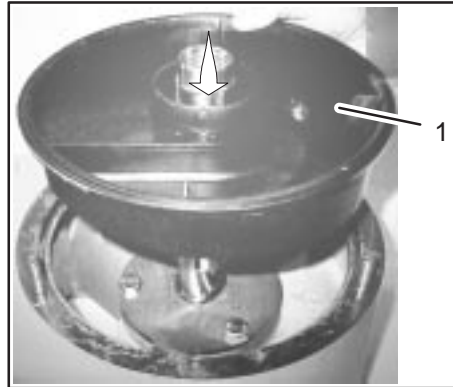


Fig. 91

- Place discharge channel 1 in the opening in the lower section of the frame.
- Introduce discharge connection into the bore.

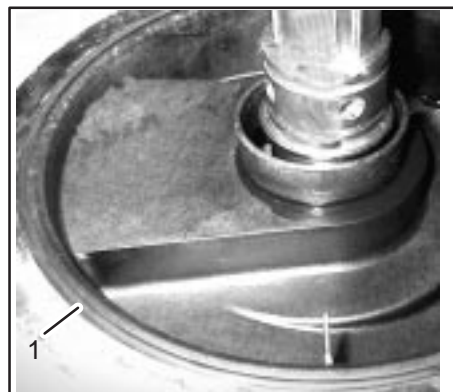


Fig. 92

- Insert gasket 1 in the groove.

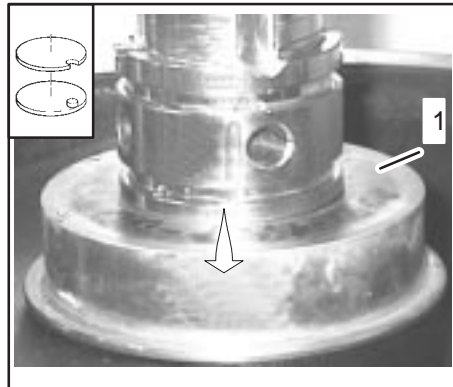


Fig. 93

**Only for OTC 2-03-:**

- Fit spindle cap 1.
- Pay attention to correct positioning!

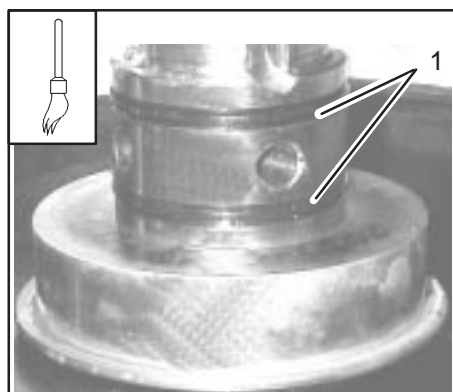


Fig. 94

- Insert gaskets 1 in the grooves of the spindle.
- Grease gaskets and guide surfaces as specified in the lubrication schedule.



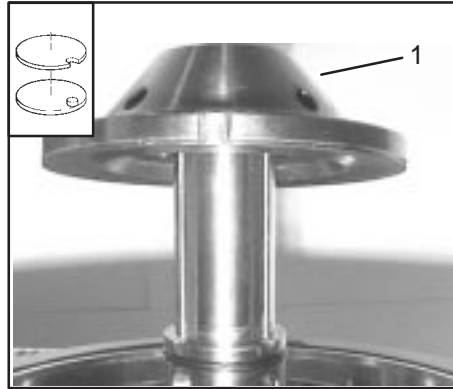


Fig. 95

- Place bottom 1 on the spindle.
- Pay attention to correct positioning!



Fig. 96

- Insert gasket 1 in the groove.
- Grease gasket as specified in the lubrication schedule.

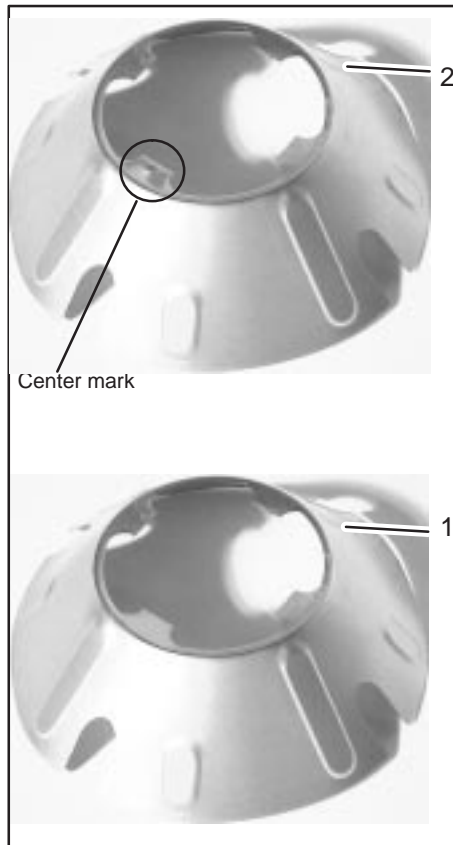
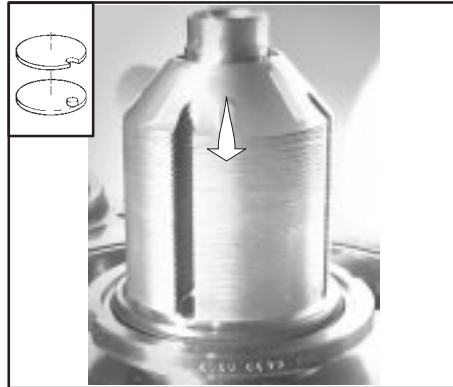


Fig. 97

Order of disks:

- Disk 1 without mark (Part-No.: 2050-6669-000).
- Disk 2 with center mark (Part-No.: 2050-6669-010).





- Place disks 1 and 2 alternately on the spindle (see fig. 97).
- Pay attention to correct positioning!

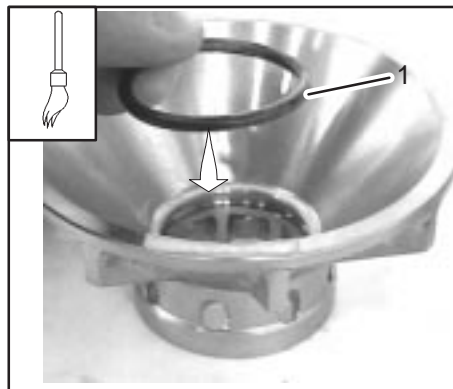
Fig. 98



**Only for OTC 2-02-:**

- Place separating disk 1 on the disk stack.

Fig. 99



**Only for OTC 2-03-:**

- Insert gasket 1 in the groove of the separating disk.
- Grease gasket as specified in the lubrication schedule.

Fig. 100



**Only for OTC 2-03-:**

- Place separating disk 1 with inserted gasket on the disk stack.

Fig. 101



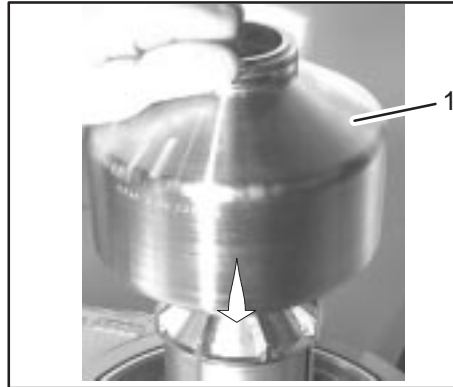


Fig. 102

- Fit bowl shell 1.

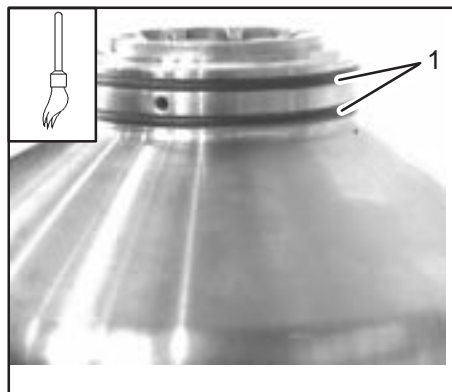


Fig. 103

**Only for OTC 2-03- or  
OTC 2-02-137 as clarifier:**

- Insert gaskets 1 in the grooves of the bowl shell.
- Grease gaskets and guide surfaces as specified in the lubrication schedule.

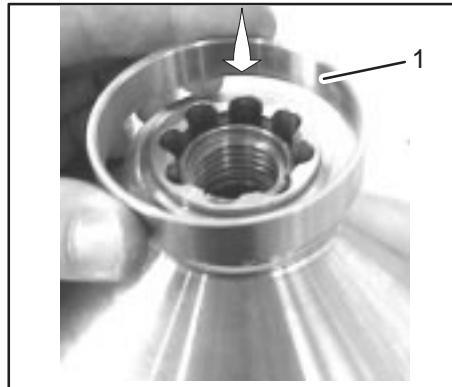


Fig. 104

**Only for OTC 2-03- or  
OTC 2-02-137 as clarifier:**

- Fit lock ring 1.

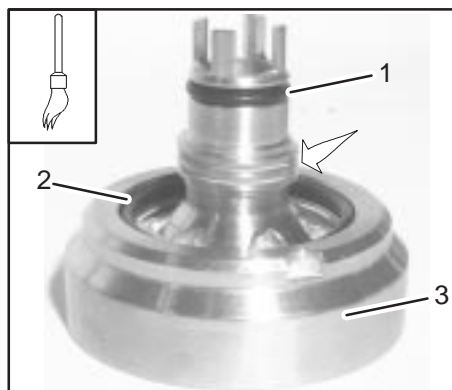


Fig. 105

- Insert gaskets 1 and 2 in the grooves of threaded ring 3.
- Grease gaskets, guide surfaces and threads as specified in the lubrication schedule.





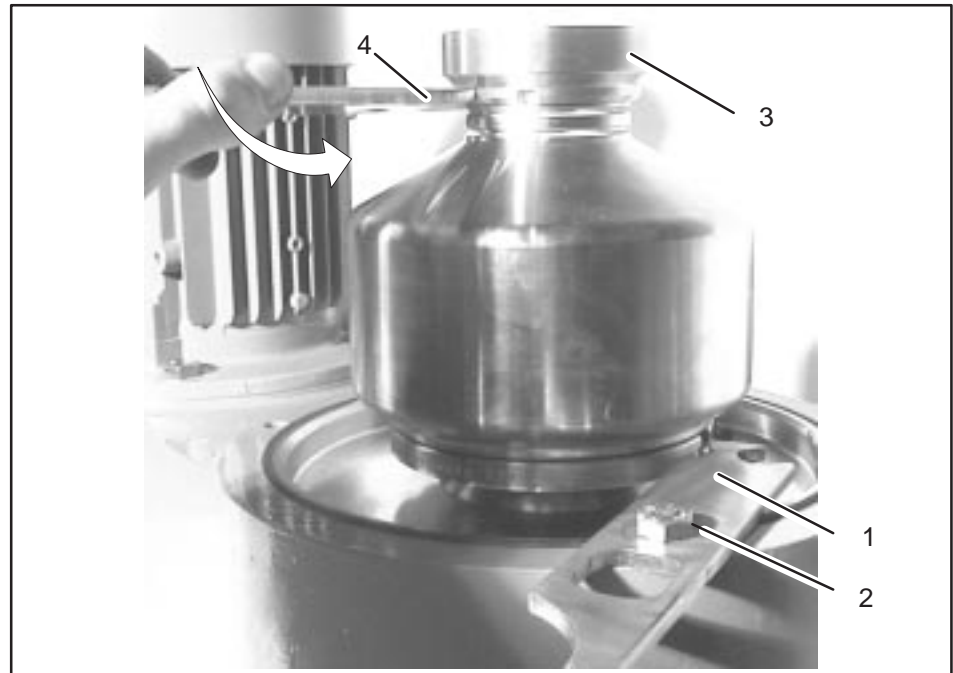


Fig. 106

- Arrest bottom with hook wrench 1 and hexagon nut 2.
- Screw in complete threaded ring 3 with hook wrench 4 (**left-hand thread**).

