

**Instruction Manual and  
Parts List**

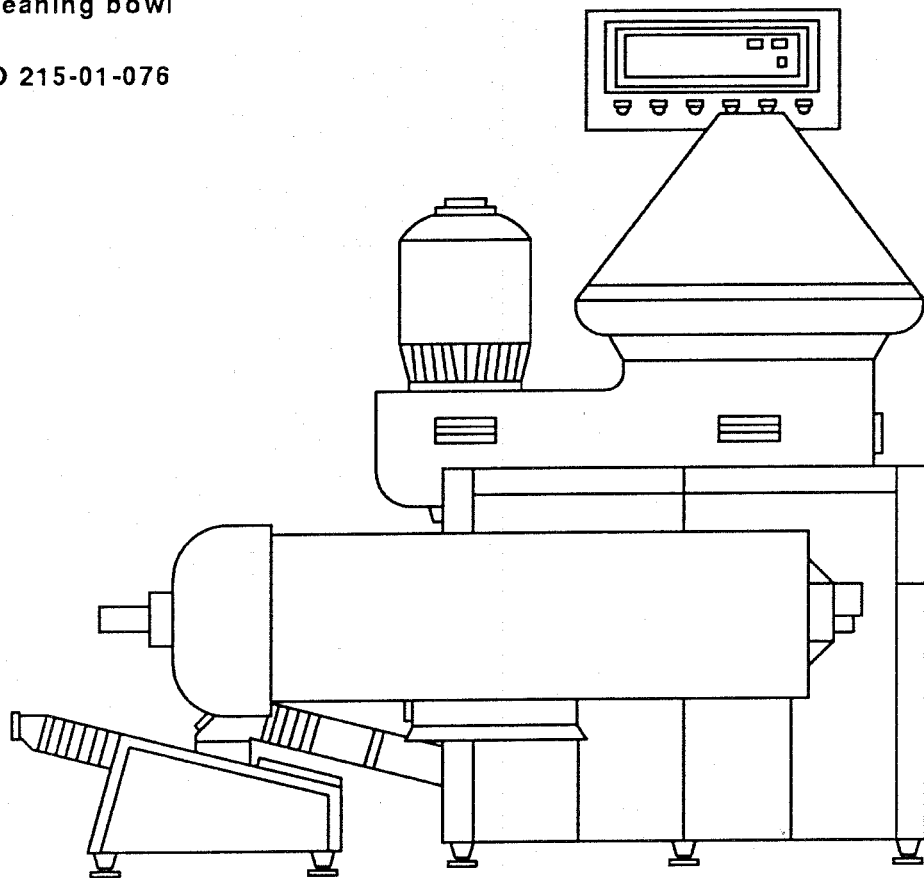
No. 1141-9001-020

Edition 0398

**Bacteria-removing separator  
with self-cleaning bowl**

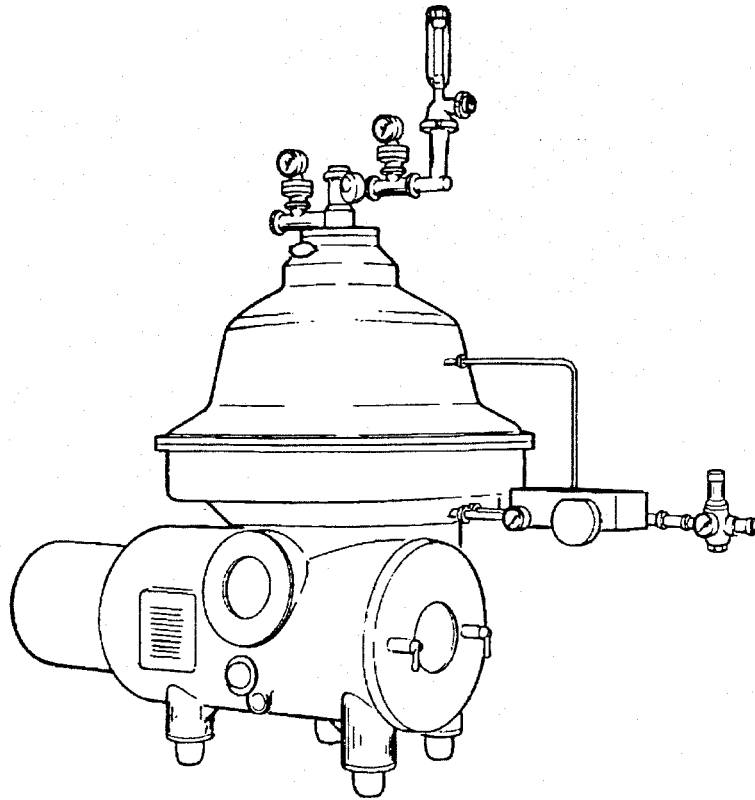
Model CND 215-01-076

**NNN**  
MACHINERY WORLD



Mechanical Separation  
Division





Westfalia Separator AG  
D-59302 Oelde (F. R. Germany)

Type	<input type="text"/>	No.	<input type="text"/>
built in	<input type="text"/>	inner Ø 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"/>

## 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	3
1.4	Bowl speed and product	3
1.5	Operations on the separator	3
1.5.1	Assembly	4
1.5.2	Electrical appliances	5
1.5.3	Before start-up	6
1.5.4	Operation	7
1.5.5	Shut-down and »Emergency-Off«	9
1.5.6	Maintenance and repair	10
1.6	Corrosion	13
1.7	Erosion	14
<b>2</b>	<b>Installation</b>	<b>17</b>
2.1	Transport	22
2.2	Installation	22
<b>3</b>	<b>Lubrication</b>	<b>25</b>
3.1	Bearings and gear	26
3.1.1	Oil quality	26
3.1.2	Oil quantity	26
3.1.3	Oil check	27
3.1.4	Oil change	27
3.2	Bowl parts	27
3.3	Motor bearings	27
<b>4</b>	<b>Motor connection</b>	<b>29</b>
4.1	Three-phase AC motor	30
4.2	Direction of rotation of the bowl	30
4.3	Speed and starting time of the bowl	30
4.4	Speed measuring unit	31
<b>5</b>	<b>Bowl</b>	<b>33</b>
5.1	Important hints	34
5.2	Removing the feed and discharge connections	36
5.3	Dismantling the bowl	38
5.4	Assembling the bowl	44
5.5	Assembling the feed and discharge connections	51
5.6	Replacing the main gasket in bowl top	53
5.7	Removal of bowl valves	54
5.8	Installation of bowl valves	54
5.9	Disc stack compressing device	55

<b>6</b>	<b>Technical information</b>	<b>57</b>
6.1	Operating principles of the bowl	58
6.2	Operating principles of the hydraulic system of the bowl	59
6.3	Control unit	61
6.4	Operating-water connection	62
6.4.1	Pressure switch	63
6.4.2	Solenoid valves	63
<b>7</b>	<b>Operation</b>	<b>65</b>
7.1	General	66
7.2	Before start-up	66
7.3	Starting	66
7.4	The separator in operation	67
7.4.1	Partial ejection	69
7.4.2	Total ejection	72
7.4.3	Function diagram	72
7.4.4	Bowl ejections (manual)	73
7.4.5	Ejection monitoring	73
7.5	Stopping the separator	74
<b>8</b>	<b>Cleaning</b>	<b>75</b>
8.1	Cleaning-in-place (CIP)	76
8.2	Bowl	77
8.3	Upper section of frame	77
8.4	Operating-water feeding system	78
8.5	Gear chamber	78
8.6	Prior to a long-term shut-down of the separator	78
<b>9</b>	<b>Drive</b>	<b>79</b>
9.1	Dismantling the vertical gear parts	80
9.1.1	Removal of ball bearing and worm	82
9.2	Re-assembly of vertical gear parts	83
9.2.1	Assembling the neck bearing bridge	84
9.2.2	Fitting the spring column into the bottom bearing	84
9.2.3	Installing the worm spindle	85
9.3	Bowl Height	86
9.3.1	Checking	86
9.3.2	Adjusting	86
9.4	Removal of the horizontal gear parts	88
9.4.1	Removing the motor	88
9.4.2	Removing the fluid clutch	88
9.4.3	Worm wheel shaft	89
9.4.4	Grooved ball bearing (motor side)	91
9.4.5	Angular contact ball bearing (brake side)	91
9.5	Re-assembly of horizontal gear parts	92

<b>10</b>	<b>Fluid clutch</b> .....	<b>95</b>
	10.1 General .....	96
	10.2 Checking the oil level: .....	96
	10.3 Filling in oil .....	97
	10.4 Type of oil .....	98
	10.5 Dismantling .....	99
	10.6 Assembling .....	101
<b>11</b>	<b>Trouble shooting</b> .....	<b>103</b>
	11.1 Fault detection - Mechanical function .....	104
	11.2 Fault detection – Ejection .....	108
<b>12</b>	<b>Lubrication and maintenance</b> .....	<b>111</b>
	12.1 Lubrication chart .....	112
	12.2 Maintenance schedule .....	113
<b>13</b>	<b>Parts list</b> .....	<b>115</b>
	Important hints for ordering parts .....	117
	Frame, complete .....	119
	Intermediate flange, complete .....	121
	Motor protective hood .....	122
	Gear, complete .....	125
	Worm spindle, complete .....	127
	Neck bearing bridge assembly with covering .....	128
	Fluid clutch, compl. ....	131
	Set of spare parts for fluid clutch .....	133
	Bowl, complete .....	135
	Valve, compl. ....	136
	Double centripetal pump, cpl. ....	137
	Hood, compl. ....	138
	Feed and discharge connections, compl. ....	139
	Flow meter, compl. ....	141
	Operating-water connection, compl. ....	143
	Solenoid valve, cpl. (24 VDC) .....	144
	Metering unit, complete .....	145
	Water pressure reducer 16/1,5–6 bar .....	146
	Set of tools .....	149
	Set of accessories .....	150
	Hydraulic unit, complete .....	151





**1 Safety precautions**

1.1	Correct usage .....	2
1.2	Safety stickers on the machine .....	2
1.3	Basic operating principles .....	3
1.4	Bowl speed and product .....	3
1.5	Operations on the separator .....	3
1.5.1	Assembly .....	4
1.5.2	Electrical appliances .....	5
1.5.3	Before start-up .....	6
1.5.4	Operation .....	7
1.5.5	Shut-down and »Emergency-Off« .....	9
1.5.6	Maintenance and repair .....	10
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.

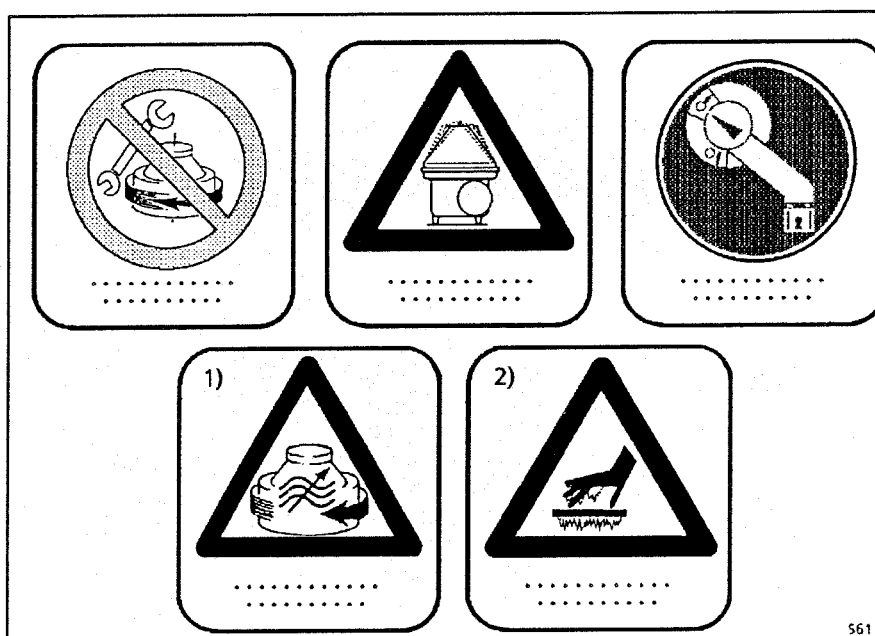


Fig.1

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



### 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.

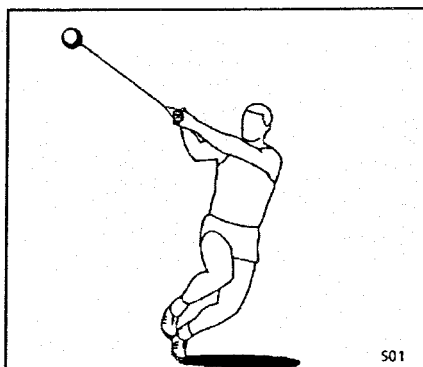


Fig. 2

High centrifugal forces are produced in the rotating bowl.

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

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

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

### 1.4 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 looked after in accordance with our operating Instructions.

Special attention must be given to:

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



## 1.5.1 Assembly

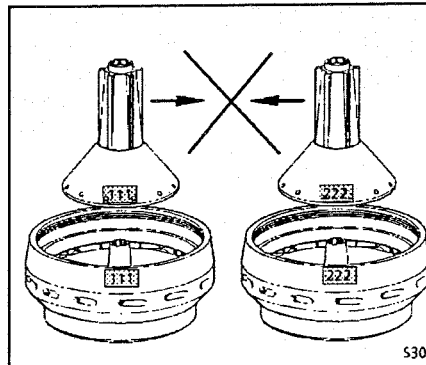


Fig. 3

- If the plant has several centrifuges, be careful not to interchange parts of different bowls since each bowl has been balanced individually. The bowl parts are marked with the serial-number of the machine or with the last three digits of the serial-number.

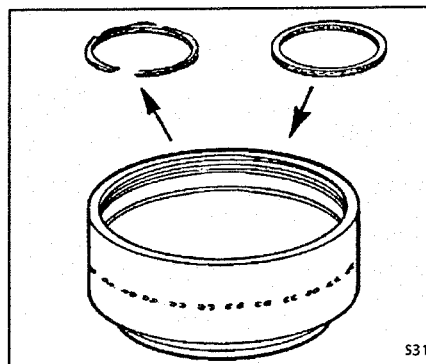


Fig. 4

- Damaged parts must be replaced immediately by new parts.

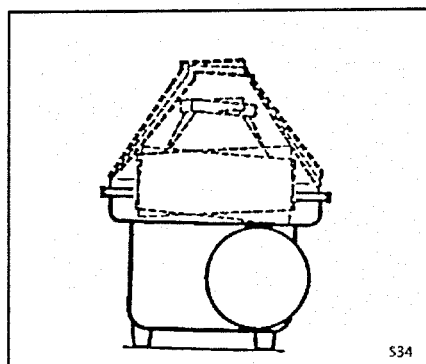


Fig. 5

- After installing spare bowl parts, the bowl must be re-balanced.

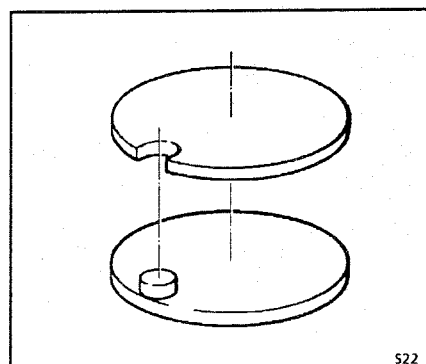


Fig. 6

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



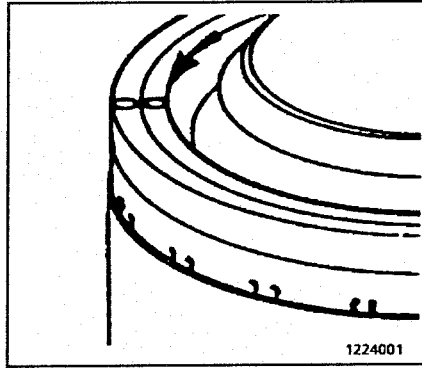


Fig. 7

- When assembling the bowl, be sure to strictly adhere to the instructions given in chapter "bowl", in order to avoid undue unbalance.
- Before starting the bowl, be sure to fit all parts.
- Tighten the bowl lock ring securely: the "O" marks on the bowl bottom or bowl top and on the lock ring must be in line with each other.

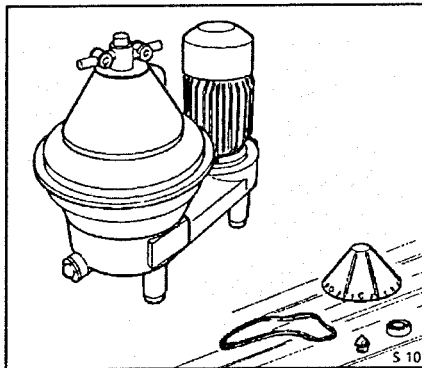


Fig. 8

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

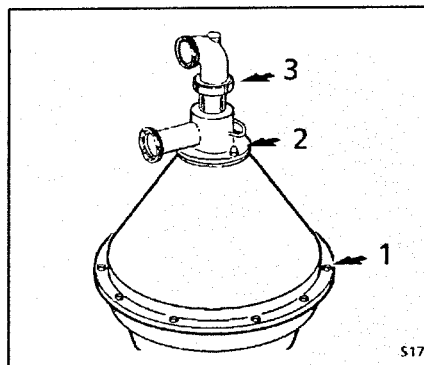


Fig. 9

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

1.5.2 Electrical appliances

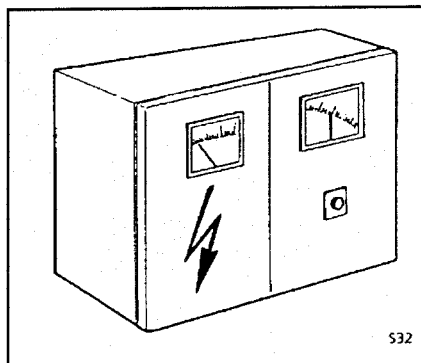


Fig. 10

- 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

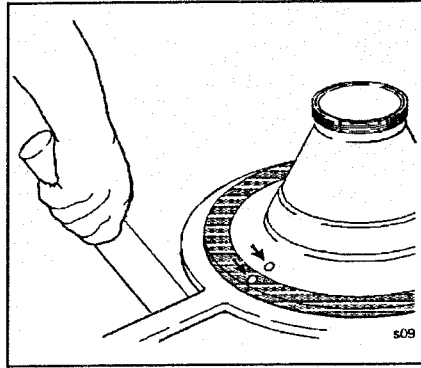


Fig. 11

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

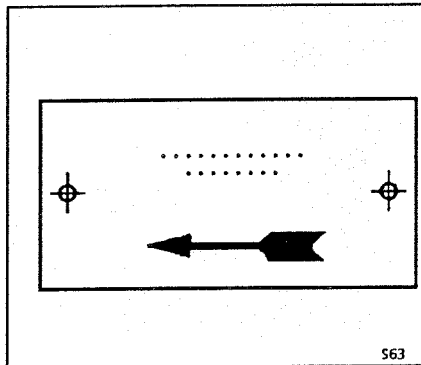


Fig. 12

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

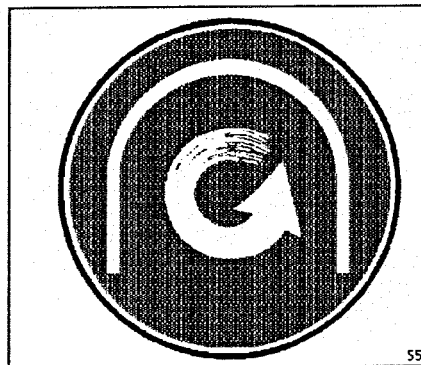


Fig. 13

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

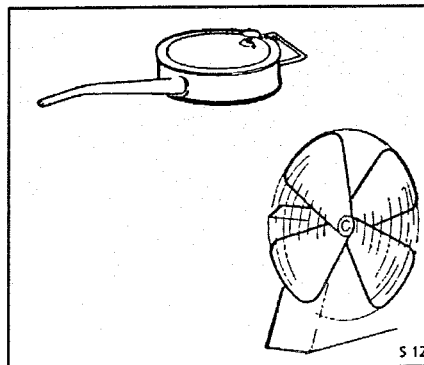


Fig. 14

- Check that the lubrication and cooling systems are serviceable.



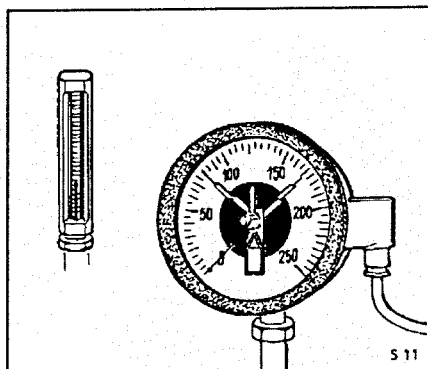


Fig. 15

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

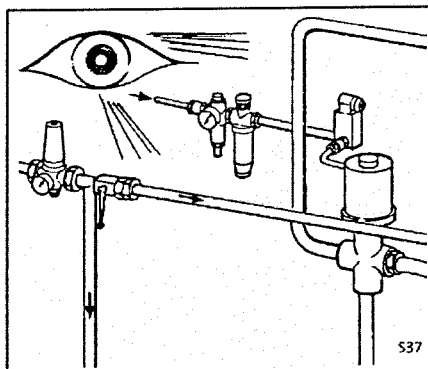


Fig. 16

- Check that the product lines are set to operation.
- Regularly check hoses for signs of ageing.
- Check sight glasses for mechanical damage.
- Replace damaged parts by parts which are as good as new.

1.5.4 Operation

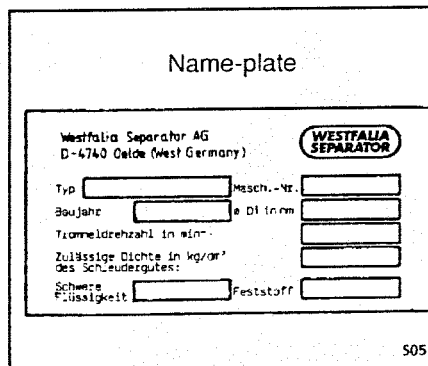


Fig. 17

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



Fig. 18

- Wear ear protection.



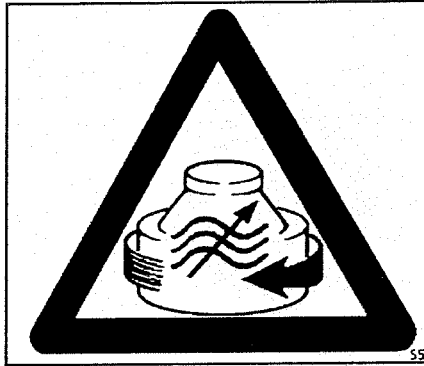


Fig. 19

**In case of frequency converter operation:**

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



Fig. 20

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



Fig. 21

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

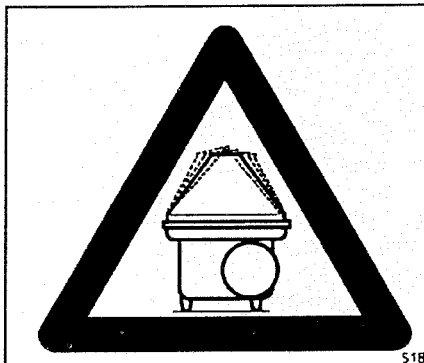


Fig. 22

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





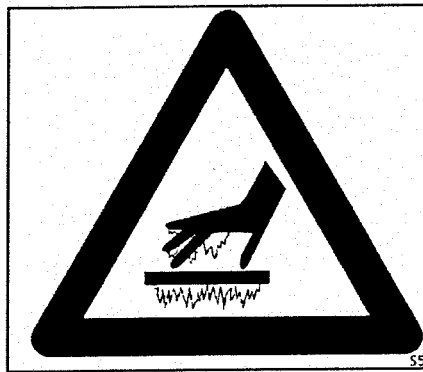


Fig. 23

Only in case of hot operation:

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

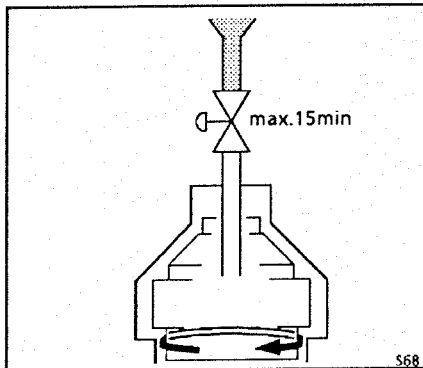


Fig. 24

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

1.5.5 Shut-down and »Emergency-Off«

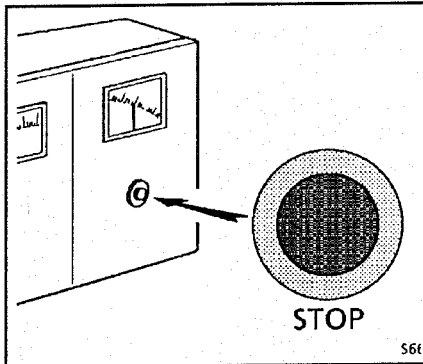


Fig. 25

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



### 1.5.6 Maintenance and repair

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

- aggressive product (chemical or physical)
- high product temperature
- product with grease decaying properties
- environment: temperature, dust and vapours

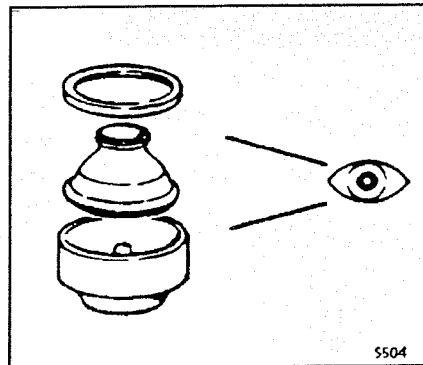


Fig. 26

Particularly stressed parts such as bearing hub, bowl hub and other bowl parts with a large outer diameter must be checked on a regular basis to ensure safe and efficient operation.

Timely maintenance 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 customer to the extent as described in this instruction manual.



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

We, therefore, recommend in your own interest to have your separator inspected by our service engineers at regular intervals. Such inspections will keep your separator working reliable and prevent undesirable shut-downs.

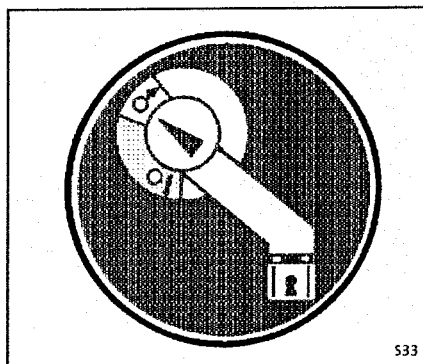


Fig. 27

Before maintenance and servicing:

- switch off all electrical appliances via the main switch,
- secure installation against unintended re-starting with locking devices.



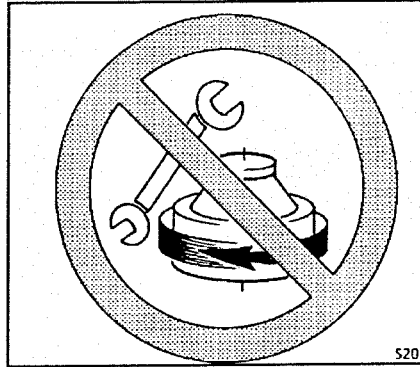


Fig. 28

- Do not loosen any part before the bowl has come to a standstill.
- For checking standstill refer to chapter "bowl".



Fig. 29

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

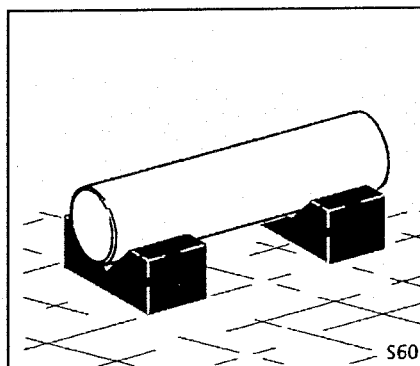


Fig. 30

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

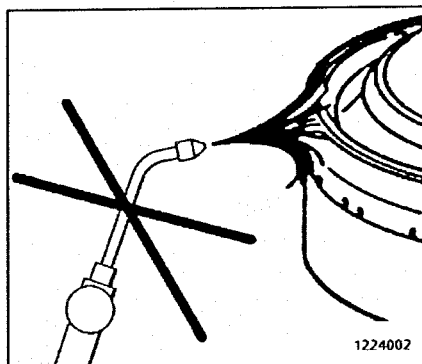


Fig. 31

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



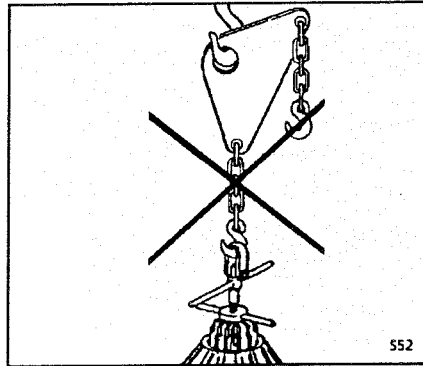


Fig. 32

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

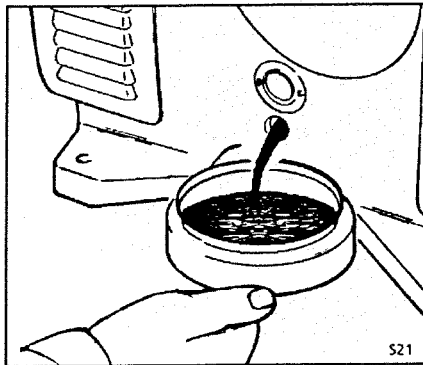


Fig. 33

- 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.

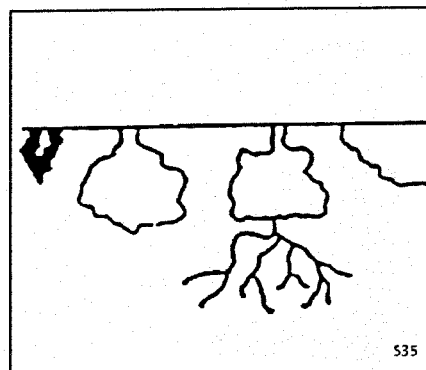


Fig. 34

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.

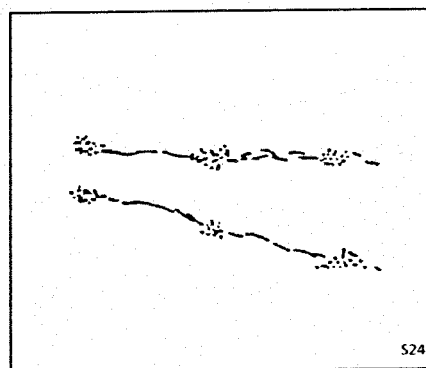


Fig. 35

Possible formation of pit-shaped corrosion.

### 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.



### 1.7 Erosion

Erosion is caused by solid particles in the process liquid. These solid particles grind marks into the surfaces with which they come into contact.

The following factors favour the occurrence of erosion:

- hard solids particles
- high throughput capacities

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

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

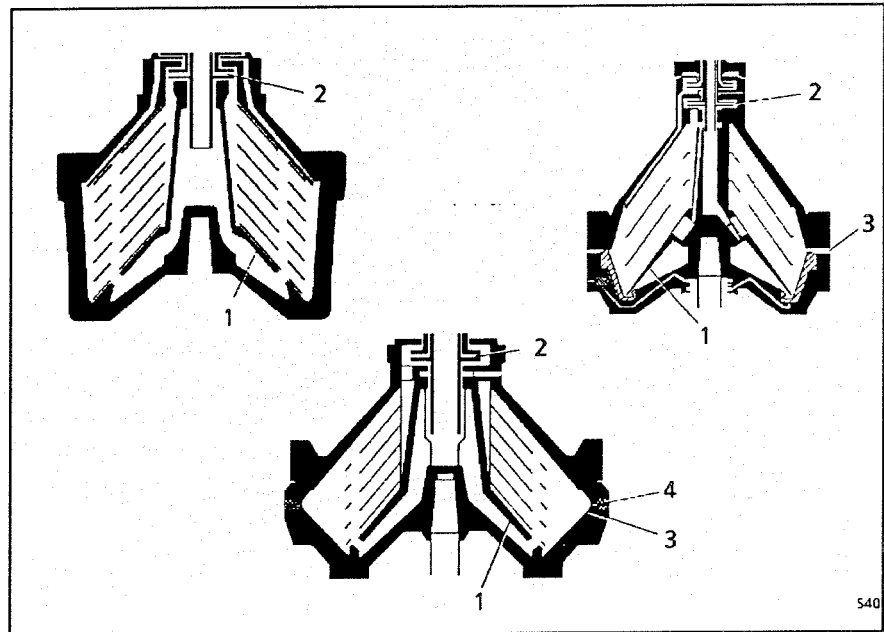


Fig.36

The surfaces most susceptible to erosion are:

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



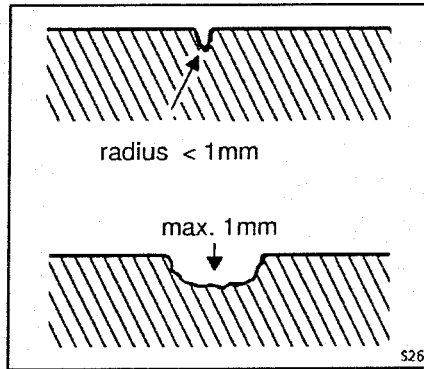


Fig. 37

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

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







**2 Installation**

2.1	Transport .....	22
2.2	Installation .....	22

Plan  
Angebot  
Leistungs  
Angebot  
Angebot  
Angebot  
Angebot

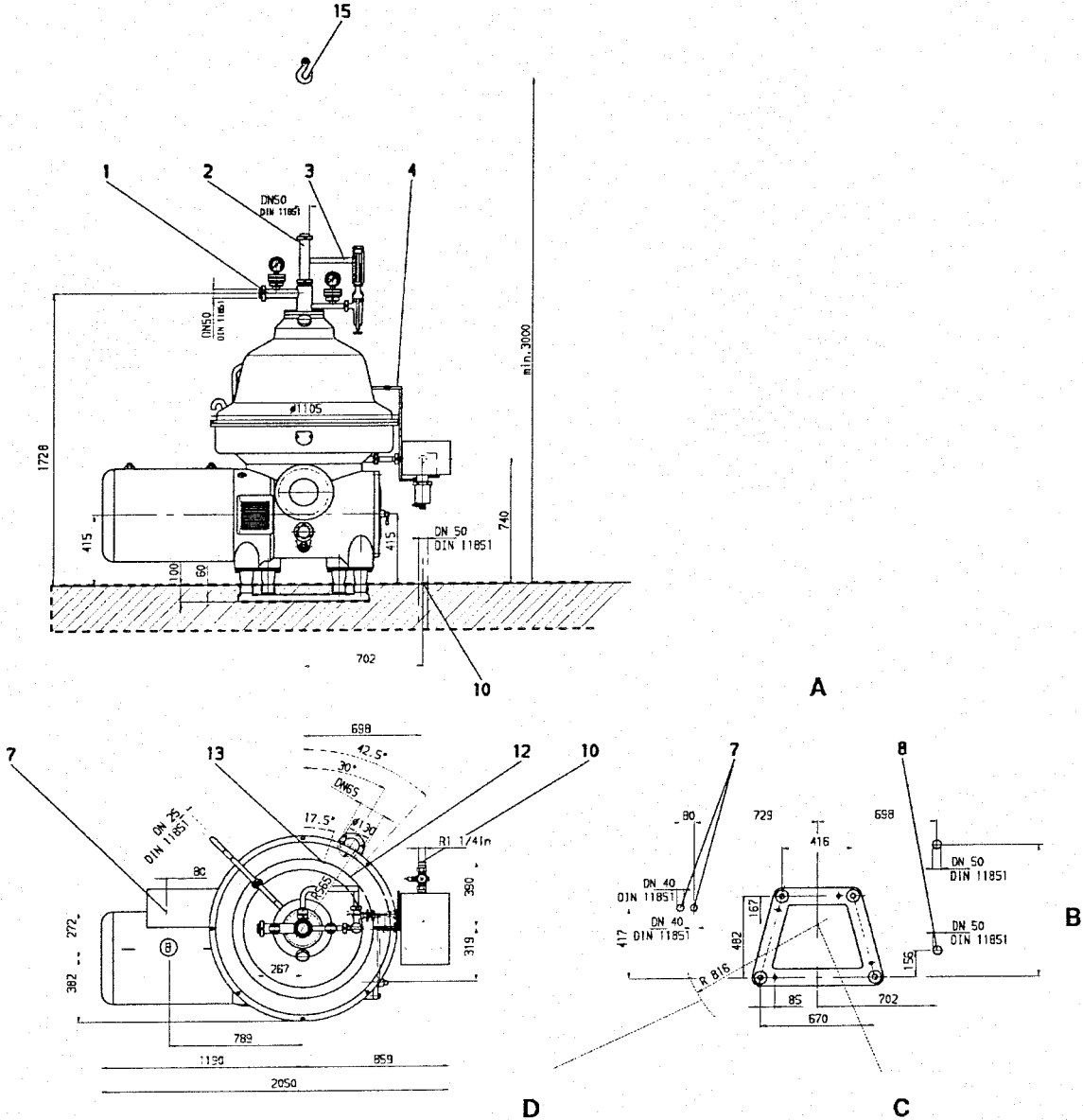


Fig.38

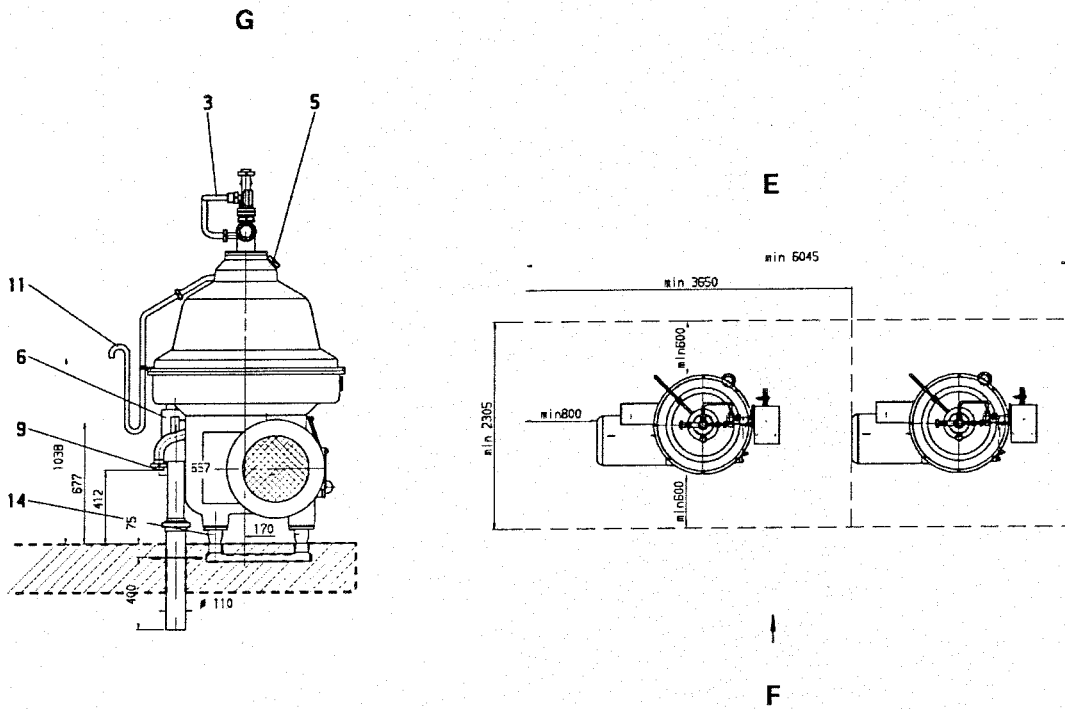


Fig.39

Subject to modification - note project-specific drawing!

