Westfalia Separator AG

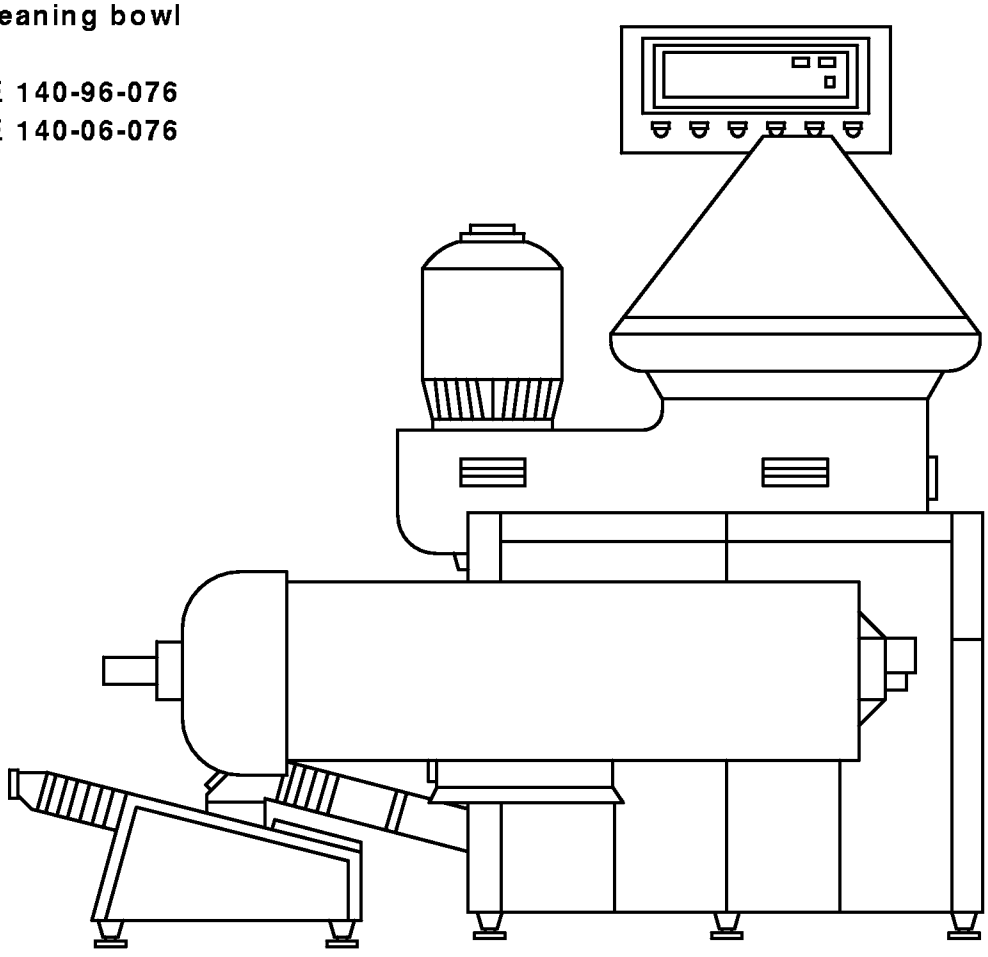
Instruction Manual and Parts List

No. 1247-9001-010

Edition 0199

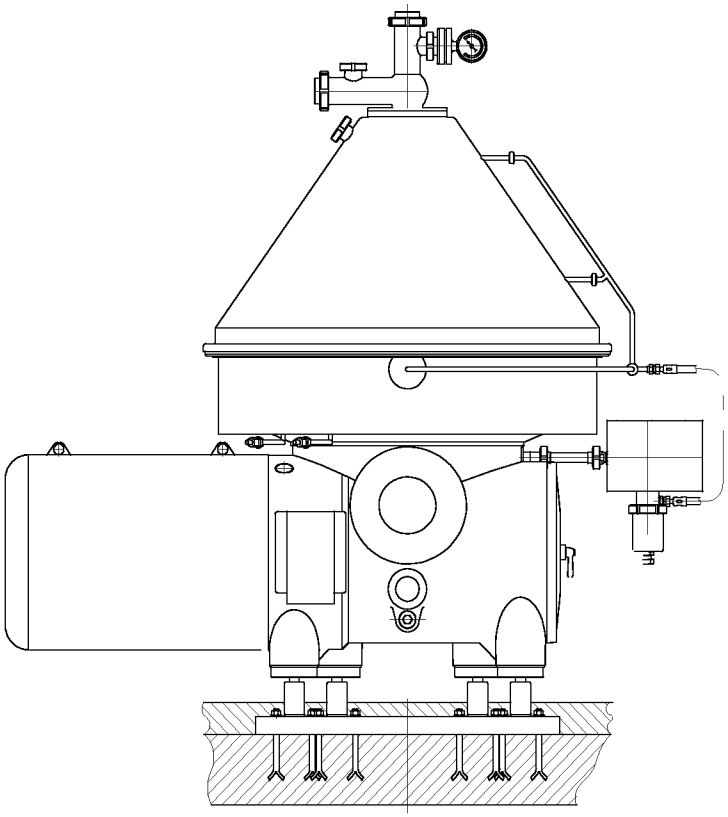
Clarifier
with self-cleaning bowl

Model MSE 140-96-076
MSE 140-06-076



Mechanical Separation
Division

Subject to modification!



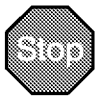
Westfalia Separator AG
D-59302 Oelde (F. R. Germany)

Type		No.	
built in		inner Ø of bowl mm	
Rpm of bowl			
Permissible density of product to be treated			
heavy liquid kg/dm^3		solids kg/dm^3	

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.

1 Safety precautions

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.

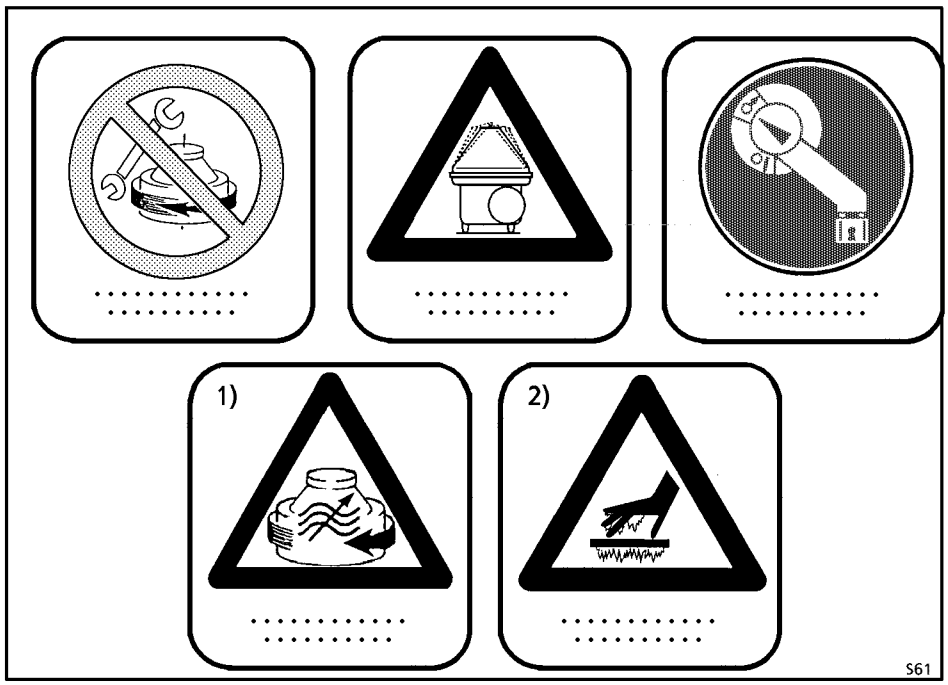


Fig. 1

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.

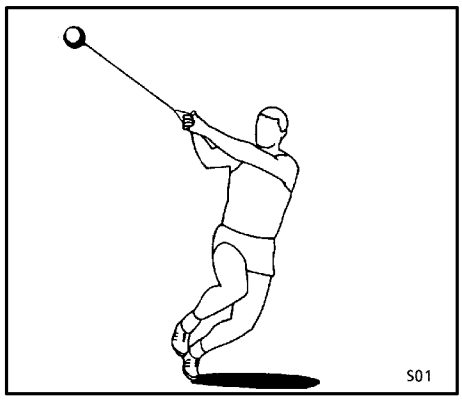


Fig. 2

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 maintained in accordance with our operating instructions.

Special attention must be given to:

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

1.5.1 Assembly

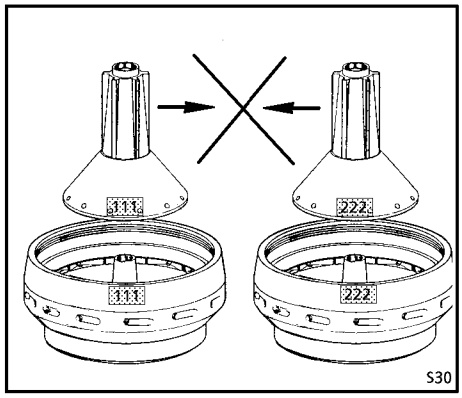


Fig. 3

- 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.

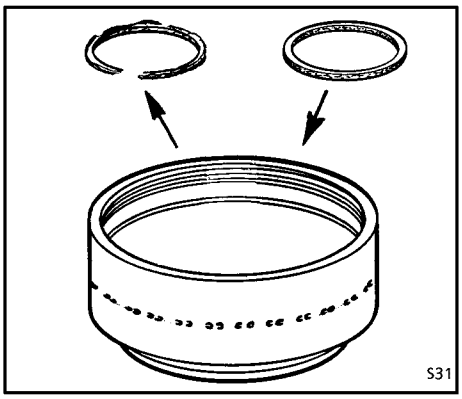


Fig. 4

- Damaged parts must be replaced immediately by new parts.

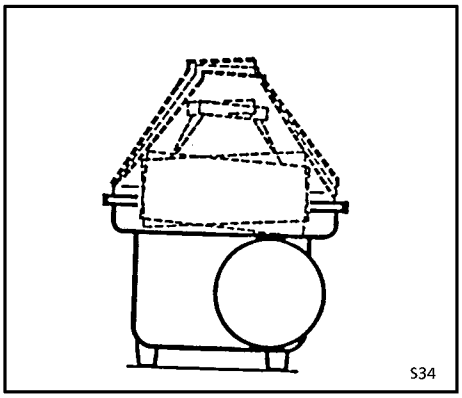


Fig. 5

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

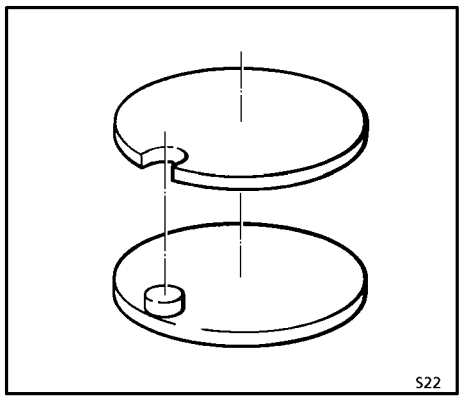


Fig. 6

- 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.

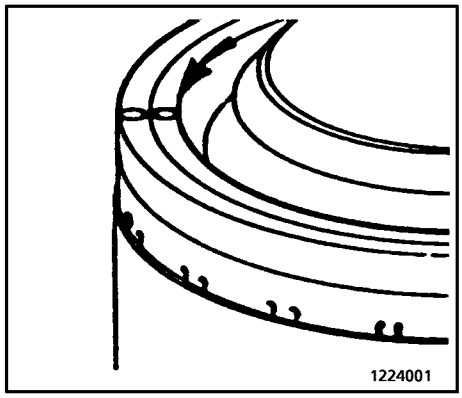


Fig. 7

- 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.

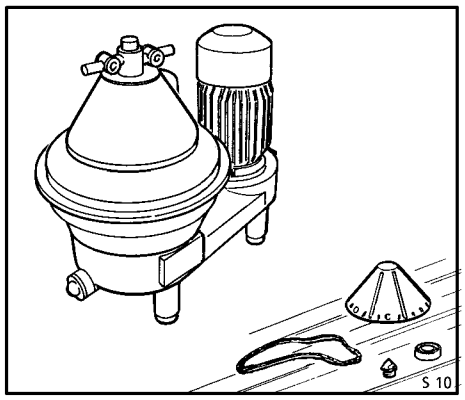


Fig. 8

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

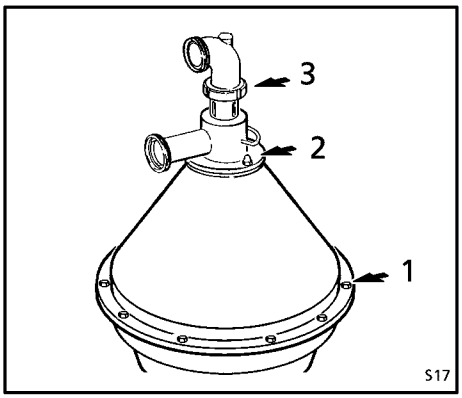


Fig. 9

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

1.5.2 Electrical appliances

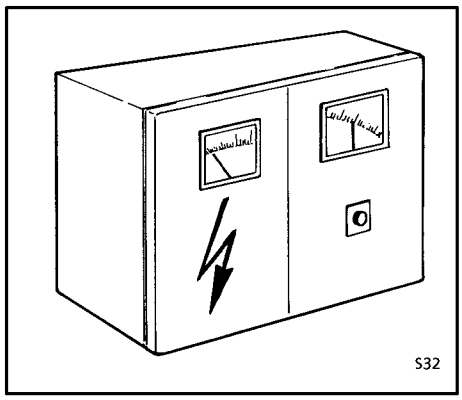


Fig. 10

- 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

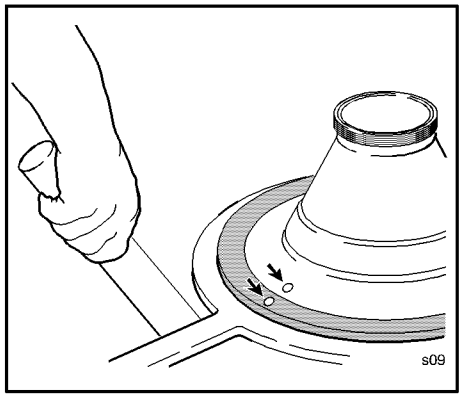


Fig. 11

- 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.

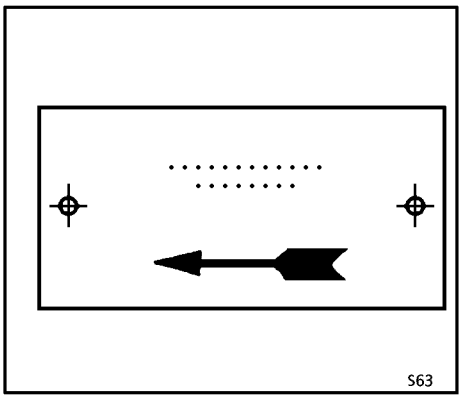


Fig. 12

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

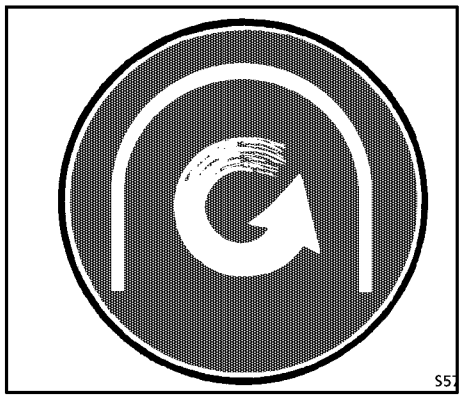


Fig. 13

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

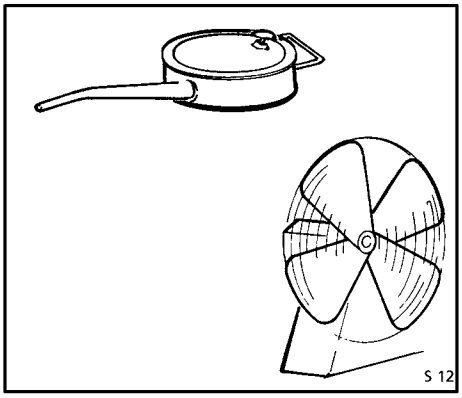


Fig. 14

- Check that the lubrication and cooling systems are serviceable.

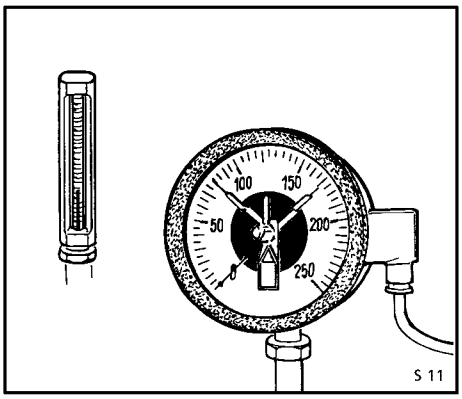


Fig. 15

- 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 nameplate must not be exceeded.

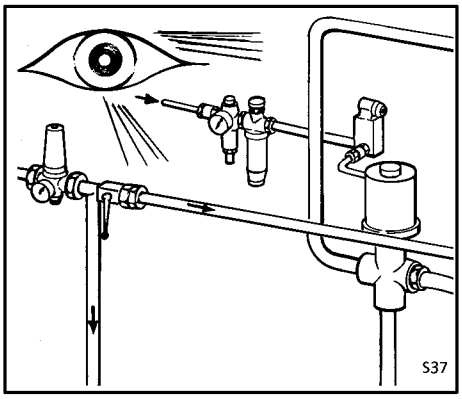


Fig. 16

- 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

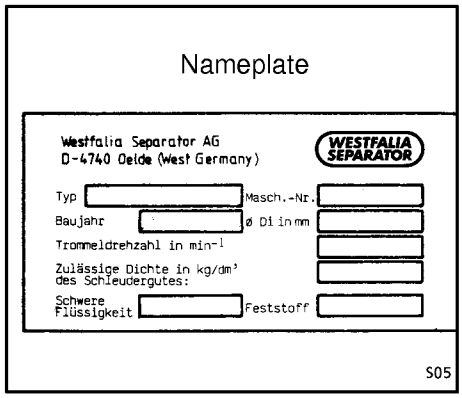


Fig. 17

- 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.

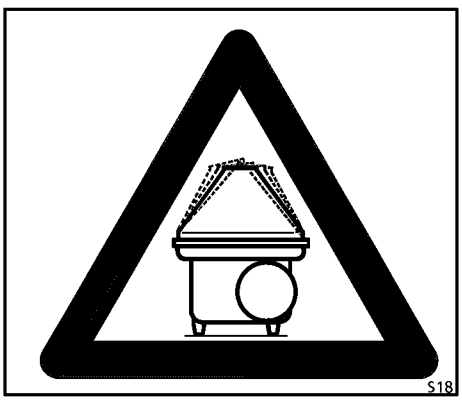


Fig. 22

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

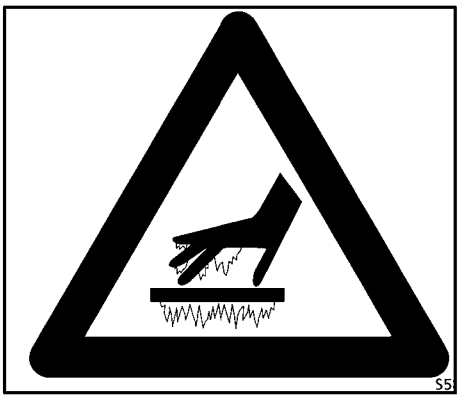


Fig. 23

Only in case of hot operation:

- Product-contacting parts such as
  - pipes and hoses,
  - hood,
  - solids collector

  reach temperatures over 80 °C.

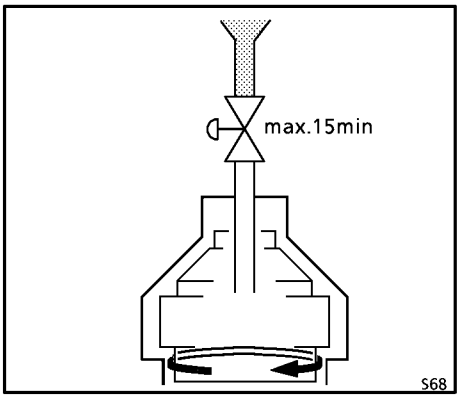


Fig. 24

- 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«

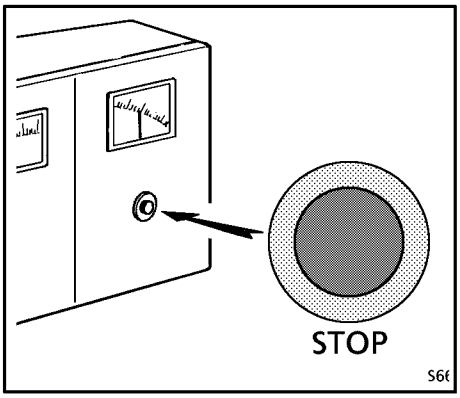


Fig. 25

- 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

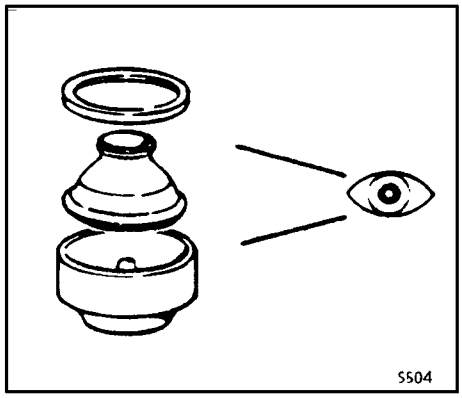


Fig. 26

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.

Stop

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.

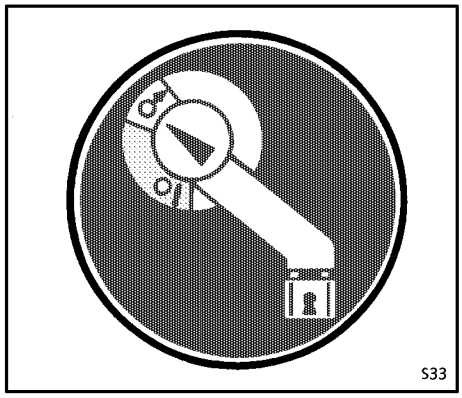


Fig. 27

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

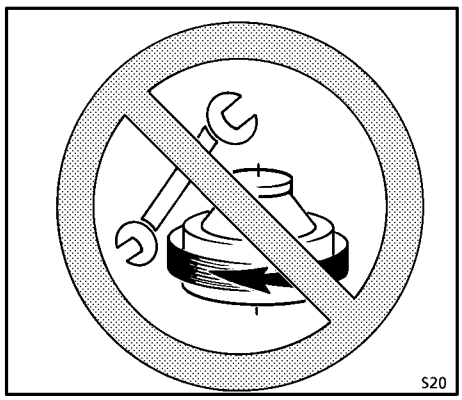


Fig. 28

- **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.

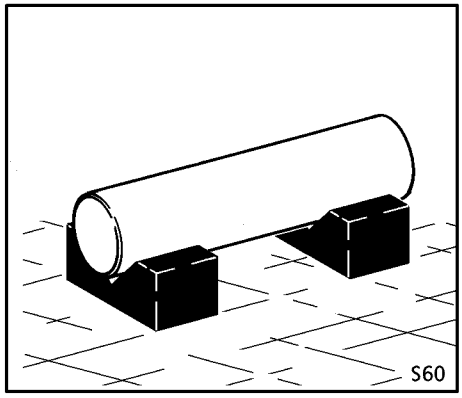


Fig. 30

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

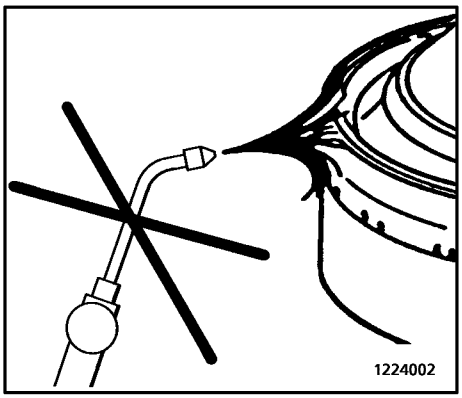


Fig. 31

- **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.

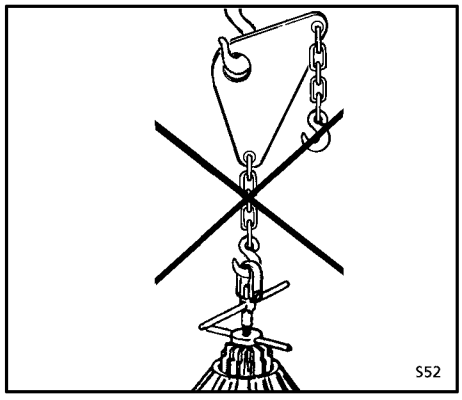


Fig. 32

- 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.

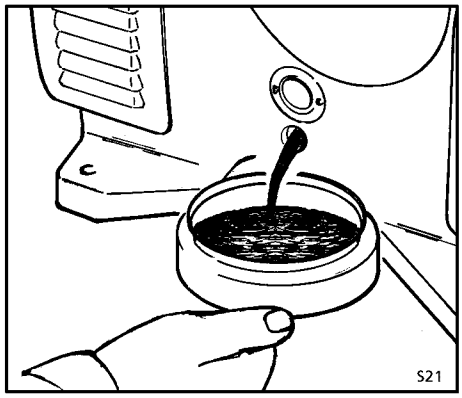


Fig. 33

- 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

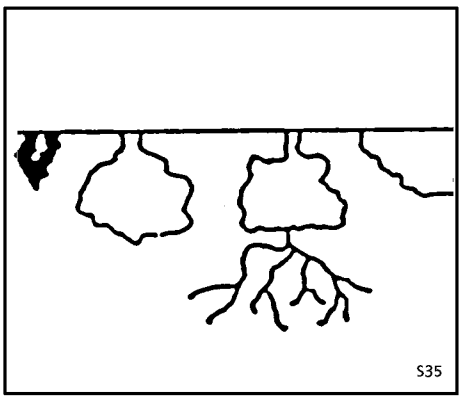
Corrosion can also affect bowl parts made of stainless steel. This corrosion can be flat-spread or pit- or crack-shaped and merits special attention.

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.



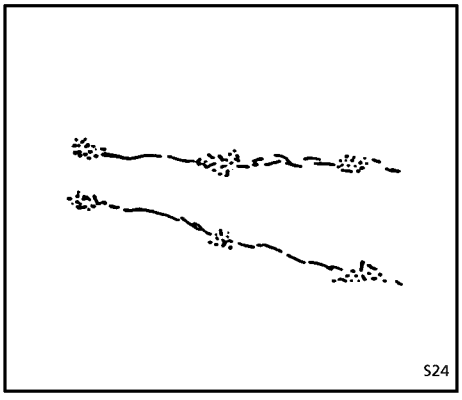
Possible formation of pit-shaped corrosion.

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.



Pittings

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

Such pittings should be investigated by a materials expert.

Fig. 35

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.

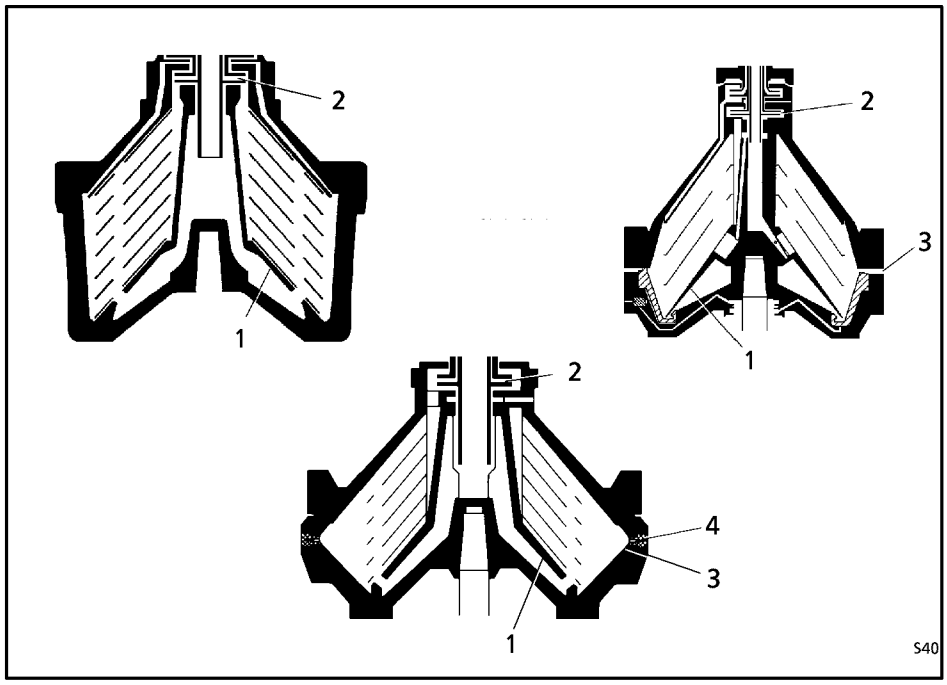


Fig.

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.

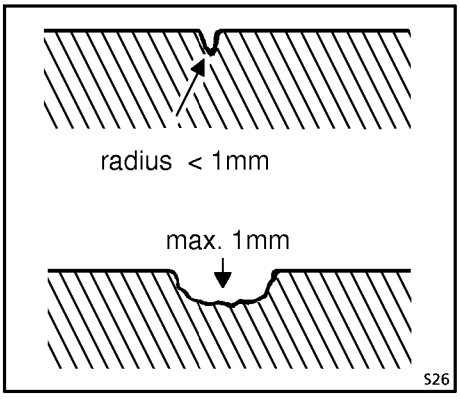


Fig. 37

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.

Note
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Anotaciones
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Note

2 Installation

Note
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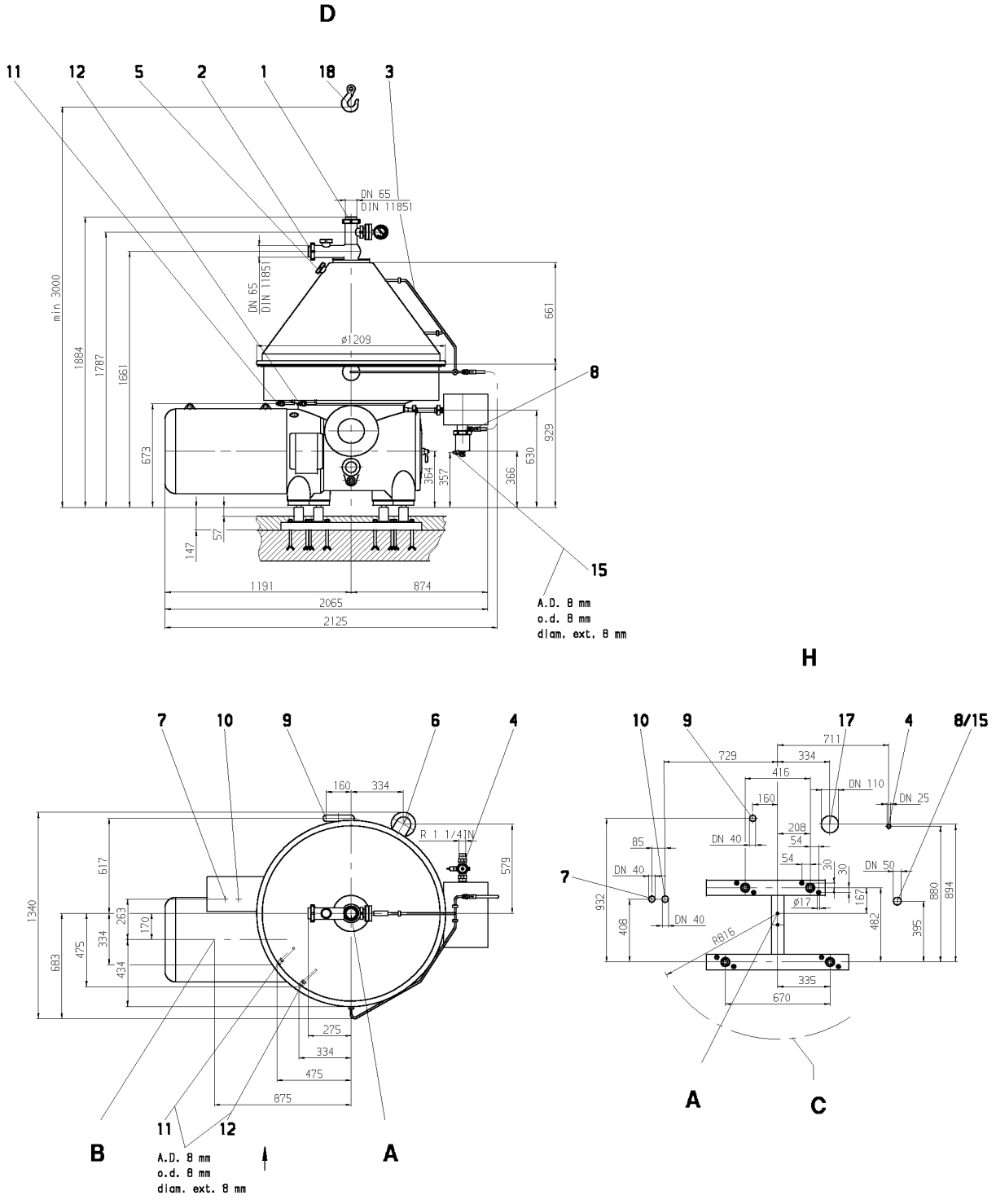
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DN 110
DN 25
160
208
54
85
DN 40
54
30
30
DN 50
7
932
DN 40
ø17
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894
408
DN 40
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482
395
335
670
A
C

Fig.38

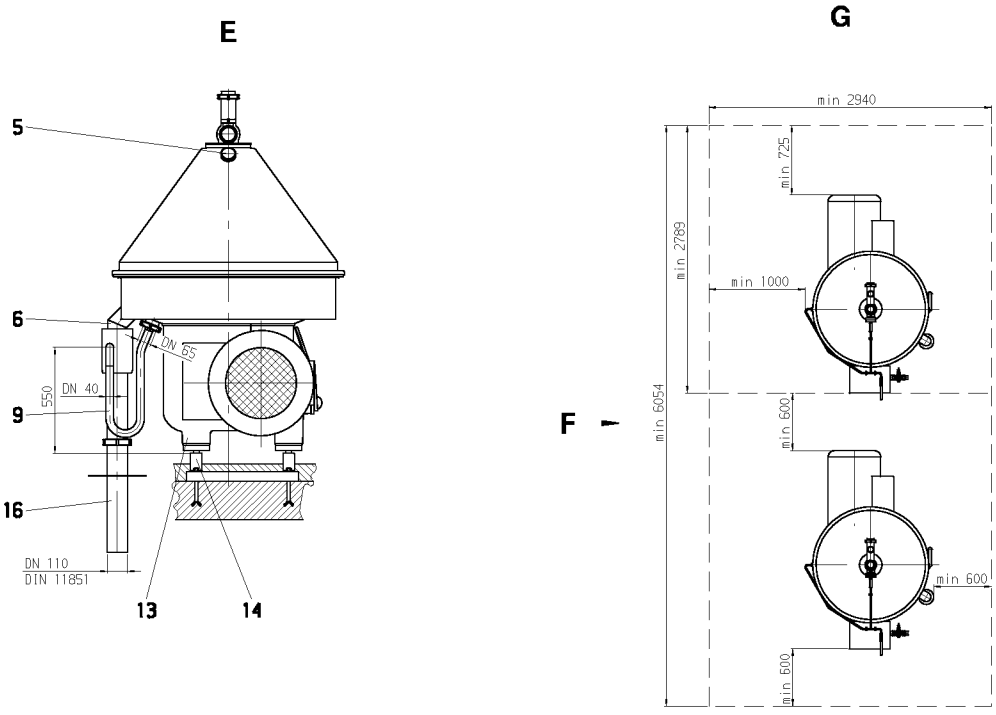


Fig.39

Subject to modification - note project-specific dimensioned drawing!