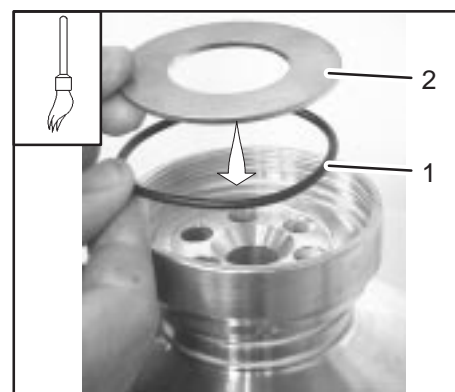


Fig. 107

- Insert gasket 1 in the groove of the threaded ring.
- Grease gasket as specified in the lubrication schedule.
- Mount the regulating ring selected from the set of regulating rings (see section 2.5).

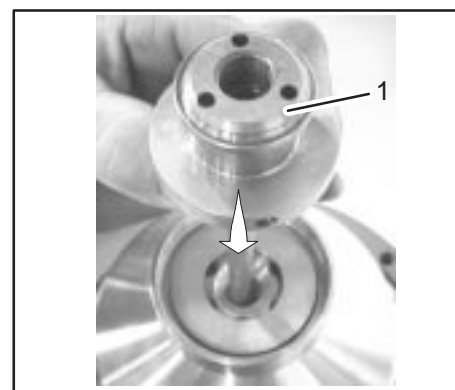


Fig. 108

- Fit centripetal pump 1.



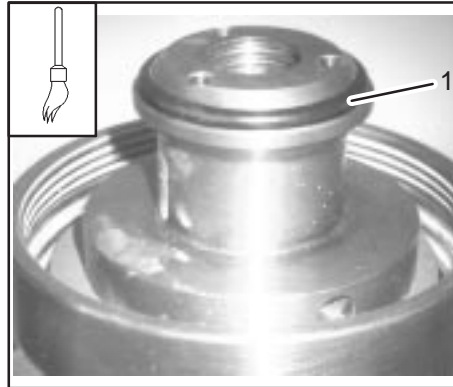


Fig. 109

- Insert gasket 1 in the groove of the centrifetal pump.
- Grease gasket as specified in the lubrication schedule.

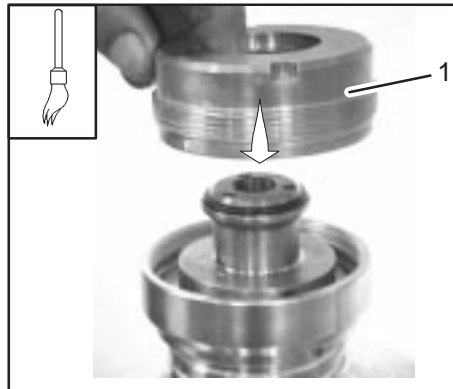


Fig. 110

- Fit centrifetal pump chamber cover 1.
- Grease threads and guide surfaces as specified in the lubrication schedule.

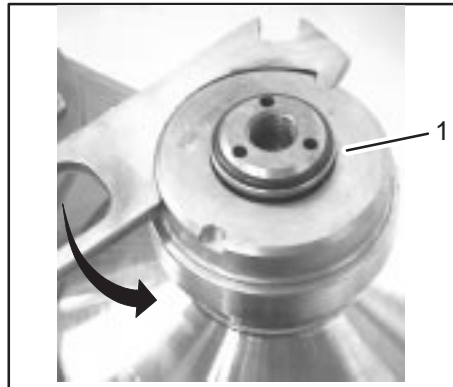


Fig. 111

- Bolt centrifetal pump chamber cover 1 using the hook wrench (**left-hand thread**).

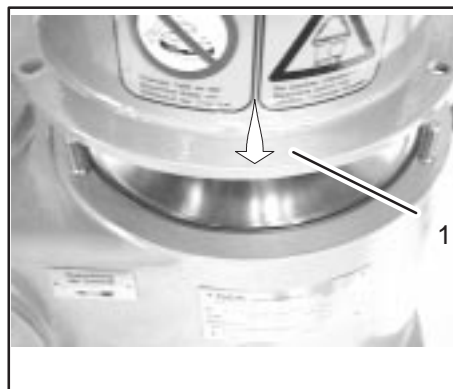


Fig. 112

- Mount hood 1.
- The connecting threads of the corrugated hoses are directed towards the rear!



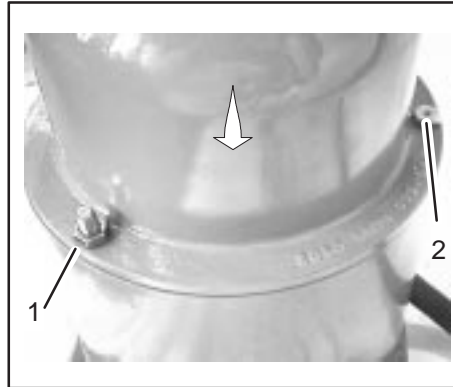


Fig. 113

- Screw tight hood with hexagon nuts 1 and hex head screw 2.

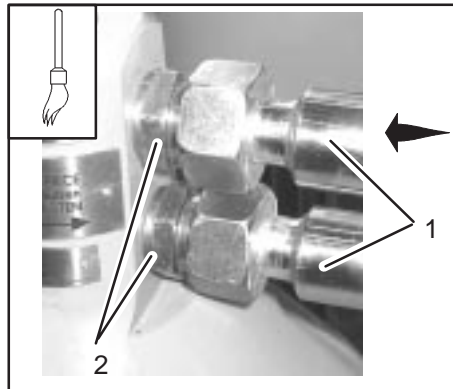


Fig. 114

- Grease threads as specified in the lubrication schedule.
- Connect corrugated hose 1.

*Note:*  
Connections 2 are glued in with Loctite 245.

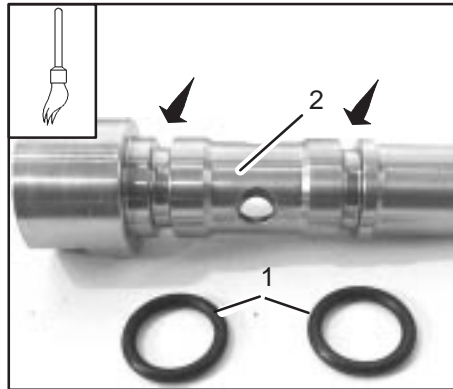


Fig. 115

- Insert gaskets 1 in the grooves of handle connection piece 2.
- Grease gaskets, guide surfaces and threads as specified in the lubrication schedule.



Fig. 116

- Insert handle connection piece 1 with fitted gaskets in the hood.



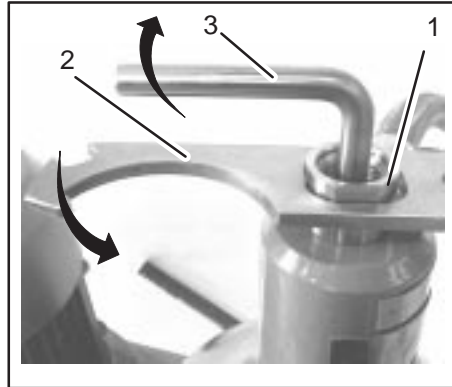


Fig. 117

- Tighten handle connection piece 1:
  - by turning hook wrench 2 counter-clockwise and
  - holding socket wrench 3.

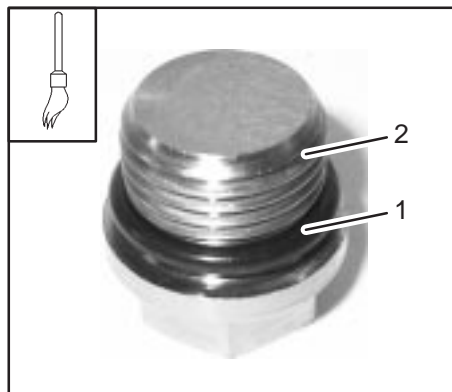


Fig. 118

- Insert gasket 1 in the groove of screw plug 2.
- Grease gasket and threads as specified in the lubrication schedule.

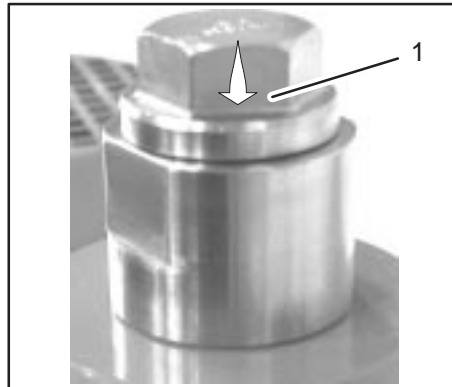


Fig. 119

- Screw screw plug 1 with inserted gasket into the hood (**right-hand thread**).

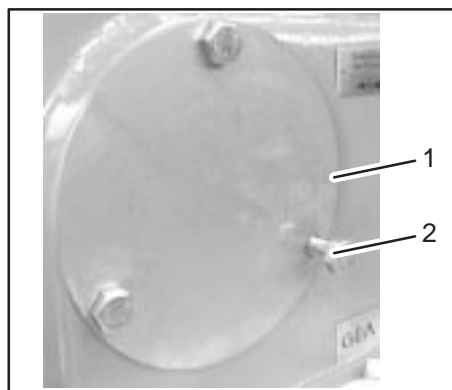


Fig. 120

- Fasten cover sheet 1 with the three hex head screws 2.



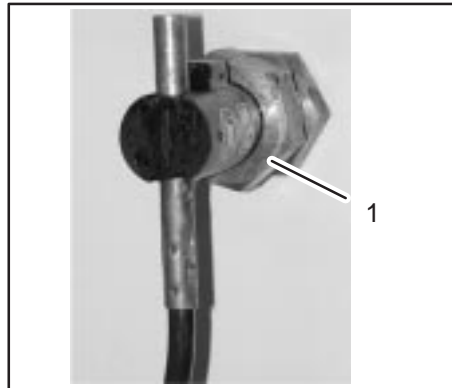


Fig. 121

**Only for OTC 2-02:-**

- Fit float switch 1 in the lower section of frame.
- Pay attention to the correct mounting position of float switch 1!

*Note:*

The thread is coated with Loctite 245.

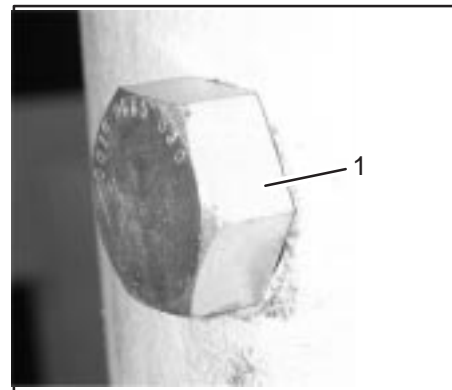


Fig. 122

**Only for OTC 2-03:-**

The plug 1 is glued in with Loctite 245.

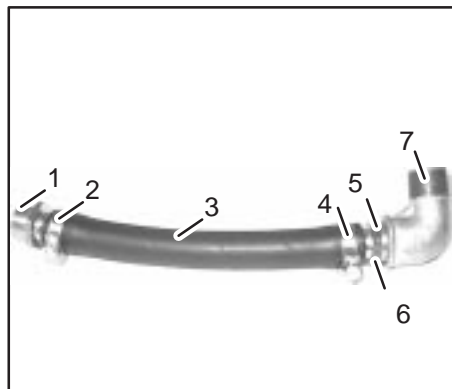


Fig. 123

**Only for OTC 2-02:-**

- Assembling the discharge line:
  - Provide hose outlet 5 with disk 6 and screw into elbow 6.
  - Attach hose 3 to hose outlet 5 and screw tight with hose clip 4.
  - Attach hose outlet 1 to hose 3 and screw tight with hose clip 2.
- Seal all threads with Loctite 245.

