Instruction book

Separator

WSPX 204TGT-70

In letters, telegrams, telex messages and calls state type and manufacturing No. of the machine.

Unless the manufacturing No. has been filled in on this page, the book serves purposes of general information only and neither part Nos. nor operating instructions are unreservedly applicable.

Manufacturing number:

Spec. 4139-04
Reg. 33436
Utg. I/7804
II/7810
III/7911,8207,8405
8504, 8506

Book No.: S4139-04:01E

Printed in Sweden

⚠ SAFETY PRECAUTIONS ⚠
FOR HIGH SPEED SEPARATORS

The bowl of a centrifugal separator rotates at a very high speed and great forces are generated.

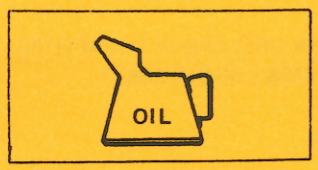
To ensure the safety of personnel and equipment:

- Always carefully follow the safety instructions and precautions.
- Always carefully follow the instructions in the instruction manuals concerning installation, assembly of the components, operation and regular maintenance.
- Always use genuine Alfa-Laval spare parts and tools.
- Ensure that all operators who run and service a separator are well trained and knowledgeable about the machine and its mode of operation.

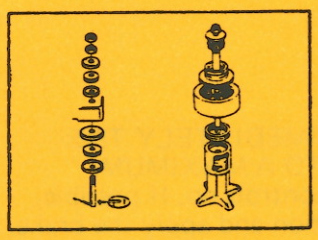
NONCOMPLIANCE MAY CAUSE A SERIOUS ACCIDENT

BEFORE INITIAL START-UP OF NEW/OVERHAULED MACHINES

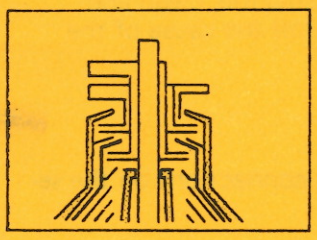
- Never transport or lift a separator with its bowl installed. This may cause bearing and bowl spindle damage.



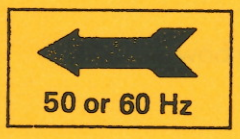
- Make sure that the gear housing has been filled with the correct quantity of specified oil.



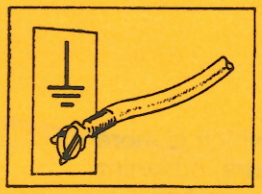
- Check that installation and tightness of rubber vibration dampers between frame and foundation is according to instructions.



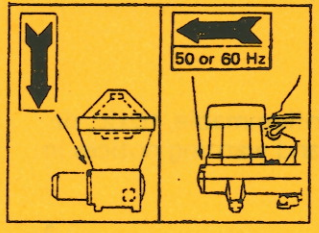
- Many separators are equipped with paring disc liquid discharge. It is important that the paring device/feed tube assembly has correct height adjustment and is securely tightened before machine is operated. See instruction manual for detailed instructions.



- Be sure to check that the frequency and voltage of the current to be connected agrees with machine specifications, see figure on the arrow sign on the frame.



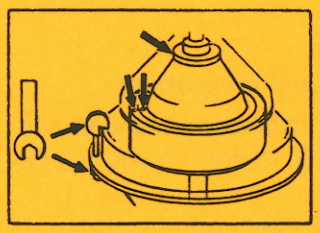
- Make sure that the separator frame, control boxes and cabinets are connected to earth (ground) in accordance with local regulations.
- Note that a separator must never be started without its bowl. This may damage its bearings.



- Be sure that the motor rotates in the same direction as arrow on separator frame. The lock ring(s) of the bowl may unscrew if it rotates in the wrong direction.

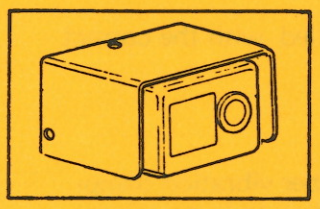
  Check the operating rpm. with an empty bowl against the value specified in the instruction book. Self-cleaning separators are to be checked before the operating water is introduced (open bowl).

OPERATION

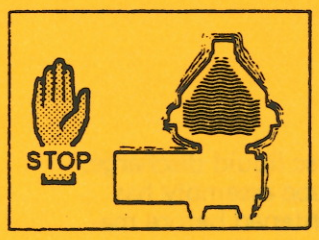


- NEVER start the machine before the lock rings of the bowl, inlet and outlet devices, frame hood, clamps, pipe couplings and other fastenings have been securely tightened. Note that the assembly mark Ó on the main lock ring must be aligned or pass the Ó mark on bowl body or bowl hood when lock ring is fully tightened. In this position there must be proper compression of disc stack.

- The brake should always be released before start.

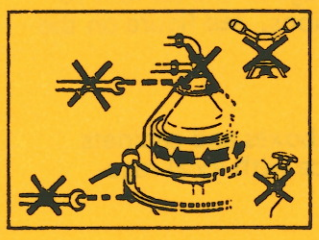


- If machine is equipped with vibration alarm unit check the setting and adjust it if necessary to individual process conditions.



- If unusual vibration occurs INCREASE IMMEDIATELY THE LIQUID FEED, PRODUCT OR WATER TO A MAXIMUM. Switch off motor, but leave the program controls on. If possible, turn the discharge frequency to OFF position and apply the brake. After the bowl has stopped completely, dismantle, clean and check all parts carefully. Do not operate until the cause of the vibration has been located and eliminated.

- Check that there is no leakage from piping connections on the separator and to/from the separator.

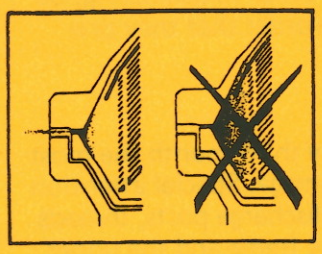


- NEVER loosen any part of the machine until the bowl has come to a COMPLETE STANDSTILL.

- NEVER use the machine for separating liquid which is more corrosive or has higher density, higher temperature, different characteristics of the solids, etc. than originally specified. Consult your ALFA-LAVAL representative.

- Follow local safety regulations concerning inflammable, toxic, or corrosive process media. Affix information and warning notices in prominent places.

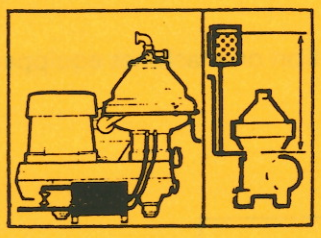
TO BE OBSERVED FOR SAFE OPERATION OF SOLIDS–EJECTING SEPARATORS OF PX–TYPE



- The bowl has to be discharged from solids at intervals which depend on the feed rate, feed solids content and the characteristics of the solids. To avoid excessive vibration and risk of damage the solids must be discharged before the solids space is overfilled or packed hard.

  Always consult your ALFA-LAVAL representative, if possible before increasing feed rate or the solids content of feed.

- NEVER program a machine with a variable discharge program for total discharge before consulting your ALFA-LAVAL representative.



- The function of the bowl's discharge mechanism is vital for safe operation of the separator. It is therefore absolutely necessary to have an uninterrupted flow of clean, soft (dehardened) water/liquid at prescribed **constant** pressure. Ensure that the **entering pressure cannot fall** below the minimum level required and does not exceed the maximum level allowed.

- At manual operation always stop the machine with a liquid filled bowl and run it down filled until the bowl opens by itself. If your separator has been equipped with an automatic safety liquid system to ensure that the bowl is filled at feed power failure, run-down or heavy unbalance – make sure that the liquid supply is always available whenever machine is operated. This is very important to avoid heavy vibrations/damages.

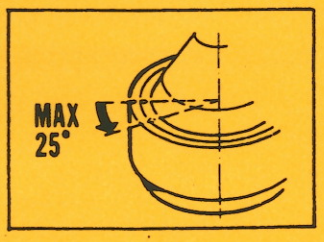
- Regarding operating water/liquid refer to separate section below.

MAINTENANCE

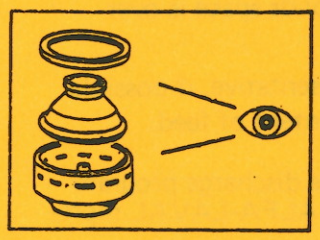
- Switch off and, if possible, lock out the power to the machine and allow it to stop completely before starting any dismantling work. Hang up sign warning against turning on power.

- A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other bowl. Make sure that no parts are left out during assembly. All major parts are marked with the full serial number or the last three digits for identification purposes.

- NEVER heat rotating bowl parts, such as bowl body, bowl hood, lock rings, etc. with a naked flame or attempt repairs by welding. This could destroy the mechanical and structural strength of the material.



- NEVER operate the machine when the ϕ assembly mark on the main lock ring can pass the corresponding mark on bowl body/bowl hood by more than 25 degrees.
  Consult your ALFA-LAVAL representative.



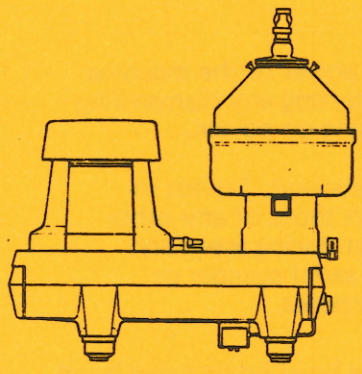
- The disc stack gradually settles and looses compression force. At each maintenance occasion check whether more disks are to be added in order to assure correct compression. NEVER remove a disc without replacing it with a new one. When reassembling, be sure to assemble slotted discs in the same order that they previously had.

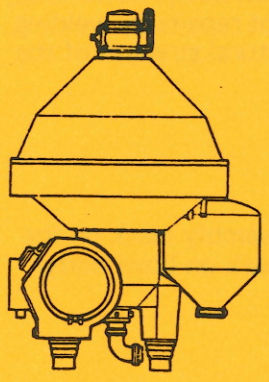
- At each service occasion, yet at least every third month the most important parts should be checked for damage. Special attention should be given to bowl pillars at sludge discharge ports, threads of bowl body/main lock ring as well as the frame and the upper frame part which is permanently hit by the ejected solids and/or the operating water. If the process conditions are corrosive or erosive the frequency must be increased.

- Make sure that the brake is in good condition on machines equipped with a brake.

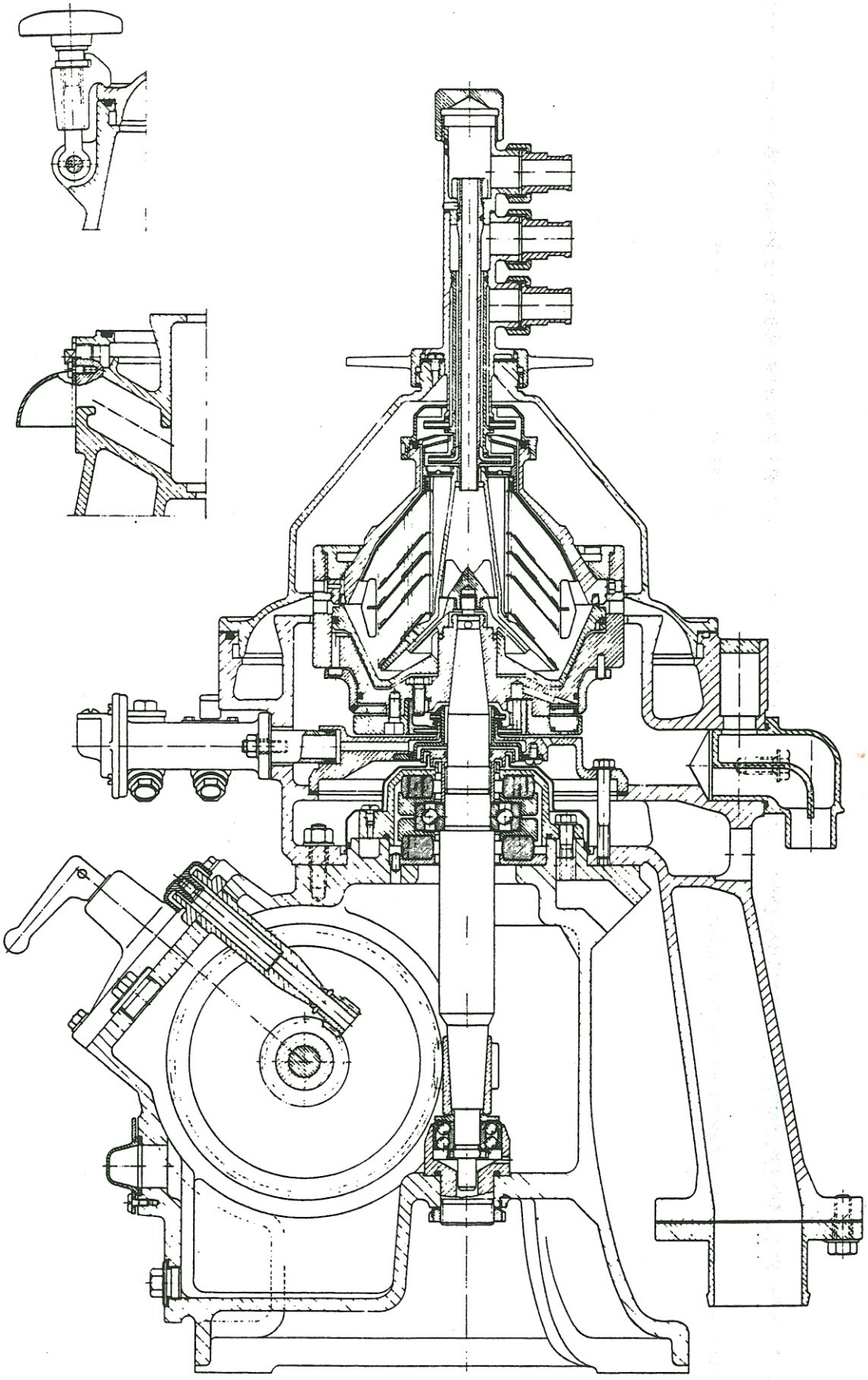
IF YOU ARE UNCERTAIN OF ANY POINTS, CONTACT YOUR ALFA-LAVAL REPRESENTATIVE.

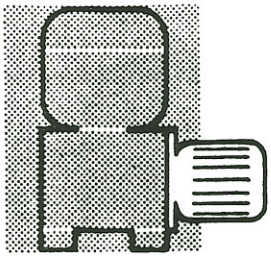
ALFA-LAVAL SERVICE

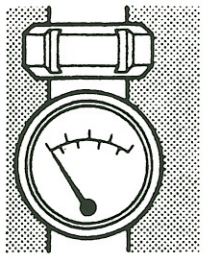


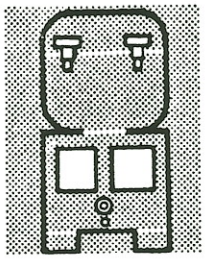


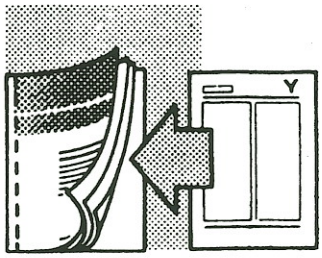
For reliability and safe operation we recommend that your separator is inspected at regular intervals by ALFA-LAVAL service engineers. These inspections will also ensure that your separator is working efficiently and economically.







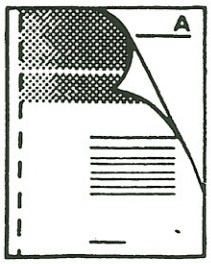




ALPHABETIC REGISTER

ALPHABETICAL INDEX

* Only for machine with automatically controlled (programmed) sludge discharge.



GENERAL INFORMATION

Contents - Disposition - Supplement - Type Denomination.
Manufacturing Number - Safety Regulations - Lubrication.
Cleaning - Special Tools - Abbreviations - Ordering Routine.

Correct installation, suitable treatment of the liquid before and after the passage through the machine, correct operation and handling of the machine according to the directions given in this book, cleanliness, carefulness and methodical overhaul are factors of the greatest importance for ensuring the best machine function and intended results.

CONTENTS

As appears from the table of contents, the Instruction Book contains instructions concerning installation and operation, dismantling and assembly as well as cleaning and overhaul. Since practically all machine parts have been identified by a part number, the Instruction Book serves also as a PART NUMBER LIST (SPARE PARTS LIST).

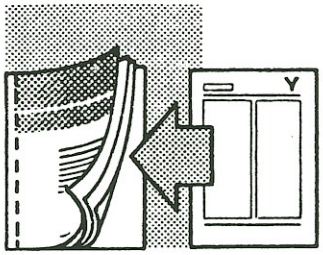
The Instruction Book deals not only with parts and devices included in the standard design, but also with special and alternative equipment. Parts incorporated in the deal are specified in the packing list accompanying the shipment.

The constructional particulars given in the Instruction Book are not binding. We reserve the right to make alterations without previous notice. Reconstructions made after delivery are not followed by new Instruction Books.

DISPOSITION

Every chapter of this book has its own reference letter which is placed in the right-hand top corner of each page. The chapters are arranged in alphabetical order. Whenever reference is made to a page of the Instruction Book in any form of communication with us, please state the reference letter and the heading of the chapter in question as well as the reference number appearing, preceded by the letter "S", at the bottom of the page. Illustrated pages also carry the drawing number at their bottom.

SUPPLEMENT



If the Instruction Book is intended for a machine made to special order, supplementary instructions are often given in chapter Y - please check this before placing the machine in service. Supplementary data (on treatment of liquid, weights etc.) are often found also in the technical information submitted in connection with the purchase.
The ALFA-LAVAL representative is always glad to provide advice and information beyound the contents of this Instruction Book.

TYPE DENOMINATION
MANUFACTURING No.

It may occur that the type denomination on the type plate of the machine and on the title page of the Instruction Book are not exactly identical. In such cases the manufacturing No. of the machine is determining; the correct Instruction Book is always marked with the manufacturing number appearing on the type plate. Always state the type denomination indicated on the type plate when ordering spares.

SAFETY REGULATIONS

Chapter K contains a survey of the safety regulations which must ABSOLUTELY be observed when the machine is to be used.
The electric installation must be done by an experienced electrician with knowledge of the local safety stipulations.
It should be noted that, as a rule, the instruction book contains no safety regulations necessitated by any special properties of the process liquid, such as inflammability, toxicity or corrosiveness.

LUBRICATION
CLEANING

As a rule, the mounting instructions are mentioning only what part or parts should be lubricated or cleaned. All information on lubricants and cleaning agents to be used is given in chapters H and L.

SPECIAL TOOLS

The design of the special tools appear from chapter F.

ORDERING ROUTINE

When ordering spare parts always state the PART NUMBER and NAME as well as the TYPE DENOMINATION and MANUFACTURING NUMBER of the machine as indicated on the type plate.
Always base the spare parts order on an Instruction Book having the manufacturing number of the actual machine stamped on its title page.

Model order form

Name of part	Part number	Quantity	Remarks
mnmnmnmnmnmn	mnmn	m	
mnmnmnmn	mnmnm	m	
mnmnmnmnmnmn	mnmn	mn	
mnmnmnmn	mnmnm	mn	

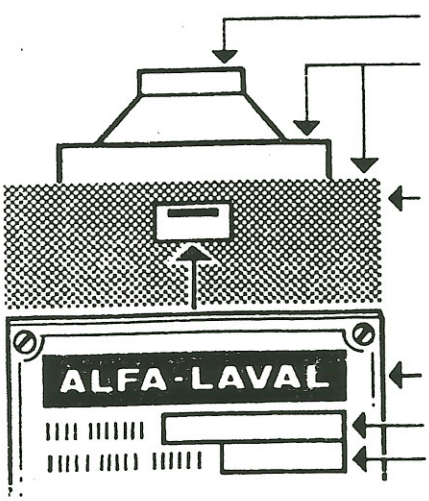
Correct ordering = Correct delivery in shortest time.

Delivery

It may occur that the part number of a delivered part differs from that stated in the Instruction Book. In such cases, the new part is at least equivalent to and fully interchangeable with the old one.

P.t.o.

(Ordering Routine, page 2)

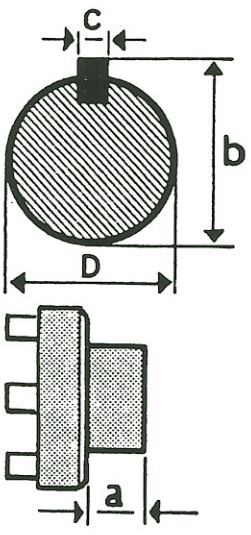


If the machine has been rebuilt after delivery, if the part number is not inserted in the Instruction Book, or when in doubt about the correct part number for other reasons, mention this in the order. In such cases correct statement of the TYPE DENOMINATION and the MANUFACTURING NUMBER indicated on the TYPE PLATE is particularly valuable.

Several manufacturing numbers

If the manufacturing numbers indicated on the bowl and on the type plate (frame) differ from each other, state both of them.

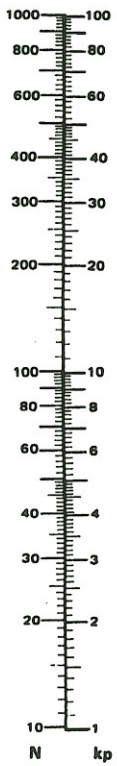
Coupling pulley. Belt pulley



Besides part number and name (see chapter R) also state the dimensions b, c and D of the motor shaft. When ordering a coupling pulley also state the suitable nave length a.