Product and operating water connection points as per DIN 11851

- A Position of floor cutouts
- B Dimension variable
- C Center line bowl
- D Radius of action of bowl wrench
- E Minimum clearance when installing two separators
- F Operating side
- G Separator with floor cutout

Load on foundation:		
static		F = 23 400 N
dynamic	horizontal	on each foot 1300 N
	vertical	on each foot 3100 N
The dynamic forces of the individual feet act jointly as torque on the foundation.		

- |  |  |
|--|--|
| 1 Product discharge                                    | 10 Operating water feed                                |
| 2 Product feed   | 11 Overflow  |
| 3 Recycle line   | 12 Cooling water feed ( hood / solids collector )      |
| 4 Flush line   | 13 Cooling water discharge ( hood / solids collector ) |
| 5 Inspection hole                                      | 14 Voltage equalization                                |
| 6 Solids discharge                                     | 15 Hoist ( lifting capacity : 1500 Kg )                |
| 7 Power supply to motor                                |  |
| 8 Power supply for solenoid valves and pressure switch |  |
| 9 Operating water discharge                            |  |

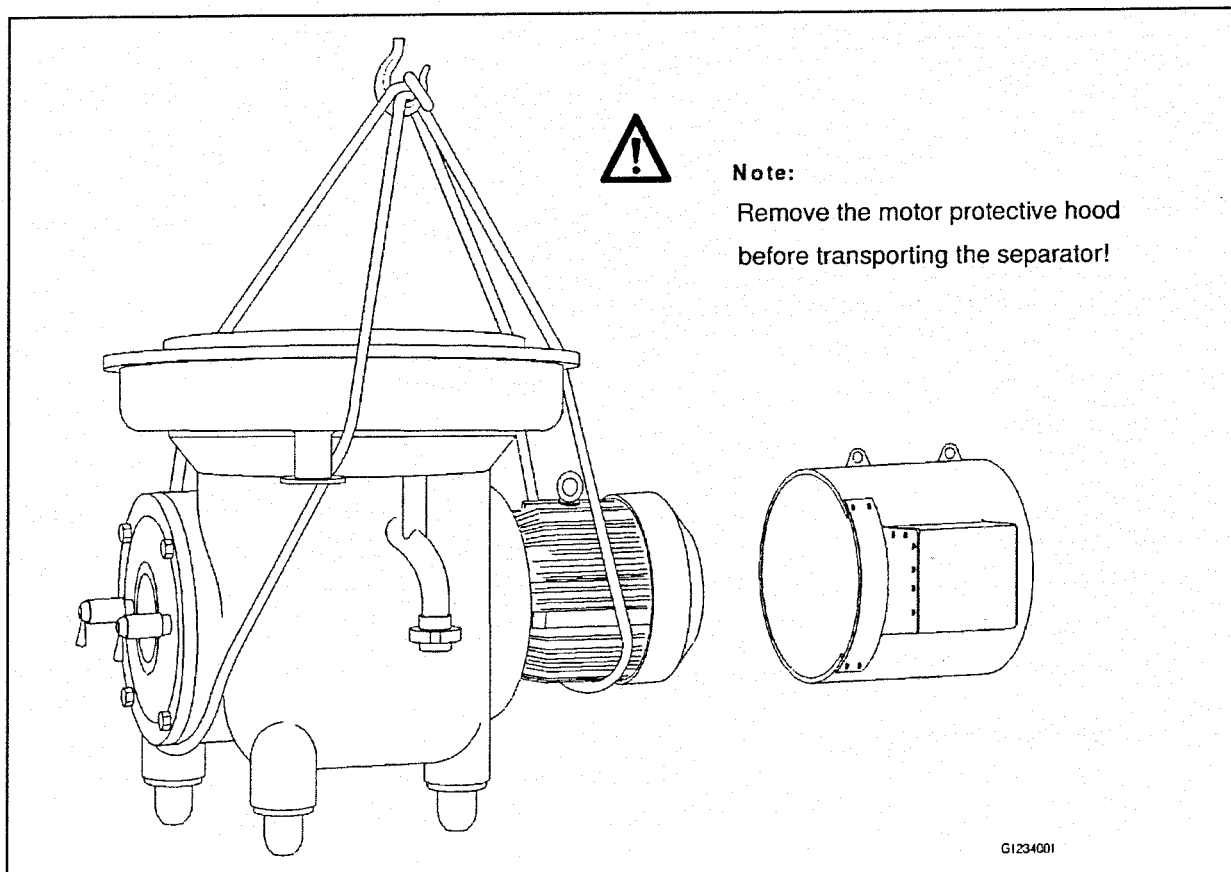


Fig.40

## 2.1 Transport

Suspend the separator as shown in figure.

Never attach rope to eye bolt on motor.

To prevent rope from slipping, wind it twice around the crane hook.

When lowering the separator, make sure it touches down gently.

## 2.2 Installation

- When installing the separator, make sure that sufficient room is available for operating and dismantling the machine (see dimensioned drawing).
- If several separators are installed, the distance from center-to-center of the separators must be observed, see dimensioned drawing.
- Do not install a shut-off valve in the frame drain and do not connect the frame drain to a piping system so that the operating water can flow off freely, e.g. through a funnel into the sewer or a sludge tank. Otherwise the water will rise into the upper section of the frame and brake the bowl. It can also seep down through the neck bearing into the gear housing and damage the gear.
- For installing and removing the bowl a hoist with a minimum lifting capacity of 1 500 kg or a swivel hoist is required. A swivel hoist is available on special order.
- Whenever possible, connect the feed and discharge lines to the fixed piping by means of compensators to absorb vibrations during start-up and run-down of the separator.

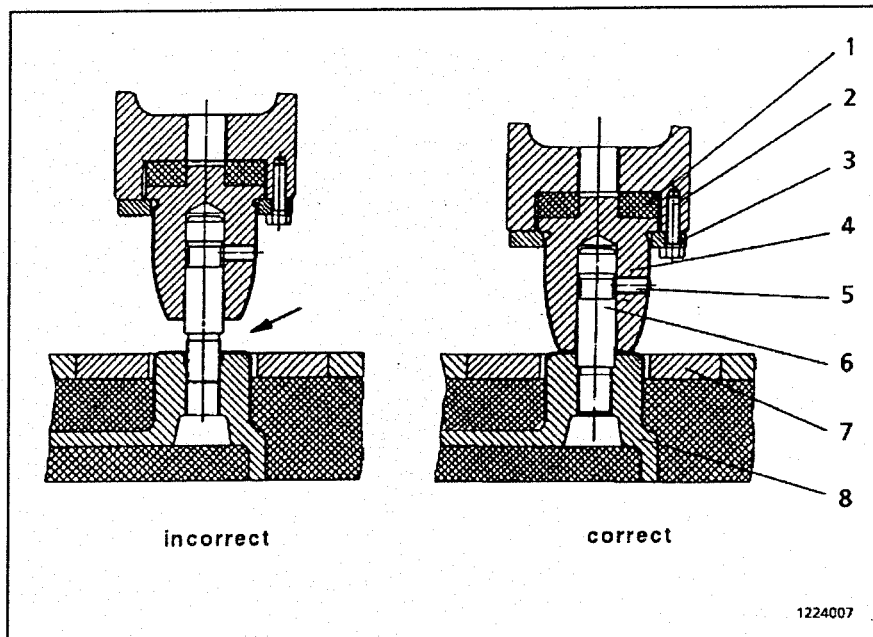


Fig. 41

- |                        |                    |
|------------------------|--------------------|
| 1 Rubber-metal cushion | 5 Threaded pin     |
| 2 Screw                | 6 Bolt             |
| 3 Flange               | 7 Base plate       |
| 4 Foot                 | 8 Foundation frame |

- Screw bolts 6 into the four mounting blocks of foundation frame 8 **as far as they will go**.
- Embed the foundation frame in the floor so that the mounting blocks of the frame protrude from the floor plates 7 by approx. 5 mm.
- Align the foundation frame so that the mounting blocks are **horizontal** and anchor it with heavy-duty wall plugs and hex head screws. ( M16 )
- Use flanges 3 and screws 2 to fasten feet 4 with fitted rubber cushions 1 to the separator frame.
- Place the separator with feet on the bolts of foundation frame.
- Tighten threaded pins 5 using a wrench.

Flow  
control  
device  
control  
device  
control  
device



### 3 Lubrication

3.1	Bearings and gear .....	26
3.1.1	Oil quality .....	26
3.1.2	Oil quantity .....	26
3.1.3	Oil check .....	27
3.1.4	Oil change .....	27
3.2	Bowl parts .....	27
3.3	Motor bearings .....	27

**3.1 Bearings and gear**

All bearings of the separator are splash-lubricated by:  
 - Immersion of the toothed rim of the wormwheel in the central oil bath.  
 All bearings are splashed with oil due to centrifugal force.

**3.1.1 Oil quality**

As lubricating oil use only industrial gear oils designated

- CLP 220 – according to DIN 51502
- CC 220 – according to ISO 3498

The lubricating oil must meet the following requirements:

Additives giving increased protection against corrosion and increased resistance to aging.		
Corrosion protection properties on steel:	degree of corrosion 0	DIN 51355/B
Corrosion effect on copper:	degree of corrosion 1	DIN 51759–100 A3
Additives for decreasing wear and increasing the load-carrying capacity.		
Basic requirement:	"FZG" gear rig test A/16,6/90 as per DIN 51534 load grade > 12	
Demulsifying power:		
min	< 60	DIN 51599
Viscosity at 40 °C	mm <sup>2</sup> /s (cSt)	220 ± 22

The gear oil designated "Separator lubricating oil CLP 220" ( WS part-no. 0015-0014-080) which we have subjected to extensive tests meets the above requirements and should be used.



Do not use mineral motor car oils or motor oils.

**3.1.2 Oil quantity**

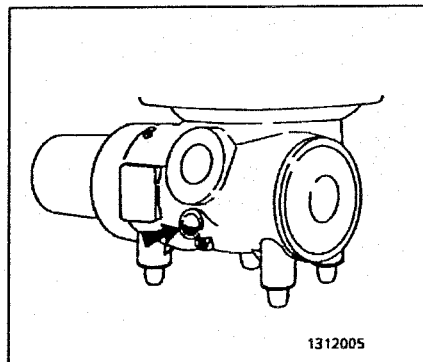


Fig. 42

Before the initial start-up of the separator,

- remove gear sight glass and
- fill gear chamber with oil.

**Quantity:** approx. 5,5 litres

**Minimum oil level:**  
slightly above middle of sight glass

**Maximum oil level:**  
up to the upper third of sight glass



During operation the oil level must never be allowed to sink below the middle of the sight glass; refill oil when necessary.

### 3.1.3 Oil check



- Check oil level daily!
- Check from time to time if oil contains water. To do this, loosen oil drain screw and allow a small amount of oil to drain out.
- If the oil shows a milky colouring (emulsification) an immediate oil change is necessary.

### 3.1.4 Oil change

- Make first oil change after about 250 operating hours; then change oil every 500 operating hours. However be sure not to wait longer than 6 months to change the oil.
- Each time when changing the oil, thoroughly clean gear chamber and flush it with thin-bodied oil before filling in new oil.
- Remove all metal particles from inner walls and corners of the gear chamber.
- Do not use fluffy cleaning rags or cotton waste.
- Clean sight glass.

### 3.2 Bowl parts

Before assembling the bowl grease bowl parts such as:

- bowl bottom
- sliding piston
- bowl top
- lock rings

with **Klüber Grease KSB 8**.

In addition to the above lubricant, other pastes or greases with the same properties may be used.

### 3.3 Motor bearings

For lubrication of the motor bearings, refer to the instructions of the motor manufacturer (see motor plate).

Plan  
Mengen  
Kontroll  
Anordnungen  
Kontroll  
Mengen  
Kontroll

**4 Motor connection**

4.1	Three-phase AC motor .....	30
4.2	Direction of rotation of the bowl .....	30
4.3	Speed and starting time of the bowl .....	30
4.4	Speed measuring unit .....	31

- 4.1 Three-phase AC motor** The separator bowl is driven by a water-cooled flange-type motor via a fluid clutch and worm wheel gear.

Motor power	37		kW
Type	IM B5		
Connection	Direct starting or star-delta starting switch over from star to delta after approx. 4 sec.		
Starting current	1.8 – 2 x I <sub>n</sub>		
Frequency	50	60	Hz
Speed	1500	1800	min <sup>-1</sup>
Type of protection	IP 55		
Motor protection	PTC resistors		

Connect the PTC resistors to an appropriate tripping device.

External voltage for the terminals of the temperature feelers **max. 2.5 volts**.

When testing for continuity, use an ohmmeter.

Never use a test lamp.

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

Dimensioning of switches, wiring and fuses should be based upon the **starting current**.

- 4.2 Direction of rotation of the bowl**

**IMPORTANT:**

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

If it turns in anti-clockwise direction (incorrect), two lead-in wires have to be interchanged.

- 4.3 Speed and starting time of the bowl**

Speed	4 700 rpm It is indicated by the speed measuring unit.
Starting time	approx. 12 minutes

Only **two** successive starts are permitted.

If, in exceptional cases, a third start becomes necessary, it must not be effected before 45 to 60 minutes have elapsed.

**Why?** The temperature of the oil in the fluid clutch will rise excessively.

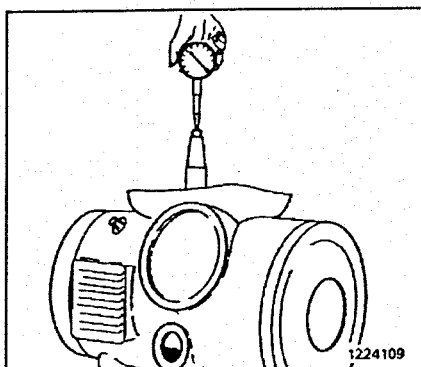


Fig. 43

- Check the spindle speed with a hand tachometer:
  - before initial start-up
  - after changing the gear
- Make this check before installing the bowl.

The spindle speed may be up to 5% above the specified bowl speed.



Make sure that the bowl reaches its rated speed within the starting time and that this speed is maintained during operation. The speed is indicated on the name-plate of the separator.

#### 4.4 Speed measuring unit Application

The speed measuring unit serves for

- bowl speed indication
  - Speed variations up to 3 % are permissible.
- monitoring of
  - speed drop
  - exceeding the starting time.

#### Description of unit

The speed measuring unit consists of

- proximity switch
- speed measuring unit
- speed indicator with limit contact

The proximity switch is mounted on the drive (brake side). Speed measuring device and speed indicator are located in the control unit.

#### Operating principles

An acoustical alarm is given if the speed drops:

- $\leq 4\,600$  rpm (50 Hz)
- $\leq 4\,600$  rpm (60 Hz)

The operating personnel must then interrupt the separating process and stop the centrifuge.

If the rated speed is not reached in the pre-set starting time (12 minutes), an acoustical alarm is also given.

The product pump is interlocked and safety water is automatically supplied.

Wiederholungsdruck  
Wiederholungsdruck  
Wiederholungsdruck  
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Wiederholungsdruck



**5 Bowl**

5.1	Important hints .....	34
5.2	Removing the feed and discharge connections .....	36
5.3	Dismantling the bowl .....	38
5.4	Assembling the bowl .....	44
5.5	Assembling the feed and discharge connections .....	51
5.6	Replacing the main gasket in bowl top .....	53
5.7	Removal of bowl valves .....	54
5.8	Installation of bowl valves .....	54
5.9	Disc stack compressing device .....	55

### 5.1 Important hints

The centrifuge bowl rotates at a very high speed. Hence, forces are produced which can endanger the operating safety of the bowl in case of

- incorrect assembly or
- inadequate cleaning of the bowl.

The instructions for assembly must therefore be followed exactly.

#### The following points should also be observed:

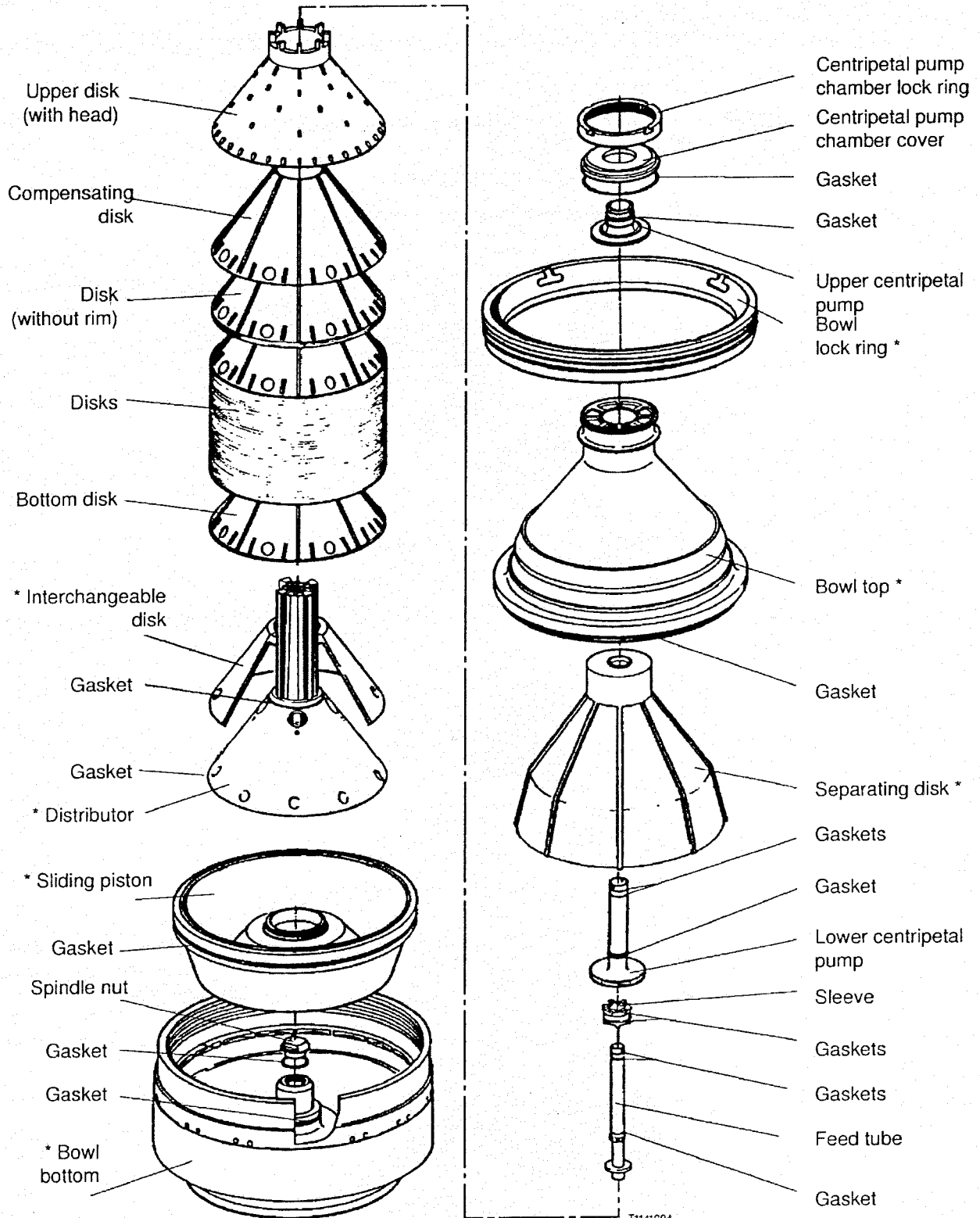
- Before fitting the bowl parts thoroughly clean, grease or lubricate (3.2) the following and check for impact marks:
  - Guide and contact surfaces
  - Bowl lock ring
- Note that lubricating surfaces are clean.
- When fitting the bowl parts, make sure that the "O" marks on all parts are in line with each other.  
(Only then will the parts fit correctly over arresting pins and guide ribs).
- Avoid damage when fitting and removing parts by
  - exact positioning.
  - avoiding diagonal pull.
  - selecting the lower lifting speed of the hoist.
- Only use correctly rated, fully functional hoists.
- Do not use force to fit or remove parts.
- Before fitting gaskets, check the gaskets and gasket grooves for cleanness and wear.
- After fitting, check that the gaskets
  - are not twisted.
  - fit evenly into their grooves.
- Handle all bowl parts with care.
- Always place them on a rubber mat or pallet.



In the case of a plant with several centrifuges:

- Do not interchange parts of different bowls (**danger of imbalance**).

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



\* After replacing this part, the complete bowl must be re-balanced.

## 5.2 Removing the feed and discharge connections

### CAUTION:

To prevent accidents, do not loosen any parts before the bowl has come to a standstill!



Only when the gear sight glass is clear and the worm wheel has stopped rotating is the bowl at a standstill.

- Replace worn gaskets immediately.
- For tools refer to chapter 13 - Parts list.

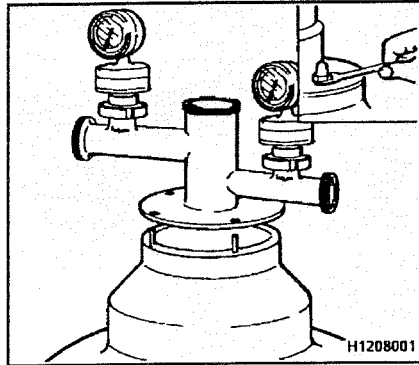


Fig. 45

- Disconnect feed and discharge lines.
- Loosen cap nuts of the connection housing and remove the housing.

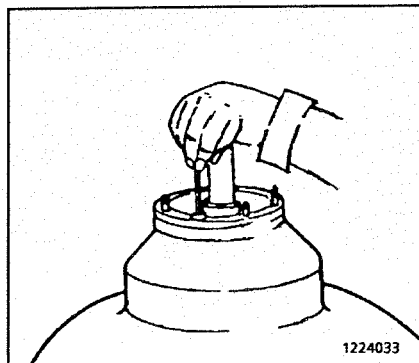


Fig. 46

- Loosen two Allen screws from the disk.

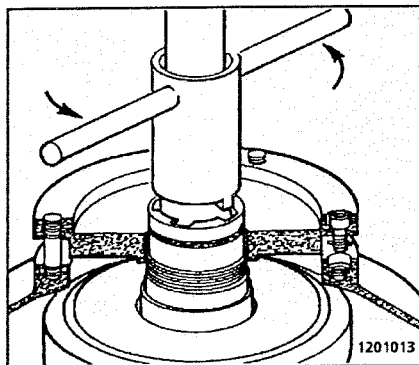


Fig. 47

- Unscrew centripetal pump anti-clockwise from the disk using wrench for centripetal pump.

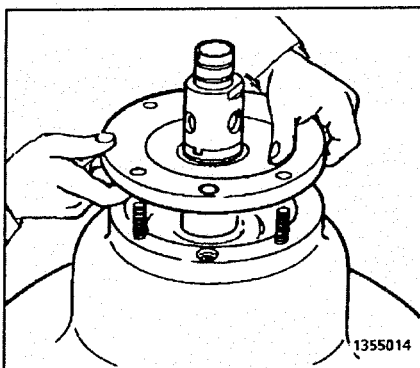


Fig. 48

- Remove the disk.

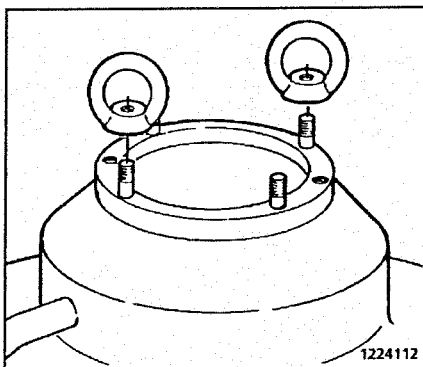


Fig. 49

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

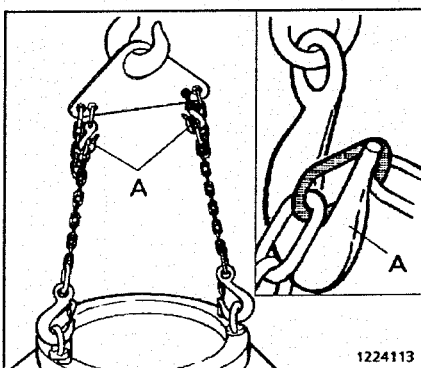


Fig. 50

- Unscrew the fastening screws of the hood.
- Disconnect hood flush water line from the operating water connection.
- Shorten the chains of the lifting device.  
The chain link must be put crosswise on hook A (see adjacent small figure)!
- Hang the shortened lifting device into the lifting-eye nuts and lift off the hood.

## 5.3 Dismantling the bowl

**CAUTION:**

To prevent accidents, do not loosen any parts before the bowl has come to a standstill!



Only when the gear sight glass is clear and the worm wheel has stopped rotating is the bowl at a standstill.

- Before opening the bowl, release the brakes by turning the two handles in clockwise direction.
- Handle bowl parts with care.
- Replace worn gaskets immediately.
- For tools see chapter 13 - Parts List.

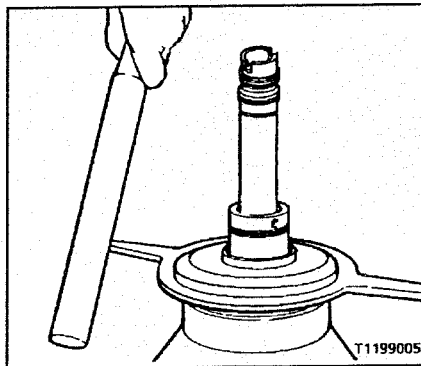


Fig. 51

- Loosen centripetal pump chamber lock ring by lightly tapping with the mallet against the handle of the annular wrench (left-hand thread).

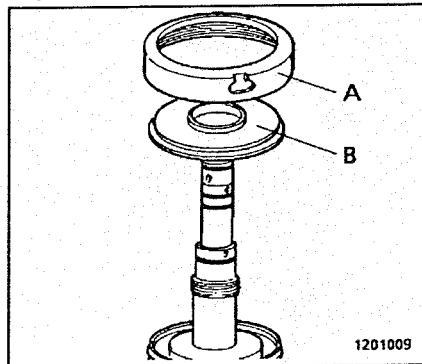


Fig. 52

- Unscrew centripetal pump chamber lock ring A by hand and remove it.
- Remove centripetal pump chamber cover B.

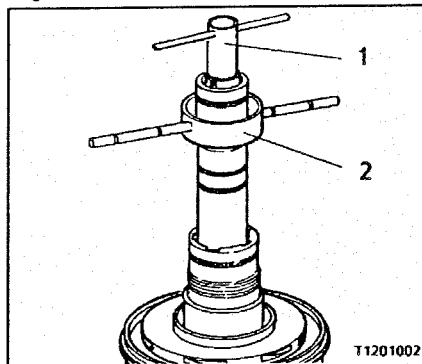


Fig. 53

- Unscrew threaded piece by means of wrench 2.
- While doing so, hold the feed tube with wrench 1.

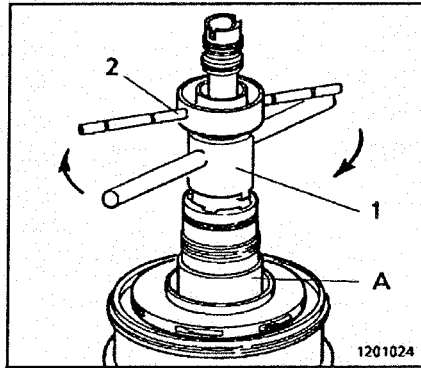


Fig. 54

- Screw centripetal pump A from lower centripetal pump using wrench 1 (**left-hand thread**).
- While doing so, hold the lower centripetal pump with wrench 2.

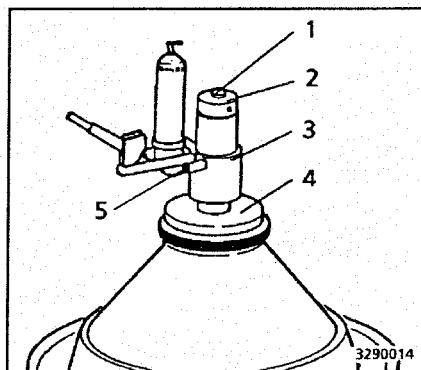


Fig. 55

#### Mount the disk stack compressing device:

- Place disk 4 onto the bowl top.
- Screw bolt 1 as far as it will go into the bowl bottom (**left-hand thread**).
- Insert hydraulic part 3 into the centering recess of the disk.
- Screw on threaded ring until its upper edge is flush with the end thread of bolt 1 (**left-hand thread**).

To prevent damage to threads:



- Screw in threaded bolt as far as it will go.
- Screw on threaded ring until end of thread.

If the threaded ring cannot be screwed down completely, then the piston and the cylinder of the compressing device are too far apart.

In this case:

- Bring piston and cylinder back into initial position:
  - Loosen pressure relief screw 5 by two turns.
  - Move pump lever to its lowest position.
  - Screw on threaded ring until end of thread.
- Tighten screwed connections of the compressing device.
- Screw tight pressure relief screw 5.

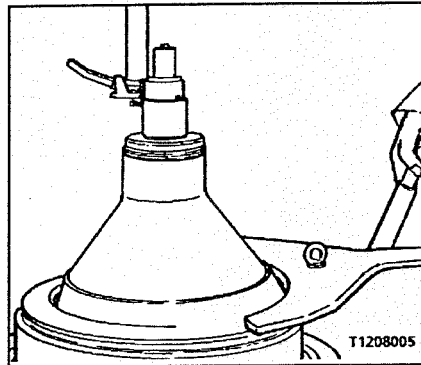


Fig. 56

- Compress the disk stack to facilitate loosening of the bowl lock ring.  
**Pressure: 300 – 350 bar**
- Loosen the bowl lock ring by rapping with a mallet against the handle of the wrench (**left-hand thread**).
- Remove the wrench using the lifting device and a hoist.

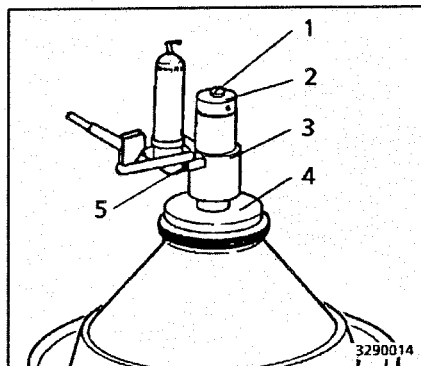


Fig. 57

#### Remove disk stack compressing device:

- Bring the pump lever into its bottom-most position to prevent it from jumping back.
- Loosen pressure relief screw 5.
- Unscrew threaded ring 2.
- Remove hydraulic part 3 with disk 4.
- Unscrew bolt 1 (**left-hand thread**).

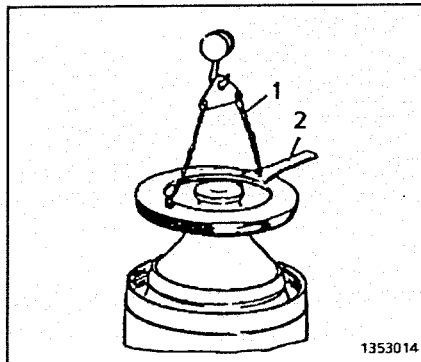


Fig. 58

- Lock annular wrench 2 by screwing the hex head screw into the groove of the bowl lock ring.
- Lift off annular wrench and bowl lock ring with the aid of tool 1 (bowl lock ring).

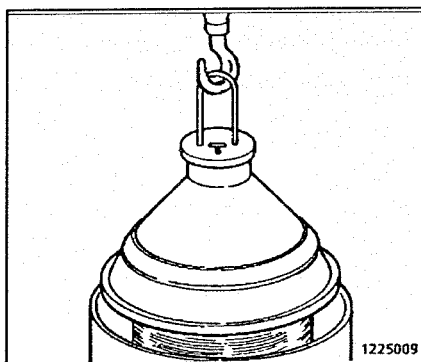


Fig. 59

- Screw lifting device onto bowl top.
- Remove bowl top from bowl bottom by means of the lifting device.

If the separating disk is stuck to the bowl top:



- Rap the bowl top with a copper or light metal hammer until the separating disk falls off. Do not let it drop onto the floor.
- If the separating disk cannot be removed in this way, put down the bowl top.
- Pass a brass mandrel through the **outer** holes in the upper part of the bowl top. Loosen the separating disk by gently tapping against the mandrel.  
**Never place a mandrel on the inner rim of the separating disk.**

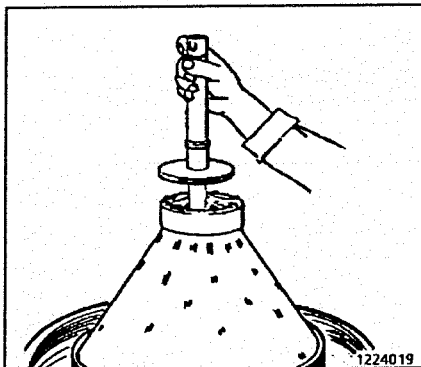


Fig. 60

- Remove lower centripetal pump.

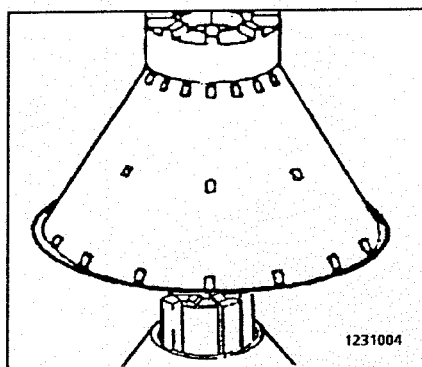


Fig. 61

- Remove upper disk.

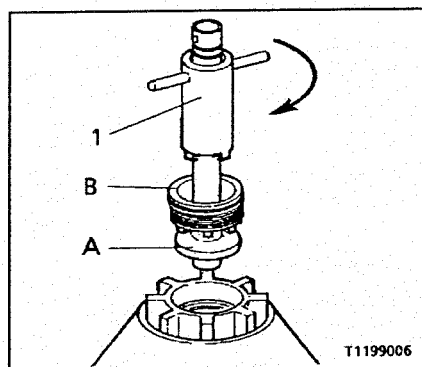


Fig. 62

- Remove sleeve B from the distributor neck using wrench 1 (left-hand thread).
- Pull out feed tube A.

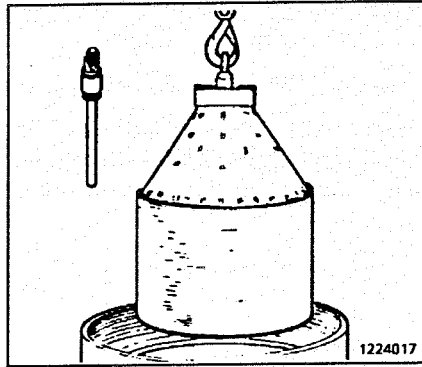


Fig. 63

- Use lifting device (for distributor) to lift out distributor and disk stack.

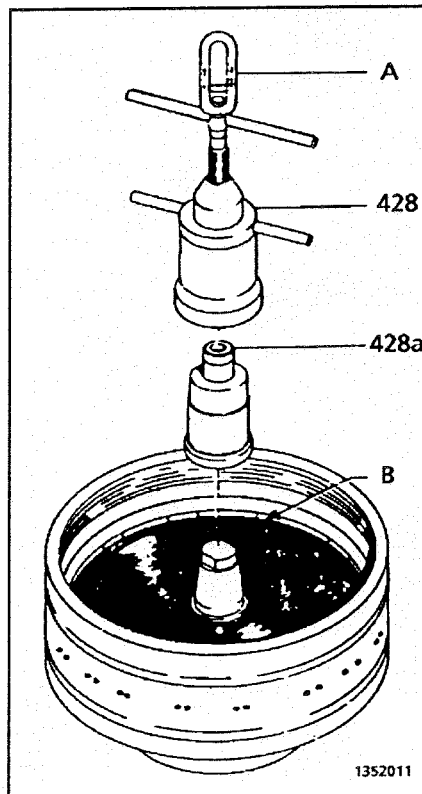


Fig. 64

- Place pressure piece 428a on bowl bottom so that the arresting pins in the bowl bottom catch into the holes in the pressure piece.
- Screw lifting device 428 onto sliding piston.
- Turn jackscrew A **clockwise** to pull the sliding piston off the bowl bottom.
- Lift out the sliding piston using the tool.