Admissible deviation for dimensions without tolerance specification according to DIN 8570-D, for foundation frame fitting according to DIN / ISO 2768 Part 1.

A Centre line of bowl
B Removing and fitting the drive motor
C Radius of action of the bowl wrench
D Product connection points according to DIN 11851
E Separator with floor cutout
F Operating side
G Minimum clearance when installing two separators
H Position of floor cutouts

Load on foundation:		
static		F = 27 300 N
dynamic	horizontal	on each foot 4700 N
	vertical	on each foot 11000 N
The dynamic forces of the individual feet act collectively as torque on the foundation.		

1 Product feed
2 Product discharge
3 Flush line
4 Operating water feed
5 Inspection hole
6 Solids ejection ports
7 Power lead to motor
8 Power lead for solenoid valves and pressure switches
9 Operating water discharge
10 Connection for PTC/NTC thermistors
11 Cooling water feed (solids collector)
12 Cooling water discharge (solids collector)
13 Voltage equalization
14 Vibration absorbers
15 Compressed air connection for metering cylinder
16 Floor cutout
17 Floor cutout
18 Hoist (lifting capacity 1500 Kg)

The hoist must be mobile or swivel-type; it must be arranged so that the following operations are possible:

- Vertical fitting and removal of hood and bowl in centre **A**
- Vertical setting down of hood and bowl , e.g. on the floor
- Removal and fitting the drive motor (point **B**)

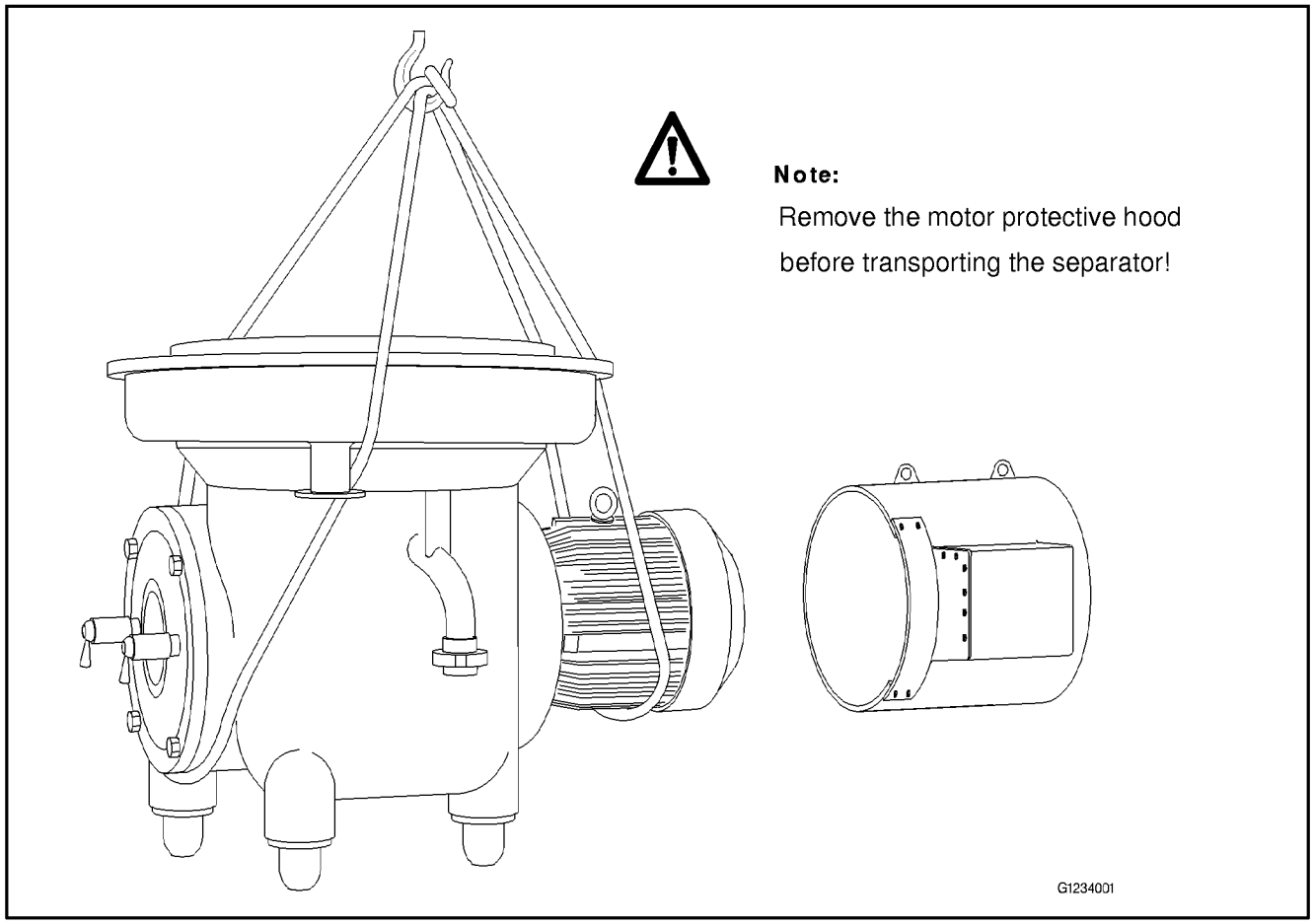


Fig.40

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.

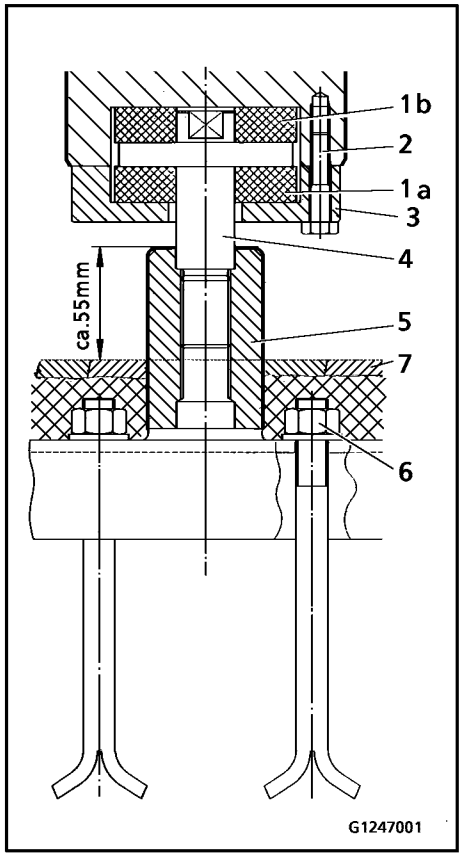
2.2 Installation

When installing the separator, make sure there is sufficient space for operating and dismantling the machine (see dimensioned drawing).

Do not fit a shut-off valve in the frame drain and do not connect the discharge 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 inside of the upper section of the frame and brake the bowl. It can also enter the gear housing through the neck bearing causing damage to the gear.

For fitting and removing the bowl, a hoist with a lifting capacity of 1500 kg is required.

Connect the feed and discharge lines to the fixed lines by means of compensators so that the vibrations occurring during start-up and shut-down are absorbed.



1 Rubber cushion
2 Screw
3 Flange
4 Bolt
5 Foundation frame
6 Anchor bolt
7 Base plate

Fig. 41

- First put rubber cushion 1a and flange 3 on bolt 4.
- Screw the bolt **as far as it will go** into the four cams of foundation frame 5.
- Embed the foundation frame in the floor so that the cams of the frame protrude from the base plates 7 by approx. 55 mm.
- Make sure that the cams on the foundation frame are **absolutely horizontal** and secure in accordance with local regulations (e.g. with approved floor anchors).
- Put the second rubber cushion 1b on the bolt and place the separator on the bolts.
- Screw flange 3 with screws 2 onto the separator frame.

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3 Lubrication

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 mm²/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

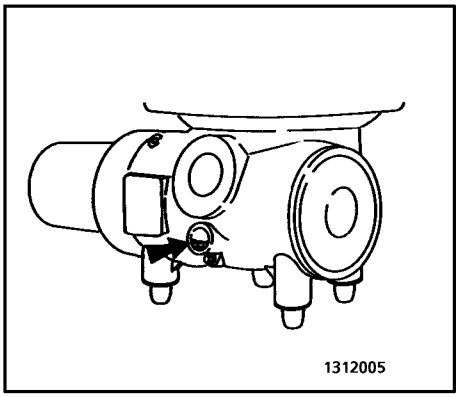

Fig. 42

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).

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4 Motor connection

4.1 Three-phase AC motor

The separator bowl is driven by an air-cooled flange-type motor via a fluid clutch and worm 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 In		
Frequency	50	60	Hz
Speed	1500	1800	min^{-1}
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 rotates in the opposite direction have two lead–in wires interchanged.

4.3 Speed and starting time of the bowl

Speed: 4 500 rpm (50 Hz)
4 500 rpm (60 Hz)

It is indicated by the measuring unit.

Starting time: approx.10 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.

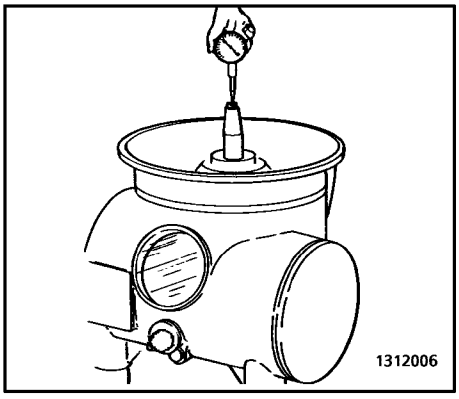

Fig. 43

- 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:

- ≤ 4 400 rpm (50 Hz)
- ≤ 4 400 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 (10 minutes), an acoustical alarm is also given.

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

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5 Bowl

5.1 Important hints

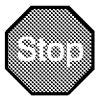
The centrifuge bowl rotates at a very high speed.
Hence, forces are produced which can endanger the operating safety of the bowl in case of

- 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.

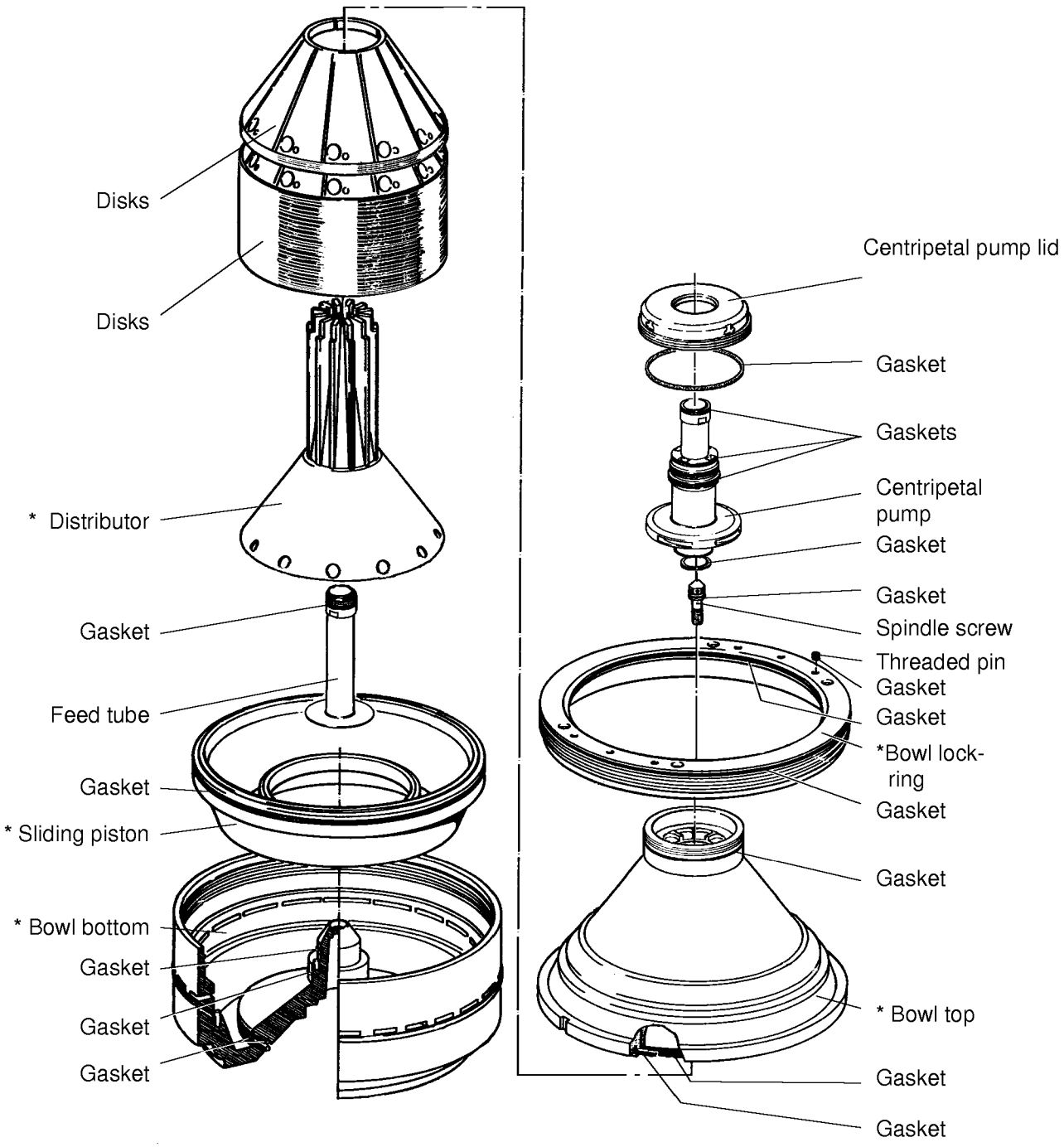


- Only use correctly rated, fully functional hoists.
- Do not use force to fit or remove parts.
- Before fitting gaskets, check the gaskets and gasket grooves for cleanness and wear.
- After fitting, check that the gaskets
  - are not twisted.
  - fit evenly into their grooves.
- Handle all bowl parts 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.



*** IMPORTANT:** When replacing this part, the complete bowl has to be re–balanced.

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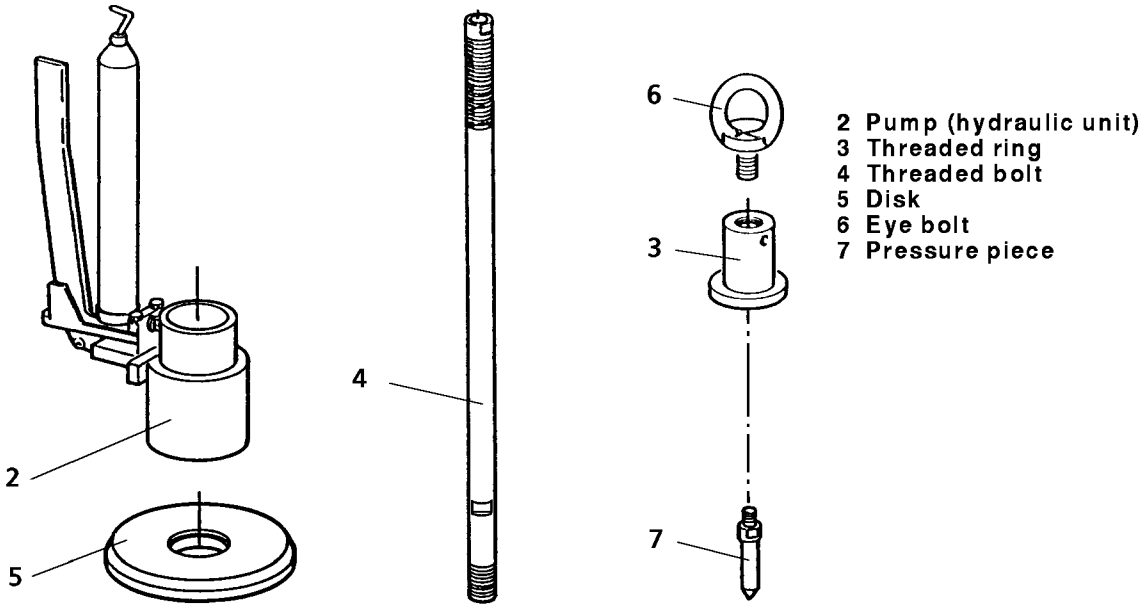


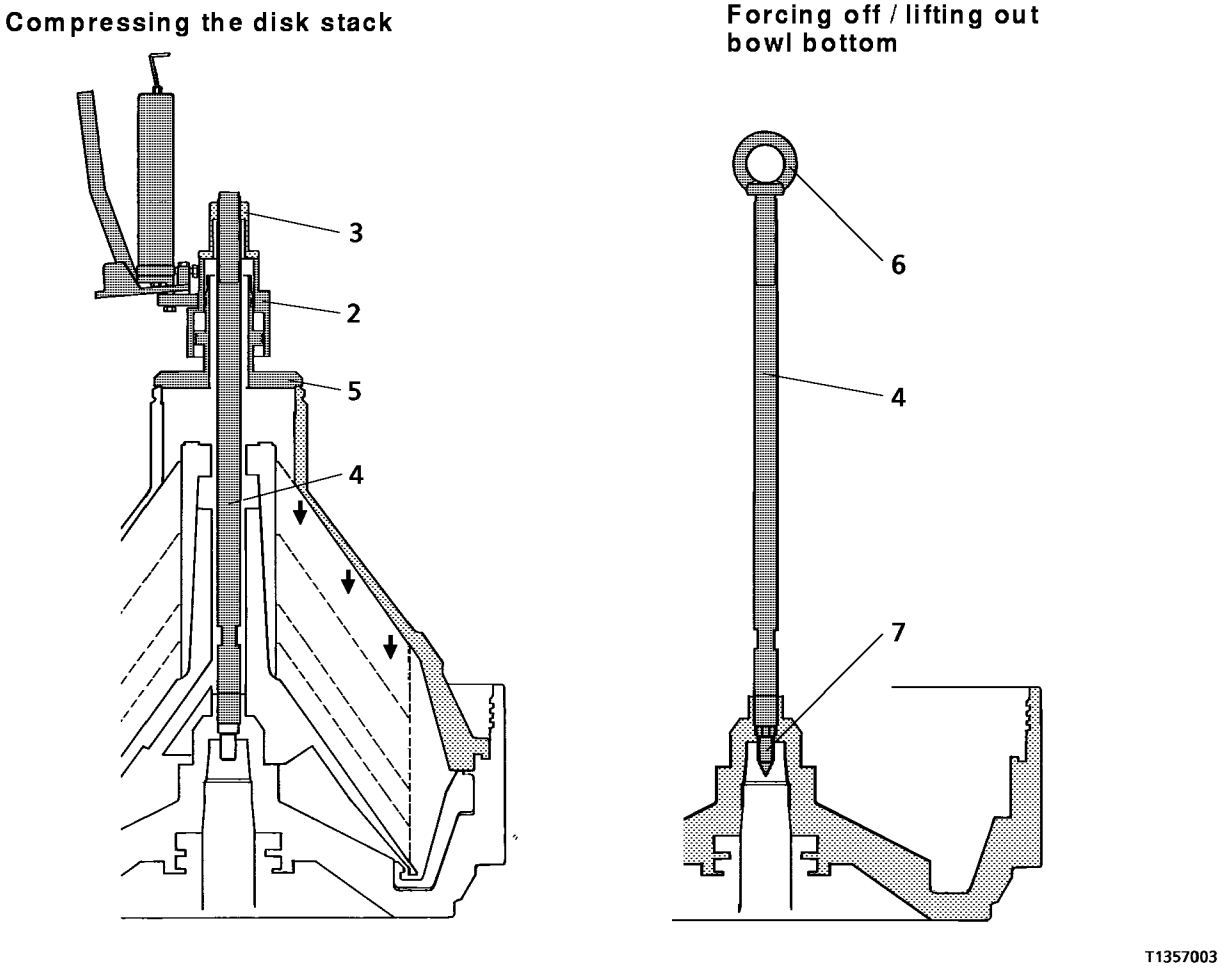
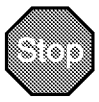


Fig. 45 – Function diagram of the compressing device

5.2 Dismantling the feed and discharge connections

CAUTION:

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



The bowl has stopped rotating when the LED "Bowl standstill" lights up.

- Replace worn gaskets immediately.
- For tools refer to chapter 12 – Parts list.

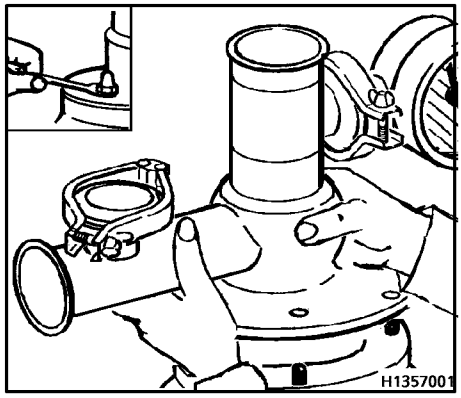


Fig.46

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

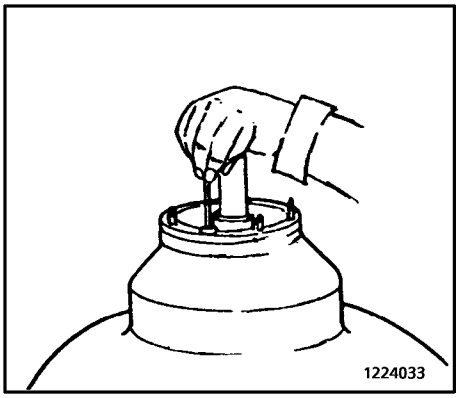


Fig. 47

- Loosen two Allen screws from the disk.

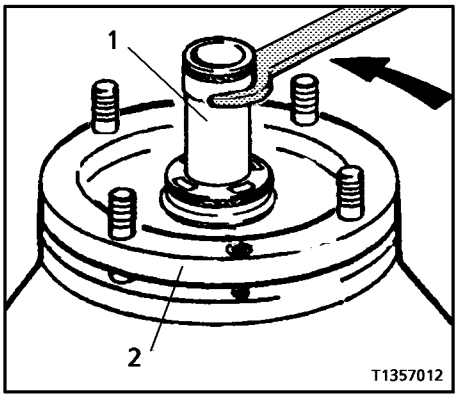


Fig. 48

- Unscrew centripetal pump 1 **anti–clockwise** from disk 2 using a single–ended wrench.

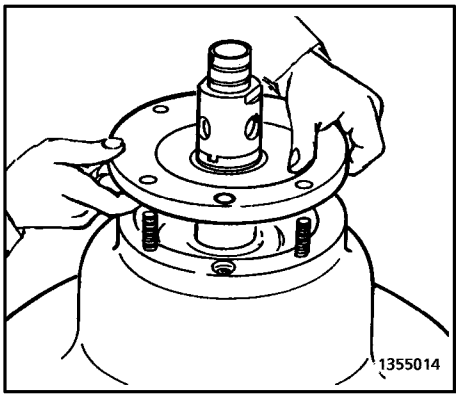


Fig. 49

- Remove the disk.

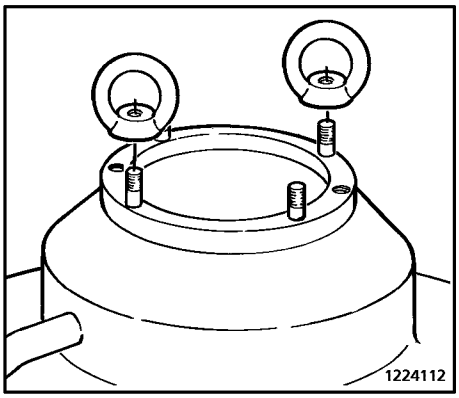


Fig. 50

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

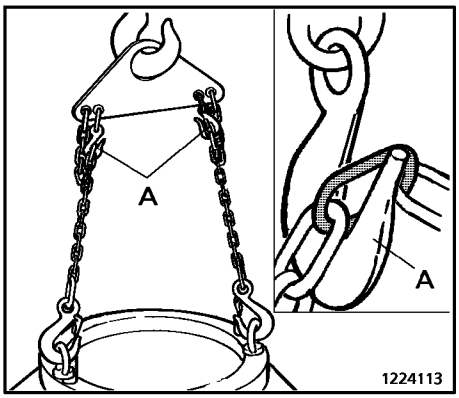


Fig. 51

- Unscrew the fastening screws of the hood.
- Disconnect and remove 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!

- Before opening the bowl, release the brake by turning the handle clockwise.
- Handle bowl parts with care.
- Replace worn gaskets immediately.
- For tools refer to chapter 12 –Parts list.

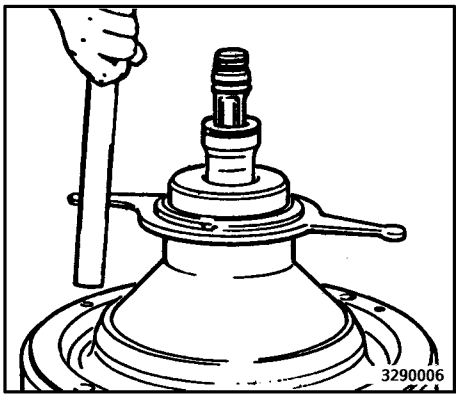


Fig. 52

- Loosen centripetal pump lid by lightly tapping with the mallet against the handle of the annular wrench **(left–hand thread).**
- Remove the lid.

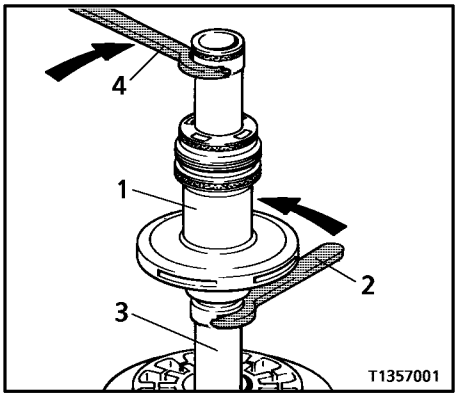


Fig. 53

- Raise centripetal pump 1.
- Unscrew centripetal pump 1 from feed tube 3 using the single–ended wrench **(left–hand thread)** .
- While doing so, hold feed tube 3 with the single–ended wrench.

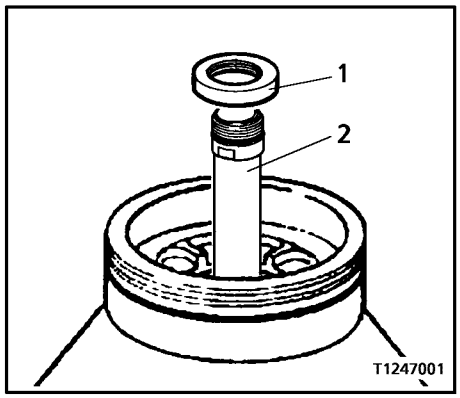


Fig. 54

- Screw threaded ring onto feed tube so that it hangs in the distributor neck.

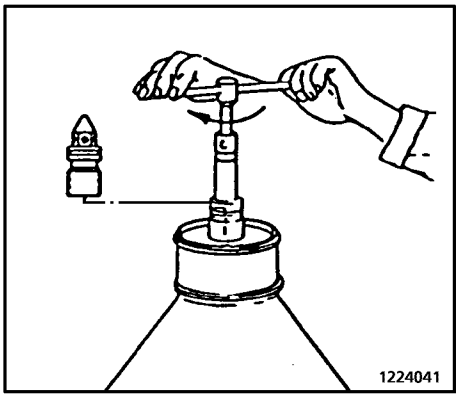


Fig. 55

- Unscrew spindle screw from bowl bottom using a socket wrench **(left–hand thread)**.

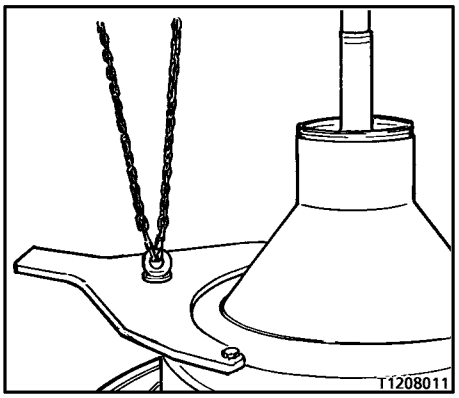


Fig. 56

- Place the wrench onto the bowl lock ring using the lifting device.
- engage the cam and
- tighten the two fastening screws **firmly** .

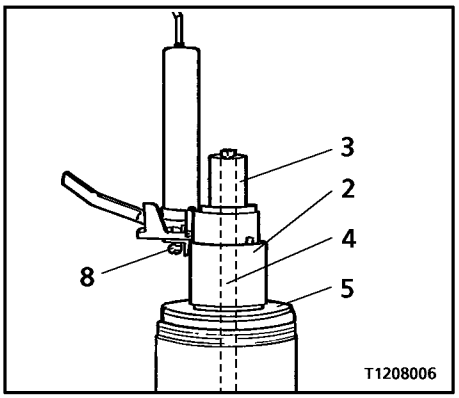


Fig. 57

Mounting the disk stack compressing device:

- Place disk 5 onto the bowl top.
- Screw bolt 4 as far as it will go into the bowl bottom **(left–hand thread).**
- Insert hydraulic part 2 into the centering recess of the disk.
- Screw on threaded ring 3 until its upper edge is flush with the end thread of bolt 4 **(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 8 by two turns.
  - Press the pump lever down as far as it will go.

- Screw on threaded ring until end of thread.

- Tighten screwed connections of the compressing device.
- Screw tight pressure relief screw 8.

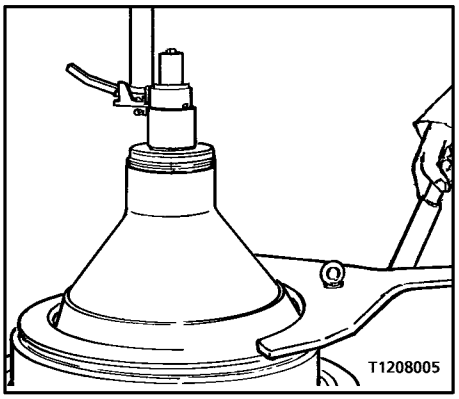


Fig. 58

- Compress the disk stack to facilitate loosening of the bowl lock ring.

  Pressure: 280–300 bar
- Loosen the bowl lock ring by hammering against the handle of the wrench **(left–hand thread)**.
- Remove the wrench using the lifting device and a hoist.

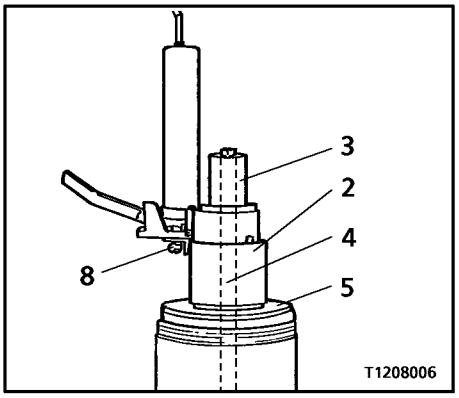


Fig. 59

Removing the disk stack compressing device:

- Bring the pump lever into its bottom-most position to prevent it from jumping back.
- Loosen pressure relief screw 8.
- Unscrew threaded ring 3 **(left–hand thread).**
- Remove hydraulic part 2 with disk 5.
- Unscrew bolt 4 **(left–hand thread)**.

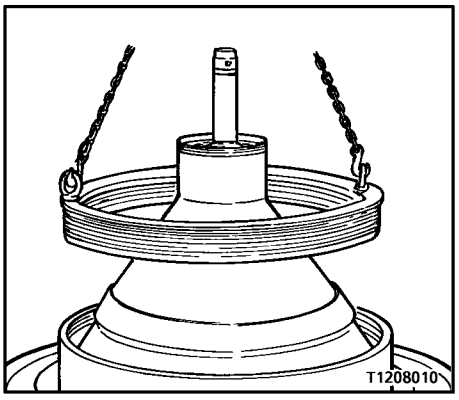


Fig. 60

- Screw two eye bolts opposite each other into the bowl lock ring.
- Lift off the lock ring using the lifting device.

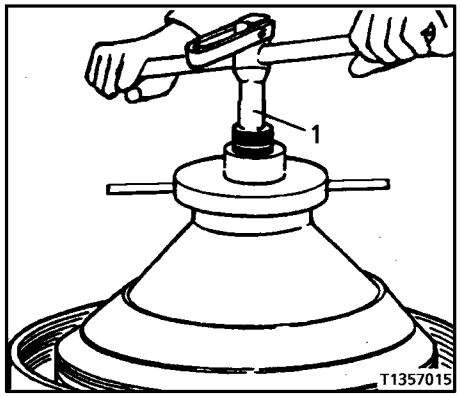


Fig. 61

- Screw lifting device 1 onto the bowl top.
- Force off the bowl top from the bowl bottom by turning the spindle clockwise and remove it.