1231152-4

Force

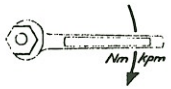


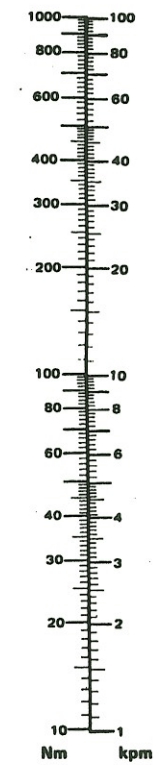
1 N = 0.102 kp

Mass

1 kg = 2.205 lb

Torque



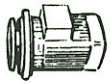


1 Nm = 0.102 kpm

Length

1 mm = 0.03937 in

Power

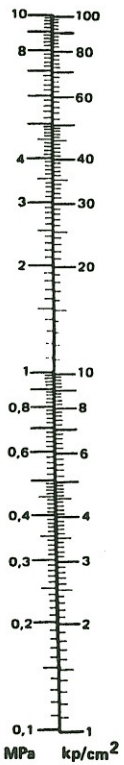


1 kW = 1.36 hp

Pressure

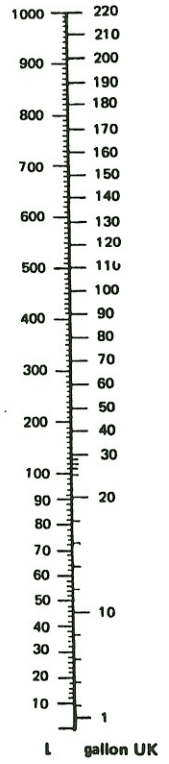
1 MPa = 145 psi

Pressure



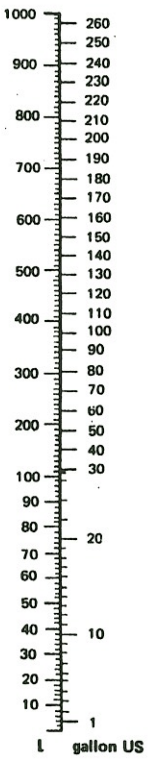
1 MPa = 10.20 kp/cm^2

Volume



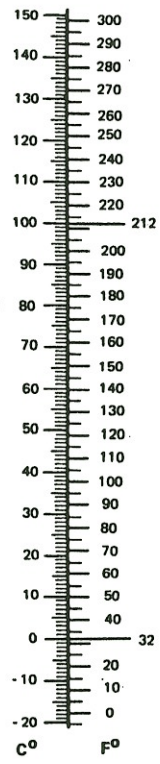
1 l = 0.220 gallon UK

Volume

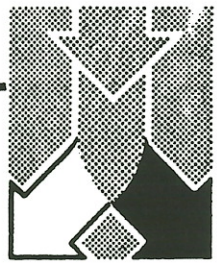


1 l = 0.264 gallon US

Temperature



°C = 5/9 (°F - 32)



Function - Definitions - Factors influencing the Process - Processing Methods - Sludge - Discharge - Automatic Control - Choice between various Possibilities of Adjustment - Special Recommendations.
Information on for instance the treatment of the process liquid is contained also in the technical information sent to you in connection with the purchase of the machine.

FUNCTION

The purpose of the operation is either to liberate a liquid from strange particles, or to separate two intermixed liquids.

DEFINITIONS

Throughput

This means the quantity of liquid supplied per unit time. The throughput is given in cu.m/h or l/h (Imp. galls/h).

Reception ability

This means the largest liquid quantity that the bowl can treat per unit time, expressed in cu.m/h or l/h (Imp. galls/h).

Purification

A liquid - liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

Clarification

A liquid - sludge separation in which the machine is used to separate particles, normally solid ones, from a liquid having a lower specific gravity than that of the particles.

Concentration

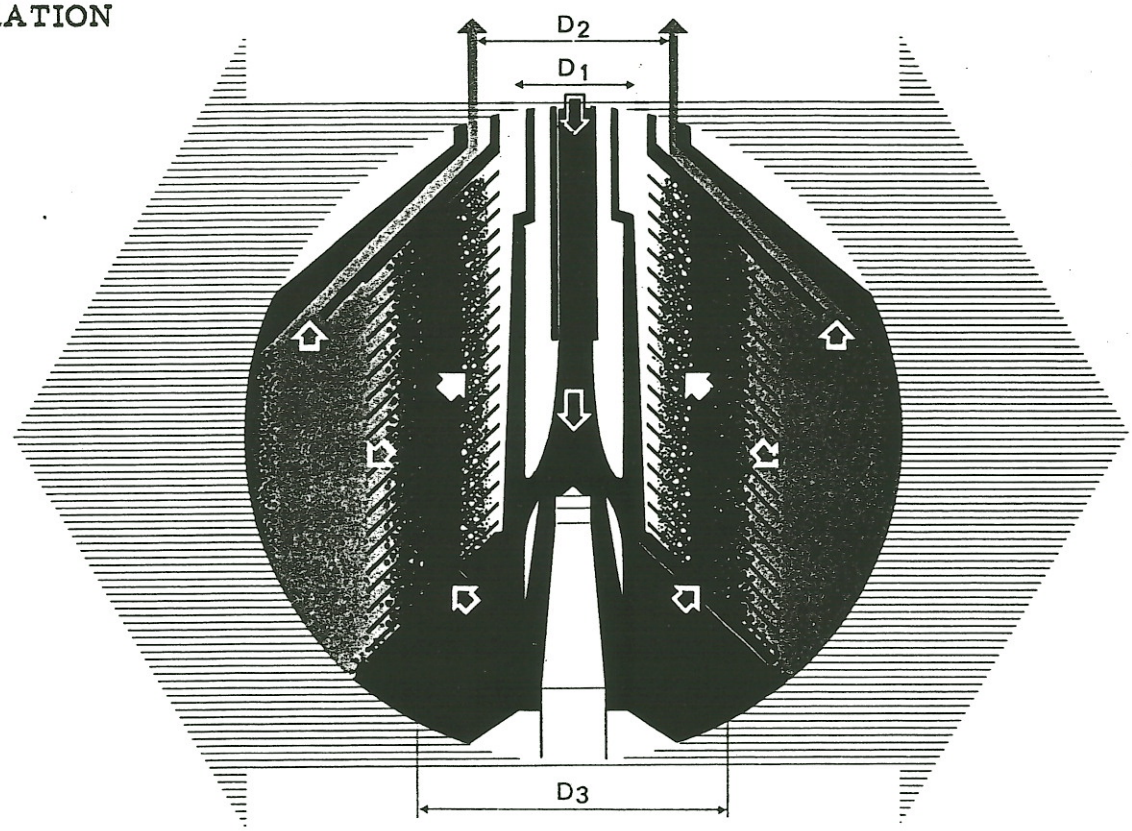
A liquid - liquid separation in which the machine is used for separating two intermixed liquids, which are insoluble in each other and have different specific gravities, the heavier liquid constituting the major part of the mixture. Solids with specific gravities higher than those of the liquids can be separated off at the same time.

Solids ejection	Emptying of the bowl during operation by uncovering and closing slots in the bowl wall.
Total ejection	Total emptying of the bowl with the feed (as a rule) turned off.
Partial ejection	Total or partial emptying of the solids space in the bowl but without emptying the rest of the bowl. The feed need not be interrupted.
Combined programme	A combination of total and partial ejections in succession.

FACTORS INFLUENCING THE SEPARATION

Difference in specific gravity	The centrifugal force acts on all particles proportionally to their specific gravity. This applies to solid particles as well as to fluid particles. The greater the difference in specific gravity, the easier the separation.
Size and shape of particles	The larger the particle, the quicker the sedimentation. The particles to be separated off must not be so small that the mixture is close to colloidal state. The smooth and round particle is easier separated off than the irregular one. Rough treatment, e.g. in pumps, can split the particles, with reduced size and separating speed as a result.
Viscosity	The more fluid a liquid is, the quicker is the separating process and the better the separation — in other words, low viscosity improves the separation result. The viscosity can in many cases be reduced by heating.
Time in centrifugal field	If the separation is not satisfactory, the throughput must be reduced. Lower throughput gives, normally, a better separation result.

CONCENTRATION



Centrifugal force

Bowl parts

Process liquid

Heavy liquid phase

Light liquid phase

Solids

D1 Diameter of inner outlet

D2 Diameter of outer outlet

D3 Diameter of interface

Concentrator bowl

This bowl has two outlets. The process liquid flows through the distributor to the interspace between the bowl discs, where the liquid phases are separated from each other by action of the centrifugal force. The heavy phase and any solids move along the underside of the bowl discs towards the periphery of the bowl, where the solids settle on the bowl wall.

The heavy phase proceeds along the upper side of the top disc towards the neck of the bowl hood and discharges over the gravity disc — the outer way (blue in the illustration).

The light phase moves along the upper side of the bowl discs towards the bowl centre and discharges via the top disc neck — the inner inner way (yellow in the illustration).

(Concentration, page 2)

Liquid seal

In a concentrator bowl the so-called liquid seal prevents the light phase from passing the outer edge of the top disc, i.e. taking the outer way. The liquid seal is built up automatically by the heavy liquid phase when this is forced out towards the bowl periphery. The border between the light and the heavy phase is called the interface. The position of the interface will depend partly on the ratio between the specific gravities of the two liquid phases, partly on the size of the diameters in the outer and the inner outlet (D_2 and D_1 respectively).

Hydrostatic balance

If the specific gravity of the light phase is s_1 and the specific gravity of the heavy phase is s_2, the hydrostatic balance can be expressed as follows:

$$\frac{s_1}{s_2} = \frac{D_3^2 - D_2^2}{D_3^2 - D_1^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Disposition of interface

The concentrator bowl is adjusted for separation of liquid mixtures with various specific gravity ratios by altering the diameter of the outlet for the heavy phase (D_2). For this purpose a number of gravity discs with various hole diameters is delivered with the machine.

Selection of gravity disc

The hole diameter in mm is stamped on each disc.

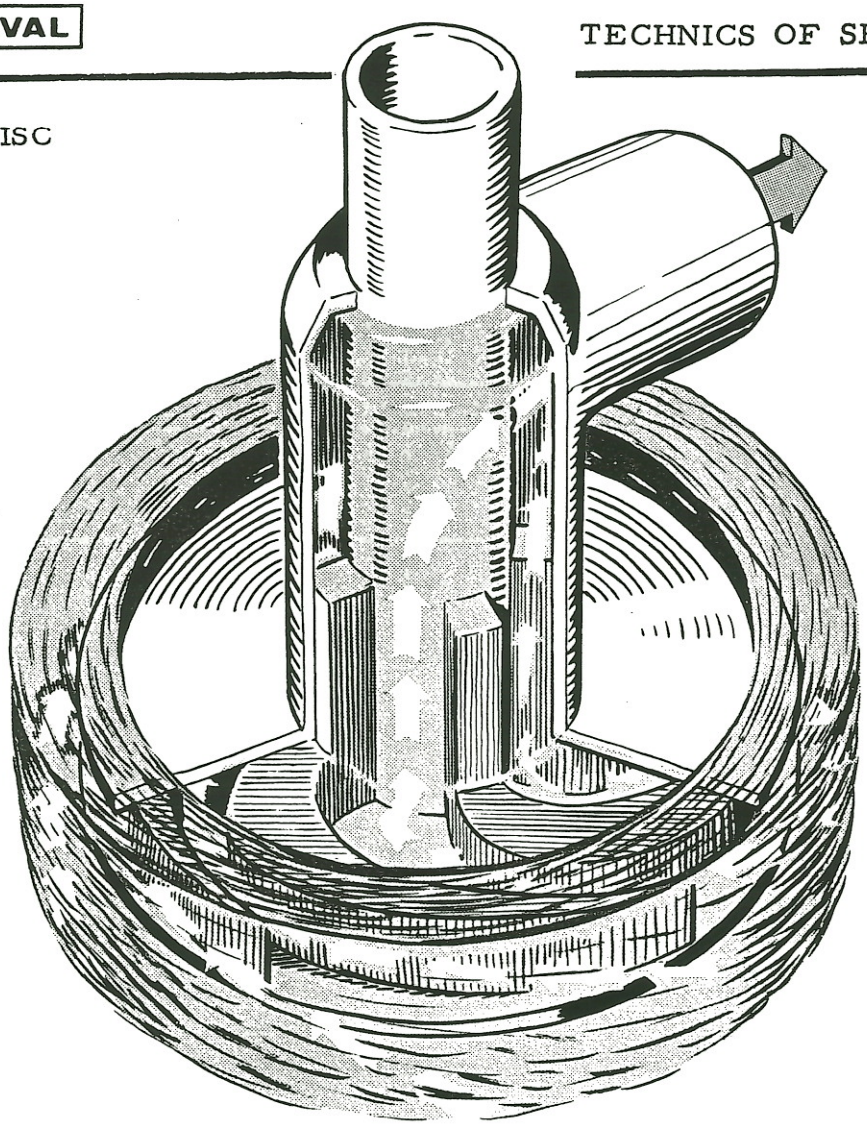
If the specific gravity ratio is close to 1, i.e. the difference between the specific gravities of the liquid phases is small, the interface should be disposed towards the bowl centre by using a gravity disc with small hole diameter. The greater the difference between the specific gravities of the phases, the larger the hole diameter of the gravity disc should be selected.

Where to dispose the interface depends on which phase should be obtained pure, and on the proportions between the amounts of the two phases as well.

If the light phase is wanted more free from the heavy one, the interface should be placed nearer the bowl periphery by inserting a gravity disc with larger hole diameter.

If the heavy phase is wanted more free from the light one, the interface should be placed nearer the bowl centre by inserting a gravity disc with smaller hole diameter, however not as far as inside the distribution holes of the bowl discs, as otherwise untreated liquid could discharge through the outlet for the light phase. The proper gravity disc in each specific case must be found out by practical separation experiments.

PARING DISC



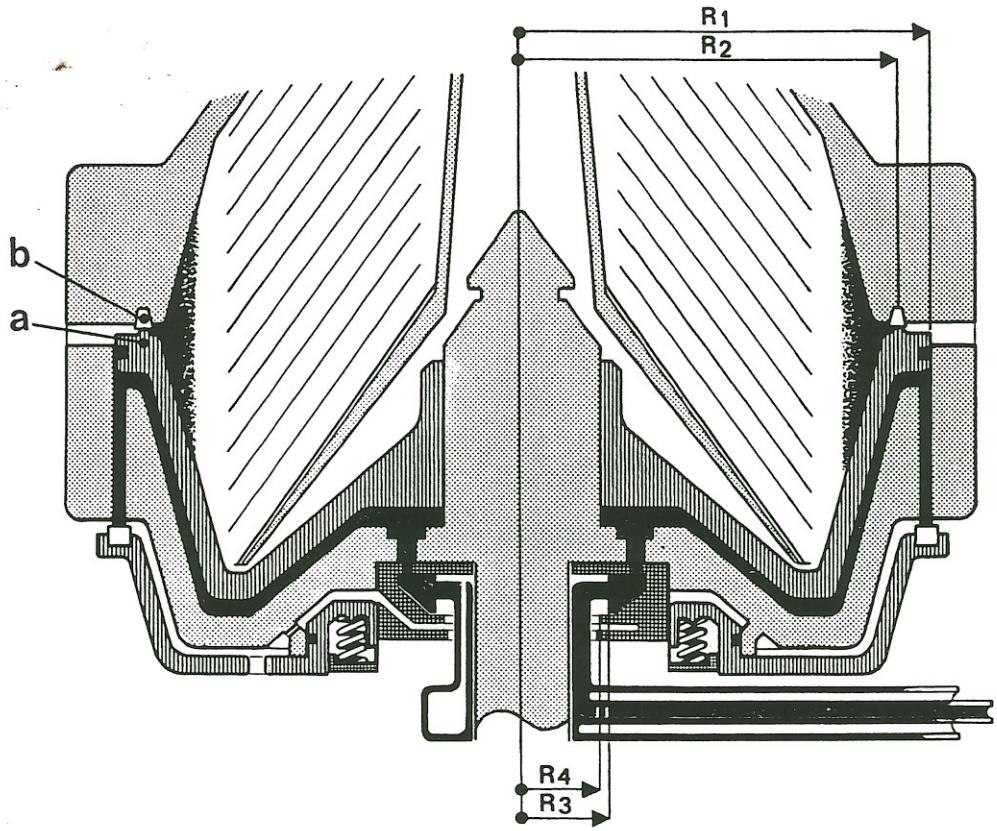
The paring disc has for its object to discharge the liquid under pressure.

The liquid rotates, driven by the rotating paring chamber, in the form of a ring around the paring disc. This dips radially, to a greater or smaller depth, into the rotating liquid ring, which exerts a pressure rising rapidly with increasing diameter. The pressure produced by the paring disc is composed partly of the "centrifugal pressure" prevailing at the periphery, partly of the kinetic energy of the rotating liquid ring which is converted more or less completely into pressure energy.

When the throughput is small and there is no back pressure in the discharge line, the inner diameter of the liquid ring will practically equal the outer diameter of the paring disc. If the liquid must overcome a back pressure, such as a high delivery head or pressure-absorbing apparatuses, the diameter of the liquid ring in the paring chamber will diminish until the back pressure is neutralized. Thus the paring disc will pump out all liquid fed to the paring chamber (notwithstanding the back pressure) up to the highest pressure the paring disc can produce at this liquid quantity.

(cont.)

SLUDGE DISCHARGE



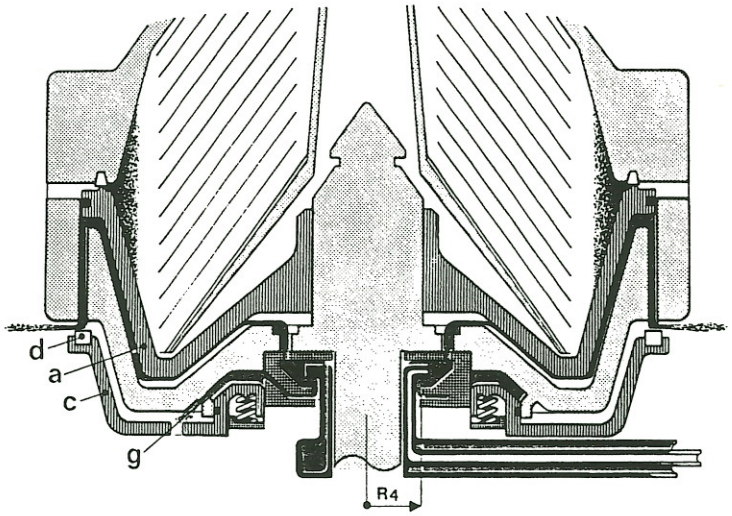
Total or partial discharge (operating slide)

The sludge discharge takes place through a number of sludge ports in the bowl wall. Between discharges these ports are closed by a large valve slide (a), the sliding bowl bottom, which constitutes an inner, sliding bottom in the separating space. The sliding bowl bottom is forced upwards against a seal ring (b) by the liquid pressure acting on its underside. During rotation, this pressure increases with the distance from the axis of rotation because of the centrifugal force. The operating liquid exerts an upward pressure exceeding the counter-acting downward pressure from the process liquid, because the underside of the sliding bowl bottom has a larger pressure surface (radius R_1) than its upper side (radius R_2).

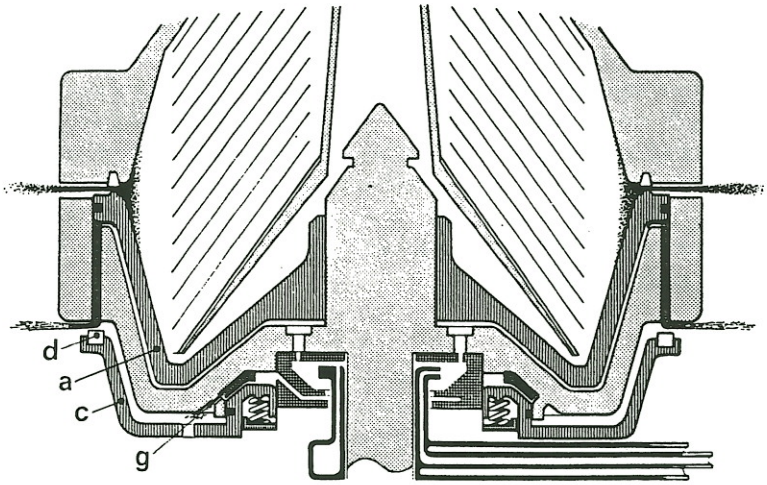
Operating liquid is supplied on the underside of the bowl through a paring disc device. Leakage or evaporation of operating liquid is made up for automatically by the paring disc, which maintains a constant horizontal operating liquid level (radius R_3), as its pumping effect neutralizes the static pressure from the supply.

This feed of operating liquid through the inner, narrower tube is going on also during the discharge cycle shown in the following illustrations but has not been indicated in the latter, as it is of minor effect in this connection.