**IMPORTANT:**

Make sure that sealing lip B of the sliding piston does not get damaged.

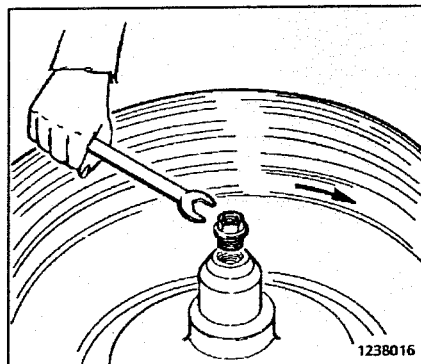
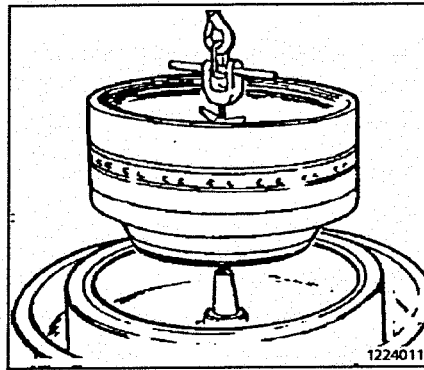


Fig. 65

- Unscrew spindle nut using the wrench (**left-hand thread**).



- Force bowl bottom off the spindle cone using jack for bowl bottom.

Fig. 66

#### 5.4 Assembling the bowl

- When assembling the bowl parts make sure the "O" marks on all parts are aligned.
- For lubrication of threads and guide surfaces of the bowl parts see 3.2
- Replace worn gaskets immediately.
- For tools see chapter 13 - Parts List.

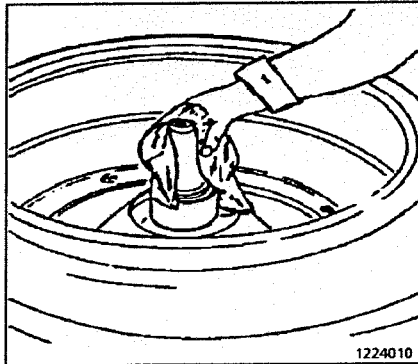


Fig. 67

- Oil the upper part of the spindle (cone and cylindrical guide surface for the spindle cap). The spindle cap must be able to move freely up and down on the spindle.
- Clean and wipe dry the conical part of the spindle with a smooth rag. Clean also the inside of the bowl hub to ensure proper fitting.

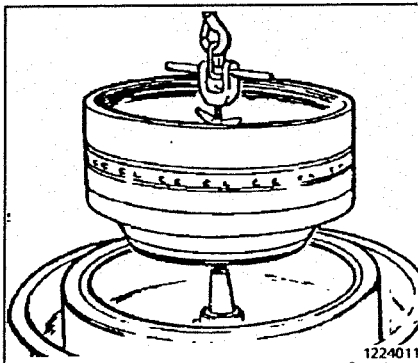


Fig. 68

#### Installing the bowl bottom:

- Place the bowl bottom onto the spindle using the jack.

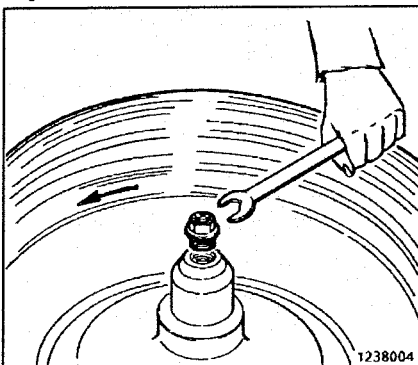


Fig. 69

- Screw on the spindle nut (with inserted gasket) firmly (left-hand thread).

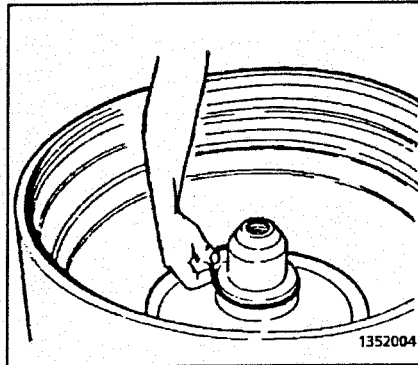


Fig. 70

- Insert the gasket in the hub of the bowl bottom.

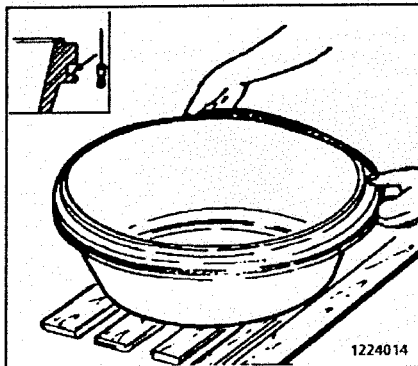


Fig. 71

- Thoroughly clean gasket groove in sliding piston and apply a thin coat of grease.  
If the gasket to be used is new, it must be stretched equally all the way around until the outer diameter almost corresponds to the outer diameter of the groove in the sliding piston.
- Insert the gasket into the groove of the sliding piston.

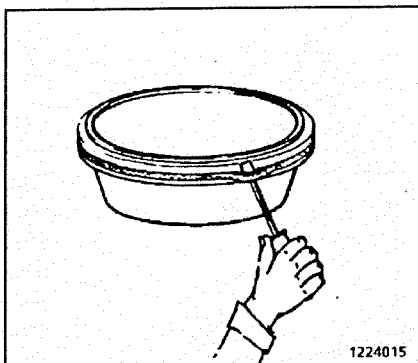


Fig. 72

- Place a screwdriver under the gasket and lever it out of the groove.
- Then run the screwdriver around the sliding piston two or three times.
- Tap the gasket back into the groove with a mallet. The gasket is now uniformly stretched all the way round and thus ensures optimum sealing during operation.

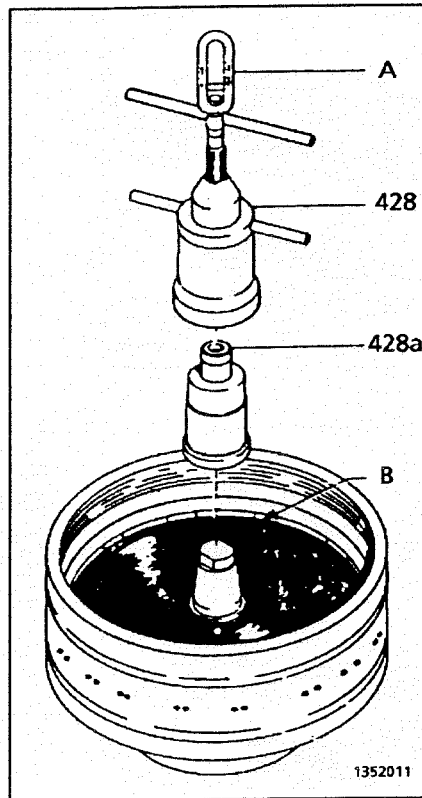


Fig. 73

- Grease guide surfaces of sliding piston and bowl bottom (see 3.2).
- Place pressure piece 428a on bowl bottom so that the arresting pins in the bowl bottom catch into the holes in the pressure piece.
- Screw lifting device 428 onto sliding piston.
- Turn jackscrew A **clockwise** to pull the sliding piston off the bowl bottom.
- Lift out the sliding piston using the tool.
- **IMPORTANT:**  
Make sure that sealing lip of the sliding piston does not get damaged.
- Remove pressure piece.

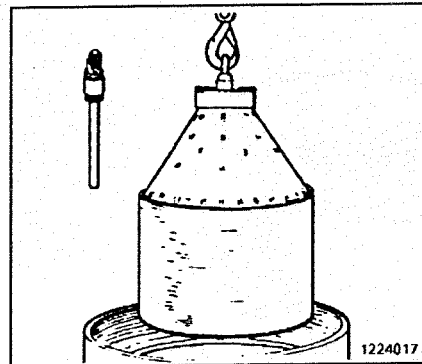


Fig. 74

- First place the interchangeable disk onto the neck of the distributor. Then stack the other disks onto the distributor neck in numerical order beginning with no. 1.
- Install the distributor together with disk stack into the bowl bottom using the lifting device for the distributor. Make sure that the arresting pins in the bowl bottom catch into the recesses of the distributor. The "O" marks on both parts must be in line with each other.

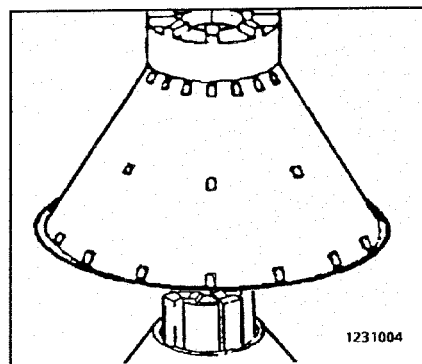


Fig. 75

- Place upper disk onto the neck of the distributor.

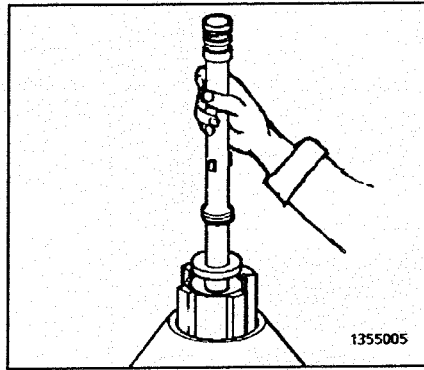


Fig. 76

- Introduce feed tube (with fitted gaskets) into the distributor neck.

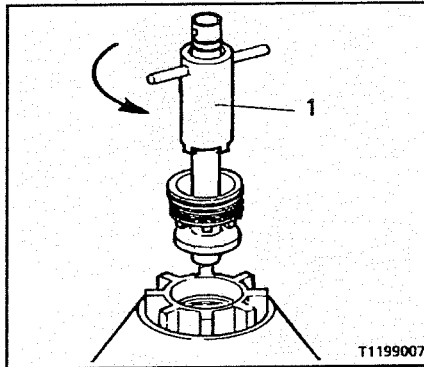


Fig. 77

- Screw sleeve (with fitted gaskets) into the distributor neck with wrench 1 (left-hand thread).

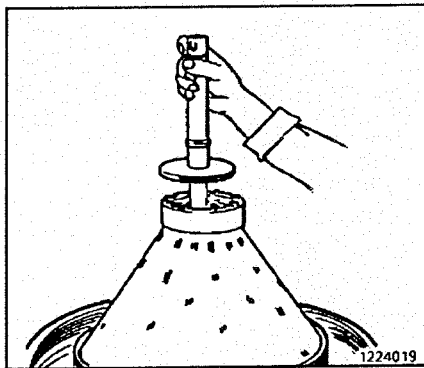


Fig. 78

- Mount lower centripetal pump (with fitted gaskets).

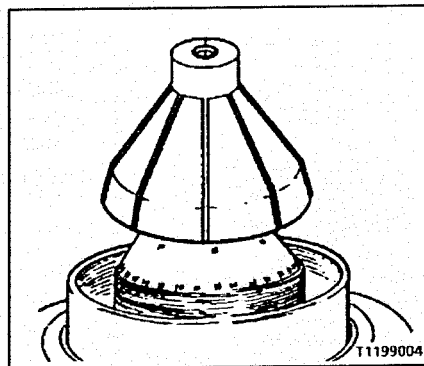


Fig. 79

- Mount the separating disk. The "O" marks on the separating disk and bowl bottom must be aligned.



Fig. 80

- Clean and grease the guide surfaces of the bowl top.
- Insert the gasket in the groove of the bowl top.
- If the main bowl gasket has to be replaced, see 5.6.

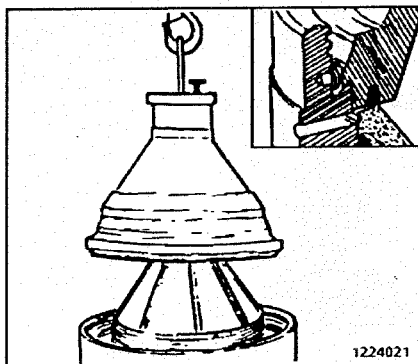


Fig. 81

- Screw lifting device (bowl top) onto the bowl top.
- Place bowl top on bowl bottom.
- Make sure that the arresting piece of the bowl bottom catches into the groove in the bowl top. The "O" marks on both parts must be in line with each other.

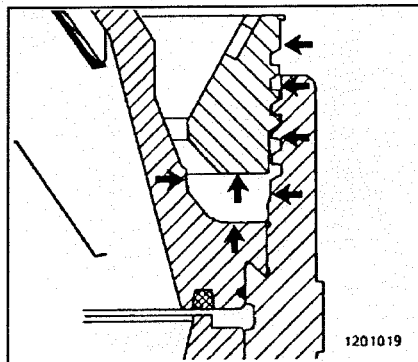


Fig. 82

- Check and grease threads and contact and guide surfaces of bowl lock ring and bowl bottom (see arrows), (see 3.2).

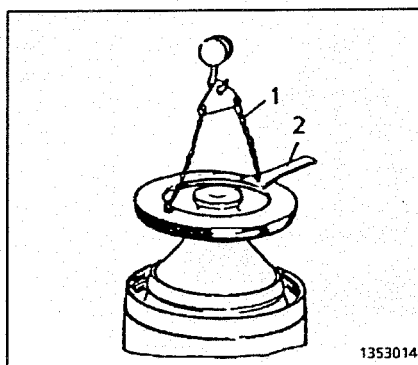


Fig. 83

- Use annular wrench 2 and lifting device 1 to place bowl lock ring on the bowl bottom.
- Screw in bowl lock ring by hand using the annular wrench (left-hand thread).



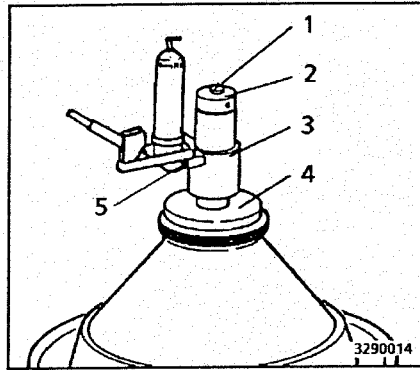


Fig. 84

**Mount the compressing device:**

- Place disk 4 onto the bowl top.
- Screw bolt 1 as far as it will go into the bowl bottom (left-hand thread).
- Insert hydraulic part 3 into the centering recess of the disk.
- Screw on threaded ring 2 (left-hand thread) until its upper edge is flush with the end thread of bolt 1.

To prevent damage to threads:



- Screw in threaded bolt as far as it will go.
- Screw on threaded ring until end of thread.

If the threaded ring cannot be screwed down completely, then the piston and the cylinder of the compressing device are too far apart.

In this case:

- Bring piston and cylinder back into initial position:
  - Loosen pressure relief screw 5 by two turns.
  - Move pump lever to its lowest position.
  - Screw on threaded ring until end of thread.
- Tighten screwed connections of the compressing device.
- Screw tight pressure relief screw 5.

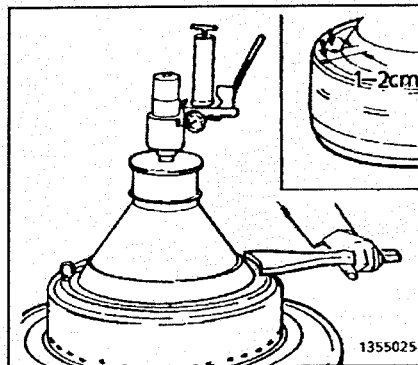


Fig. 85

**Compressing the disk stack:**

Apply pressure gradually to the disk stack until the max. disk compression of 300 – 350 bar is reached. Each pressure increase should be approx. 50 bar. After each pressure increase the bowl lock ring must be tightened further. When the max. disk compression of 300 – 350 bar has been reached, the "O" mark on the bowl lock ring must be approx. 1 - 2 cm apart from the "O" mark on the bowl bottom.

If the disk compression is too low, it must be re-adjusted in the factory.

If the maximum pressure is not attained and grease discharges through the stroke limiting hole, bolt 1 has not been screwed far enough into the bowl bottom. The compressing device is not operative until bolt 1 and threaded ring 2 have been brought into the specified end position.

When compressing make sure that the groove of the bowl top catches over the arresting piece of the bowl bottom and that the bowl top does not tilt when being lowered.

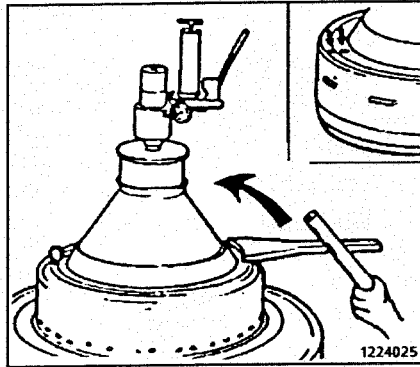


Fig. 86

- Hit the wrench handle with the mallet to tighten the bowl lock ring to obtain "O" mark alignment.

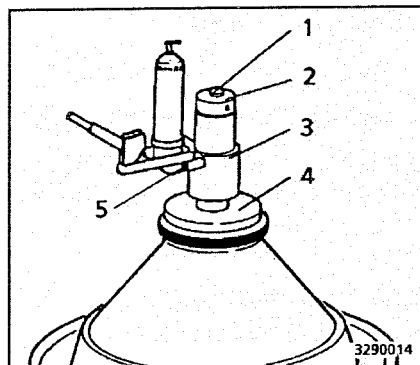


Fig. 87

Dismantling the compressing device:

- Bring the pump lever into its bottom-most position to prevent it from jumping back. Only then loosen pressure relief screw 5.
- Unscrew threaded ring 2 (left-hand thread).
- Remove hydraulic part 3 with disk 4.
- Unscrew bolt 1 (left-hand thread).

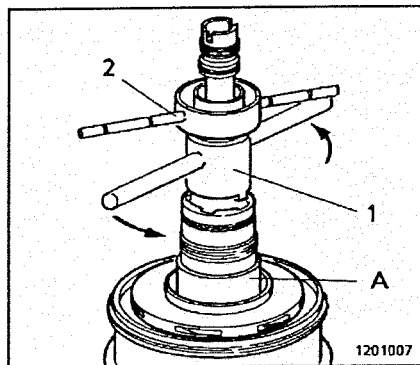


Fig. 88

- Screw upper centripetal pump A (with inserted gasket) onto the lower centripetal pump (left-hand thread).
- Insert wrench 1 into the groove of the upper centripetal pump as far as it will go.
- While doing so, hold lower centripetal pump with wrench 2. **IMPORTANT:** Do not use force. Do not hammer against the wrench handle.

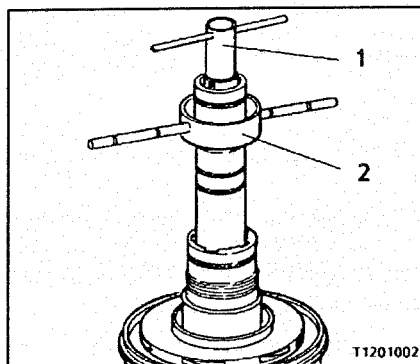


Fig. 89

- Fit on sleeve using wrench 2.
- While doing so, hold the feed tube with wrench 1.

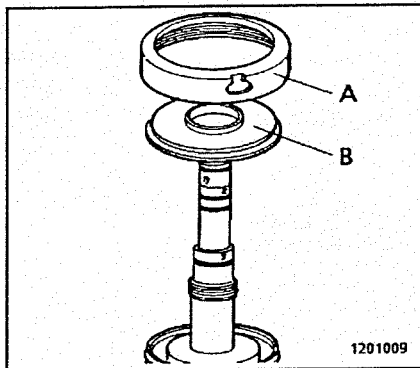


Fig. 90

- Mount centripetal pump chamber cover B (with inserted gasket). Pay attention to correct positioning.
- Screw on centripetal pump chamber lock ring A by hand (left-hand thread).

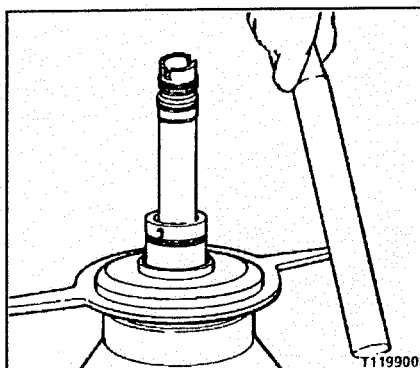


Fig. 91

- Tighten centripetal pump chamber lock ring by tapping the handle of the annular wrench (left-hand thread).
- Check if the bowl can be rotated by hand.

**5.5 Assembling the feed and discharge connections**

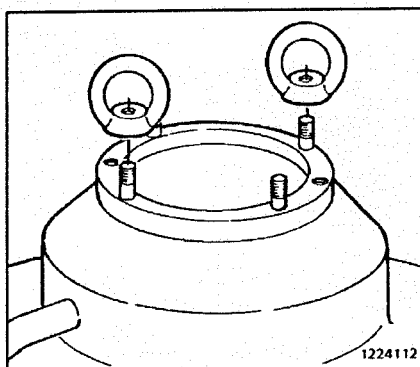


Fig. 92

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

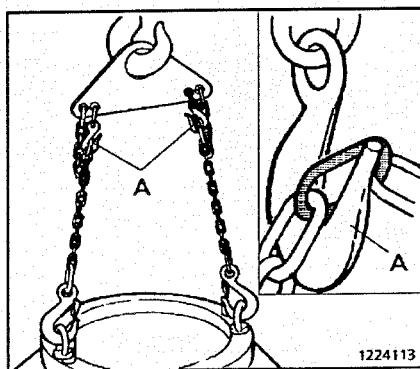


Fig. 93

- Shorten the chains of the lifting device. The chain link must be put crosswise on hook A (see adjacent small figure)!
- Then hang the lifting device in the lifting-eye nuts and place the hood on the solids collector.
- Bolt hood and solids collector together using hex head screws.
- Connect hood flush line.

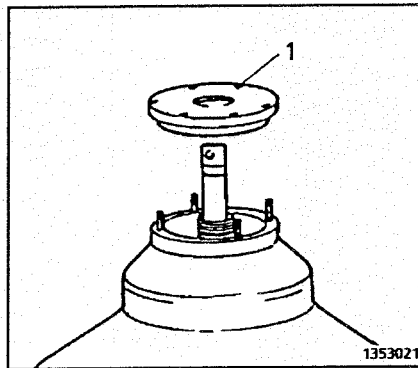


Fig. 94

- Place the disk onto the hood so that both Allen screws B are positioned over the respective tapholes in the hood.  
Do not tighten the screws.

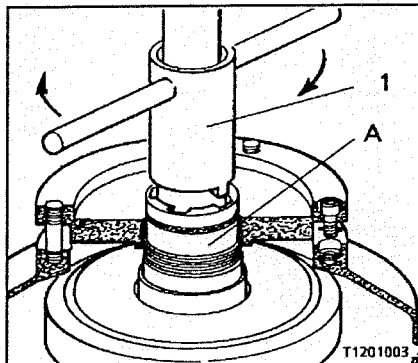


Fig. 95

- Screw centripetal pump A into the disk by hand **clockwise**.
- Tighten it with wrench 1 as far as it will go.

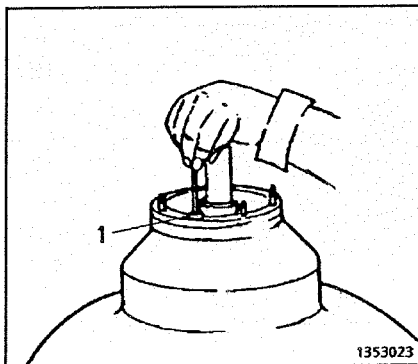


Fig. 96

- Screw the two Allen screws 1 in the disk into the hood.

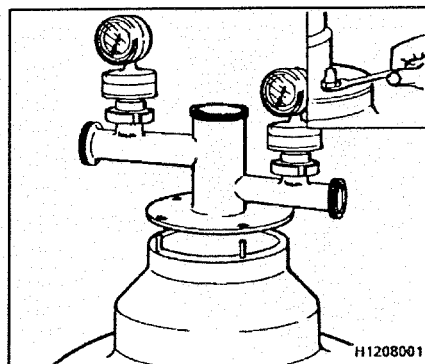


Fig. 97

- Install connection housing and fasten it with cap nuts.
- Insert sleeve into feed and discharge housing.
- Connect the feed and discharge lines.

### 5.6 Replacing the main gasket in bowl top

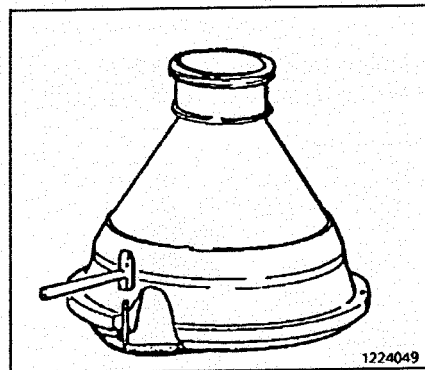


Fig. 98

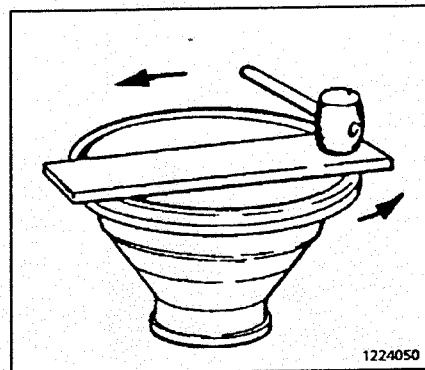


Fig. 99

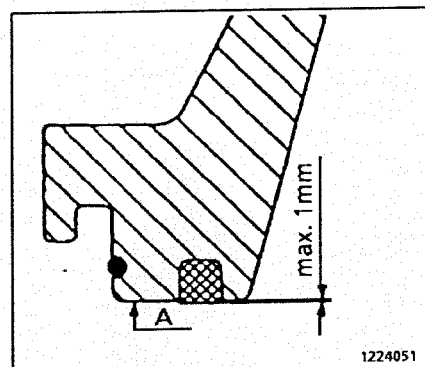


Fig. 100

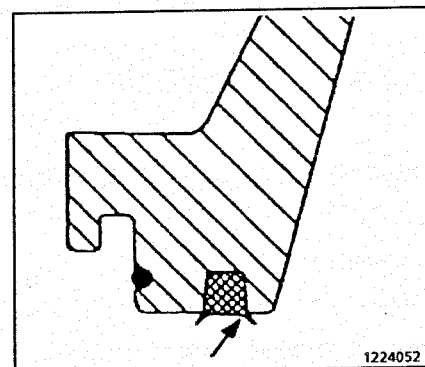


Fig. 101

#### Removal

- Drive out gasket from groove of bowl top with the aid of a drift pin which is supplied with the machine.
- To do this, insert the drift pin into the holes around the bowl top alternately and hammer onto the pin until the gasket becomes loose.

#### Installation

- Insert gasket (with its narrow side facing the bowl top) into the clean groove of the bowl top.
- Using a smooth piece of hard wood, hammer the gasket evenly into the groove until its sealing surface protrudes from surface A by not more than 1 mm.

#### IMPORTANT!

It is possible that a new gasket will be too small.

If the gasket is too small, soak it for about 5 min. in a water bath at a temperature of 70 – 80°C (160 – 175°F).

The gasket will then return to its original size.

After using for the first time and after the main bowl gasket has been replaced, excess material must be trimmed off with a knife after 4 weeks operation. Excess material can cause extensive damage to the gasket, leading to bowl leakage.

### 5.7 Removal of bowl valves

- Remove the bowl valves **once a month** for cleaning.
- At the same time, check the gaskets and replace them if necessary. Use the tools stated in the parts list to fit the gaskets.

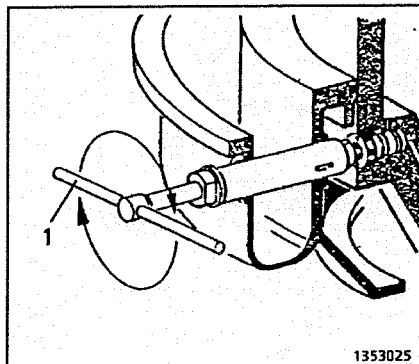


Fig. 1 02

- Screw wrench 1 (for bowl valve) into the bowl valve.

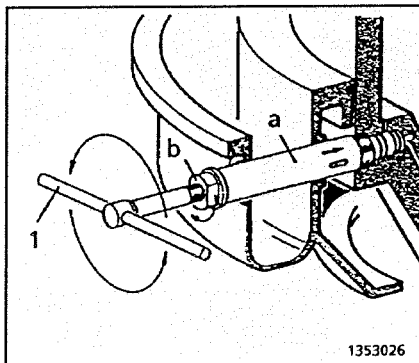


Fig. 1 03

- Push sleeve **a** of the wrench together with the pins into the bores of the bowl valve.
- Tighten collar nut **b**.
- Unscrew bowl valve from bowl bottom using socket wrench 1.

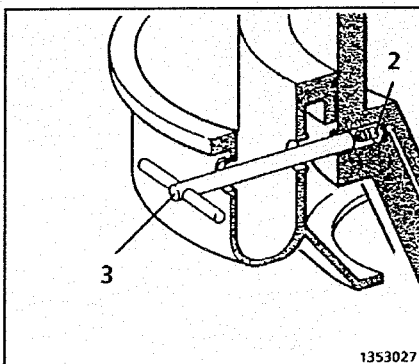


Fig. 1 04

If the valve piston **2** remains stuck in the bowl bottom while pulling out the valve proceed as follows:

- Screw wrench **3** (for valve piston) into the valve piston.
- Pull valve piston out of the bowl bottom by means of the wrench.

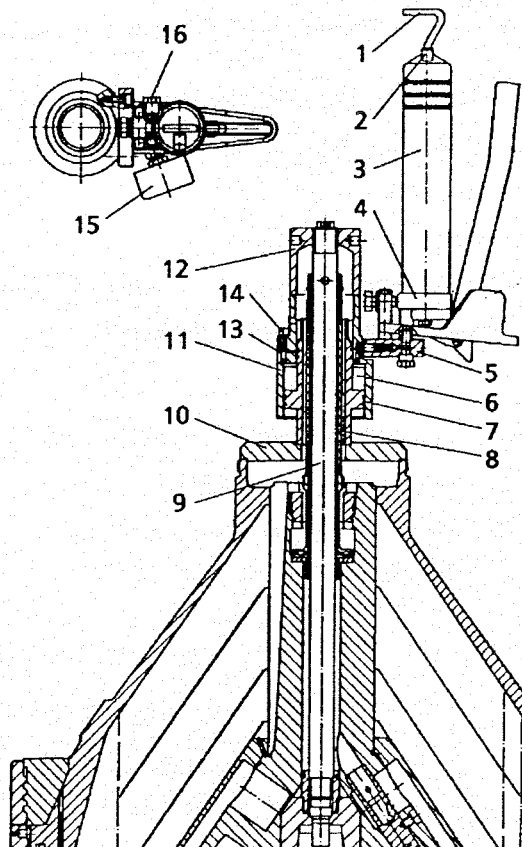
### 5.8 Installation of bowl valves

For installation proceed in opposite order of removal.

#### NOTE:

- Moisten gaskets.
- Grease threads.
- Screw in valve as far as it will go, but **not too tightly**.
- The front face of the valve housing must be flush with the outer wall of the bowl bottom.

### 5.9 Disc stack compressing device



- |    |                               |
|----|-------------------------------|
| 1  | Filling device                |
| 2  | Clamp piece                   |
| 3  | Grease cartridge              |
| 4  | Pump head                     |
| 5  | Non-return valve              |
| 6  | Pressure chamber              |
| 7  | Hydraulic cylinder            |
| 8  | Piston                        |
| 9  | Bolt                          |
| 10 | Disk                          |
| 11 | Hydraulic part                |
| 12 | Threaded ring                 |
| 13 | Stroke limiting hole          |
| 14 | Vent screw                    |
| 15 | Pressure gauge (0 to 600 bar) |
| 16 | Pressure relief screw         |

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Fig.105

#### Operating principles

The disc stack compressing device facilitates closing the bowl.

The pump presses grease at a high pressure into pressure chamber 6.

The increase in pressure in the pressure chamber displaces piston 8 in relation to hydraulic cylinder 7.

The hydraulic part 11 (piston, hydraulic cylinder) is bolted securely to the bowl bottom by means of bolt 9 and threaded ring 12.

When the pressure increases in pressure chamber 6, piston 8 is displaced downwards.

The force produced is transferred to the bowl top via the disk 10. The disc stack is compressed.

Required pressure:	280 – 320 bar
Maximum pressure:	390 bar

#### Pump

The pump produces a pressure of max. 400 bar. It consists of:

- pump head
- grease cartridge
- filling device
- non-return valve

### Filling the grease cartridge

Filling of grease cartridge: 450 g special grease K2R

The grease cartridge of the compressing device is filled with special grease before delivery.

- Actuate clamp piece 2 and pull the filling device 1 upwards.
- Unscrew grease cartridge 3 from pump head 4.
- Fill in grease, approx. 450 g.
- Screw grease cartridge 3 into pump head 4.
- Actuate clamp piece 2 and push filling device 1 into grease cartridge 3.



Fill the grease cartridge only with WS special grease K2R.

### Malfunctions

If there is no build-up of pressure, the following must be checked:

- Is the pressure relief screw 16 screwed in tightly?
- Is there enough K2R grease in the grease cartridge?
- Has piston 8 travelled too far out of hydraulic cylinder 7?

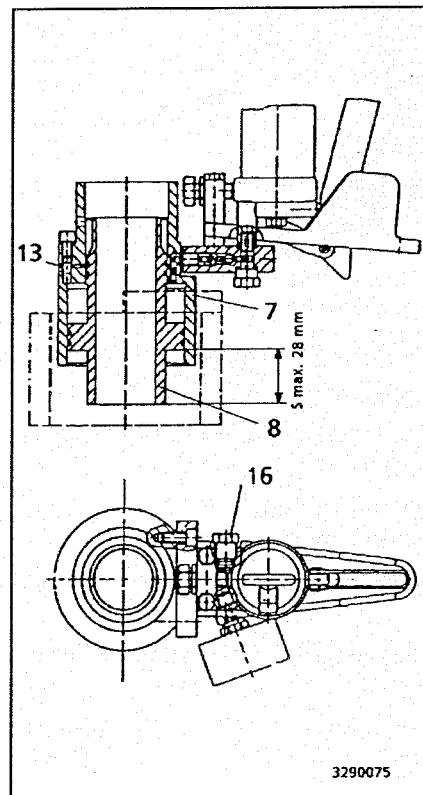


Fig. 106

If yes,

- press piston 8 back into hydraulic cylinder 7.
- This must be done in the absence of pump pressure and while the pressure relief screw 16 is open.
- Re-tighten pressure relief screw 16.

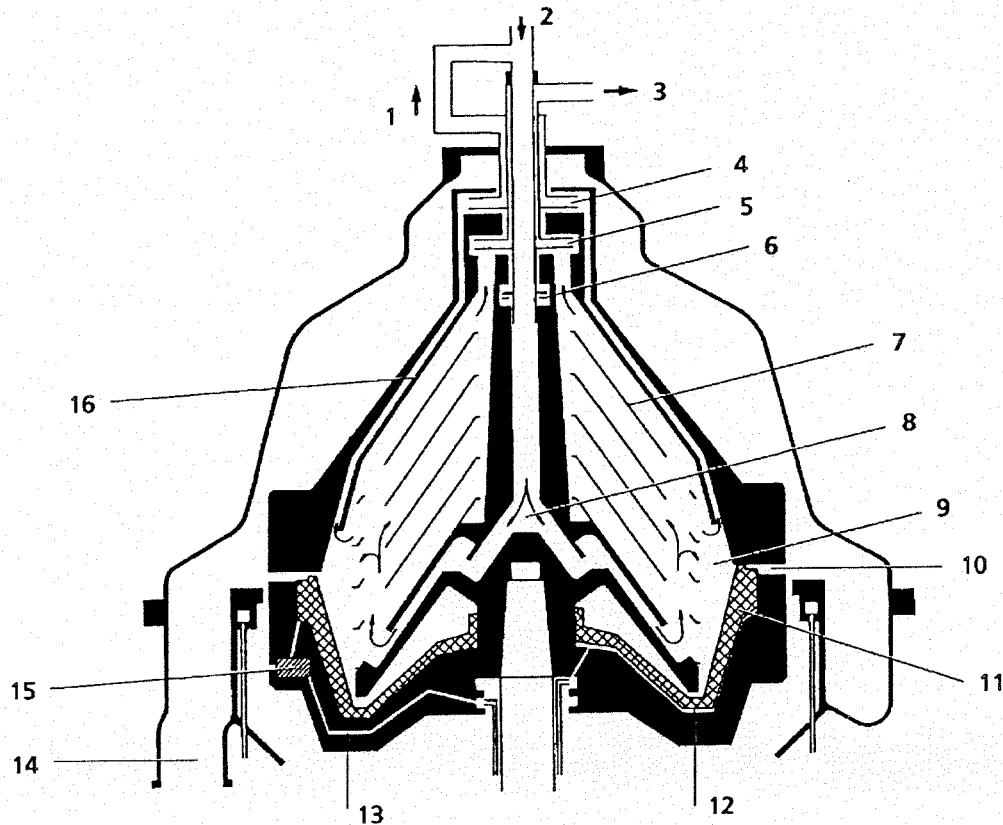
### Stroke limiting hole

To prevent the compressing device from getting damaged due to improper assembly, the stroke limiting hole 13 is provided.



**6 Technical information**

6.1	Operating principles of the bowl .....	58
6.2	Operating principles of the hydraulic system of the bowl .....	59
6.3	Control unit .....	61
6.4	Operating-water connection .....	62
6.4.1	Pressure switch .....	63
6.4.2	Solenoid valves .....	63



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Fig.107

- |   |   |    |                         |
|---|---|----|-------------------------|
| 1 | Discharge, transport liquid                     | 9  | Sediment holding space  |
| 2 | Feed  | 10 | Sediment ejection ports |
| 3 | Discharge, bacterially clarified product        | 11 | Sliding piston          |
| 4 | Centripetal pump, transport liquid              | 12 | Closing water chamber   |
| 5 | Centripetal pump, bacterially clarified product | 13 | Opening water duct      |
| 6 | Hydropump                                       | 14 | Discharge, sediment     |
| 7 | Disc stack                                      | 15 | Bowl valve              |
| 8 | Soft-stream-inlet                               | 16 | Separating disc         |

### 6.1 Operating principles of the bowl

The separator is equipped with a self-cleaning disc type bowl.