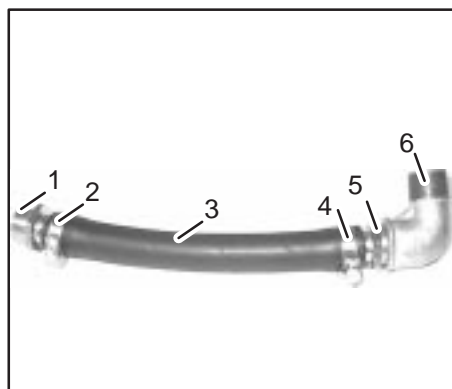
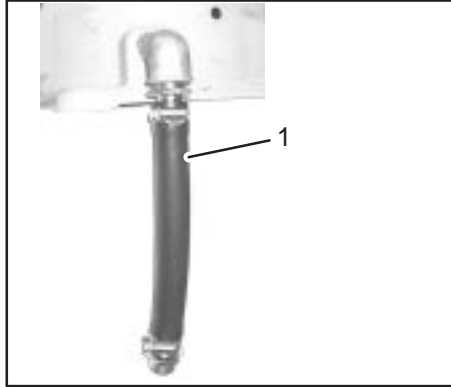


Fig. 124

**Only for OTC 2-03:-**

- Assembling the discharge line:
  - Screw hose outlet 5 into elbow 6.
  - Attach hose 3 to hose outlet 5 and screw tight with hose clip 4.
  - Attach hose outlet 1 to hose 3 and screw tight with hose clip 2.
- Seal all threads with Loctite 245.





- Connect discharge line 1.

Fig. 125



## 5 Accessories

5.1	Starter box .....	72
5.1.1	Electrical connection .....	73
5.2	Hood end switch .....	75
5.3	Frequency converter (FC) .....	76
5.3.1	A.C. design 230 VAC - 1 Ph - N - PEN .....	77
5.3.2	A.C. design 115 VAC - 1 Ph - N - PEN .....	77
5.3.3	D.C. design 24 VDC - 1 Ph - N .....	78
5.4	Transformer (option) .....	79
5.5	Inverter (option) .....	80
5.5.1	Solenoid valve (option) .....	81



### 5.1 Starter box

The starter box

- must be in the vicinity of the machine and
- installed in accordance with the following instructions and wiring proposals.

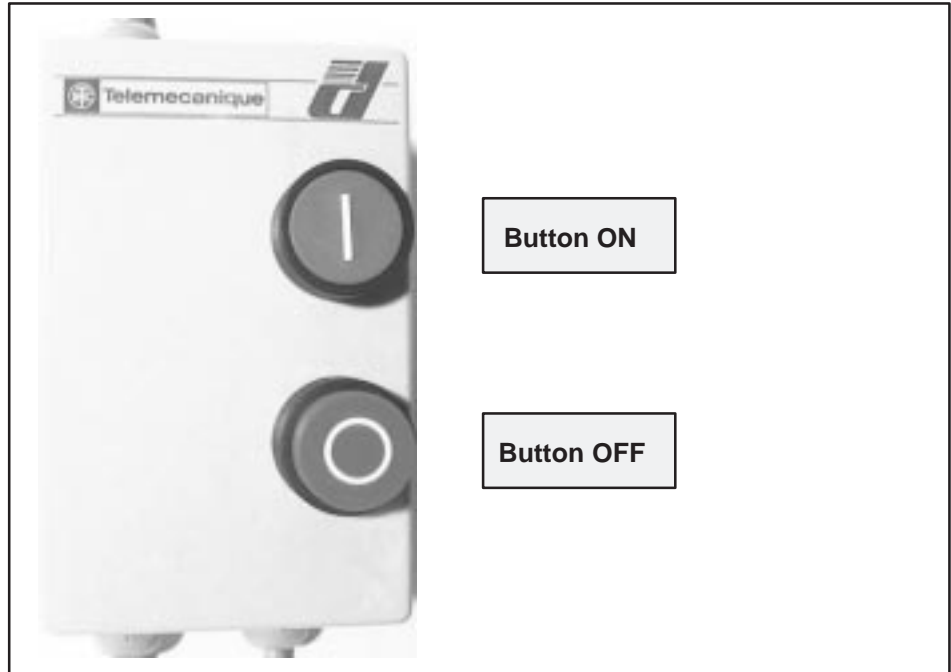


Fig. 126 - External view of the starter box



#### **Fuse protection by the customer**


The customer must provide for adequate motor fuse protection as specified in the electro documentation.

- **Refer to the manual of the starter box manufacturer!**





5.1.1 Electrical connection



Stop

**Open the starter box only when no voltage is applied.**

- Undo the cover of the starter box.

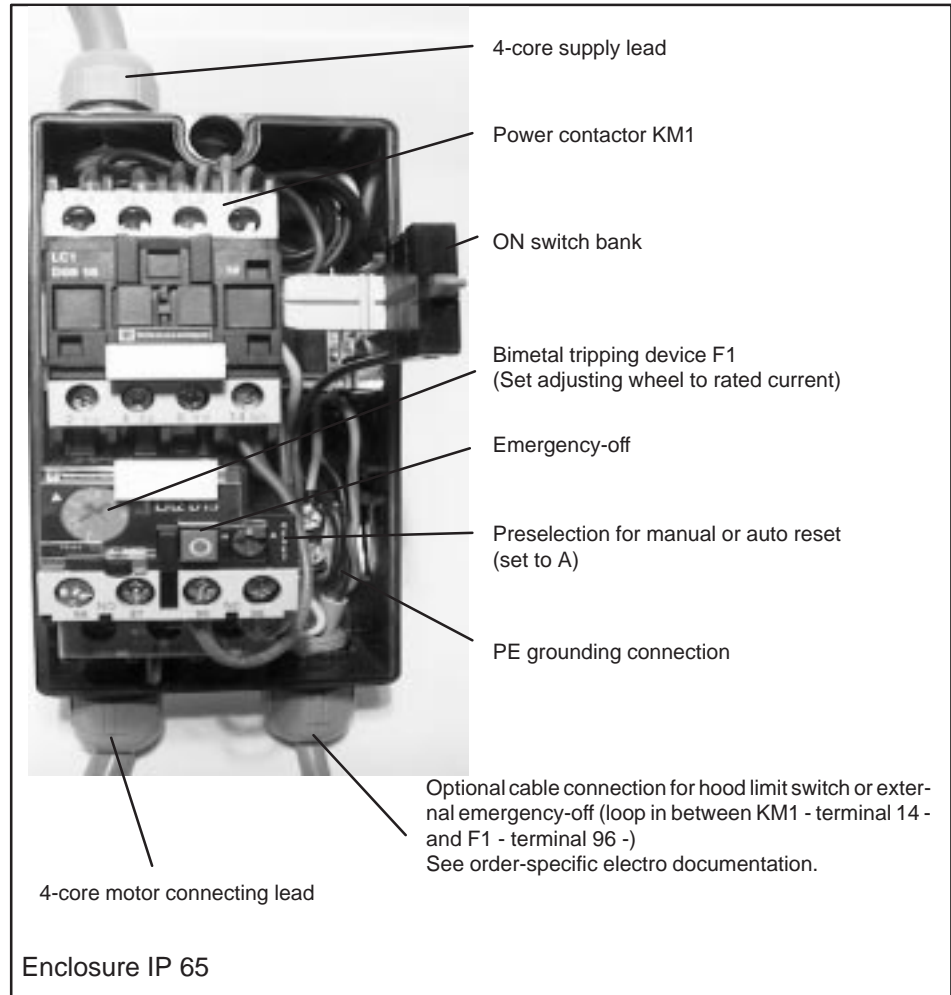


Fig. 127 - Inner view of the starter box

- Lead the **dead** lead-in cable with at least 4 x 1.5 mm<sup>2</sup> Cu (for shipboard operation: 3 x 1.5 mm<sup>2</sup> Cu) through the cable gland in the starter box and
- connect the leads in accordance with the following switching proposal:

- L1** to terminal 1 of contactor KM1
- L2** to terminal 3 of contactor KM1
- L3** to terminal 5 of contactor KM1
- PEN** to grounding terminal

- Lead the motor connection cable with at least 4 x 1.5 mm<sup>2</sup> (for shipboard operation: 3 x 1.5 mm<sup>2</sup>) through the cable gland in the starter box and
- connect the leads as follows:

- L1** to terminal 2 of the bimetallic strip relay F1
- L2** to terminal 4 of the bimetallic strip relay F1

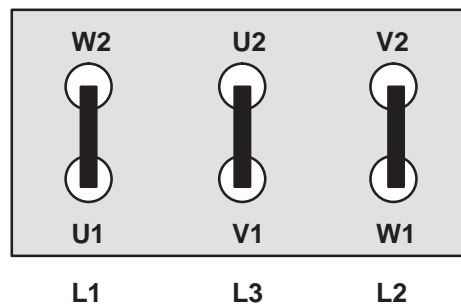


**L3** to terminal 6 of the bimetallic strip relay F1  
**PEN** to grounding terminal

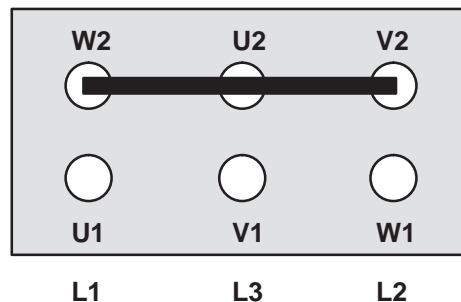
- Check the motor rated current setting on bimetal relay F1.  
When necessary, correct the setting with the aid of the table (see section 4.4).
- Screw the cover onto the starter box.
- Check the function of the ON and OFF switch.

### Motor wiring diagrams

The operating voltage of the local mains determines the type of motor connection.  
The connection method is stated on the motor nameplate.



**Delta switching**  
(counterclockwise rotary field)



**Star switching**  
(counterclockwise rotary field)

- Take the cover off the terminal box.
- Connect the motor cable as follows:
  - L1** to terminal U1 of the motor
  - L2** to terminal W1 of the motor
  - L3** to terminal V1 of the motor
  - PEN** to the grounding terminal of the motor



- Before connecting the motor cable, check the position of the connection bridges in the terminal box (delta or star switching).
- Screw the cover onto the terminal box.
- Feed supply voltage to the starter box.
- Press the ON and OFF buttons on the starter box consecutively.



- Check the direction of rotation of the motor with the aid of the direction of rotation arrow on the separator.  
If necessary, **two** phases of the motor lead-in cable must be interchanged.



## 5.2 Hood end switch

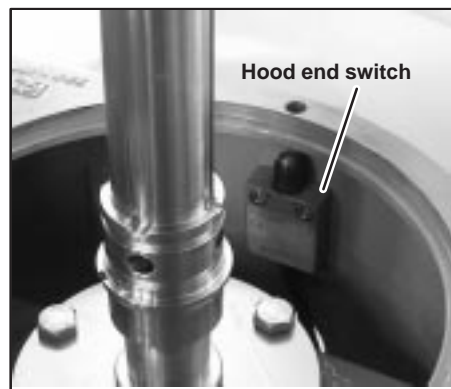


Fig. 128

### Important instructions:

- For safety reasons a hood end switch **must** be installed.
- The hood end switch prevents the motor from being switched on when the hood is open.

In this version, the coil voltage of the power contactor is connected to the voltage between two phase conductors of the three-phase network.

When installing a hood end switch or an external emergency-off device, they must be looped in in the starter box at connection points F1 (terminal 96) and contactor KM1 (terminal 14).