(Sludge Discharge, page 2)

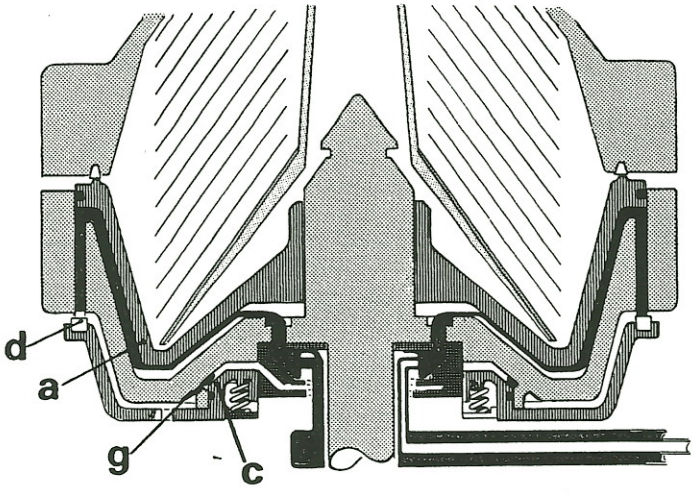


Operating liquid is now supplied through the outer, wider tube so that it flows over the lower edge of the paring chamber (radius R_4) and continues through a channel out to the space above an operating slide (c). Between discharges the operating slide is pressed upwards by coil springs. It is now forced downwards by the liquid pressure, thereby opening discharge valves (d) from the space below the sliding bowl bottom so that the operating liquid in this space flows out.

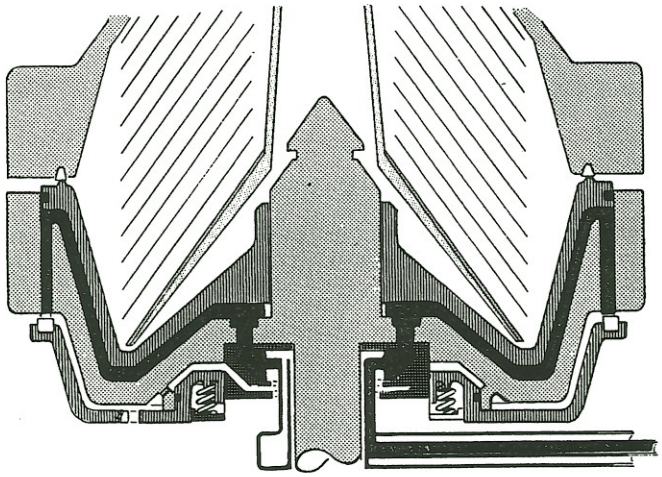


When the pressure exerted by the operating liquid against the underside of the sliding bowl bottom diminishes, the latter is forced downwards and opens so that the sludge is ejected from the bowl through the sludge ports in the bowl wall. The operating liquid on the upper side of the operating slide flows out through a nozzle (g). This nozzle is always open but so small that the outflow is negligible in view of the rapid inflow shown in the foregoing illustration.

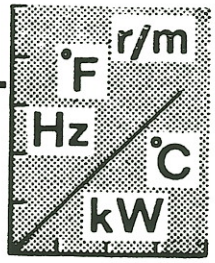
(Sludge Discharge, page 3)



The coil springs force the operating slide (c) upwards again, which closes the discharge valves (d) from the space below the sliding bowl bottom (a). Operating liquid is supplied through the outer, wider tube, but only enough to flow to the space below the sliding bowl bottom (a) and force the latter upwards so that the bowl is closed. (Any surplus supply of operating liquid flows through the channel to the operating slide, opening the bowl again).



The discharge cycle is accomplished when the situation is indentical with that shown in the first illustration in the series (but for the absence of sludge). The outer, wider tube is now closed, whereas the inner, narrower operating liquid intake is still open. The paring disc device counterbalances the static pressure from the operating liquid supply. The situation is identical with that shown in the first illustration of the series but for the difference that the sludge discharge cycle is now accomplished.



DATA

Supplementary particulars (such as weight data) are contained in the technical information sent to you in connection with the purchase of the machine.

POWER REQUIREMENTS

Suitable motor output: 2.2 kW (3.0 HP)
Working power for machine with motor 50 Hz:
Machine without pump 1.6 kW (2.2HP).

Working power for machine with motor 60 Hz:
Machine without pump 1.7 kW(2.3 HP)

SPEED

The prescribed speed of the worm wheel shaft, which must not be exceeded, is stamped on the type plate of the machine.
The speed table indicates r.p.m.

WORM WHEEL SHAFT	1420 - 1500	1700 - 1800
Drive (motor)	1420 - 1500*	1700 - 1800**
Revolution counter	118 - 125	142 - 150
Tachometer	-	-

* with direct coupling: 4-polar, 50 c/s A.C. motor or D.C. motor.
** with direct coupling: 4-polar, 60 c/s A.C. motor.

LUBRICATING OIL

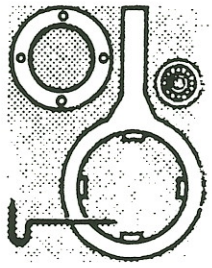
Depending on working temperature – see lubricating chart, chapter H.

ACCELERATION TIME

From 0 to operation speed: approx. 1.5 minutes.

OPERATING LIQUID

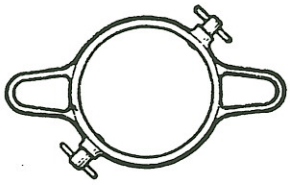
Low-pressure liquid (from tank): 0.05-0.12 kg/cm^2 (0.71-1.75 psi.).
High-pressure liquid: 1.5-3.0 kg/cm^2 (21.4-42.7 psi.).



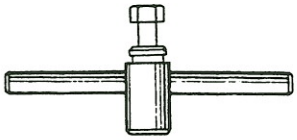
SET OF TOOLS

The special tools for the bowl are preferably hung up as close to the machine (or the cleaning place) as possible. If a tool is provided with left-hand screwed joint, this has been specially pointed out in the dismantling and assembling instructions. Notification in this respect is not made where right-hand thread is concerned.

TOOLS for BOWL

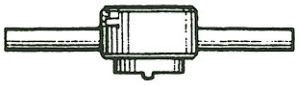


Spanner for small lock ring
-- 528182-80

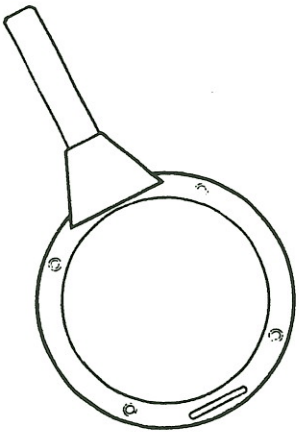


Lifting tool for bowl body, distributor and distributing cone
-- 543932-80

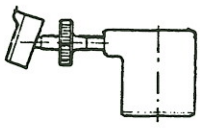
Tin mallet
-- 528927-1



Lifting tool for sliding bowl bottom
-- 525724-80

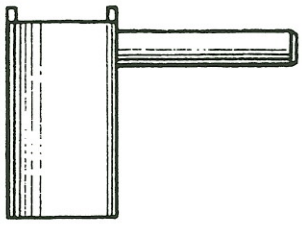


Spanner for large lock ring
-- 525726-80



Assembling tool for wear liner
-- 540192-80

TOOLS for POWER TRANSMISSION



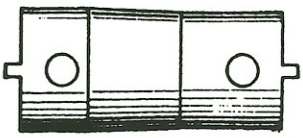
Pin spanner for throw-off collar of bowl spindle -- 521703-80

TOOLS for MOTOR ASSEMBLING

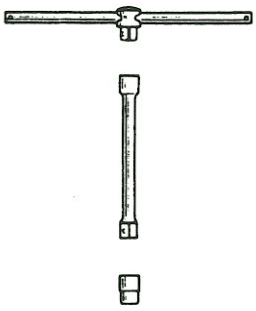
Lining-up tool -- 525339-1*

* Not included when motor has been lined up before delivery.

GENERAL TOOLS



Pin spanner for round nuts -- 37996



T-handle --72243

Extension rod --72244

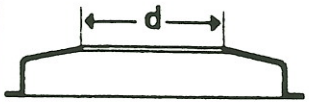
Sockets:

11 mm --72978
1/2 " --42369
9/16" --73376
3/4 " --73377
15/16" --42384
24 mm --73085

SPECIAL SPARE PART NUMBERS

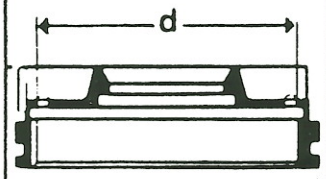
Listed below are some spare part numbers which for practical reasons have not been inserted in the chapter where they properly belong.

BOWL (comp. chapter I) Gravity disc



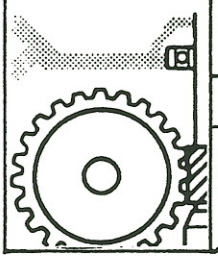
Hole diameter in mm (stamped on)	Part number
53.5	528138-09
55.0	528138-10
56.5	528138-11
59.0	528138-06
61.0	528138-13
63.0	528138-07

Level ring



Hole diameter in mm (stamped on)	Part number
50	525648-03

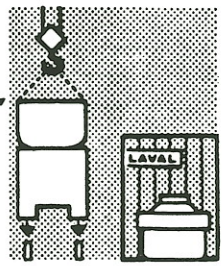
Power transmission (comp. chapter P)



Speed of worm wheel shaft in r.p.m	1420-1500	1700-1800
Worm wheel	526700-80	526701-80
Friction block (2) with pad and screws	527983-82	527983-83

The speed of the worm wheel shaft is indicated on the type plate.

Always check that the old worm gear part and the new one have the same number of teeth.



INSTALLATION

This chapter deals with the mounting of the machine and with the actions to be taken before the first start. The ALFA-LAVAL representative is always glad to provide further advice and information.

DIMENSIONED DRAWING

All measurements needed for the installation are given in the dimensioned drawing, the reference numbers of which are explained below. (The table applies to several types of separator and thus comprises more reference numbers than are found in the drawing.)

1 Feed
2 From heater
3 To heater
4 Light effluent
5 Heavy effluent
6 Solid effluent
7 Overflow liquid
8 Drain
9 Auxiliary liquid for liquid seal

10 Auxiliary liquid for liquid seal
11 Auxiliary liquid
12 Flushing liquid
13 Self-emptying
14 Air or other gas (except steam)
15 Operating liquid
16 Operating liquid
17 Cooling air
18 Cooling air
19 Ventilation

20 Ventilation
21 Return flow
22 Electric connection
23 Effluent
24 Raw material
25 Treated raw material
26 Steam
27 Waste liquid
28 Flushing liquid
29 Reagent

30 Flushing liquid
31 Barrier liquid
32 Barrier liquid
33 Barrier liquid
34 Barrier liquid
35 Waste liquid
36 Ventilation
37 Air or other gas (except steam)
38 Water feed
39 Outlet for bowl emptying

40 Inlet
41 Outlet
42 Concentrate
43 Operating liquid
44 Ventilation
45 Air or other gas (except steam)
46 Waste liquid
47 Constant pressure valve
48 Flow meter
49 Shut-off valve

50 Control valve
51 Flow indicator
52 Sight glass
53 Electric connection
54 Brake handle
55 Revolution counter
56 Oil filling screw
57 Oil gauge glass
58 Oil drain screw
59 Waste liquid

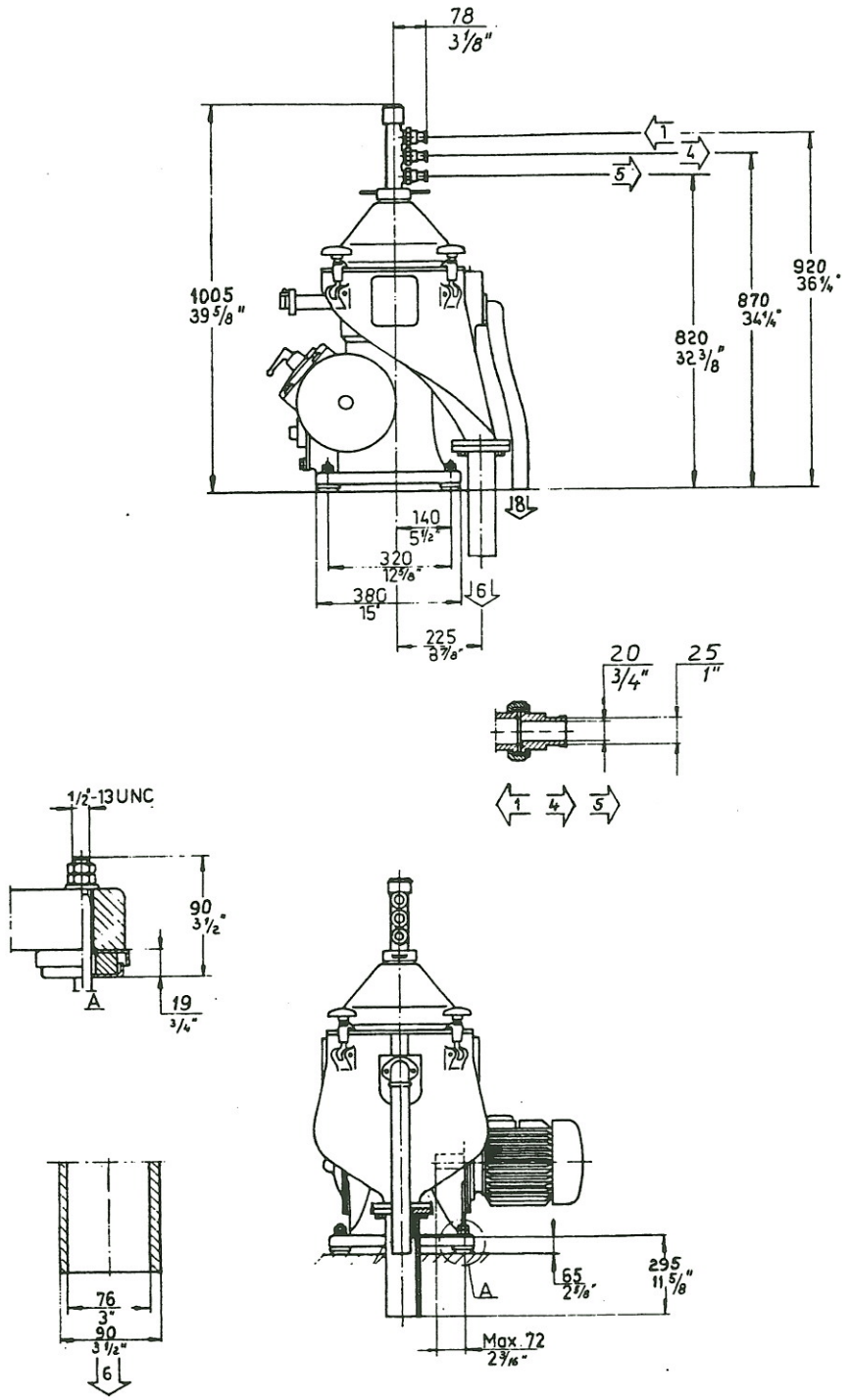
60 Shut-off valve
61 Feed pump
62 Strainer
63 Light liquid feed
64 Heavy liquid feed
65 Light effluent
66 Heavy effluent
67 Barrier liquid
68 Air or other gas (except steam)
69 Protective gas

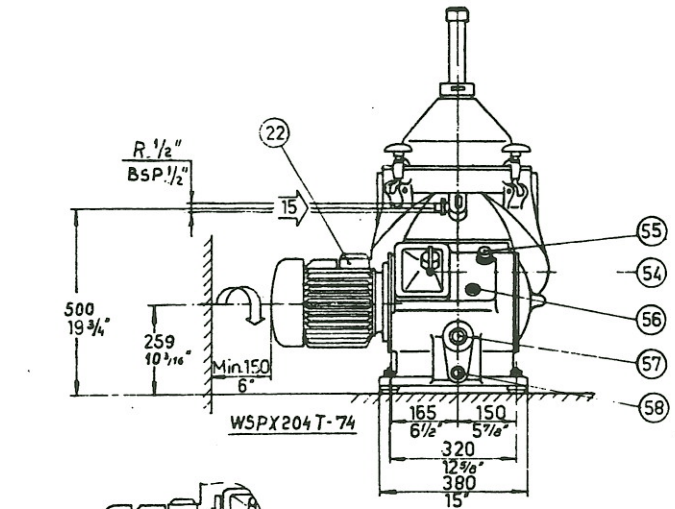
70 Protective gas
71 Electric connection
72 Cream
73 Thermometer
74 Strainer
75 Steam preheater
76 Operating water tank
77 Sludge tank
78 Sludge pump
79 Softening filter

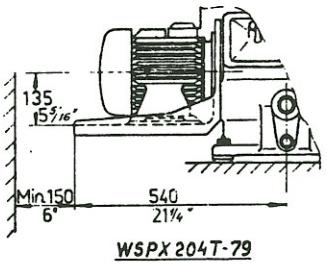
80 Condensation water
81 Interface control
82 Pump for feed and discharge
83 Discharge pump
84 Three-way valve
85 Plate heat exchanger
86 Skimmilk
87 Whey
88 Bowl emptying
89 Draw-off

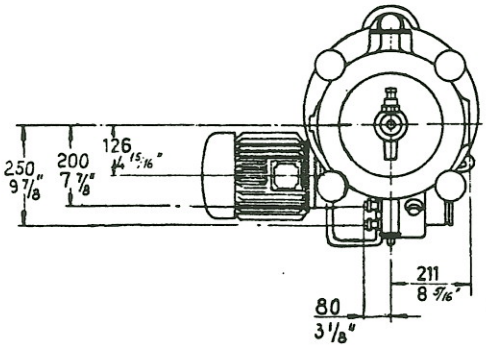
90 Nozzle flow
91 Flow-control valve
92 Flushing liquid
93 Barrier liquid
94 Check valve
95 Pressure regulator
96 Pressure gauge
97 Fixed throttling
98 Pilot liquid
99 Indicator gas

100 Cooling liquid
101 Compressed air
102 Vibration switch
103 Oil level switch
104 Protective gas
105 Protective gas


78
3 1/8"
1
4
5
1005
39 5/8"
920
36 1/4"
870
34 1/4"
820
32 3/8"
18
140
5 1/2"
320
12 5/8"
380
15"
6
225
8 7/8"
20
3/4"
25
1"
1 4 5
1/2"-13UNC
90
3 1/2"
A
19
3/4"
76
3"
90
3 1/2"
6
65
2 5/8"
295
11 5/8"
Max. 72
2 13/16"







(1) Liquid to be treated
Separierungsflüssigkeit
Liquide à traiter
Сепарируемая жидкость
Separeringsvätska

(4) Light liquid component
Leichter Flüssigkeitsbestandteil
Composant léger du liquide
Лёгкий компонент жидкости
Lätt vätskekomponent

(5) Heavy liquid component
Schwerer Flüssigkeitsbestandteil
Composant lourd du liquide
Тяжелый компонент жидкости
Tung vätskekomponent

(6) Sludge
Schlamm
Boues
Грязь
Slam

(8) Drain
Abfluss
Egout
Дренаж
Dränering

(15) Operating liquid, in
Steuerflüssigkeit, ein
Liquide de manoeuvre, entree
Жидкость открыв и закрыв барабан, впуск
Manövervätska, in

(22) Electric connection
Elektrischer Anschluss
Raccordement électrique
Подключение к силовой сети
Elanslutning

(54) Brake handle
Bremshebel
Poignée du frein
Тормозная рукоятка
Bromshandtag

(55) Revolution counter
Umlaufzähler
Compteur de tours
Счетчик числа оборотов
Varvräknare

(56) Oil filling screw
Oileinfüllschraube
Vis de remplissage pour huile lubrifiante
Винт для наполнения масло
Påfyllningsskruv för smörjolja

(57) Oil gauge glass
Ölstandglas
Verre de niveau de l'huile
Стекло для проверки уровня масла
Oljenivåglas

(58) Oil drain screw
Ölablasschaube
Vis de vidange pour huile lubrifiante
Винт для спуска масло
Avtappningsskruv för smörjolja

UNPACKING

When unpacking take care not to scratch metallic or printed surfaces.
Check by means of the packing list that all parts have been unpacked.

FOUNDATION

The foundation must be plane and solid and can consist of girders, concrete or the like. Bolt dimensions, distance between the bolts etc. appear from the dimensioned drawing. The distance to the nearest wall must not be smaller than the minimum stated in the dimensioned drawing. Arrange pipes, pumps and other apparatuses so that they are easily accessible for inspection.

FRAME. ERECTION

See chapter S. Necessary measurements are found in the dimensioned drawing.

LUBRICATION

Never start the machine unless there is oil in the worm gear housing. See chapter H.

HEIGHT ADJUSTMENT

Check as described in chapter L.

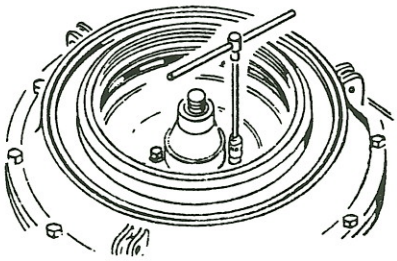
BOWL. INLET. OUTLET

Dismantle and (if necessary) clean the parts in contact with liquid - see chapter I. Make sure the seal rings are fitted in their places (in some cases they are packed separately in the pack box).

The seal ring in the lower edge of the bowl hood must be protected against injury. The bowl hood should, therefore, be placed on a soft base, such as wood or rubber.

(cont.)

(Bowl. Inlet. Outlet, page 2)



Screw the three screws out of the distributing ring. The ring is later to be secured to the bowl body by these screws.
If the cap nut sits on the bowl spindle unscrew it (clockwise) before mounting the bowl body.
Before running, the bowl must be assembled as directed in chapter I.

MOTOR MOUNTING

See chapter R.