A hydraulically movable sliding piston opens and closes the bowl.

The bowl is equipped with a soft-stream product feed system. The inlet system avoids the occurrence of shearing forces when the product enters the bowl. The product is thus treated gently.

The product to be bacterially clarified flows into the bowl through feed (2) and is separated in disc stack (7) into a light and a heavy liquid phase. The light, bacterially clarified phase flows to the centre of the bowl and the heavy phase enriched with germs flows to the bowl outer diameter.

The bacterially clarified phase is conveyed to discharge (3) under pressure and without foam by means of centripetal pump (5).

A transport liquid is conveyed via the separating disc (16) under pressure and without foam to recycle outlet (1) by means of centripetal pump (4).

From here the transport liquid returns to feed (2).

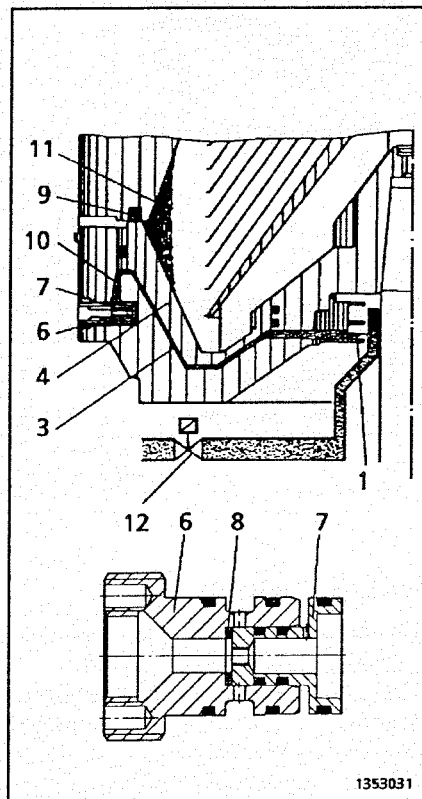
The task of the transport liquid is to convey the smallest bacteria at the edge of the centrifugal field to the solids holding space (9).

The separated bacteria and solids collect in the solids holding space (9) are instantaneously ejected through ports (10).

The ejection process is initiated by a control unit.

The product is fed into and discharged from the centrifuge by means of a closed system of pipes.

## 6.2 Operating principles of the hydraulic system of the bowl



**Bowl closed**

- 1 Injection chamber for operating water (closing chamber)
- 3 Closing chamber
- 4 Piston
- 6 Bowl valve
- 7 Valve piston
- 8 Gasket
- 9 Bowl gasket
- 10 Drain hole for operating water (closing chamber)
- 11 Solids holding space
- 12 Solenoid valve

Fig.108

### Closing the bowl

When the bowl has reached its rated speed, solenoid valve 12 for closing water is opened briefly several times.

The closing water flows into the closing chamber 3 beneath the sliding piston 4. Due to the rotation, pressure builds up in the closing chamber. This pressure creates force in axial direction which presses the sliding piston against gasket 9 of bowl top, thus closing the solids holding space 11 during the separation process. Closing chamber 3 is sealed by valve piston 7 which is pressed through centrifugal force against gasket 8 and thus closes discharge hole 10.

Operating water is supplied every minute for 1 second to ensure that in case of small operating-water losses the bowl remains closed.

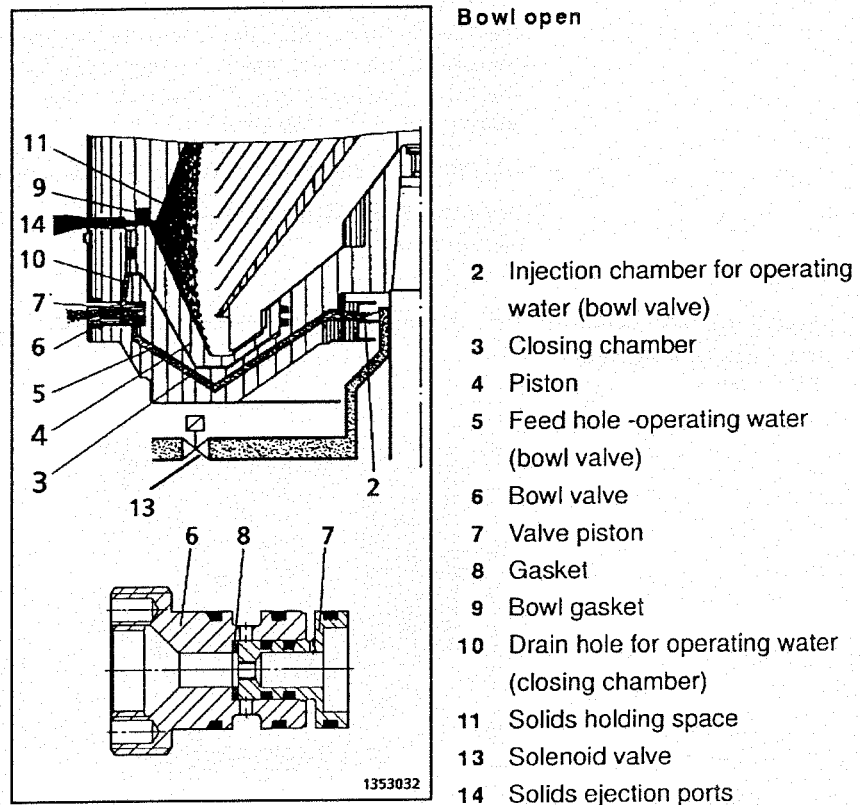


Fig.109

#### Opening the bowl (ejection)

If the solenoid valve 13 (opening water) opens, operating water flows from injection chamber 2 through hole 5 to bowl valve 6.

Piston 7 of bowl valve 6 is then pushed inwards and releases the drain hole 10 so that operating water can discharge from the closing chamber 3.

As the liquid level recedes the pressure acting on the underside of the sliding piston decreases quickly. As soon as it is smaller than the liquid pressure acting on the upper side of the sliding piston, the piston moves downwards, thus opening the solids ejection ports in the bowl bottom. The solids are ejected instantaneously through annular gap 14.

After ejection:

- solenoid valve 13 (opening water) closes,
- solenoid valve 12 (closing water) opens.

Valve piston 7 reseals drain hole 10 and closing chamber 3 fills with operating water again.

As soon as the liquid pressure in the closing chamber is higher than the liquid pressure in the centrifugation space the sliding piston moves upwards, thus closing the bowl.

**6.3 Control unit**

Partial sediment ejections are initiated by the control unit in accordance with a pre-set program.

By pressing the button "Partial ejection", the program in progress can be interrupted and a partial ejection can be initiated immediately.

Total ejections and hood flushings (bowl overflow) during cleaning-in-place are initiated manually on the control unit or automatically from a separate CIP unit.

For further details refer to the instruction manual "Control unit".

#### 6.4 Operating-water connection

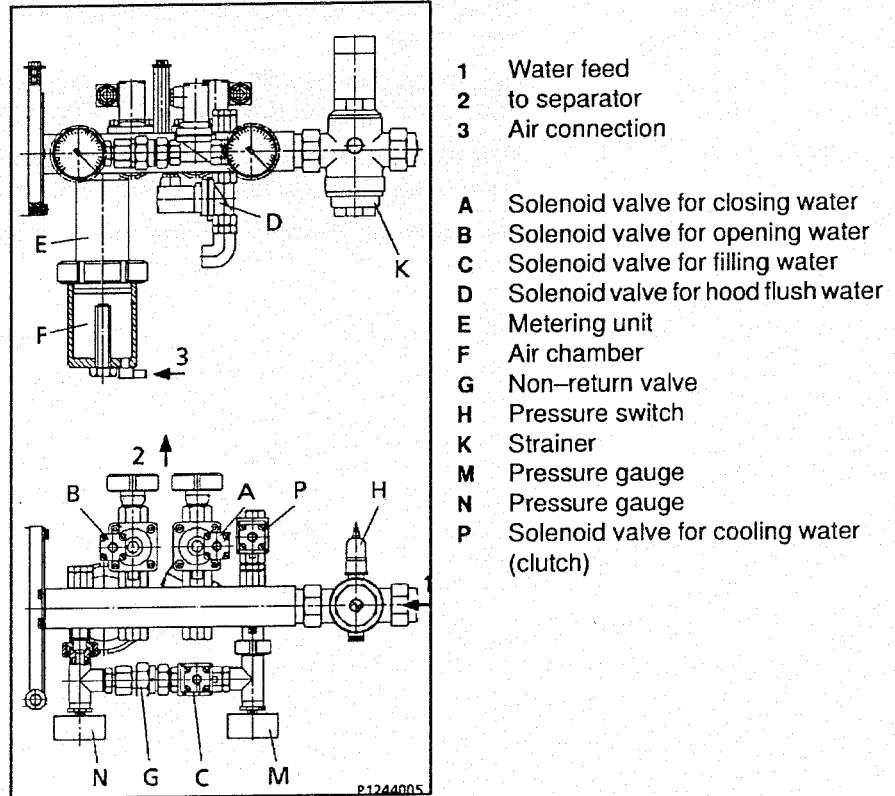


Fig. 110

Operating-water connection:	1 in
Operating-water pressure:	Pmin. = 3 Pmax. = 4,5
Required operating water:	2 000 l/h
Air pressure for metering unit:	≥ 4.5 bar

#### Standard operating-water values:

- Hardness: ≤ 12° dH at separating temperatures of up to 55° C  
≤ 6° dH at separating temperatures above 55° C
- Suspended matter: max. 10 mg/l
- Particle size: max. 50 µm

To convert the hardness values stated use the following equation:

$$- 1^{\circ}\text{dH} = 1.79^{\circ}\text{fH} = 1.25^{\circ}\text{eH} = 17.9 \text{ ppm CaCO}_3$$

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

Clean strainer K from time to time by temporarily soaking it in vinegar or hydrochloric acid. Before re-fitting rinse the strainer thoroughly with water.

#### 6.4.1 Pressure switch

For proper functioning of the automatic control a pressure of approx. 2.5 bar is required while the closing-water valve is open. At a lower pressure the bowl will either not open or not close.

For this reason the operating-water line is provided with the **pressure switch** which triggers an acoustical or optical signal if the minimum pressure drops below a preset value.

The product valve closes.

#### 6.4.2 Solenoid valves

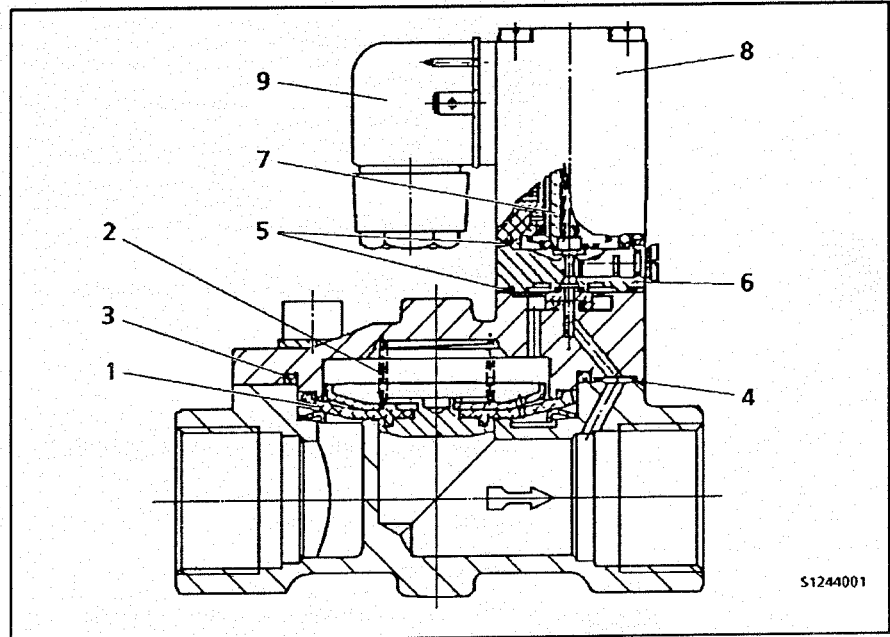


Fig.111

- |                               |                                 |
|-------------------------------|---------------------------------|
| 1 Diaphragm                   | 6 Housing (for manual override) |
| 2 Cylindrical pressure spring | 7 Solenoid core                 |
| 3 Gasket                      | 8 Solenoid head                 |
| 4 Gasket                      | 9 Coupler socket                |
| 5 Gasket                      |                                 |

The solenoid valves incorporated in the operating-water system are 2/2-way straight-way diaphragm valves with internal piloting. They are equipped with a manual override for testing purposes.

**The adjusting screw must be adjusted manually using a screwdriver!**

The solenoid coil is entirely embedded in Epoxy resin which ensures protection against moisture, good dissipation of heat, and perfect electrical insulation.

The valves are fully tropicalized.

**Technical data:**

Solenoid valve	Type	281	281
Part-Number		0018-5870-610	0018-5947-610
Pipe connection	R	3/4in	1/2in
Voltage	V DC	24	24
Power consumption:	pull-in	W	8
	operation	W	8
Duty cycle	%	100	100
Frequency of operation	/h	1000	1000
Type of enclosure	IP	65	65
Pressure range	bar	0,5 – 16	0,5 – 16
Temperature:	medium	°C	+ 100
	ambient	°C	+ 55
Cable entry (coupler socket)	Pg	9	9

**Maintenance**

The solenoid valves do not require special maintenance.

**Locating electrical faults**

- Switch off main switch.
- Shut off main valve for operating water.

Fault	Cause	Remedies
Valve does not function.	Control unit defective.	Call Service Engineer.
	Faulty wire in connecting terminal.	Replace wire.
	Connecting terminal loose on terminal strip.	Tighten screw of connecting terminal.
	Poor contact to connecting terminal.	Clean contact or replace it.
	Coupler socket loose or leaky.	Tighten coupler socket.
	Solenoid coil defective.	Replace complete solenoid head.



## 7 Operation

7.1	General .....	66
7.2	Before start-up .....	66
7.3	Starting .....	66
7.4	The separator in operation .....	67
7.4.1	Partial ejection .....	69
7.4.2	Total ejection .....	72
7.4.3	Function diagram .....	72
7.4.4	Bowl ejections (manual) .....	73
7.4.5	Ejection monitoring .....	73
7.5	Stopping the separator .....	74

### 7.1 General

This chapter gives general instructions for operating the separator. However, operation of the respective machine depends on the control unit used and the arrangement of the valves.

The individual process may necessitate changes in the operating procedure.

*Refer also to the instruction manual of the respective control unit.*

### 7.2 Before start-up

check that

- brake is released by turning handle clockwise.
- oil level is up to middle of the sight glass.
- hex head screws for fastening the hood and cap nuts for fastening the feed and discharge housing are tightened securely.
- hand shut-off valves are opened in the supply lines for:
  - operating water
  - cooling water
  - compressed air
- concentrate valve is open.
- timers on the control unit are set according to the instructions in the control unit manual to suit the respective processing conditions.
- metering unit is adjusted (see sect. 7.4.1).
- compressed air on the pressure reducer is adjusted to 4 – 5 bar.

### 7.3 Starting

- Switch on main switch on control unit (position I):  
The LED "control unit ON" flashes to signal that the control unit is ready for operation.  
The buttons "product", "partial ejection" and "total ejection" are not released until the signal "motor in operation" is on (see LED in motor mimic diagram).
- Start motor.  
After a pre-set delay time of 10 minutes, closing water is supplied automatically; the bowl closes.
- Open valve in cooling-water line for upper frame part. Feed rate is approx. 500 l/h.
- After a further two minutes water can be circulated as generally practiced in dairies.
- Switch over from water to product.  
Actuate "separation" button on the control unit.
- After opening the milk feed adjust throughput and discharge pressures.
  - Reduce air pressure on pressure reducer to such an extent that a pressure to 0.5 bar lower than the maximum pressure is indicated on the pressure gauge.

It is only necessary to adjust the constant-pressure valve to operating pressure when starting for the first time.

**7.4 The separator in operation**     **Bacteria removal temperature:** 40 – 60°C, depending on type of cheese

**Throughput:** 15 000 – 25 000 l/h.

The throughput capacity depends on the bacterial properties and on the temperature of the raw milk. Separator plants provided with a flow constrictor need not be adjusted manually every day.

**Discharge pressure of milk pump:** approx. 5 bar

By means of constant pressure valve, throttle pressure in discharge line of treated milk until slight overflow occurs in the bowl. To check the overflow, open inspection cover on hood slightly.

The pressure indicated by the pressure gauge the moment when overflow occurs is the maximum pressure. Now open constant pressure valve until the pressure gauge indicates a pressure which is 0.5 bar lower than the maximum pressure. The discharge pressure must be re-set when the throughput rate has been changed.

**Discharge pressure of concentrate pump:** approx. 2 bar

Throttle pressure in concentrate discharge line by means of regulating valve on flowmeter until the desired amount of concentrate is obtained.

**Concentrate collecting vessel:**

The concentrate discharged during partial ejection as well as the concentrate discharged by the centripetal pump flows under gravity into a collecting vessel from where it is pumped off continuously. In order to stop the milk flowing back into the concentrate catcher of the separator the collecting vessel should have an open air vent (DN 80) and a syphon (see dimensioned drawing).

If the bowl overflows during operation, then the pressure in the downstream equipment must be reduced.

If the bowl overflows even when the milk pressure is low, check whether the gasket in the centripetal pump chamber cover is damaged.

In some cases - particularly when heat exchangers with low counter-pressure are used - it is advisable to install a throttle valve downstream of the exchanger and to set it to about 1.5 bar. This ensures that the milk is conveyed foamfree to the cheese milk tank.

The bacteria-removing separator can also be used for clarification by using a by-pass line. Then appropriate shut-off and leakage valves must be installed in the by-pass line.

When the milk is being treated, the valves in the by-pass line must be set so that, if the shut-off valves leak, the milk cannot flow back into the system.

**Insufficient bacteria removal can be caused by the following:**

- Change in raw milk quality, separating temperature, bowl speed or throughput capacity.
- Concentrate entering the milk after treatment caused through wrong positioning of leakage valve in the by-pass line.
- Separating disc is not sealed properly.
- Partial ejection is too small.
- The intervals between the partial ejections are too large.

**Analysis of milk samples:**

Special aseptic valves must be built in to the feed and discharge lines directly on the separator in order to take off milk samples for testing. Usual regulations for taking milk samples for bacteriological tests must be observed.

### 7.4.1 Partial ejection

Partial ejection is a term used to denote partial emptying of the solids holding space of the bowl. The product feed is not interrupted during partial ejections.

Separating time: 10 - 20 minutes (depending on raw milk quality)

Ejection volume: 8 - 10 kg

To initiate the ejection cycle, opening water is fed to the hydraulic system of the bowl via the metering device.

The amount of solids to be ejected is determined by the opening water volume.

The opening water volume is adjusted on the metering device.

To determine the ejected solids volume, feed the bowl with water and measure the amount of liquid discharging from the solids outlet by means of a measuring bucket.

Check the ejected amount of solids during separation.

In order to carry out a measurement of the volume discharged, the pre- and post-flushing times must be set to 3 seconds on the control unit. Since with this setting approx. 1 l water enters the partial ejection volume via the hood flushing, 1 l must be subtracted from the measured ejection volume. This value then corresponds to the volume ejected.

The partial ejections necessary during separation are automatically carried out according to a pre-set program.

The operating water consumption for pulse-like closing water supply is approx. 30 l/h plus approx. 50 l per partial ejection.

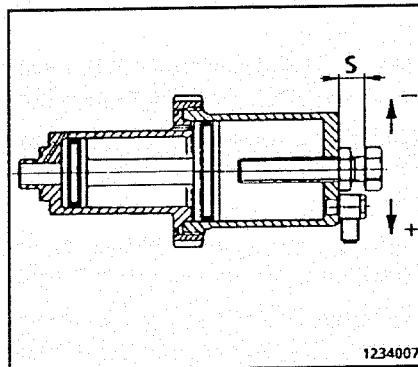


Fig. 112

#### Adjusting the amount to be ejected

Adjusting by means of the adjusting screw of the metering device.

#### To reduce ejection volume:

- Turn adjusting screw clockwise

#### To increase ejection volume:

- Turn adjusting screw anti-clockwise

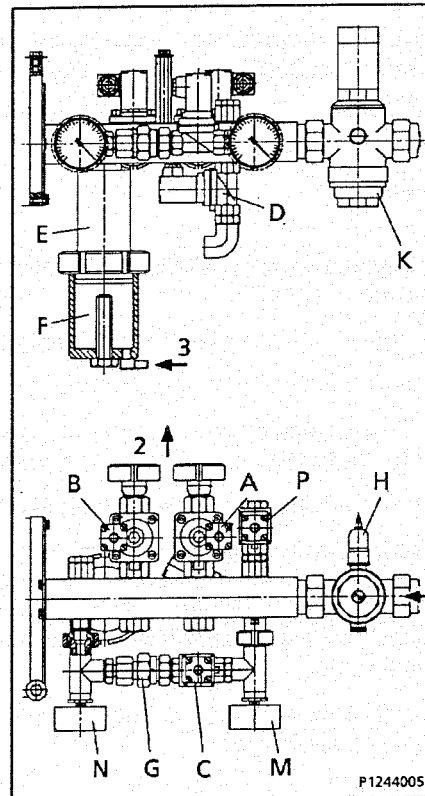


Fig. 113

#### Operating principles of the metering unit

The metering device E is filled with water via filling valve C after every ejection.

For partial ejection chamber F is supplied with compressed air.

Through actuating the opening water valve the adjusted water volume is displaced by air pressure and fed to the hydraulic system of the bowl.

- A Solenoid valve for closing water
- B Solenoid valve for opening water
- C Solenoid valve for filling water
- D Solenoid valve for hood flush water
- E Metering device
- F Air chamber, metering device
- P Solenoid valve for cooling water (clutch)

#### Program sequence

After the program time "Separation - Partial ejection" has elapsed, a partial ejection is initiated automatically which is then repeated at identical intervals.

Before each partial ejection the solenoid valves "closing water" and "hood flush water" open for 10 seconds. Water is sprayed into the hood to prevent the solids from sticking to the walls.

For solids ejection the solenoid valve A "opening water" opens for 1 second. This time can be preset as the program time "Partial ejection".

The solenoid valves B "closing-water" and D "hood flush water" remain open during the ejection and 20 seconds afterwards. The time these valves are to remain open after the ejection cycle can be set via the program time "subsequent flushing". It should be at least 20 seconds.

The "Separation" program can be interrupted by pressing the "Partial ejection" button. A partial ejection is then triggered. After termination of this forced partial ejection the control program automatically switches back to "Separation".

**Program time settings:**

Program times ... sec are process-related and must be set before start-up.

<b>Program time</b>	
Pre-flushing	approx. 10 secs Pre-flushing hood/solids collector.
Partial ejection	1 sec Determines the opening time of the operating water valve. This time must be longer than the displacement time of the opening water from the metering unit. The ejected solids volume depends on the pre-set volume in the metering unit.
Subsequent flushing	approx. 20 secs Flushing the hood and solids collector after an ejection.
Closing	5 sec Addition of closing water after an ejection.
Metering device	3 secs Continued control of air for metering device after partial ejection.
Filling water	2 secs Delay of filling water supply after the partial ejection.
Total ejection	10 secs (not variable) Addition of opening water during total ejection.
Waiting	approx. 60 secs Waiting time after total ejection for speed recovery of bowl.

### 7.4.2 Total ejection

During cleaning-in-place total ejections can only be initiated manually with the control unit. (Automatic cleaning-in-place requires a separate CIP unit, see relevant brochure.)

For initiating a total ejection, push button "total ejection" must be operated.

If the installation is correctly set up (see connection diagram), the feed pump is automatically switched off by pressing push button "total ejection" and automatically re-started approx. 1 min. after completion of the total ejection.

The interruption of the liquid supply to the bowl by switching off the feed pump is necessary for the bowl speed to recover, which drops slightly during total ejections.

Once the bowl has been filled again (observe increasing discharge pressure of centrifuge), a further total ejection can be carried out by again pressing push button "total ejection".

Should the feed pump fail to stop automatically during a total ejection, it must be switched off manually and re-started 1 min. after total ejection.

### 7.4.3 Function diagram

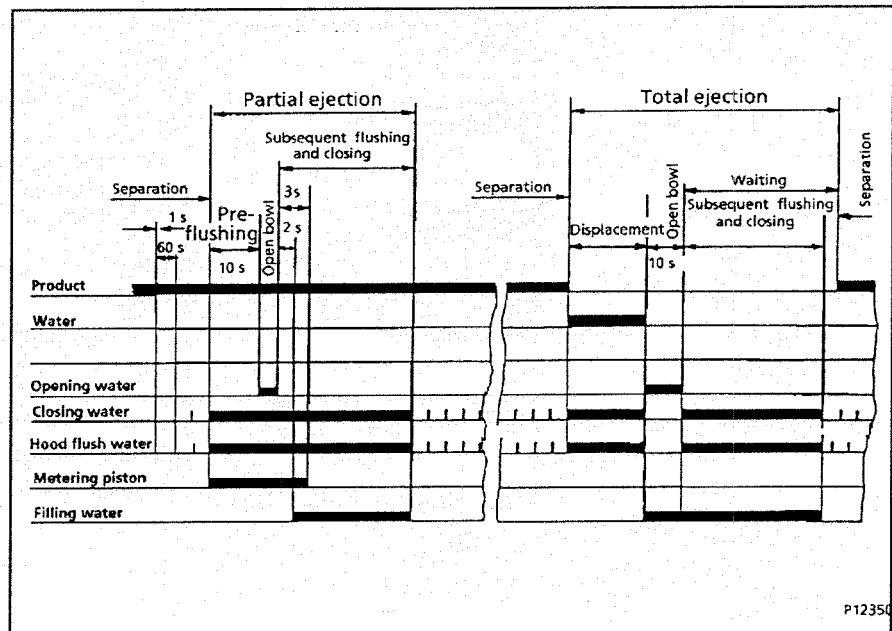


Fig.114

**Adjusting the timers:** Refer to instruction manual for control unit.



#### 7.4.4 Bowl ejections (manual)

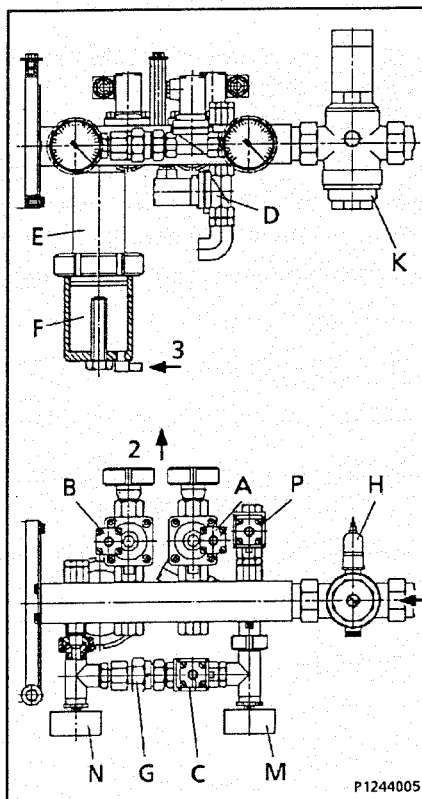


Fig. 115

In the case of failure of the control unit or defective solenoid valves, the separator can be manually controlled as follows:

##### Partial ejection

- Open closing-water valve A and fill-up valve C manually by means of hand lever.
- Open opening-water valve B briefly (approx. 0.1 sec.).
- After partial ejection leave closing-water valve A open.

##### Total ejection

- Stop product pump.
- Open closing-water valve A and fill-up valve C manually by means of hand lever.
- Open opening-water valve B by means of hand lever until the ejection noise has stopped.
- Then close opening-water valve B and fill-up valve C; leave closing-water valve A open.
- Re-start product pump 1 minute after total ejection.

#### 7.4.5 Ejection monitoring

The ejection monitoring system ensures that the bacteria are efficiently removed from the product.

The adjusted partial ejection volume is monitored via analogue value processing of current rise. The increase of current results from the partial ejection and is the indicator for the size of the partial ejection.

If the current rise following a partial ejection is not attained, the following actions are initiated:

- An alarm (lamp or klaxon) is triggered.  
Max. three additional partial ejections take place at intervals of 4 minutes.
- If the required current rise has been reached within the partial ejections, it is immediately changed to the normal ejection intervals during the separating process.
- If the required current rise has not been reached after the three additional partial ejections have elapsed, the command "product off" is given, i.e. the feed pump is stopped or the plant is switched over to recycling.

When starting bacteria removing separators, the following must be observed for setting the ejection monitoring system (see instruction manual for control unit):

- Adjust the permissible ejection volume for the respective separator type.
- Read off the max. current rise during partial ejection on the control unit.
- Program the respective current rise in the control unit.
- Slightly increase the partial ejection volume, in order to obtain a larger safety margin as regards activating the program as described before.

- 7.5 Stopping the separator**
- Flushing the system with water (not necessary if cleaning-in-place has been carried out after milk processing):
    - Cut off product supply to separator (stop feed pump).
    - Remove remaining product from bowl, using water.
    - Initiate total ejection by operating push button "total ejection" on control unit.
    - Flush the system thoroughly with water.
    - Flush hood after each ejection by operating push button "overflow".
  - Switch off motor.
  - Apply brakes by turning both handles in anti-clockwise direction.
  - **Do not loosen any part before the bowl has stopped completely!**
  - Note that the bowl has not stopped moving until the gear sight glass is clear and the worm wheel has ceased rotating.
  - Close manual shut-off valves for supply lines:
    - operating water
    - compressed air
    - cooling water



**8 Cleaning**

8.1	Cleaning-in-place (CIP) .....	76
8.2	Bowl .....	77
8.3	Upper section of frame .....	77
8.4	Operating-water feeding system .....	78
8.5	Gear chamber .....	78
8.6	Prior to a long-term shut-down of the separator .....	78

- 8.1 Cleaning-in-place (CIP)** The separator is generally included in the CIP cycle of the pasteurizers. For cleaning the separator, the detergents and times used for cleaning the pasteurizers will be adequate. However, be sure that the last cleaning agent to be circulated is acid.

Caustic	1.5 – 2 % concentration
Acid	max. 1 % concentration

Consult the detergent manufacturer for correct temperature.



Bear in mind that bowl parts of stainless steel will be attacked by chlorine. Therefore, make sure that detergents are free from chlorine.

To prevent damage due to corrosion, only approved cleaning agents should be used.

**Procedure:**

- Switch control unit to CIP.
- Displace remaining product from the machine and flush the complete installation thoroughly with water.
- Flushing is followed by two "total ejections" accomplished by pressing the push button "total ejection" on control unit.
- Fill bowl with water between total ejections.



The CIP-program should comprise the following program steps:

- Circulation with caustic solution
- Flushing with water
- Circulation with acid solution
- Flushing with water

Each program step ends with bowl overflow and a total ejection.

Bowl overflow is initiated by actuating the button "bowl overflow" on the control unit. By this means the constant-pressure valve in the discharge line is throttled for 10 secs and bowl overflow occurs. In this way the hood and upper bowl walls are cleaned. The function is indicated by LED.

Total ejections are performed by means of the respective button.

Bowl overflow occurs automatically before each total ejection.

The commands "overflow" and "total ejection" can also be initiated automatically from an external CIP control.

## 8.2 Bowl

It is not normally necessary to dismantle and clean the self-cleaning bowl upon completion of the separation process, provided that cleaning-in-place has been adequately performed while the bowl was still moving. How often it is necessary to clean the bowl by hand is dependent on the nature of the product and can only be determined by tests.

- However the bowl should be dismantled once a month for the purpose of checking and manual cleaning.



- Never use metal scrapers or metal brushes for cleaning the discs and bowl parts!
- Remove gaskets from the bowl parts.
- Clean grooves and gaskets to prevent corrosion.
- Replace damaged or swollen gaskets.
- Carefully clean the small holes for feed and discharge of the operating water in bowl bottom as well as the piston valve to assure trouble-free performance of the solids ejection process.
- Clean and wipe dry guide surfaces and threads of bowl parts and grease them (see 3.2).
- Spindle cone and inside of bowl hub should be oiled and then wiped clean and dry with a smooth rag.
- Re-assemble bowl immediately after cleaning.

## 8.3 Upper section of frame

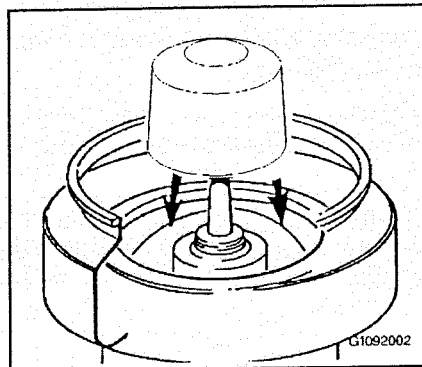


Fig. 116

- From time to time, the inside of the upper section of the frame has to be cleaned in the area below the bowl.
- After removing the bowl (see 5.3), place a protective hood e.g. a commercially available container over the spindle to prevent wash liquid from seeping into the drive and rendering the lubricating oil unserviceable.



Never aim a water jet directly at the separator for the purpose of cleaning. Clean it by hand with a sponge or cloth.

- 8.4 Operating-water feeding system**
- The small holes in the operating-water feeding device should be cleaned every 3–6 months.
- 8.5 Gear chamber**
- When changing oil, clean gear chamber thoroughly with thin-bodied oil.
  - Be sure to remove all metal particles from walls and corners.
  - Do not use fluffy cleaning rags or cotton waste!
- 8.6 Prior to a long-term shut-down of the separator**
- Prior to a long-term shut-down, clean the separator thoroughly (see 8.2 and 8.3).
  - The clean bowl parts and all unvarnished machine parts should be wiped dry and greased to avoid corrosion.
  - The clean grease-coated bowl should be kept in a dry place.
  - To prevent gaskets from getting brittle, keep them in a cool and dry room, protected from dust and light.
  - Drain the lubricating oil and fill gear chamber with corrosion-preventing oil, e.g. SHELL Ensis Oil 30.  
Oil level must be up to middle of sight glass.  
Let separator run without bowl for approx. 10 minutes to make sure that all gear parts are coated with the corrosion-preventing oil.  
Drain the oil.  
Oil upper end of spindle by hand and protect it with a protective hood.
  - Check water shut-off devices for leakage. If necessary, remove connecting piping between faulty shut-off device and separator to avoid damage which may be caused by drip water.
  - Stop operating-water supply at the branch point of the water mains to prevent inrush of water into the separator, caused by unintended opening of the shut-off valve.
  - Before re-starting the separator, fill gear chamber with the lubricating oil specified in chapter 3. Oil level must be slightly above middle of sight glass. Then let the separator run without bowl for 10 minutes.

**9 Drive**

9.1	Dismantling the vertical gear parts .....	80
9.1.1	Removal of ball bearing and worm .....	82
9.2	Re-assembly of vertical gear parts .....	83
9.2.1	Assembling the neck bearing bridge .....	84
9.2.2	Fitting the spring column into the bottom bearing .....	84
9.2.3	Installing the worm spindle .....	85
9.3	Bowl Height .....	86
9.3.1	Checking .....	86
9.3.2	Adjusting .....	86
9.4	Removal of the horizontal gear parts .....	88
9.4.1	Removing the motor .....	88
9.4.2	Removing the fluid clutch .....	88
9.4.3	Worm wheel shaft .....	89
9.4.4	Grooved ball bearing (motor side) .....	91
9.4.5	Angular contact ball bearing (brake side) .....	91
9.5	Re-assembly of horizontal gear parts .....	92

### 9.1 Dismantling the vertical gear parts

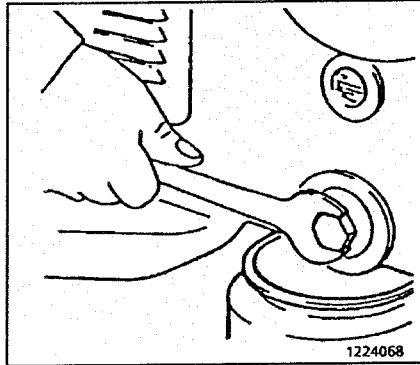


Fig. 117

- After dismantling the bowl,
- loosen oil drain screw and
- drain oil into oil pan.

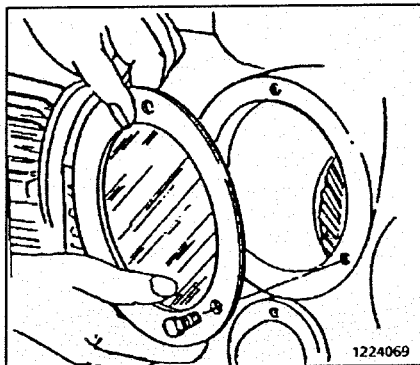


Fig. 118

- Unscrew hex head screws from gear sight glass and
- remove it.