The reset device following response of the motor protection can optionally be set to

- H = manual reset, i.e. the OFF button must be pressed before re-starting.
- A = Automatic reset, i.e. the motor can be started directly by pressing the ON button.

When the bimetal relay responds, the power contactor KM1 switches the motor off.

- Check the motor for overload or the rated current setting on the bimetal release F1.



- **Refer to the manual of the hood end switch manufacturer!**



### 5.3 Frequency converter (FC)



Fig. 129

The frequency converter

- serves as a starting aid.
- can be fitted at extra charge.

The frequency converter must be fitted on site.

**Dimensions:**

130 x 210 x 154 mm (W x H x D)

- **Refer to the manual of the frequency converter manufacturer!**

#### Frequency converter operation

In 230-VAC single-phase operation, where the high starting current can lead to network problems, a frequency converter can be used (see section 5.3.1).

In this operating mode and given appropriate parametrization the three-phase AC motor will run up at maximum starting current.

In 15-VAC single-phase operation a transformer is installed ahead of the frequency converter so as to be able to operate the frequency converter with 230 V (see section 5.3.2).

In 24-VDC single-phase operation an inverter is installed ahead of the frequency converter to be able to operate the frequency converter with 230 V (see section 5.3.3).



5.3.1 A.C. design  
230 VAC - 1 Ph - N -  
PEN

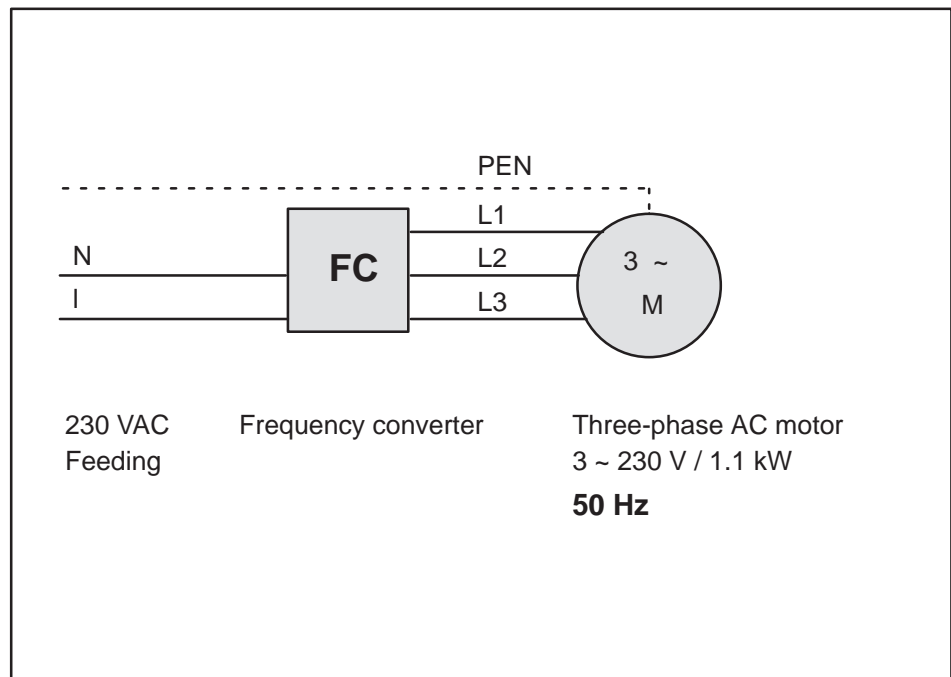


Fig. 130

5.3.2 A.C. design  
115 VAC - 1 Ph - N -  
PEN

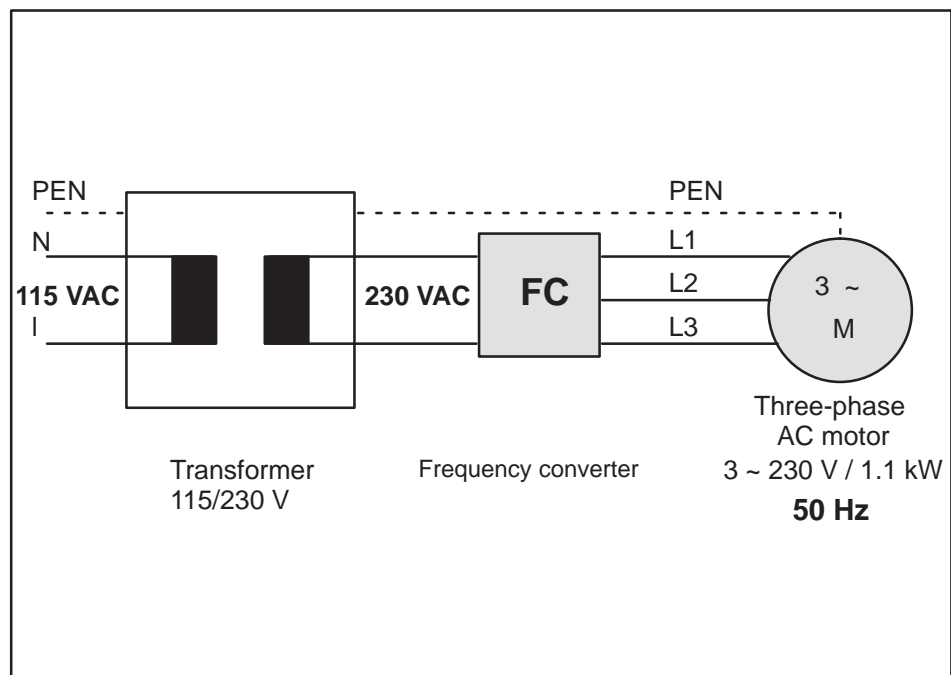


Fig. 131



**5.3.3 D.C. design  
24 VDC - 1 Ph - N**

24 V D.C. networks require the use of an inverter (see section 5.4) to reduce the high currents.

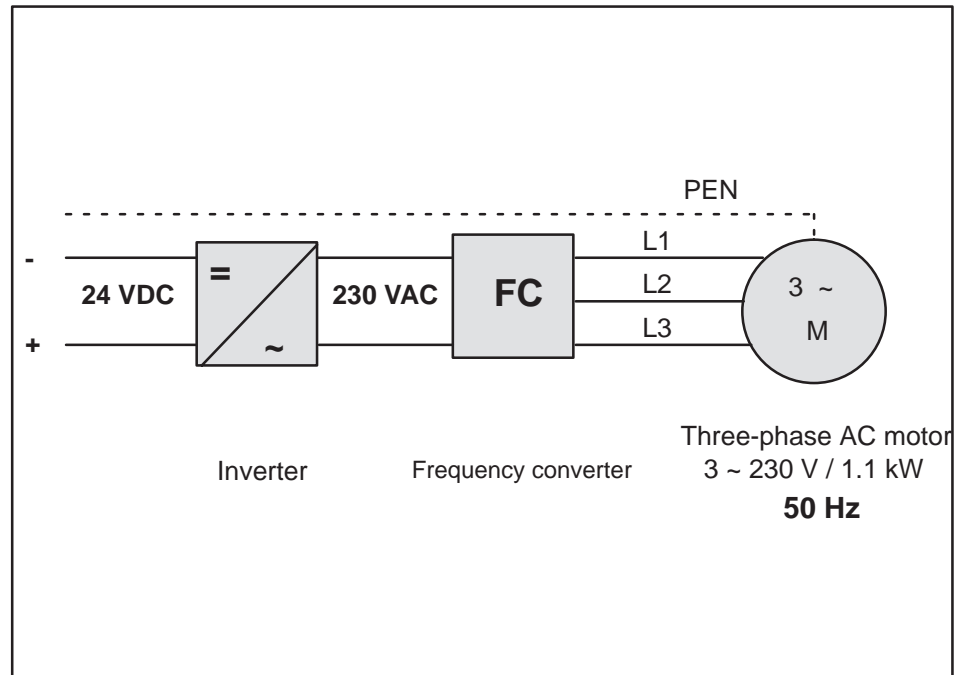


Fig. 132



#### 5.4 Transformer (option)



Fig. 133

The transformer

- converts the 115-V alternating current into 230 V alternating current and
- feeds a frequency converter with downstream three-phase AC motor.

- **Refer to the manual of the transformer manufacturer!**



## 5.5 Inverter (option)



Fig. 134

The inverter

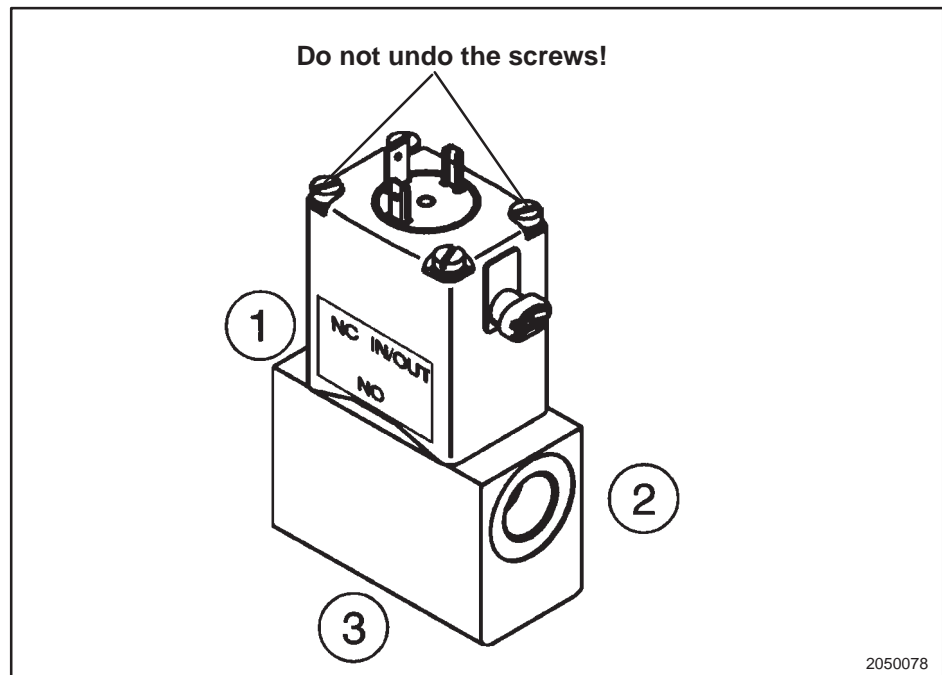
- transforms the 24 V D.C. current into 230 V alternating current and
- feeds a frequency converter with downstream three-phase AC motor.

- **Refer to the manual of the inverter manufacturer!**





5.5.1 Solenoid valve (option)

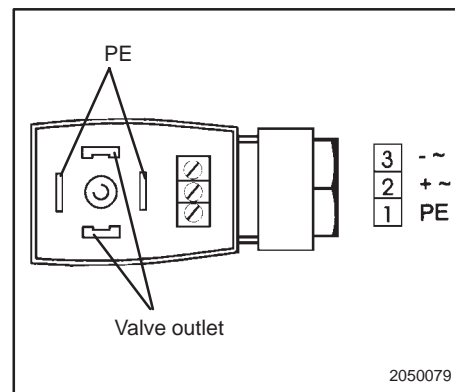


2050078

Fig. 135

**Connections:**

- |   |                      |               |
|---|----------------------|---------------|
| 1 | NC (Normally Closed) | NC channel    |
| 2 | IN/OUT               | joint channel |
| 3 | NO (Normally Open)   | NO channel    |



Pin connections of the coupler socket

2050079

Fig. 136

- Refer to the manual of the solenoid valve manufacturer!