CONNECTION TO MAINS

Connect the motor to mains so that the bowl will rotate CLOCKWISE.

Note.

The machine must never be started unless the bowl is placed on the spindle and the worm gear housing contains lubricating oil in the prescribed quantity and of the proper quality. If the machine is to be run up to full speed the covers must, besides, be fastened.

ACCESSOIRES

For installation of pumps, strainers etc., if any, see chapter X.

Piping

Fit the pipes and hoses so that the inlet and outlet connections of the machine are not subjected to strain. Tightweld (hard-solder) internal pipe ends in connection sleeves so as to avoid dirt-collecting pockets. This is particularly important in plants on which high hygienic demands are made, such as in the food industry.
Grind and polish all welding seams (hard-solderings) carefully.
All attachements should be made so as to allow variations in length and to prevent transmission of strains and vibrations.
Blow or flush out each section of the piping after mounting. Also flush out the whole pipe system after installation so that metallic ashes and other impurities are removed entirely and cannot get into the machine, pumps or other apparatuses.

Sludge tank

This tank should hold min. 100 lit. It should be provided with de-aeration in order to avoid that a back pressure is built up during evacuation. The tank could either be open at the top or it could also be provided with a vertical ventilation tube min. 100 mm (4").

OPERATING LIQUID SYSTEM

The design of the control mechanism determines what type of sludge discharge is performed. The control mechanism can be constructed to give total, rapid total, partial or combined discharge of the bowl, and the actual type of discharge is stated in each case on the perspective bowl draining in chapter I. The discharge will be performed properly when operating liquid is supplied at the correct pressure, at the right time and in the correct quantities during correctly calculated periods.

Operating liquid

Pure, soft water can be used as operating liquid. Hard water will involve a risk of lime deposits, which may obstruct the narrow channels in the operating liquid system with service interruptions as a result.

The demands on the softness of the water increase with the operating temperature, since lime precipitation is more liable to occur at higher temperature.

Addition of a dehardening agent or provision of a dehardening filter in the operating liquid line will prevent lime precipitation.

Operating liquid tank

The operating liquid tank, which should be made of copper or stainless steel and should hold 50-100 l (11-22 Imp. galls), must be placed so that the liquid level will be lying within the measurement limits stated in the figure for correct height above the control valve. In case of insufficient space the tank may be replaced by a reducing valve or the like. Such an arrangement may, however, be less reliable than a tank. Besides, the tank system saves liquid during operation, since the back pressure of the control paring disc is in this case balanced in an open system.

Bowl for total discharge

When the machine is equipped with bowl for total discharge and the discharge should be controlled manually (by means of control valve), the operating liquid system must be arranged as shown in the adjoining figure:

Low-pressure liquid from the tank — closes the bowl and keeps it closed during operation, High-pressure liquid from the water line — opens the bowl (supply to be shut off during operation).

Automation

The sludge discharge cycle can be automated — see special directions for programmed sludge discharge (automatic control).

FULLY AUTOMATED SYSTEM

In connexion with the automatization of the operating liquid system it is preferable and in some cases even necessary to automatize also the other actions connected with the sludge discharge (such as interruption of the feed to the bowl).

If the automatic system is included in the delivery, the installation and operation is carried out according to the accompanying directions for programmed discharged (automatic control), otherwise consult an ALFA-LAVAL/DE LAVAL representative on the choice of suitable equipment.

ALARM DEVICE

Pressure drops in pipes from the machine during operation can indicate a liquid loss. Such pressure drops will occur if the bowl does not close or closes only partly, and, in purification when the liquid seal breaks so that light phase runs out through the outlet for the heavy phase. Whether the machine is automated or not it is suitable, with closed systems, to provide a guard such as a pressostat with alarm device. With a purifier the pressostat is fitted in the conduit for light phase and with a clarifier in the conduit for clarified liquid. The device should be of such a design that the alarm impulse from the pressostat is blocked when a normal pressure drop occurs, e.g. in connexion with normal sludge discharge.

CHECK

Before putting the machine to service check the installation, ascertaining in particular:

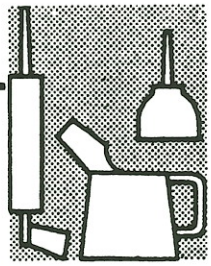
o that the worm wheel shaft rotates at prescribed speed and that the bowl rotates in the correct direction

o that the nuts of the resilient frame anchorage are tightened (finally adjusted) according to the directions in chapter S

o that the directions under heading BEFORE STARTING in chapter K have been followed.

CLEANING PLACE

A table, a stand or the like affording place for the bowl and its special tools should be placed as close to the machine as possible.



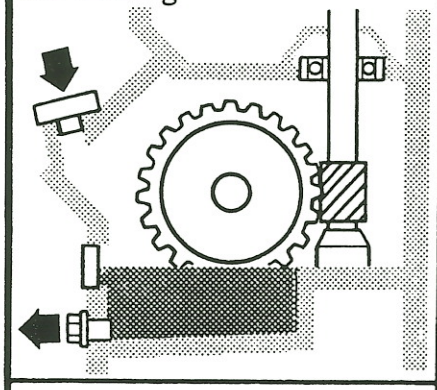
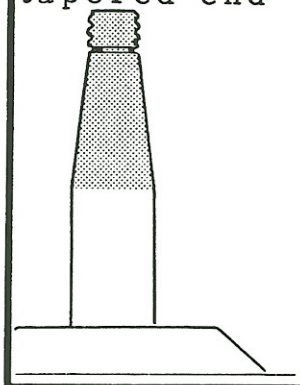
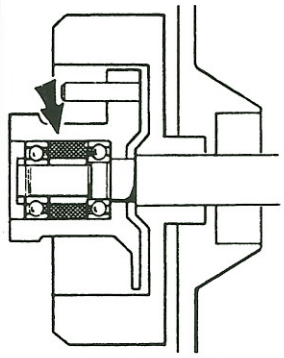
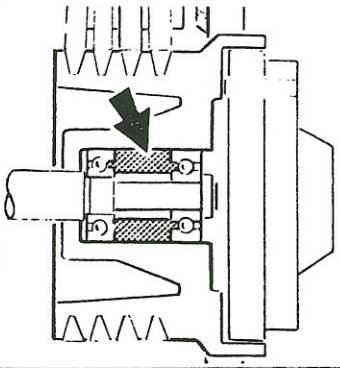
LUBRICATION

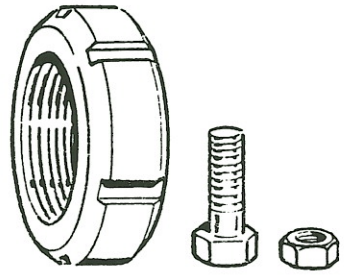
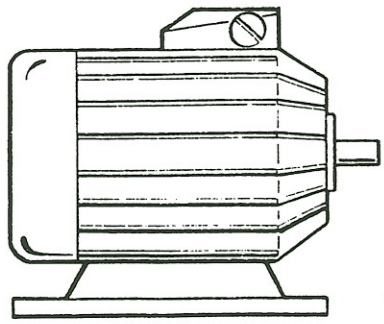
It should be understood that the mentioning of certain brands as examples of a suitable lubricant does not involve an exclusion of other brands with equivalent properties.

ABREVIATIONS – see chapter A.

The machine is delivered without oil in the worm gear housing. It must NOT be started unless oil in the quantity and of the quality prescribed has been supplied. A change of the separating temperature can make it necessary to replace the oil by oil of a different type.

Lubricants, oil as well as grease, must be kept in clean, closed cans to prevent penetration of dust and moisture and to reduce the oxidizing effect to the air as far as possible. The storing room should be dry and cool.

LUBRICATION POINT	LUBRICANT	WHEN
Worm gear housing 	Separating temp: 0 - +30°C = SAE 40 +30 - +100°C = SAE 50 Ambient temp: lowest +5°C Oil quantity: 3 l (0.7 UK gal).	Filling before first starting. First oil exchange after 300 hours´operation, then after every period of 1500 hours´ operation. In seasonal operation before every operating period. Cleaning before exchange. Oil level in upper half of the gauge glass.
Bowl spindle tapered end 	Molybdenum disulfide paste. Oil Grease Anti-corrosive agent	Always before putting the bowl body on the spindle, however at least once a month. Apply sparsely to avoid slipping but sufficiently to avoid seizing. At service interruptions with bowl removed.
Clutch coupling nave 	Anyone of the recommended ball bearing greases.	Renewal of grease once a year, as well as cleaning of bearings and bearing seats. Grease the bearings and fill the space around the spacing sleeve to approx. one third.
Nave of V belt and flat belt gearing 	Anyone of the recommended ball bearing greases.	Renewal of grease once a year, as well as cleaning of bearings and bearing seats. Grease the bearins and fill the space around the spacing sleeve to approx. one third.

LUBRICATION POINT	LUBRICANT	WHEN
Other machine parts 	Parts of stainless steel: Molybdenum disulfide grease, Molykote 1000 Parts of steel: Oil as recommended for the worm gear housing.	Before every mounting. Observe, however, that the conveyor pulley must NEVER be lubricated.
Motor 	Follow motor supplier´s re-commendations.	Follow motor supplier´s recommendations.
Bowl lock ring and other bowl parts	See special re-commendations below.	See special recommenda-tions below.
Feed pump	Lubricated by process liquid	Continous lubrication during operation.

LUBRICANTS

Lubricating oil for worm gear housing

For choise of lubricating oil type follow the recommendations given in the lubrication schedule.
The oil types mentioned in the table must meet the demands on quality stated below. When in doubt consult an authorized ALFA-LAVAL representative.
Always use a high grade lubricating oil.

SAE-oils

Oil type	Max. viscosity		Min. viscosity index	Pour point
	SSU at 210°F	°E at 100°C		°C (°F)
SAE 10W	210 at 100°F	1,5-2 at 50°C	-	-20 -4
SAE 20	45-58	1,4-1,8	80	-10 +14
SAE 30	58-70	1,8-2,1	80	-10 +14
SAE 40	70-85	2,1-2,5	80	-10 +14
SAE 50	85-110	2,5-3,2	80	-10 +14

EP-oils

	Examples
EP - 1	BP Energol Gear 300 EP Caltex Meropa Lubricant 3 Gulf EP Lubricant 75 Mobil Compound DD Shell Macoma 72
EP - 2	BP Energol Gear 425 Caltex Meropa Lubricant 3 Gulf EP Lubricant 115 Mobil Compound EE Shell Macoma 75
EP - 3	Mobil Mobilube HD 80 - 90 Gulf Transgear EP 80 - 90

Observe

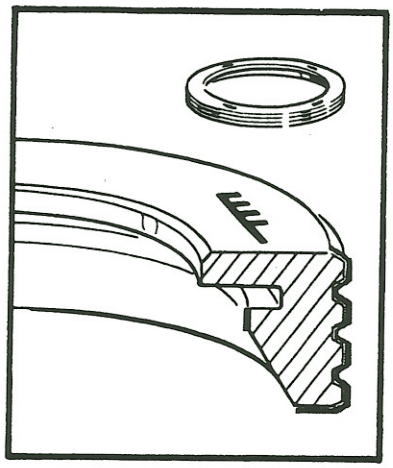
- Special Diesel cylinder lubricating oils containing amine type additives (generally intended for heavy-oil-burning marine diesel engines) and "multigrade" motor-car lubricating oils should not be used.
- Never intermix oils of different makes, as they may contain different components.

(Lubricants, page 2)

Molybdenum disulfide paste	Examples: Molykote Paste G Rocol Anti-Scuffing Paste
Molybdenum disulfide grease	Examples: Molykote BR-2 Molykote BR-3 Polyethylene-castor oil paste or polytetrafluoro ethylene-castor oil paste is recommended for machines used in the food industry or where dark-coloured lubricants are unsuitable.
Ball bearing grease	Always use a high grade lithium soap type ball bearing grease according to NLGI-class 2 or 3 and usable at temperatures above 100°C (212°F). Drop point about 180°C (356°F) according to ASTM D 566-44. Examples: BP Energrease 2 or 3, Caltex Starfak premium Grease 2 or 3, Castrol Spheerol AP Grease 2 or 3, Esso Beacon Grease 2 or 3, Gulfcrown Grease 2 or 3, Mobilux Grease 2 or 3, Shell Alvania Grease 2 or 3.
Lubricating grease. Consistent grease.	Always use one of the recommended ball bearing greases.
Oil	Use the oil recommended for the worm gear housing

Bowl

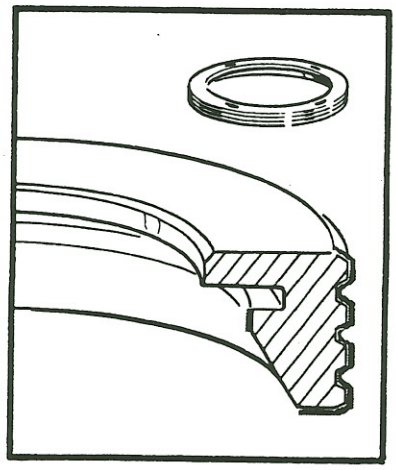
Before every assembly wipe clean the threads of lock rings, bowl body and bowl hood as well as the contact surfaces between these parts. If necessary, they should be cleaned with a clean cloth moistened with cleaning agent (see chapter L). After wiping, lubricate them according to one of the alternatives below.



Alternative 1

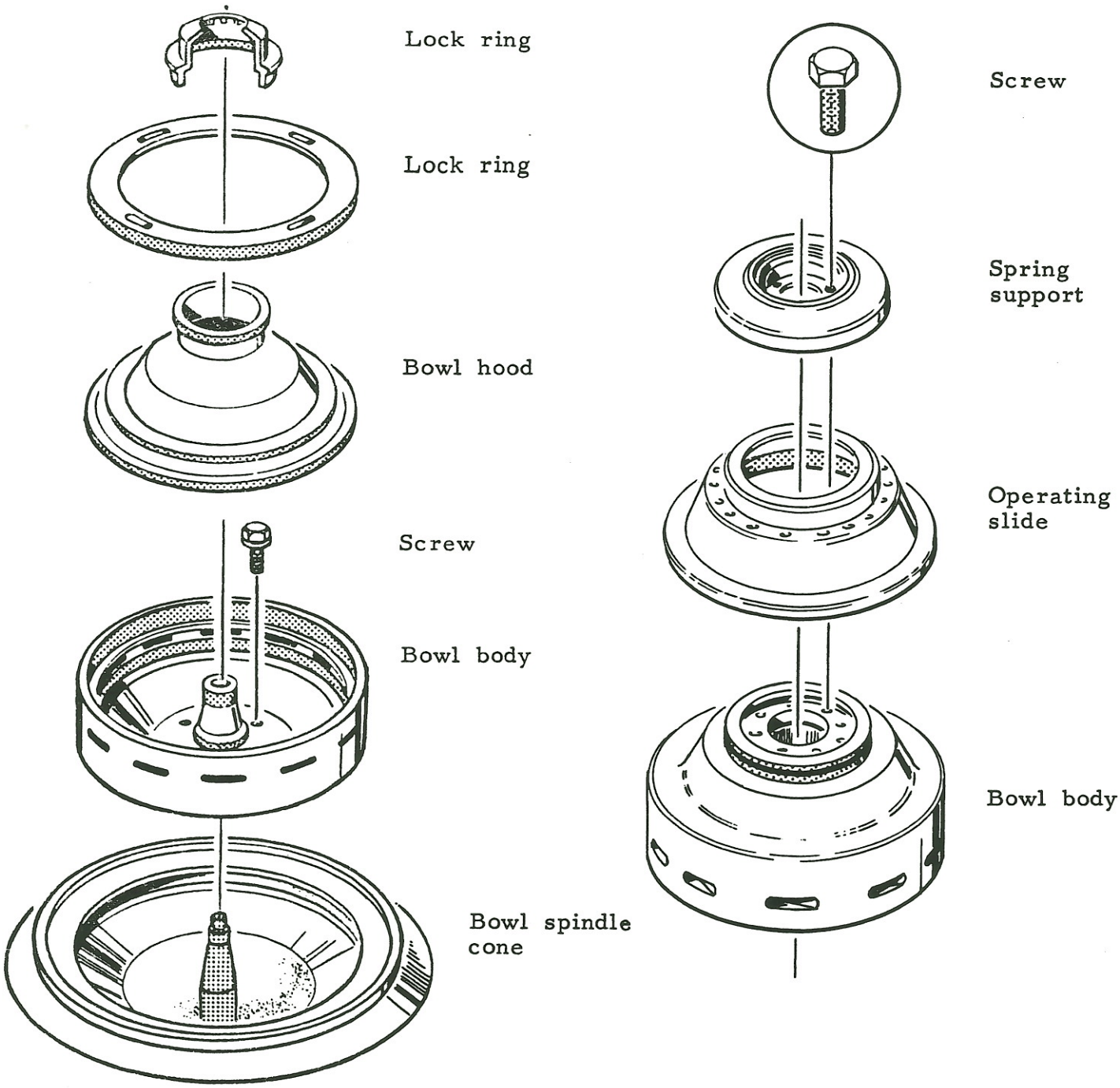
When the bowl lock ring is made of stainless steel or monel metal and the bowl body and/or the bowl hood are of stainless steel, the lock ring carries the symbol shown in the adjoining drawing. The following lubrication procedure is recommended:

1. PRIMING with molybdenum disulfide paste. Rub or brush in the paste sparsely all over the surface – follow the directions printed on the wrapping, if any. Always prime new parts as well as parts which have lost their previously applied primer due to e.g. thorough cleaning or machining.
2. LUBRICATION with Molykote paste 1000 grease after priming, and before assembly after routine dismantling as well. Polyethylene-castor oil paste, Castor oil or some other equivalent lubricant can be used for machines emploied in the food industry or where dark-coloured lubricants are unsuitable, for instance Molykote paste D (white).