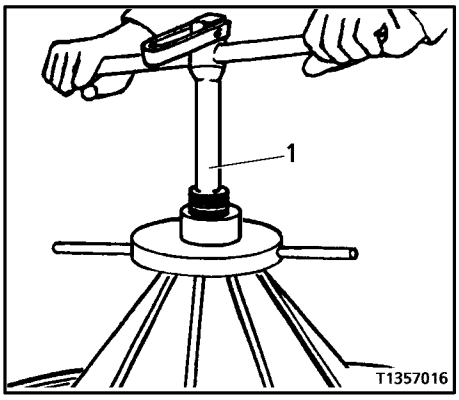


Fig. 62

- Screw lifting device 1 onto the distributor.
- Force off the distributor together with the disk stack by turning the spindle clockwise.
- Lift out distributor together with disk stack.
- Remove the feed tube.

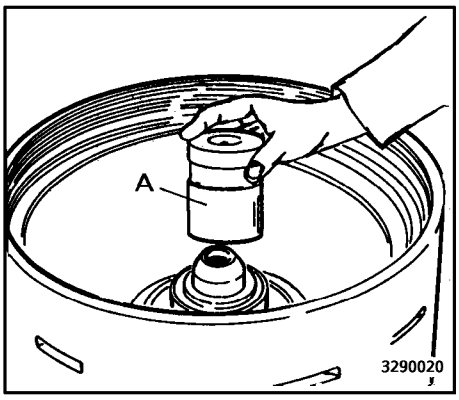


Fig. 63

- Place pressure piece A of lifting device for sliding piston on the hub of the bowl bottom.

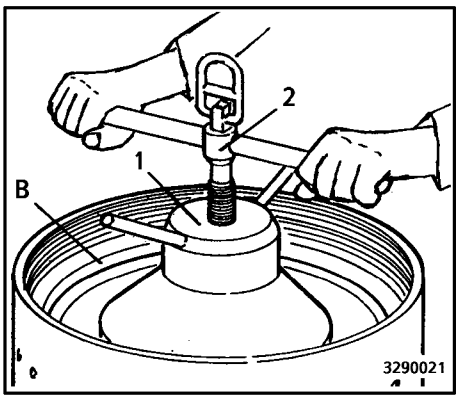


Fig. 64

- Screw lifting device 1 onto the sliding piston.
- Force the sliding piston off the bowl bottom by turning threaded spindle 2 **clockwise**.
- Remove the sliding piston.

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

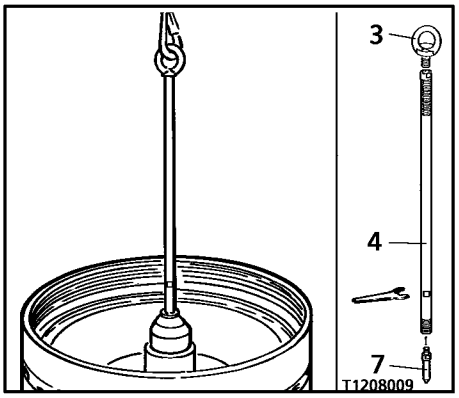


Fig. 65

Force off bowl bottom:

- Screw pressure piece 7 into threaded bolt 4.
- Screw eye bolt 3 into upper bolt end 4.
- Screw the whole device into the thread of the bowl bottom **as far as it will go (left–hand thread).**
- Force bowl off spindle cone by means of wrench (SW 24) which is placed on the corresponding surface at the lower end of the bolt.

5.4 Assembling the bowl

- For lubrication of threads and guide surfaces of the bowl parts refer to 3.2.
- Replace worn gaskets immediately.
- Tools see chapter 12 – List of spare parts.

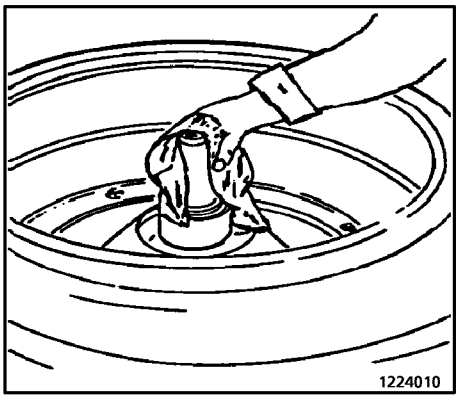


Fig. 66

- **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 thoroughly to ensure proper fitting.

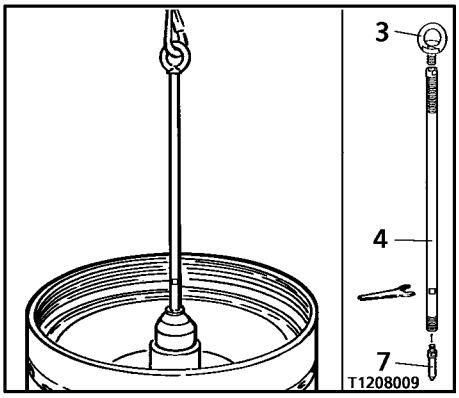


Fig. 67

Installing the bowl bottom:

- Screw pressure piece 7 into threaded bolt 4.
- Screw eye bolt 3 into upper bolt end 4.
- Screw the whole device into the bowl bottom **(left–hand thread).**
- Place bowl bottom onto the spindle.
- Place open–ended wrench on the corresponding surface at the lower end of the bolt and unscrew the device.

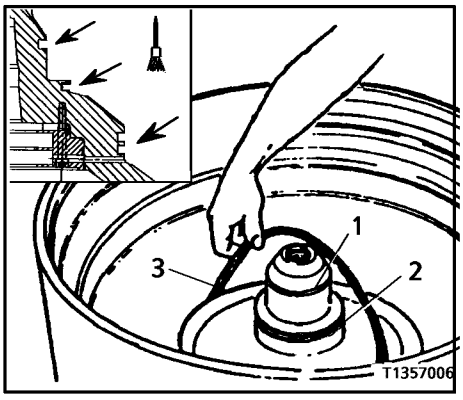


Fig. 68

- Thoroughly clean the gasket groove in the bowl bottom.
- Insert the gaskets in the groove of the bowl bottom:
  - first the perbunan gasket,
  - then the teflon gasket.

To facilitate assembly place the teflon gasket in hot water for about 5 minutes and then insert immediately.

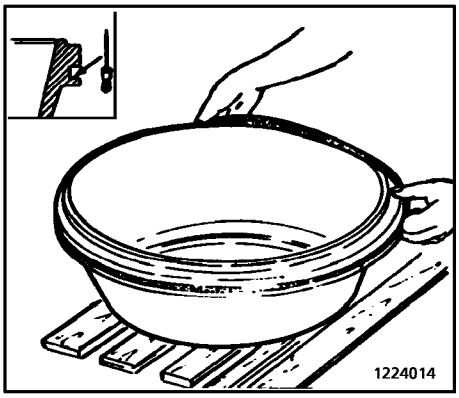


Fig. 69

- Thoroughly clean groove for gasket in sliding piston.
- Insert gaskets in the groove of the sliding piston:
  - first the perbunan gasket,
  - then the teflon gasket.

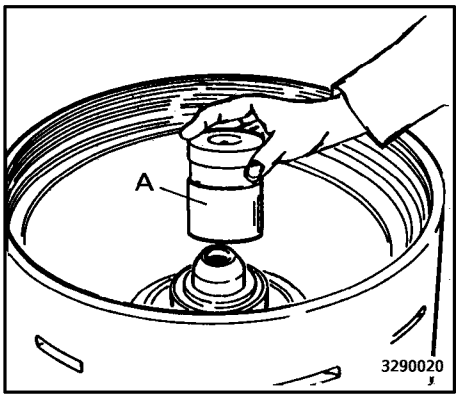


Fig. 70

- Place pressure piece A of lifting device onto the hub of the bowl bottom.

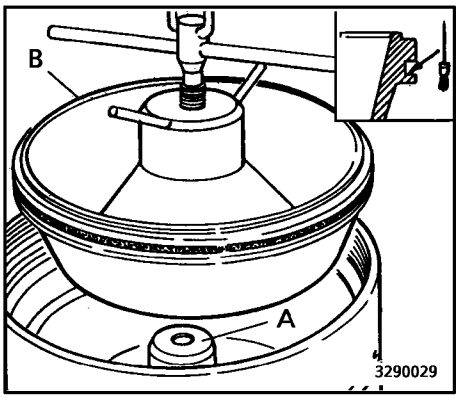


Fig. 71

- Grease guide surfaces of the sliding piston and bowl bottom.
- Insert the sliding piston using lifting device so that the „O" marks are perfectly aligned.
- Lower the sliding piston slowly by turning the jackscrew anti–clockwise until the arresting pins of the bowl bottom catch into the holes of the sliding piston.
  If necessary, wriggle the piston until it snaps into position.

- Be careful not to damage sealing lip B of the sliding piston.
- After inserting the sliding piston, take out pressure piece A!

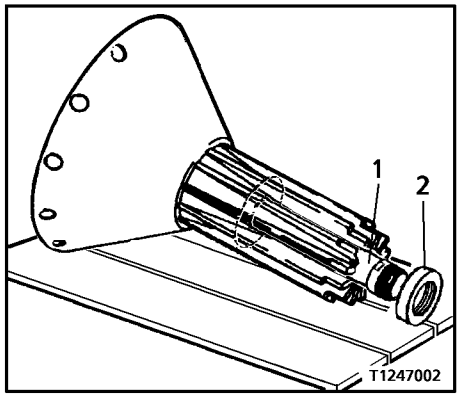


Fig. 72

- Tilt distributor onto a wooden base.
- Screw the threaded ring onto the feed tube so that the feed tube is suspended in the distributor neck.

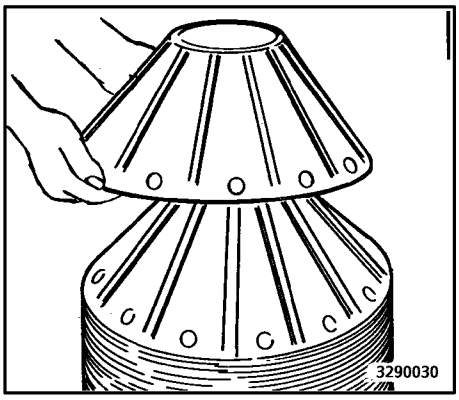


Fig. 73

- Stack the discs onto the neck of the distributor in numerical order, beginning with number 1.
- Screw lifting device onto the distributor.

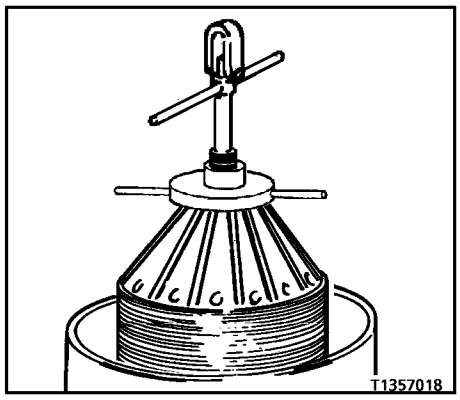


Fig. 74

- Grease contact surfaces.
- Install distributor together with discs into the bowl bottom.

  The „O" marks on the bowl bottom and distributor must be aligned; the arresting pins in the bowl bottom will then catch into the holes of the distributor.

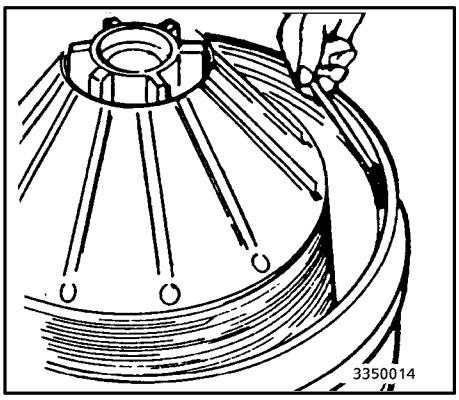


Fig. 75

- Clean and grease guide surfaces and threads of the bowl bottom.

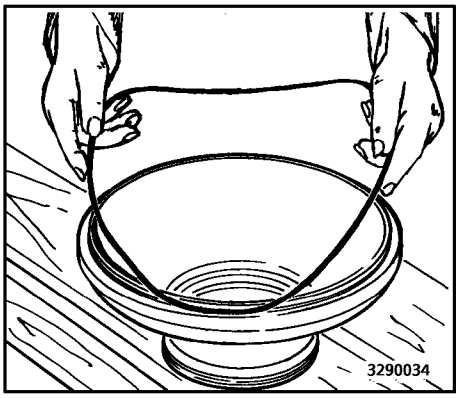


Fig. 76

- Insert gasket into groove of bowl top.

  If the main bowl gasket must be replaced, refer to 5.6.
- Clean and grease guide surfaces of bowl top.

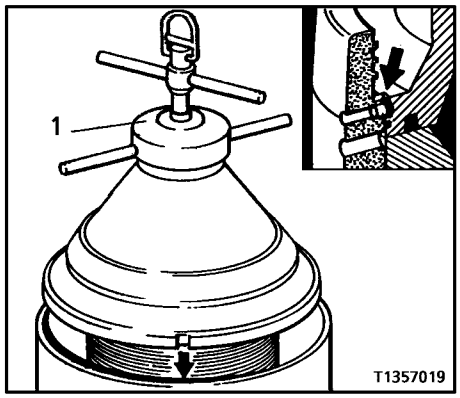


Fig. 77

- Place bowl top onto bowl bottom using lifting device 1.
- Slowly lower the bowl top by turning the jackscrew anti–clockwise.
  Make sure that the arresting piece of the bowl bottom catches into the groove of the bowl top.
  The "O" marks of both parts must be aligned.

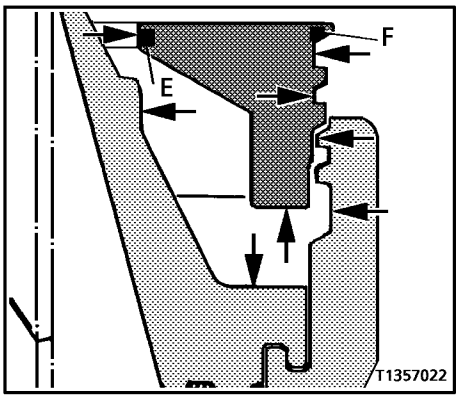


Fig. 78

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

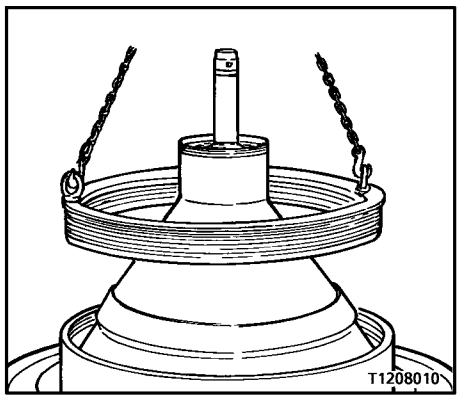


Fig. 79

- Screw two eye bolts diametrically opposite each other into the bowl lock ring.
- Place bowl lock ring onto bowl bottom using lifting device.

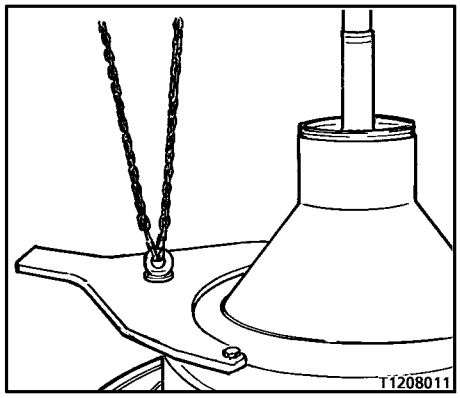


Fig. 80

- Use lifting device and hoist to place the wrench onto the bowl lock ring.
  - Engage the cam and
  - tighten the two fastening screws **firmly.**
- Screw down the bowl lock ring by means of the wrench **(left–hand thread)**.

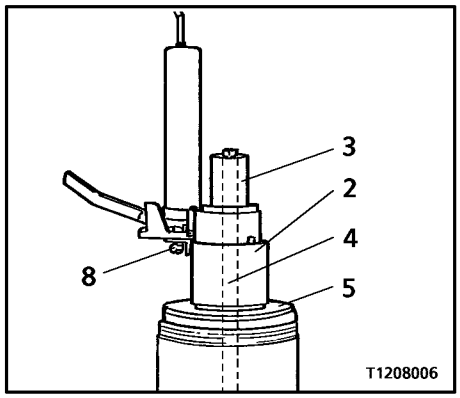


Fig. 81

Mount compressing device:

- Place disk 5 onto bowl top.
- Screw bolt 4 as far as it will go into the bowl bottom **(left–hand thread).**
- Insert hydraulic part 2 into the centering recess of the disk.
- Screw on threaded ring 3 **(left–hand thread)** until its upper edge is flush with end thread of bolt 4.

To prevent damage to threads:

- screw in threaded bolt completely,
- screw on threaded ring completely down to thread end.

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

In this case:

- Bring piston and cylinder into initial position.
  - loosen pressure relief screw 8 by two turns,
  - press the pump lever down as far as it will go,
  - screw on threaded ring down to thread end.
- Tighten screw connections of the compressing device.
- Screw tight pressure relief screw 8.

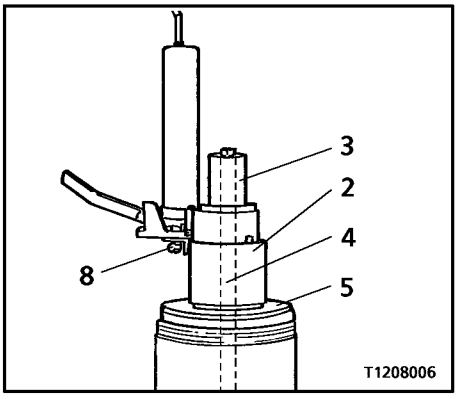


Fig. 82

Compressing the disc stack:

Pressure must be gradually applied to the disc stack until the max. disc compression of 280–300 bar is attained. Each pressure increase should be approx. 50 bar.

- After each pressure increase, tighten bowl lock ring further.

  When the max. disc compression of 280 – 300 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 disc stack pressure is too low, an additional disc must be inserted.

If the maximum pressure is not attained and grease flows out of the stroke limiting hole, then bolt 4 has not been screwed far enough into the bowl bottom.
The compressing device is only ready for use again when bolt 4 and threaded ring 3 have been brought back into the position as described above.

While compressing the disc stack make sure that

- arresting piece of bowl bottom snaps into groove of bowl top and
- bowl top does not become tilted.

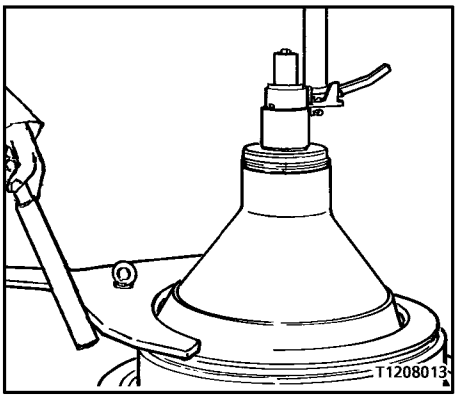


Fig. 83

- Tighten bowl lock ring by hitting with mallet against handle of wrench **until „O" mark alignment of bowl bottom and bowl lock ring is obtained.**

- Undo the fastening screws and remove the wrench and lifting device.

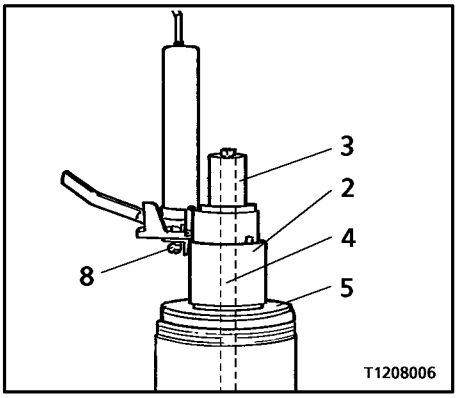


Fig. 84

Dismantle compressing device:

- Push lever of compressing device down as far as it will go to prevent it from springing back. Only then loosen pressure relief screw 8.
- Unscrew threaded ring 3 **(left–hand thread)**.
- Remove hydraulic part 2 and disk 5.
- Unscrew bolt 4 **(left–hand thread)**.

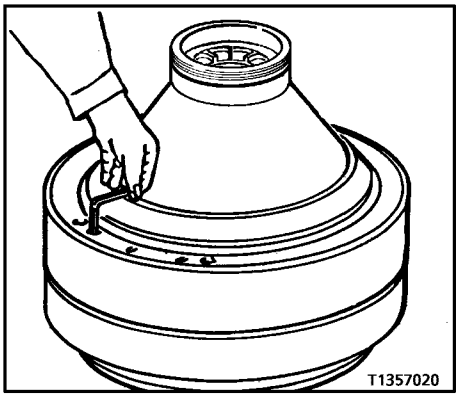


Fig. 85

- Unscrew the hex head screws of wrench and remove the wrench.
- Unscrew eye bolt.
- Insert the threaded rings into the lock ring and screw them in using an Allen wrench until they are flush with the lock ring.

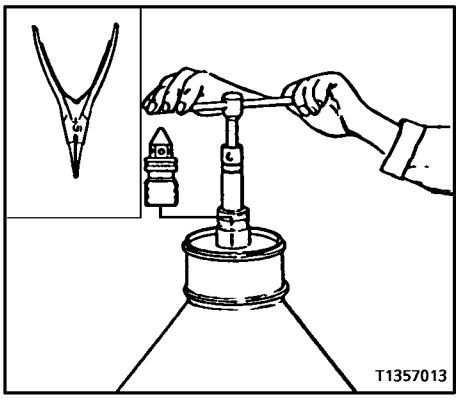


Fig. 86

- Screw spindle screw (with inserted gasket) firmly into the spindle **(left–hand thread)**.
- Use the securing ring pliers to lift the feed tube.

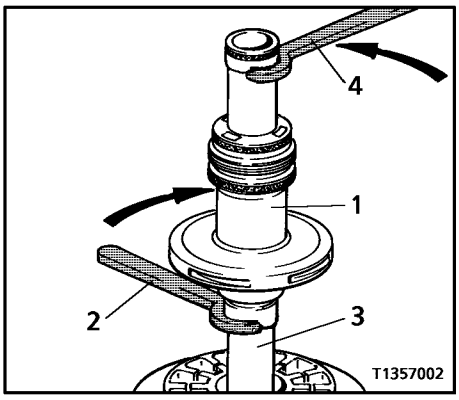


Fig. 87

- Insert gaskets into centripetal pump 1.
- Screw centripetal pump 1 tightly onto feed tube 3 using a single–ended wrench 2 **(left–hand thread).**
- While doing so, hold feed tube 3 with a single–ended wrench 4.

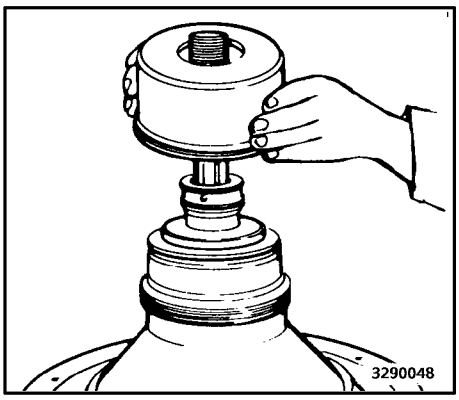


Fig. 88

- Grease threads of bowl top and lock ring.
- Install the lid.

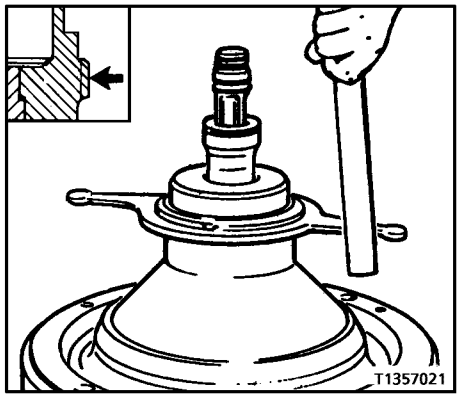


Fig. 89

- Screw on the lid by hand **(left–hand thread)** and tighten it firmly by striking the arm of annular wrench.

5.5 Assembling the feed and discharge connections

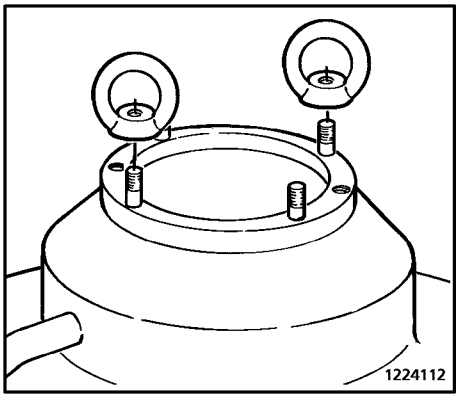


Fig. 90

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

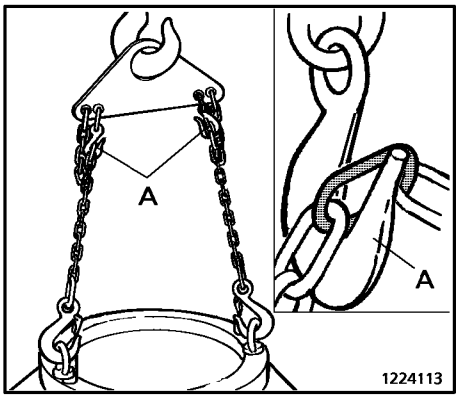


Fig. 91

- 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.

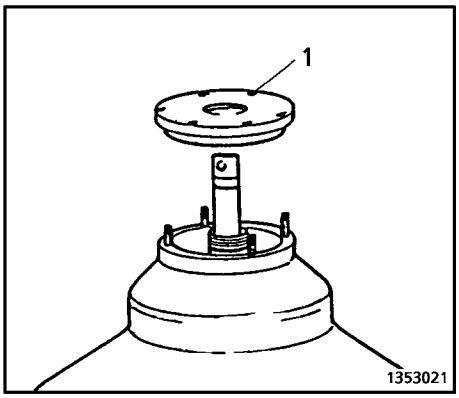


Fig. 92

- Place the disk on the hood so that the two Allen screws 1 are positioned over the respective tapholes in the hood. Do **not** tighten the screws.

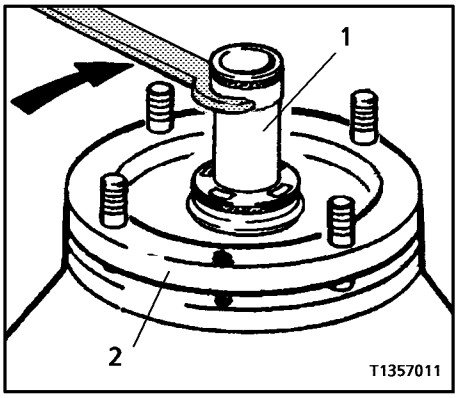


Fig. 93

- Screw centripetal pump 1 **clockwise** into the ring 2 and tighten it with single–ended wrench **as far as it will go** .

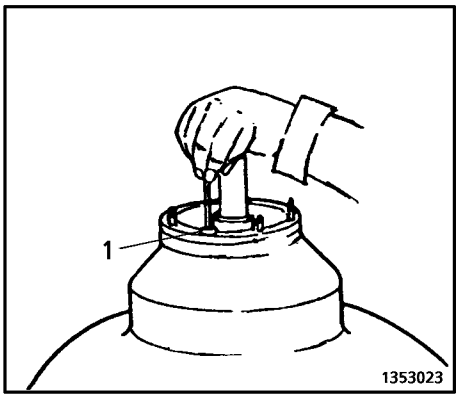


Fig. 94

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

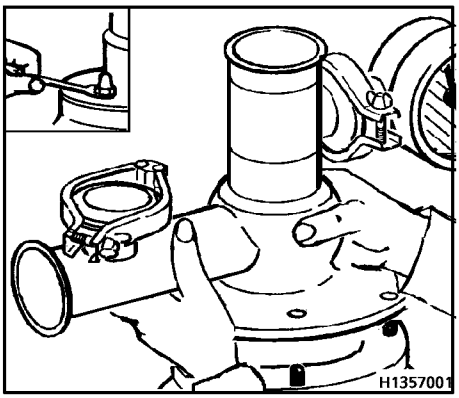


Fig. 95

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

5.6 Replacing the main gasket in bowl top

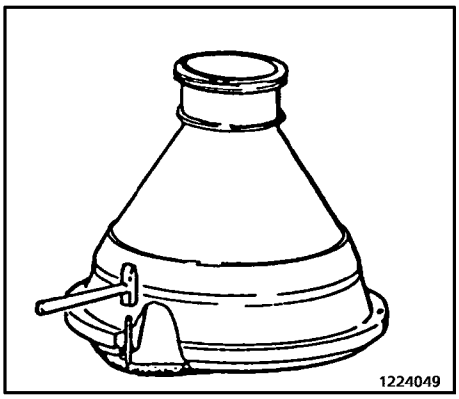


Fig. 96

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.

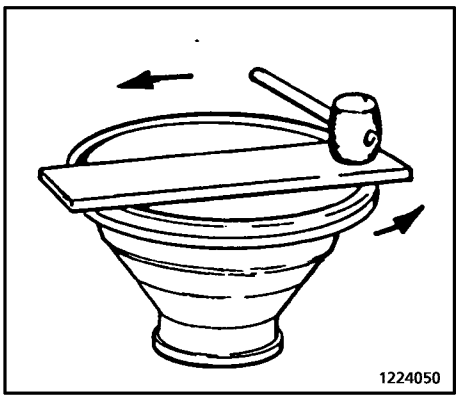


Fig. 97

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.

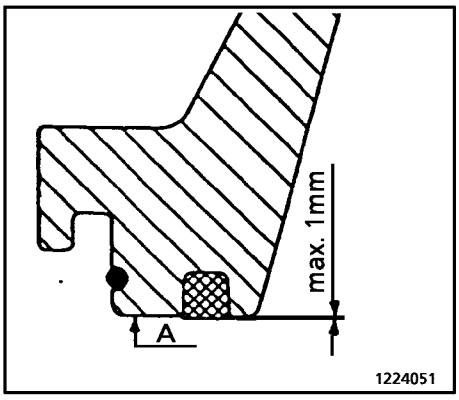


Fig. 98

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.

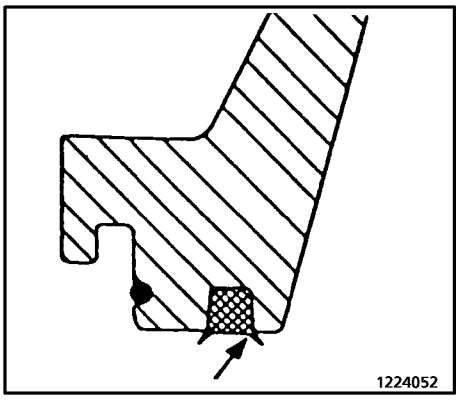


Fig. 99

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.

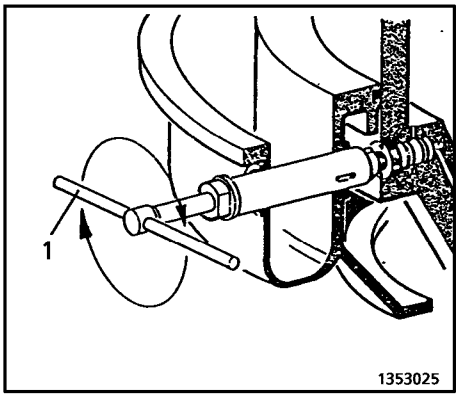


Fig. 100

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

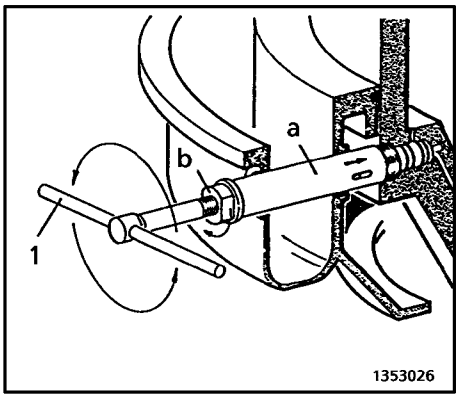


Fig. 101

- 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.**

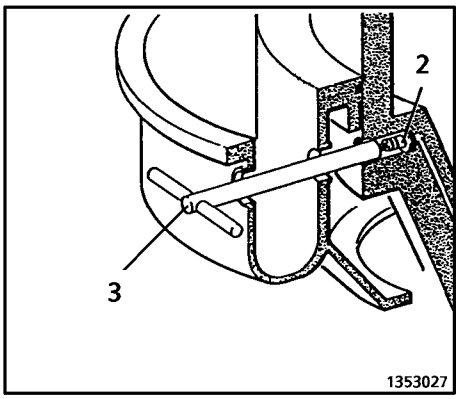


Fig. 102

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 Disk stack compressing device

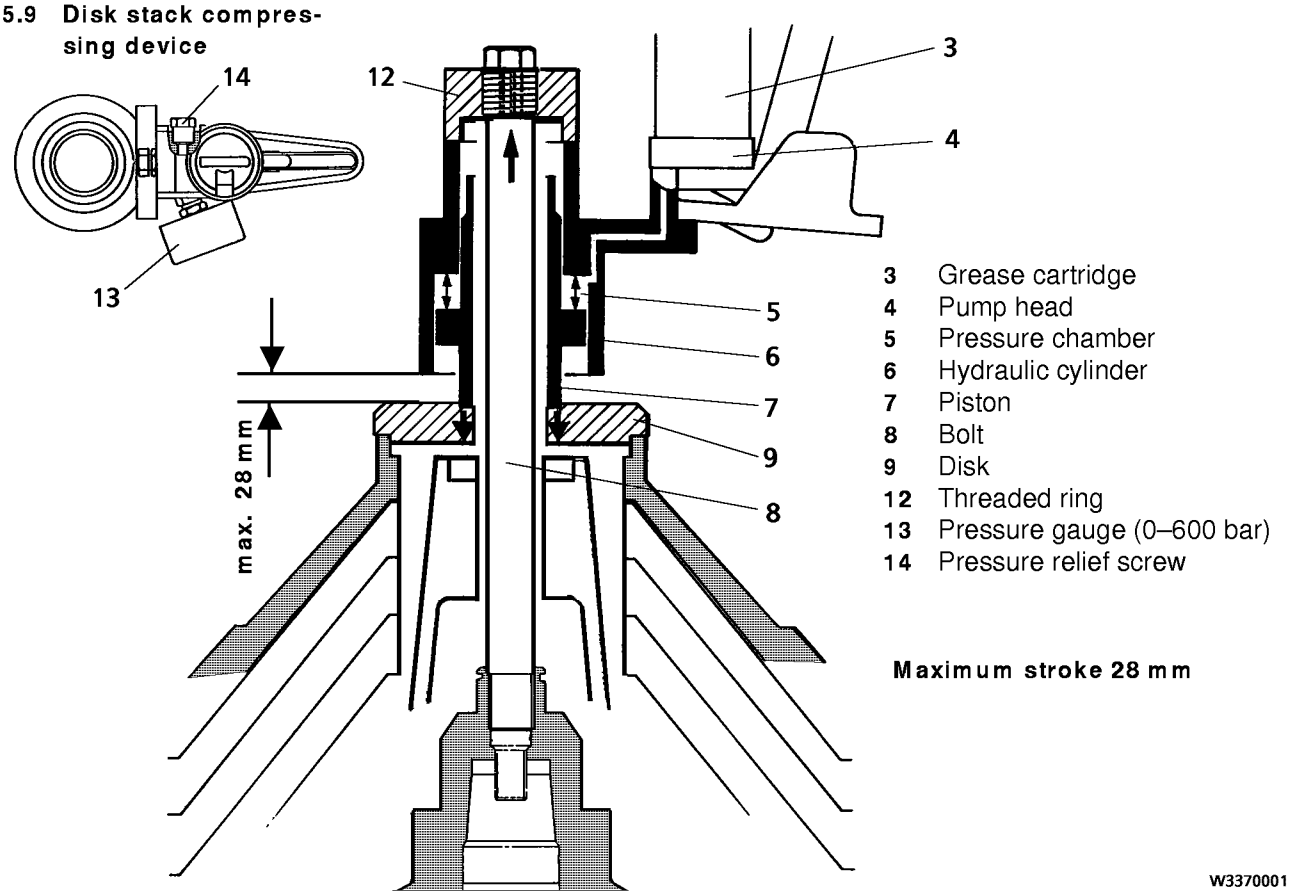


Fig. 103

Operating principles

The pump presses grease at a high pressure into pressure chamber 5.