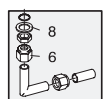
**Technical data**

Part-No.	0018-6869-600 (see Parts list)	
Operating principles	3/2-way closed without auxiliary energy	
Nominal width	10 mm	
Material:	Gasket	FPM (Viton)
	Housing	CuZn
Line connection	G 1/2 sleeve	
Supply voltage	24 V	
Kind of current	UC (direct and alternating current)	
Power consumption:	Pick-up	40 W
	Operation	3 W
Coupler socket	GL-approved with built-in electronics, 24 VDC, and free-wheeling diode without cable with luminous gasket (when actuated)	
Temperature:	Medium	0-100 °C
	Environment	0-55 °C
Pressure	Medium	0-16 bar
Switching frequency	max. (1/min)	200



## 6 Parts list

Guide to ordering parts .....	85
Separator, complete (OTC 2-02-137) .....	87
Separator, complete (OTC 2-03-107) .....	91
Set of drive parts .....	95
Set of spare parts "bowl/hood" – 50 Hz (operation: 1 year or 8000 hours) .....	97
Set of spare parts "bowl/hood" – 60 Hz (operation: 1 year or 8000 hours) .....	97
Set of spare parts "drive" (operation: 2 years or 16000 hours) .....	99
Set of tools and accessories (for maintenance and commissioning) .....	101
3/2-way solenoid valve .....	102



Note  
Notes  
Notizen  
Anotaciones  
Notizen  
Notes  
Note



### Guide to ordering parts

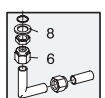
A rapid and correct supply of spare parts can only be guaranteed if your order includes the following details:

- Model of centrifuge      see nameplate  
                                         e.g. OTC 2-03-107
- Serial-No.                    see nameplate or frame rim  
                                         e.g. 9000-223
- Bowl Serial-No.            see bowl shell  
                                         If it differs from the Serial-No. of the machine.
- Part description            see List of Parts  
                                         e.g. frame
- Part-No.                      see List of Parts  
                                         e.g. 2050-1100-020  
                                         The part no. is also shown on all major parts.

### Use only genuine spare parts!

- Model and number of pump      see nameplate on pump  
                                         Only when ordering spare parts for pump and pump connection parts.

Part-Numbers ending with letter "L" (e.g. 2050-6600-L) designate parts which are available in different designs for the separator concerned.



OTC 2-02-137

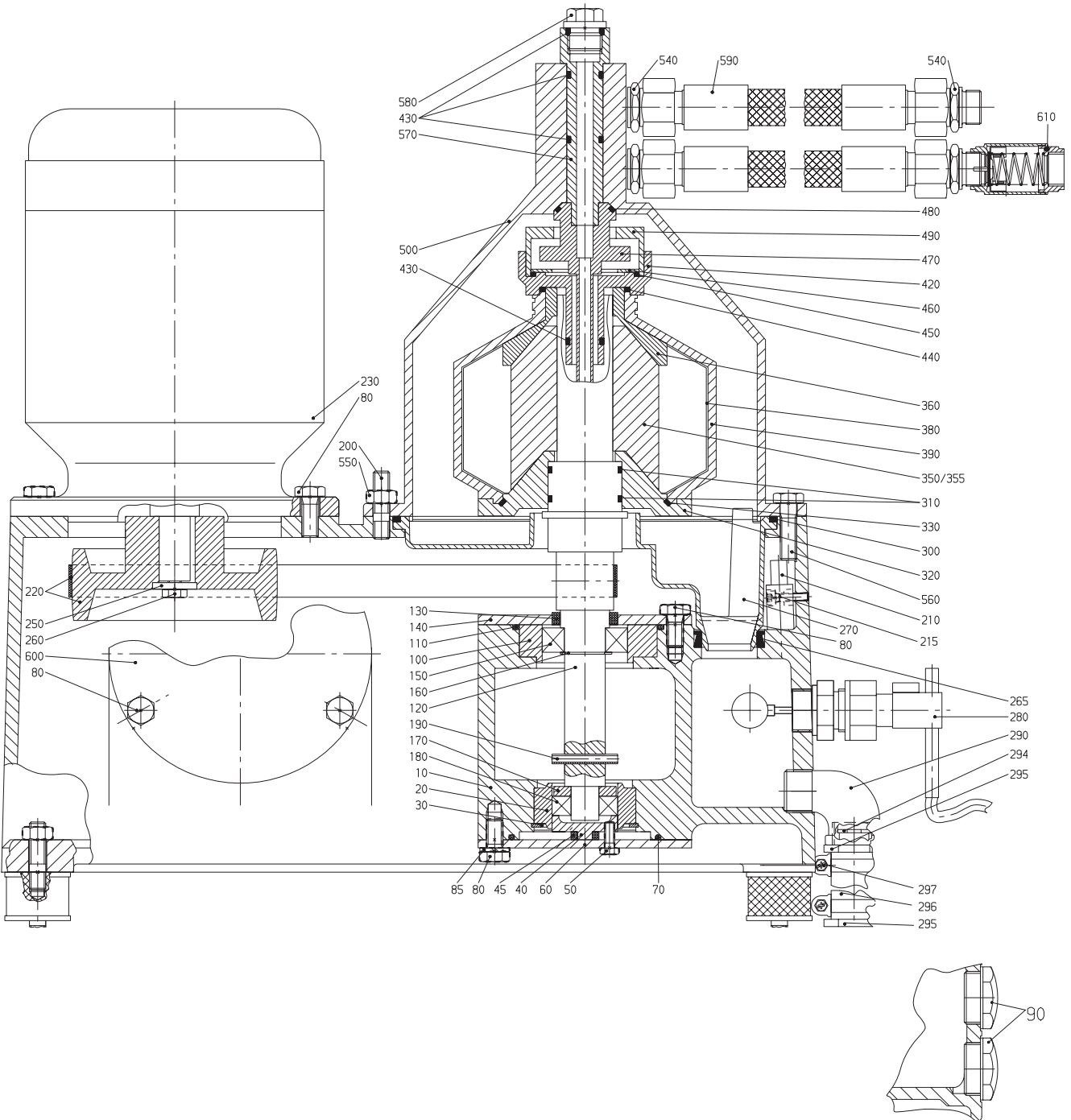
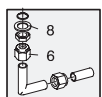


Fig. 137

2050-0001-000-BA



Pos.	Part-No.	Qty.	Designation
-	<b>2050-0001-000</b>	<b>1</b>	<b>Separator, complete (OTC 2-02-137)</b>
10	2050-1001-010	1	Lower section of frame
20	0011-8040-000	1	Pivoting bearing, compl.
30	0026-5849-170	1	Retaining ring
40	0010-4001-010	1	Bottom bearing threaded piece
45	0007-2070-830	1	Gasket
50	0019-6841-400	1	Hex head screw
60	2050-3375-010	1	Bearing cover
70	0007-2608-750	1	Gasket
80	0019-6933-400	13	Hex head screw
85	0026-1337-300	3	Lock washer
90	0001-0926-800	2	Sight glass
100	0008-2533-010	1	Rubber-metal cushion
110	0007-2608-750	1	Gasket
120	2050-3410-000	1	Spindle
130	0004-1949-830	1	Lip seal
140	2050-3375-000	1	Bearing cover
150	0011-6205-000	1	Grooved ball bearing
160	0026-5861-170	1	Retaining ring
170	0008-1708-010	1	Ball bearing protection ring
180	0011-6203-000	1	Grooved ball bearing
190	0026-0310-170	1	Dowel pin
200	0019-7640-400	2	Stud
210	0005-1847-000	1	Limit switch
215	0019-6094-300	2	Allen screw
220	see page 95	1	Set of drive parts
230	as per order	1	Motor
250	0026-2417-400	1	Disk
260	0019-6903-300	1	Hex head screw
265	0007-2387-750	1	Gasket
270	2050-1268-020	1	Discharge channel
280	0005-4112-600	1	Float switch
290	0018-0022-260	1	Angle
294	0026-1875-300	1	Disk
295	0018-1797-600	2	Hose outlet
296	0018-2793-758	0.200 m	Hose
297	0018-3814-300	2	Hose clip
300	0007-2706-750	1	Gasket
310	0007-2925-750	2	Gasket
320	2050-6699-000	1	Bottom, compl.
330	0007-1822-750	1	Gasket
350	2050-6669-000	36	Disks



OTC 2-02-137

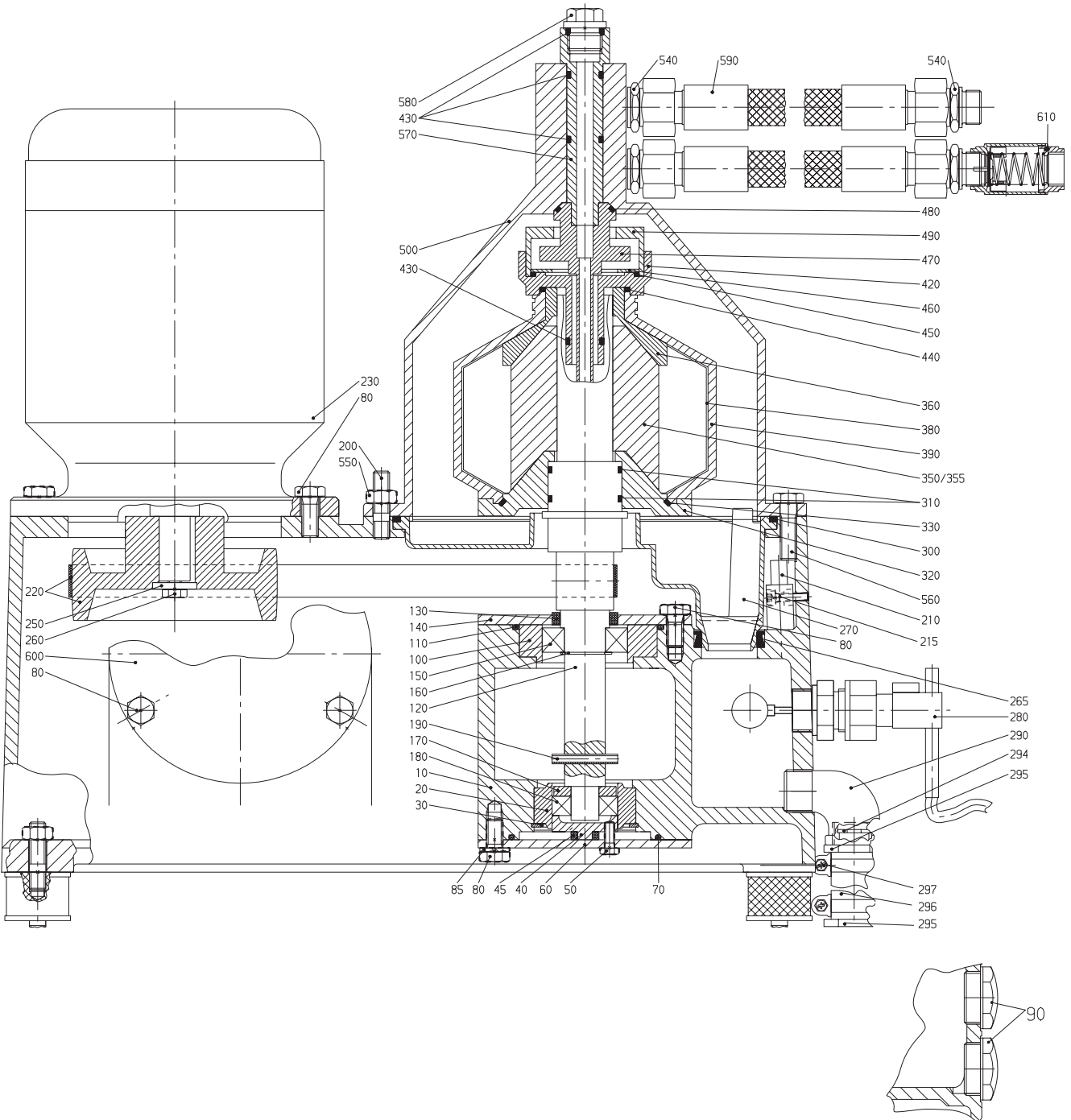


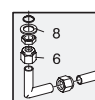
Fig. 138

2050-0001-000-BA





Pos.	Part-No.	Qty.	Designation
355	2050-6669-010	36	Disks
360	2050-6652-020	1	Separating disk
380	as per order	1	Insert
390	2050-6489-000	1	Bowl shell
420	2050-6464-000	1	Threaded ring
430	0007-2983-750	4	Gasket
440	0007-1907-750	1	Gasket
450	0007-1735-750	1	Gasket
460	2050-6691-000	1	Set of regulating rings
470	2050-2213-000	1	Centripetal pump, compl.
480	0007-1936-750	1	Gasket
490	2050-6642-010	1	Centripetal pump chamber cover
500	2050-8808-010	1	Hood
540	0018-6676-030	4	Connector
550	0013-0279-300	2	Hexagon nut
560	0019-6937-400	1	Hex head screw
570	2050-2191-000	1	Handle connection piece
580	0019-8907-300	1	Screw plug
590	0018-6820-010	2	Corrugated hose, compl.
600	2050-1120-000	1	Cover
610	0018-6282-600	1	Non-return valve, compl.