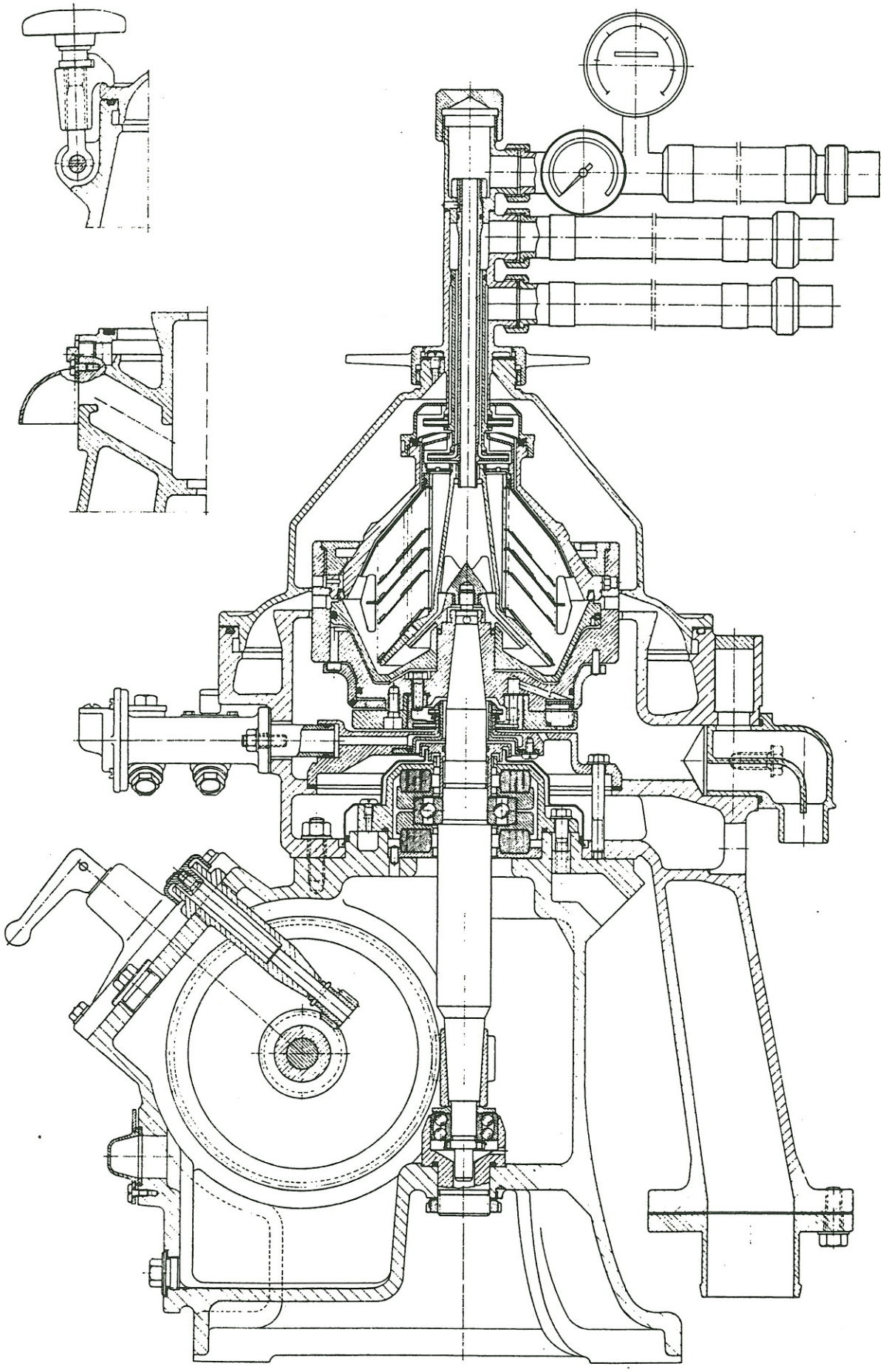


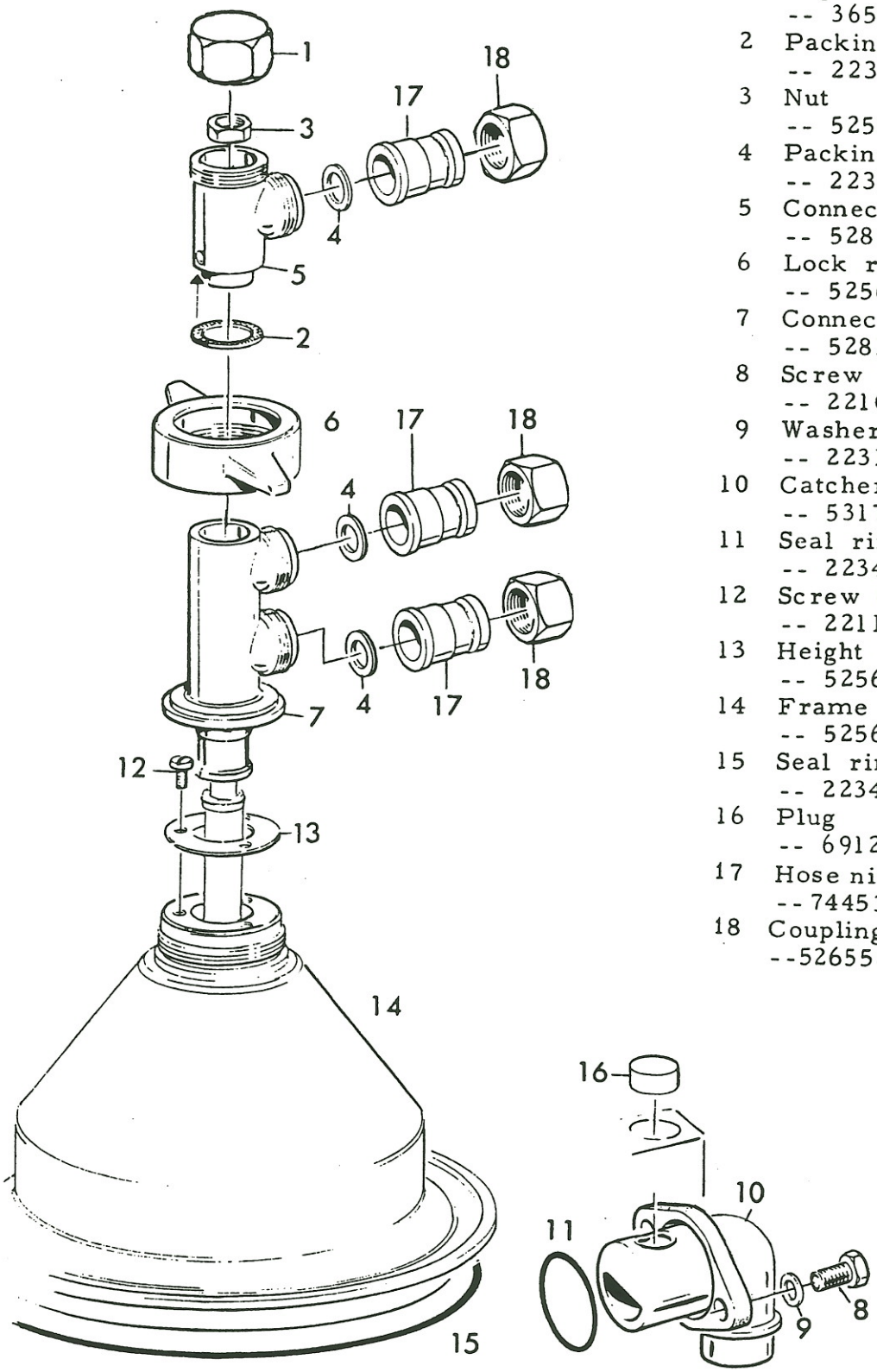
Alternative 2

When the lock ring is made of carbon steel priming is normally unnecessary, lubrication alone will do – for lubricant see above.
However, if a tendency to seizing is observed, alternative 1 must be applied.



All surfaces spotted on the drawing must be cleaned and lubricated before the parts are mounted.
Notify the special lubricating directions on foregoing page.





PARTS for INLET and OUTLET.
FRAME HOOD

1 Cap nut
-- 36540
2 Packing
-- 223434-04
3 Nut
-- 525616-01
4 Packing (3)
-- 223433-17
5 Connection piece
-- 528151-80
6 Lock ring
-- 525612-02
7 Connection housing
-- 528139-02
8 Screw (2)
-- 2210947-15
9 Washer (2)
-- 223101-50
10 Catcher
-- 531756-02
11 Seal ring
-- 223401-23
12 Screw (3)
-- 2211721-07
13 Height adjusting ring (1-5)
-- 525625-01
14 Frame hood
-- 525611-02
15 Seal ring
-- 223412-52
16 Plug
-- 69121
17 Hose nipple
--744530-01 (3)
18 Coupling nut
--526558-01 (3)

DISMANTLING

Note that the bowl must come to rest before dismantling is commenced – check by means of the revolution counter. To render the bowl accessible e.g. for cleaning, dismantle as follows:

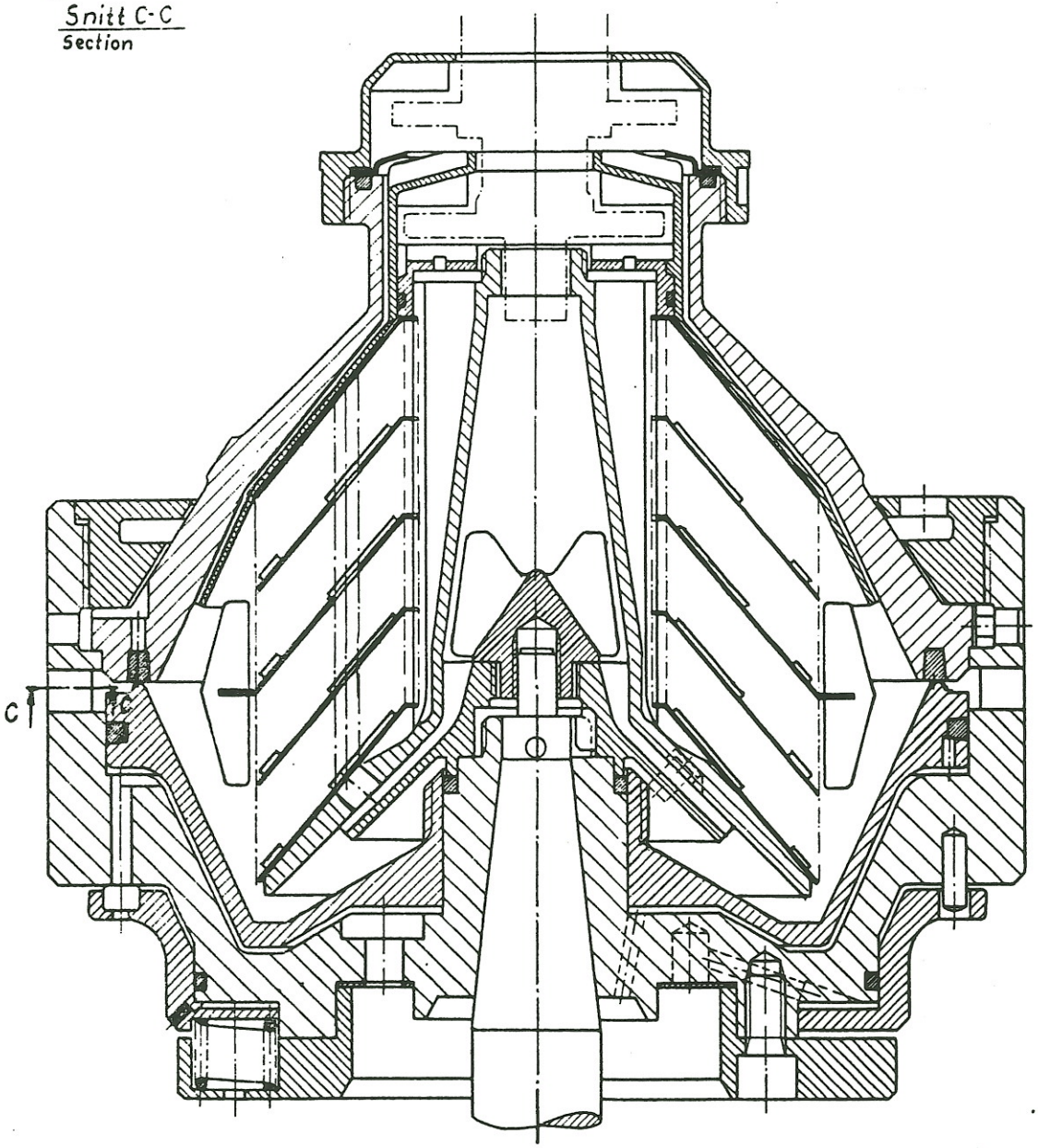
- Unscrew the nut for the paring disc (pos. 3) and remove the connection piece (pos. 9). Loosen the lock ring (pos. 10) and lift off the connection housing.
- Undo the hinged bolts and lift off the frame hood.

Do not dismantle the connection housing unless it is necessary.
Loosen the height adjusting rings (pos. 24) only when adjusting the height position of the paring disc.

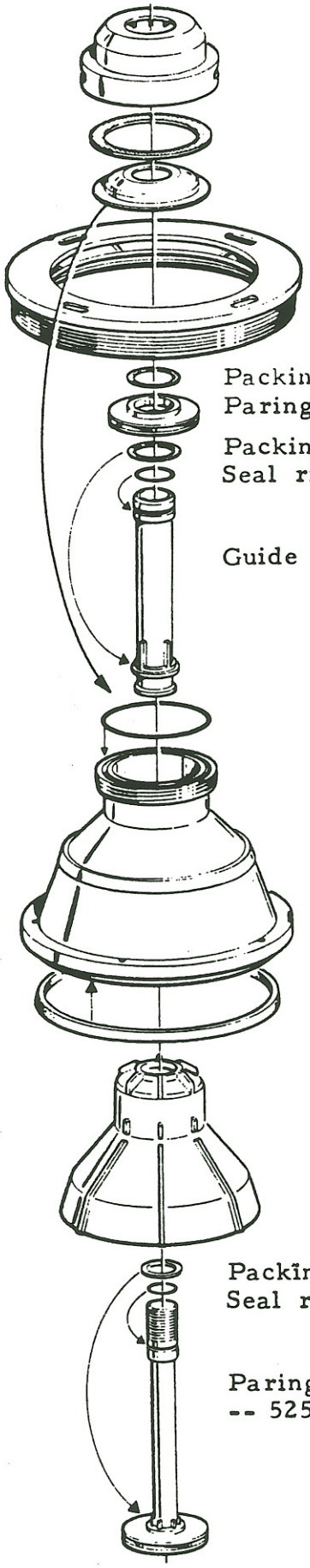
ASSEMBLY

Clean all parts. Carefully lubricate threads and contact surfaces. Ascertain particularly that the nut of the paring disc is well lubricated and properly tightened.
Check the height position of the paring discs before the first start and after exchange of parts which can affect this position – see chapter L, "Height adjustment".

Snitt C-C
Section



CONCENTRATOR BOWL for TOTAL DISCHARGE -- 540213-80



Lock ring
-- 528137-03
(left-hand thread)
Packing
-- 517774-29
Gravity disc
-- see chapter F

Lock ring*
-- 525653-01
(left-hand thread)

Packing -- 223314-06**
Paring disc -- 525719-80**

Packing -- 223314-06**
Seal ring -- 223406-16**

Guide sleeve -- 525686-02**

Seal ring
-- 70942

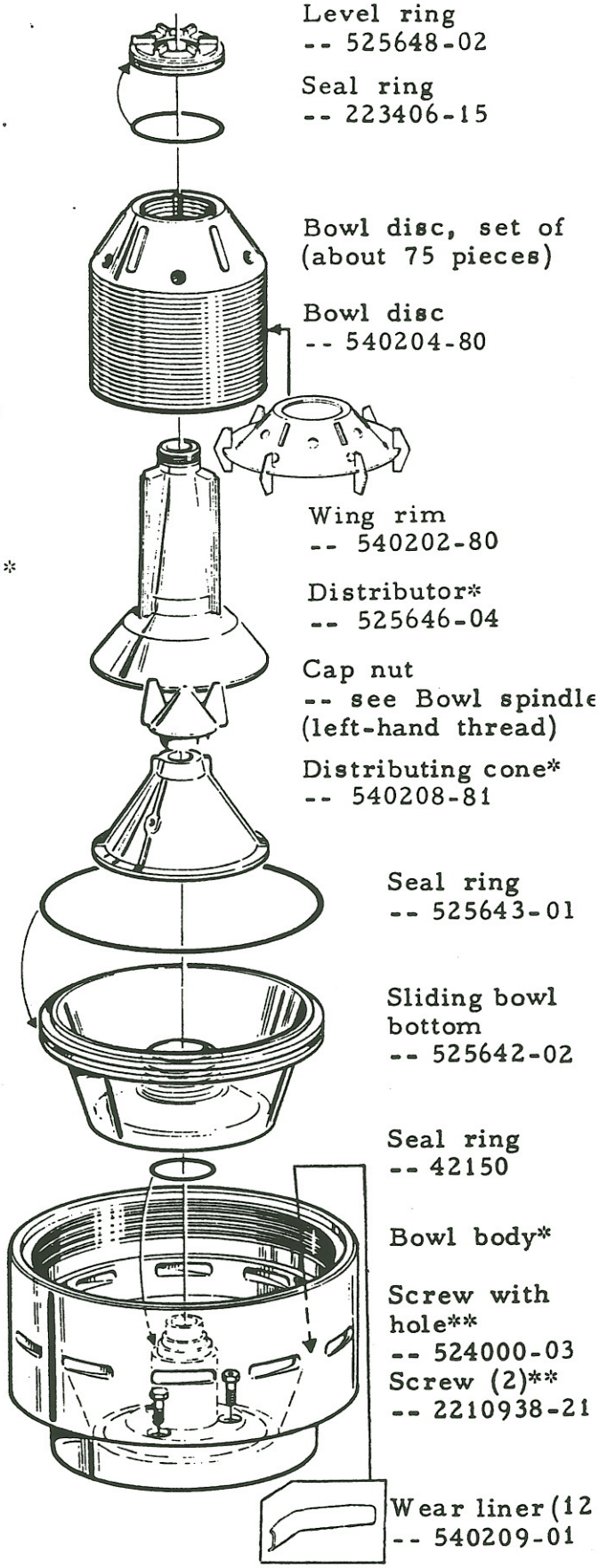
Bowl hood*
-- 528131-01

Seal ring
-- 521875-02

Top disc*
-- 543347-01

Packing -- 223312-04**
Seal ring -- 223404-01**

Paring disc with tube**
-- 525713-80



Level ring
-- 525648-02

Seal ring
-- 223406-15

Bowl disc, set of
(about 75 pieces)

Bowl disc
-- 540204-80

Wing rim
-- 540202-80

Distributor*
-- 525646-04

Cap nut
-- see Bowl spindle
(left-hand thread)

Distributing cone*
-- 540208-81

Seal ring
-- 525643-01

Sliding bowl
bottom
-- 525642-02

Seal ring
-- 42150

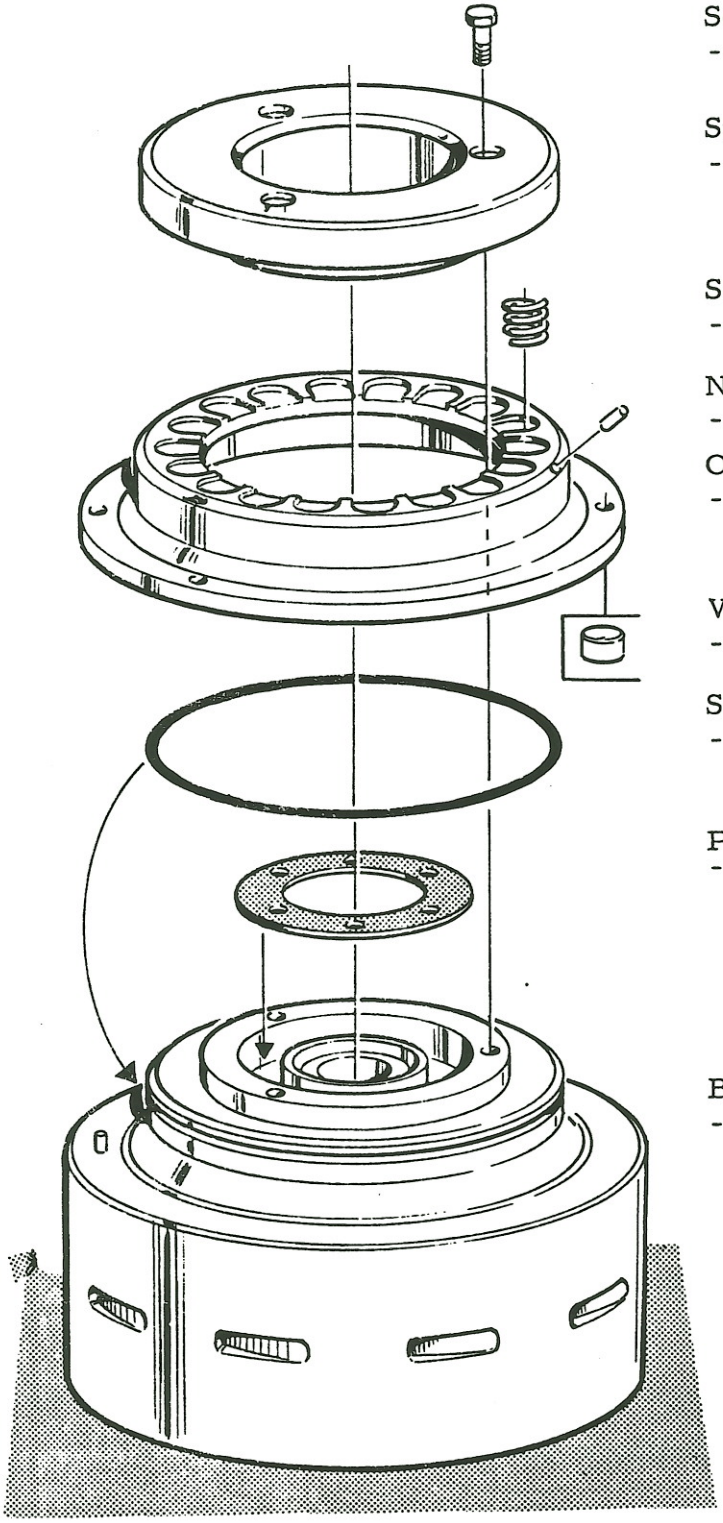
Bowl body*

Screw with
hole**
-- 524000-03
Screw (2)**
-- 2210938-21

Wear liner (12
-- 540209-01

(cont. page S95003)

(Bowl for TOTAL DISCHARGE, page 2)



Screw (3)
-- 2217759-23

Spring support
-- 528130-02

Spring (15)
-- 226214-75

Nozzle
-- 528129-02

Operating slide
-- 528128-01

Valve plug (3)
-- 521864-02

Seal ring
-- 223408-06

Packing
-- 525639-01

Bowl body*
-- 528124-80

* Exchange necessitates rebalancing – send the COMPLETE bowl to an ALFA-LAVAL representative.

** Not included in the complete-unit number.

CLEANING. OVERHAUL. LUBRICATION

Satisfactory functioning cannot be ensured unless the parts in contact with liquid are carefully cleaned before assembly. This applies particularly to seal rings, sliding surfaces, guiding and contact surfaces, and threads. Also take care that no burrs are knocked up on the metal parts when handling them.
Follow the directions given in chapter L and H.

EXCHANGE of PARTS

Each bowl constitutes a balanced unit which will get out of balance if any parts having an "*" added to their part number in the general drawing are exchanged without the bowl being rebalanced. To prevent confusion of parts, for instance when a plant consists of several machines of the same type, these main parts are stamped either with the complete manufacturing number or its three last digits.

GUIDES

When assembling make sure that the parts are placed in the position defined by the guides. Be careful not to damage the guides when handling the parts.

SEAL RINGS. PACKINGS

Check seal rings and packings for defects and make sure that the corresponding grooves and sealing surfaces are well cleaned.

After mounting check:
... that the ring lies properly (not twisted) in the groove.
... that it fills the groove evenly all around.

THREADS. PRESSURE IN DISC SET

Check the lock ring threads and the pressure in the disc set at regular intervals – see chapter L.

CORROSION. EROSION

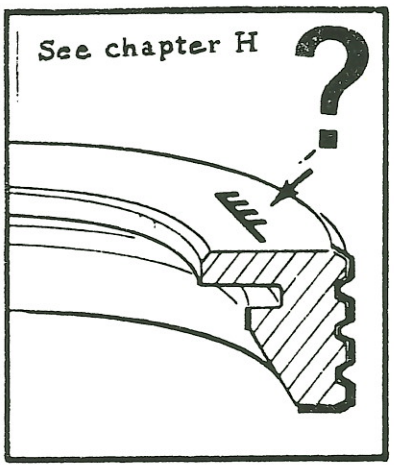
Aggressive liquids as well as liquids containing very hard particles may cause corrosion and erosion damage. If rapidly growing or advanced damage is noticed, consult an ALFA-LAVAL representative.