The increase in pressure in the pressure chamber displaces piston 7 relative to hydraulic cylinder 6.

The hydraulic part (piston, hydraulic cylinder) is bolted securely to the bowl bottom by means of bolt 8 and threaded ring 12.

When the pressure increases in pressure chamber 5, piston 7 is displaced downwards.

The force produced is transferred to the bowl top via disk 9. The disk stack is compressed.

Required pressure: 290-300 bar

Pump

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

- Pump head
- 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 this special grease before shipment.

- Actuate clamp piece 13 and pull filling device 12 upwards.
- Unscrew grease cartridge 14 from pump head 15.
- Fill in grease, approx. 450 g.
- Screw grease cartridge 14 into pump head 15.
- Actuate clamp piece 13 and push filling device 12 into the grease cartridge.

Fill the grease cartridge only with WS special grease K2R.

Malfunction

If there is no build–up of pressure, check the following:

- Is the pressure relief screw 10 screwed in tightly?
- Is there enough K2R grease in the grease cartridge?
- Has piston 21 travelled too far out of hydraulic cylinder 20?

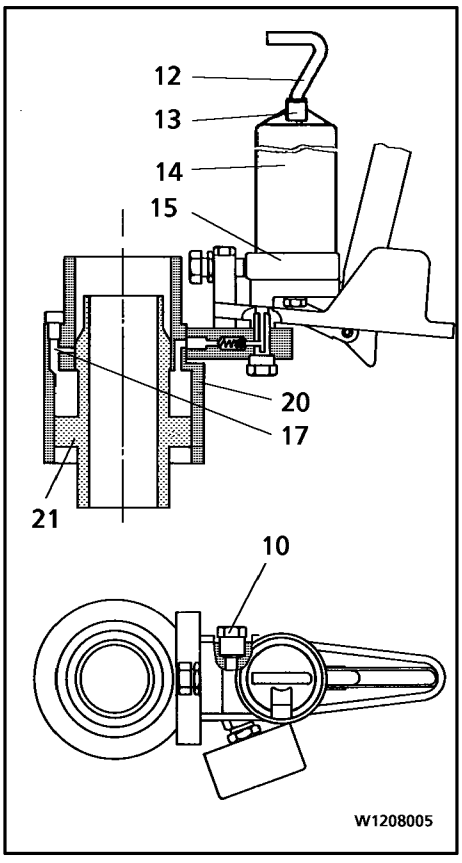


Fig. 104

If yes,

- Loosen pressure relief screw 10.
- Press piston 21 without pressure back into hydraulic cylinder 20.
- The screw in pressure relief screw 10 again ***tightly***.

10 Pressure relief screw
12 Filling device
13 Clamp piece
14 Grease cartridge
15 Pump head
17 Stroke limiting hole
20 Hydraulic cylinder
21 Piston

- If grease discharges through stroke limiting hole 17, bolt 4 and threaded ring 3 are not screwed into their correct end position; the stroke is too long.

6 Technical information

6.1 Operating principles of the bowl

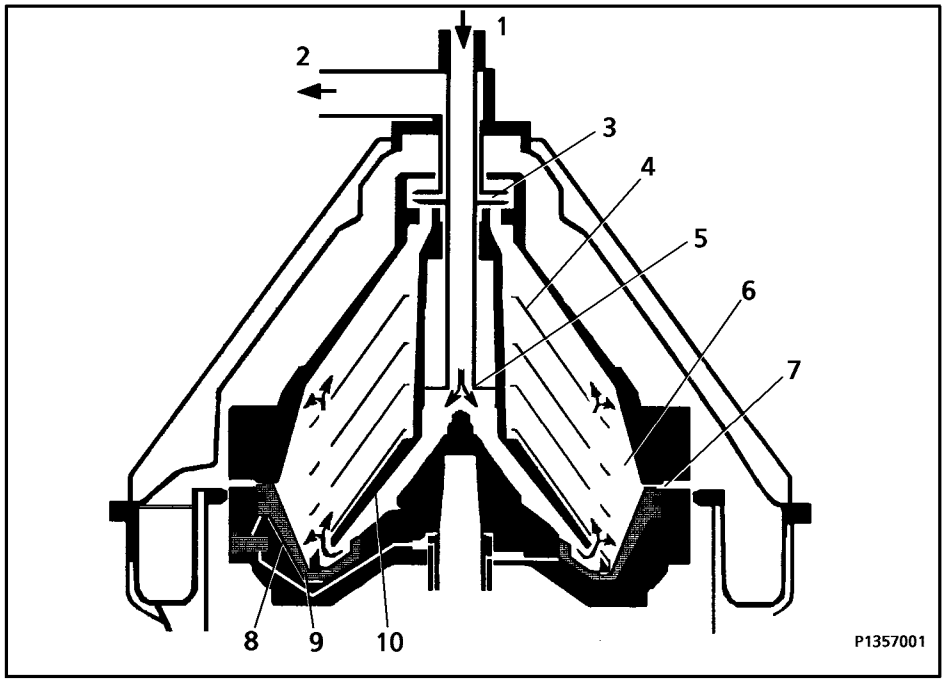


Fig.105

1	Feed	**6**	Solids holding space
2	Discharge	**7**	Solids ejection ports
3	Centripetal pump	**8**	Closing chamber
4	Disc stack	**9**	Sliding piston
5	Hydrohermetic feed	**10**	Distributor

The centrifuge is equipped with a self–cleaning disc type bowl.
The bowl is used for the clarification of milk and/or whey.

The milk or whey is supplied to the bowl via feed 1.

In distributor 10 the product is gently accelerated by the hydrohermetic feed 5 to the angular velocity of the bowl and fed to the disc stack.

The disc stack consists of a number of conical discs placed one above the other. Due to the narrow interspaces between the discs the liquid is divided into thin layers thus reducing the settling path.
The solid particles are thrown against the underside of the discs from where they slide down into the solids space 6.
The clarified milk or whey flows towards the bowl centre and from there to the centripetal pump chamber from where it is discharged foamfree and under pressure by means of centripetal pump 3.

The separated solids accumulate in solids space 6 from where they are ejected periodically through ejections holes 7.

The hydraulically movable sliding piston 9 opens and closes the bowl.

The ejection process is initiated by a control unit.

The feed and discharge system is an enclosed piping system.

The pressure in discharge line 2 can be adjusted by means of a constant–pressure valve and checked by a pressure gauge.

6.2 Operating principles of the hydraulic system of the bowl

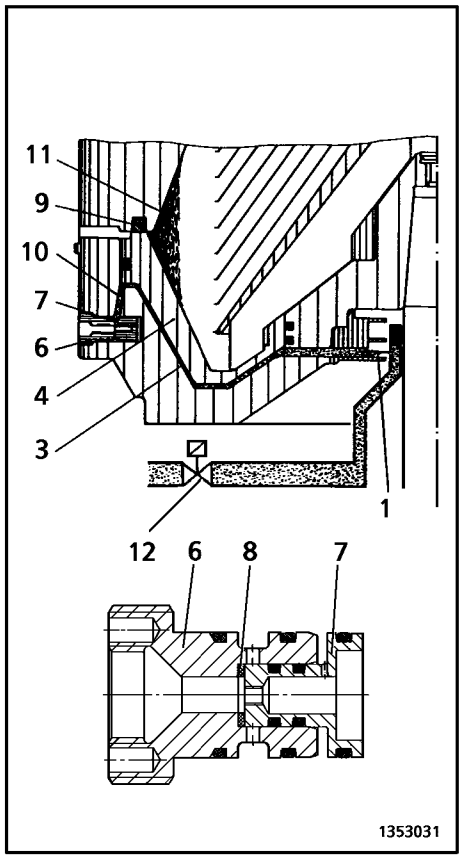


Fig.106

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

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.

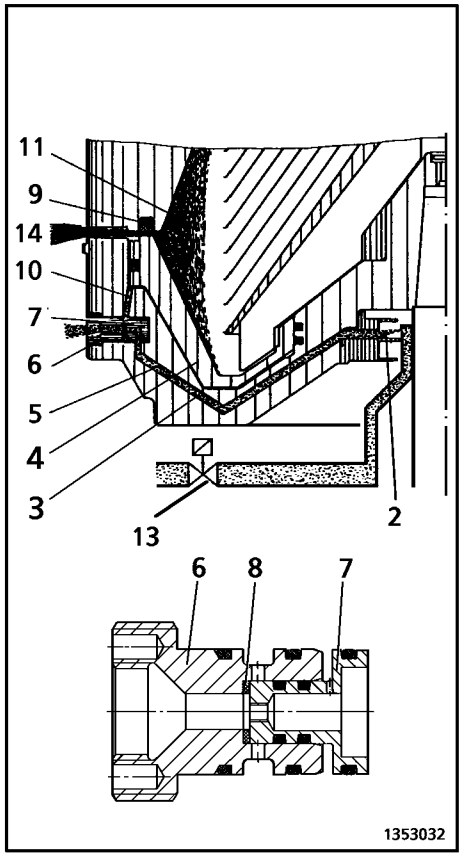


Fig.107

Bowl open

2 Injection chamber for operating water (bowl valve)
3 Closing chamber
4 Piston
5 Feed hole -operating water (bowl valve)
6 Bowl valve
7 Valve piston
8 Gasket
9 Bowl gasket
10 Drain hole for operating water (closing chamber)
11 Solids holding space
13 Solenoid valve
14 Solids ejection ports

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 preset 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

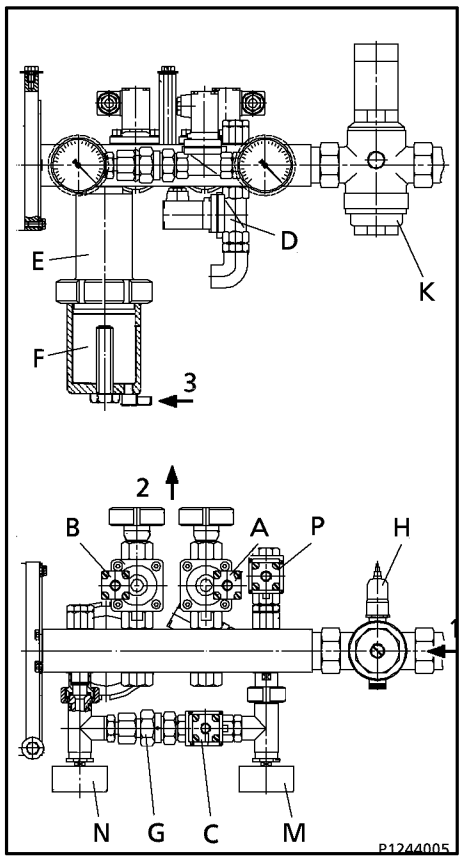


Fig. 108

1 Water feed
2 to separator
3 Air connection

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 unit
F Air chamber
G Non–return valve
H Pressure switch
K Strainer
M Pressure gauge
N Pressure gauge
P Solenoid valve for cooling water (clutch)

Operating-water connection:	1 in
Operating-water pressure:	Pmin. = 2,5 Pmax. = 4
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°dH = 1.79°fH = 1.25°eH = 17.9 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 thouroughly 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

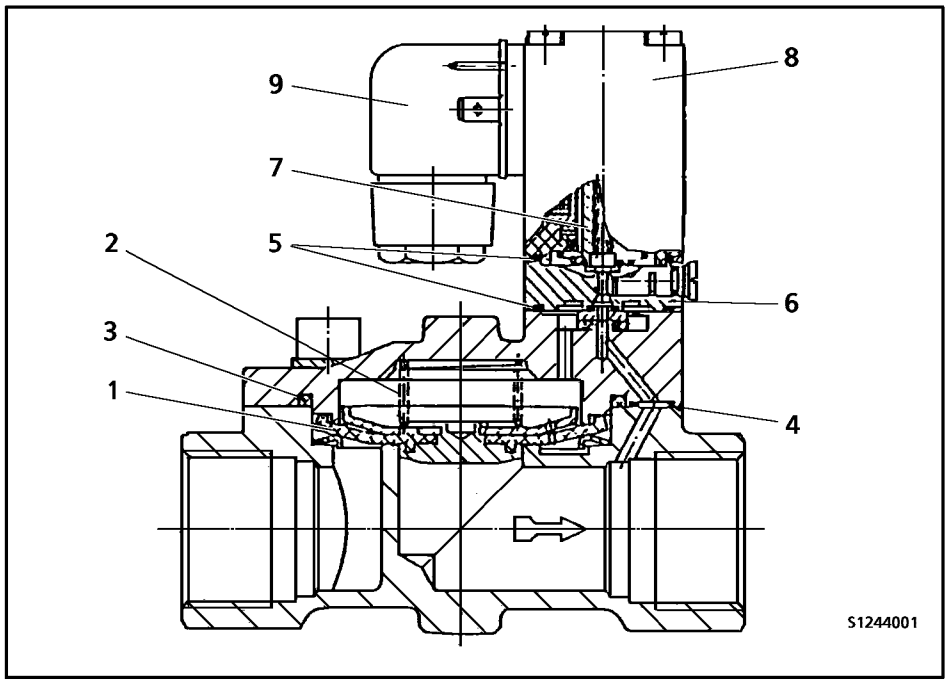


Fig.109

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

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	8
	operation	W	8	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	^{0}C	+ 100	+ 100
	ambient	^{0}C	+ 55	+ 55
Cable entry (coupler socket)		Pg	9	9

Maintenance

The solenoid valves do not require special maintenance.

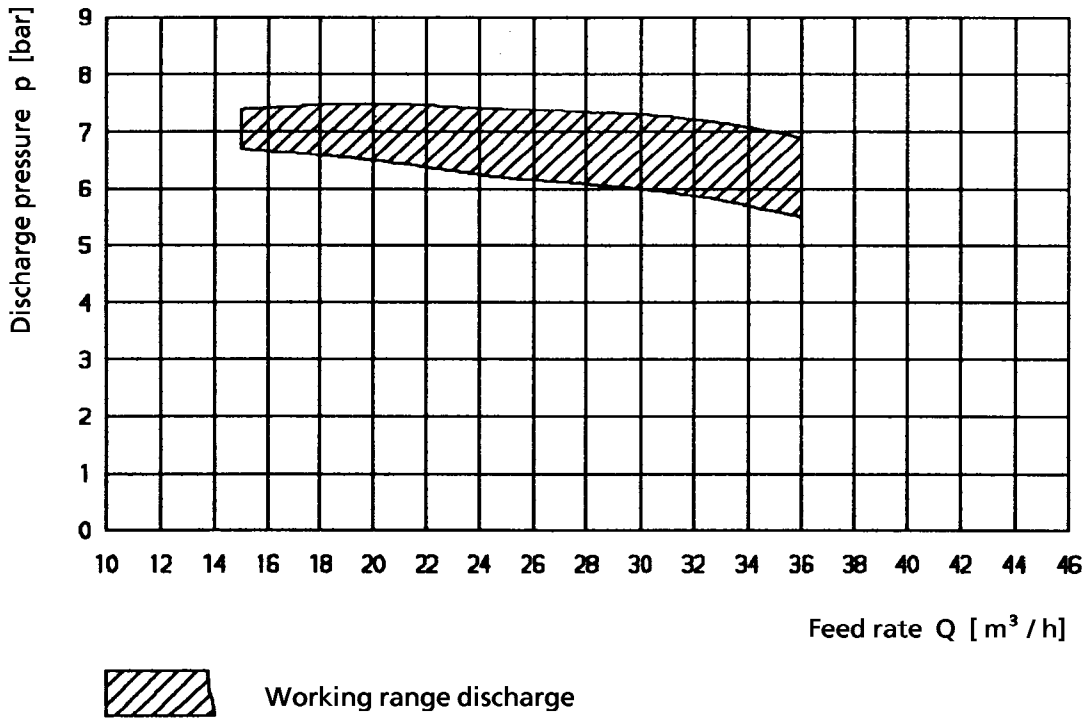
Locating electrical faults

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

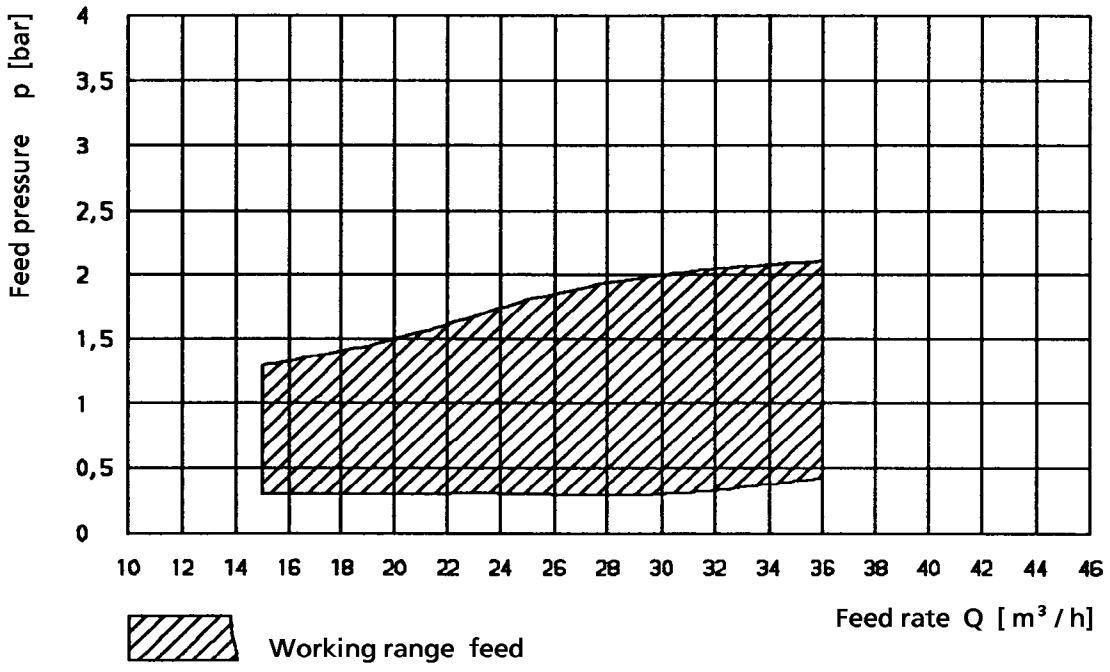
Fault	Cause	Remedies
Valve does not function.	Control unit defective.	Call Service Engineer.
	Faulty wire in connecting terminal.	Replace wire.
	Connecting terminal loose on terminal strip.	Tighten screw of connecting terminal.
	Poor contact to connecting terminal.	Clean contact or replace it.
	Coupler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

7 Operation

Centripetal pump characteristic curve



Feed characteristic curve



P1247003E

Fig.11 0

7.1 General

This chapter gives general instructions for operating the centrifuge. However, operation of the respective machine depends on the control unit used and the arrangement of the valves. Subject to process–specific modifications.

Note: Refer also to the instruction manual of the respective control unit.

7.2 Before start–up

Before starting the machine check that

- brake is released (turn handle clockwise).
- oil level is up to middle of 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
  - compressed air
  - cooling water
- timers on the control unit are set according to the instructions in the control unit manual to suit the respective operating conditions.
- metering device is adjusted.
- compressed air on the pressure reducer is adjusted to 4–5.

7.3 Start–up

- 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 function keys "product", ", "partial ejection" and "total ejection" are not released until the signal "motor in operation" is on (see LED in motor mimic display).
- Switch on the motor.
  After a pre–set delay time of 13 minutes, closing water is supplied automatically; the bowl closes.
- After a further three minutes water can be circulated as generally practiced in dairies.
- Switch–over from water to product.
  Press "separation" key on the control unit.
- Adjust discharge pressure as follows:
  - Throttle discharge pressure by means of constant pressure valve (approx. 3 – 4 bar) so that the product is discharged foamfree.
- The feed and discharge pressures must be within the working ranges marked in diagrams 1 and 2.
  - **If the pressure falls below the working ranges:**
    The hydrohermetic disk at the end of the lower feed tube rises above the liquid level. The product is therefore subjected to strong shearing forces on entering the lower distributor.
  - **If the pressures exceed the working ranges:**
    overflow of the centripetal pump occurs.

- The feed and discharge pressures are interlinked within the working ranges. A change in the discharge pressure leads to a change in the feed pressure and vice versa.

7.4 The separator in operation

At higher temperatures protein is increasingly precipitated from the milk. For this reason the temperature of 55°C should not be exceeded.

The back pressure in the downstream equipment must not exceed 3.0 bar in the discharge.

If, in spite of a low discharge pressure, overflow occurs, check if gaskets in the following places are damaged:

- in the centripetal pump chamber cover
- in the centripetal pump
- in the feed tube

Insufficient clarification can result from

- unfavourable pretreatment of the milk (pumps, agitator, very high temperature),
- soiled discs due to not enough ejections or too small ones
- changes in temperature, bowl speed, flow rate or discharge pressure adjustment.

Investigation of discharge samples:

Samples must always be taken directly after the separator at the screw coupling of the discharge line.

7.5 Ejection of the bowl

General

Solids ejection from the bowl must be carried out at periodic intervals in relation to the product and the process. The solids chamber of the bowl should not be filled to capacity. As soon as the separating or clarifying efficiency decreases, a partial ejection must be carried out.

7.5.1 Partial ejection

Partial ejection of the bowl during milk processing means partial emptying of the sediment space of the bowl. The product supply to the bowl is not interrupted during partial sediment ejection.

Separating time:	30	(clarification of milk)
	15 -30	(clarification of whey)
Ejection volume:	about 5	litres (clarification of milk)
	about10	litres (clarification of whey)

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

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

The quantity of opening water is adjusted at the metering unit.

For determining the ejected amount of solids, 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 ejection operations required during separation are carried out automatically according to a preset program by a control unit.

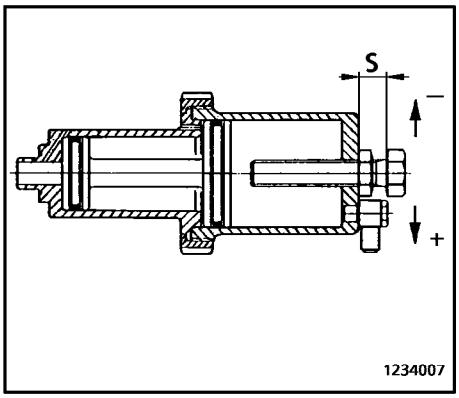


Fig. 111

Adjusting the amount of ejected solids

Adjustment by means of the regulating screw of the metering unit.

Turn regulating screw clockwise: reduce amount of ejected solids.

Turn regulating screw anti–clockwise: increase amount of ejected solids.

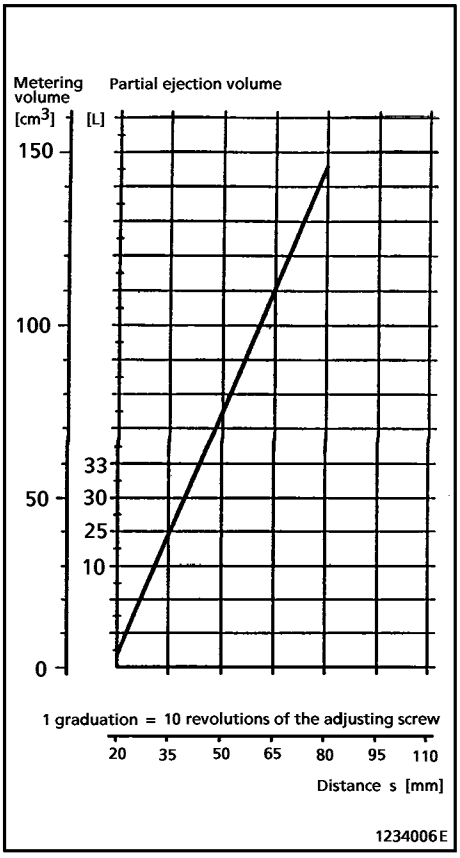


Fig. 11 2

Diagram for adjusting the opening–water volumes (guide value):

1 revolution of adjusting screw corresponds to 1.5 mm

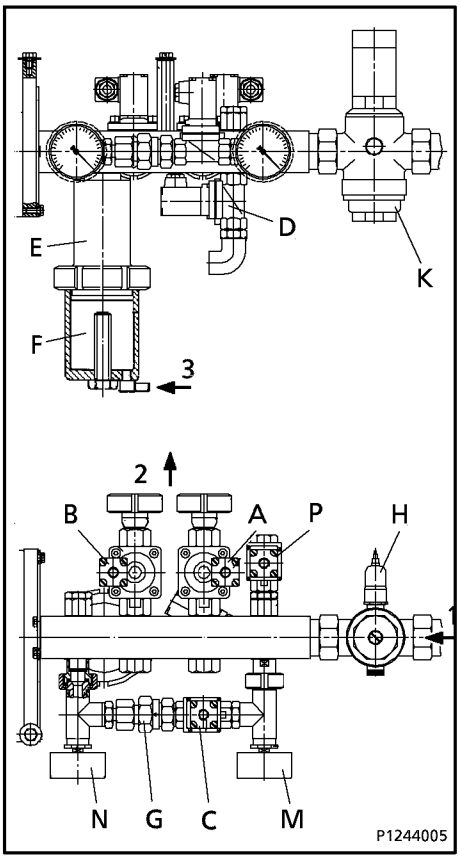


Fig. 11 3

Operational principles of the metering unit

The metering unit is filled with water after every ejection cycle via the filling–water valve C.

To perform a partial solids ejection, chamber F is supplied with compressed air.

By actuating opening water valve B, the adjusted quantity of water is forced out by the compressed air and fed to 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 flushing water
E Metering unit
F Air chamber
P Cooling–water valve (fluid clutch)

Program sequence

When the time "separation – partial ejection" adjusted at the respective timer has elapsed, a partial ejection takes place automatically and is repeated at regular intervals.

Before each partial ejection – this time can be set on timer "pre–flushing" – the solenoid valves A "closing water" and D "hood flushing water" open for 10 seconds. Water is injected into the hood to prevent the sediment to be ejected from sticking to the walls.

For sediment ejection the solenoid valve B "opening water" opens for 1 second. This time can be set on timer "partial ejection".

The solenoid valve A "closing water" remains open during ejection and 20 seconds afterwards. The time this valve is to remain open after the ejection cycle can be set on timer "subsequent flushing". It should be at least 20 seconds.

The "separation" program can be interrupted by operating push button "partial ejection" whereby a partial ejection is initiated. After this enforced partial ejection the "separation" cycle re–commences.

Setting of program times:
Program times **.sec** are process–related and must be set before start–up.

Program time	
Pre–flushing	approx. 10 secs Pre–flushing hood and solids collector.
Partial ejection	1 sec Determines the opening time of the opening–water valve. This time must be longer than the period of dispacement of the opening water from the metering unit. The amount of solids ejected depends on the volume adjusted in the metering unit.
Subsequent flushing	approx. 20 secs Flushing the hood and solids collector after an ejection.
Closing	5 secs Addition of closing water after an ejection.
Metering unit	3 sec Post–controlling of control air for the metering unit after partial ejection.
Filling water	2 sec Delay of the filling water supply following 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.

7.5.2 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.

7.5.3 Function diagram

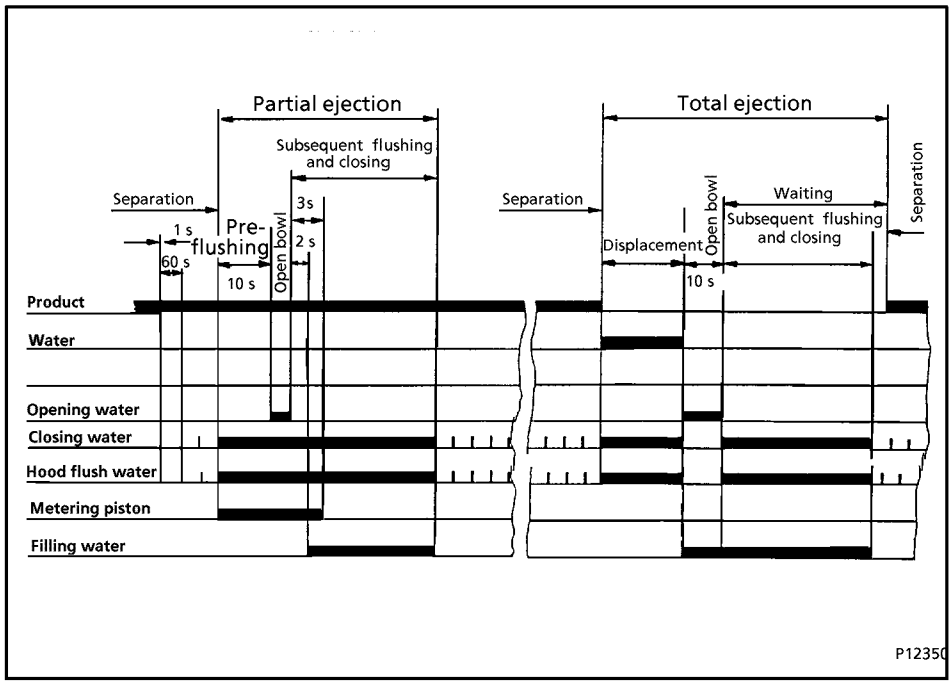


Fig.114

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

7.5.4 Bowl ejections (manual)

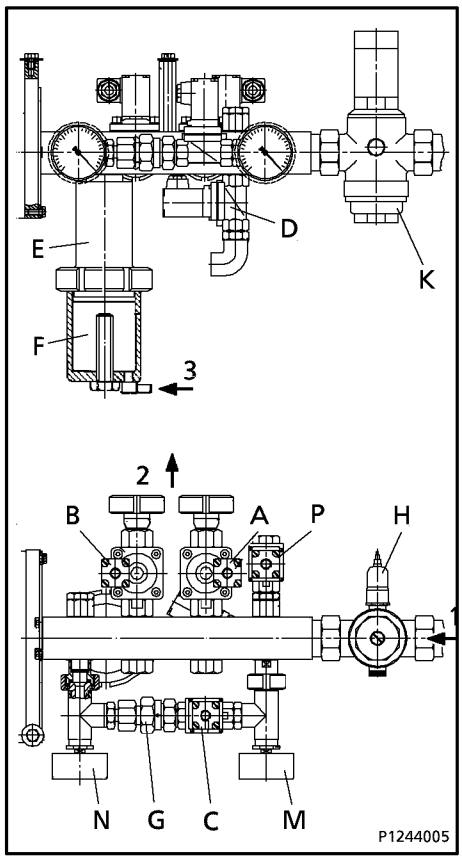


Fig.115

1 Water feed
2 to centrifuge
3 Air connection

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 unit
F Air chamber
G Non–return valve
H Pressure switch
M Pressure gauge
N Pressure gauge
P Solenoid valve for cooling water (clutch)

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

Partial ejection

Open closing–water valve and the solenoid valve for filling water manually by means of adjusting screw and screwdriver.

Open opening–water valve briefly (approx. 1 sec.).

After partial ejection leave closing–water valve open.

Total ejection

Stop product pump.

Open closing–water valve and the solenoid valve for filling water with a screwdriver.

Open opening–water valve until the ejection noise has subsided.
Then close opening–water valve and fill–up valve; leave the closing–water valve open.

After speed recovery, i. e. reaching operating speed re–start product pump 1 minute after total ejection.

7.6 Shutting down the separator

- Flush 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).
  - Flush hood after every ejection by pressing the key "overflow".
- Displace residual milk from the bowl with water.
- Flush the system thoroughly with water.
- Perform a total ejection by pressing the "Total ejection" key on the control unit.
- Switch off the motor.

- Apply the brakes by turning both handles counter-clockwise.
- **Do not loosen any part 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.