OTC 2-03-107

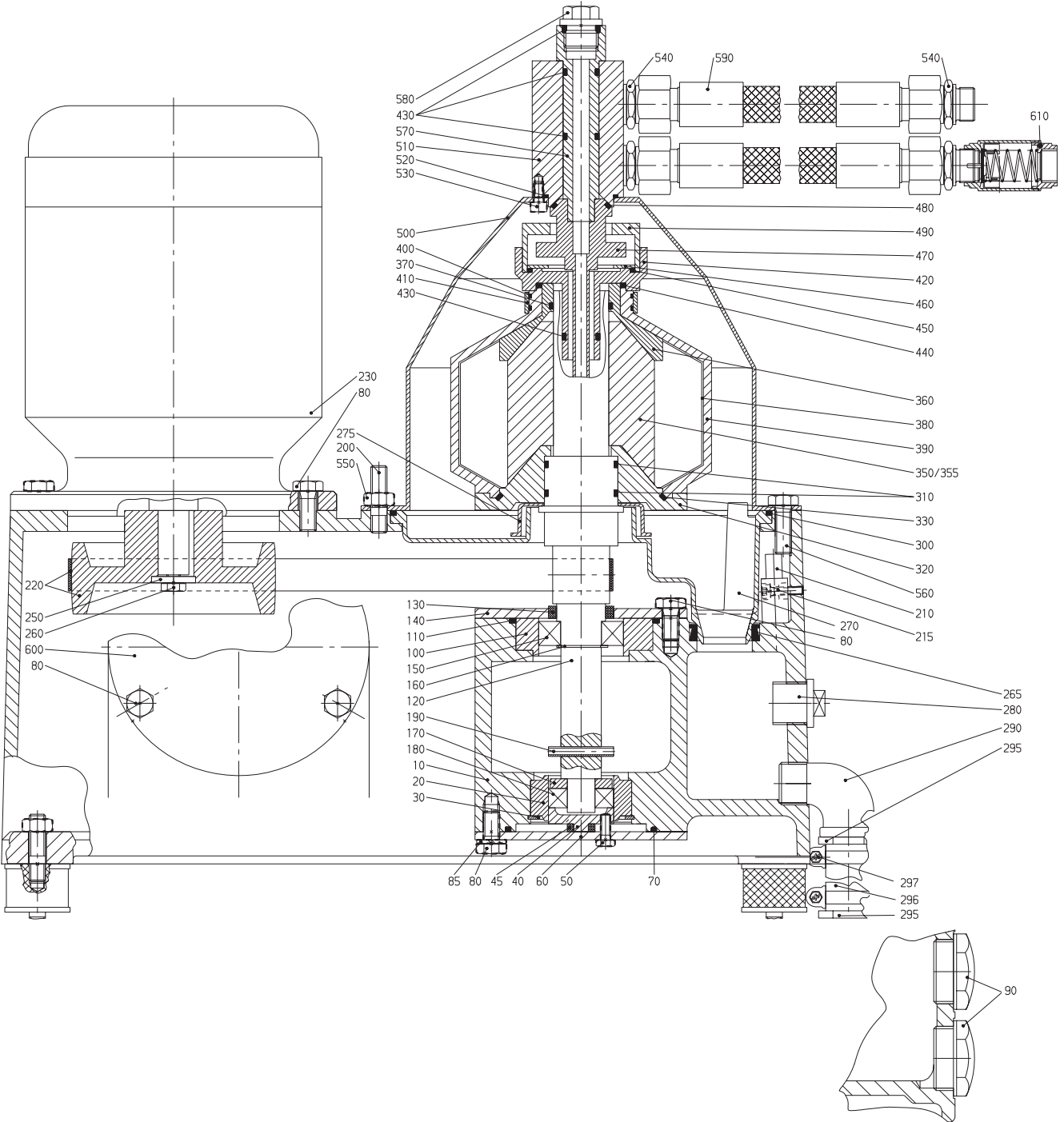
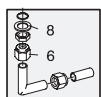


Fig. 139

2050-0001-020-BA



Pos.	Part-No.	Qty.	Designation
-	<b>2050-0001-020</b>	<b>1</b>	<b>Separator, complete (OTC 2-03-107)</b>
10	2050-1001-010	1	Lower section of frame
20	0011-8040-000	1	Pivoting bearing, compl.
30	0026-5849-170	1	Retaining ring
40	0010-4001-010	1	Bottom bearing threaded piece
45	0007-2070-830	1	Gasket
50	0019-6841-400	1	Hex head screw
60	2050-3375-010	1	Bearing cover
70	0007-2608-750	1	Gasket
80	0019-6933-400	13	Hex head screw
85	0026-1337-300	3	Lock washer
90	0001-0926-800	2	Sight glass
100	0008-2533-010	1	Rubber-metal cushion
110	0007-2608-750	1	Gasket
120	2050-3410-000	1	Spindle
130	0004-1949-830	1	Lip seal
140	2050-3375-000	1	Bearing cover
150	0011-6205-000	1	Grooved ball bearing
160	0026-5861-170	1	Retaining ring
170	0008-1708-010	1	Ball bearing protection ring
180	0011-6203-000	1	Grooved ball bearing
190	0026-0310-170	1	Dowel pin
200	0019-7640-400	2	Stud
210	0005-1847-000	1	Limit switch
215	0019-6094-300	2	Allen screw
220	see page 95	1	Set of drive parts
230	as per order	1	Motor
250	0026-2417-400	1	Disk
260	0019-6903-300	1	Hex head screw
265	0007-2387-750	1	Gasket
270	2050-1268-020	1	Discharge channel
275	2050-1467-000	1	Cap
280	0018-0991-260	1	Plug
290	0018-0022-260	1	Angle
295	0018-1797-600	2	Hose outlet
296	0018-2793-758	0.200 m	Hose
297	0018-3814-300	2	Hose clip
300	0007-2706-750	1	Gasket
310	0007-2925-750	2	Gasket
320	2050-6699-010	1	Bottom, complete
330	0007-1822-750	1	Gasket
350	2050-6669-000	36	Disks



OTC 2-03-107

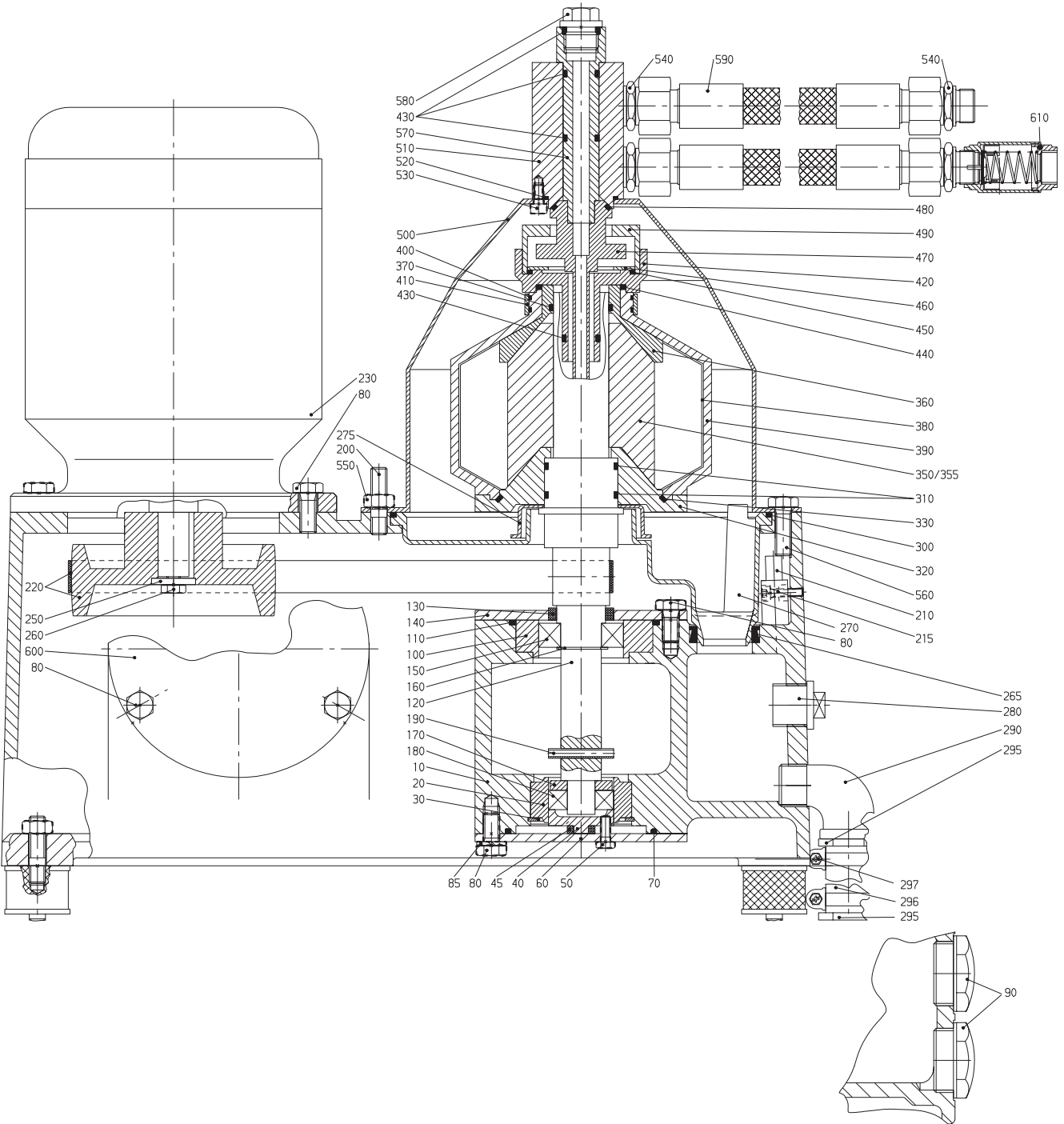
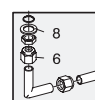


Fig. 140

2050-0001-020-BA



Pos.	Part-No.	Qty.	Designation
355	2050-6669-010	36	Disks
360	2050-6650-010	1	Separating disk
370	0007-1943-750	1	Gasket
380	as per order	1	Insert
390	2050-6489-000	1	Bowl shell
400	0007-2539-750	2	Gasket
410	2050-6631-000	1	Lock ring
420	2050-6464-000	1	Threaded ring
430	0007-2983-750	4	Gasket
440	0007-1907-750	1	Gasket
450	0007-1735-750	1	Gasket
460	2050-6691-000	1	Set of regulating rings
470	2050-2213-000	1	Centripetal pump, compl.
480	0007-1936-750	1	Gasket
490	2050-6642-010	1	Centripetal pump chamber cover
500	2050-7765-000	1	Hood
510	2050-7095-000	1	Connection piece
520	0007-1914-750	1	Gasket
530	0019-6105-400	4	Allen screw
540	0018-6676-030	4	Connector
550	0013-0279-300	2	Hexagon nut
560	0019-6935-400	1	Hex head screw
570	2050-2191-000	1	Handle connection piece
580	0019-8907-300	1	Screw plug
590	0018-6820-010	2	Corrugated hose, compl.
600	2050-1120-000	1	Cover
610	0018-6282-600	1	Non-return valve, compl.