DISMANTLING. ASSEMBLY

Dismantle and assemble the bowl with the help of the special tools in the order indicated by the exploded drawing. Place the parts on a clean, soft surface.

The bowl should rotate clockwise. The principal components therefore have left-hand threads where indicated in the text.

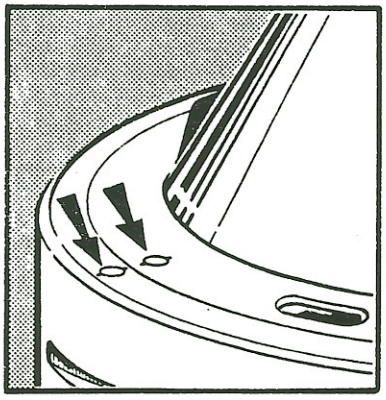
Lock rings



The lock rings have left-hand threads and are unscrewed CLOCKWISE. The large lock ring is loosened by blows of a lead mallet or similar on the handle of the spanner.

Clean and lubricate the threads of the lock rings and their contact surfaces with bowl hood and bowl body before every assembly. Seizing may be the result, especially in new machines, if this lubrication is neglected or an unsuitable lubricant is used. Careful lubrication of these surfaces will prevent unnecessary wear on threads and contact surfaces.

Tighten the lock rings ANTI-CLOCKWISE – the small lock ring until a tight seal is obtained and the large lock ring until the bowl hood lies TIGHTLY against the bowl body.



In a new bowl the marks ◊ will now be in line with each other (see fig.). The best way to use a spanner is to move the handle clockwise and check the movement with a heavy jerk. The lock ring should press the bowl hood against the bowl body so that perfect sealing is obtained at the seal ring and should also keep the distributor pressed against the bottom of the bowl body, firmly clamping the disc set. For final tightening it may thus be necessary to hit the spanner handle with a lead mallet or similar (NEVER extend the spanner handle).

Note: See chapter L for checking pressure in disc set and inspecting threads.

Bowl hood

Lift the bowl hood off and on with the lifting tool. To ease the hood off the bowl body, the central screw of the tool is screwed down.

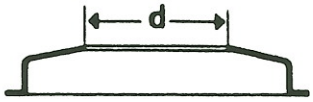
If the hood does not engage on assembly, this means that one of the locating pieces is out of position – check this.

The sealing ring at the lower edge of the hood should not be removed except when being exchanged –see Chapter L, Overhaul of Bowl.

Bowl insert parts

The design of the insert parts determines whether the bowl is of CLARIFIER, PURIFIER or CONCENTRATOR type. The bowl may be intended for one of these processing methods or may be equipped and balanced with parts for two of them so that either can be chosen as needed. In the latter case it is important that the bowl is correctly assembled with the parts designed for the processing method chosen.

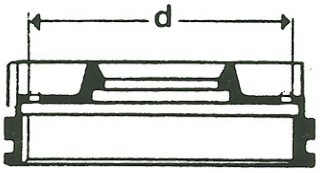
Gravity disc



For CLARIFICATION: See chapter K.

For CONCENTRATION: Use a gravity disc having a suitable hole diameter in view of the specific gravity ratio of the process liquid – see chapter K.

Level ring



Distributor. Disc set

Lift the distributor in and out with the disc set on it. The centre stud of the lifting tool must be depressed in order that the tool shall engage.

Cap nut

The cap nut has a left-hand thread and is unscrewed CLOCKWISE. Lubricate the thread and contact surface before putting on. Tighten the cap nut securely.

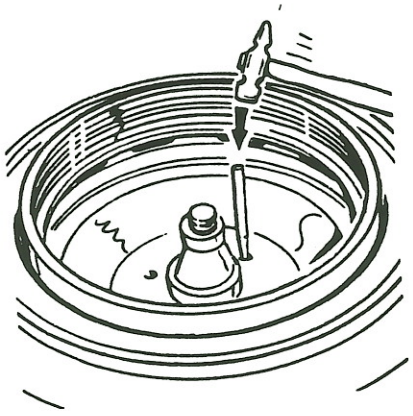
Sliding bowl bottom

Lift the sliding bowl bottom in and out with the tool. Handle with care to avoid damaging the sealing edge. If the surface that seals against the bowl hood needs improving, it can be adjusted by turning provided that the sliding bowl bottom does not have an anti-erosion lining - see chapter L, Overhaul of Bowl.

If an anti-erosion lining is provided, check that it shows no traces of wear. To avoid permanent erosion attacks against one and the same spots, the lining should be loosened, turned by 5 - 10°, and fastened again.

Bowl body

The bowl body need not normally be removed except for protective lubrication of the spindle cone - see chapter L, Bowl Cleaning - or for disassembly of the discharge mechanism.

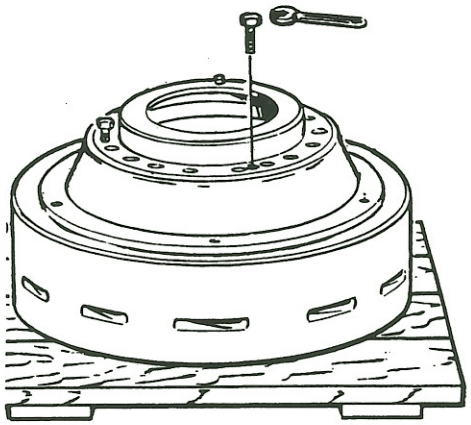


The screws in the bottom of the bowl must be unscrewed and removed before the lifting tool is positioned. It is also advisable to knock off the distributing ring with a drift. The bowl body is eased off the spindle cone with the central screw of the lifting tool.

Lubricate the nave opening, the nave and the top of the spindle sparingly before mounting the bowl body - excessive lubrication may cause the bowl to slip.

Discharge mechanism

When the bowl is dismantled, it is also advisable to dismantle the discharge mechanism for lubrication and for cleaning of the passages and nozzle.

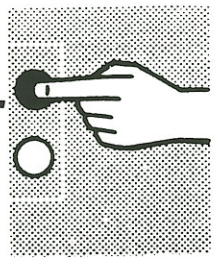


Force loose the operating slide with the three screws that hold the distributing ring to the bowl body. The slide must be handled with great care. Skew and uneven insertion or removal and the use of force lead in most cases to deformation and consequently to breakdowns. When placed in position the slide should be lowered perfectly level.

Valve plugs should not be removed except to be exchanged. The nozzles and the passages should be cleaned with special tools, or failing that with a soft iron wire.

Lubricate the outer edge surface of the operating slide as well as the surface in the bowl body over which the slide moves.

Tighten the spring support screws evenly and firmly.



OPERATION

DATA see chapter C.
SPECIAL EQUIPMENT see chapter X.

SAFETY REGULATIONS

In all centrifugal separators the bowl rotates at a very high speed, normally between 100 and 150 revolutions per SECOND. Thus, very great forces are released and it is essential, therefore, to follow strictly the directions given in the Instruction Book concerning assembly of parts, starting, stopping and overhaul.

In this connection remember particularly:

... to tighten the bowl lock ring (lock rings),

... to fasten carefully the frame hood as well as the inlet and outlet parts,

... to check the speed,

... that no machine part must be loosened until the bowl has topped rotating,

... that bowl body, bowl hood and lock ring must never be heated by means of a flame,

... that the machine must never be used for processing liquids with a higher density (temperature, sludge nature etc.) than that for which it was originally intended. Thus, always consult an ALFA-LAVAL representative before using the machine beyond its proper range of separation.

SEPARATION of WORKSHOP LIQUIDS

Separation temperature

	°C	°F
Metal working coolants	20 - 30	68 - 86
Cold rolling mill coolants	60	140
Washing liquids	60 - 90	140 - 195

SEPARATION CAPACITY

As a rule the machine is installed in a by-pass system, i.e. the separated liquid is led back to the same tank as the one from which the feed is taken. The optimum capacity (the capacity at which the maximum amount of impurities, e.g. tramp oil, is removed) depends on both the liquid characteristics and on the system build-up.

The usual range of optimum capacities is 300 - 1000 l/h.

SELECTION of GRAVITY DISC

The choice of gravity disc for the bowl, depends on whether concentration or clarification is to be carried out.

Machine WITHOUT Equipment for interface disposition

In the case of concentration the throughput exerts a certain influence on the position of the interface and thus an alteration of the troughput, as a rule, necessitates a reconsideration of the size of gravity disc to be used.

Gravity disc

The machine is designed for concentration. Select the gravity disc by means of the nomogram or by experience.

Clarification can be performed by fitting gravity disc No 528138-01 with 30 mm diameter and bottom disc of disc stack No 2423338-02.
These parts are not included in the standard machine set-up.
Separated liquid is led out through the light phase outlet.

(Selection of gravity disc, page 3)

Where the specific gravity of the light phase is known at any temperature between 15° - 95°C (60° - 203°F) and the heavy phase is water, the hole diameter of the disc to be tried first at separating temperatures up to 95°C (203°F) can be found out from the nomogram.

X = separating temperature in °C and °F.

Y = specific gravity of light phase.

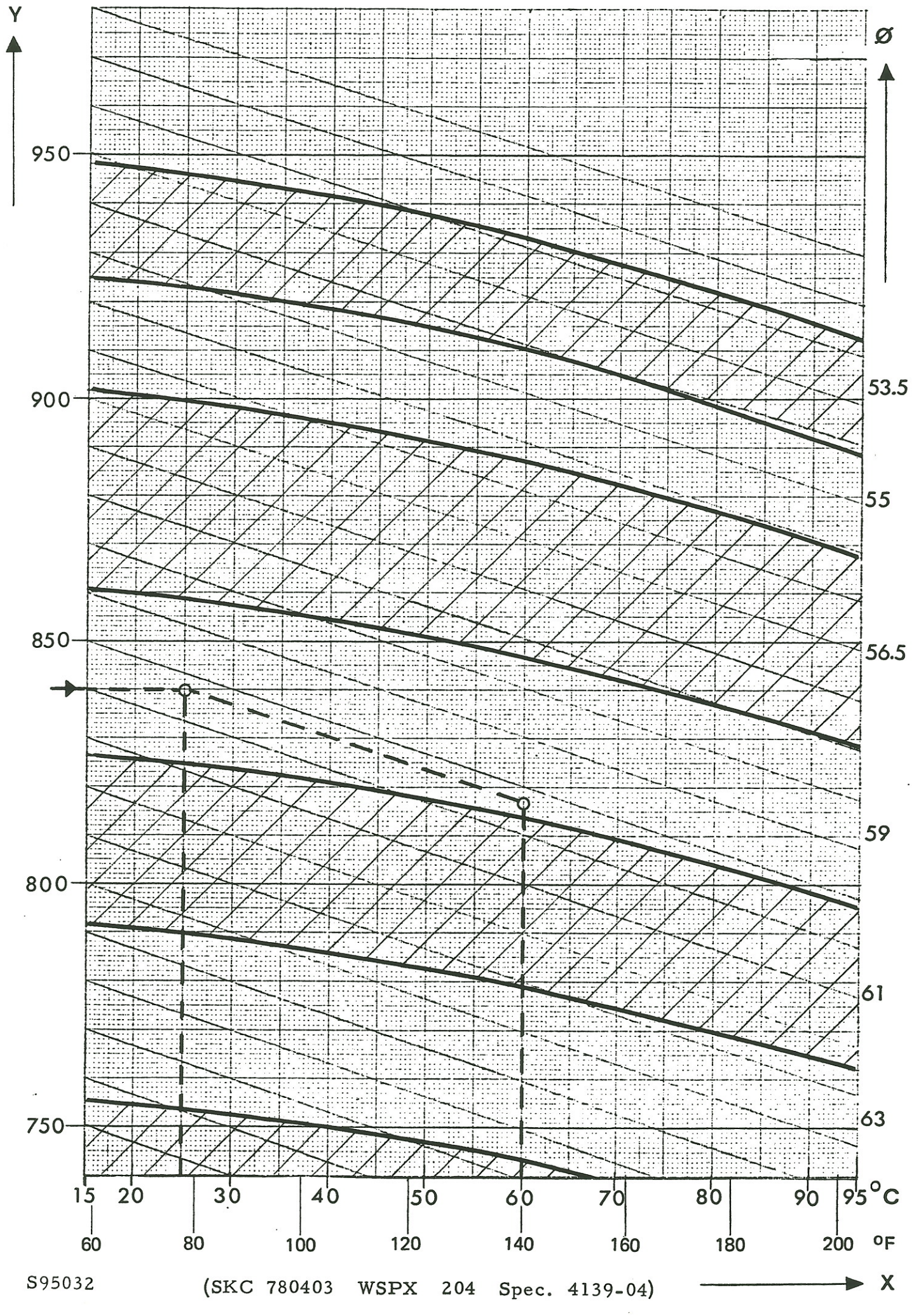
ϕ = hole diameter of gravity disc in mm

Example in nomogram (I)	
Reference in graph	----------
Spec. gravity of light phase	840 at 25°C (76°F)
Separating temperature	60° (140°F)
Hole diameter	59.0 mm

Of course the separating result obtained both the inner way and the outer way should be checked and finally decide the adjustment of the machine.

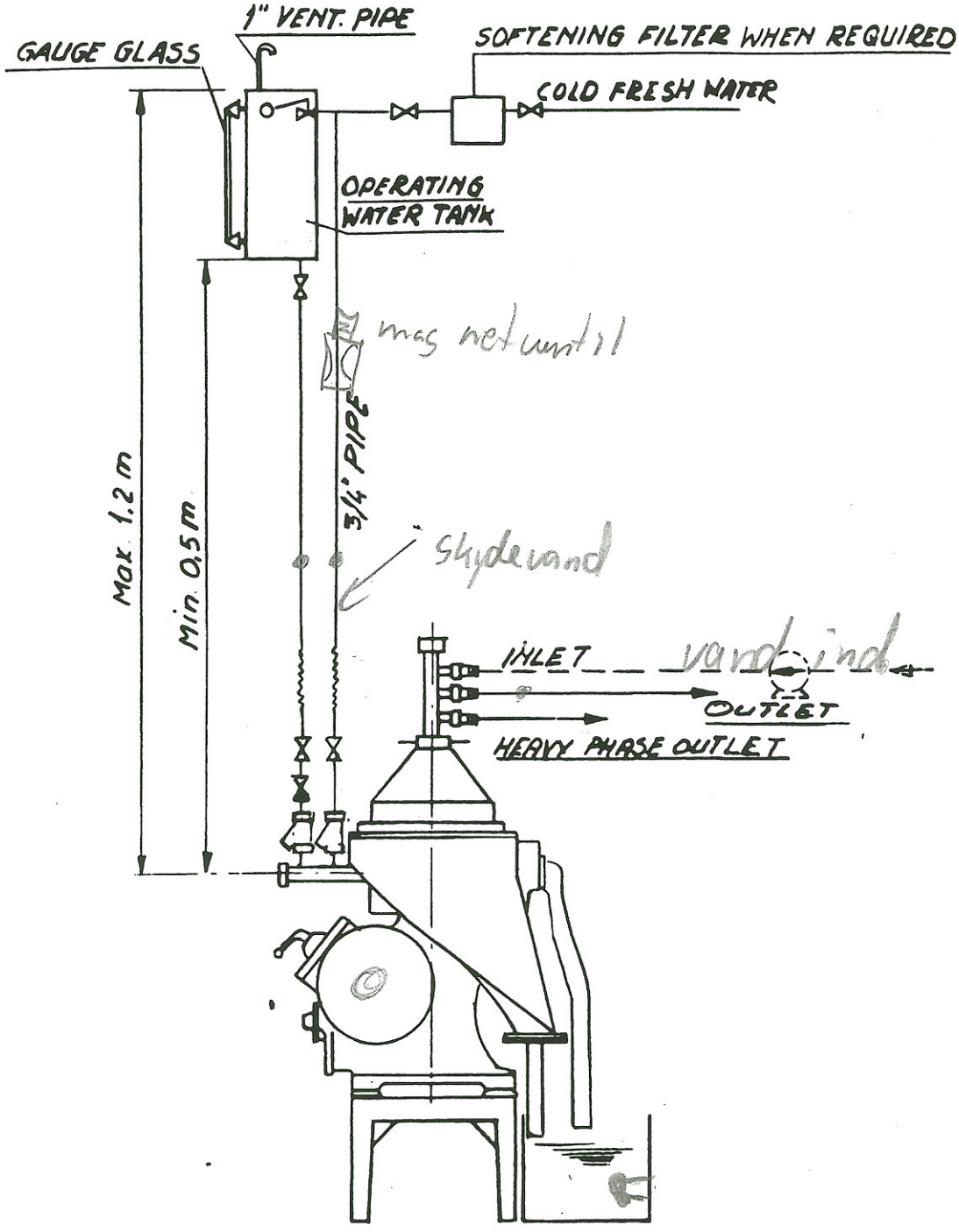
ALFA-LAVAL

K



S95032

(SKC 780403 WSPX 204 Spec. 4139-04)


1" VENT. PIPE
SOFTENING FILTER WHEN REQUIRED
GAUGE GLASS
COLD FRESH WATER
OPERATING WATER TANK
mag net ventil
Pipe 3/4"
Max. 1.2 m
Min. 0.5 m
Skydeventil
INLET
vandind
OUTLET
HEAVY PHASE OUTLET

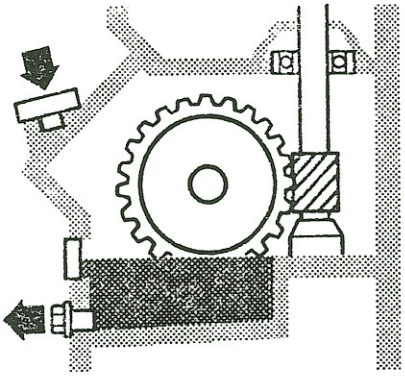
BEFORE STARTING

For machine equipped for programmed sludge discharge — see special instructions.

For machine provided with equipment for interface disposition — see special directions in chapter B.

The bowl should be well cleaned and assembled as directed in chapter I.

Check partcularly: that brake is released — that collecting covers (frame hood respectively) are clamped with the hinged bolts — that oil level in worm gear housing is somewhat above the middle of the gauge glass* — that operating liquid tank is full — that control valves 15a and 15b are closed (operating liquid feed turned off; bowl open).



* Note. The oil level must never be allowed to sink below the lower edge of the gauge glass. If the glass is provided with corrugations they should be vertical. Keep the gauge glass clean, otherwise a line, which could be mistaken for the oil level, will in time build up on the inside of the glass.

If the machine has been idle (for instance during a night), screw out the drain screw some turns and drain off any water.

START and RE-CIRCULATION

Start the motor. If the process liquid is to be preheated, circulate it through the preheater until suitable temperature is reached.

ACCELERATION PERIOD

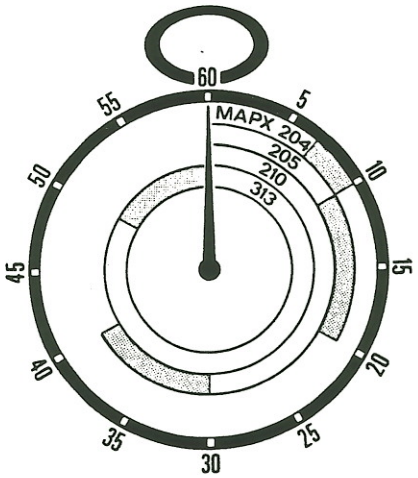
Shortly after starting it may occur that the bowl begins to vibrate more than normal. The cause is generally lack of balance due to bad cleaning of the bowl. Stop the machine and clean the bowl if the vibrations are very heavy.

Heat is always generated in the clutch coupling during the running-up period. This will be noticeable, especially when the pads on the friction blocks are new, through smoke and a smell of burning. Like the sliding sound, this is quite normal and has no importance.

During acceleration the power consumption is higher than in normal operation.

The acceleration time stated in chapter C may vary somewhat depending for instance on the condition of the friction pads in the clutch coupling.

BOWL CLOSING



(Example MAPX 205 closes after 10-20 sec.)

After attaining the right speed, the bowl should be closed. Before starting the closing operation, the number of revolutions of the speed indicating means must be checked against the speed table in chapter C. The acceleration time stated in chapter C can vary somewhat depending i.a. on the wear of the friction pads.

o Close the bowl by opening the control valve 15a. Wait till the bowl has closed, then fill it.

FILLING

The filling procedure differs for purification, clarification and concentration, i.e. for machines provided with purifier, clarifier and concentrator bowl respectively.
Note Before the first start after installation, when there is no oil in pump and piping, the valve on the pump should preferably be unscrewed and the pump charged with oil.

Clarification (clarifier bowl)

o Open fully the valve on the pump and close the regulating valve.
o Then slightly open the regulating valve and close entirely the valve on the pump. The pump should now begin to suck (provided that there is no air leakage). If the pump fails to suck, repeatedly open the pump valve quickly, but very little.
o When the pumping has started, set to desired throughput by means of the regulating valve.

Purification (purifier bowl)

o Supply liquid — usually water — to form the liquid seal. This liquid should preferably have the same temperature as the process liquid and must be supplied quickly.
o Shut off the feed of sealing liquid when this begins flowing out and becomes visible in the sight glass.
o Open fully the valve on the pump and close the regulating valve.
o Then slightly open the regulating valve and close entirely the valve on the pump. The pump should now begin to suck (provided that there is no air leakage). If the pump fails to suck, repeatedly open the pump valve quickly, but very little.
o When the pumping has started, set to desired throughput by means of the regulating valve.