8 Cleaning

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

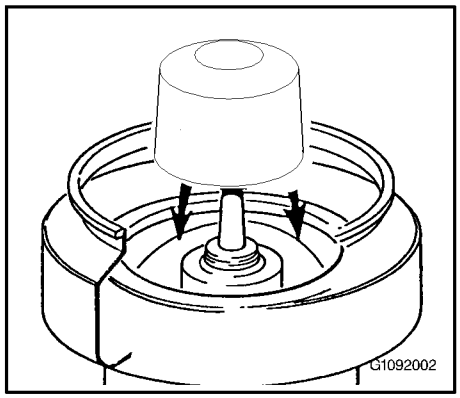


Fig. 116

- 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 Before a long-term shut-down

- Prior to a long-term shut-down, clean the separator thoroughly (8.2 and 8.3).
- The clean bowl parts and all unvarnished machine parts must be wiped dry and greased to avoid corrosion.
- Keep the bowl in a dry place until it is re-used.
- The gaskets should be kept in a cool, dry room, protected from dust and light, to prevent them from getting brittle.
- Drain the lube oil and fill the gear chamber with a slushing oil, e.g. SHELL Ensis oil 30, up to the oil level mark.
- Let the separator run without bowl for about 10 minutes to make sure that all gear parts are coated with the corrosion-preventing oil. Then drain the slushing oil.
- Oil upper end of spindle by hand and mount splash cover.
- Check water shut-off devices for leakage.
  If necessary, disconnect water supply lines to avoid damage caused by drip water.
- Switch off operating water supply at the mains to prevent inrush of water caused by inadvertent opening of the shut-off valve.
- Before re-starting the separator fill the gear chamber with the lube oil specified in section 3. The oil level must be slightly above the oil level mark. Then let the separator run without bowl for 10 minutes.

9 Drive

9.1 Dismantling the vertical gear parts

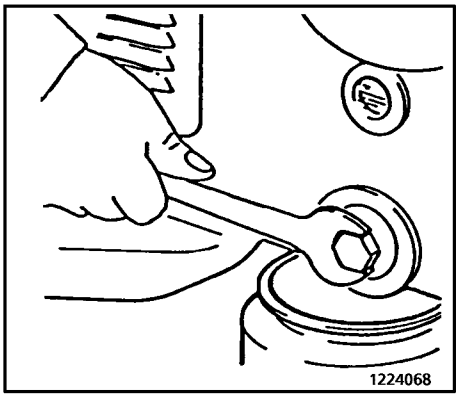


Fig. 117

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

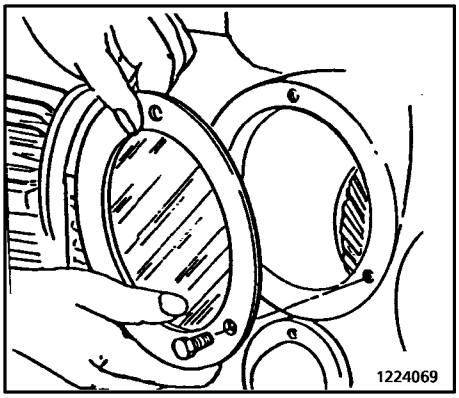


Fig. 118

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

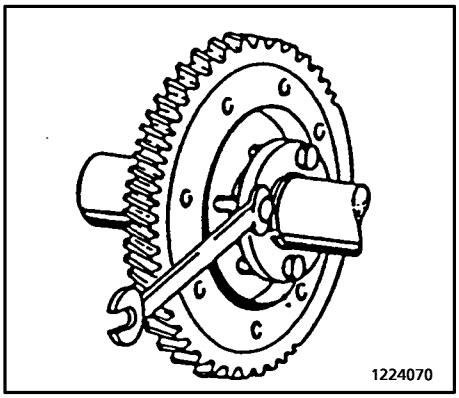


Fig. 119

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

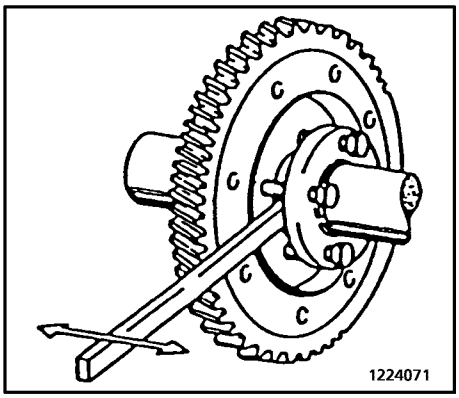


Fig. 120

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

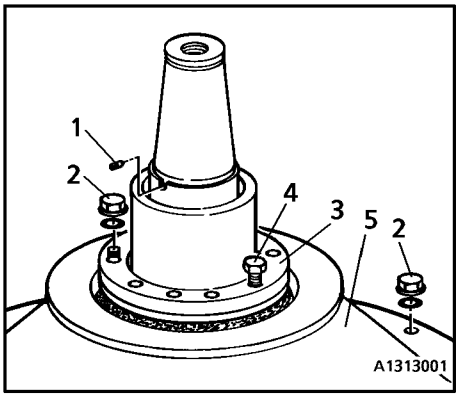


Fig. 1 21

- Unscrew Allen screws 1 out of sleeve/spindle.
- Unscrew cap nuts 2 of the operating water feeding device.
- Press off ring 3 with hex head screws 4 (M8) which are screwed into the two puller holes.

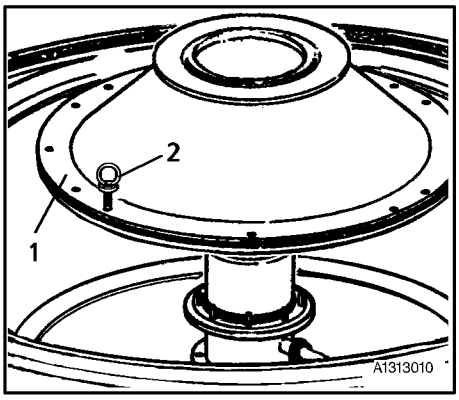


Fig. 1 22

- Lift off the protective housing 1 using two puller screws 2.

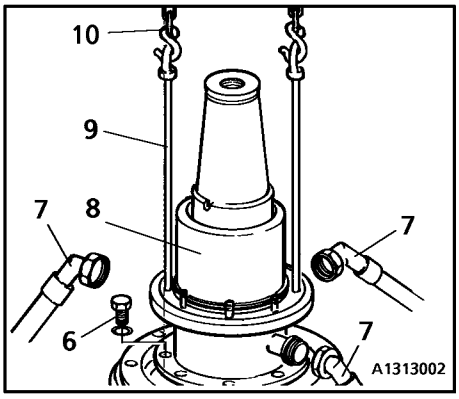


Fig. 1 23

- Unscrew hex head screws 6.
- Disconnect hoses 7 of the operating water feeding device.
- To pull the operating water 8 feeding device off the spindle:
  - Screw the threaded spindle of the puller device 9 into the taphole and
  - pull off using lifter 10.

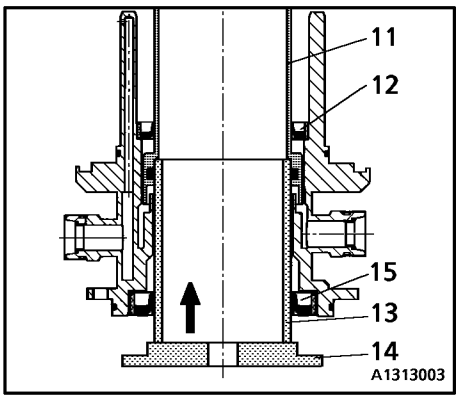


Fig. 1 24

- Dismantle upper sealing ring 12 and spindle cap 11 with sleeve 13 and centering 14.
- Force out the lower gasket 15 with a screwdriver.

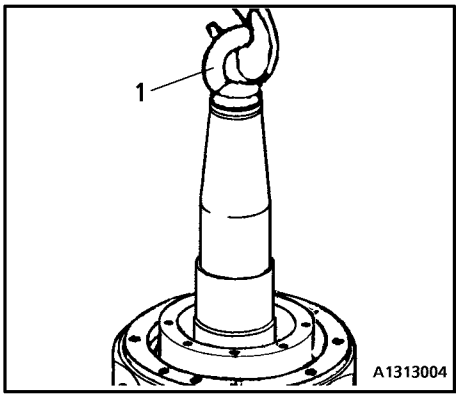


Fig. 1 25

- Pull out spindle upwards using spindle lifter 1.

9.1.1 Dismantling the neck bearing bridge

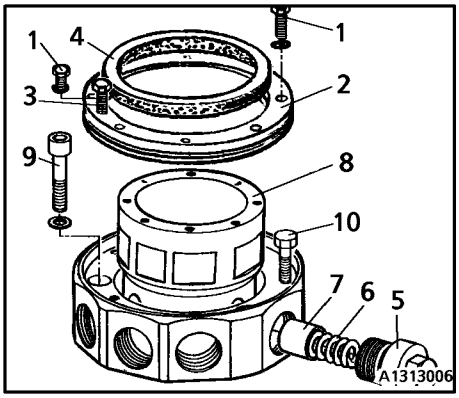


Fig. 1 26

- Undo screws on ring 2 and force off the ring.
- Dismantle gasket 4.
- Dismantle threaded plugs 5, springs 6 and spring pistons 7.
- Remove neck bearing pressure ring 8.
- Unscrew Allen screws 9.
- Force off neck bearing bridge using hex head screws 10.

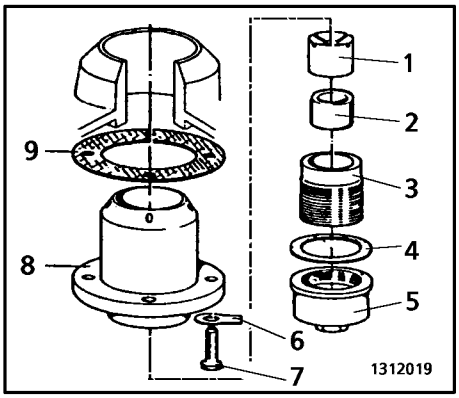


Fig. 1 27

- 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 tap-holes of bottom bearing housing
  - force out bottom bearing housing by pressing it downwards.

9.1.2 Removal of ball bearing and worm

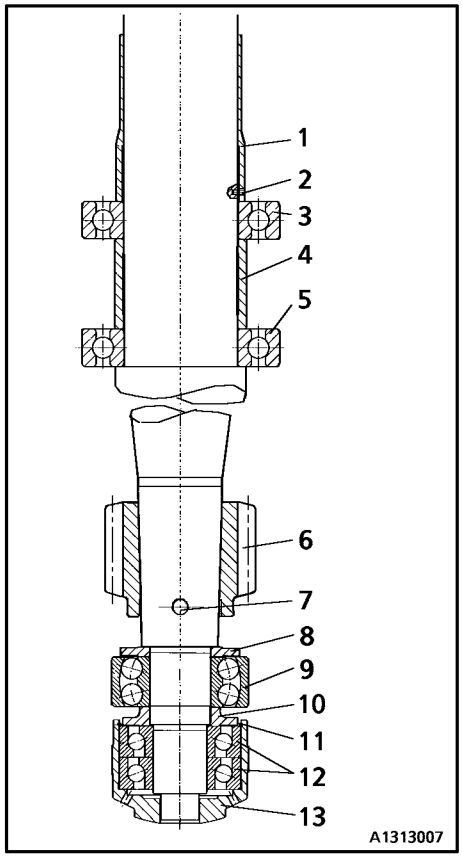


Fig. 128

- Pull out the following components using a commercially available puller:
  - Ball bearing protection ring 10, angular contact ball bearings 12 and bottom bearing housing 13,
  - Ball bearing protection ring 8 and pendulum ball bearings 9
  - Worm 6 (before removal, knock out cylindrical notched pin 7)
- Unscrew screw 2 and remove sleeve 1.
- Grooved ball bearings 3 and 5 and sleeve 4.
- Press snap ring 11 out of the groove of bottom bearing housing.
- Remove angular contact ball bearing 12 from bottom bearing housing 13.

9.2 Re–assembly of vertical gear parts

When re–assembling the vertical gear parts proceed in reverse order of removal (9.1), whereby sections 9.2.1, 9.2.2, 9.2.3 and 9.3 should also be noted.

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 5000 operating hours.
- Before fitting ball bearing and ball bearing protection ring 1 onto the spindle, heat these parts in oil to approx. 80 °C.
- The two angular contact ball bearings 10 must always be replaced together. Note that the angular contact ball bearings 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 damaged to bearings.

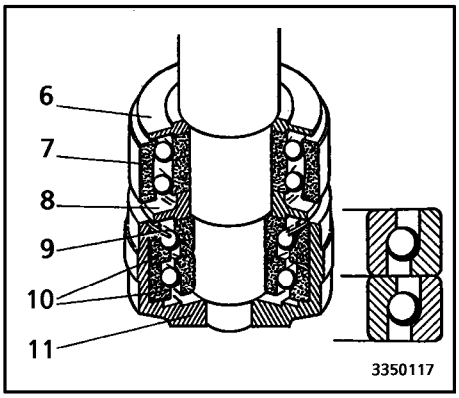


Fig. 1 29

For re–assembly proceed as follows:

- Slide the heated angular contact ball bearings onto the spindle.
- Slip snap ring 9 over the ball bearings.
- Let ball bearings cool down.
- Fit bottom bearing pressure housing 11 over the ball bearings.
- Press snap ring 9 into the groove of the bottom bearing pressure housing.

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

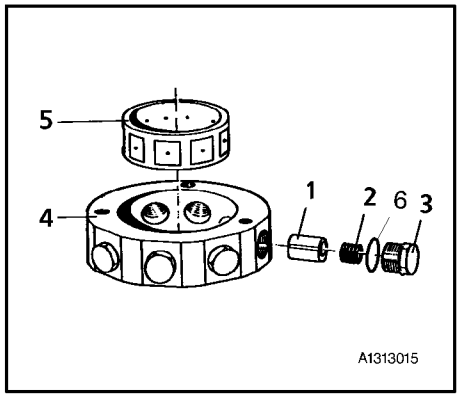


Fig. 130

- 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 plug 3 wth gasket 6 together with spring pistons 1 and neck bearing springs 2 into the neck bearing bridge and tighten until the pessure ring 5 is in its guide.

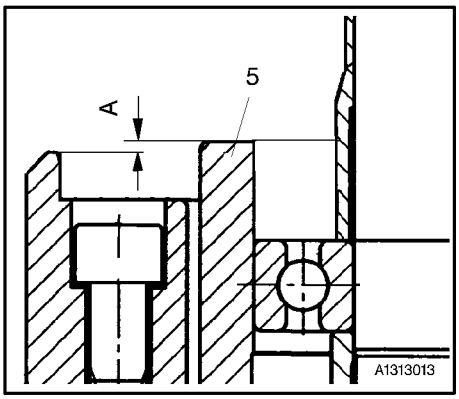


Fig. 131

- Align pressre ring 5 so that the dimension A between upper edge of neck bearing bridge and upper edge of pressure ring is 3 mm.
- Tighten threaded plug.

9.2.2 Fitting the spring column into the bottom bearing

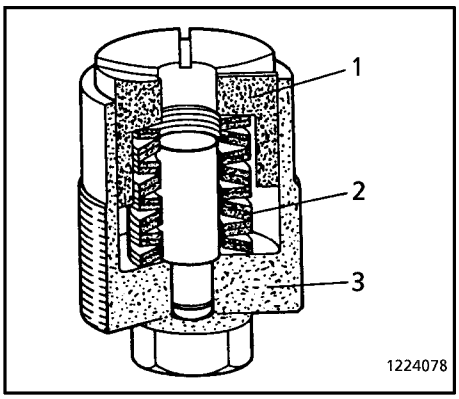


Fig. 132

- 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 Fitting the operating water feeding device

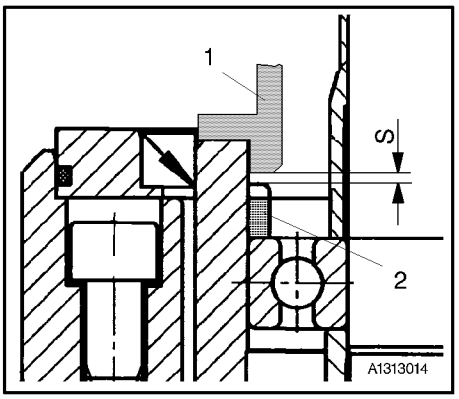


Fig. 133

- Before fitting the operating water feed 1 check the clearance s between the cams of the spacer ring 2 and the operating water feed 1.

  The clearance must be 0.2 - 0.5 mm!

  s < 0.2 mm - file off cams.

  s > 0.5 mm - Weld on cams or order new spacer ring from the factory stating the required cam height.

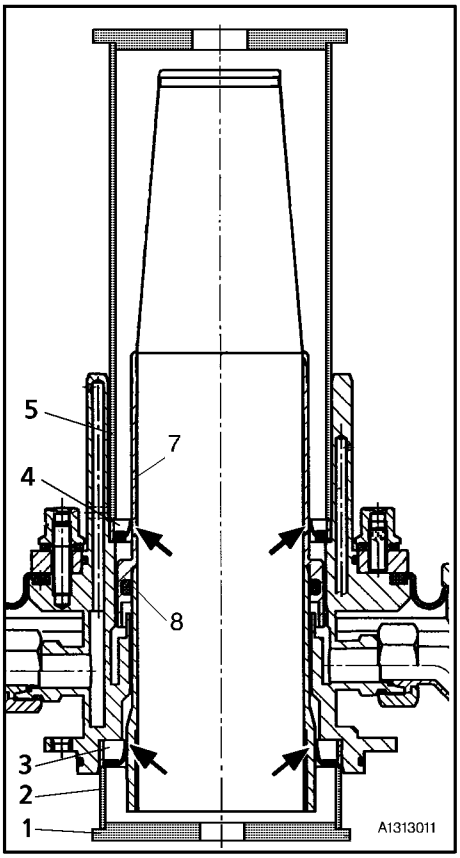


Fig. 134

Fitting the sealing rings:

- Fit lower sealing ring 3 into the operating water feed with sleeve 2 and centering disk 1.
- Assemble operating water feeding device.
- Fit sleeve 7 with O–ring seal 8.
- Fit upper sealing ring 4 with sleeve 5 and centering disk 1.

  Make sure the sealing rings are positioned correctly! (see arrows)

- Then proceed in reverse order of removal.

9.3 Bowl Height

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

9.3.1 Inspection

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.

Prerequiste 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.

Whenever work has been carried out on the vertical gear parts, the clearance of the centripetal pump must be checked!

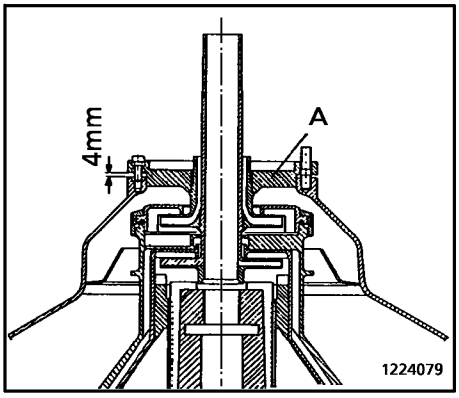


Fig. 135

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
< 5 mm, bowl is too low.
> 6 mm, bowl is too high.

9.3.2 Adjusting

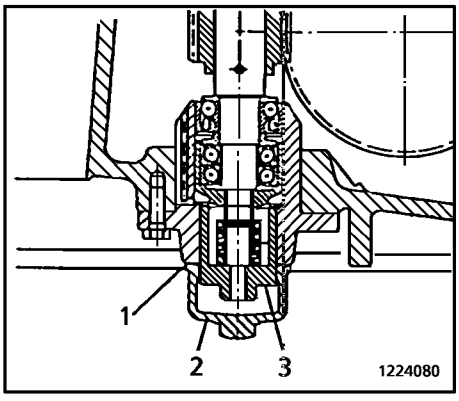


Fig. 136

- 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.

After adjusting the bowl height, the distance between the cams of the distance ring and the pressure ring (see fig. 133)must be checked!

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

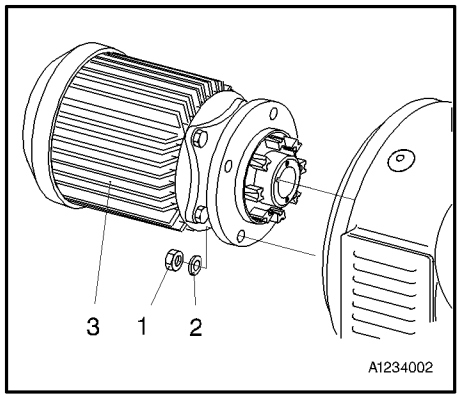


Fig. 137

- Remove motor protecting hood.
- Disconnect the motor and suspend it in hoist.
- Unscrew hexagon nut 1 and take off lock washer 2.
- By means of hoist lift off the motor 3 together with the cam hub.

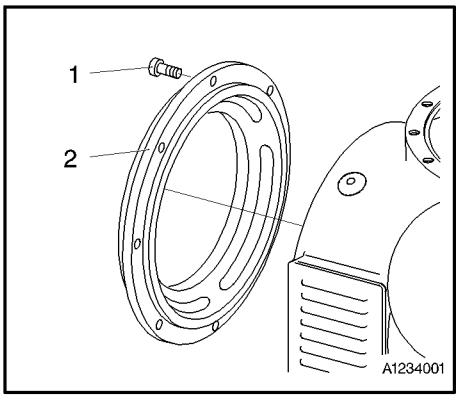


Fig. 138

- Unscrew Allen screw 1 and take off flange 2.

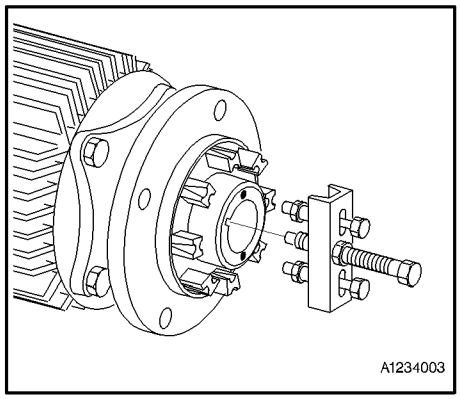


Fig. 139

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

9.4.2 Removing the fluid clutch

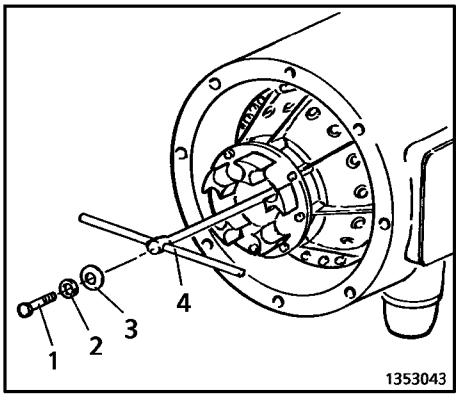


Fig. 1 40

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

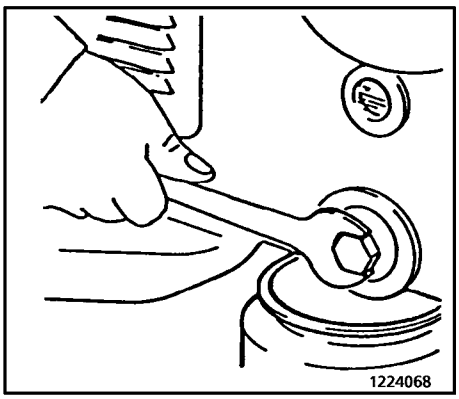


Fig. 1 41

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

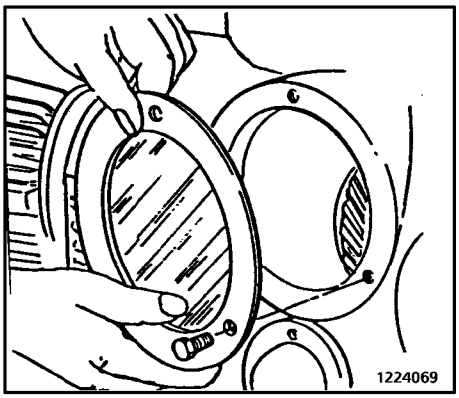


Fig. 1 42

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

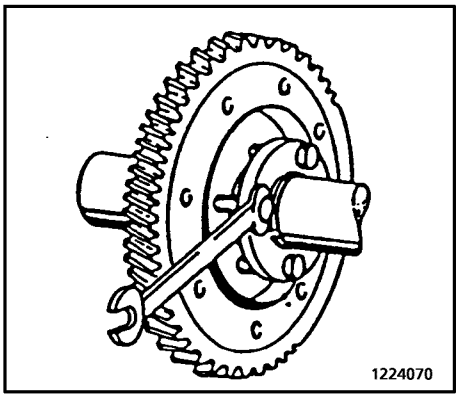


Fig. 1 43

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

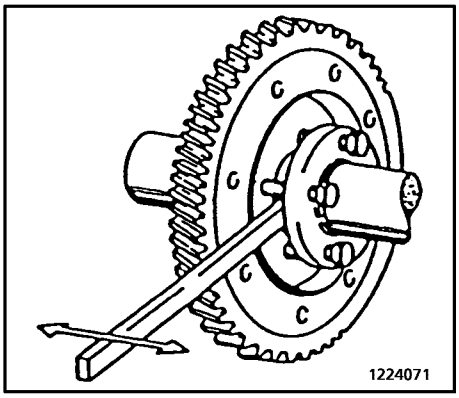


Fig. 1 44

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

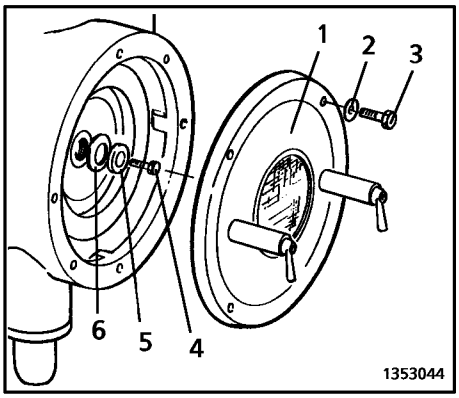


Fig. 1 45

- 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)

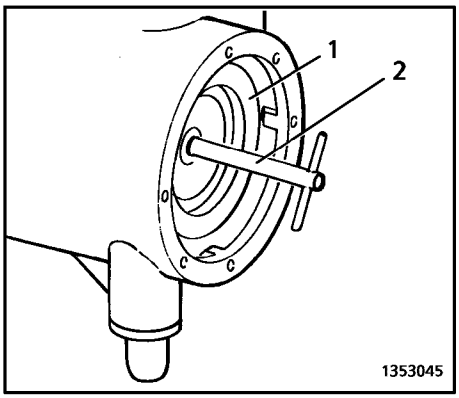


Fig. 1 46

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

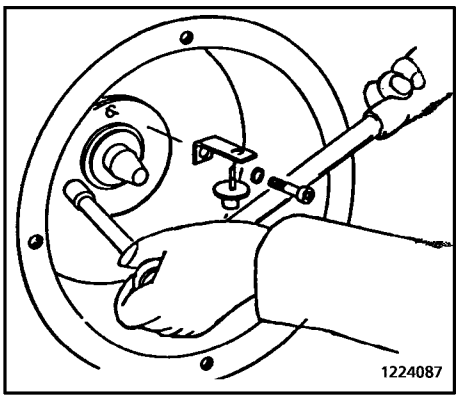


Fig. 1 47

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

Tools:
Torque wrench
Hexagon socket (SW 8 mm)

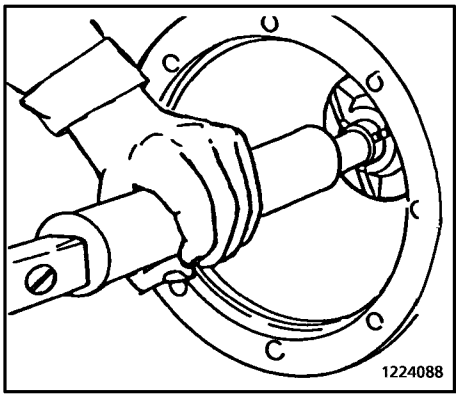


Fig. 1 48

- 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)

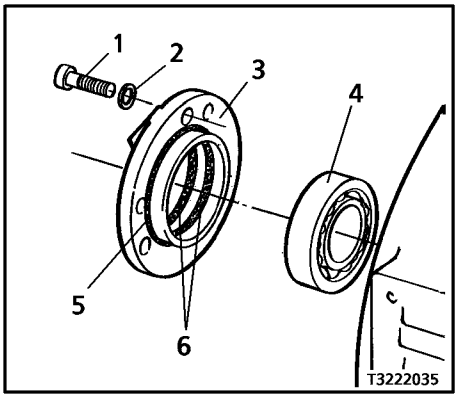


Fig. 1 49

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)

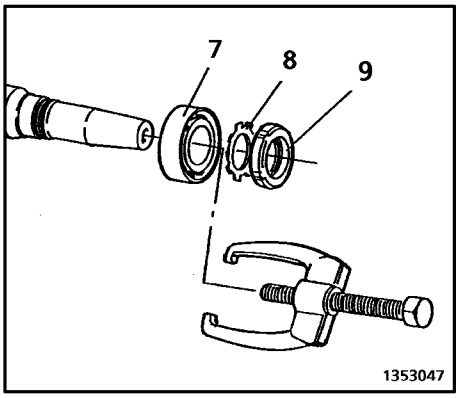


Fig. 1 50

- 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

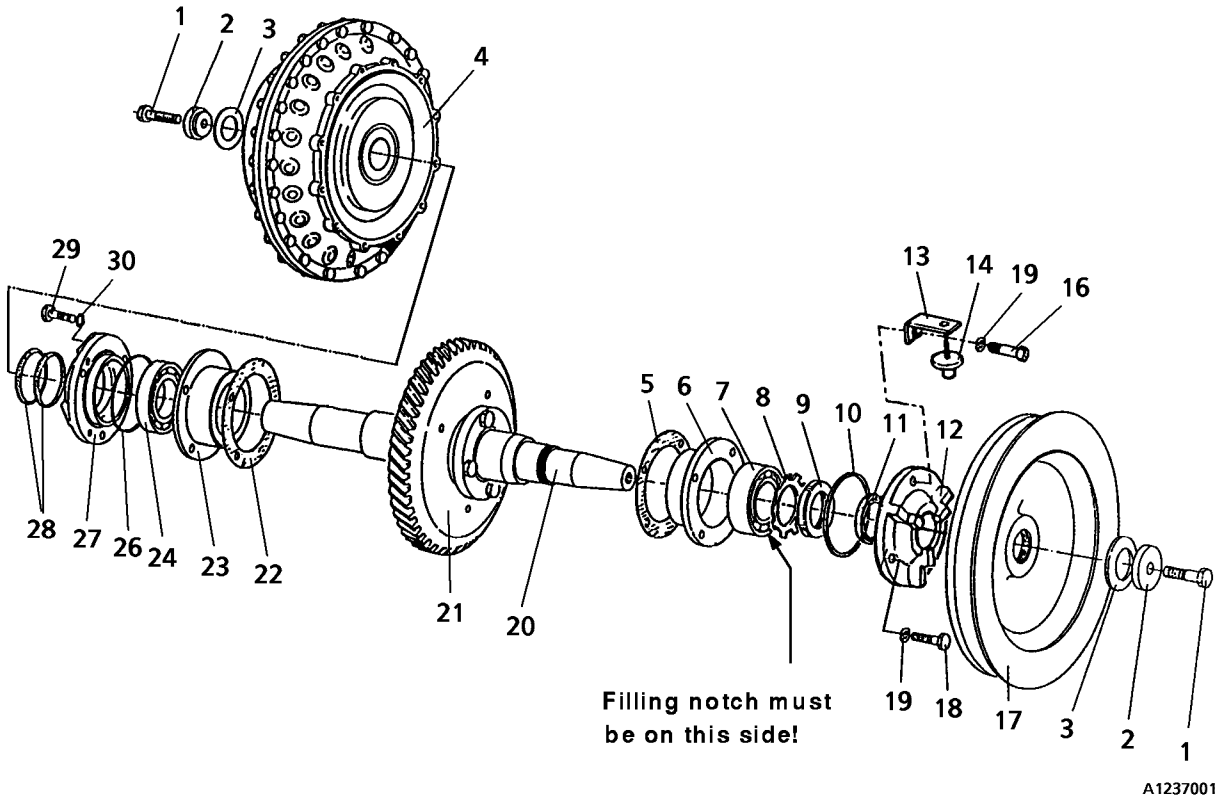


Fig. 1 51

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.

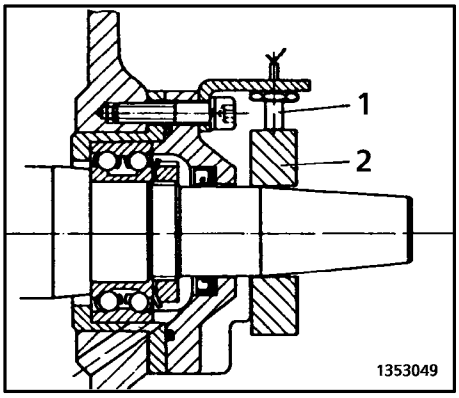


Fig. 1 52

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

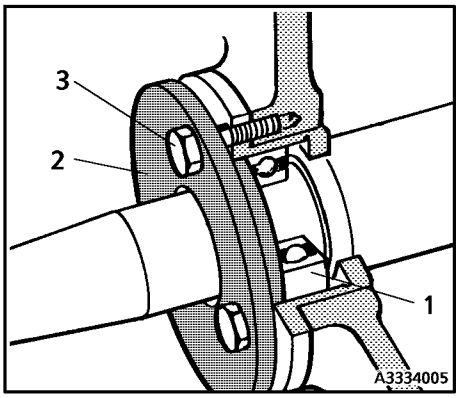


Fig. 1 53

- 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.