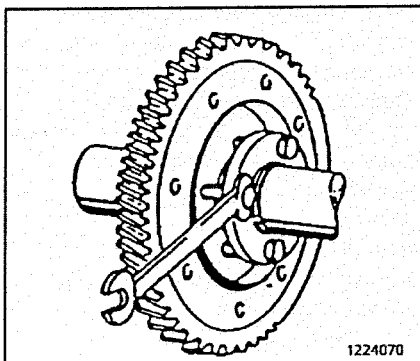


Fig. 119

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

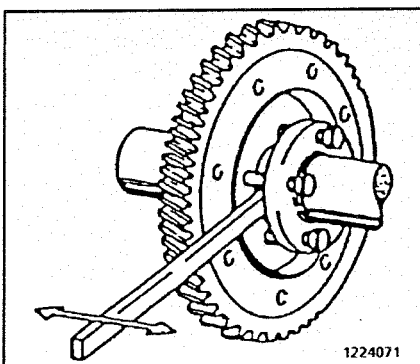


Fig. 120

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



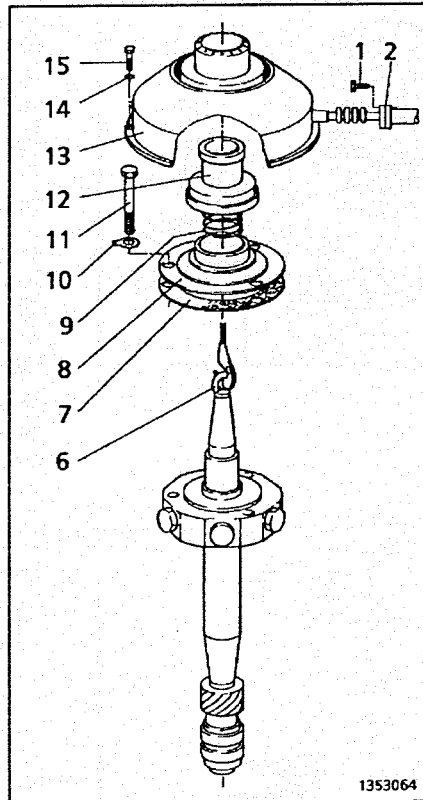


Fig. 1 21

- Unscrew Allen screws 1 of the operating-water connection
- Unscrew Allen screws 15 from the operating-water feeding device.
- Remove operating-water feeding device 13.
- Make sure that the gasket 2 does not get lost or damaged.
- Remove spindle cap 12.
- Unscrew hex head screws 11.
- Straighten tab washer 10.
- Remove protective cap 8 and spindle spring 9.
- Screw spindle lifting device 6 into tap hole of spindle.
- Pull off spindle together with neck bearing bridge assembly.

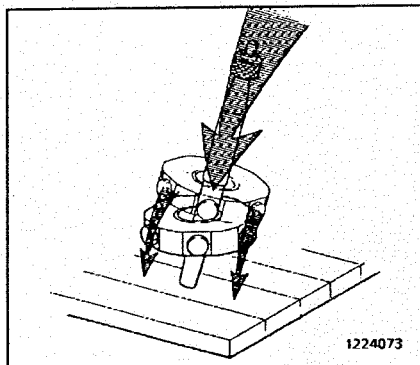


Fig. 1 22

- To remove neck bearing bridge, hold spindle in inverted position, upper end down, and tap it against a wooden block.

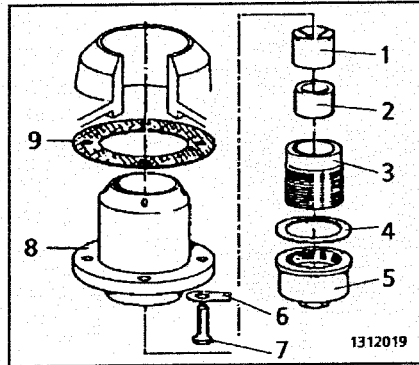


Fig. 123

- Unscrew bottom bearing cap 5 and remove gasket 4.
- Unscrew bottom bearing threaded piece 3 and remove it together with spring column 2 and bottom bearing pressure piece 1.

In case the bottom bearing housing 8 must be replaced:

- straighten tab washers 6,
- unscrew hex head screws 7.
- Screw two screws 7 into the tapholes of bottom bearing housing
- force out bottom bearing housing by pressing it downwards.

### 9.1.1 Removal of ball bearing and worm

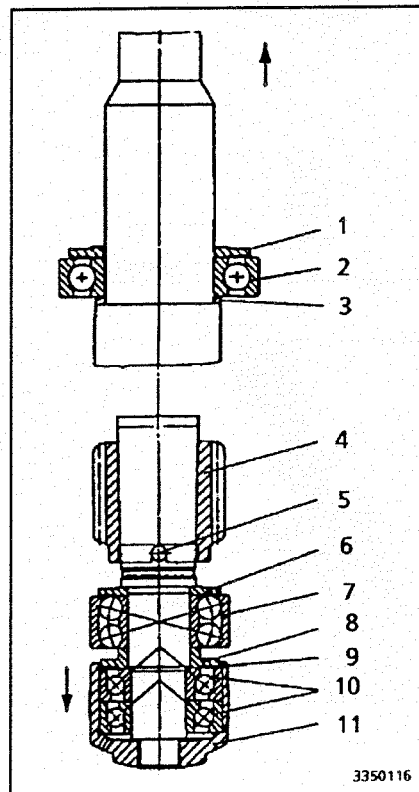


Fig. 124

- Pull out the following components using a commercially available puller:
  - Ball bearing protection ring 8, angular contact ball bearings 10 and bottom bearing housing 11,
  - Ball bearing protection ring 6 and pendulum ball bearings 7
  - Worm 4 (before removal, knock out cylindrical notched pin 5)
  - Grooved ball bearings 2 and ball bearing protection ring 1
- Lift off ring 3.
- Press snap ring 9 out of the groove of bottom bearing housing 11.
- Remove angular contact ball bearing 10 from bottom bearing housing 11.

## 9.2 Re-assembly of vertical gear parts

When re-assembling the vertical gear parts proceed in reverse order of removal (9.1).

### Important hints:

When installing the vertical gear parts bear in mind the following:

- Thoroughly clean gear chamber before installing the vertical gear parts (8.5).
- Check ball bearings of worm spindle before re-fitting.
- Use only high-precision ball bearings (see list of spare parts).
- For safety reasons, the ball bearings of the worm spindle must be replaced every 5 000 operating hours.
- Before fitting grooved ball bearing, pendulum ball bearing, angular contact ball bearing and sleeve (grooved ball bearing), heat these parts in oil to approx. 80 °C.

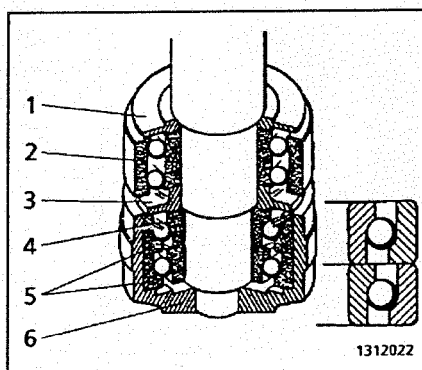


Fig. 125

### Note that

- the angular contact ball bearings 5 may be loaded axially in one direction only.
- They must be fitted so that the **broad shoulder** of the inner ring of the bearing is **on top**.
- Faulty mounting will inevitably result in damage to bearings.

For re-assembly proceed as follows:

- Slide the heated angular contact ball bearings 5 onto the spindle.
- Slip snap ring 4 over the ball bearings.
- Let ball bearings cool down.
- Fit bottom bearing pressure housing 6 over the ball bearings.
- Press snap ring 4 into the groove of the bottom bearing pressure housing.
- The worm spindle with fitted ball bearings must be able to be fitted on the upper end of the spindle without hammering and be moved axially by hand. If this is not the case, remove burrs or similar from the bottom bearing housing using fine emery paper.



- When installing a new worm, the worm wheel assembly must be replaced at the same time.
- When fitting the neck bearing bridge complete, make sure the gaskets do not get damaged.



- After installation of the vertical gear parts the height of the fitted bowl must be checked and re-adjusted, if necessary (9.3).

### 9.2.1 Assembling the neck bearing bridge

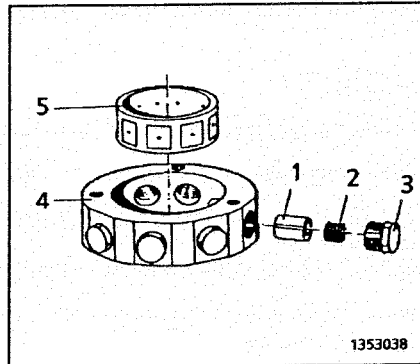


Fig. 126

- Insert pressure ring 5 in neck bearing bridge 4 in such a manner that the recesses of the pressure ring face the tapholes of the neck bearing bridge.
- Insert neck bearing springs 2 into spring pistons 1.
- Grease spring pistons thoroughly.
- Screw threaded plugs 3 with spring pistons 1 and neck bearing springs 2 into neck bearing bridge 2 into neck bearing bridge, and tighten them.

### 9.2.2 Fitting the spring column into the bottom bearing

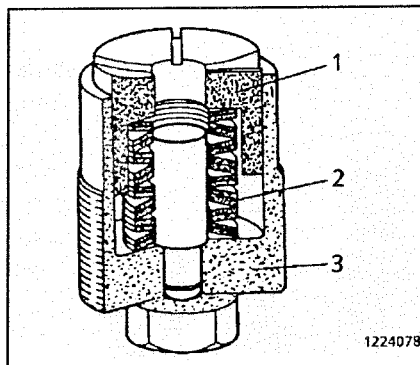


Fig. 127

- Slide cup springs 2 onto bolt of bottom bearing threaded piece as illustrated in the adjacent figure.
- Insert bottom bearing pressure piece 1 into bottom bearing threaded piece, sliding it over the cup springs.

### 9.2.3 Installing the worm spindle

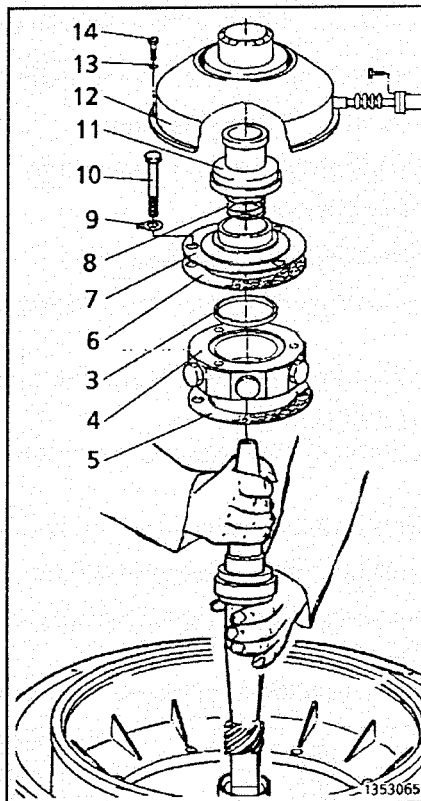


Fig. 128

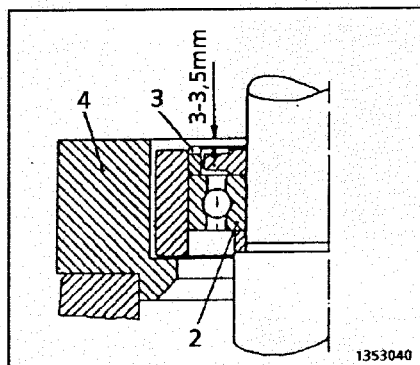


Fig. 129

- Install worm spindle without neck bearing bridge. It must be possible to install the worm spindle without having to rap on the upper spindle end, and to move the built-in spindle axially by hand. If this is not the case, smooth the inside of the bottom bearing housing with a fine emery cloth.
- Insert gasket 5, neck bearing bridge 4 and distance ring 3.
- Check dimension between distance ring and neck bearing bridge (see following figure).
- Fit gasket 6, protective cap 7, spindle spring 8 and spindle cap 11.
- Screw in hex head screws 10, with lock washers 9 underneath, tighten and secure them.
- Install operating-water feeding device 12 and
- tighten it with hex head screws 14 and lock washers 13 placed underneath.

- Before installing the neck bearing protection cap, check if the distance between the cams of distance ring 3 and neck bearing bridge 4.

Distance between cam-distance ring and neck bearing bridge:

$\leq 3 \text{ mm}$  - File cams to proper dimension.

$\geq 3.5 \text{ mm}$  - Raise cam by welding or order a new distance ring from the factory stating the dimension of the required cam height.

- Note that after tightening the neck bearing protection cap, the distance ring 3 and, hence, the ball bearing 2 will be under pressure until the spring column in the bottom bearing is compressed by the weight of the bowl.

### 9.3 Bowl Height

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

#### 9.3.1 Checking

The bowl height must be checked for re-adjustment

- before the first start of the separator,
- after re-assembling the vertical gear parts,
- after exchanging the bowl,
- after exchanging the centripetal pump,
- as soon as the centripetal pump shows any grinding marks.

Prerequisite to correct bowl height adjustment is that

- the bowl is properly closed, (the "O" marks on bowl lock ring and on bowl bottom must be in line with each other.)
- the hood is properly seated on the solids collector,
- the fastening screws of the hood are tight,
- the upper centripetal pump is screwed onto the lower centripetal pump as far as it will go,
- the centripetal pumps are screwed into the disk as far as it will go.

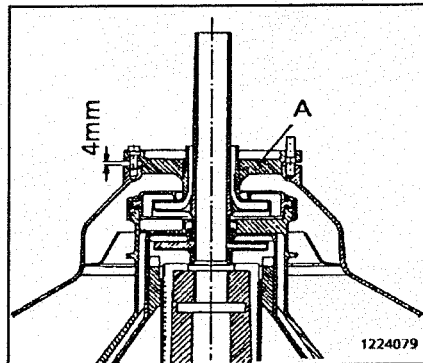


Fig. 130

The bowl height is correct when the disk A with screwed-in centripetal pumps can be raised by about 4 mm. Otherwise the bowl height has to be re-adjusted.

Distance between disk and hood  
 $\leq 4 \text{ mm}$ , bowl is too low.  
 $\geq 4 \text{ mm}$ , bowl is too high.

#### 9.3.2 Adjusting

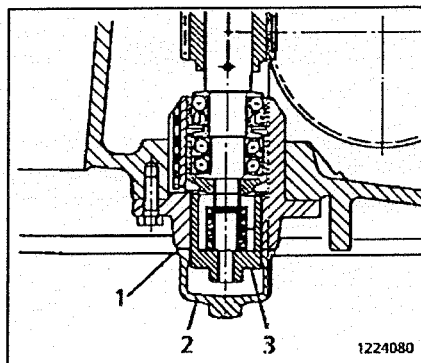


Fig. 131

- Unscrew bottom bearing cap 2 and remove gasket 1.
- Adjust bowl to correct height by turning bottom bearing threaded piece 3 (1 revolution = 2 mm).
- **Bowl is too low**, turn bottom bearing threaded piece *clockwise*.
- **Bowl is too high**, turn bottom bearing threaded piece *counter-clockwise*.

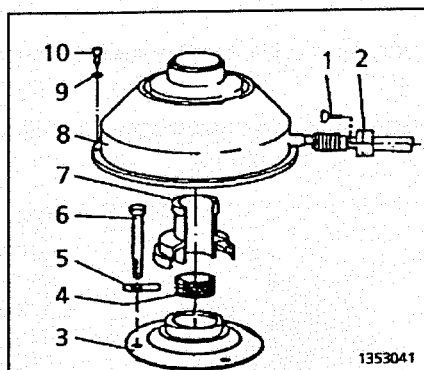


Fig. 132

If the bowl must be adjusted by more than 1 mm, proceed as follows:

- Remove the bowl (5.3).
- Unscrew Allen screws 1 and 10.
- Remove operating-water feed 8.
- Remove spindle cap 7.
- Unscrew hex head screws 6.
- Straighten tab washer 5.
- Remove neck bearing protection cap 3.
- Turn bottom bearing threaded piece clockwise until the bowl is correctly adjusted.

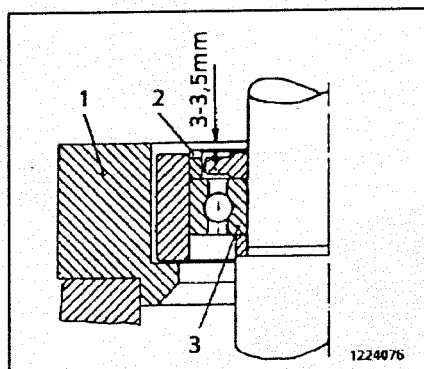


Fig. 133

Each time the bowl has been lowered or raised, check the clearance between cam of distance ring 2 and neck bearing bridge 1.

**Specified dimension: 3 – 3.5 mm**

This check is not required if it has been made after re-assembling the vertical gear parts and the bowl had not to be raised by more than 1 mm.

Clearance between cam of distance ring and neck bearing bridge:

- ≤ 3 mm – File cams to proper dimension.
- ≥ 3.5 mm – Raise cam by welding or order a new distance ring from the factory, stating the required cam height.

- Then re-install the dismantled parts.
- Note, that after tightening the neck bearing protection cap, the distance ring 2 and, hence, the ball bearing 3 will be under pressure until the spring column in the bottom bearing is compressed by the weight of the bowl.

#### 9.4 Removal of the horizontal gear parts

For removal of the horizontal gear parts proceed according to the following sections.

Work on electric lines may only be carried out by a qualified electrician under observation of the safety regulations.

##### 9.4.1 Removing the motor

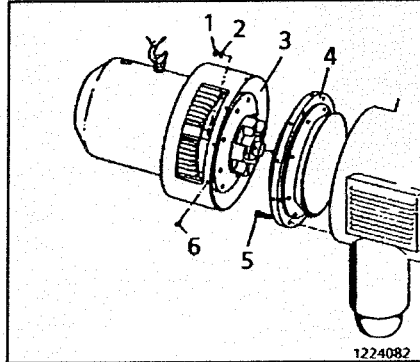


Fig. 134

- Disconnect the motor.
- Unscrew hex head screws 6 and move cover 3 sideways.
- Suspend motor in hoist and tighten carrying rope.
- Unscrew hexagon nuts 1 through opening of cover which can be turned on the flange. Take off lock washers 2.
- By means of hoist lift off the motor together with the cam hub.

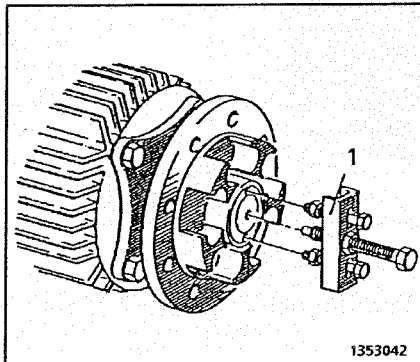


Fig. 135

- Withdraw cam hub from motor shaft end using pulling device 1.

##### 9.4.2 Removing the fluid clutch

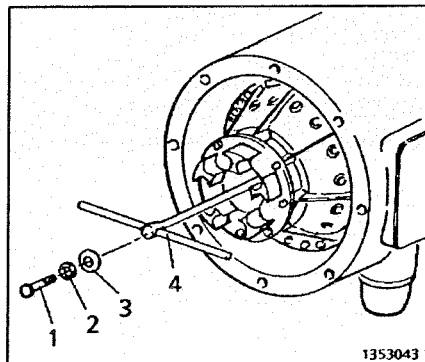


Fig. 136

After removing the motor:

- Loosen hex head screw 1 using torque wrench.
- Note tension of cup spring 3!
- Unscrew hex head screw, remove washer 2 and cup spring.
- To remove fluid clutch from cone of worm wheel shaft use tool 4.



9.4.3 Worm wheel shaft

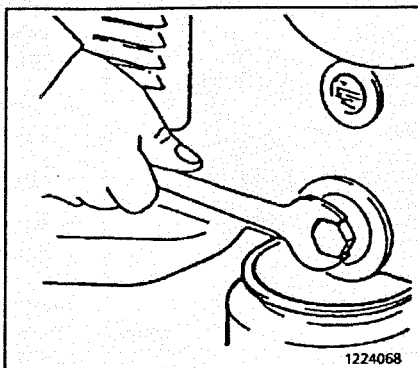


Fig. 137

- Loosen oil drain screw and
- drain oil into oil cup.

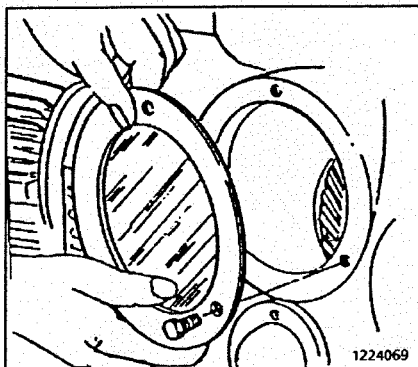


Fig. 138

- Unscrew hex head screws from gear sight glass and
- remove sight glass.

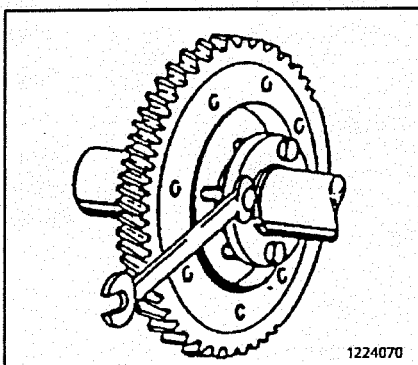


Fig. 139

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

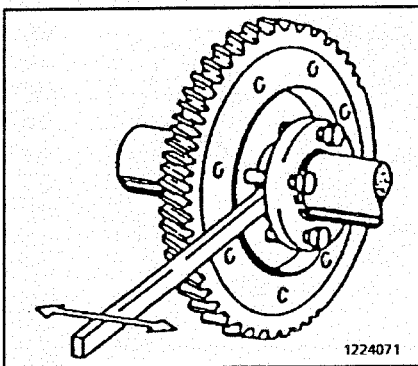


Fig. 140

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

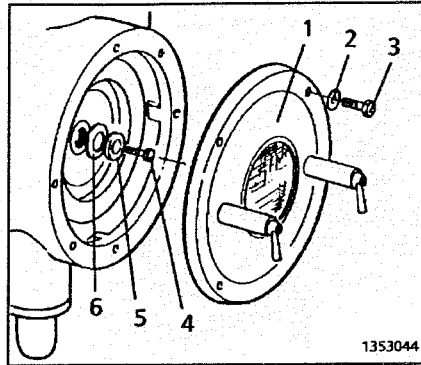


Fig. 141

- Unscrew hex head screws 3 (washers 2) and
- remove fan cover 1.
- Unscrew hex head screw 4 from worm wheel shaft.
- Note tension of cup spring!
- Remove centering disc 5 and cup spring 6.

**Tools:**

Torque wrench  
Hexagon socket (SW 24 mm)

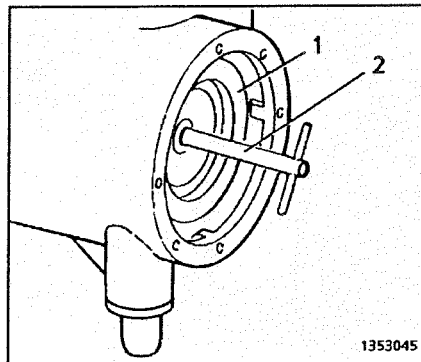


Fig. 142

- Remove brake pulley 1 from cone of worm wheel shaft using device 2 (brake pulley).

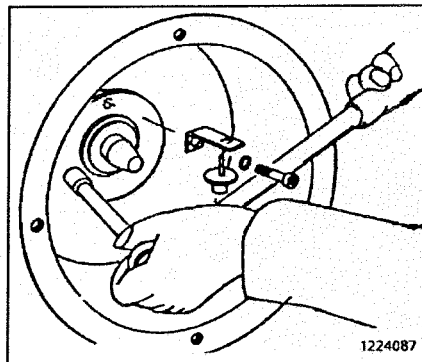


Fig. 143

- Unscrew Allen screws from bearing cover (brake side)
- Remove holder and proximity switch.

**Tools:**

Torque wrench  
Hexagon socket (SW 8 mm)

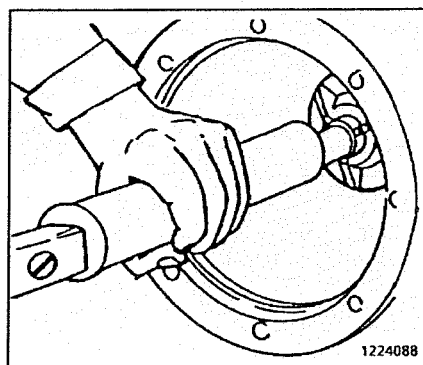


Fig. 144

- Drive out worm wheel shaft together with ball bearing, nut and bearing cover towards **brake side** using a hammer and wooden block. When the shaft has completely loosened from the ball bearing on the motor side,
- remove the worm wheel shaft by hand; while doing so, hold the worm wheel, to prevent damage to the gear teeth.
- Take the worm wheel assembly out of the gear housing.

#### 9.4.4 Grooved ball bearing (motor side)

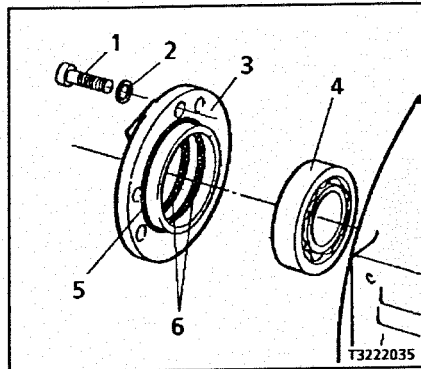


Fig. 145

For removing the bearing refer to assembly drawing, sect. 9.5.

- Unscrew hex head screws 1 and remove lock washers 2.
- Remove bearing cover 3 with felt rings 6 and gasket 5.
- Hold a brass mandrel against inner ring of ball bearing, and
- hammer it lightly to drive out the ball bearing 4.

#### 9.4.5 Angular contact ball bearing (brake side)

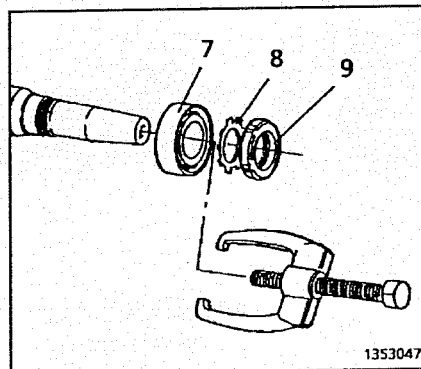
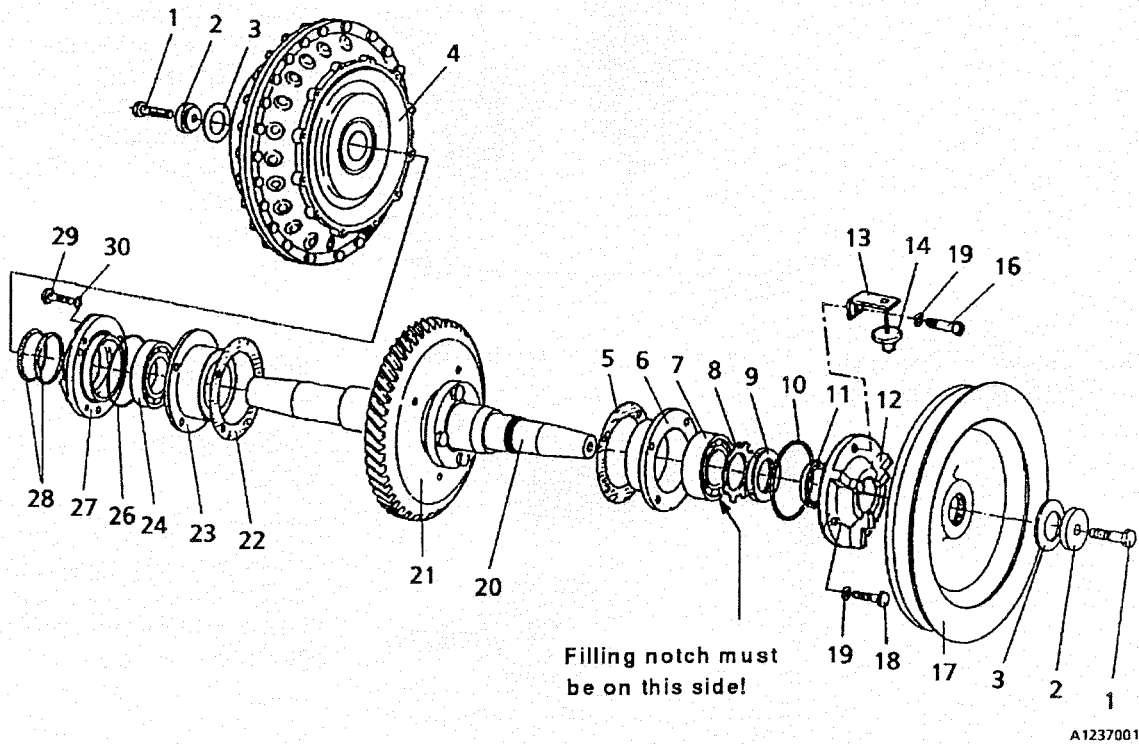


Fig. 146

- Lift tab of washer 8 out of groove of nut 9.
- Unscrew grooved nut using pivoted hook wrench.
- Remove tab washer 8.
- Withdraw angular contact ball bearing 7 from the worm wheel shaft using a commercially available pulling device.

## 9.5 Re-assembly of horizontal gear parts



A1237001

Fig. 1 47

**Note:**

For reasons of safety, replace ball bearings of worm wheel shaft every 10 000 operating hours.

- When fitting the angular contact ball bearing 7 onto the worm wheel shaft, make sure that the filling notch of the bearing faces the bearing cover.
- Install tab washer 8 and grooved nut 9.  
After having tightened nut 9, bend one tab of washer into a groove of the nut. Ensure that the tab does not extend beyond the outer diameter of the nut.
- Install worm wheel assembly with clamp plate 21 so into gear housing that the screw heads of the clamp plate are directed towards the brake side.
- The worm wheel has been balanced in the factory as complete assembly. To avoid unbalance, the clamp plates and the toothed rim must, therefore, not be rotated on the wheel body and component parts must not be replaced individually.
- When the toothed rim is worn and needs replacement, the entire worm wheel assembly 20 with clamp plates must be replaced. The worm of the worm spindle should be replaced at the same time.
- Introduce the worm wheel shaft 20 into the separator frame from the brake side, and slide on the worm wheel.
- Place a hard wooden block against the worm wheel shaft and tap it lightly with a hammer until the angular contact ball bearing 7 is tightly seated in the housing.



- Install bearing cover 12 with inserted sealing ring 11 and gasket 10.
  - Bolt bearing cover 12 and holder 13 of proximity switch 14 together by means of Allen screws 16 and 18 (with lock washers 19 underneath).
- Required torque: 45 Nm.

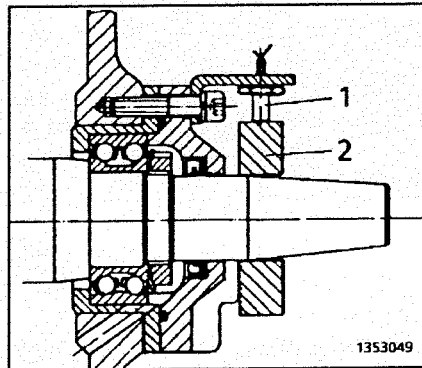


Fig. 148

- Re-adjust proximity switch 1 with the aid of adjusting ring 2.

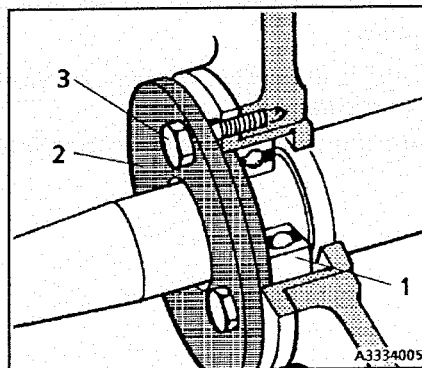


Fig. 149

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

- Replace bearing cover 27 including felt rings 28 and gasket 26 and tighten evenly with hex head screws 29 (lock washer 30 placed underneath).
  - Move worm wheel towards brake side until it rests against shoulder of worm wheel shaft. This will ensure proper positioning of the toothed rim with reference to the worm.
  - Fasten worm wheel 21 securely on the worm wheel shaft 20 by tightening the screws in the two clamp plates evenly and crosswise.
- Required torque: 45 Nm
- Before installing the fluid clutch and the brake pulley:
    - apply a thin film of grease to the tapered ends of the worm wheel shaft. Then clean and wipe dry the tapered ends with a rag.
    - Clean the inside of the hubs of the fluid clutch and brake pulley carefully.
  - The fluid clutch and the brake pulley must be firmly clamped to the worm wheel shaft, accomplished by tightening the hex head screws 1 of the clutch and brake pulley with the torque wrench.
- Required torque: 150 Nm
- Be sure to fit cup springs 3 under the disks 2.

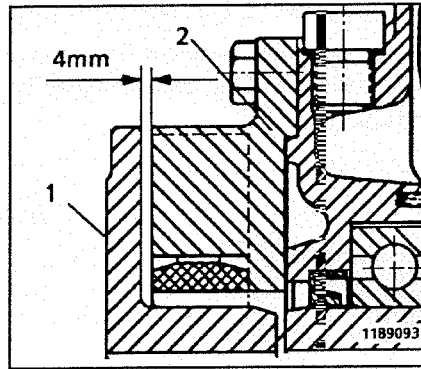


Fig. 150

When installing the motor, make sure that

- there is a distance of 4 mm between claw hub 1 and fluid clutch 2.

After exchanging:

- the motor
  - the claw hub
  - the fluid clutch
  - the worm wheel shaft
- the distance must be checked.

If necessary,

- adjust the distance by displacing the claw hub on the motor shaft, and
- drill a new hole into the motor shaft for the threaded pin.

- Fill gear chamber with oil specified in chapter 3 until oil level is slightly above middle of sight glass.
- Check spindle speed with a hand tachometer and check direction of rotation of bowl (see 4.3).
- To run in new gear parts (worm wheel, worm) let the separator run - without bowl - for about one hour.

During this time switch the motor on and off several times.

**10 Fluid clutch**

10.1	General .....	96
10.2	Checking the oil level: .....	96
10.3	Filling in oil .....	97
10.4	Type of oil .....	98
10.5	Dismantling .....	99
10.6	Assembling .....	101

## 10.1 General

The fluid (Turbo) clutch

- ensures power transmission between motor and gear,
- gradually accelerates the bowl to its rated speed,
- while protecting the gear and the motor against undueload.

By means of an oil filling, power is transmitted from the primary wheel (driven by the motor shaft) to the secondary wheel (fitted to the worm wheel shaft).

The fluid clutch has to be filled with the appropriate quantity of oil (10.2) (to make sure that the bowl reaches its rated speed within the prescribed starting period – 4.3).

If the fluid clutch contains	
too small an amount of oil:	too much oil:
<ul style="list-style-type: none"> <li>● starting time of bowl too long</li> <li>● excessive slippage</li> <li>● clutch temperature too high</li> </ul>	<ul style="list-style-type: none"> <li>● starting time of bowl too short</li> <li>● excessive load on motor</li> </ul>

- Change the oil in the fluid clutch
  - after approx. 8000–10 000 operating hours,
  - preferably during an inspection of the separator (while replacing the bearings of the worm spindle and of the worm wheel shaft).

For a new oil filling of the fluid clutch, you need: (standard values)

**about 6,75 liters of oil for a motor speed of  $n = 1\ 455$  rpm**

**about 6,5 liters of oil for a motor speed of  $n = 1\ 745$  rpm**

To determine the definite quantity of oil needed, refer to the instructions given under 10.2.



**Be sure only to use the oil stated under 10.4.**

The oil quantity is correct when, during start-up, the max. current consumption of the motor is 1.8 to 2 times the rated current.

## 10.2 Checking the oil level:

- The oil level in the fluid clutch has to be checked
  - prior to the first start of the separator,
  - after each re-filling of oil,
  - once a week, in order to detect oil losses.
- **Important: Check the oil level only while the clutch is cold!**

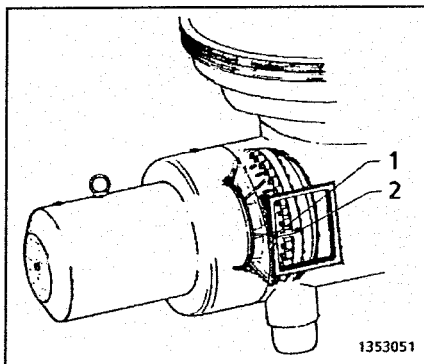


Fig. 1 51

### Brand-new separator:

The mark of oil level plate 1 must be flush with the lower rim of bore 2 (the oil level will then be up to the lower rim of bore 2).

When replacing the clutch, the existing oil level plate becomes invalid.

Re-adjust the oil level plate as stated under "Separator with replacement clutch"



The required quantity of oil can be roughly determined with the aid of the oil level plate. .

**For checking the oil level, proceed as follows:**

*Separator with original clutch (fitted at the factory):*

- Unscrew the ventilation grid to uncover the oil level plate.
- Turn the fluid clutch until threaded plug 2 can be unscrewed without oil escaping.
- Unscrew the threaded plug using the pin spanner.
- Then turn the clutch until
  - the lower rim of the bore for the threaded plug
  - is flush with the mark of the oil level plate (10.2).

In this position, oil should just escape from the bore.

If this is not the case, re-fill oil and check the starting current, referring to section 10.3.

*Separator with replacement clutch:*

- After replacement of the clutch, the existing oil level plate becomes invalid!
- The oil quantity is correct when, during start-up, the max. current consumption of the motor is 1.8 to 2 times the rated current.
- If an exact measurement of the motor current is not possible, the oil level can be checked by measuring the speed of the worm wheel shaft.  
While the separator motor is under nominal load, the speed should be
  - approx. 1 455 rpm at 50 Hz,
  - approx. 1 745 rpm at 60 Hz.
- If the starting current and the speed respectively are much higher than these values, the clutch contains too much oil.
- If, however, the measured values are lower, the clutch contains too small an amount of oil.
- Once the correct oil level is reached, re-place the oil level plate accordingly.

### 10.3 Filling in oil

**Fill the clutch with oil before installing it**  
(for the required quantity of oil, refer to 10.1)

- Thread in the screw plug fitted with a new gasket, and tighten **firmly**.
- The correct oil quantity is reached when, during start-up, the max. current consumption is 1.8 to 2 times the rated motor current.