Concentration (concentrator bowl)

The liquid seal builds up automatically. Adjust to to wanted throughput – see Purification above.

RUNNING

Check particularly: That throughput and working temperature are constant – That oil does not leak from the worm gear housing (oil level at operative height) – That, in purification, light phase is not escaping together with the heavy one, thereby indicating that the bowl is clogged or the liquid seal is broken. If so, a sludge discharge must be carried out immediately and henceforth the interval between discharges be reduced. If sludge has packed between the bowl discs it may, besides, be necessary to stop the machine for manual cleaning of the bowl.

Washing

In a purifier bowl the process liquid can be washed.

RECOVERY

Besides sludge (and in purification, heavy liquid phase) the bowl contains a certain amount of treated liquid (in purification: light liquid phase). When desired, this can be recovered instead of being discharged together with the sludge at sludge discharge. Practical experiments will show how far the recovery can be carried on.
For recovery, first interrupt the process liquid feed by closing the feed valve. Then proceed as follows:

Purification (purifier bowl)

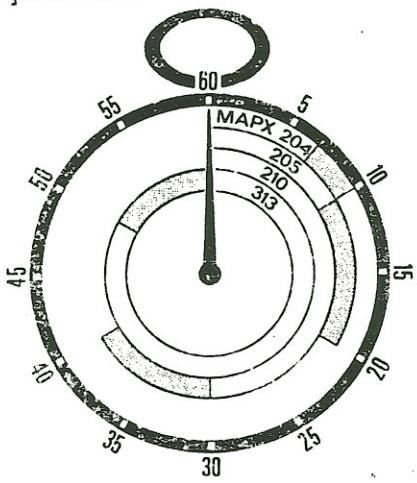
Supply water briefly through the pipe for the liquid seal, so that the major part of the liquid is forced out of the bowl. When heavy phase flows out through the light phase outlet the recovery has been overdone. Effect the sludge discharge – see below.

Clarification (clarifier bowl)

Supply water carefully. Observe the liquid forced out. Shut off the water feed as soon as the liquid shows traces of water admixture. Effect the sludge discharge – see below.

SLUDGE DISCHARGE

Bowl for total discharge — manual operation



(Example: MAPX 205 closes after 10-20 sec.)

Shut off the feed, open the bowl by opening the control valve 16a. Wait till the discharge report is heard, i.e. the sound resulting from the ejection of the sludge from the bowl. Then close the control valve immediately and wait till the bowl has closed. Refill the bowl — see Filling.

From time to time the sludge discharge should be executed twice, especially when the sludge is corrosive, and also when the sludge space is overfilled. Between such repeated discharges the bowl is preferably flushed out for instance by supplying flushing water.

Bowl for total discharge — programmed operation

The above actions are executed automatically. If interruption of the process liquid feed is not included in the programme, this must be done manually.

Bowl for rapid total or partial discharge — programmed operation

Sludge discharge is effected automatically, but without interruption of the process liquid feed — flushing of the sludge cover is usually included.

Bowl for combined programme — programmed operation

Sludge discharge is effected automatically either totally or partially (arbitrarily). At partial discharge no interruption of the process liquid feed but, as a rule, flushing of sludge cover included. If interruption of the process liquid feed is not included, this must be done manually at total discharge.

Note. For manual operation of automated machine see chapter B.

CLEANING BY RINSING

The bowl need not be dismantled after every run if it can be adequately cleaned by rinsing before being stopped.

In some cases it is sufficient to shut off the process liquid feed and supply a rinsing liquid, e.g. water, instead and work the sludge discharge mechanism a few times. In other cases, a suitable detergent must be added to the rinsing liquid and a longer series of discharges performed. It is particularly important to rinse the bowl thoroughly if the process liquid contains active substances that may cause corrosion or sludge of an adhesive type. Residues of corrosive liquids can often be neutralized by the addition of suitable agents before the last rinse. A suitable procedure can be worked out by practical trials and its effectiveness checked when the bowl is dismantled.

The check should be concentrated in the first instance on the discs near the bottom of the disc set, as it has been found by experience that these are the most difficult to get clean. If detergents are used, the last discharge or the last few discharges should always be performed with pure rinsing liquid without any additives. Where there is a long standstill between runs, the bowl should be cleaned manually – see Chapter L.

Note: If the machine begins to vibrate abnormally, this means that the bowl has not been properly cleaned. The machine must then be stopped for manual cleaning and a different rinsing programme worked out.

Flushing the frame hood (or set of covers respectively)

When the bowl is provided with discharge pump so-called paring disc), the inside of the frame hood (or set of covers respectively) and the outside of the bowl can be flushed either by raising the back pressure above the highest permissible value or by entirely shutting off discharge pipe. The flushing liquid will now be thrown out at the bowl top and discharge through the draining device of the bowl casing. Check the drainage.

STOPPING

Always apply the brake when stopping. Bowls for partial discharge and for combined programme must always be kept closed and filled with liquid during the deceleration period, and so must bowls for total discharge if heavy vibration occurs.

Bowl for total discharge — manual operation

Turn off the process liquid feed and close the control valve 15a. Open the bowl by opening the control valve 16a, wait till the bowl has discharged, and then immediately close the vlave. Turn off the feed of operating liquid to the control valves.
Switch off the motor and apply the brake. Release the brake only when the bowl has stopped. Neither loosen the hinged bolts of the covers (frame hood) nor start any other dismantling until the bowl has stopped completely.

Bowl for total discharge — programmed operation

Turn off the process liquid feed — empty the bowl by means of the programme equipment — turn off the operating liquid feed — switch off the programme equipment — switch off the motor etc. (see above).

Bowl for rapid total or partial discharge and for combined programme — programmed operation

Empty the bowl by means of the programme equipment — wait until the bowl has closed and refilled — turn off the process liquid feed — switch off the programme equipment — switch off the motor etc. (see above).

EXPULSION

A small quantity of liquid will collect at the bottom of the bowl after the machine has stopped. To expel this residue proceed as follows: Release the brake when the bowl has stopped after the last flushing — start the motor of the machine and let the bowl accelerate, without liquid feed, to approx. 10% of its full speed — switch off the motor and apply the brake — see Stopping.

MANUAL CLEANING

See chapter L.

Indication	Cause	Remedy
Machine vibrates	1. Moderate vibrations normally occur at the critical number of revolutions during the running-up and retardation periods.	None.
	2. Bowl out of balance due to: bad cleaning – wrong assembling – badly tightened lock ring – bowl assembled with parts from different machines.	Stop immediately and establish cause. Badly tightened lock ring involves fatal danger.
	3. Vibration damping rubber washers have lost elasticity.	Renew rubber washers.
	4. Foundation too weak.	Reinforce foundation.
Speed too high	1. Tachometer reading wrong.	Check by means of revolution counter.
	2. Wrong transmission.	Stop immediately. Check that proper transmission or belt pulley is used in view of motor speed.
	3. The motor speed is not appropriate.	Stop immediately and provide a motor with correct speed.
Speed is too low. Running-up time too long.	1. Brake applied.	Release the brake.
	2. Pads of clutch are worn or oily.	Exchange or clean all pads.
	3. Voltage drop in mains.	Check mains voltage (D.C.)
	4. Ball bearing damage.	Locate and exchange defective bearing.
	5. Other machine defects.	Stop immediately. Check that bowl can be rotated by hand.
	6. Motor defect.	Exchange or repair motor.
Starting power too low.	1. Ammeter reading wrong.	
	2. Clutch pads worn or oily.	See -- Speed is too low.
Starting power too high.	1. Ammeter reading wrong.	
	2. Motor defect.	Exchange or repair motor.
	3. Ball bearing damaged.	Locate and exchange defective bearing.
	4. Other machine defects.	See -- Speed is too low.
Retardation time too long.	Brake lining worn or oily.	Exchange or clean lining.
Water in worm gear housing.	1. Condensation.	Drain water.
	2. Axial seals not tight or turned wrongly.	Exchange rings and turn correctly.
	3. Leakage via top bearing.	Exchange seal rings and adjust axial seal.
Noise from worm gear housing.	1. Oil quantity wrong.	Check quantity and quality.
	2. Worm wheel or worm worn.	Exchange worn parts. Exchange of complete gear is generally advisable.
	3. Ball bearing worn or damaged.	Exchange bearing.
Noise from clutch coupling.	1. Normal when starting and stopping due to sliding of friction blocks.	None.
	2. Wrong play between coupling pulley and elastic plate.	Adjust.
	3. Speed too low.	See -- Speed too low.
Smell	1. Normal at start and stop when friction blocks are sliding, thus causing burnt smell.	None.
	2. V belts or flat belts are sliding.	Clean belts. Adjust belt tension.
	3. Bearing running hot.	Feel over machine and locate spot. Exchange bearing.
	4. Motor overheated.	Trace cause. Adjust overcurrent relay, if any provided.
"Scraping" sounds	Wrong height position	Stop and adjust -- see Chapter L.

Indication	Cause	Remedy
Purification and concentration: Outgoing heavy phase contains light phase.	1. Liquid seal has broken or is close to breaking due to:	No separate filling of seal liquid is needed for concentration (see chapter B) or if the heavy phase constitutes at least 25 % of the process liquid.
	o filling too fast at start	
	o too little seal liquid	
	2. Closed valve in light phase outlet.	Open valve.
	3. Gravity disc too large.	Change to smaller disc.
	4. Throughput too high.	Reduce rate of feed.
	5. Seal ring under gravity disc missing or damaged.	Check and rectify.
	6. Changed separation temperature resulting in changed density ratio.	Change to smaller disc.
	7. For bowl with paring disc: Back pressure too high.	Reduce the back pressure in light phase outlet.
Purification and concentration: Outgoing light phase contains heavy phase.	1. Gravity disc too small.	Change to larger disc.
	2. Closed valve in heavy phase outlet.	Open valve.
	3. Throughput too high.	Reduce rate of feed.
	4. Sludge space overfull.	Empty bowl more often.
Purification and concentration: Light and heavy phases fail to separate.	1. Purifier bowl assembled with clarifier bowl parts.	Check. Exchange parts.
	2. Sludge space overfull.	Empty bowl.
	3. Closed valves.	Check. Open valves.
Clarification: Poor clarification	1. Unsuitable separation temperature.	
	2. Sludge space overfull.	Empty bowl more often.
	3. Throughput too high.	Reduce rate of feed.
	4. Water present in feed.	Run the machine as a purifier.
	5. Clarifier bowl assembled with purifier bowl parts.	Check. Exchange parts.
Bowl clogs with sludge.	1. Water washing unsuitable or incorrectly applied.	
	2. Sludge too viscous.	Empty bowl more often.
	3. Frame filled with sludge.	Clean frame and shorten interval between discharges. Flush sludge cover during discharge cycle.
	4. Sludge tank overfull.	Empty sludge tank and clean bowl casing in frame.
	5. Defective strainer.	Check whether solid particles are stuck between the bowl discs.
Too much process liquid in sludge.	1. Feed not shut off during total discharge.	
	2. Leakage between bowl hood and sliding bowl bottom.	Check. Exchange seal ring. If necessary, turn the sliding bowl bottom smooth.
	3. Bowl not fully closed.	Check the operating liquid system and automatic controls if any.
Gas is liberated (only for bowl with paring disc).	Back pressure is too low.	Increase the back pressure.

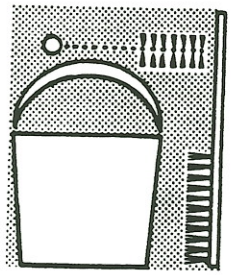
Control system

Before any other actions are taken, a control cycle should be accomplished in accordance with the directions given in the Instruction Book.

In case the bowl does not close after discharge, does not open after a discharge impulse, or opens unintentionally during operation the operating liquid supply should be checked. Trace the trouble systematically, following the path of the operating liquid stage by stage beginning with the operating liquid tank or feed pipe. Nothing should be done with the machine or the bowl until it has been ascertained that operating liquid at correct pressure is supplied.

If there is no fault in the liquid supply continue the examination in the first hand with the control valve, then the paring device and finally with the discharge mechanism of the bowl. With automatically controlled machines follow the trouble tracing chart for the automatic control device.

In most cases the trouble is caused by wrong mounting, careless handling of parts resulting in burrs being knocked up, poor lubrication or deformed seal rings. If, on the other hand, the cause lies in obstructed channels or nozzles, the insertion of a more close-meshed gauze in the filter of the operating liquid line may prevent a repetition. When obstruction is caused by lime or salt deposits it may in many cases be necessary to use a suitable dehardening filter, dehardening liquid, or condensation water.



CLEANING. OVERHAUL

It has proved very difficult in practice to prescribe how often cleaning should be carried out and how thorough the overhaul should be. However, aided by the directions given in this chapter it should not be difficult to make up a suitable working routine with regard paid to special local conditions. The ALFA-LAVAL representative will always be glad to provide further advice and information.

GENERAL HINTS	When cleaning and overhauling always follow strictly the directions given in this book concerning the dismantling, lubrication and assembling.
Set of spares	Make it a habit to inspect and replenish the set of spare parts (and tools) once a year. It pays to keep the consuming parts in stock.
Service interruptions	If the machine is to be put out of service for some time, the parts in contact with liquid should be oiled. Preferably, the bowl should be removed from the spindle. The seal rings should be taken out and kept flat, not hanging.

The time intervals stated below relate to continuous operation. If the mentioned number of operating hours is not obtained during the period, the latter can be extended, but a thorough overhaul at least once every third year is imperative.

OPERATING HOURS	Operation check	
Every 24th (every day*)	Machine run (speed). Power consumption. Oil level in worm gear housing. Observation of discharged liquids. Temperature.	Throughput. Sludge tank. Pressure. Level in operating liquid tank. Automatic control device, if any, (signal lamps).
Every 200th (every week*)	Worm gear housing Check and if necessary replenish oil.	Further actions Speed check. Leakage tracing.
Every 750th (every month*)	Bowl Dismantling of bowl and thorough cleaning of bowl inset parts. Thorough cleaning and lubrication of lock rings and oiling of bowl body nave bore. Check on seals.	Power transmission Cleaning and oiling of bowl spindle cone. Control system Check flow of operating liquid. Check sludge discharge interval of automatic control device. Strainers and filters Cleaning and checking.
Every 1500th (every second month*)	Worm gear housing Cleaning and oil change. (In case of new installation, however, after 300 operating hours and in seasonal operation before every working period).	Bowl Dismantle and clean sludge discharge mechanism of bowl. Check springs, seals and sludge ports. Check erosion.
Every 9000th (every year*)	Thorough overhaul, cleaning and lubrication. Bowl check Pressure in set of discs. Lock ring joint. Corrosion and other material attacks. Power transmission Dismantle bowl spindle, clutch coupling and worm wheel shaft. Check particularly ball bearings and gear as well as rubber buffer. Exchange friction pads. Renew grease in nave.	Control system Clean operating liquid tank and check pipes and valves. Height positions Check and adjust. Frame Renew brake lining. Touch up the paint. Check elasticity of vibration dampers and mounting of machine. Motor – see special manual for motor.

* In continuous operation

CLEANING AGENTS

Metallic machine parts	Use cleaning kerosene, white spirit, mineral spirit or another solvent with equivalent properties. If the cleaning agent is unsuitable in view of the product of the process, the bowl, inlet and outlet parts in contact with liquid can normally be cleaned with a soda or trisodiumphosphate solution, or with any current technical defatting agent on an alkaline basis. A certain care should be exercised when cleaning light metal parts, as these may be attacked by strong alkaline solutions. Benzine or benzol may also be used for the metal parts, but if so, the cleaning should be done in the open air due to the risk of explosion, and because benzol vapours are dangerous to inhale.
Seal rings	Wipe seal rings with a cloth moistened with some of the above cleaning agents.
Coupling pads and brake lining	Trichlorethylene should be used for cleaning these parts and the corresponding friction surfaces. Note that it should be done under safe control (ventilation), and preferably in the open air.
Discharge mechanism	Any deposits on the parts of the control device are to advantage dissolved in an approx. 10 percent solution of acetic acid heated to about 80°C (175°F).
Note.	All metallic parts EXCEPT the friction surfaces in clutch coupling and brake must be oiled after cleaning - see chapter H.

BOWL CLEANING

How often the bowl should be stopped, dismantled and cleaned must be learned by experience. It depends, among other things, on the type of sludge contained in the process liquid and on the condition of strainers and filters as well. Defective or wrongly mounted strainers letting through particles so bigsized that they get stuck between the bowl discs will cause sludge blockage. If this occours, the discs must be cleaned one by one. Any tendency of the lock ring to stick to the bowl body must also be considered when determining the intervals between dismantlings. It is difficult to prescribe how often the lock ring must be unscrewed for lubrication, as this depends partly on the lubricant used, partly on the care exercised in lubricating. During the first time the bowl spindle cone must be lubricated at least once a month to prevent the bowl body from sticking to the spindle. In time the interval between lubrications may be extended according to experience.
If the process liquid contains salt water or the sludge is corrosive (because it contains acids or salts), the bowl must be cleaned thoroughly through feed of flushing liquid and repeated discharges immediately after the operation is finished, however, at least once in a 24-hour-period. This is of particular importance when treating lubricating oils or heavy fuel oils.

Discharge parts

Clean the control parts every time the bowl is removed from the spindle.
Clean all channels and nozzles in bowl body, operating slide, control paring disc, and control valve.
The hardness of the water decides how often cleaning must be carried out.

ACCESSORIES
(e.g. pumps)

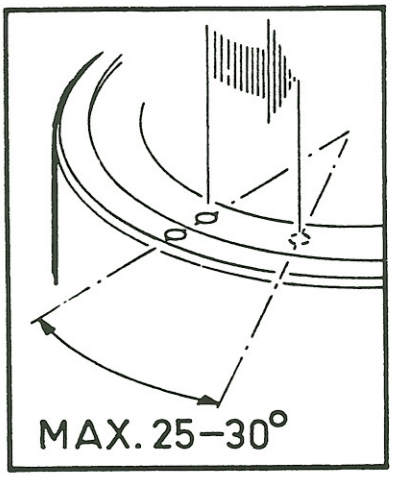
See chapter X.

BOWL OVERHAUL

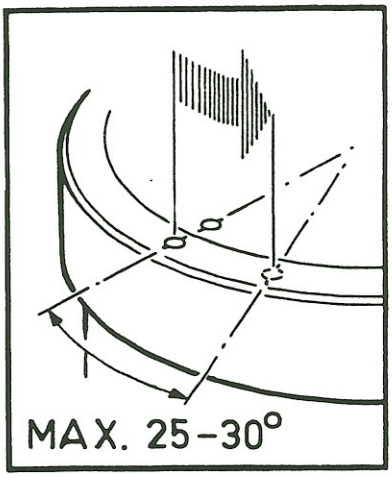
Exchange of parts

Bowl parts marked "*" on the perspective drawing in chapter I can be exchanged only in an authorized ALFA-LAVAL, workshop, as the exchange necessitates rebalancing – thus the COMPLETE bowl must be sent in. Other **parts** can be exchanged on the spot.

Thread checking



Lock ring with external thread



Lock ring with internal thread

In a new bowl, the guide marks (ϕ) should be right in front of each other. In time, these marks can be drawn past each other due to wear of the threads. When the ϕ-mark of the lock ring can be drawn past the other ϕ-mark by more than 25-30°, an authorized ALFA-LAVAL representative should be consulted.

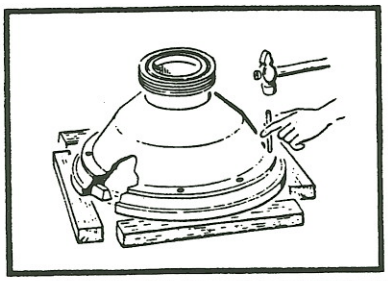
Thread checking should be done at least once a year. The checking is carried out as follows:
Unscrew the large lock ring, remove the distributor with disc set. Remove the outer seal ring of the bowl hood, put on the hood and screw on the lock ring.

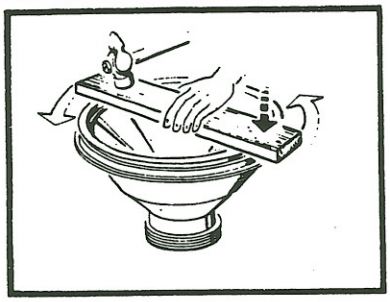
Tighten the large lock ring anti-clockwise till tight contact is obtained between the contact surfaces of bowl body and bowl hood.

Pressure in disc set

If the lock ring can be tightened without resistance by means of the spanner till the hood lies tightly against the bowl body, the pressure should be increased by adding the extra bowl disc (included in the set of spares) on top of the set of bowl discs. Make sure the seal ring lies in its groove in the bowl hood.

Seal ring of bowl hood





When exchanging the seal ring drive it out by means of the tool, which should be inserted alternately in the holes provided for this purpose.

The seal ring is pressed into the groove in the lower edge of the bowl hood by means of a planed board (1"x5"), which should be placed across the ring. Knock carefully on the board right above the ring, first on one side and then on the other. Turn the board around successively and drive the ring into the groove as evenly as possible.

If a new seal ring of nylon (polyamide) turns out to be too wide when mounted, this is due to absorption of moisture – it will recover correct dimensions after drying for about 24 hours at a temperature of 175°-195°F (80°-90°C) in heating chamber.

If the ring is too narrow, put it in hot water, 160°-175°F (70°-80°C), for 5-10 minutes.