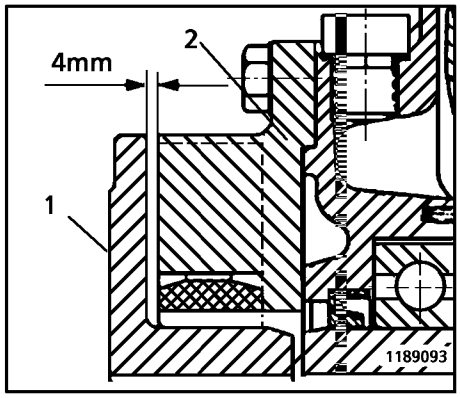


Fig. 154

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 tachomter 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

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:
• starting time of bowl too long • excessive slippage • clutch temperature too high	• starting time of bowl too short • excessive load on motor

- 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!**

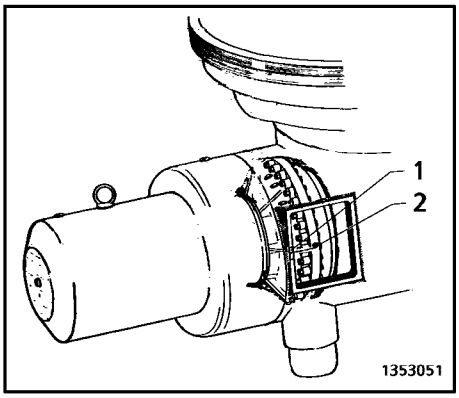


Fig. 1 55

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)

- Thead 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).
- Thead 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^2/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 - steel	 degree of corrosion 2 – 100 A3 according to DIN 51759 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

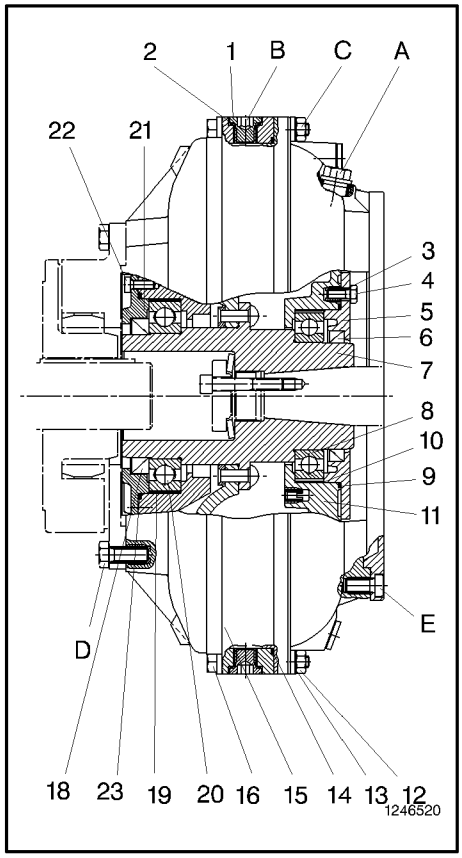


Fig. 1 56

Normally, the fluid clutch has to 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.

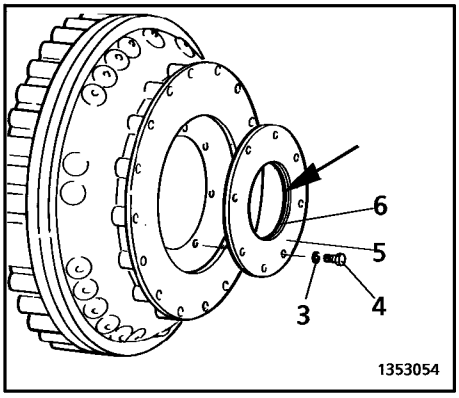


Fig.1 57

Removing sealing ring 6

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

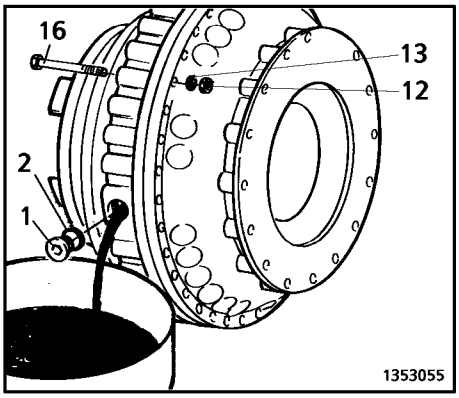


Fig. 1 58

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.

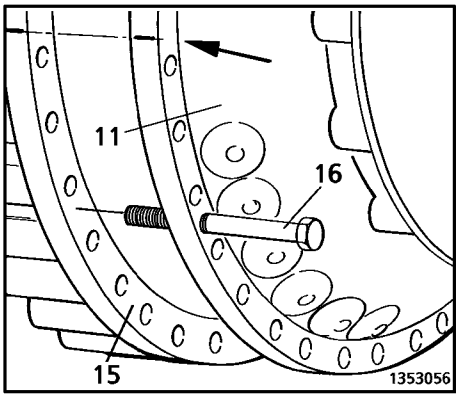


Fig. 159

- 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)**

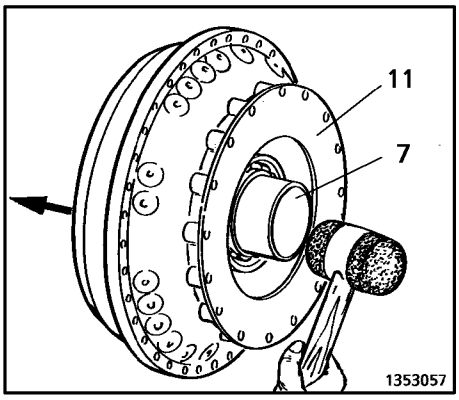


Fig. 160

- 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).

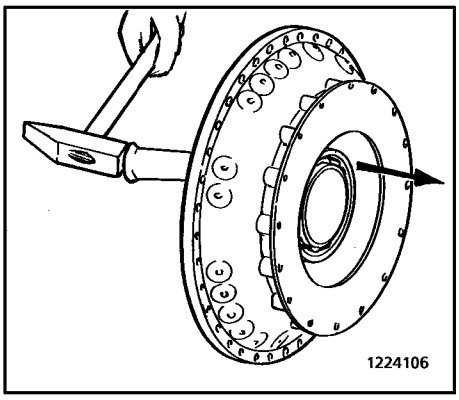


Fig. 161

- 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 oft and pliable.
- Drive ball bearing 20 out of the clutch casing using a mandrel and hammer.

10.6 Assembling

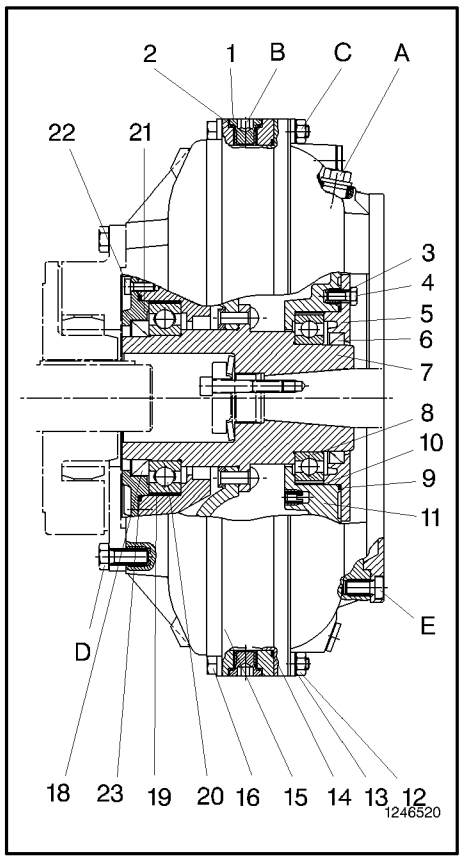


Fig. 162

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.

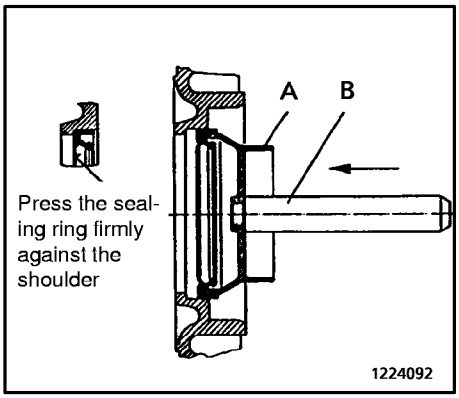


Fig. 163

- 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.

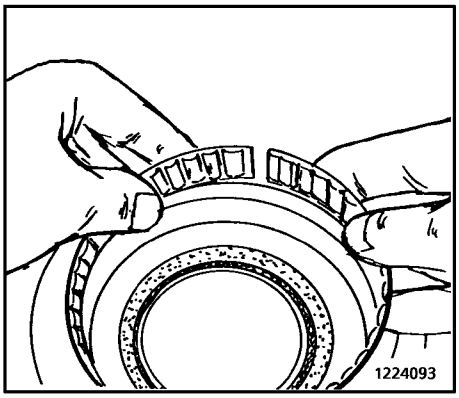


Fig. 164

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

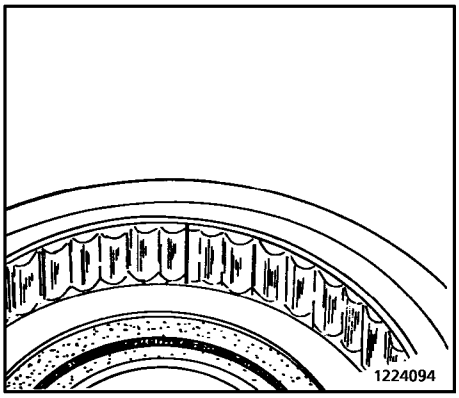


Fig. 165

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

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 *firmly*. 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.	Incomplete solids ejection. The remaining solids have deposited unevenly in the bowl.	Perform several partial ejections (7.5.1). 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 .
	Bowl is not properly assembled or, if plant has several separators, parts of different bowls may have been interchanged.	Assemble bowl properly (see 5.4).
	Tension of disc stack has slackened.	Make sure bowl lock ring is screwed on tightly (see 5.4). Check number of disks. If necessary, add spare disc or compensating disc.
	Bowl is damaged and, therefore, out of balance.	Send bowl to factory or authorized factory repair shop. **Do not attempt to make your own repairs.** Never weld or solder. Bowl is made of heat-treated steels.
	Neck bearing springs are weak or broken.	Replace all 9 neck bearing springs.
	Ball bearings are worn.	Replace damaged bearings. **IMPORTANT:** When replacing, use only the high precision ball bearings as specified in the Parts List.

Fault	Possible causes	Remedies
Uneven run of the separator (cont'd.).	Gear parts are in bad condition as a result of	Clean gear chamber thoroughly (see 8.5).
	1. normal wear,	Replace damaged gear parts (see 9.1 and 9.4).
	2. premature wear caused by: a) lack of oil [1] b) oil of too low a viscosity, [1] c) metal abrasives present in the lubricating oil due to the following possible causes: - viscosity of oil is too low, - oil has not been changed in time, - gear chamber has not been cleaned, d) replacement of one gear part only, instead of both parts.	Change oil (see chapt. 3). If necessary, change oil more often.
	[1] in general, recognized by blue tempering colour of gear parts.	
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.

11.2 Fault detection – Ejection

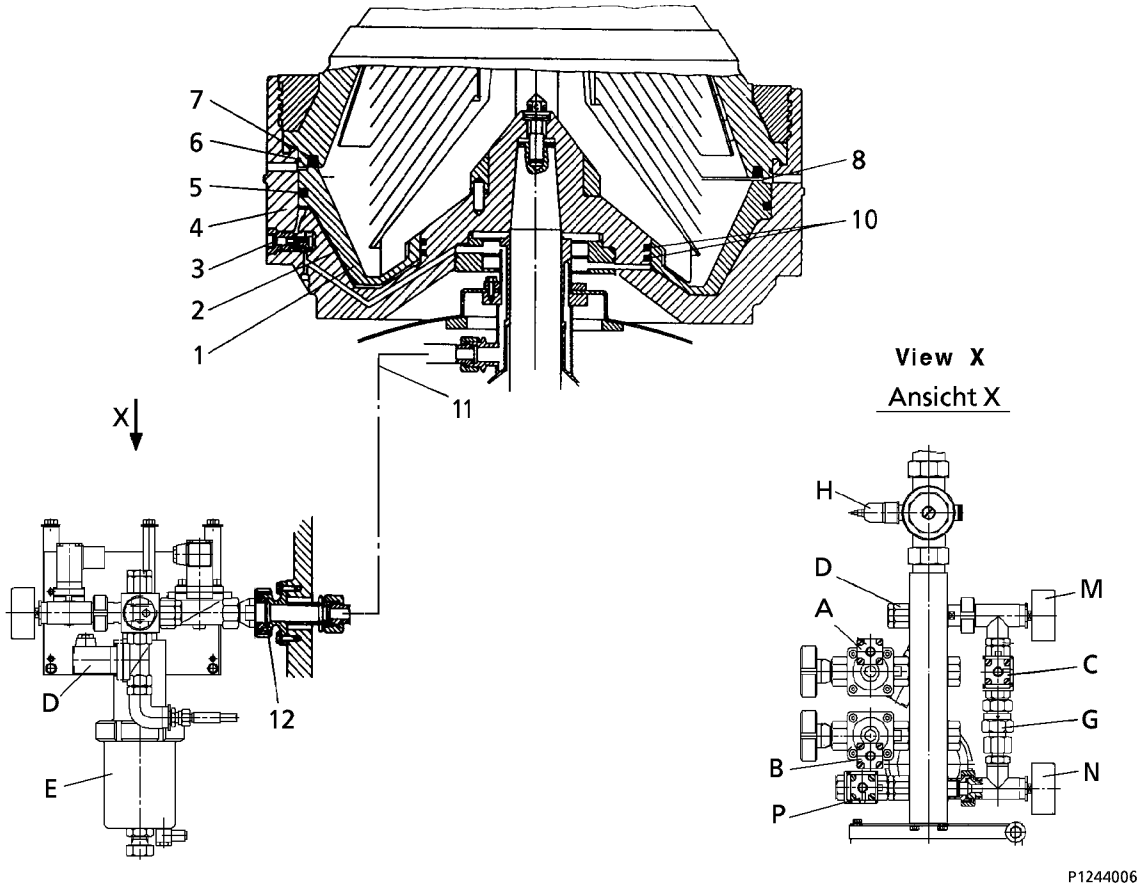


Fig.166– Bowl and operating–water feed system

1	Sliding piston	**A**	Closing-water valve
2	Closing chamber	**B**	Opening–water valve
3	Bowl valve	**C**	Filling–water valve
4	Bowl bottom	**D**	Hood flushing-water valve
5	Gasket	**E**	Metering unit
6	Gasket	**G**	Non-return valve
7	Gasket	**H**	Pressure switch
8	Sealing surface – sliding piston	**M**	Pressure gauge
10	Gaskets	**N**	Pressure gauge
11	Operating–water feed	**P**	Cooling-water valve (fluid clutch)
12	Gasket		

Fault	Possible causes	Remedies
The bowl does not close at all. **IMPORTANT:** In this case switch off feed pump immediately.	The amount of closing water fed to the bowl is insufficient because	a)
	a) the water pressure in the supply line to the operating–water con nection is too low (see 6.4).	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.
	b) the water discharge holes in the top of the operating–water feed 11 are clogged with scale.	Clean discharge holes.
	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.
	The bowl receives no or too little opening water for the following reasons (check gauge M does not indicate): a) non–return valve F is dirty or defective,	Clean or replace non–return valve.
	b) solenoid valve A or C is defective,	Replace solenoid valve.
	c) air pressure for metering unit D is too low,	Increase air pressure to ≥ 4.5 bar.
	d) control periods of solenoid valves are not adjusted correctly.	Check adjusting periods of timers on control unit (see function diagram). Check adjusting periods of timers on control unit (see function diagram).

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12 Lubrication and maintenance

12.1 Lubrication chart

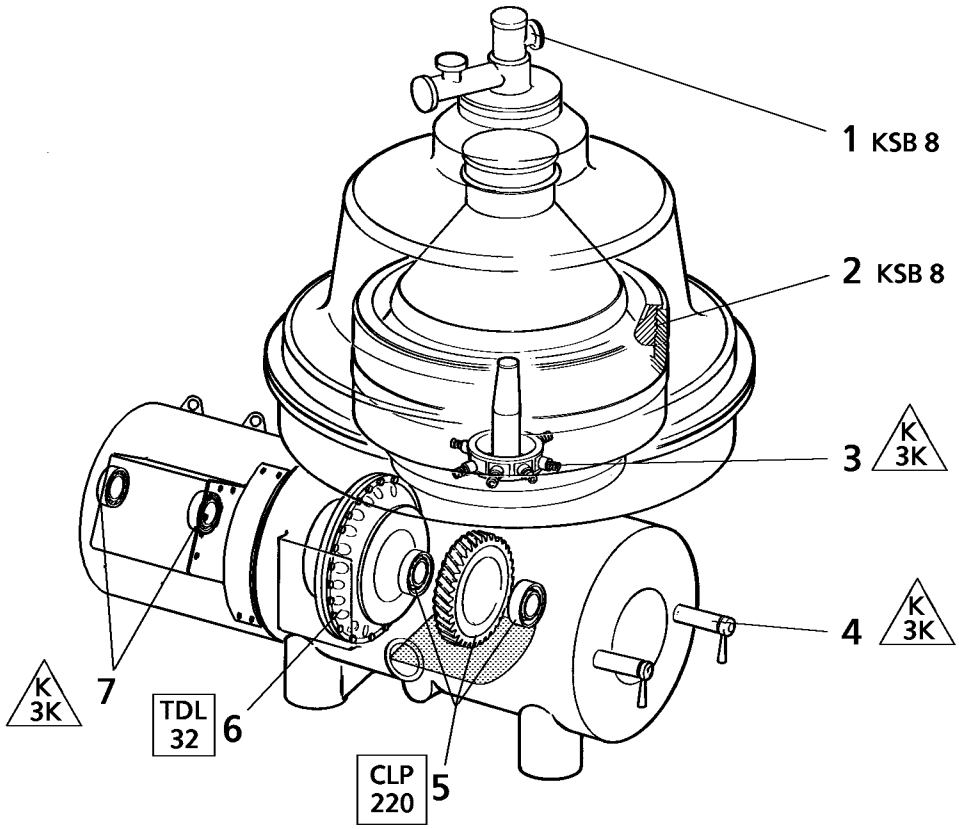

Fig.1 67

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^3	Threads and fittings
2	Klüber Grease KSB 8			before each assembly	150 cm^3	Threads and sliding surfaces of bowl
3	Roller bearing grease K3K		2	1 500	20 cm^3	Neck bearing springs and spring pistons
4	Roller bearing grease K3K		2	1 500	10 cm^3	Manually–operated parts (brake bolt, valves, etc)
5	Lubricating oil CLP 220 DIN 51502	CC 220	2	500	5 500 cm^3	Gear chamber
6	Steam turbine oil TDL 32 DIN 51515			10 000	6 250 cm^3	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
LUBRICATION CHART										
●						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.			
CLEANING										
●						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.				
INSPECTION										
●						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.				
REPLACEMENTS										
				●		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.

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13 Parts list

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Important hints for ordering parts

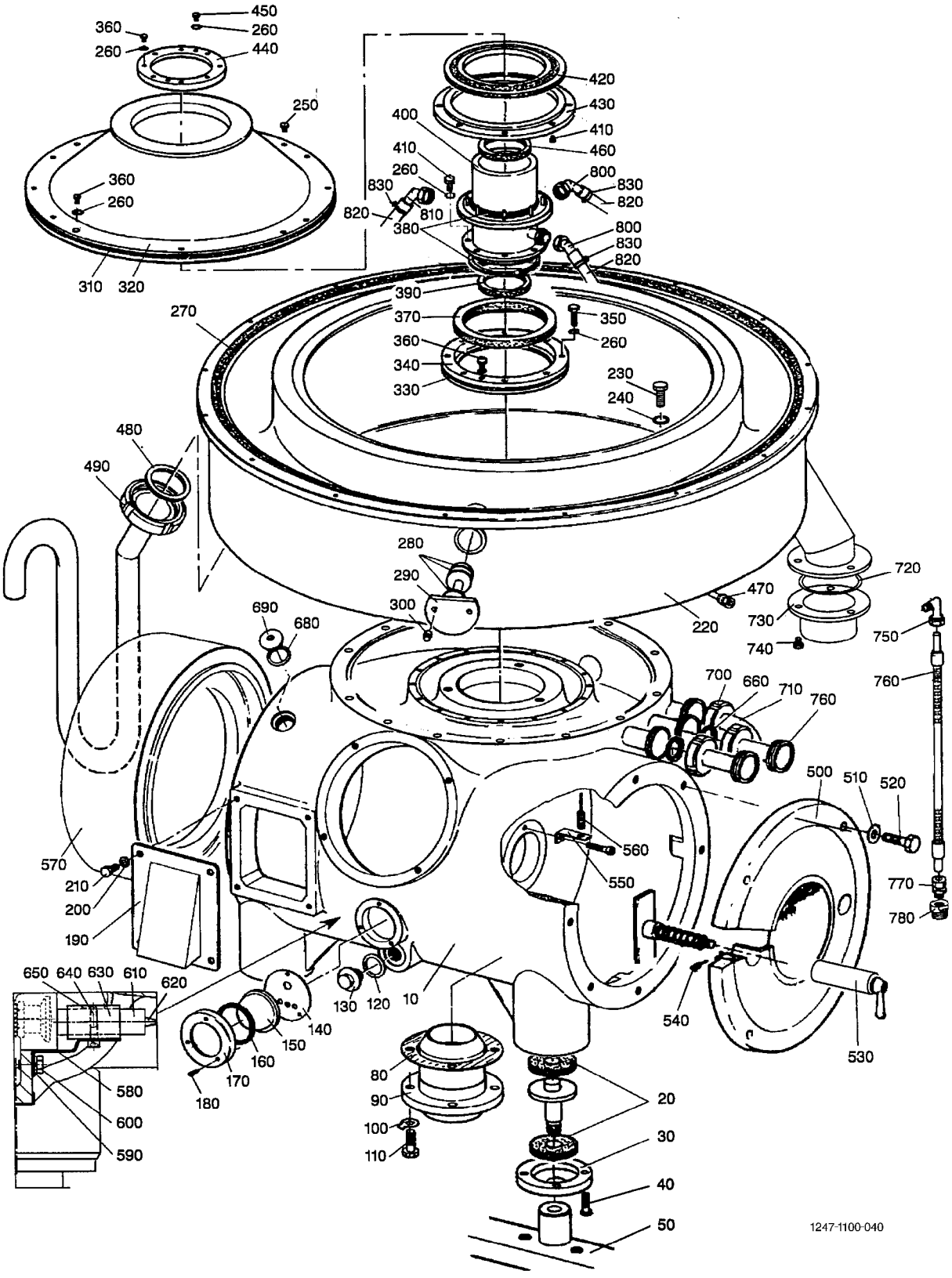
To ensure correct delivery when ordering parts, please state the following:

- Model of separator — see name-plate
  e.g. MSE 140-06-076
- 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.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1247-1100-040

Fig.1 68

Pos.	Part-No.	Qty.		Part description	Dimensions
	1247-1100-040			**Frame, complete**	
10	1313-1006-000	1		Lower section of frame, compl.	
20	0021-3018-750	8		Rubber-metal cushion	30X92X20
30	3222-1079-000	4		Cover	
40	0019-6513-300	24		Hex head screw	M10X45
50	1313-1020-010	1		Foundation frame compl.	
80	0004-5793-770	1		Gasket	130X204X0
90	3050-1112-020	1		Bottom bearing housing	
100	0026-5894-400	4		Tab washer	17
110	0019-7038-400	4		Hex head screw	M16X45
120	0004-5294-780	1		Gasket	27X48X1
130	0019-0840-400	1		Screw plug	R3/4IN
140	0004-5406-750	1		Gasket	110X3
150	0001-0028-800	1		Sight glass	80-70
160	0004-5056-780	1		Gasket	70X80X1
170	0001-0022-400	1		Sight glass holder	72
180	0019-6845-400	3		Hex head screw	M6X25
190	3350-1085-010	1		Ventilating plate	
200	0026-1371-400	4		Disk	13
210	0019-6966-400	4		Hex head screw	M12X20
220	2294-1018-020	1		Solids collector, welded	
230	0019-7037-400	15		Hex head screw	M16X40
240	0004-2509-400	15		Gasket	UA22X16X1,5
250	0019-6906-400	8		Hex head screw	M8X25
260	0004-2873-400	35		Gasket	UA12X8,2X1
270	0004-2389-608	3,700		Packing cord	10X16
280	0007-1907-750	3		Gasket	49X3,5
290	1313-1183-010	1		Plug	
300	0013-0404-400	2		Cap nut	M 8
310	0007-3032-750	1		Gasket	568X6
320	1313-1262-000	1		Protective cover	
330	0007-2574-750	1		Gasket	218,5X4,5
340	1313-1157-020	1		Ring	
350	0019-6907-400	4		Hex head screw	M8X30
360	0019-6897-400	6		Hex head screw	M8X8
370	0004-2677-750	1		Sealing ring	AS160X190X15
380	0007-2648-750	2		Gasket	120X3
390	0004-2719-850	1		Sealing ring	HN2380-1-84,7X1
400	1247-1219-000	1		Operating water feeding system	
410	0019-6901-400	15		Hex head screw	M8X16
420	0004-2871-820	1		Membrane	156X222X16
430	3370-1157-020	1		Ring	
440	1313-1157-010	1		Ring	
450	0019-6903-400	8		Hex head screw	M8X20
460	0004-2654-850	1		Sealing ring	HN2380-1-80X1
470	0007-2003-750	1		Gasket	9X1,5
480	0007-2212-750	1		Gasket	G 65
490	1313-2775-010	1		Siphon, compl.	

Pos.	Part-No.	Qty.		Part description	Dimensions
500	3170-1065-020	1		Fan cover, compl.	
510	0026-1335-400	4		Disk	17
520	0019-6608-400	4		Hex head screw	M16X60
530	3170-1043-000	2		Brake, complete	
540	0019-8974-150	2		Threaded pin	AM8X16
550	1168-1192-000	1		Angle	
560	0005-0964-000	1		Proximity switch	NJ2-11-SN-G
570	as per order	1		Intermediate flange	
580	3019-1192-000	1		Angle	
590	0026-1325-300	2		Lock washer	B 8
600	0019-6901-300	2		Hex head screw	M8X16
610	0005-0973-000	1		Proximity switch	NJ10-22-N-E93-Y3
620	0005-3634-020	1		Connecting cable	V1-G-N-5M-PUR-2X
630	0005-0188-900	1		Clamp holder	4-342
640	0019-6111-150	2		Allen screw	M6X30
650	3019-1162-000	2		Nut	
660	0007-2208-750	3		Gasket	G 25
670	0018-6278-400	2		Transition piece, compl.	25
680	0007-2229-750	1		Gasket	40X48X
690	0019-1748-400	1		Screw plug	40X1/14INX10
700	0013-2842-300	1		Grooved coupling nut	F25
710	0018-1608-300	1		Pipe bend	25
720	0007-2113-750	1		Gasket	94X104X
730	1226-1045-000	1		Pipe socket, welded	
740	0019-6968-300	3		Hex head screw	M12X25
750	0018-2483-400	1		Angular screw coupling	GL8
760	0018-1870-310	1		Low-pressure hose	N1BE8-L-600
770	0018-3465-400	1		Screw coupling	DL8
780	0018-0999-400	1		Reducer	1/2INX1/4IN
790	0005-0211-900	2	*	Screw coupling	PG7X3-6,5
800	0018-6295-400	3		Connecting nipple	A25-DN16
810	0018-6294-400	3		Connecting nipple	A35-DN16
820	0018-6293-758	2		High-pressure hose	2TE-16
830	0018-5318-300	6		Hose clip	AL20-32

* This item is not illustrated in the drawing.

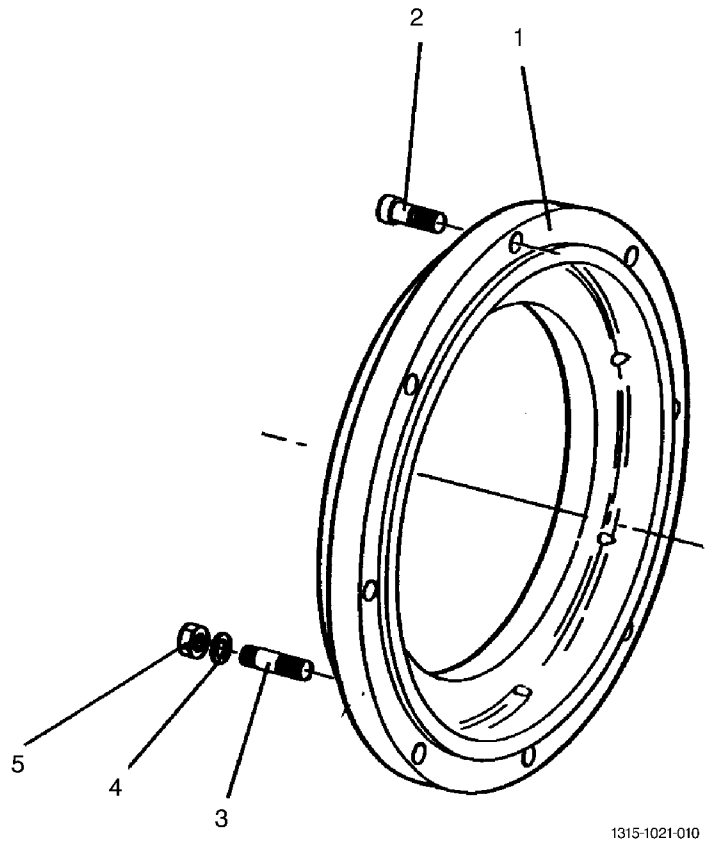

Fig.169

Pos.	Part-No.	Qty.		Designation	Dimensions
-	**1315-1021-L**	**1**		**Intermediate flange, complete**	
1	1166-1028-L	1		Intermediate flange	
2	0019-6202-150	8		Allen screw	M16X45
3	0019-7726-150	8		Stud	M16X40
4	0026-1330-190	8		Lock washer	A16
5	0013-0282-400	8		Hexagon nut	M16

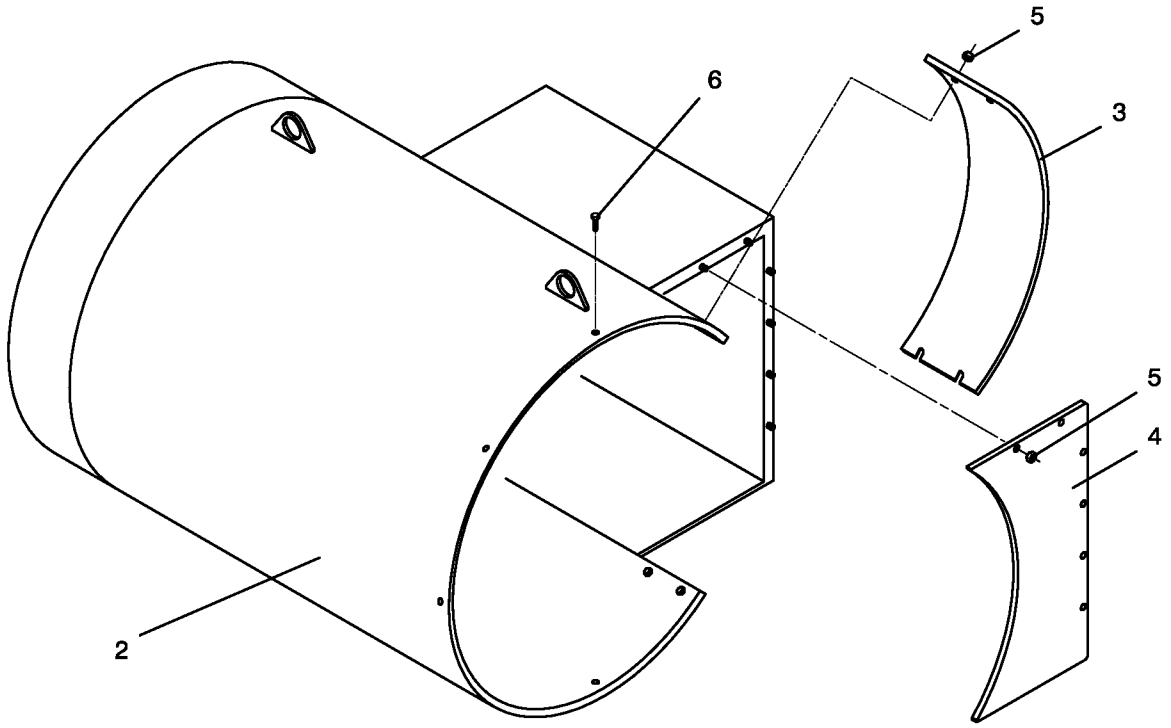

Fig. 170

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

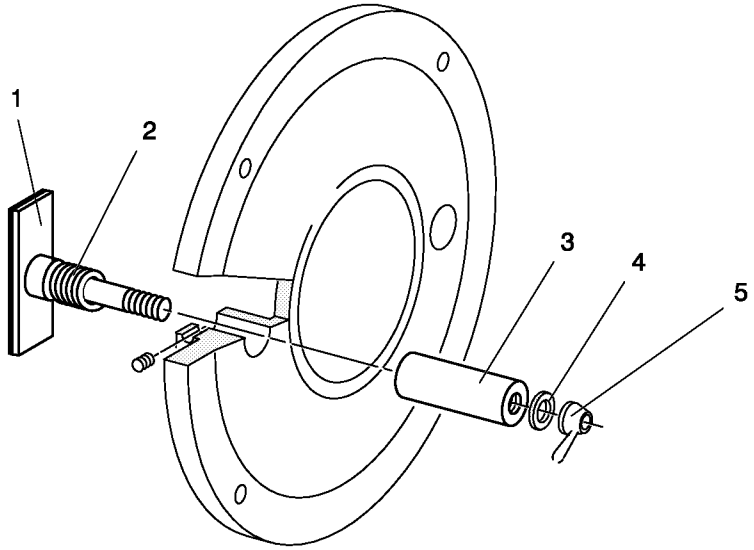

Fig. 171

Pos.	Part-Number	Quantity		Part Description	Dimensions
–	**3170-1043-000**	**1**		**Brake, complete**	
1	3170-1031-000	1		Brake bolt, compl.	
–	0021-4096-850	1		Brake lining	50X150X6
–	0026-1263-550	4		Rivet DIN 661	4X16
–	0026-1086-400	1		Cylindrical pin ISO 2338	B-6X14
2	0006-4208-160	1		Cylindrical pressure spring	29X3.5X83
3	0021-3537-300	1		Brake housing	32X42X123
4	0004-1914-720	1		Gasket	17.5X25.5X2
5	0021-3514-300	1		Tapered handle	M16