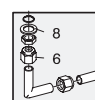
Note  
Notes  
Notizen  
Anotaciones  
Notizen  
Notes  
Note

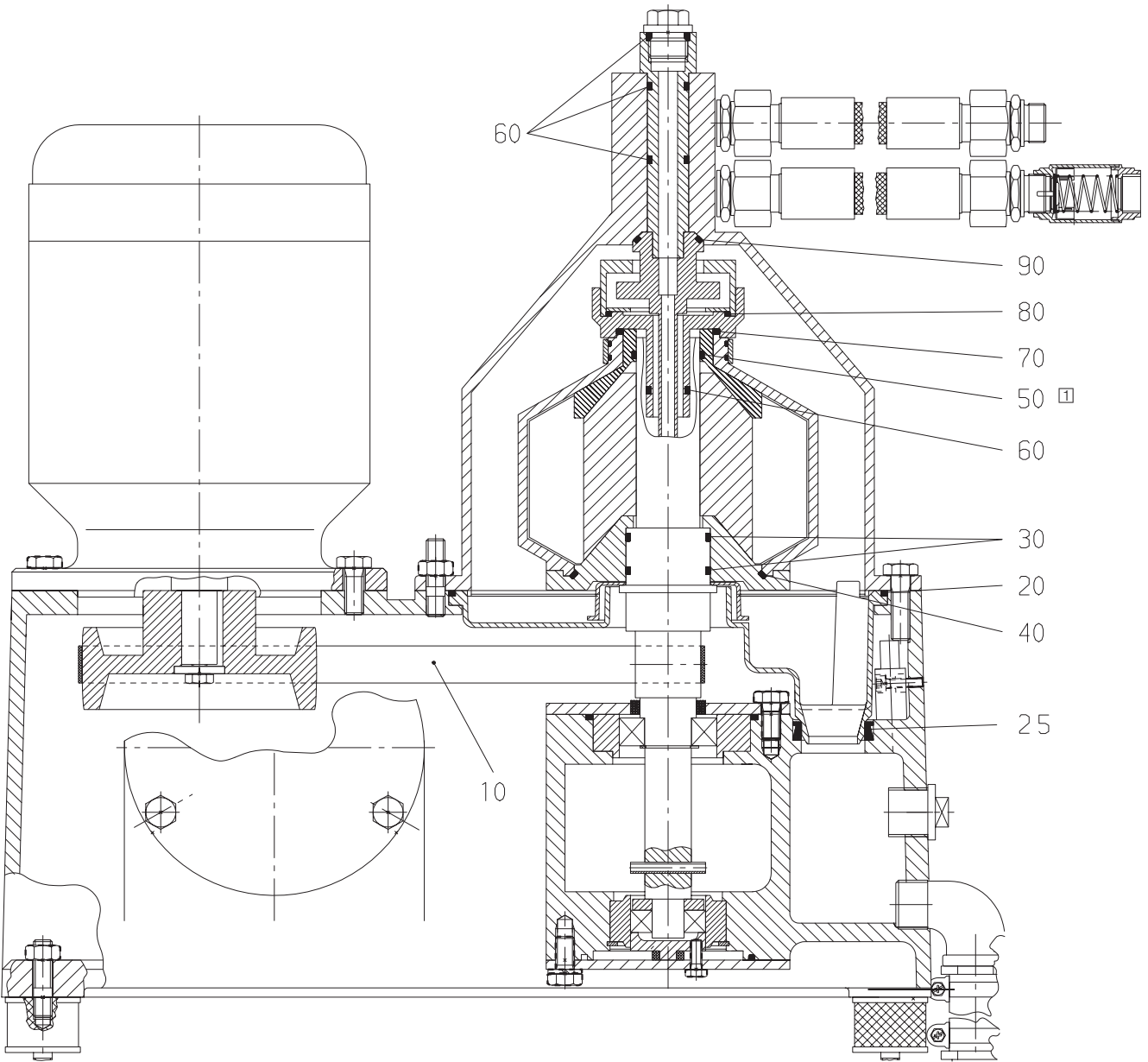


Set of drive parts

Part-No.		Designation
50 Hz	60 Hz	
<b>Motor speed</b> $n = 2\,800 \text{ min}^{-1}$  <b>Bowl speed</b> $n = 10\,000 \text{ min}^{-1}$	<b>Motor speed</b> $n = 3\,360 \text{ min}^{-1}$  <b>Bowl speed</b> $n = 10\,080 \text{ min}^{-1}$	
<b>2050-3050-000</b>	<b>2050-3060-000</b>	<b>Set of drive parts</b>
2050-3474-000	2050-3474-010	Flat belt pulley <sup>1)</sup>
0021-3214-900	0021-3212-900	Drive belt <sup>1)</sup>

<sup>1)</sup> This part is included in the *Set of drive parts*, but it can also be supplied separately.





- 1 Nur für Separator OTC 2-03- . . .
- 1 Only for separator OTC 2-03- . . .
- 1 Seulement pour séparateur OTC 2-03- . . .
- 1 Sólo para la centrífuga OTC 2-03- . . .
- 1 Alleen voor separator OTC 2-03- . . .

Fig. 141

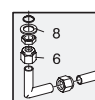
2050-9902-000





Pos.	Part-No.	Qty.	Designation
–	<b>2050-9902-020</b>	<b>1</b>	<b>Set of spare parts "bowl/hood" – 50 Hz</b> (operation: 1 year or 8000 hours)
10	0021-3214-900	1	Drive belt
20	0007-2706-750	1	Gasket
25	0007-2387-750	1	Gasket
30	0007-2925-750	4	Gasket
40	0007-1822-750	2	Gasket
50	0007-1943-750	2	Gasket
60	0007-2983-750	8	Gasket
70	0007-1907-750	2	Gasket
80	0007-1735-750	2	Gasket
90	0007-1936-750	2	Gasket

Pos.	Part-No.	Qty.	Designation
–	<b>2050-9902-040</b>	<b>1</b>	<b>Set of spare parts "bowl/hood" – 60 Hz</b> (operation: 1 year or 8000 hours)
10	0021-3212-900	1	Drive belt
20	0007-2706-750	1	Gasket
25	0007-2387-750	1	Gasket
30	0007-2925-750	4	Gasket
40	0007-1822-750	2	Gasket
50	0007-1943-750	2	Gasket
60	0007-2983-750	8	Gasket
70	0007-1907-750	2	Gasket
80	0007-1735-750	2	Gasket
90	0007-1936-750	2	Gasket



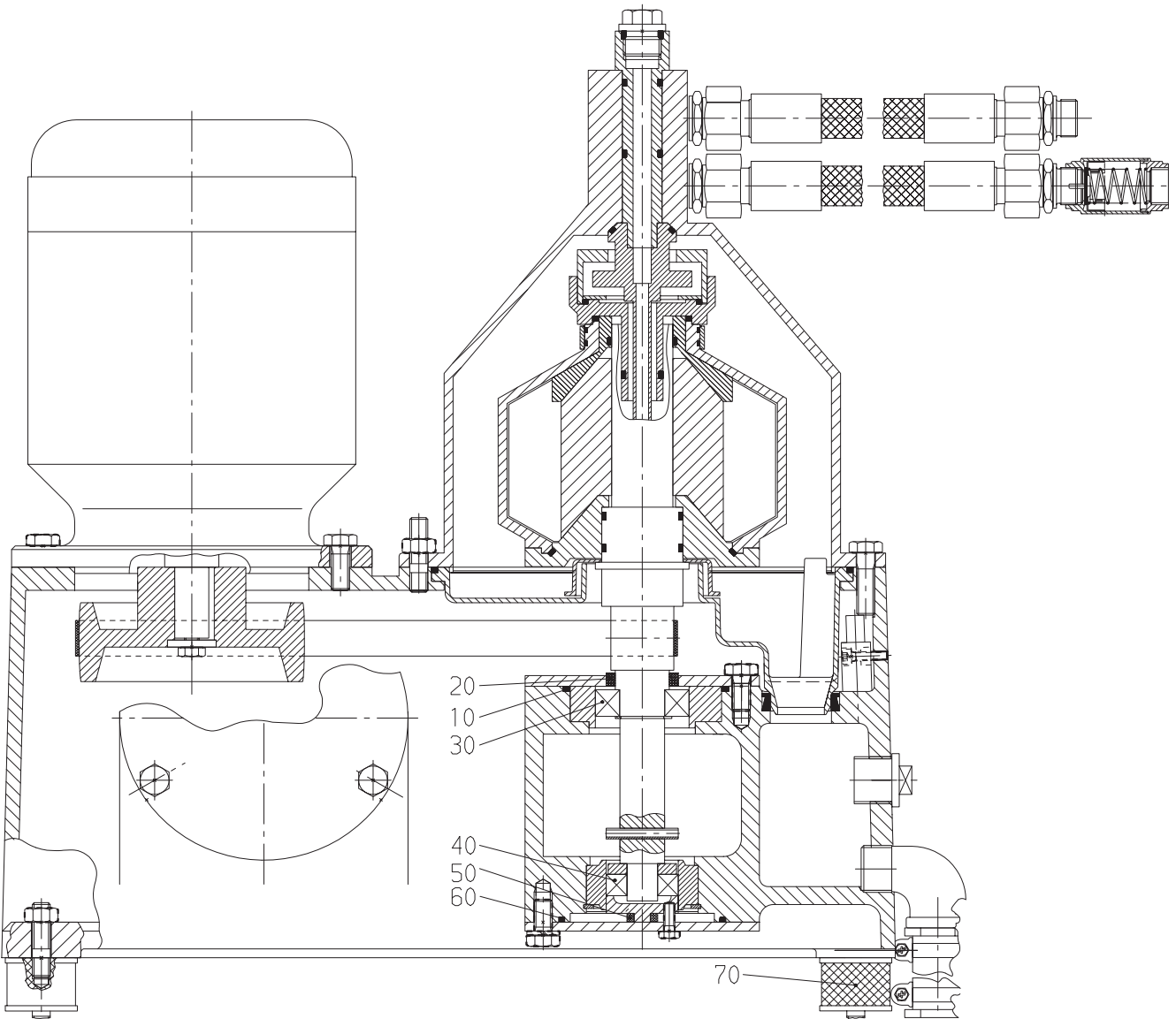
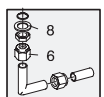