**If oil has to be added, proceed as follows:**

- Unscrew the ventilation grid to uncover the oil level plate.
- Turn the fluid clutch until threaded plug 2 can be unscrewed without oil escaping.
- Unscrew the threaded plug using the pin spanner.
- Re-fill oil through the bore  
(e.g. using a commercially available funnel and a hose).
- Thread in the screw plug fitted with a new gasket, and tighten **firmly**.
- Re-fit the ventilation grid.

## 10.4 Type of oil

For filling the fluid clutch use only

steam turbine oil TDL 32 (WS part-no. 0015-0050-090 )

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

Designation	Lubricating oil TDL 32 – DIN 51515 (steam turbine oil with additives giving increased protection against corrosion and increased resistance to aging.
Kinematic viscosity	32 ± 3,2 mm <sup>2</sup> /s (cSt) at 40 °C
Density / 15 °C	max. 0,900 g/ml
Pour point	≤ 9°C
Open flash point	≥ 210°C to Cleveland
Corrosive effect on	
- copper	degree of corrosion 2 – 100 A3 according to DIN 51759
- steel	degree of corrosion 0 – A according to DIN 51585
Aging characteristics	Increase of the neutralization number after 1000 h max. 2,0 mg KOH/g oil according to DIN 51587

The following branded oil meets this requirement: **Shell Turbo Oil T 32.**



Steam turbine oils TDL 32 of other brands may be used provided they comply with the above specification.

Each clarifier is supplied with an amount of TDL 32 oil which is sufficient for one filling.

10.5 Dismantling

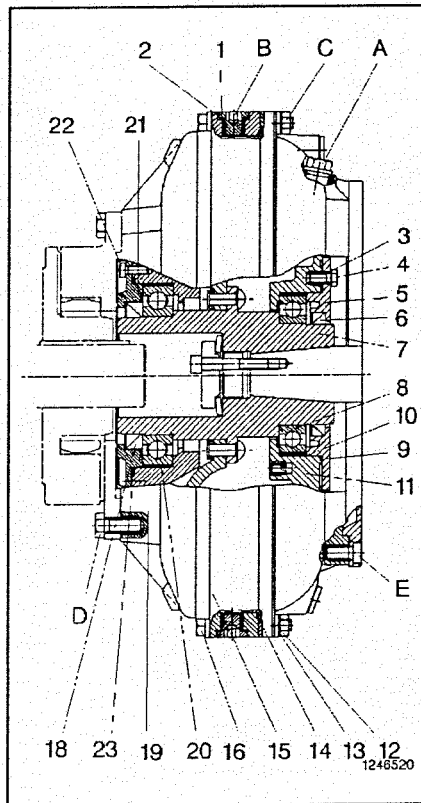


Fig. 152

Normally, the fluid clutch has to be sent to the factory for repair. Only then can perfect repair of the clutch be assured. A replacement clutch can be supplied on request.

If, in exceptional cases, the clutch has to be dismantled at site:

First check sealing ring 6 and replace if necessary.

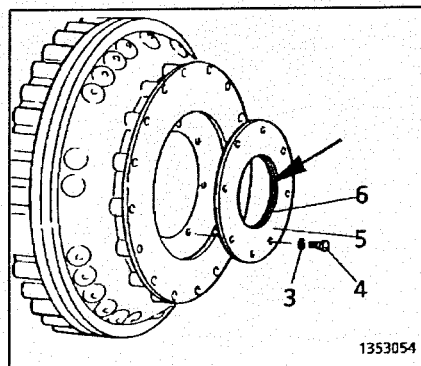


Fig. 153

Removing sealing ring 6

- Unscrew screws 4 together with lock washers 3.
- Remove cover 5.
- Lever off sealing ring 6 with a screwdriver.
- Replace the sealing ring if its sealing lip is no longer soft and pliable.

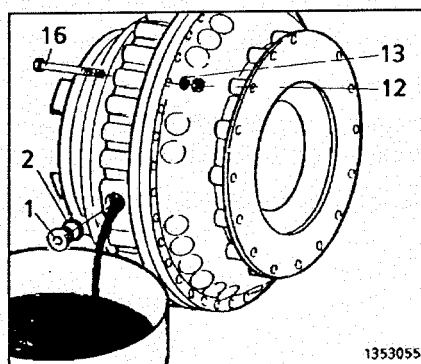


Fig. 154

Removing sealing ring 18 and ball bearing

- Unscrew threaded plug 1 together with gasket 2.
- Drain the oil.
- Unscrew hexagon nuts 12.
- remove screws 16 together with lock washers 13.

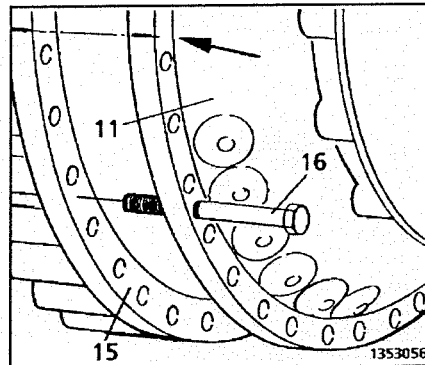


Fig. 155

- Screw two screws 16 into the tap-holes in primary wheel 11.
- Force the primary wheel off the clutch casing 15. (primary and secondary wheel remain together).

**Mark the following parts before dismantling:**

- clutch casing 15 and
- primary wheel 11.  
(Do NOT offset them when re-installing - risk of imbalance)

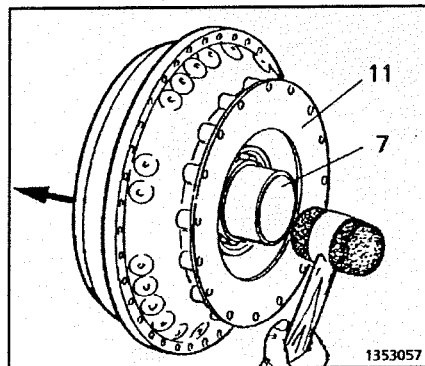


Fig. 156

- Separate primary wheel 11 from secondary wheel 7 by hammering with a mallet against the hub of secondary wheel 7.  
(ball bearing 8 stays in primary wheel 11).

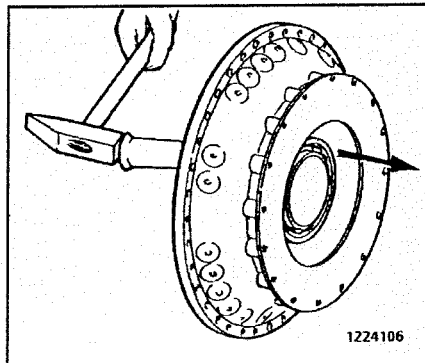


Fig. 157

- Drive ball bearing 8 out of primary wheel 11 using a mandrel and hammer.

#### Removing sealing ring 18 and ball bearing 20

- Undo screws 22 together with the lock washers.
- Remove cover 21.
- Lever off sealing ring 18 with a screwdriver.  
Replace the sealing ring if its sealing lip is no longer soft and pliable.
- Drive ball bearing 20 out of the clutch casing using a mandrel and hammer.

10.6 Assembling

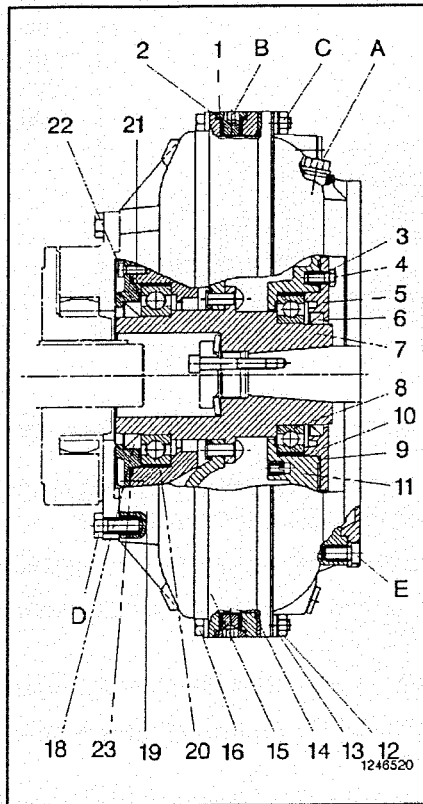


Fig. 158

For re-assembling the fluid clutch proceed in reverse order of dismantling. Pay special attention to the following:

- Torques:
- A = 150 Nm
  - B = 95 Nm
  - C = 46 Nm
  - D = 80 Nm
  - E = 40 Nm.

Glue in screws pos. E with Loctite 245.

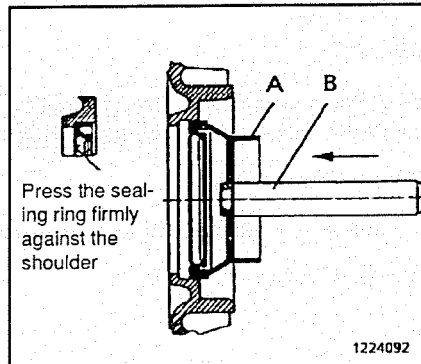


Fig. 159

- Moisten the sealing rings.
- Screw bolt B into disk A and position it against the sealing ring.
- Press sealing ring 18 into cover 21 by lightly hammering against bolt B.
- Screw bolt B into the other side of disk A and press sealing ring 6 into cover 5 in exactly the same way.

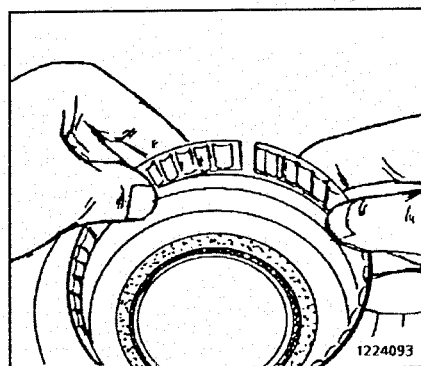


Fig. 160

- Insert spacer ring 19 into clutch casing 15.
- Insert spacer ring 10 into primary wheel 11.

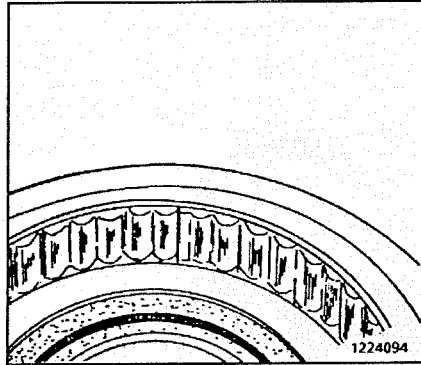


Fig. 161

**Note:**

The chamfered edges of the rings must snap into the grooves.  
(Only then are the spacer rings secured against axial travel).

- Press ball bearing 20 into the clutch casing and ball bearing 8 into the primary wheel.  
Check that the ball bearings pressed into the spacer rings have a perfectly tight fit. Otherwise replace the spacer rings.
- Insert gasket 9 into the groove of the primary wheel.
- Fasten cover 5 to the primary wheel by means of hex head screws 4 with their lock washers.
- Insert gasket 23 into the groove of the clutch casing.
- Fasten cover 21 to the clutch casing by means of Allen screws 22 and their lock washers.
- Press secondary hub together with secondary wheel 7 into the clutch casing.  
(The contact surfaces of the sealing rings must be in perfect condition in order to prevent leakage).
- Insert gasket 14.
- Press the primary wheel onto the secondary hub so that the marks on the primary wheel and the clutch casing are aligned.
- Bolt the two parts together.



**After re-assembly, the clutch has to be re-balanced!**

- Fill in oil before fitting the clutch.

**11 Trouble shooting**

11.1	Fault detection - Mechanical function .....	104
11.2	Fault detection – Ejection .....	108

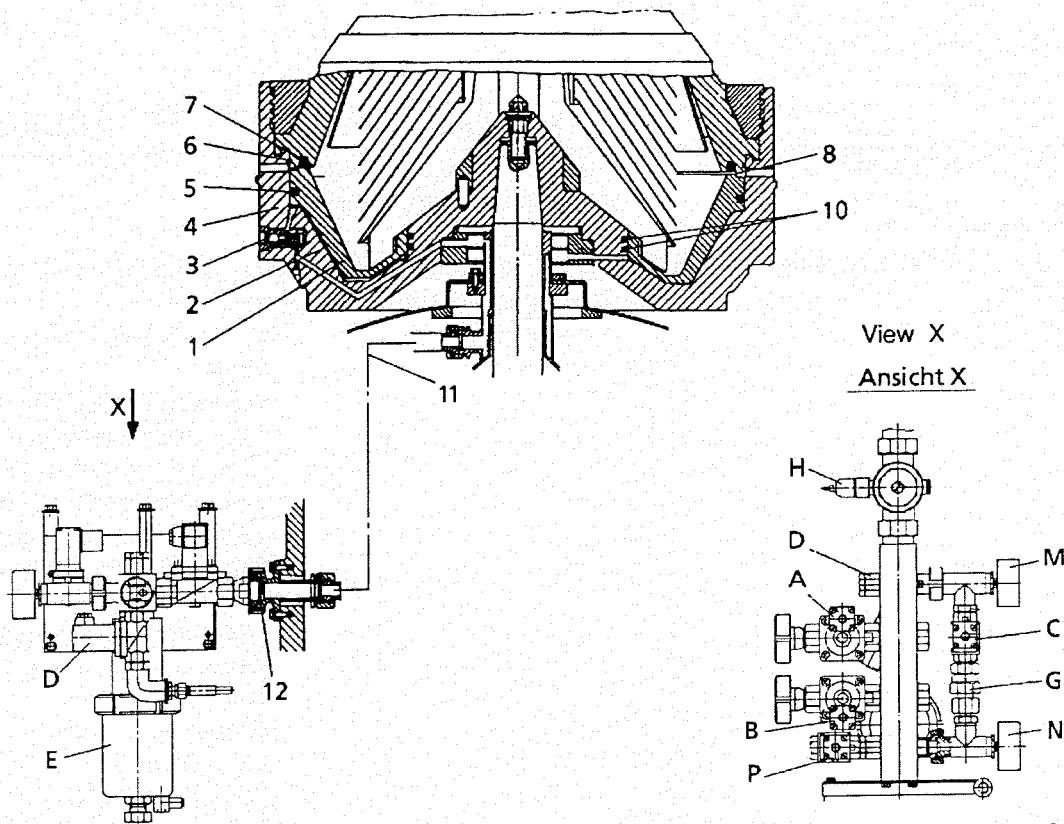
## 11.1 Fault detection - Mechanical function

Fault	Possible causes	Remedies
The bowl does not come up to rated speed or takes too long to do so (see 4.3).	Brakes are on.	Release brakes by turning handles clockwise.
	Motor is incorrectly connected.	See wiring diagram.
	The fluid clutch does not contain enough oil or clutch is leaky.	Refill oil (see 10.3). Re-tighten nuts of screws on clutch. If sealing rings and do not seal properly, ask for a reconditioned clutch in exchange for your clutch.
	Bowl is too high or too low and, therefore, rubs against centripetal pump.	Adjust to proper bowl height (see 9.3).
	Clamp plates are not tight enough; worm wheel slips on shaft.	Tighten long hex head screws on worm wheel evenly and <i>firmly</i> . Tighten crosswise, by single turns, with a torque of 45 Nm.
	Product feed valve is open.	Close product feed valve.
The bowl speed drops during operation.	The fluid clutch does not contain enough oil.	Refill oil (see 10.3).
	Motor speed drops during operation.	Inspect motor and line voltage.
	Main bowl gasket in bowl top is damaged.	Replace the gasket (see sect. 5.6).
	Gaskets in bowl valves are damaged; the bowl loses sealing water.	Replace gaskets (see 5.7). The bowl can be kept closed temporarily by opening the solenoid valve B for closing water manually.
The bowl comes up to rated speed too quickly (in less than 8 minutes). Motor pulls too high a starting current.	The clutch contains too much oil.	Check oil level (10.2). Drain excess oil.



Fault	Possible causes	Remedies
Uneven run of the separator.	<p>Incomplete solids ejection. The remaining solids have deposited unevenly in the bowl.</p>	<p>Perform several partial ejections (7.4.1). If this does not improve conditions, close the bowl and fill it with water to attenuate the increased vibrations occurring during slowing-down of the bowl.  Stop the separator. Apply brakes. If bowl is leaking, leave feed open Clean bowl thoroughly. Remove protruding edges of bowl gasket with a knife .</p>
	<p>Bowl is not properly assembled or, if plant has several separators, parts of different bowls may have been interchanged.</p>	<p>Assemble bowl properly (see 5.4).</p>
	<p>Tension of disc stack has slackened.</p>	<p>Make sure bowl lock ring is screwed on tightly (see 5.4). Check number of disks. If necessary, add spare disc or compensating disc.</p>
	<p>Bowl is damaged and, therefore, out of balance.</p>	<p>Send bowl to factory or authorized factory repair shop.  <b>Do not attempt to make your own repairs.</b> Never weld or solder. Bowl is made of heat-treated steels.</p>
	<p>Neck bearing springs are weak or broken.</p>	<p>Replace all 9 neck bearing springs.</p>
	<p>Ball bearings are worn.</p>	<p>Replace damaged bearings.  <b>IMPORTANT:</b> When replacing, use only the high precision ball bearings as specified in the Parts List.</p>

Fault	Possible causes	Remedies
Uneven run of the separator (cont'd.).	<p>Gear parts are in bad condition as a result of</p> <ol style="list-style-type: none"> <li>1. normal wear,</li> <li>2. premature wear caused by:               <ol style="list-style-type: none"> <li>a) lack of oil <input type="checkbox"/></li> <li>b) oil of too low a viscosity, <input type="checkbox"/></li> <li>c) metal abrasives present in the lubricating oil due to the following possible causes:                   <ul style="list-style-type: none"> <li>- viscosity of oil is too low,</li> <li>- oil has not been changed in time,</li> <li>- gear chamber has not been cleaned,</li> </ul> </li> <li>d) replacement of one gear part only, instead of both parts.</li> </ol> </li> </ol> <p><input type="checkbox"/> in general, recognized by blue tempering colour of gear parts.</p>	<p>Clean gear chamber thoroughly (see 8.5).</p> <p>Replace damaged gear parts (see 9.1 and 9.4).</p> <p>Change oil (see chapt. 3).</p> <p>If necessary, change oil more often.</p>
Bowl lock ring is difficult to loosen.	Bowl has not been dismantled at regular intervals (see 8.2).	Unscrewing of the bowl lock ring can be very much facilitated by blocking the bowl, which is accomplished by putting wedges between bowl bottom and solids collector.



P1244006

Fig.162 – Bowl and operating-water feed

- |    |                                  |   |   |
|----|----------------------------------|---|---|
| 1  | Sliding piston                   | A | Solenoid valve for closing water          |
| 2  | Closing chamber                  | B | Solenoid valve for opening water          |
| 3  | Bowl valve                       | C | Solenoid valve for filling water          |
| 4  | Bowl bottom                      | D | Solenoid valve for hood flushing water    |
| 5  | Gasket (sliding piston)          | E | Metering unit                             |
| 6  | Gasket                           | G | Non-return valve                          |
| 7  | Main bowl gasket                 | H | Pressure switch                           |
| 8  | Sealing surface (sliding piston) | M | Pressure gauge                            |
| 10 | Gaskets (bowl bottom)            | N | Pressure gauge                            |
| 11 | Operating-water feed             | P | Solenoid valve for cooling water (clutch) |
| 12 | Gasket (operating water)         |   |   |

### 11.2 Fault detection – Ejection

Fault	Possible causes	Remedies
<p>The bowl does not close at all.</p> <p><b>IMPORTANT:</b> In this case switch off feed pump immediately.</p>	<p>The amount of closing water fed to the bowl is insufficient because</p> <p>a) the water pressure in the supply line to the operating–water connection is too low (see 6.4).</p> <p>b) the water discharge holes in the top of the operating–water feed 11 are clogged with scale.</p>	<p>a) Check pressure in water supply line. The pressure should be at least 2.5 bar. Check also if there is sufficient closing–water coming in. The closing–water valve opens for 60 seconds after the separator has reached its operating speed and after each solids ejection. During this time the amount of discharging closing water should be measured at the operating–water discharge. The closing–water must discharge at a rate of 550 l/h. Closing water can be supplied as often as you like by switching on and off the main switch on the control unit.</p> <p>b) Clean discharge holes.</p>
	Strainer in operating–water line is clogged.	Clean strainer.
	Gaskets of bowl valves 3 are damaged.	Remove valves (see 5.7). Install new gaskets.
	Gasket 5 in sliding piston is damaged or its edges have been frayed through the up– and down movement of the piston.	Replace damaged gasket. If, however, only the edges of the gasket are frayed and the gasket is not damaged otherwise, it can be re-used after grinding it off with an emery wheel.
	The operating–water feed 11 is clogged.	Clean operating–water feed.

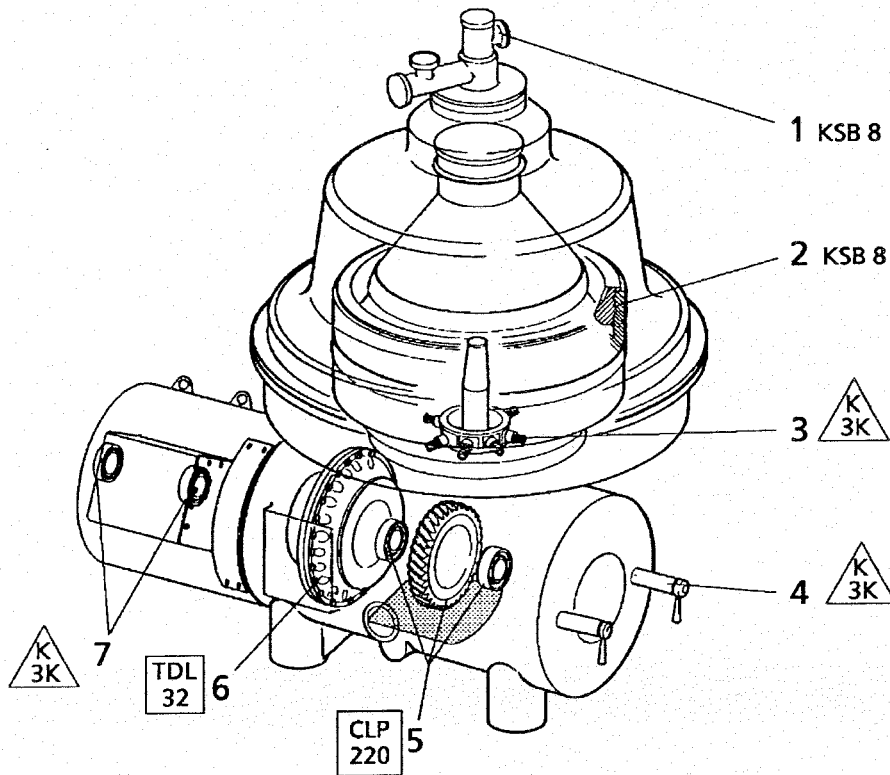
Fault	Possible causes	Remedies
The bowl does not close and open properly.	Gasket 5 in sliding piston does not fit properly at all points of the guide surfaces, thus failing to seal properly.	If necessary, stretch gasket. Before installing the gasket, lightly grease groove in sliding piston.
	Gasket 7 in bowl top is damaged.	Replace gasket (see 5.6).
	Gaskets 10 in bowl bottom have not been inserted or are damaged.	Insert gaskets or replace them.
	Gasket 5 in sliding piston is uneven in height.	Replace gasket. The difference in height on a gasket must not exceed 0.25 mm.
	Sealing surface 8 of sliding piston is damaged.	Replace the sliding piston.
The bowl does not open at all or not completely.	Dirt or rubber particles have settled between sliding piston 1 and bowl bottom 4.	Clean bowl parts. Round off edges of gaskets. Replace damaged gaskets. Grease guide surfaces with the special lubricating paste supplied.
	Sealing chamber 2 between bowl bottom and sliding piston is soiled.	Remove sliding piston 1 and clean sealing chamber.
	The drill holes in bowl valves 3 are clogged.	Remove the valves (see 5.7) and clean them.
	<p>The bowl receives no or too little opening water for the following reasons (check gauge M does not indicate):</p> <ul style="list-style-type: none"> <li>a) non-return valve is dirty or defective,</li> <li>b) solenoid valve A or C is defective,</li> <li>c) air pressure for metering unit is too low,</li> <li>d) control times of solenoid valves are not adjusted correctly.</li> </ul>	<p>Clean or replace non-return valve.</p> <p>Replace solenoid valve.</p> <p>Increase air pressure to <math>\geq 4.5</math> bar.</p> <p>Check adjusting periods of timers on control unit (see function diagram). Check adjusting periods of timers on control unit (see function diagram).</p>



**12 Lubrication and maintenance**

12.1	Lubrication chart .....	112
12.2	Maintenance schedule .....	113

## 12.1 Lubrication chart



F1234005

Fig.163

No. in Fig.	Lubricant		Frequency of lubrication		Amount of lubricant	Lubrication point
	DIN	ISO	per year	after operating hours		
1	Klüber Grease KSB 8			when necessary	10 cm <sup>3</sup>	Threads and fittings
2	Klüber Grease KSB 8			before each assembly	150 cm <sup>3</sup>	Threads and sliding surfaces of bowl
3	Roller bearing grease K3K		2	1 500	20 cm <sup>3</sup>	Neck bearing springs and spring pistons
4	Roller bearing grease K3K		2	1 500	10 cm <sup>3</sup>	Manually-operated parts (brake bolt, valves, etc)
5	Lubricating oil CLP 220 DIN 51502	CC 220	2	500	5 500 cm <sup>3</sup>	Gear chamber
6	Steam turbine oil TDL 32 DIN 51515			10 000	6 250 cm <sup>3</sup>	Fluid clutch
7	Roller bearing grease K3K			according to manufacturer's instructions	according to manufacturer's instructions	Motor bearings



12.2 Maintenance schedule

every operating hours						Operations	every			
250	500	1500	3000	5000	10 000		Week	1/4 year	1/2 year	1 year
<b>LUBRICATION CHART</b>										
•						First oil change after first start-up or after replacing worm wheel and worm. Thorough cleaning of gear chamber.				
						Check oil level of gear chamber.	•			
	•					Oil change and thorough cleaning of the gear chamber.			•	
		•				Lubrication of hand-operated parts such as brakes, valves, etc*			•	
whenever dismantling						Grease threads, and guide and contact surfaces of bowl parts (3.2)	whenever dismantling			
according to manufacturer's instructions						Grease motor ball bearings.	accord. to manufact. instruct.			
<b>CLEANING</b>										
•						Clean bowl valves (5.7)				
	•					Clean strainer operating-water line.			•	
		•				Dismantle bowl and clean also holes and chambers of the hydraulic system.		•		
			•			Clean discharge holes in operating-water feeding system.				
<b>INSPECTION</b>										
•						Check oil level of fluid clutch	4 weeks			
		•				Remove and check bowl gaskets. Clean gasket grooves and check for corrosion.		•		
		•				Check starting time and speed of bowl spindle.			•	
		•				Check neck bearing springs and spring pistons.			•	
		•				Check thickness of brake linings.			•	
			•			Check toothing of worm gear through inspection hole. (after removing the gear sight glass)				•
			•			Check spaces between solids ejection holes.				
		•				Bowl inspection.* Check threads of lock rings for erosion and corrosion.				
<b>REPLACEMENTS</b>										
				•		Replace neck bearing springs.				
				•		Replace roller bearings of worm spindle.				
					•	Replace oil in fluid clutch.				
					•	Replace roller bearings of worm wheel shaft.				

\* Keep to the maintenance intervals even if the operating hours have not been reached.



**13 Parts list**

Important hints for ordering parts .....	117
Frame, complete .....	119
Intermediate flange, complete .....	121
Motor protective hood .....	122
Gear, complete .....	125
Worm spindle, complete .....	127
Neck bearing bridge assembly with covering .....	128
Fluid clutch, compl. ....	131
Set of spare parts for fluid clutch .....	133
Bowl, complete .....	135
Valve, compl. ....	136
Double centripetal pump, cpl. ....	137
Hood, compl. ....	138
Feed and discharge connections, compl. ....	139
Flow meter, compl. ....	141
Operating-water connection, compl. ....	143
Solenoid valve, cpl. (24 VDC) .....	144
Metering unit, complete .....	145
Water pressure reducer 16/1,5-6 bar .....	146
Set of tools .....	149
Set of accessories .....	150
Hydraulic unit, complete .....	151

Bitte  
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den  
Anleitung  
buch  
des  
Gerätes  
ganz  
genau  
durch.

**Important hints for ordering parts**

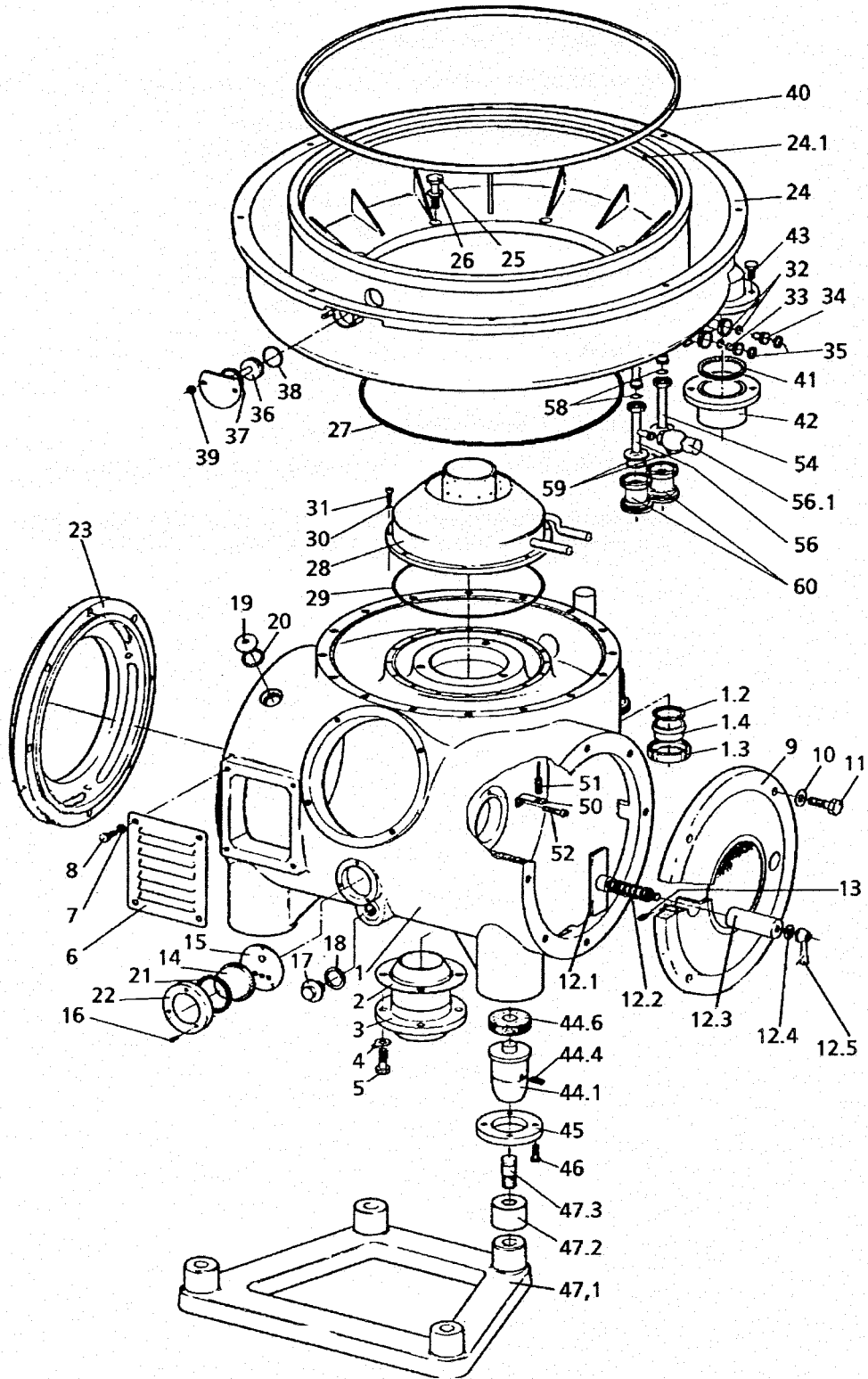
To ensure correct delivery when ordering parts, please state the following:

- Model of separator      see name-plate  
   e.g. CND 215-01-076
- Serial-No.                    see name-plate  
   e.g. 1 721 620
- Description                see List of Parts  
   e.g. Distributor
- Part-No.                    see List of Parts  
   e.g. 3289-1343-000

Only required when ordering bowl parts:

- Bowl Serial-No.            see bowl lock ring and bowl bottom

Part-Numbers ending with letter "L" (e. g. 3289-1021-L) designate parts which are available in different designs for the separator concerned.