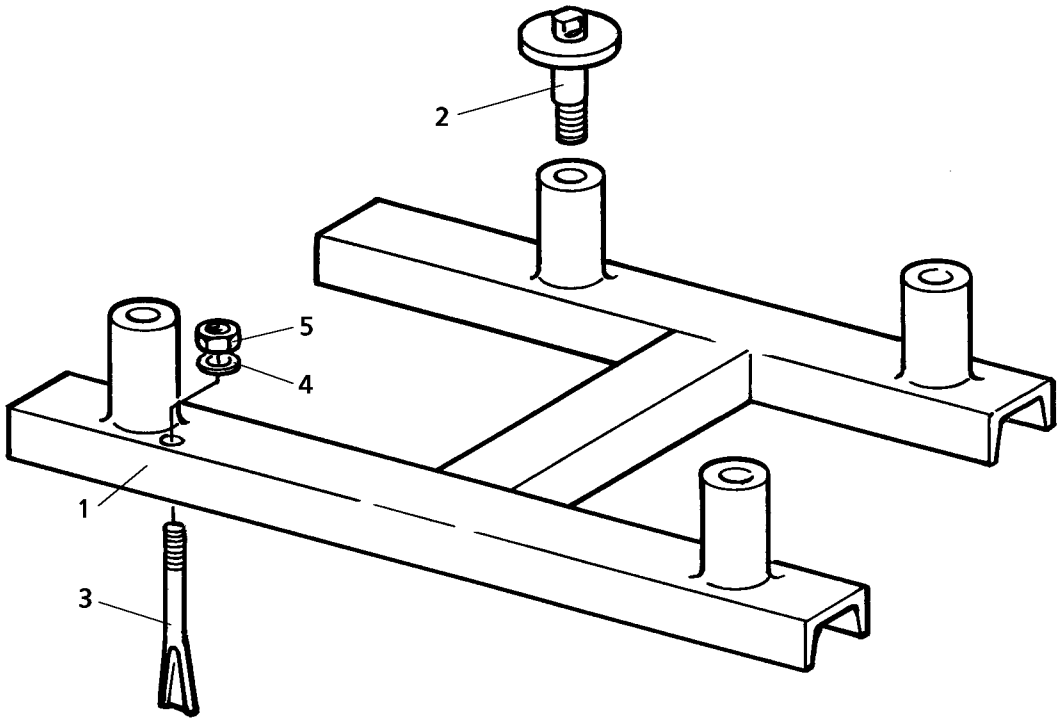

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Fig.172

Pos.	Part–No.	Qty.		Designation	Dimensions
	1313-1020-010			**Foundation frame compl.**	
1	1313-1003-010	1		Foundation frame	
2	3222-1033-000	4		Bolt	
3	0019-4867-000	8		Anchor bolt DIN 529	FM16x200-MU
4	0026-1335-300	8		Washer DIN 125	17
5	0013-0282-300	8		Hexagon nut ISO 4032	M 16

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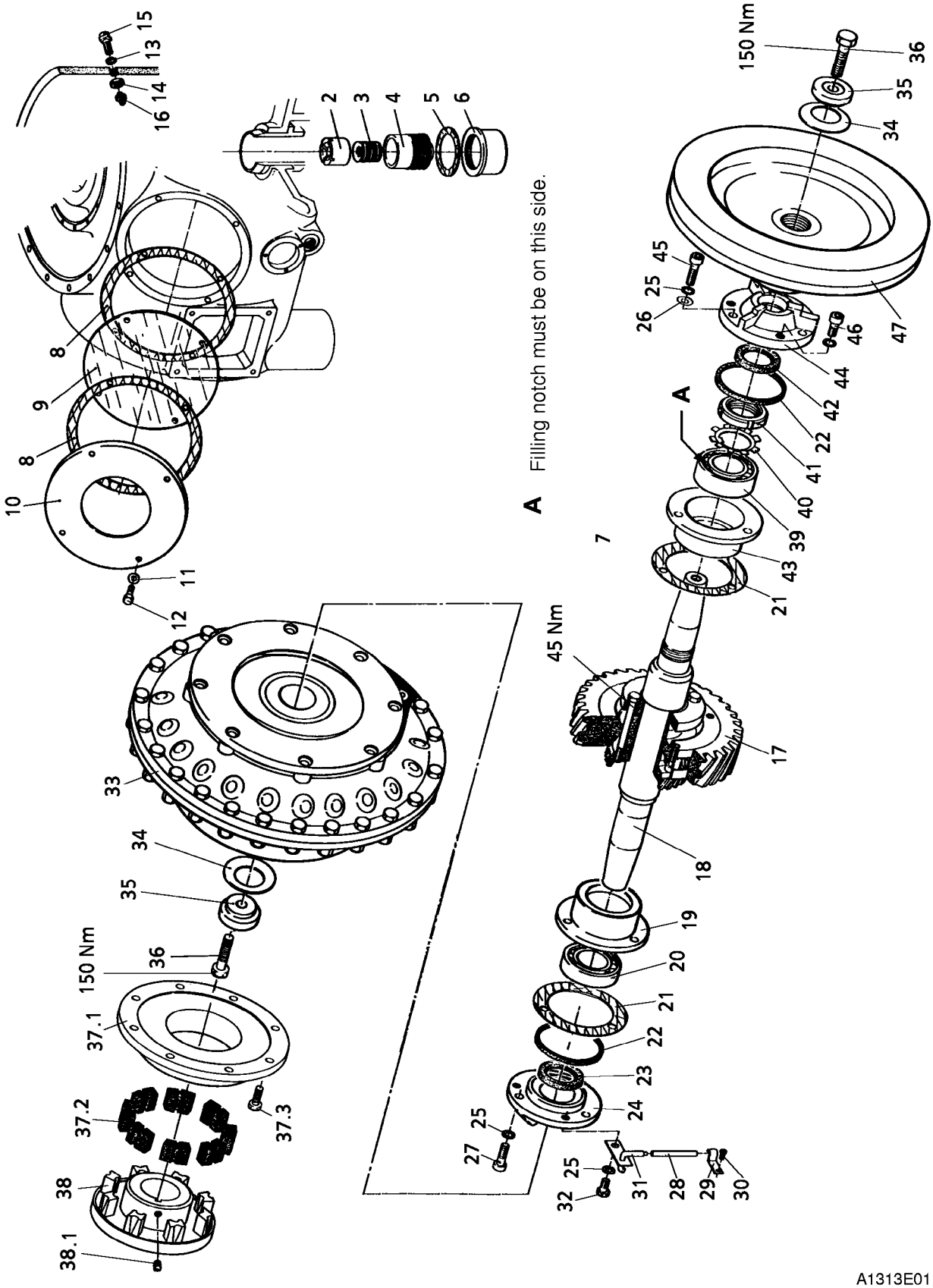


Fig.173

Pos.	Part–No.	Qty.		Designation	Dimensions
-	**1313-3300-010**	**1**		**Gear, complete**	
1	siehe Seite 129	1	*	Worm spindle, complete	
2	0010-8001-200	1		Bottom bearing pressure piece	80
3	0006-4440-160	1		Spring column DIN 2093	A45X48
4	0010-8002-040	1		Bottom bearing threaded piece	80
5	0004-2221-780	1		Gasket	80X108X1
6	0010-8003-210	1		Bottom bearing cap	80
7	0008-7510-050	1	*	Neck bearing bridge assembly	75
8	0004-5762-700	2		Gasket	273X318X2
9	0001-0925-870	1		Sight glass disk	322X8
10	1166-1157-020	1		Ring	
11	0026-1371-400	4		Washer DIN 125	13
12	0019-6970-400	4		Hex head screw ISO 4017	M12X30
13	0007-2184-750	1		Gasket	15X22X
14	0013-1023-250	1		Lock water DIN 2950	P4-3/8IN
15	1166-3308-000	1		Threaded piece	
16	0018-3725-600	1		Srewed hose connection	R1/4IN-4X6
17	siehe Seite 129	1		Worm wheel, compl.	
18	2231-3400-020	1		Worm wheel shaft	
19	3351-3136-000	1		Bearing housing	
20	0011-6210-000	1		Grooved ball bearing	6210J
21	0004-2559-780	2		Gasket	99X140X1
22	0007-1996-750	2		Gasket	96X4
23	0004-2982-750	1		Shaft sealing ring	A50X68X10
24	2231-3375-040	1		Bearing cover	
25	0026-1337-300	6		Lock washer DIN 127	B10
26	0026-1369-030	1		Washer DIN 433	10,5
27	0019-6146-150	3		Allen screw DIN 912	M10X35
28	0018-0585-848	1		Pipe	6X1 – 0,93m
29	0018-1276-400	2		Pipe clip	5,5
30	0019-2507-400	2		Pan head screw	M6X10
31	1166-3710-010	1		Nozzle	
32	0019-6929-400	1		Hex head screw	M10X10
33	1166-3280-560	1		Fluid clutch	422-TSBF
34	0006-4404-010	2		Cup spring	70X40,5X5
35	0026-1834-030	2		Centering disc	14,5X55
36	0019-9371-150	2		Hex head screw	M14X1,5X60
37	1166-3259-000	1		Set of clutch connecting parts	
37.1	1166-3283-010	1		- Claw flange	
37.2	1166-3393-000	1		- Set of coupling components	
37.3	0019-6970-150	8		- Hex head screw ISO 4017	M12x30
38	as per order	1		Cam hub, complete	
38.1	0019-8984-150	1		- Threaded pin DIN 914	M 10x25
39	0011-3210-470	1		Angular contact ball bearing DIN 628	3210
40	0026-0915-170	1		Tab washer DIN 5406	MB10
41	0013-0448-090	1		Grooved nut	M50X1,5
42	0004-5566-750	1		Shaft sealing ring DIN 3760	BAFUD3X745X
43	1166-3131-000	1		Bearing housing	
44	2231-3375-020	1		Bearing cover	
45	0019-6149-300	1		Allen screw DIN 912	M10X50
46	0019-6147-150	2		Allen screw DIN 912	M10X40
47	1229-3368-000	1		Brake pulley, compl.	
48	0004-5851-770	1	*	Gasket	

* This Pos. is not illustrated.

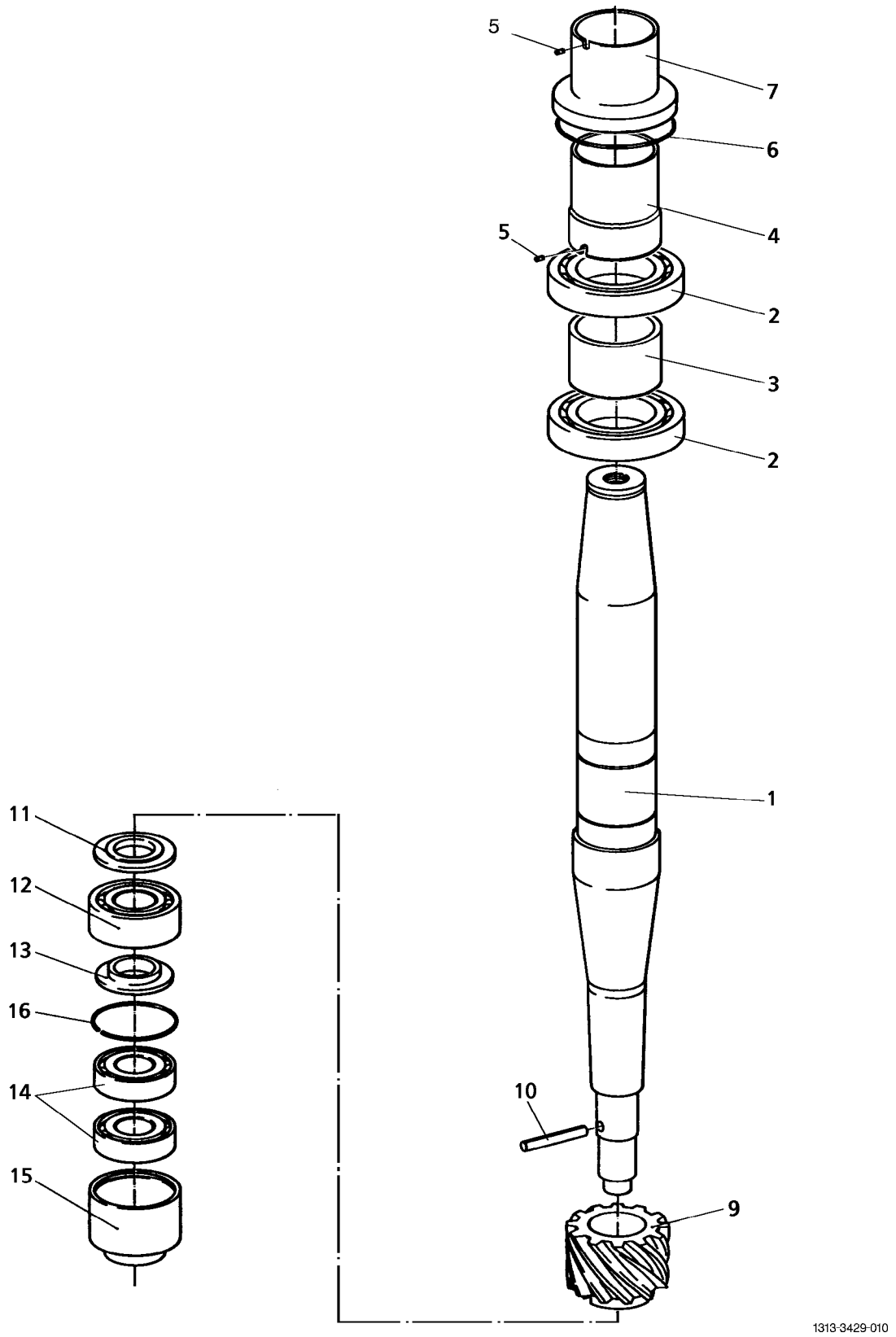


Fig.174

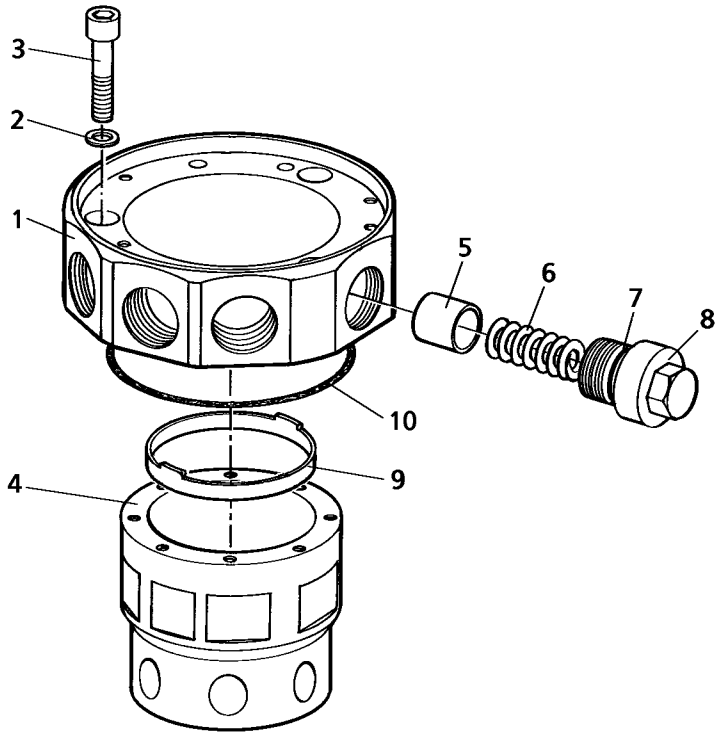
Pos.	Part-No.	Qty.		Part description	Dimensions
-	**see diagram below**	**1**		**Worm spindle assembly**	
1	1313-3410-000	1		Spindle	
2	0011-6215-110	2		Grooved ball bearing DIN 625	6215 P 6
3	0008-7504-010	1		Sleeve 75	
4	0008-7504-300	1		Sleeve 75	
5	0019-6357-400	2		Stud	
6	0007-3162-750	1		Gasket	78.75x5.33
7	0008-7501-300	1		Spindle cap 75	
9	see diagram below	1		Worm	
10	0026-1563-120	1		Cylindrical notched pin DIN 1473	10x70
11	0008-4008-020	1		Ball bearing protection ring 40	
12	0011-2308-120	1		Pendulum ball bearing DIN 630	2308 MP6
13	0008-4008-030	1		Ball bearing protection ring 40	
14	0011-7307-100	2		Angular contact ball bearing DIN 628	7307 BECBM-P6
15	0010-8012-020	1		Bottom bearing pressure housing 80	
16	0026-2109-170	1		Snap ring 78	

Available gear parts

Part-No. **50 Hz** Motor speed n = 1475 rpm Bowl speed n = 4650 rpm	Part-No. **60 Hz** Motor speed n = 1770rpm Bowl speed n = 4650 rpm	Part description
1313-3429-000	1313-3429-010	** Worm spindle compl.
2239-3423-000	3170-3423-040	** Worm
2239-3449-000	1167-3449-050	** Worm wheel assembly with clamp plates, compl.

** The part-no. of this item depends on the motor speed as well as on the bowl speed stated on the name-plate of the separator.

When this part is worn and needs replacement, the worm and worm wheel assembly with clamp plates should be replaced at the same time.



A1313E03

Fig.175

Pos.	Part-No.	Qty.		Part description	Dimensions
	0008–7510–050			**Neck bearing bridge, compl.**	75
1	0008–7506–070	1		Neck bearing bridge	75
2	0004–2509–400	3		Gasket	UA22x16x1,5
3	0019–6206–400	3		Allen screw DIN 912	M16x65
4	0008–7507–070	1		Neck bearing pressure ring	75
5	0026–0841–110	9		Spring piston	35,9x30,8x35
6	0006–4313–090	1		Set of neck bearing springs	30x8x76
7	0007–2580–750	9		Gasket	42x2,5
8	0019–0913–030	9		Threaded plug	M45x1,5–36x40
9	0008–7509–040	1		Spacing ring	75
10	0007–2825–750	1		Gasket	165x4

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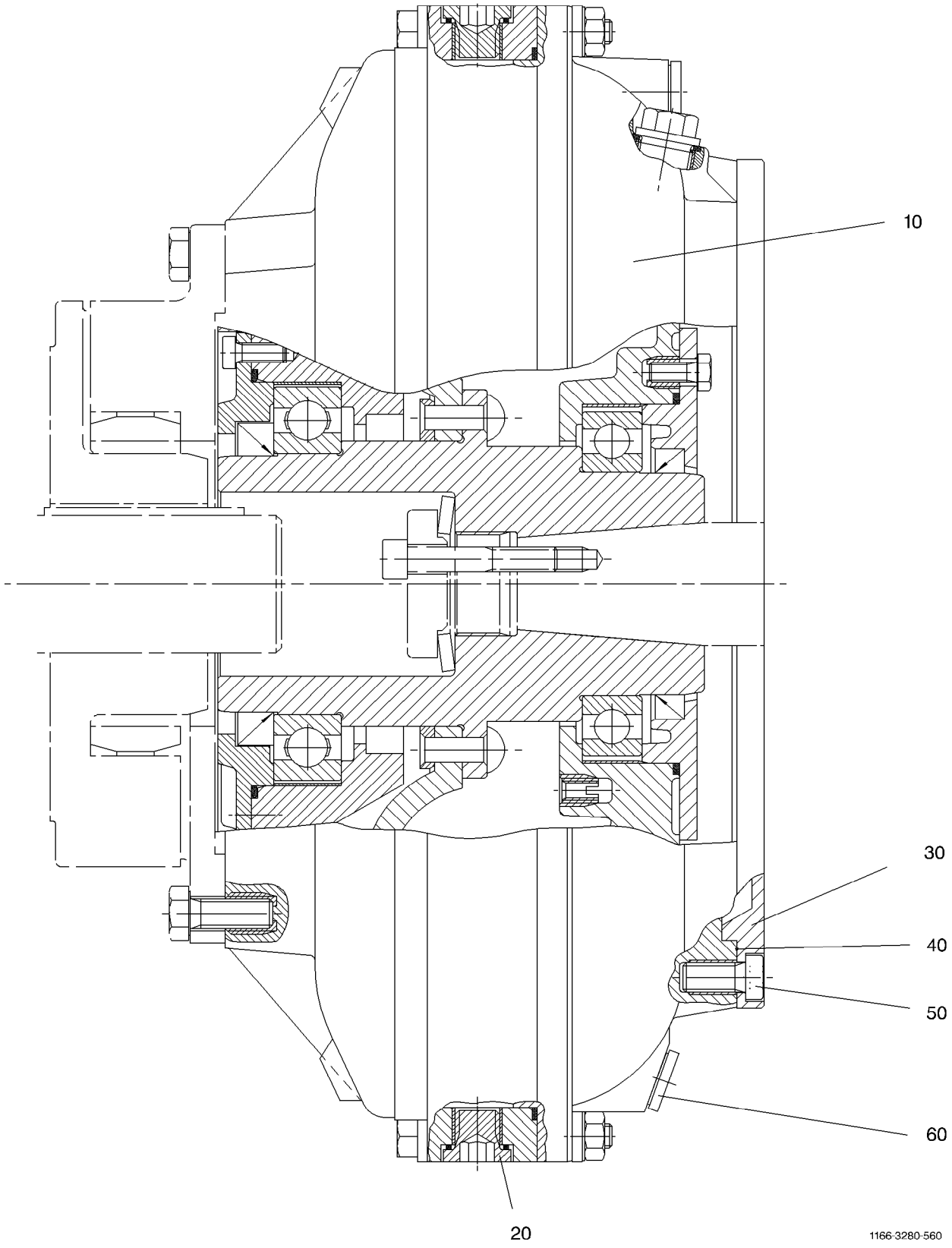
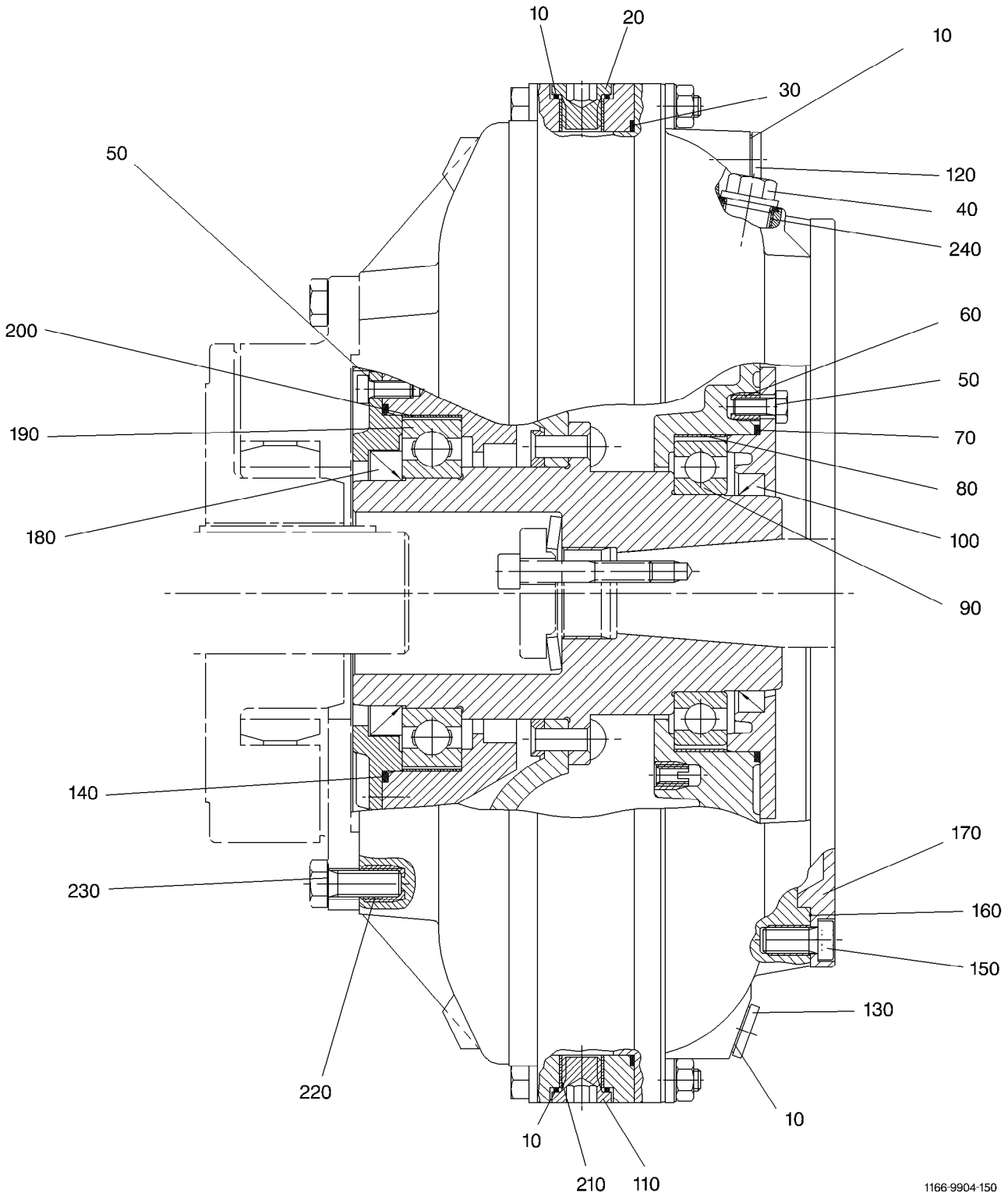


Fig.176

Pos.	Part-No.	Qty.		Part description	Dimensions
	1166-3280-560			**Fluid clutch, compl.**	422-TSF
10	1166-3280-500	1		Fluid clutch, compl.	422-TSF
20	0019-1490-000	1		Threaded plug	M18X1,5X15
30	1166-3367-000	1		Ring	
40	0004-2385-858	1		Packing cord	1
50	0019-8440-150	8		Cylindrical screw	M12X25
60	0005-1346-000	1		Switching element	180 C°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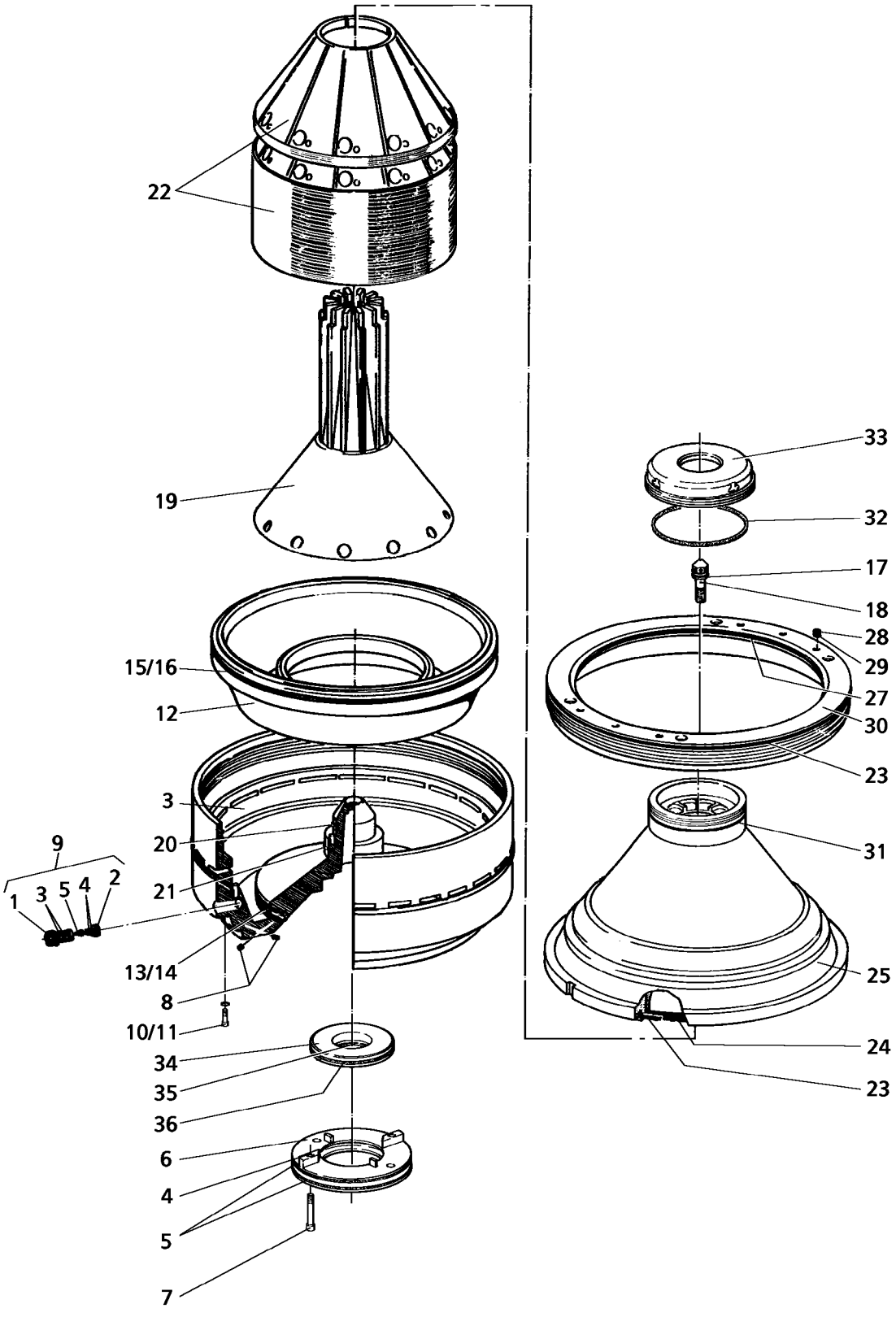
1166-9904-150

Fig.177

Pos.	Part-No.	Qty.		Part description	Dimensions
-	**1166-9904-210**	**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	0005-1346-000	1		Switching element	180 C°
140	0007-2566-830	1		Gasket	160X3
150	0019-8440-150	8		Cylindrical screw	M12X25
160	0004-2385-858	1		Packing cord	
170	1166-3367-000	1		Ring	
180	0004-2913-830	1		Sealing ring	105X130X13-BAFSVI1DRW
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-COILM18X1,5X18
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



T1247E01

Fig.178

Pos.	Part-No.	Qty.		Designation	Dimensions
-	**1247-6600-000**	**1**		**Bowl, compl.**	
3	1247-6604-000	1	*	Bowl bottom, compl.	
4	0007-3155-750	4		Gasket	11x4
5	0007-2707-750	2		Gasket	225x3
6	1247-6597-000	1		Ring	
7	0019-6148-300	4		Cylindrical screwDIN 912	M 10x45
8	0019-6324-400	4		Threaded pin DIN 913	M 10x10
9	3159-6280-070	2		Valve, compl.	
10	0004-2288-400	2		Gasket	U7.3x10.2x1
11	0019-6105-400	2		Allen screw DIN 912	M 6x12
12	1357-6501-010	1	*	Sliding piston	
13	0007-3273-850	1		Gasket	335x339x6.7
14	0007-3271-750	1		Gasket	320x6
15	0007-3266-750	1		Gasket	650x10
16	0007-3274-850	1		Gasket	688x696x11.8
17	0007-2077-600	1		Gasket	30x5
18	0019-0947-400	1		Spindle screw	M 22x1.5-LH
19	1357-6620-000	1	*	Distributor	
20	0007-2066-600	1		Gasket	124x6
21	0007-2023-600	1		Gasket	172x6
22	1357-6660-040	1		Disc stack, compl.	
-	1357-6662-040	1		- Bottom disc	
-	1357-6663-080	95		- Disc	
-	1357-6663-090	10		- Disc	
23	0007-1756-610	1		Gasket	665x5
24	0007-1789-840	1		Gasket	639.5x16.5
25	1357-6611-010	1	*	Bowl top	
27	0004-2364-608			Packing cord	
28	0007-2507-600	4		Gasket	16x3.5
29	1357-6161-000	4		Screw	M 16
30	1357-6631-000	1	*	Lock ring	S 755x14-LH
31	0007-2980-600	1		Gasket	205x5
32	0007-2703-600	1		Gasket	188x8
33	1357-6632-000	1	*	Lid	
34	1247-6597-010	1		Ring	
35	0007-3162-750	1		Gasket	78.75x5.33
36	0007-2825-750	1		Gasket	165x4

* This part can only be replaced by one of our service engineers or by a special repair-shop authorized by us, because of special re-fitting to machine and possible re-balancing of bowl.