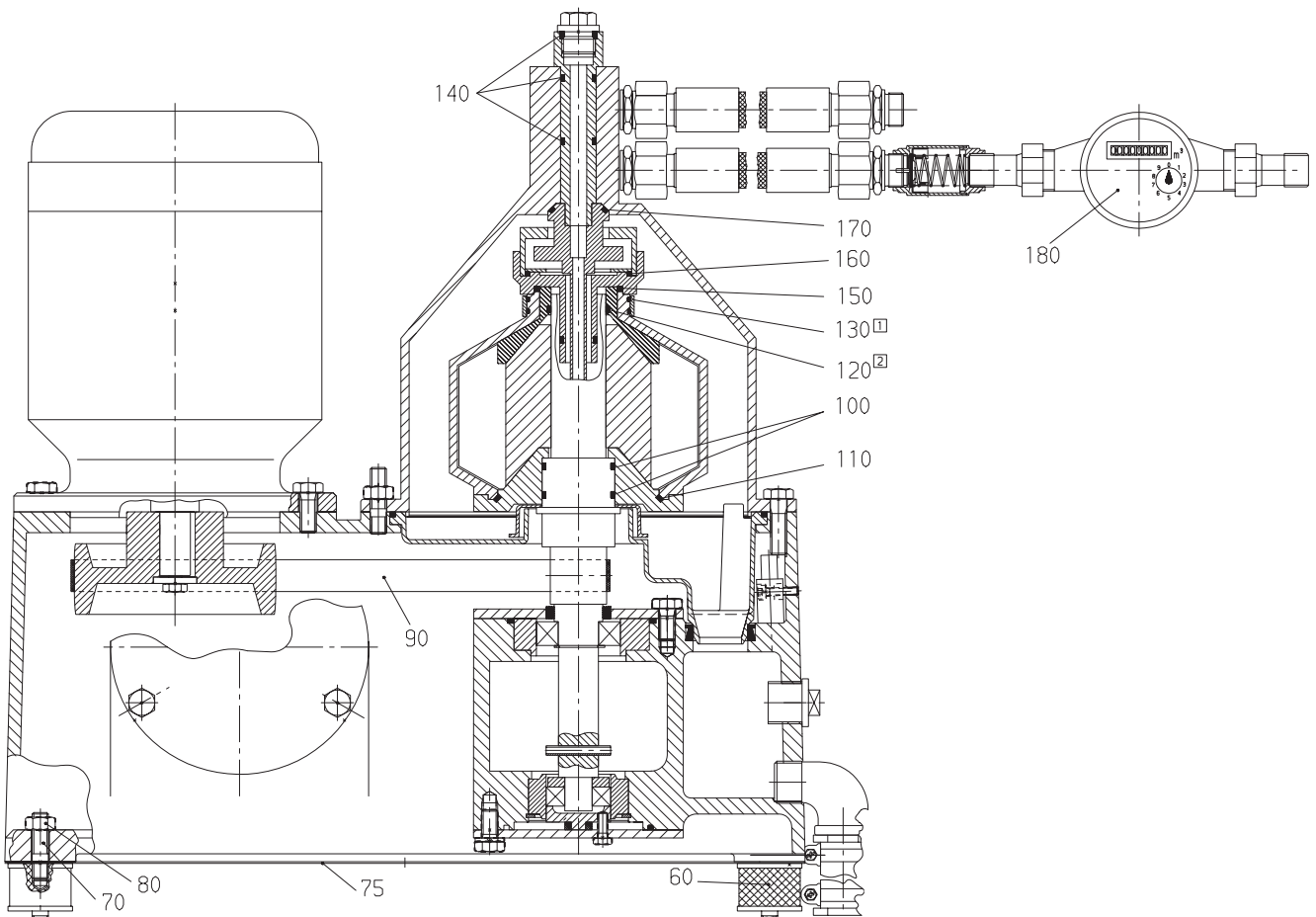
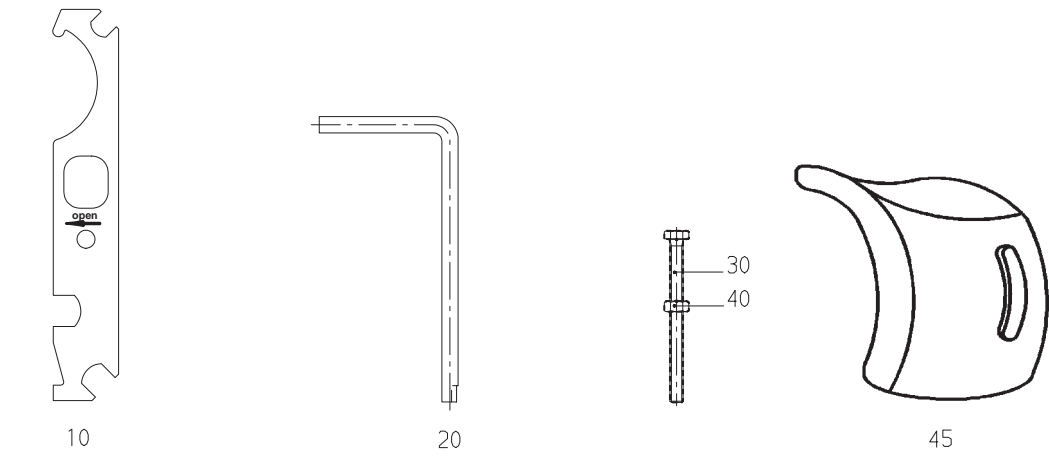
Fig. 142

2050-9902-010



Pos.	Part-No.	Qty.	Designation
–	<b>2050-9902-030</b>	<b>1</b>	<b>Set of spare parts "drive"</b> (operation: 2 years or 16000 hours)
10	0007-2608-750	1	Gasket
20	0004-1949-830	1	Lip seal
30	0011-6205-000	1	Grooved ball bearing
40	0011-6203-000	1	Grooved ball bearing
50	0007-2070-830	1	Gasket
60	0007-2608-750	1	Gasket
70	0021-3147-750	4	Rubber-metal cushion





1 Nur für OTC 2-03- oder OTC 2-02-137 als Klärer  
1 Only for OTC 2-03- or OTC 2-02-137 as clarifier

2 Nur für Separator OTC 2-03- ...  
2 Only for separator OTC 2-03- ...  
2 Seulement pour séparateur OTC 2-03- ...  
2 Sólo para la centrífuga OTC 2-03- ...  
2 Alleen voor separator OTC 2-03- ...

Fig. 143

2050-9901-000



Pos.	Part-No.	Qty.	Designation
-	<b>2050-9901-000</b>	<b>1</b>	<b>Set of tools and accessories (for maintenance and commissioning)</b>
10	2050-9856-000	2	Hook wrench
20	2050-9894-000	1	Socket wrench
30	0019-6918-300	1	Hex head screw
40	0013-0278-300	1	Hexagon nut
45	0003-0588-890	1	Measuring cup, 2 l
50	0015-0003-080	2.5 l	Lube oil CLP 100
60	0021-3147-750	4	Rubber-metal cushion
70	0019-7640-400	4	Stud
75	2050-1191-000	1	Protective plate
80	0013-0279-300	4	Hexagon nut
90	see page 95	1	Drive belt
100	0007-2925-750	1	Gasket
110	0007-1822-750	1	Gasket
120	0007-1943-750	1	Gasket
130	0007-2539-750	2	Gasket
140	0007-2983-750	1	Gasket
150	0007-1907-750	1	Gasket
160	0007-1735-750	1	Gasket
170	0007-1936-750	1	Gasket
180	0001-1427-630	1	Flowmeter



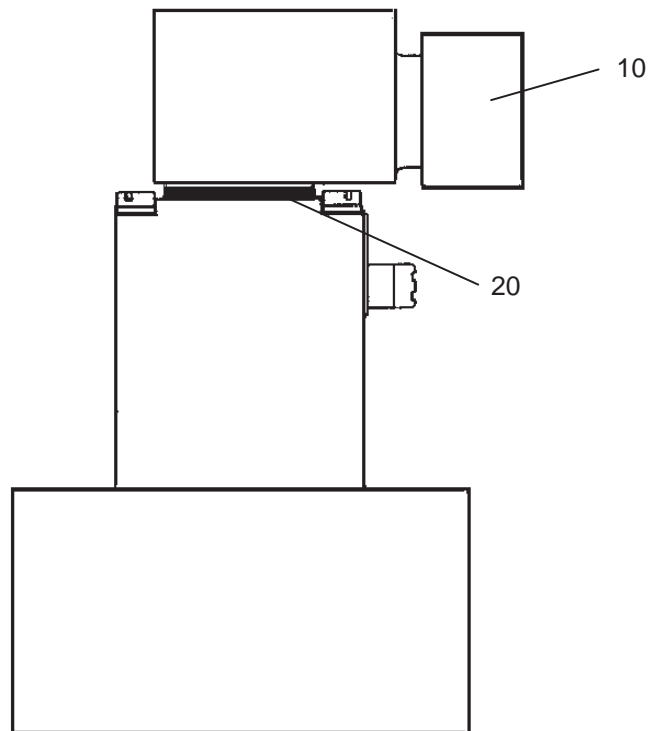


Fig. 144

**Option**

Pos.	Part-No.	Qty.	Designation
–	<b>0018-6869-600</b>	<b>1</b>	<b>3/2-way solenoid valve</b>
10	0018-5118-020	1	Coupler socket
20	0018-5118-030	1	Gasket (for coupler socket)



## 7 Appendix

Table of lubricating oils .....	104
Comments on table of lubricating oils .....	105
The health hazards involved when handling heavy oils and lube oils .....	106

Table of lubricating oils

Schmieröl-Tabelle für Westfalia Mineralöl-Separatoren in Land- und Schiffsbetrieben		Schmieröl LUB. OIL		TABLE OF LUB. OILS FOR WESTFALIA MINERAL OIL SEPARATORS IN LAND- AND SHIPBOARD INSTALLATIONS		Schmieröl LUB. OIL		TABLE OF LUB. OILS FOR WESTFALIA MINERAL OIL SEPARATORS IN LAND- AND SHIPBOARD INSTALLATIONS	
Separator-typ	Typ	Viskosität VISCOSITY	Symbol (1) mit Kennzahl nach DIN 51502	Viskosität VISCOSITY	Symbol (1) mit Kennzahl nach DIN 51502	Ölfüllung QUANTITY	Ölfüllung QUANTITY	Ölfüllung QUANTITY	Ölfüllung QUANTITY
OTC 2	1,3		CLP 100	90 bis/70 110	CLP 100				
OSD 10									
OSC 15	2,5								
OTB 18									
OTB 1 <sup>a</sup>	0,75								
OTB 3 <sup>a</sup>									
OSC 4 <sup>a</sup>			CLP 100						
OSC 5 <sup>a</sup>									
ESC 4 <sup>a</sup>	1,7		CLP 220	100 bis/70 242	CLP 220				
WSC 5 <sup>a</sup>									
OTB 9 <sup>a</sup>									
OSA 7 <sup>a</sup>	1,2								
OTA 14 <sup>a</sup>									
OTA 18									
OTB 35									
OSA 20									
OSB 20									
OSB 25									
OSB 30									
OSC 18									
OSC 25									
OSC 30									
OSB 35									
OSC 40									
OSC 50									
WSC 50	6,5								

1) SYMBOL SHOULD READ "SYMBOL WITH IDENTIFICATION NUMBER"

2) bei höheren Umgebungstemperaturen über 45°C soll/Lte nur ein CLP220 Öl eingesetzt werden /AT AMBIENT TEMP. HIGHER THAN 45°C USE CLP220 OIL

Fig. 145



**Comments on table of lubricating oils  
for mineral oil separators  
from Westfalia Separator AG**

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

Therefore, 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 Westfalia Separator AG.

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

Some of the separators mentioned have immersion lubrication. Power is transmitted to a worm wheel gear with a relatively high tooth load. The operating temperature of the separator exceeds normally 80 °C. 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.

EP oils (EP = **E**xtrême **P**ressure), i.e. oils with high pressure additives, may only be used if they have no corrosive effect even in the event of water seeping into the oil sump. Since tests carried through with various types of standard EP oils have shown that there are great differences in the intended effect of marked interfacial activity and aggressiveness of EP additives on bronze toothed wheels, EP oils may only be used if they do not attack bronze.

### 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).

#### 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!





Mechanical Separation  
Division

## Westfalia Separator Mineraloil Systems GmbH

Westfalia Separator Mineraloil Systems GmbH • Werner-Habig-Str.1 • D-59302 Oelde  
Telefon +49 (0) 2522/77-0 • Telefax: +49 (0) 2522/77-2394