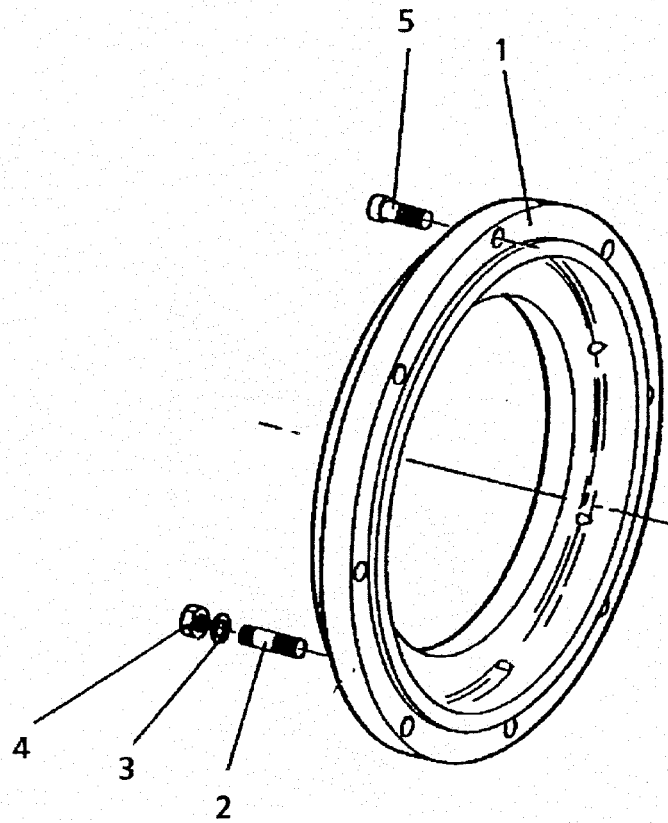
1352-1100-000

Fig.164

Pos.	Part-No.	Qty.	Part description	Dimensions
-	1352-1100-000	1	Frame, complete	
1	1166-1006-030	1	Lower section of frame	
-	1165-1122-010	1	Discharge pipe, compl.	
1.2	0007-2211-750	1	- Gasket DIN 11851	G 50
1.3	0013-2845-300	1	- Grooved coupling nut DIN 11851	F 50
1.4	0018-3955-300	1	- Cone connection DIN 11851	D 50
2	0004-5793-770	1	Gasket	130x204x0,3
3	3050-1112-020	1	Bottom bearing housing	
4	0026-5894-600	4	Tab washer DIN 93	17
5	0019-7038-150	4	Hex head screw DIN 933	M 16x45
6	3050-1085-010	1	Ventilation grid	
7	0026-1371-400	4	Washer DIN 125	13
8	0019-6966-400	4	Hex head screw DIN 933	M 12x20
9	3170-1065-010	1	Fan cover	
10	0026-1335-400	4	Washer DIN 125	17
11	0019-6608-400	4	Hex head screw DIN 931	M 16x60
12	3170-1043-000	2	Brake, complete	
12.1	3170-1031-000	2	- Brake bolt	
-	0021-4096-850	2	- Brake lining	50x150x6
-	0026-1263-550	8	- Rivet DIN 661	4x16
-	0026-1086-400	2	- Cylindrical pin DIN 7	6H8x14
12.2	0006-4208-160	2	- Cly. pressure spring	29x3,5x83
12.3	0021-3537-300	2	- Brake housing	32x42x123
12.4	0004-1914-720	2	- Gasket	17,5x25,5x2
12.5	0021-3514-300	2	- Tapered handle	M16
13	0019-9063-150	2	Threaded pin DIN 916	AM 8x10
14	0001-0027-830	1	Sight glass	80-70
15	0004-5406-750	1	Gasket	110x3
16	0019-6845-400	3	Hex head screw DIN 933	M 6x25
17	0019-0840-400	1	Screw plug	R 3/4in
18	0004-5294-780	1	Gasket	27x48x1,5
19	0019-1748-400	1	Screw plug	40x1/14in x10
20	0007-2229-750	1	Gasket	40x48x5
21	0004-5056-740	1	Gasket	70x80x2
22	0001-0022-400	1	Sight glass holder	72
23	as per order	1	Intermediate flange, complete	
24	1201-1018-000	1	Solids collector	
24.1	3118-6710-070	3	- Nozzle	
25	0019-7038-400	8	Hex head screw DIN 933	M 16x45
26	0004-2290-400	8	Gasket	16,7x24x1,5
27	0007-2954-750	1	Gasket	590x4
28	1352-1219-010	1	Operating water feeding system	
29	0007-2571-750	1	Gasket	297x4
30	0026-1325-300	8	Lock washer DIN 127	B8
31	0019-6124-400	8	Allen screw DIN 912	M 8x25
32	0007-2521-750	2	Gasket DIN 11851	G 15
33	1167-1074-000	1	Sleeve	

Pos.	Part-No.	Qty.	Part description	Dimensions
34	1168-1074-000	1	Sleeve	
35	0007-2208-750	2	Gasket DIN 11851	G 25
36	1165-1183-000	1	Plug	
37	0007-2320-750	1	Gasket	45x55x5
38	0007-2580-750	1	Gasket	42x2,5
39	0013-0404-400	2	Cap nut DIN 1587	M 8
40	0007-2803-840	1	Gasket	770x788x9,8
41	0007-2113-750	1	Gasket	94x104x6
42	1167-1045-000	1	Pipe connector	
43	0019-6968-300	3	Hex head screw DIN 933	M 12x25
44	2315-1015-010	4	Foot, complete	
44.1	2315-1011-000	4	- Foot with coating	
44.4	0019-6387-400	4	- Threaded pin DIN 915	AM 12x28
44.6	0021-3018-750	4	- Rubber-metal cushion	30x92x20
45	0001-0516-300	4	Flange	80
46	0019-6937-400	12	Hex head screw DIN 933	M 10x30
47	3170-1020-010	1	Foundation frame compl.	
47.1	3170-1003-010	1	- Foundation frame	
47.2	0026-2031-300	4	- Cap	75x50
47.3	3157-1033-000	4	- Bolt	
-	0005-0222-630	1	Screw plug DIN 46320	Pg 9
-	0005-0202-630	1	Screw coupling DIN 46320	C4 Pg 9x6 7
50	1168-1192-000	1	Angle	
51	0005-0964-000	1	Proximity switch NJ 2-11-SN-G	
-	0005-3534-900	1	Base KR 6	G5
52	0019-2233-400	1	Cheese-head screw DIN 84	M 5x12
-	0005-3538-900	1	Cable tape	180x4,5
54	1199-1370-000	1	Cooling line, compl. (feed)	
56	1199-1370-010	1	Cooling line, compl. (discharge)	
56.1	0018-1365-690	1	- Pressure relief valve	DN1/2IN-0,5 bar
58	0007-2402-750	2	Gasket	17x23x3
59	0007-2208-750	2	Gasket DIN 11851	G 25
60	0018-4843-400	2	Transition piece, compl.	25





G1315E04

Fig. 165

Pos.	Part-Number	Quantity	Part Description	Dimensions
—	1315-1021-000	1	Intermediate flange, complete	
1	1166-1028-020	1	Intermediate flange with lining	
2	0019-7726-150	8	Stud DIN 939	M16x40
3	0026-1330-190	8	Lock washer DIN 127	A16
4	0013-0282-400	8	Hexagon nut ISO 4032	M16
5	0019-6202-150	8	Allen screw DIN 912	M16x45

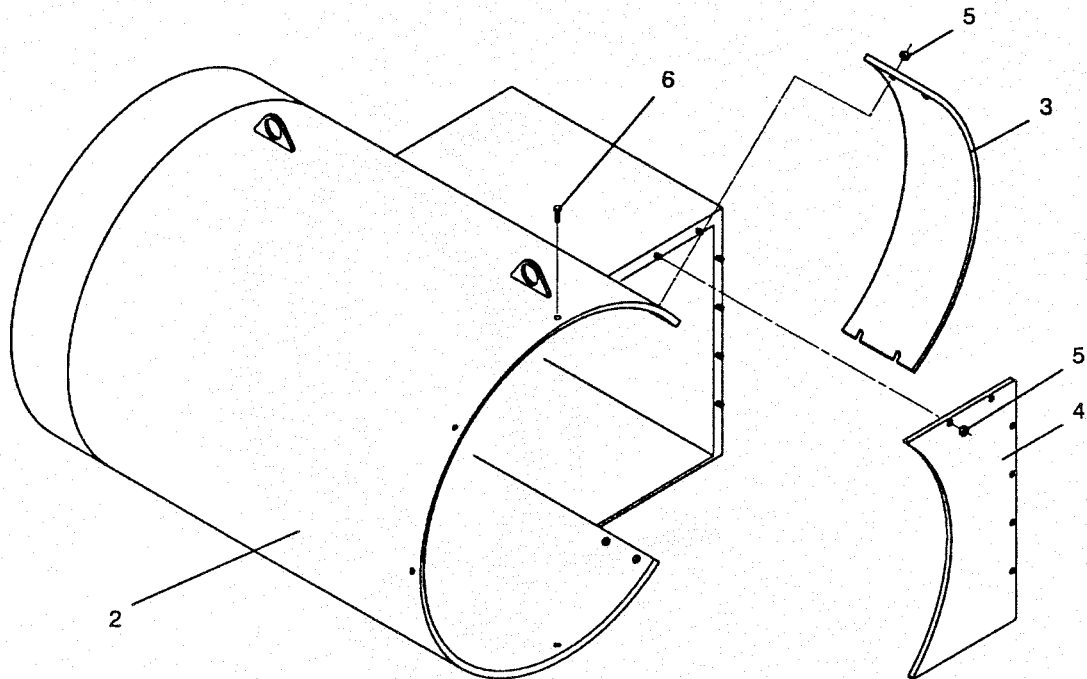
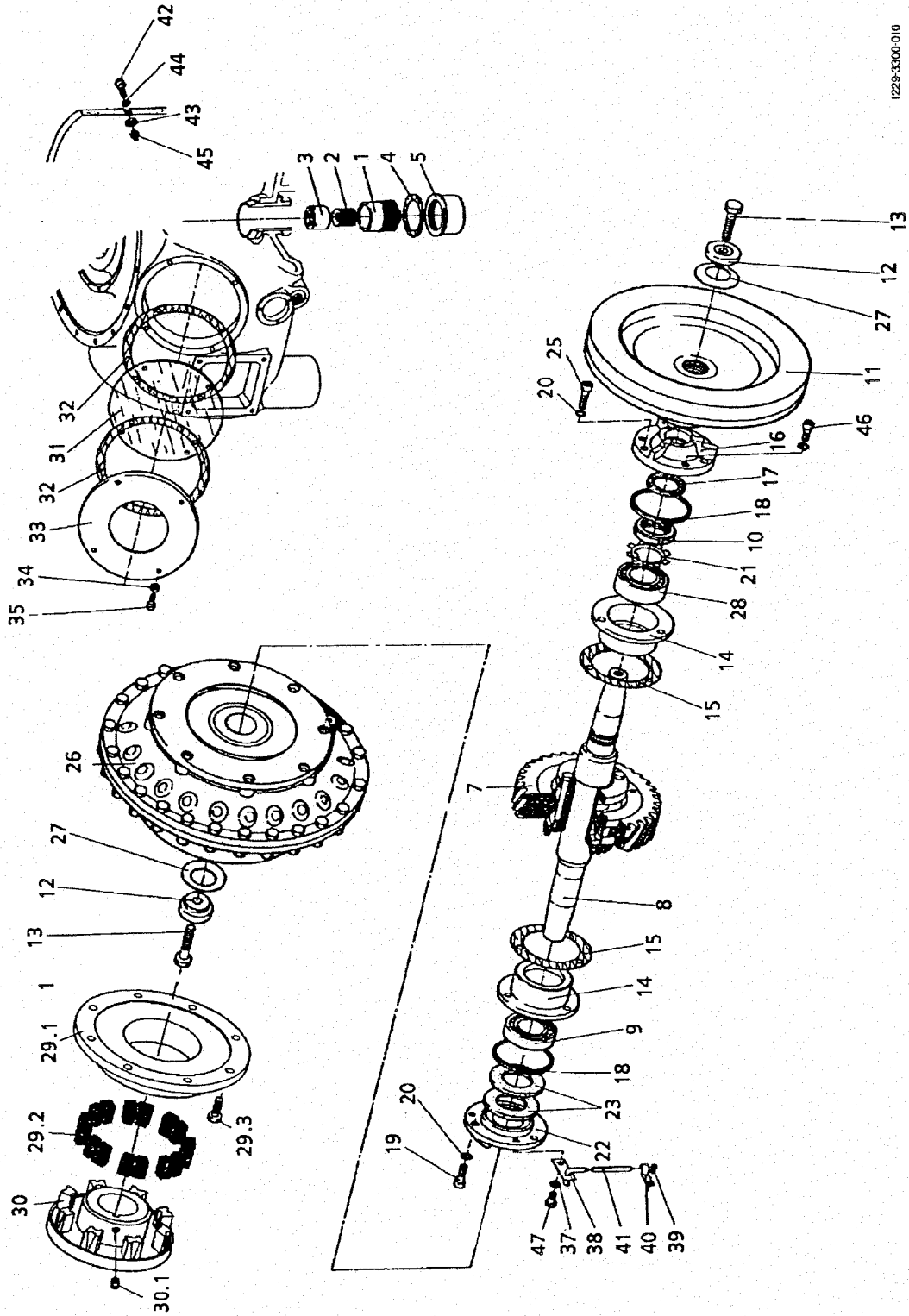


Fig. 166

1315-3090-000

Pos.	Part-Number	Quantity	Part Description	Dimensions
–	1315-3090-000	1	Motor protective hood	
2	1315-1262-000	1	Protective hood	
3	1315-1061-000	1	Cover	
4	1315-1061-010	1	Cover	
5	0013-0276-400	10	Hexagon nut ISO 4032	M6
6	0019-6839-400	10	Hex head screw ISO 4017	M6x10

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1229-3300-010

Fig. 167

Pos.	Part-Number	Quantity		Part Description	Dimensions
-	1229-3300-010	1		<b>Gear, complete</b>	
1	0010-8002-040	1		Bottom bearing threaded piece, compl.	80
2	0006-4440-160	1		Spring column, compl.	A 45x48
3	0010-8001-200	1		Bottom bearing pressure piece	80
4	0004-2221-780	1		Gasket	80x108x1.5
5	0010-8003-210	1		Bottom bearing cap	80
-	see page 127	1		Worm spindle, complete	
7	1166-3449-020	1	①	Worm wheel assembly (50 Hz)	
8	2231-3400-020	1		Worm wheel shaft	
9	0011-6210-000	1		Angular contact ball bearing DIN 625	6210 J
10	0013-0448-090	1		Grooved nut	M 50x1.5
11	1229-3368-000	1		Brake disk, complete	
12	0026-1834-030	2		Centering disc	14.5x55
13	0019-9371-150	2		Hex head screw DIN 960	M 14x1.5x60
14	1166-3131-000	2		Bearing housing	
15	0004-2559-780	2		Gasket	99x140x1
16	2231-3375-020	1		Bearing cover	
17	0004-5566-750	1		Gasket DIN 3760	A 45x65x8
18	0007-1996-750	2		Gasket	96x4
19	0019-6146-150	3		Allen screw DIN 912	M 10x35
20	0026-1337-300	6		Lock washer DIN 127	B 10
21	0026-0915-170	1		Tab washer DIN 5406	MB 10
22	2231-3375-010	1		Bearing cover	
23	0004-1957-830	2		Felt ring DIN 5419	50
25	0019-6149-300	1		Allen screw DIN 912	M 10x50
26	see page 131	1		Fluid clutch, complete	422 K-TSF
27	0006-4404-010	2		Cup spring	70x40.5x5
28	0011-3210-470	1		Grooved ball bearing DIN 628	3210
29	1166-3259-000	1		Set of clutch connecting parts	
29.1	1166-3283-010	1		- Claw flange	
29.2	1166-3393-000	1		- Set of coupling components	
29.3	0019-6970-150	8		- Hex head screw	M 12x30
30	1166-3389-L	1	②	Cam hub, complete	
30.1	0019-8984-150	1		- Threaded pin DIN 914	M 10x25
31	0001-0925-870	1		Sight glass	322x8
32	0004-5762-700	2		Gasket	273x318x2
33	1166-1157-020	1		Ring	
34	0026-1371-400	4		Washer DIN 125	13
35	0019-6970-400	4		Hex head screw ISO 4017	M 12x30
-	see page 128	1		Neck bearing bridge assembly with covering	
37	0026-1369-030	2		Washer DIN 433	10.5
38	1166-3710-010	1		Nozzle, compl.	
39	0019-2507-400	1		Pan head screw ISO 1580	M 6x10
40	0018-1276-400	1		Pipe clip	5,5
41	0018-0585-848	1		Pipe	6x1
42	1166-3308-000	1		Threaded piece	
43	0013-1023-250	1		Lock nut EN 10242	P 4 - 3/8in
44	0007-2184-750	1		Gasket	15/22x3
45	0018-3725-600	1		Screwed hose connection	R 1/4in/4x6
46	0019-6147-150	2		Allen screw DIN 912	M 10x40
47	0019-6929-400	1		Hex head screw ISO 4017	M 10x10

① Important: Worm or worm spindle and worm wheel assembly must always be replaced at the same time

② When ordering this part, please state diameter of motor shaft end and width of key.

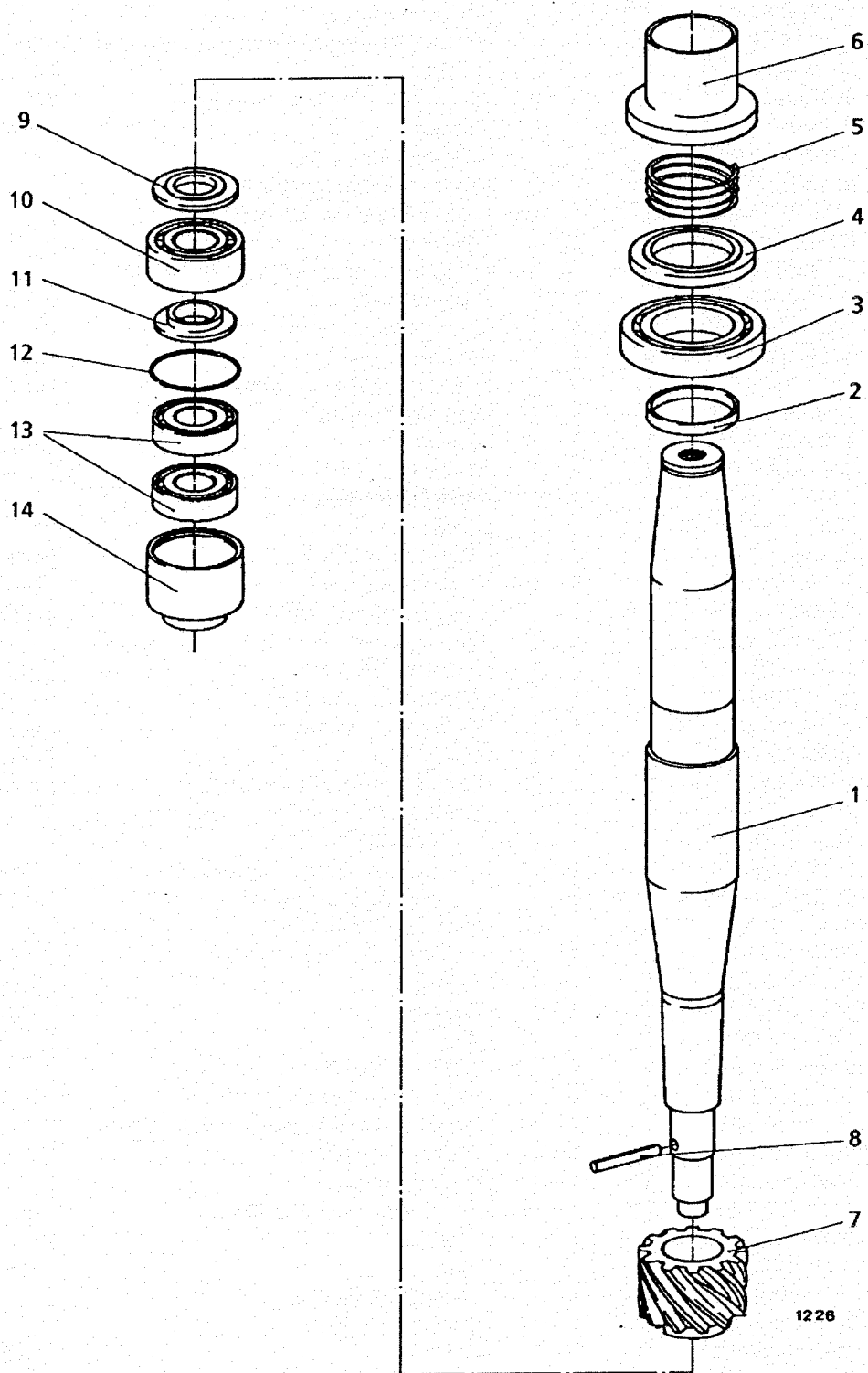
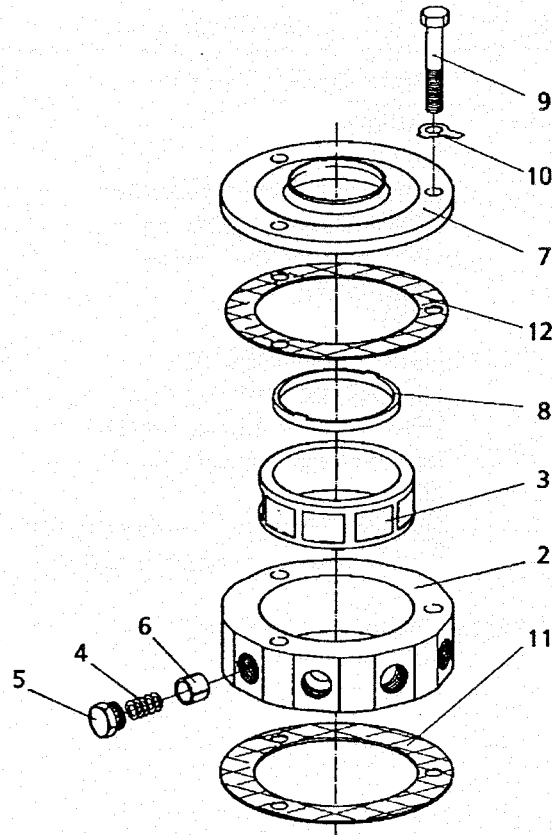


Fig.168

1224E03

Pos.	Part-No.	Qty.	Part description	Dimensions
-	1166-3429-030	1	Worm spindle, complete	
1	1166-3410-000	1	Spindle	
2	0008-7512-010	1	Ring	75
3	0011-6215-110	1	Grooved ball bearing DIN 625	6215-P6
4	0008-7508-000	1	Ball bearing protection ring.	75
5	0006-4311-160	1	Cylindrical pressure spring	
6	0008-7501-640	1	Spindle cap	75
7	1166-3423-000	1	Worm	
8	0026-1563-120	1	Notched pin ISO 8740	10x70
9	0008-4008-020	1	Ball bearing protection ring.	40
10	0011-2308-120	1	Pendulum ball bearing DIN 630	2308-M-P6
11	0008-4008-030	1	Ball bearing protection ring.	40
12	0026-2109-170	1	Snap ring	78
13	0011-7307-100	2	Angular contact ball bearing DIN 628	7307-BECBM-P6
14	0010-8012-020	1	Bottom bearing pressure housing	80

**Important:** Always replace worm or worm spindle and worm wheel at the same time.



1224E04

Fig. 169

Pos.	Part-No.	Quantity	Part Description	Dimensions
	<b>0008-7500-010</b>		<b>Neck bearing bridge assembly with covering</b>	
1	0008-7510-000	1	Neck bearing bridge assembly	75
2	0008-7506-030	1	- Neck bearing bridge	
3	0008-7507-050	1	- Neck bearing pressure ring	
4	0006-4380-090	1	- Set of neck bearing springs	
5	0019-1423-030	9	- Threaded plug	
6	0026-2220-110	9	- Spring piston	
7	0008-7502-050	1	Cover	
8	0008-7509-000	1	Distance ring	
9	0019-6616-150	3	Hex head screw DIN 931	M 16x100
10	0026-5897-600	3	Washer DIN 463	17
11	0004-5854-770	1	Gasket	205x250x0,3
12	0004-5851-770	1	Gasket	176x235x0.3



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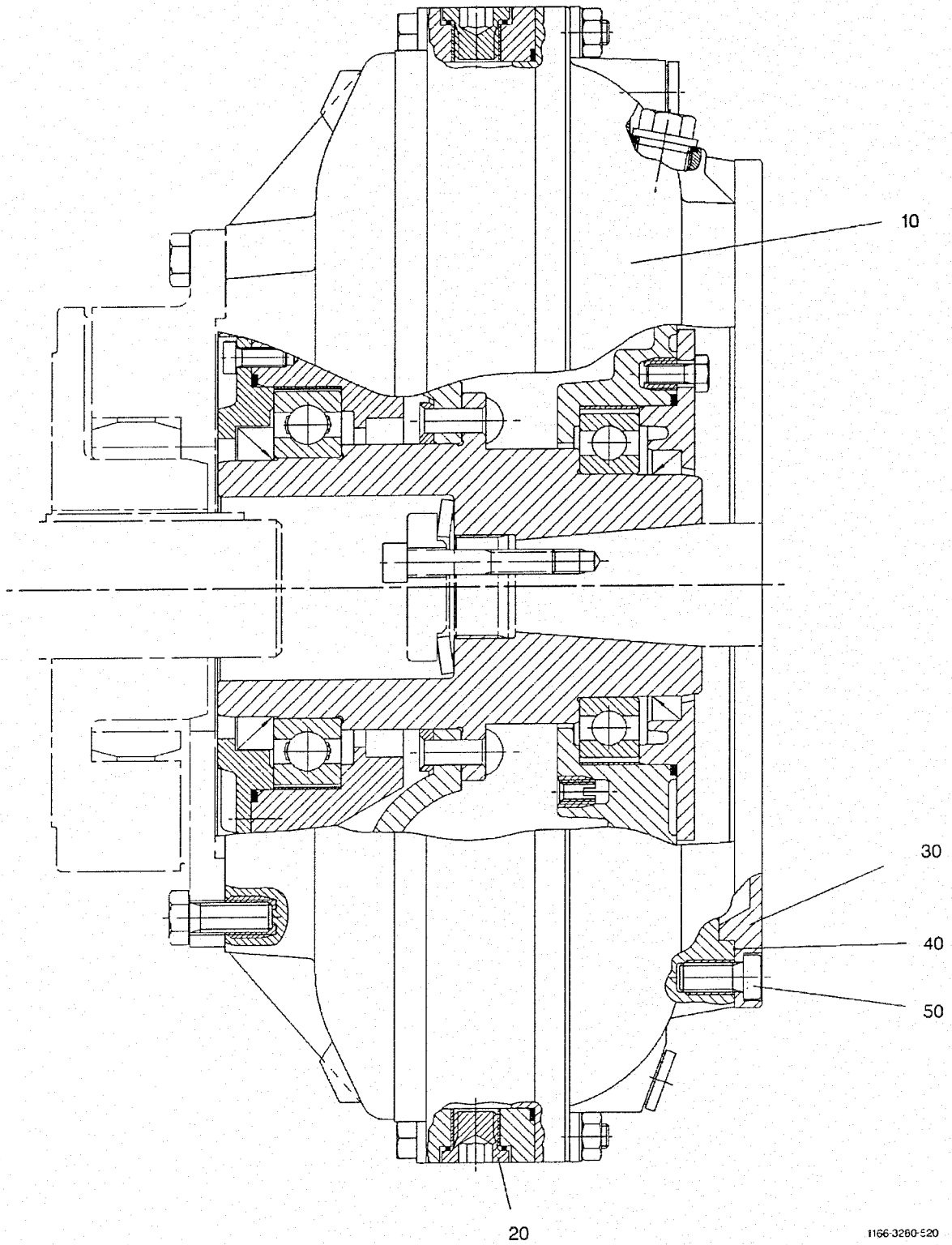


Fig.170

1166-3260-520

Pos.	Part-No.	Qty.	Part description	Dimensions
	<b>1166-3280-520</b>		<b>Fluid clutch, compl.</b>	422-TSF
10	1166-3280-500	1	Fluid clutch, compl.	422-TSF
20	0000-0006-162	1	not included	
30	1166-3367-000	1	Ring	
40	0004-2385-858	1	Packing cord	1
50	0019-8440-150	8	Cylindrical screw DIN 7984	M12X25
60	0000-0006-162	1	not included	

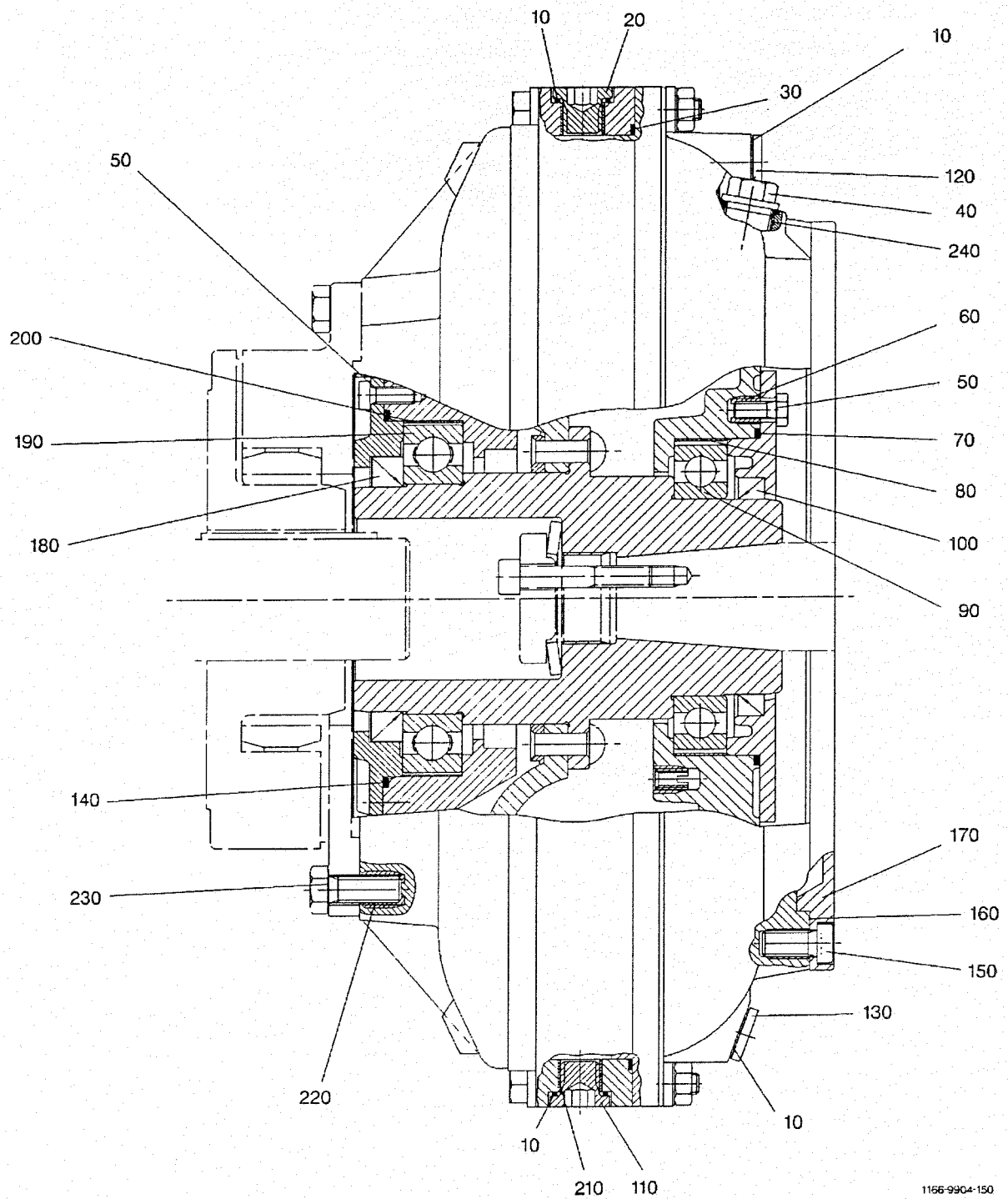
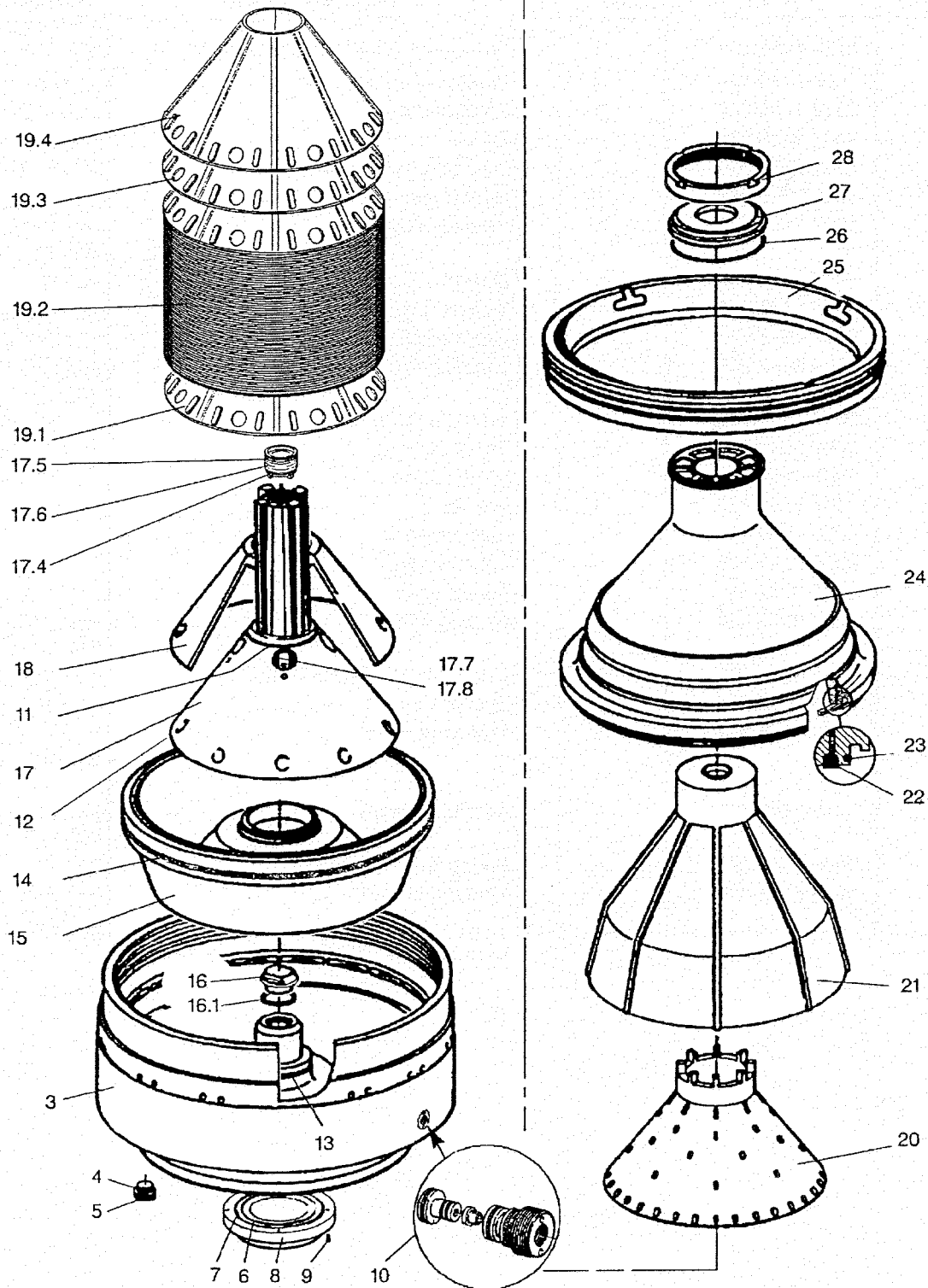


Fig.171

Pos.	Part-No.	Qty.	Part description	Dimensions
-	1166-9904-150	1	Set of spare parts for fluid clutch	422-TSF
10	0007-1740-280	4	Gasket DIN 7603	A18X24
20	0019-1490-000	1	Threaded plug	M18X1,5X15
30	0007-2863-830	1	Gasket	410X4
40	1166-1161-000	1	Hexagon collar screw	M24X1,5X28
50	0026-0770-190	16	Spring washer DIN 137	B8
60	0019-1139-300	8	Threaded insert	HELICOIL- M8X12
70	0007-2944-830	1	Gasket	140X3
80	0026-0180-170	1	Spacer ring	AN140X24
90	0011-6018-400	1	Grooved ball bearing DIN 625	6018-MC4S0
100	0004-2912-830	1	Sealing ring	90X110X13-BA- VISSL
110	0019-1490-000	1	Threaded plug	M18X1,5X15
120	0019-0861-000	2	Threaded plug	M18X1,5X15
130	0000-0006-162	1	not included	
140	0007-2566-830	1	Gasket	160X3
150	0000-0006-162	1	not included	
160	0000-0006-162	1	not included	
170	0000-0006-162	1	not included	
180	0004-2913-830	1	Sealing ring	105X130X13-B AFSVI1DRW
190	0011-6021-400	1	Grooved ball bearing DIN 625	6021-MC4S1
200	0026-0182-170	1	Spacer ring	AN160X26
210	0019-1137-300	2	Threaded insert	HELI- COILM18X1,5X 18
220	0019-1141-300	8	Threaded insert	HELICOIL- M12X18
230	0026-0772-170	8	Spring washer DIN 137	B12
240	0019-1142-300	2	Threaded insert	HELICOIL- M24X1,5X18



1141-6600-020

Fig.172

Pos.	Part-No.	Qty.		Part description	Dimensions
-	1141-6600-020	1		<b>Bowl, complete</b>	
3	1201-6604-050	1	*	Bowl bottom	
4	0007-1970-840	2		Gasket	26,5X35X5,25
5	0019-1450-400	2		Threaded plug	M42X1,5X19
6	0007-2640-750	1		Gasket	150X3
7	0007-2704-750	1		Gasket	182X3
8	1352-6597-000	1		Ring	
9	0019-6108-400	4		Allen screw DIN 912	M6X20
10	3159-6280-070	2		Valve, compl.	
11	0007-3364-760	1		Gasket	133X141X4
12	0007-1733-760	1		Gasket	424X434X5
13	0007-2647-750	1		Gasket	119X10
14	0007-2964-760	1		Gasket	636X660X12
15	1168-6501-050	1	*	Sliding piston	
16	0013-3076-400	1		Spindle nut	TR44X3-LH
16.1	0007-2382-850	1		- Gasket	60X70X4
17	1141-6620-010	1	*	Distributor, complete	
17.4	0007-2485-750	1		- Gasket	62,2X3
17.5	0007-1945-750	1		- Gasket	65X3
17.6	1201-6526-010	1		- Threaded sleeve	
17.7	0007-2414-750	4		- Gasket	20X2
17.8	1201-6526-020	4		- Sleeve	
-	0019-6369-400	4		- Threaded pin DIN 915	M8X25
18	1141-6667-010	1	*	Interchangeable disc	
19	1201-6660-060	1		Disk stack	
19.1	1201-6662-020	1		- Bottom disk	
19.2	1201-6663-070	220		- Disks	
19.3	1201-6663-060	19		- Disks	
19.4	1201-6666-020	3		- Blind disk	
20	1201-6670-000	1		Upper disk with head	
21	1141-6650-000	1	*	Separating disk	
22	0007-2466-840	1		Gasket	607X12,5
23	0007-2546-750	1		Gasket	600X5
24	1141-6611-000	1	*	Bowl top,	
25	1168-6631-020	1	*	Lock ring	S700X14-LHAG
26	0007-2854-750	1		Gasket	190X6
27	1201-6645-010	1		Centripetal pump chamber cover	
28	1234-6631-010	1		Lock ring	TR215X6-LHIG

- \* This part requires special fitting and can only be replaced by one of our servicemen or in one of our workshops.