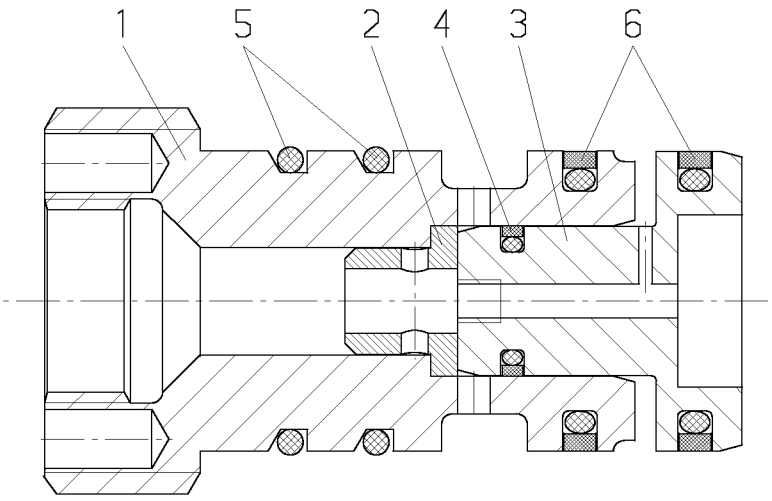


Fig. 179 (3159-6280-070)

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

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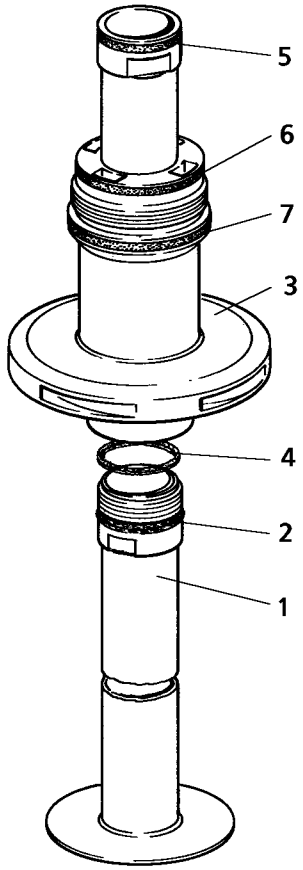

T1357E02

Fig.1 80

Pos.	Part–No.	Qty.		Designation	Dimensions
-	**1357-2213-010**	**1**		**Single centripetal pump, compl.**	
1	1357-2246-000	1		Feed tube	
2	0007-2730-600	1		Gasket	46,2x3
3	1357-2252-010	1		Centripetal pump	
4	0007-2666-600	1		Gasket	42x52x5
5	0007-1905-600	1		Gasket	45x4
6	0007-1800-600	1		Gasket	68x4
7	0007-2601-600	1		Gasket	80x4,5

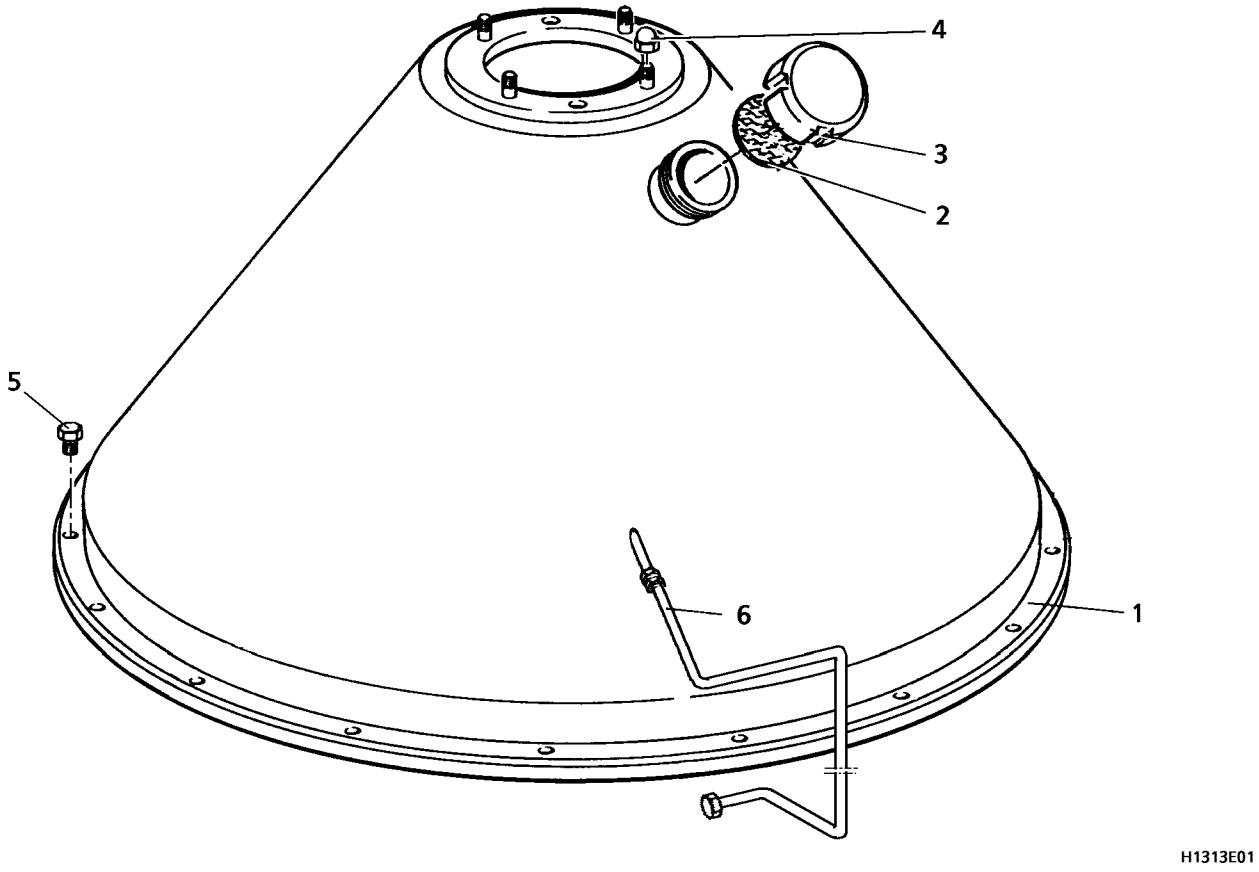

Fig.1 81

Pos.	Part-No.	Qty.		Part description	Dimensions
-	**1313-7759-010**	**1**		**Hood, compl.**	
1	1313-7765-010	1		Hood	
2	0004-1757-750	1		Gasket	65x3
3	0013-3297-300	1		Blind nut	NW 40
4	0013-0406-400	4		Cap nut DIN 1587	M 12
5	0019-6966-400	16		Hex head screw ISO 4017	M 12x20
6	1313-1369-000	1		Cooling line	
6.1	0018-1697-400	2		- Welded coupling	
6.2	0007-2003-830	2		- Gasket	

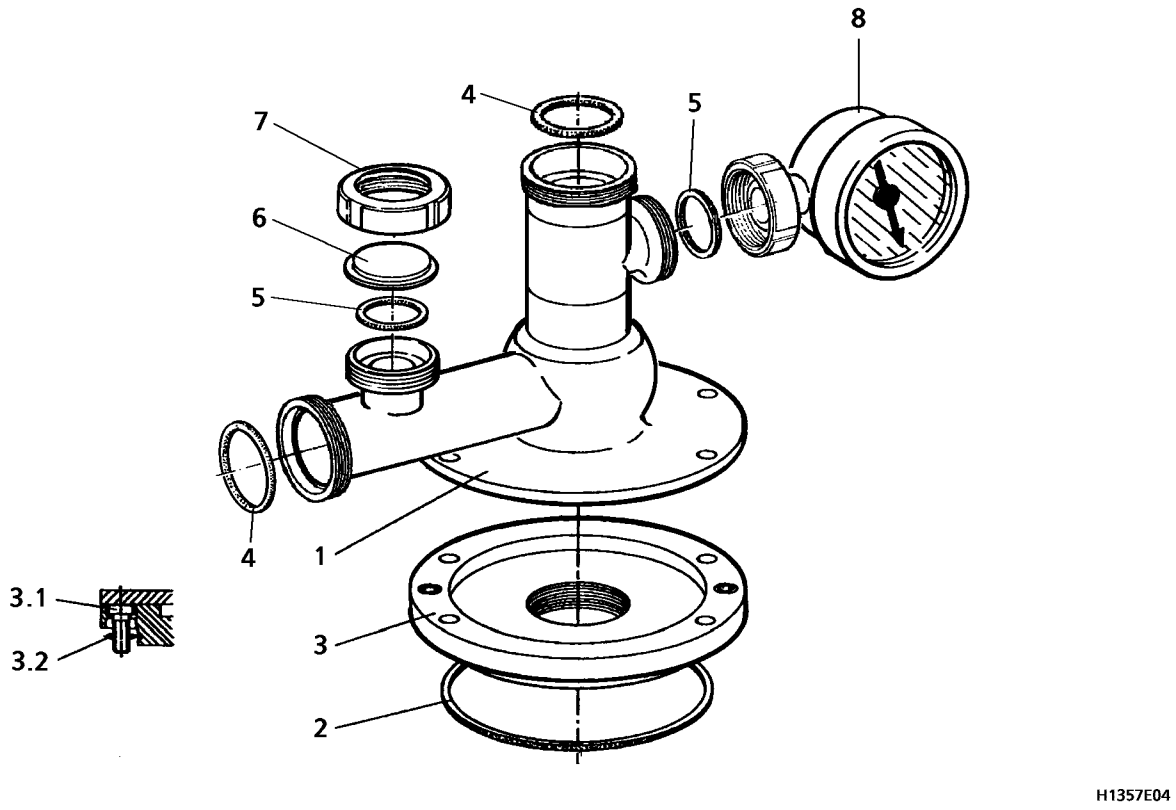

Fig.1 82

Pos.	Part–No.	Qty.		Designation	Dimensions
-	**1357-2296-000**	1		**Feed and discharge connections, cpl. Connections DIN 11851**	
1	1357-2301-000	1		Connection housing	
2	0007-2023-600	1		Gasket	172x6
3	1357-2217-000	1		Ring, compl.	
3.1	0019-8372-400	2		- Cylindrical screw DIN 6912	M 10x20
3.2	0026-1044-400	2		- Cylindrical pin DIN 7	3h8x16
4	0007-2212-750	2		Gasket DIN 11851	G 65
5	0007-2210-750	2		Gasket DIN 11851	G40
6	0001-0263-300	1		Blind cap	40
7	0013-3348-300	1		Grooved coupling nut	40
8	0001-1178-400	1		Pressure gauge, compl.	

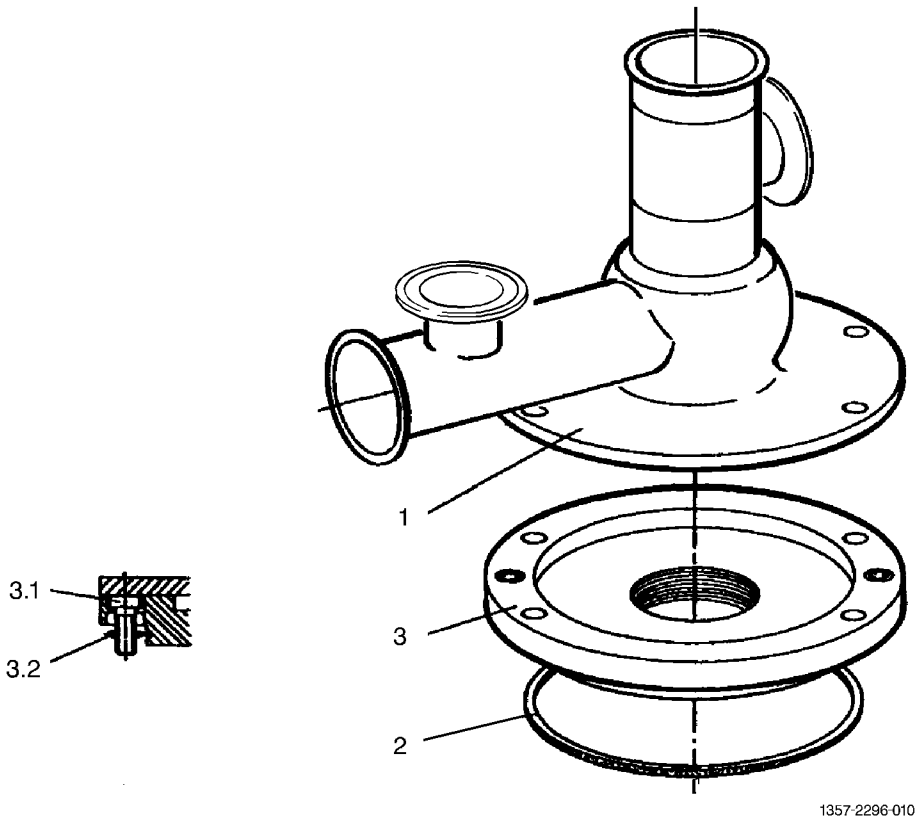

Fig.1 83

Pos.	Part–No.	Qty.		Designation	Dimensions
-	**1357-2296-010**	**1**		**Feed and discharge connections, cpl. Connections Tri - Clamp**	
1	1357-2301-010	1		Connection housing	
2	0007-2023-600	1		Gasket	172x6
3	1357-2217-000	1		Ring, compl.	
3.1	0019-8372-400	2		- Cylindrical screw DIN 6912	M 10x20
3.2	0026-1044-400	2		- Cylindrical pin DIN 7	3h8x16

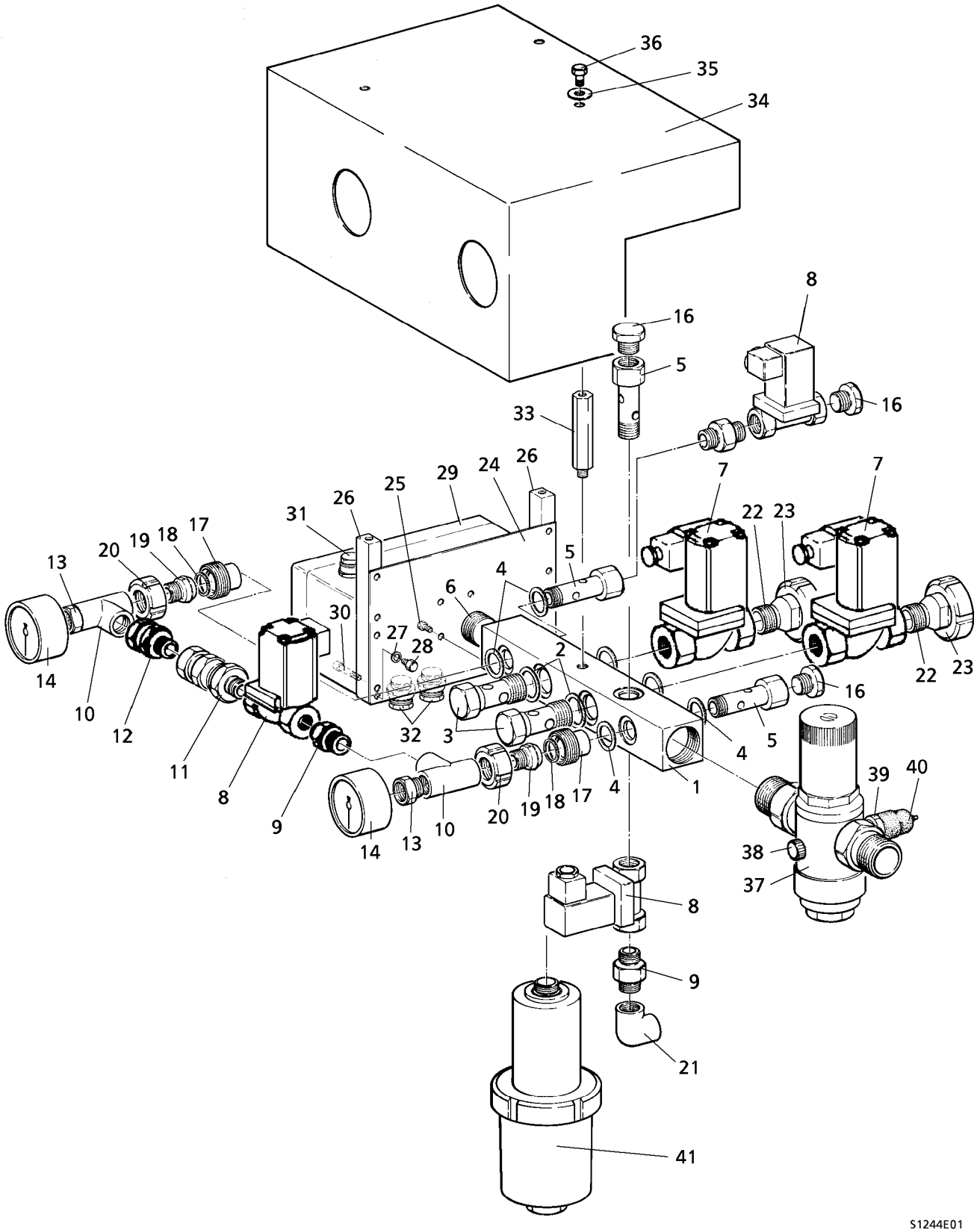
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Fig. 184

Pos.	Part-No.	Qty.		Part description	Dimensions
-	**8134-2110-400**	**1**		**Operating-water connection, compl.**	
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-L	1		- Solenoid valve, compl. (for closing water)	3/4in
7.2	0018-5870-L	1		- Solenoid valve, compl. (for opening water)	3/4in
8.1	0018-5947-L	1		- Solenoid valve, compl. (for filling water)	1/2in
8.2	0018-5947-L	1		- Solenoid valve, compl. (for hood flushing water)	1/2in
8.3	0018-5947-L	1		- Solenoid valve, compl. (for cooling water - clutch)	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	0018-4819-400	1		Screwed socket	
13	0018-5168-400	2		Transition nipple	
14	0001-0279-600	1		Pressure gauge DIN 16063	0-6 bar
15	0001-1196-400	1		Pressure gauge DIN 16063	0-16 bar
16	0019-0559-300	2		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	0018-6236-400	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	
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 150	1		Metering unit, compl.	

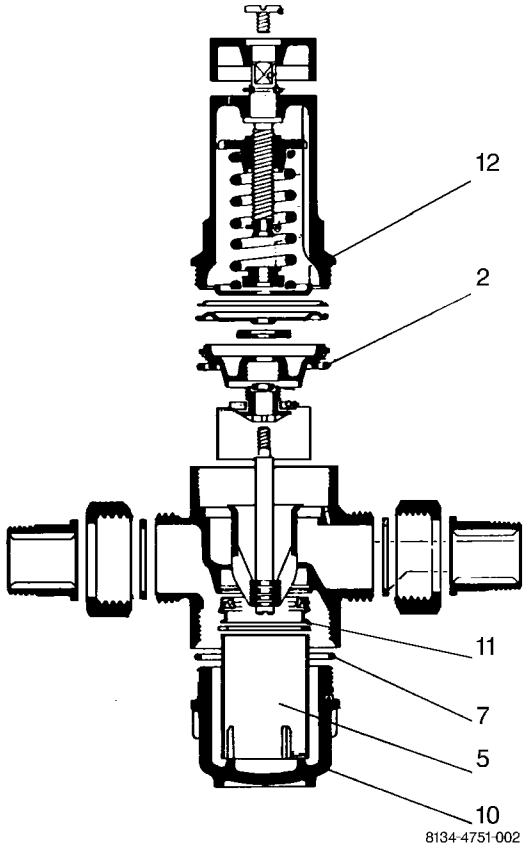

Fig.1 85

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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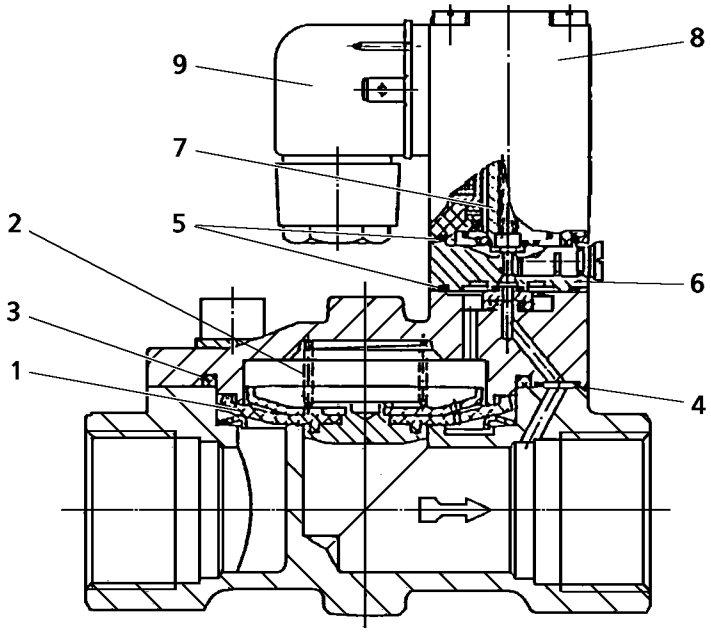

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Fig. 186

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	

Pos.	Part-No.		Qty.		Designation	Dimen-sions
-	**0018-5870-630**	**0018-5947-630**	**1**		**Solenoid valve, compl.**	**110 VAC**
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	0007-1754-820	1		Gasket	
5	0007-1753-820	0007-1753-820	1		Gasket	24x1,5
6	0018-5947-030	0018-5947-030	1		Housing (for manual over-ride)	
7	0018-3695-000	0018-3695-000	1		Magnet core	
8	0018-3695-020	0018-3695-020	1		Magnet coil	110 VAC
9	0018-5870-010	0018-5870-010	1		Coupler socket	

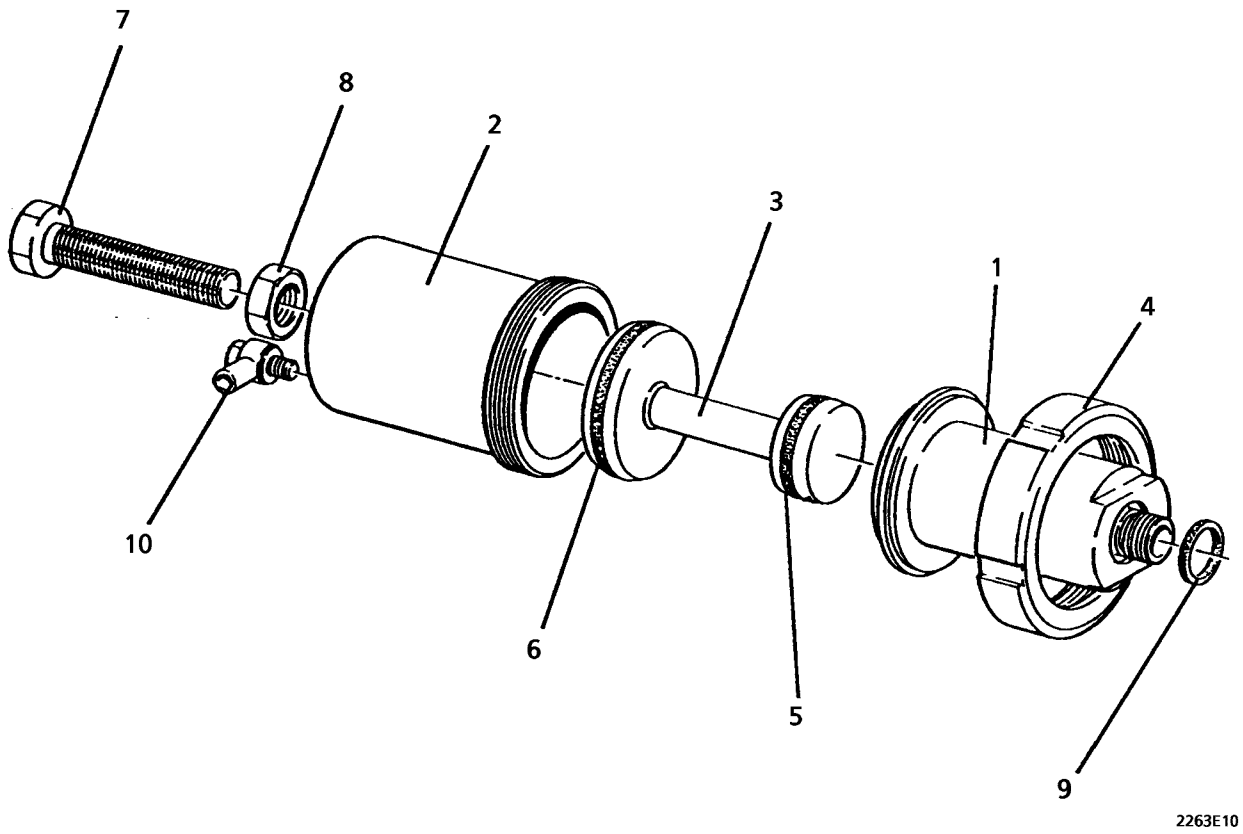

Fig. 187

Pos.	Part-Number	Quantity		Part Description	Dimensions
-	**8134-2202-030**	**1**		**Metering unit, complete**	
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

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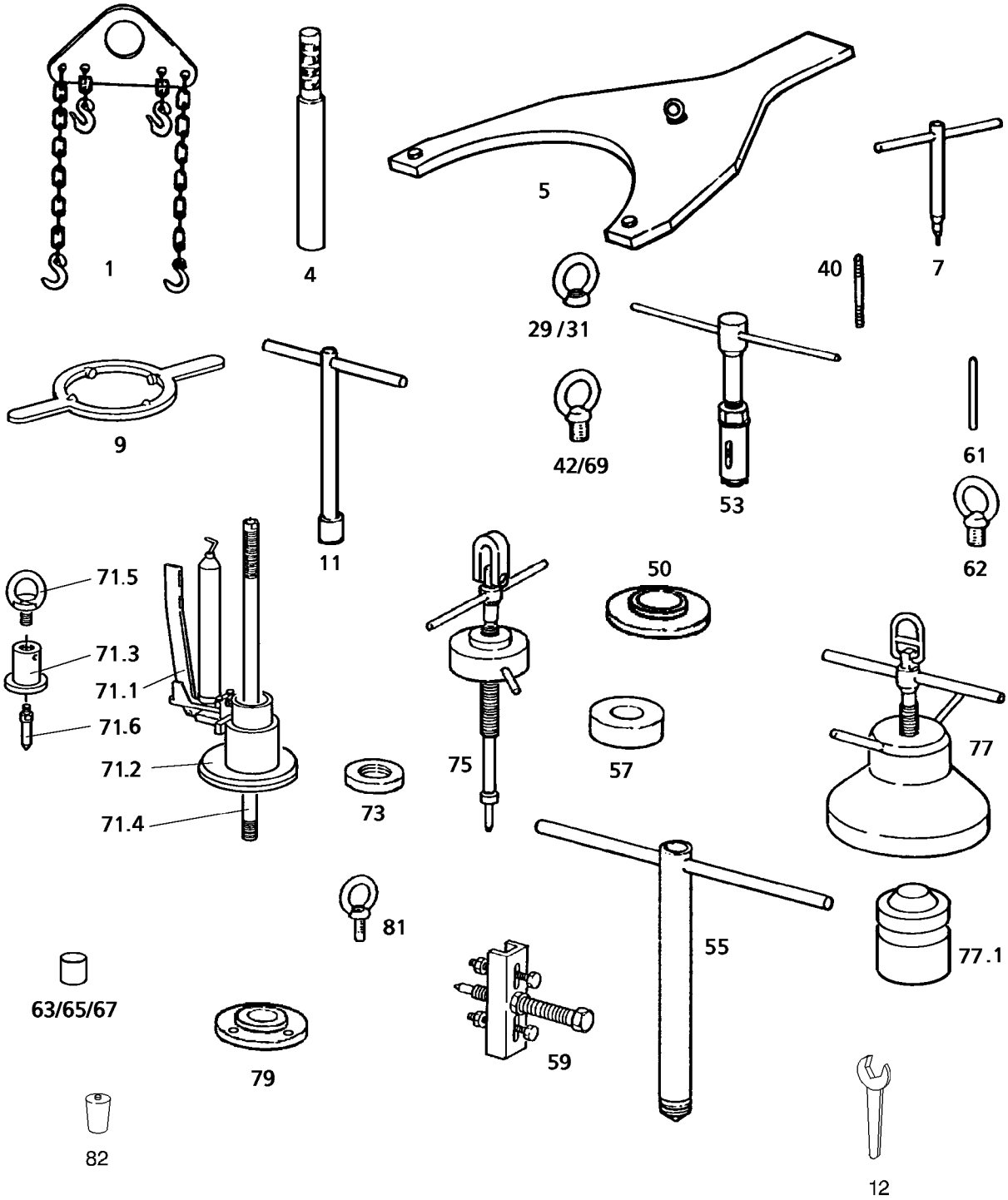
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Fig.1 88

Pos.	Part-No.	Qty.		Designation	Dimensions
-	**1247-9900-000**	**1**		**Set of tools**	
1	0003-0065-030	1		Lifting device (bowl lock ring, hood)	350 kg
4	0003-0200-000	1		Mallet	42x420
5	0003-0343-000	1		Wrench (bowl lock ring)	
7	0003-3727-030	1		Wrench (for valve piston)	M4
9	0003-4002-000	1		Annular wrench (centripetal pump chamber lock ring)	
11	0003-4193-030	1		Socket wrench (spindle screw)	24
12	0003-4223-320	1		Wrench	46
29	0013-0386-030	2		Lifting-eye nut DIN 582 (operating-water feeding device)	M 8
31	0013-0388-030	2		Lifting-eye nut (for hood)	M 12
40	0019-0689-090	2		Threaded spindle (operating-water feeding device)	
42	0019-5384-050	2		Eye bolt DIN 580 (bowl lock ring)	M 16
50	0026-1829-030	1		Centering disk (shaft sealing ring / operating-water feeding device)	
53	1165-9895-010	1		Wrench (for bowl valve)	
55	1166-9910-010	1		Lifting device (fluid clutch, brake pulley)	
57	1168-9823-000	1		Adjusting ring (feeler for speed monitoring)	
59	1171-9910-000	1		Pulling device (for cam hub, fluid clutch)	
61	1226-9869-000	1		Mandrel	
62	1231-9862-000	1		Spindelausheber	
63	1313-9868-000	1		Sleeve (shaft sealing ring/ operating-water feeding device)	
65	1313-9868-010	1		Sleeve (shaft sealing ring/ operating-water feeding device)	
67	1313-9868-020	1		Sleeve (shaft sealing ring/ operating-water feeding device)	
69	1354-9982-000	1		Eye screw (bowl bottom)	
71	1357-9820-010	1		Compressing device, complete	
71.1	1235-9770-000	1		- Hydraulic unit	
71.2	1357-9939-000	1		- Washer	
71.3	1235-9851-020	1		- Threaded ring	
71.4	1235-9877-020	1		- Threaded bolt	
71.5	0019-5385-050	1		- Eye bolt DIN 580	M 20
71.6	1357-9935-000	1		- Pressure piece	
73	1357-9851-000	1		Threaded ring (assembly feed tube)	
75	1357-9970-000	1		Lifting device (distributor/ bowl top)	
77	3287-9960-000	1		Lifting device (sliding piston)	
77.1	3287-9935-000	1		- Pressure piece	
79	3347-9861-000	1		Mounting tool (grooved ball bearing-gear)	
81	2294-1161-000	2		Puller screw (dismantling protective housing)	M 8x35
82	1235-9860-010	1		Assembling device (assembly tool, piston valve)	

The tools delivered are stated in the packing list.

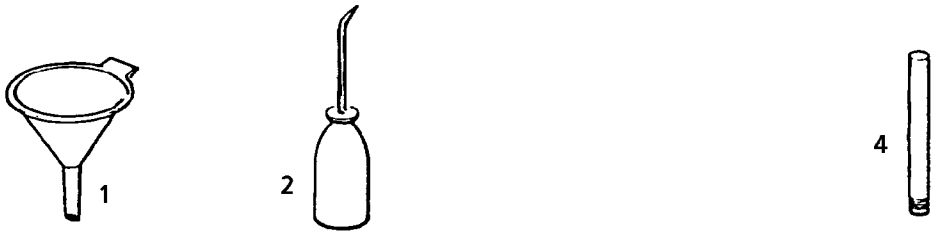

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Fig.1 89

Pos.	Part-No.	Qty.		Part description	Dimensions
-	**1313-9901-000**			**Set of accessories**	
1	0003-0168-890	1		Funnel	140
2	0003-0256-890	1		Force-feed oiler	250 cm^3
4	0018-3430-030	1		Pipe	M22x1,5x200
-	0015-0014-080	5		Lubricating oil CLP220 (dangerous substance)	2,5 l
-	0015-0050-090	2		Lubricating oil DIN 51515 L-TD32 (dangerous substance)	5L
-	0015-0121-000	1		Ball and roller bearing grease DIN 51825 K3K	0,85 kg
-	0015-0113-020	4		Lubricating grease KSB8 (dangerous substance)	50 g

The tools delivered are stated in the packing list.

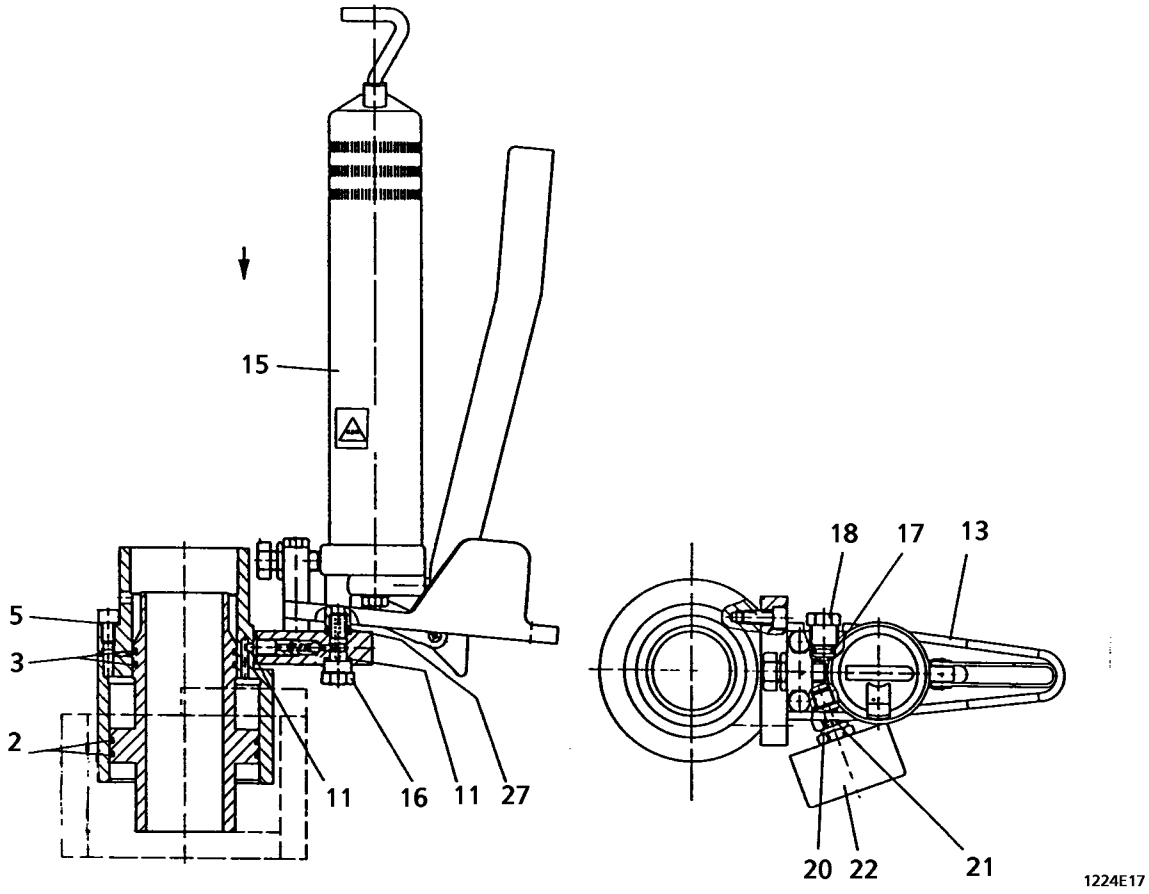

Fig.190

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

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GEA Westfalia Separator AG

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