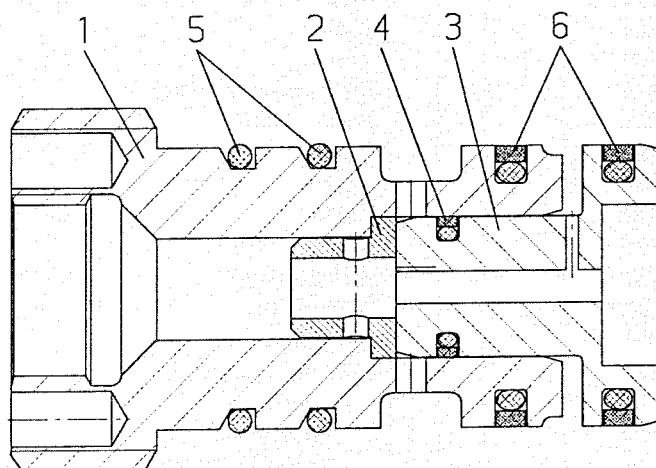
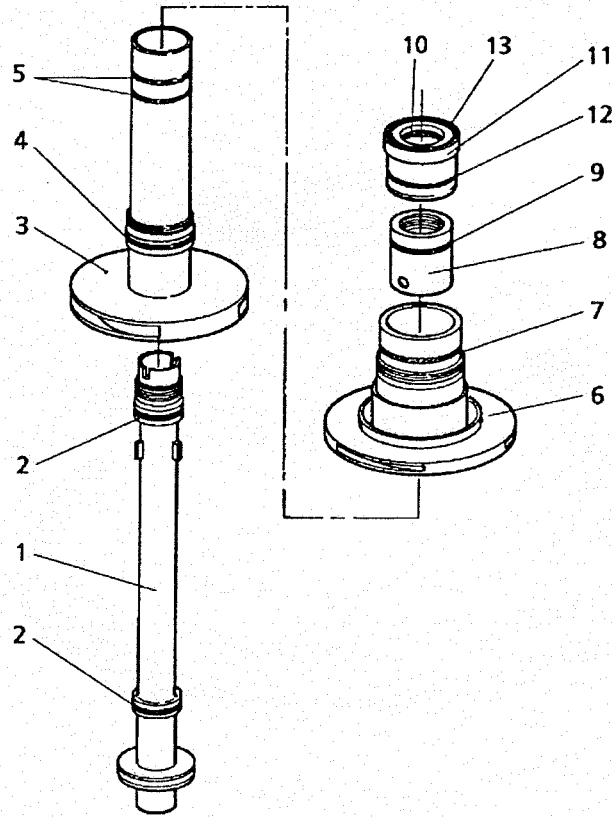


Fig. 173 (3159-6280-070)

Pos.	Part-No.	Qty.	Part description	Dimensions
	<b>3159-6280-070</b>		<b>Valve, compl.</b>	
1	3159-6281-020	2	Valve housing	
2	0004-2341-940	2	Gasket	6X9,9X10
3	3159-6276-020	2	Valve piston	
4	0007-3452-830	2	Piston gasket	PT00-14,0-9,1-2
5	0007-2920-760	4	Gasket	23,3X2,4
6	0007-3453-830	4	Piston gasket	PT01-28,0-20,5-

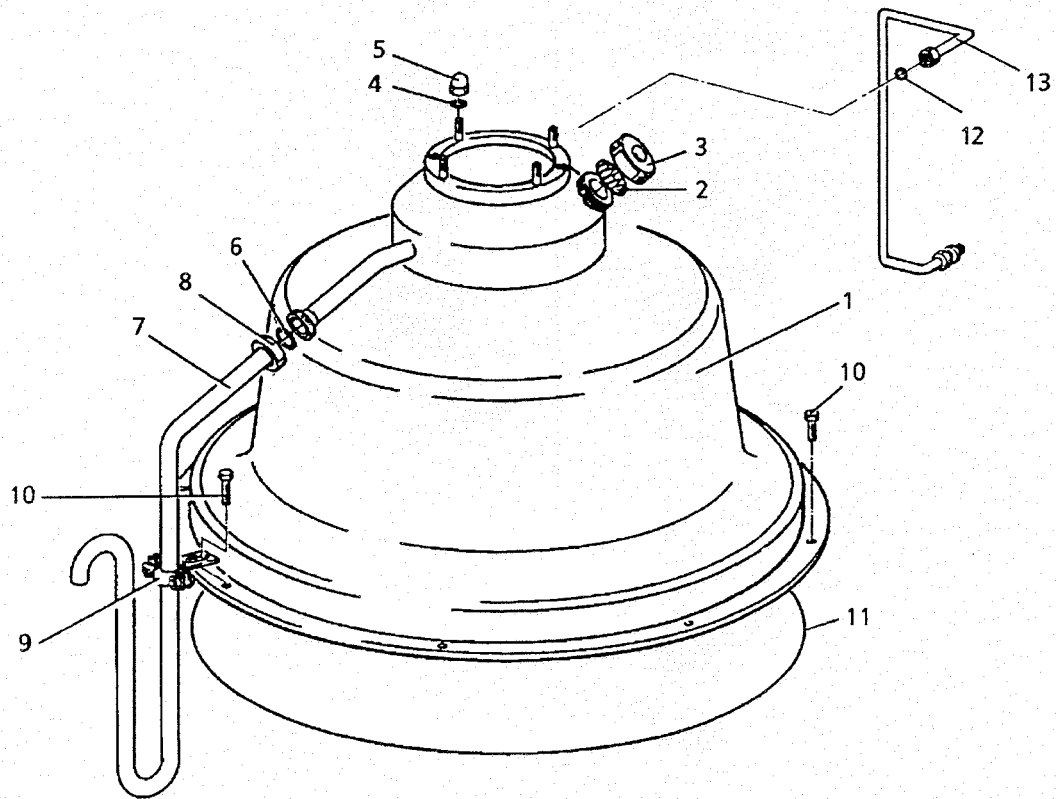




1201E05

Fig.174

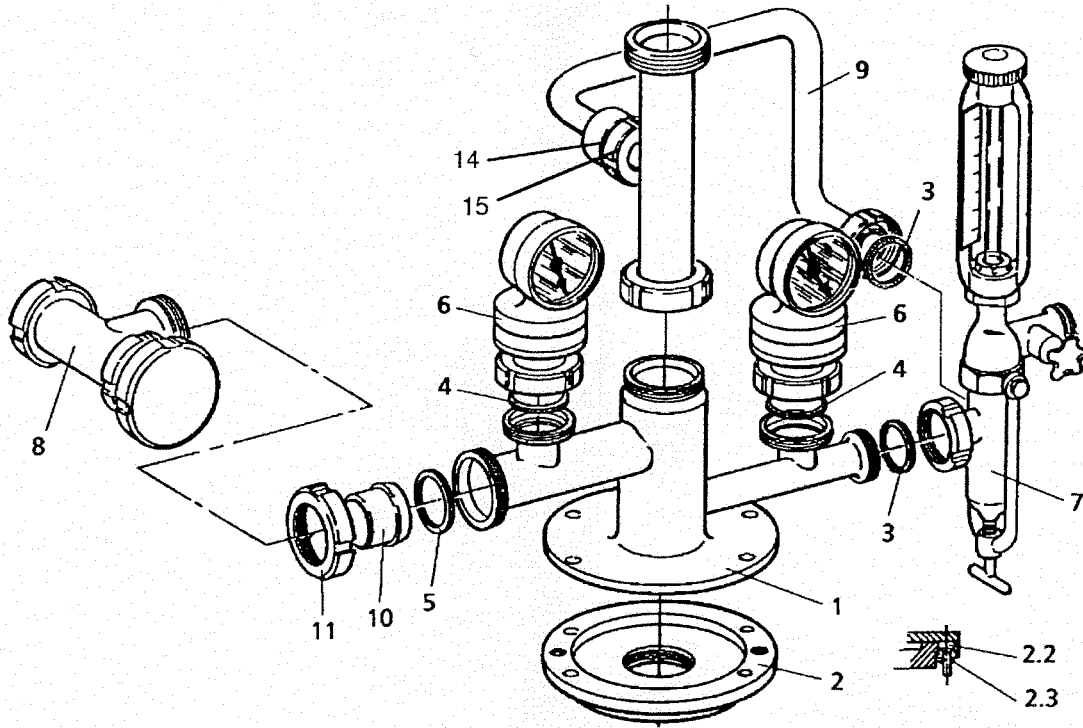
Pos.	Part-No.	Qty.	Part description	Dimensions
-	<b>1201-2213-060</b>	<b>1</b>	<b>Double centripetal pump, cpl.</b>	
1	1201-2246-030	1	Feed tube	
2	0007-2925-750	2	Gasket	36,2x3
3	1201-2241-040	1	Lower centripetal pump	
4	0007-1944-750	1	Gasket	44,2x3
5	0007-2580-750	2	Gasket	42x2,5
6	1201-2252-010	1	Upper centripetal pump	
7	0007-2929-750	1	Gasket	55,2x3
8	1201-2236-000	1	Threaded piece	
9	0007-2580-750	1	Gasket	42x2,5
10	0007-2614-750	1	Gasket	35x3,5
11	1201-2130-000	1	Connection piece	
12	0007-2927-750	1	Gasket	50,2x3
13	0007-2211-750	1	Gasket DIN 11851	G 50



H1141E02

Fig.175

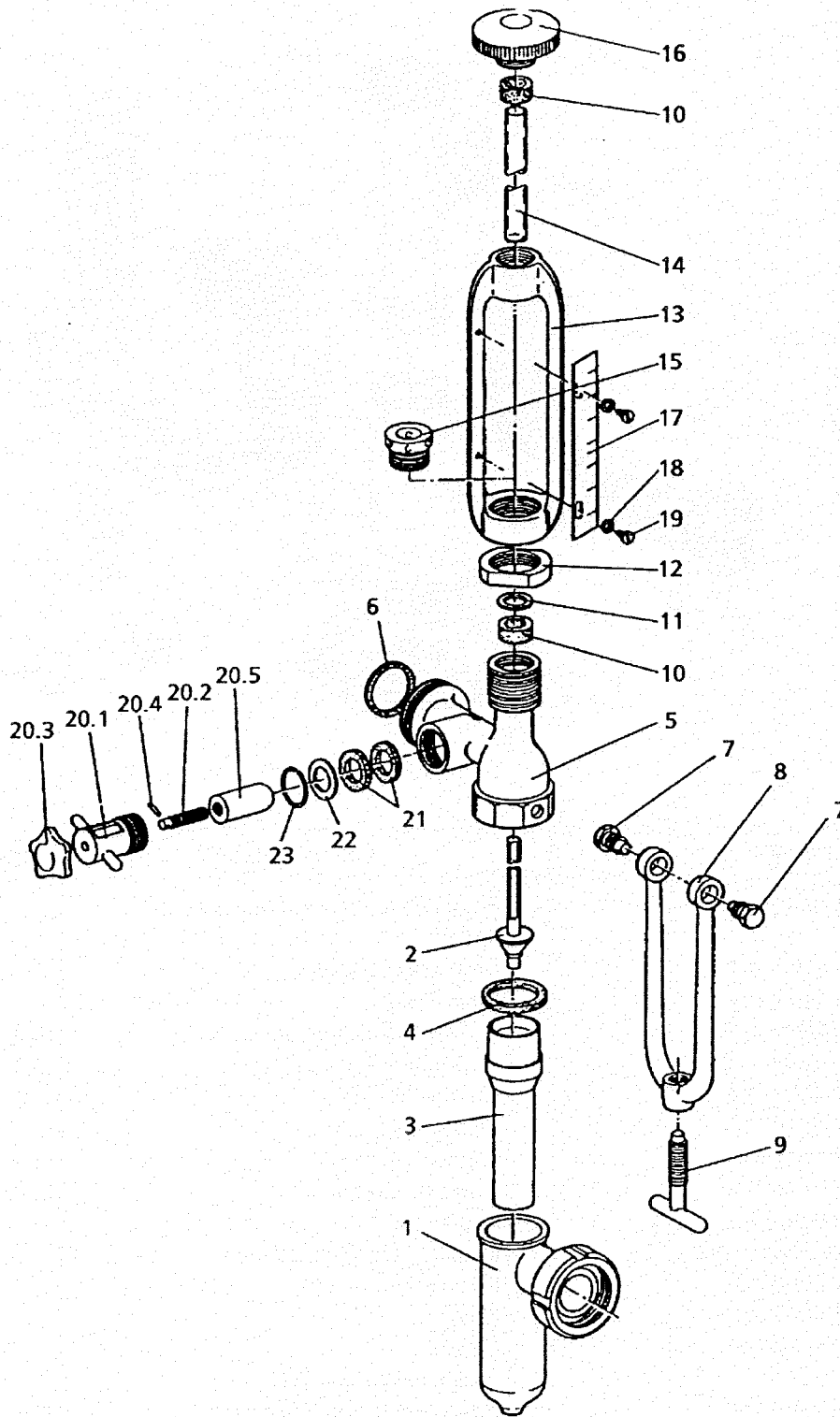
Pos.	Part-No.	Qty.	Part description	Dimensions
-	<b>1141-7759-000</b>	<b>1</b>	<b>Hood, compl.</b>	
1	1141-7765-000	1	Hood	
2	0004-1757-750	1	Gasket	65x3
3	0013-3297-300	1	Blind nut	40
4	0026-0165-400	4	Disk DIN 433	13
5	0013-0406-400	4	Cap nut DIN 1587	M 12
6	0007-2208-750	1	Gasket DIN 11851	G 25
7	1234-2776-000	1	Siphon	
8	0013-2842-300	1	Grooved coupling nut DIN 11851	F 25
9	0018-1330-300	1	Pipe clip	25
10	0019-6972-400	8	Hex head screw ISO4017	M 12x40
11	0004-2364-758	1	Packing cord	8x8x3300
12	0007-2003-750	3	Gasket	9x1,5
13	1141-7448-010	1	Pipe	



H1141E01

Fig.176

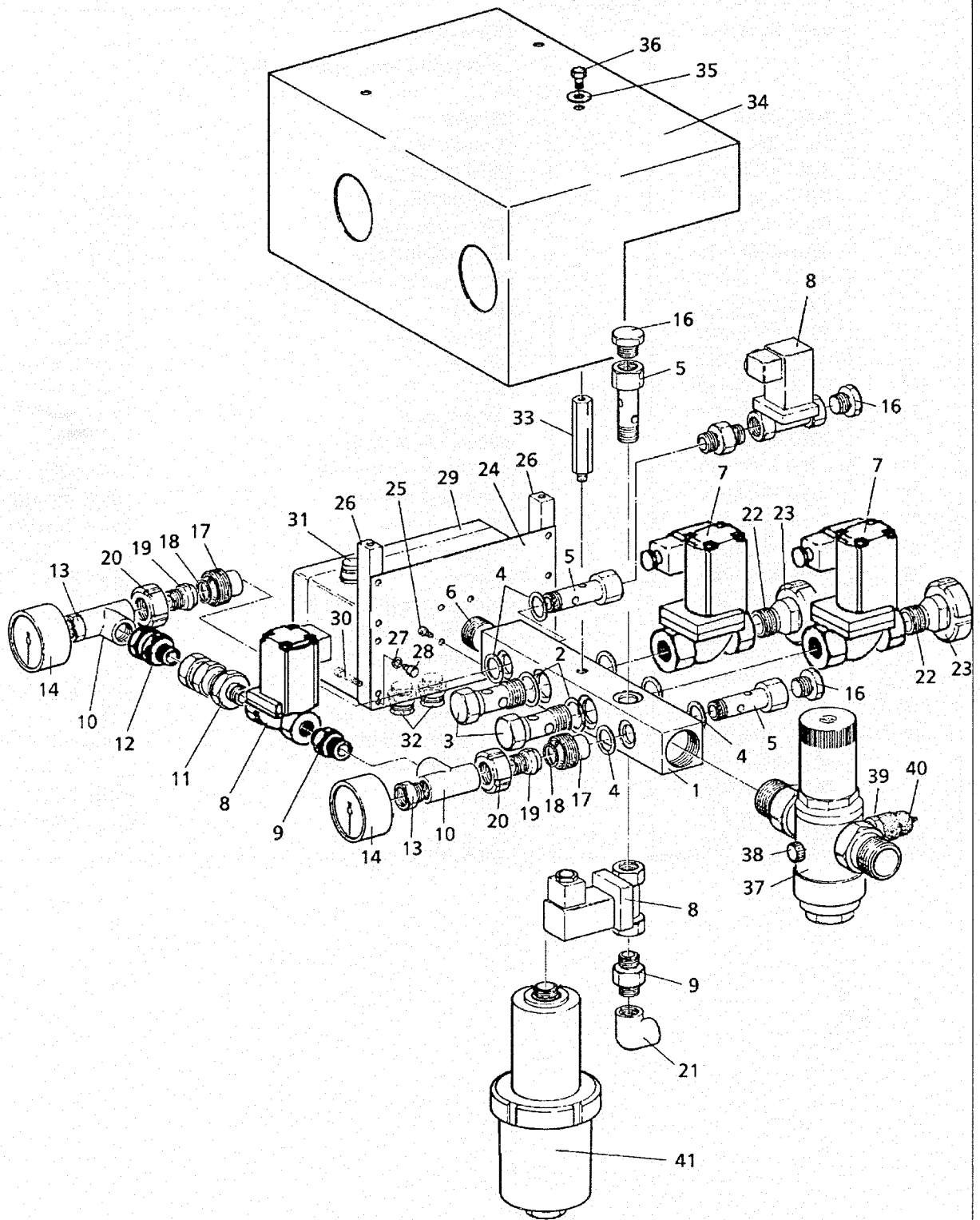
Pos.	Part-No.	Qty.	Part description	Dimensions
-	<b>1141-2296-000</b>	<b>1</b>	<b>Feed and discharge connections, compl.</b>	
1	1201-2301-020	1	Connection housing	
2	1201-2217-000	1	Ring, compl.	
2.2	0019-8372-400	2	- Cylindrical screw DIN 6912	M10x20
2.3	0026-1044-400	2	- Cylindrical pin DIN 7	3h8x16
3	0007-2208-750	2	Gasket DIN 11851	G 25
4	0007-2210-750	2	Gasket DIN 11851	G40
5	0007-2211-750	2	Gasket DIN 11851	G 50
6	0001-1178-400	2	Pressure gauge, compl.	0-10 bar
7	see page 141	1	Flowmeter	
8	see special manual	1	Constant pressure valve	
9	1141-2298-000	1	Recycle line, compl.	
14	0007-1909-750	1	Gasket	
15	0007-3110-750	1	Gasket	
			<b>Pipe connection parts</b>	
10	0018-3955-300	2	Cone connection DIN 11851	D 50
11	0013-2845-300	2	Grooved coupling nut DIN 11851	F 50
12	0018-3939-300	1	Cone connection DIN 11851	D 25
13	0013-2842-300	1	Grooved coupling nut DIN 11851	F 25



1225E04

Fig. 177

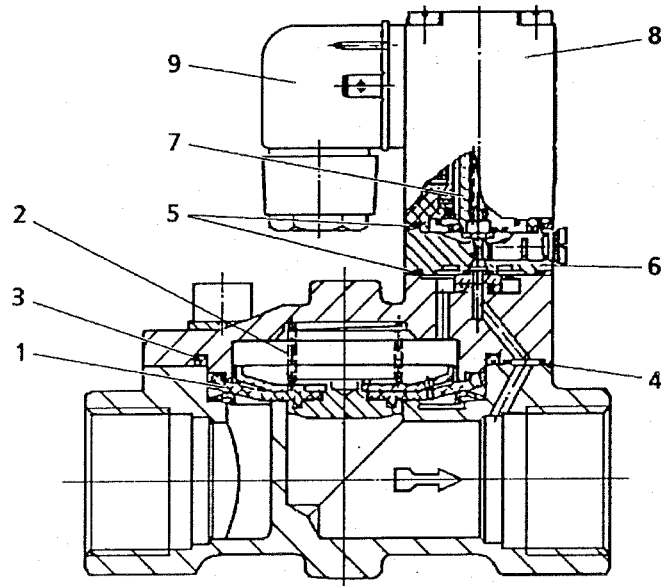
Pos.	Part-No.	Qty.	Part description	Dimensions
-	8020-2240-010	1	Flow meter, compl. Measuring range: 200 - 1400 l/h	
1	8020-2001-110	1	Beaker	
2	8020-2012-000	1	Conical weight	
3	8020-2206-010	1	Measuring tube	
4	0007-2209-750	1	Gasket DIN 11851	G32
5	8020-2003-170	1	Discharge pipe	
6	0007-2208-750	1	Gasket DIN 11851	G 25
7	0019-0170-400	2	Hex head screw with shank	M12x17,5
8	8020-2004-000	1	U-bolt	
9	0019-0002-640	1	Tommy screw	M12x33,5
10	0007-2298-750	1	Gasket	13,5x22x10
11	0026-1375-300	1	Disk	15,5x22x2
12	0013-3010-300	1	Dihedral nut	M35x1,5
13	8020-2002-000	1	Intermediate piece	
14	0001-0083-890	1	Cylindrical sight glass	14x2x210
15	0019-1380-300	1	Threaded sleeve	M26x1,5/15x23
16	0019-1732-400	1	Handle screw	M26x1,5x19
17	8020-2217-000	1	Scale 200 - 1400 l/h	
18	0004-5261-720	2	Gasket	4,8x9x1
19	0019-2478-300	2	Pan head screw DIN 85	M4x8
20	1072-2273-020	1	Stuffing box assembly	
20.1	1072-2284-000	1	- Stuffing box housing	
20.2	0019-1590-610	1	- Threaded bolt	M12 LHx53
20.3	0021-3096-300	1	- Star screw	65x11
20.4	0026-1058-400	1	- Cylindrical pin DIN 7	4h8x20
20.5	1072-2279-020	1	- Round-slide valve	
21	0007-2285-750	2	Gasket	22x32x5
22	0026-5508-300	1	Disk	22x31,5x2
23	0026-1445-300	1	Snap ring	31



S1244E01

Fig. 178

Pos.	Part-Number	Quantity	Part Description	Dimensions
—	8134-2110-400	1	<b>Operating-water connection, compl.</b>	
1	8134-2319-100	1	Distributor	
2	0004-5982-300	4	Gasket	U28.7x35x2
3	8134-2161-040	2	Screw	
4	0004-2891-300	6	Gasket	U22.7xx30x2
5	8134-2161-050	3	Screw	R1/2in
6	0019-0653-400	1	Threaded plug	R1inx20
7.1	0018-5870-610	1	Solenoid valve, compl. (closing water)	3/4in
7.2	0018-5870-610	1	Solenoid valve, compl. (opening water)	3/4in
8.1	0018-5947-610	1	Solenoid valve, compl. (filling water)	1/2in
8.2	0018-5947-610	1	Solenoid valve, compl. (hood flushing water)	1/2in
8.3	0018-5947-610	1	Solenoid valve, compl. (cooling water)	1/2in
9	0018-0965-400	3	Double nipple	R1/2in
10	0018-0116-400	2	T-Piece DIN 2987	1/2in
11	0018-5936-400	1	Non-return valve	
12	0018-4819-600	1	Screwed socket	
13	0018-5168-400	2	Transition nipple	
14	0001-0299-610	1	Pressure gauge DIN 16063	0-6 bar
15	0001-1196-400	1	Pressure gauge DIN 16063	0-16 bar
16	0019-0559-300	3	Threaded plug	R1/2in x15
17	0018-5937-400	2	Screw-on threaded connection	15-R1/2in
18	0007-2521-750	2	Gasket DIN 11851	G 15
19	0018-4573-400	2	Threaded cone connection	15-R1/2in
20	0013-2842-300	2	Grooved coupling nut DIN 11851	F 15
21	0018-0004-300	1	Angle piece DIN 2987	1/2in
22	0018-5286-400	2	Threaded cone connection	25-R3/4in
23	0013-2842-300	2	Grooved coupling nut DIN 11851	F 25
24	8134-2208-150	1	Plate	
25	0019-6840-400	4	Hex head screw ISO 4017	M 6x12
26	8134-2059-040	2	Distance piece	
27	0026-1382-300	6	Washer DIN 125	6.4
28	0019-6841-300	6	Hex head screw ISO 4017	M 6x16
29	0005-3492-280	1	Terminal box	
30	0019-6111-400	4	Allen screw DIN 912	M 6x30
31	0005-0203-630	15	Screw coupling	C4PG11
32	0005-0206-630	3	Screw coupling	C4PG21
33	8134-2059-030	1	Distance piece	
34	8134-2355-090	1	Protective cover	
35	0026-0439-300	3	Washer	8.4x25x2
36	0019-6900-300	3	Hex head screw ISO 4017	M 8x12
37	0018-1742-650	1	Water pressure reducer	
38	0019-1492-400	1	Threaded plug	R1/4
39	0005-4111-010	1	Pressure switch	1-10 bar
40	0005-4111-890	1	Coupler socket	
41	see page 145	1	Metering cylinder, compl.	

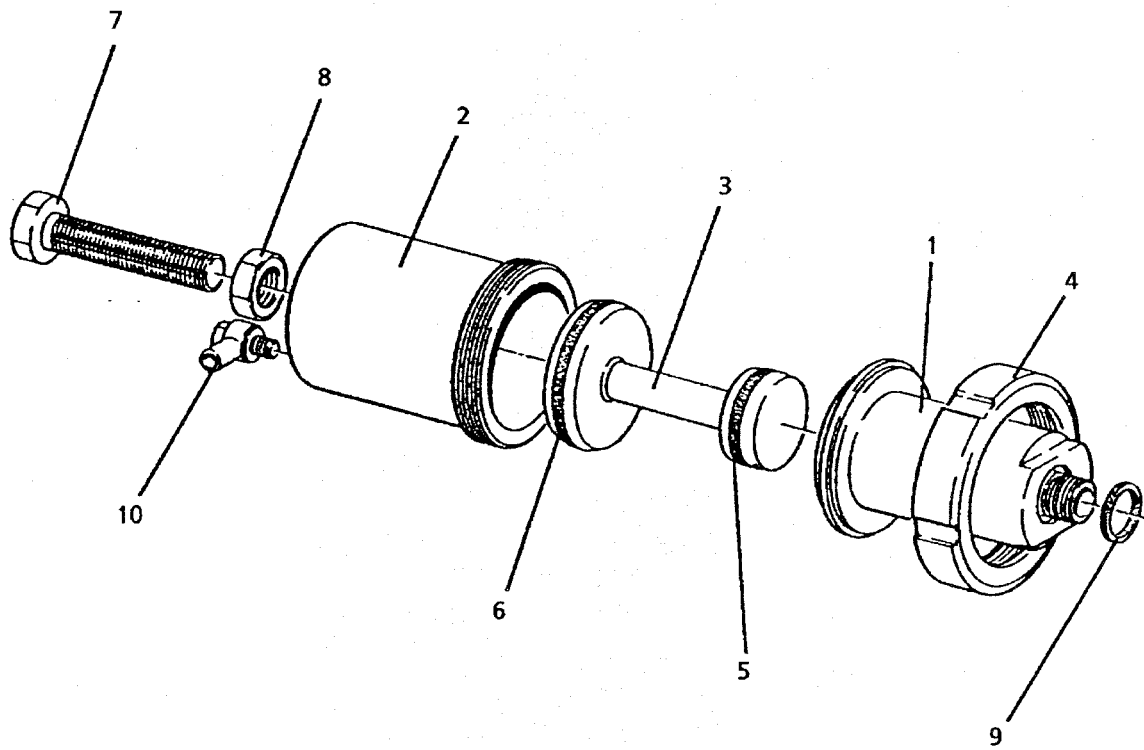


S1244E02

Fig. 179

Pos.	Part-Number		Qty.	Part Description	Dimension
-	0018-5870-610	0018-5947-610		Solenoid valve, cpl. (24 VDC)	
1	0018-5870-820	0018-5947-820	1	Diaphragm	
2	0018-5870-000	0018-5947-010	1	Pressure spring	
3	0007-2927-820	-	1	Gasket	
4	0007-2987-820	0007-1747-820	1	Gasket	
5	0007-1753-820	0007-1753-820	1	Gasket	24x1.5
6	0018-5947-030	0018-5947-030	1	Housing (for manual operating)	
7	0018-3695-000	0018-3695-000	1	Solenoid core	
8	0018-5947-060	0018-5947-060	1	Solenoid head	24 VDC
9	0018-5118-010	0018-5118-010	1	Coupler socket	





2263E10

Fig. 180

Pos.	Part-Number	Quantity	Part Description	Dimensions
—	8134-2202-030	1	<b>Metering unit, complete</b>	
1	8134-2311-130	1	Housing	
2	8134-2311-140	1	Housing	
3	8134-2279-030	1	Piston	
4	0013-2846-300	1	Grooved coupling nut	F 65
5	0007-3202-750	1	Gasket	43.8x5.33
6	0007-3203-750	1	Gasket	69.2x5.33
7	0019-9436-400	1	Hex head screw DIN 961	M 20x1.5 x110
8	0013-0319-400	1	Hexagon nut DIN 936	M 20x1.5
9	0007-1941-750	1	Gasket	25x2.5
10	0018-3732-600	1	Angular hose screw coupling	G 1/4 in

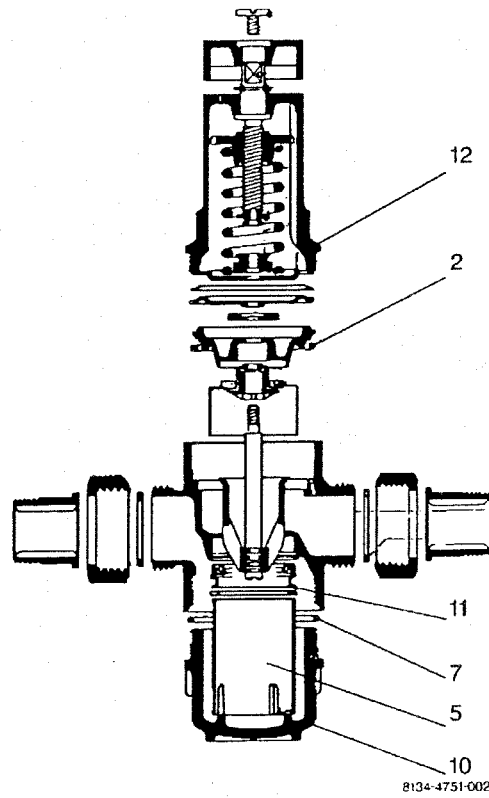
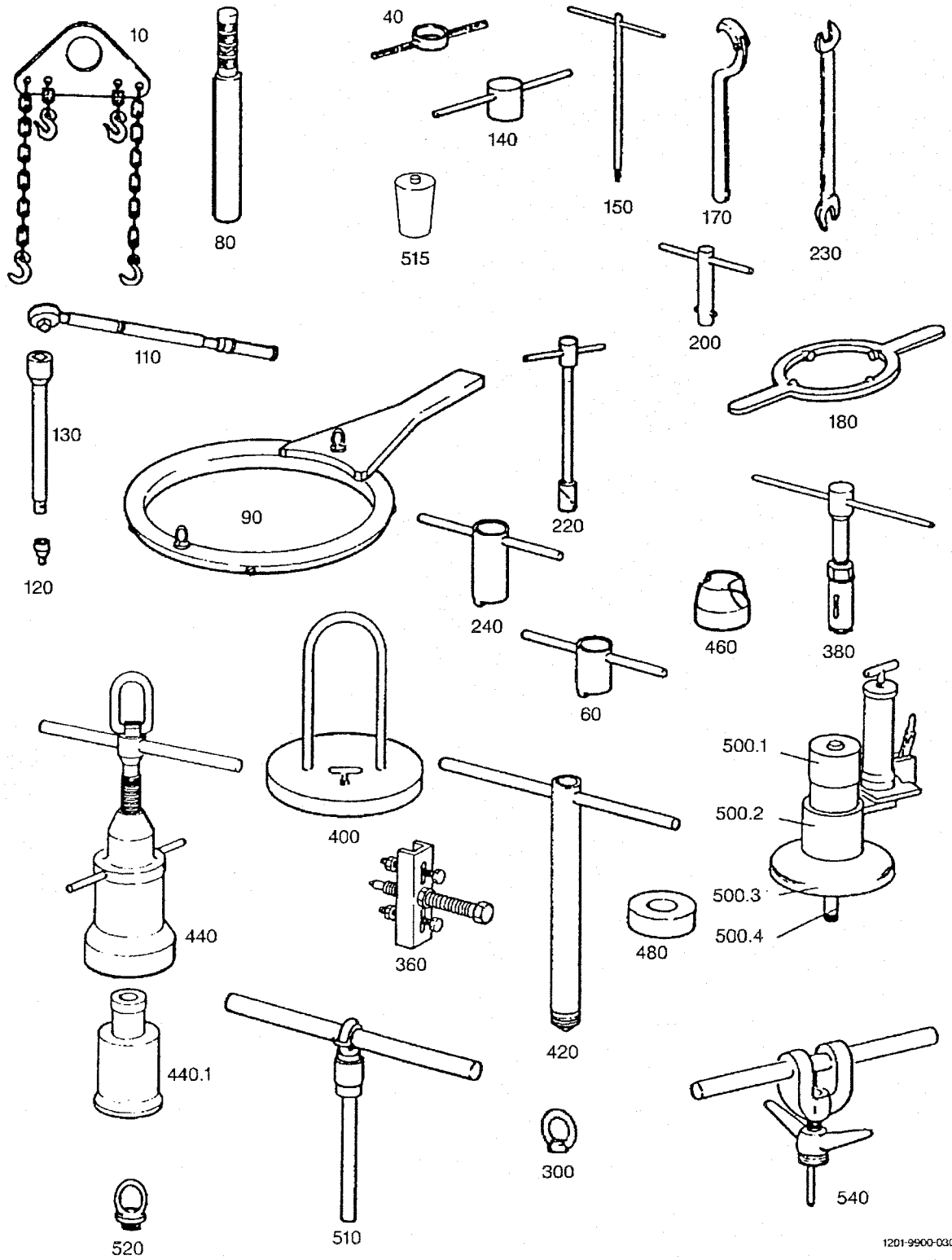


Fig.1 B1

Pos.	Part-No.	Qty.	Part description	Dimensions
–	0018-1742-650		Water pressure reducer 16/1,5-6 bar	1 1/4in
2	0007-1907-750	1	Gasket	49x3,5
5	0018-1741-030	1	Single strainer	1in-1 1/4in
7	0007-2929-750	1	Gasket	55,2x3
10	0018-1741-610	1	Strainer plug	1in
11	0018-1741-620	1	Grooved ring holder	1in
12	0018-1741-040	1	Spring retainer	1in
–	0018-1741-100	1	Valve case, compl.	1in

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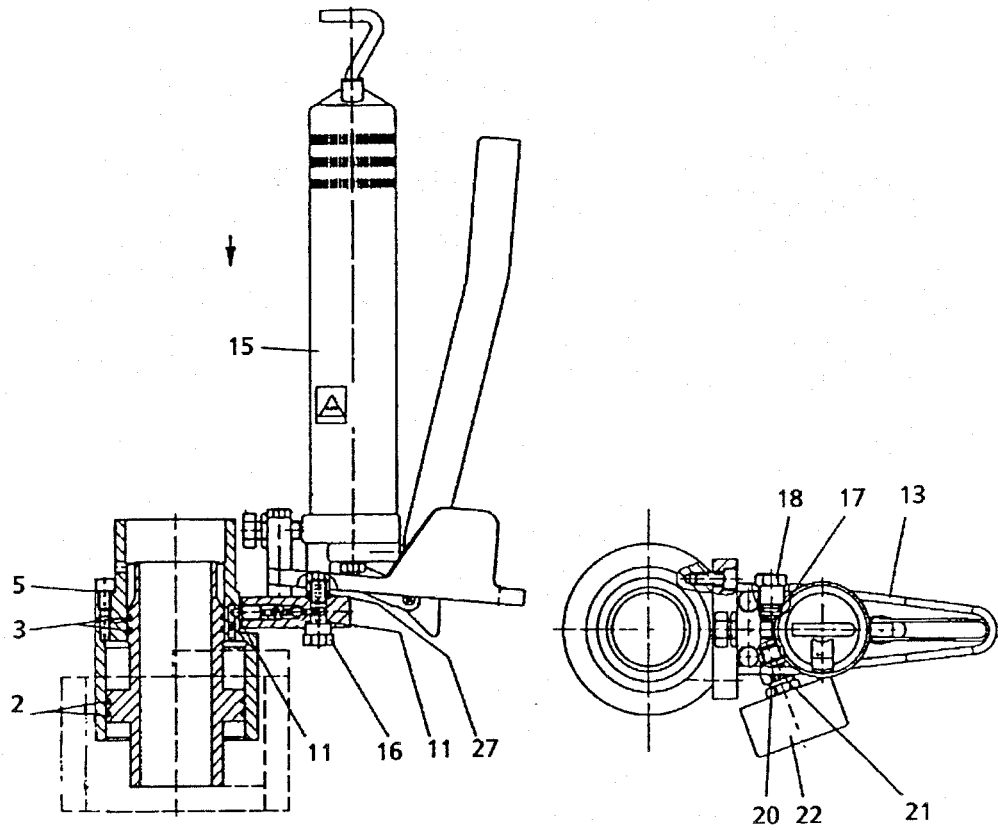
1201-9900-030

Fig.182

Pos.	Part-No.	Qty.	Part description	Dimensions
	<b>1201-9900-030</b>	<b>1</b>	<b>Set of tools</b>	
10	0003-0065-030	1	Jack (bowl lock ring/hood)	350KG
40	0003-0113-030	1	Wrench (centripetal pump)	30X8
60	0003-0183-100	1	Socket wrench (centripetal pump)	60,3X52
80	0003-0200-000	1	Mallet	42x420
90	0003-0345-000	1	Annular wrench (bowl lock ring)	584,5
110	0003-0590-000	1	Torque wrench	20 to150 Nm
120	0003-0601-320	1	Hexagon socket	8
130	0003-0615-000	1	Extension DIN 3123	B12,7X250
140	0003-3720-000	1	Socket wrench (spindle nut)	55
150	0003-3727-030	1	Wrench (piston valve)	M 4
170	0003-3846-000	1	Pivoted hook wrench	90-155
180	0003-4002-000	1	Annular wrench (centripetal pump chamber lock ring)	226
200	0003-4137-030	1	Socket wrench (feed tube)	36X6
220	0003-4176-110	1	Nozzle wrench	7
230	0003-4222-320	1	Wrench DIN 3110	36X41
240	0003-4532-100	1	Socket wrench (threaded sleeve)	56X50
300	0013-0388-030	2	Lifting-eye nut DIN 582 (hood)	M 12
360	1087-9910-020	1	Pulling device (cam hub)	
380	1165-9895-010	1	Socket wrench (piston valve)	
400	1166-9840-000	1	Lifting device (bowl top)	
420	1166-9910-010	1	Pulling device (clutch/brake pulley)	
440	1166-9960-000	1	Lifting device (sliding piston)	
440.1	1166-9872-000	1	- Pressure piece	
460	1166-9972-000	1	Threaded piece (spindle)	
480	1168-9823-000	1	Adjusting ring (feeler for speed monitoring)	
500	1175-9820-000	1	Compressing device	
500.1	1175-9851-000	1	- Threaded ring	
500.2	see page 151	1	- Hydraulic unit	
500.3	1167-9939-000	1	- Disk	
500.4	1175-9877-000	1	- Bolt	
510	1201-9970-000	1	Lifter (distributor)	
515	1235-9860-010	1	Assembling device ( assembly tool, piston valve )	
520	1354-9982-000	1	Eye bolt (bowl bottom)	
540	3050-9930-000	1	Pressing device (bowl bottom)	

The packing list enclosed with the separator is decisive for the delivery scope.

Pos.	Part-No.	Qty.	Designation	Dimensions
-	1225-9901-000		<b>Set of accessories</b>	
30	0003-0277-800	1	Oil cup	2.7 l
100	0015-0014-080	5	Lube oil	CLP220-2.5LG
110	0015-0050-090	2	Lube oil DIN 51515	L-TD32-5L
120	0015-0113-020	4	Lubricating grease	KSB8-50GG
130	0015-0121-000	1	Roller bearing grease DIN 51825	K3K-0.85KG



1224E17

Fig.183

Pos.	Part-Number	Quantity	Part Description	Dimensions
-	1235-9770-000	1	Hydraulic unit, complete	
2	0007-2608-750	2	Gasket	85x3.5
3	0007-2052-750	2	Gasket	60x3.5
5	0004-1918-550	1	Gasket	18x13x2
11	0004-2108-760	2	Gasket	10.4x17x2
13	1231-9931-000	1	Holder	
15	0003-3017-000	1	Grease cartridge	
16	1167-9916-020	1	Screw	R 1/8in
17	0007-2508-750	1	Gasket	10.3x2.4
18	1167-9916-000	1	Pressure relief screw	
20	0004-5266-550	1	Gasket	12.2x17x2
21	0007-2099-850	1	Gasket	5x11x4
22	0001-0277-600	1	Pressure gauge	0-600 bar
27	0004-2111-760	1	Gasket	10.5x16x2.5







**Westfalia Separator AG**

Geschäftsbereich  
Mechanische Trenntechnik

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