POWER TRANSMISSION

Bowl spindle

When overhauling the bowl spindle, check particularly the nave bore in the bowl body, the conical portion of the bowl spindle, and the height position.

Clutch coupling. Brake

Clean the conveyor pulley, pads of friction blocks and brake lining. Roughen up the wearing surfaces of pads and lining with a coarse file. Remember that all pads must be exchanged at the same time even if only one of them is worn.

Worm wheel shaft. Worm

When exchanging the worm wheel check the worm. If it is heavily worn or its tooth flanks are scratched, renew it.

Oil pan

Clean the oil pan in the worm gear housing. Supply fresh oil.

FRAME

Check the rubber washers of the anchoring parts. Renew them every second year.

Clean the bowl casing in the frame with a brush and a non-fluffy cloth (never use twist). When using washing liquid, never pour it into the bowl casing, nor flush out the casing after washing. If washing or flushing liquid enters the oil bath of the worm gear housing it will ruin the lubricating oil.

BOWL DISCHARGE MECHANISM

o Loosen the control valve housing complete and pull it out of the frame. Open the plug cocks one at a time ascertain that operating liquid can pass through unimpeded. If so, mount the housing again.

o Lift off the bowl body. Turn on the feed from the operating liquid tank.

o Open the valve for low-pressure water. Liquid should now flow out through the paring disc.

o Open the plug cock for high-pressure water. Liquid should now spurt out through the paring disc in larger quantities.

HEIGHT ADJUSTMENT

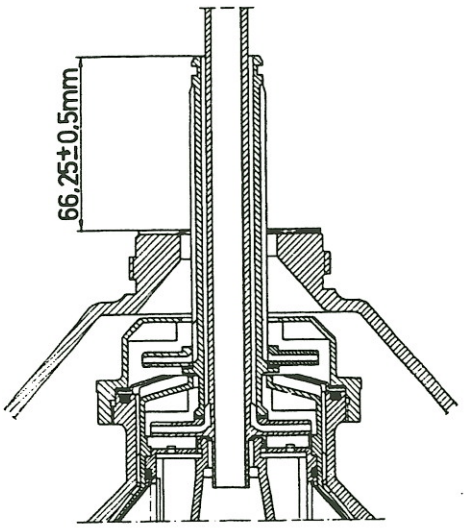
The height positions should be checked both in connection with the yearly inspection and after exchange of parts which can affect the height position.
The tolerances are narrow and it is essential, therefore, that all parts are well cleaned and free from burrs.

Check

After every height adjustment loosen the brake cap and turn the worm wheel shaft by hand. If it turns heavily or a scraping noise is heard, wrong adjustment may be the cause - recheck.

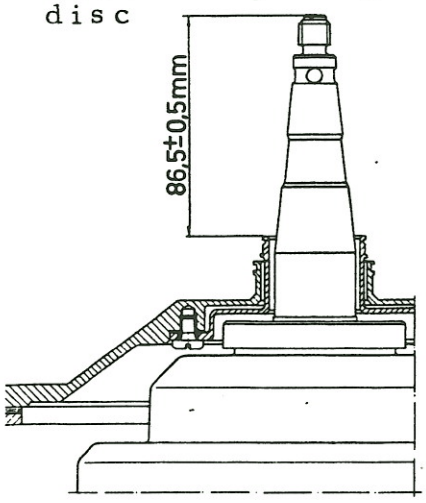
Paring disc of bowl

Assemble the bowl. Check that the lock rings are properly tightened. Put on the frame hood (cover) and clamp it with the hinged bolts.
The correct distance from the pipe of the paring disc to the upper plane of the height adjusting ring on the frame hood is stated in the illustration. Measure with a slide gauge. The distance is adjusted with height adjusting rings - see chapter I, "Inlet. Outlet".

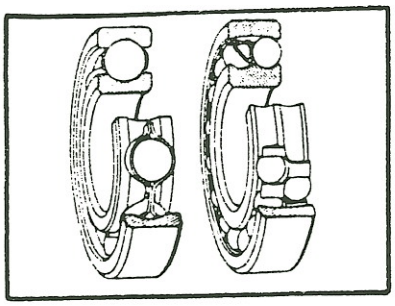


Control paring disc

The correct distance between the bowl spindle and the sleeve of the control paring disc device is stated in the illustration. The distance is adjusted by means of height adjusting rings under the distributing cover - see chapter S, "Paring disc device for operating liquid".

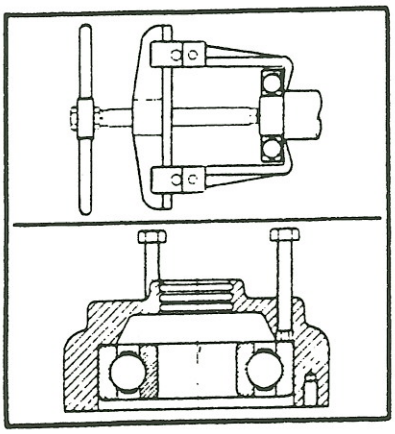


BALL BEARINGS. ROLLER BEARINGS



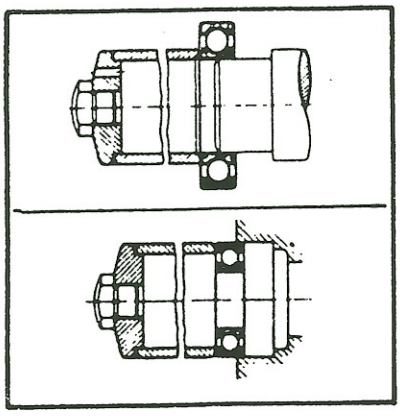
Use the greatest cleanliness when handling roller bearings.

Avoid unnecessary dismounting of bearings. They may suffer damage, or impurities may get into them during the handling.



Dismounting

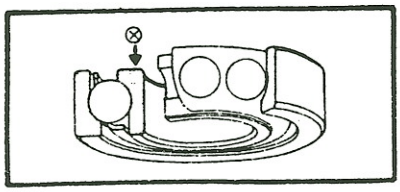
Detach the bearing from its seat by pressing against the race having the tightest fit. Use a puller or special tool. Thus, apply the pressure to the inner race when the bearing sits tightly on the shaft, and to the outer race when the bearing is tightly fitted in the housing respectively.
Arrange dismounted bearings and other parts in assembling order to avoid confusion.
Check the shaft end and the bearing seat in the housing for damage indicating that the bearing has rotated on the shaft, and in the housing respectively. Replace the damaged part, if the faults cannot be remedied by polishing or in some other way.



Fitting

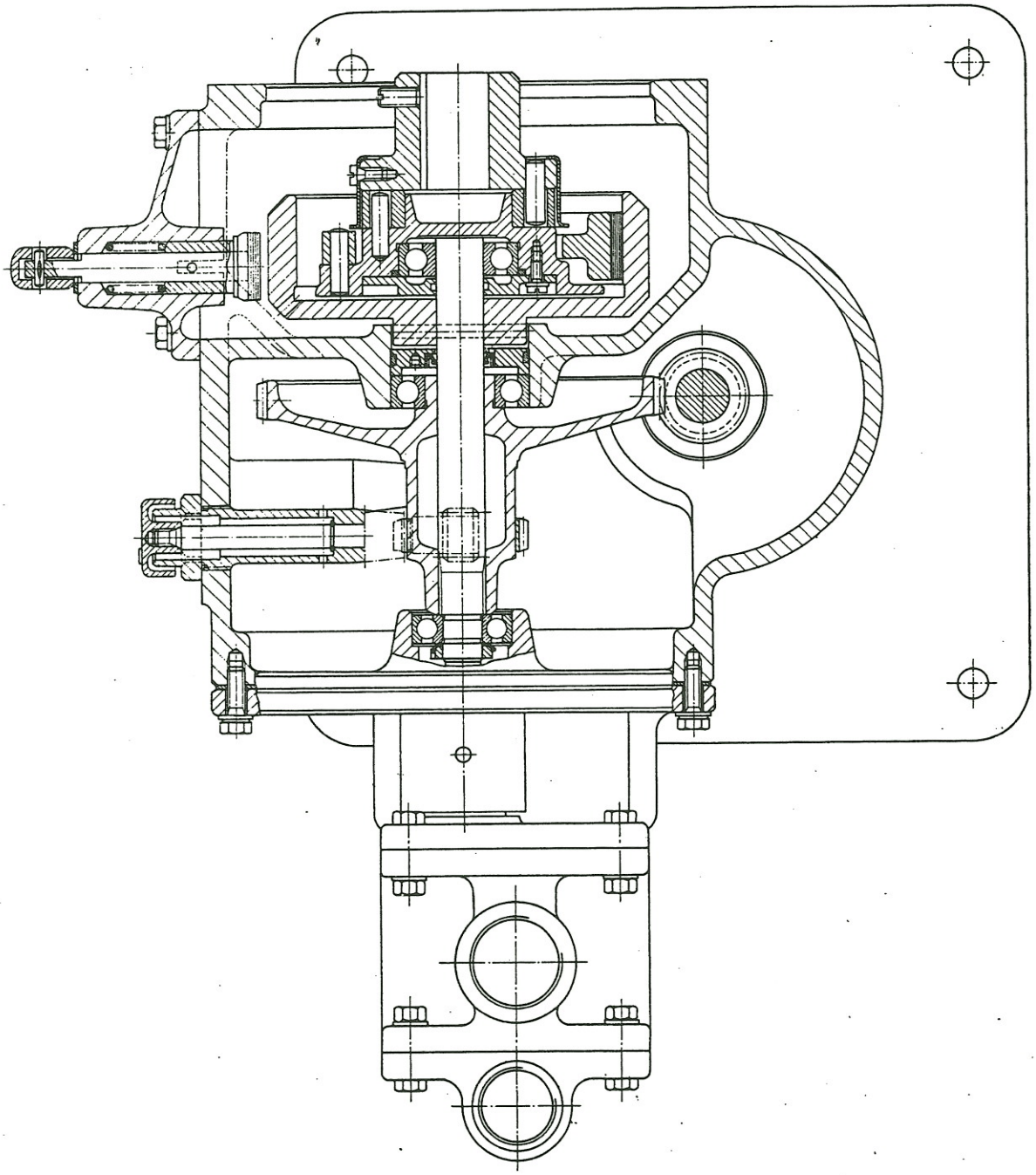
Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing need not be removed.

Fit a bearing on a shaft by pressure applied to the inner race and in a housing by pressure applied to the outer race. Use a suitable piece of pipe or a metal drift and a hammer. Never strike the bearing directly.
Bearings sitting with tight fit on a shaft should be heated in oil before assembly. The oil temperature should not exceed 100 ^{o}C. Never leave the bearing in the oil bath longer than required for throrough heating.



Angular contact ball bearings

Always fit single-row angular contact ball bearings with the stamped side of the inner race facing the axial load.



POWER TRANSMISSION

Dismantle and assemble the parts in sequence shown in the illustrations on the following pages, using the special tools supplied.

In addition to the specific instructions, remember the following points at all times...

... cleanliness and neatness are essential

... make sure that all seal rings and gaskets are intact

... exchange spring washers whenever necessary

... exchange all clutch pads, even if only one of them is worn

... oily clutch pads should be degreased according to the directions in chapter L, Cleaning Agents, and roughened with a coarse file

... take care to avoid getting oil or grease on the clutch and the friction surface of the conveyor pulley

... avoid unnecessary dismantling of ball bearings

... follow the directions given in chapter L for assembly of ball and roller bearings

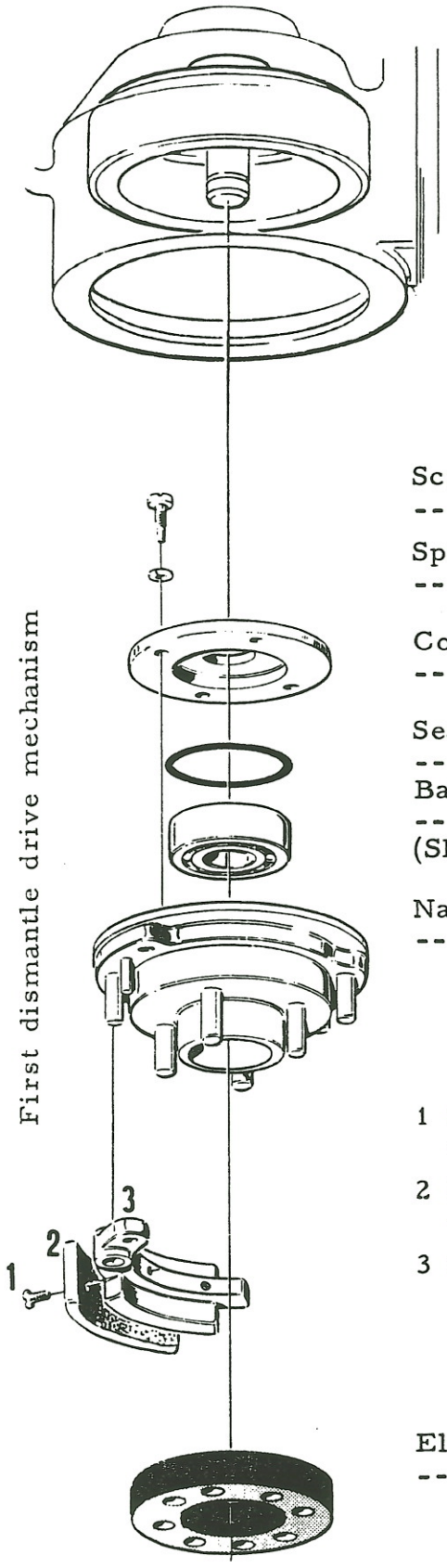
... round nuts should be tightened with a spanner and locked with lock washers

... the worm-gear housing should be cleaned and filled with clean oil after any work that may have introduced dirt

... follow the directions for cleaning and overhaul in chapter L and the directions for lubrication in chapter H.

Note:

Directions and data on spare parts and tools for the friction coupling are not applicable to machines with "fixed" coupling.



First dismantle drive mechanism

Screw (4)
-- 2211721-9

Spring washer (4)
-- 72896

Cover
-- 519529-2

Seal ring
-- 223406-3

Ball bearing
-- 7026
(SKF 6305*)

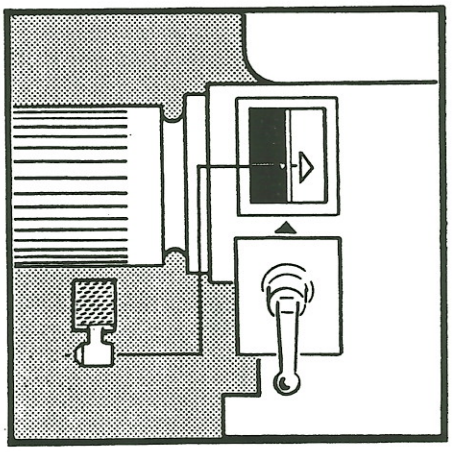
Nave
-- 519528-80

1 Screw (4)
-- 8341

2 Pad (2)
-- 519619-01

3 Friction block
-- see chapter F

Elastic plate
-- 519532-1



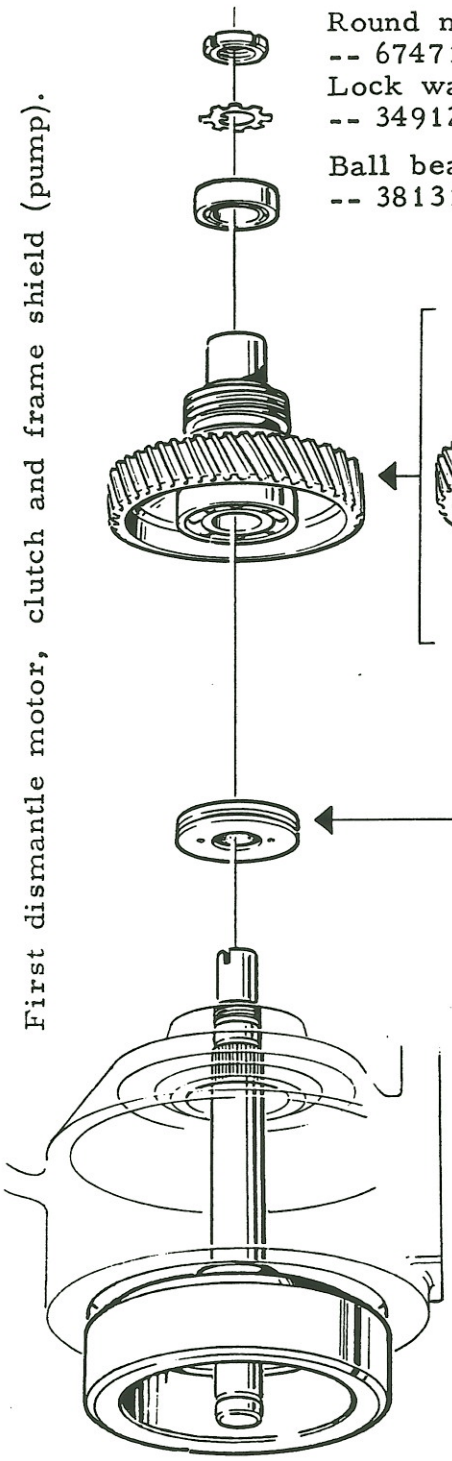
The friction blocks can be removed without the necessity of dismantling the rest of the clutch.

To this end loosen the cap over the coupling pulley of the motor and push it towards the rear. When assembling make sure that the friction blocks are moving freely on the pivots and mount the cap again.

Before fitting the nave lubricate the ball bearing amply with ball bearing grease. Make sure the seal ring has no defects and has been inserted, as otherwise grease may leak out on the friction blocks.

* or equivalent bearing of other make.

First dismantle motor, clutch and frame shield (pump).



Round nut
-- 67471 (SKF KM4)
Lock washer
-- 34912 (SKF MB4)

Ball bearing
-- 38131 (SKF 6304*)

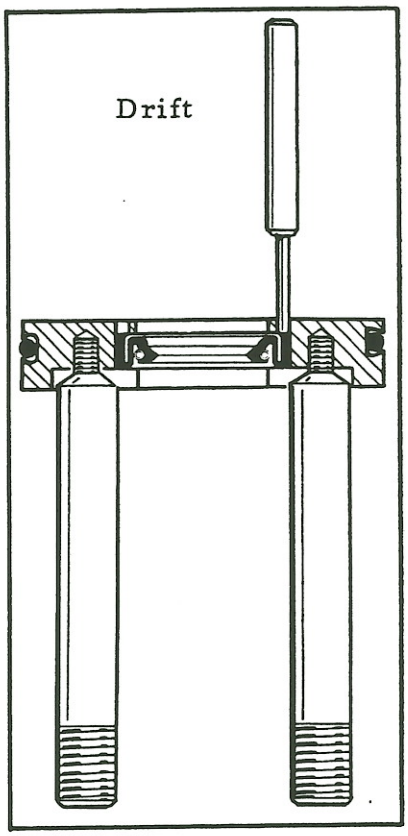
Worm wheel
-- see Ch. F

Ball bearing
-- 7142
(SKF 6207*)

Lipseal ring
-- 223521-12
Seal washer
-- 526704-1

Seal ring
-- 64702

Worm wheel shaft with conveyor pulley
-- 526690-80 (Spec. 4139-2)
-- 526690-81 (Spec. 4139-3)**
-- 526690-81 (Spec. 4139-4)

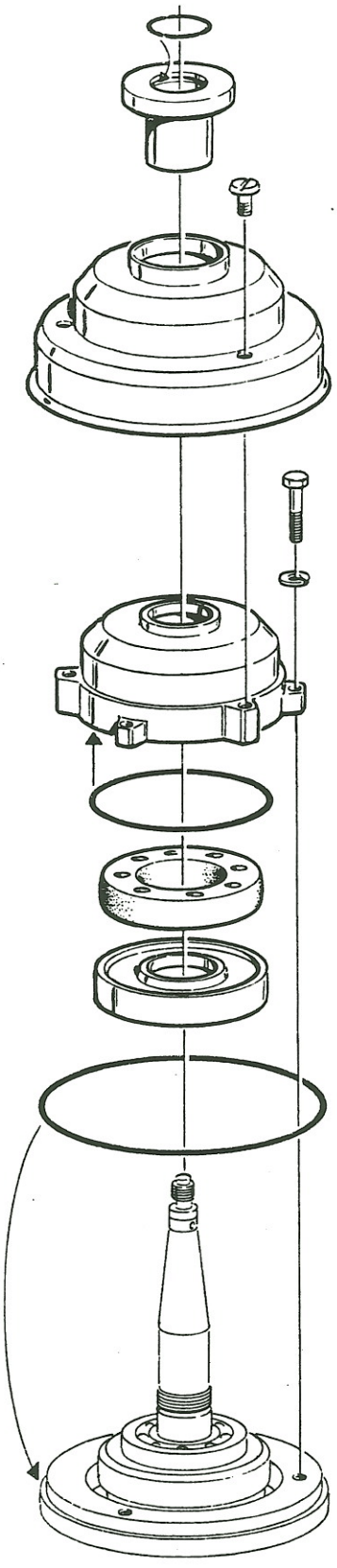


Use the motor guide bolts to draw out the seal washer. When assembling, make sure that the lipseal ring is turned as shown in the illustration. Warm the ball bearing before fitting it on the worm wheel.

* or equivalent bearing of other make.

** Spec. No. 4139-3 for feed pump with flexible coupling 538574-80 – see chapter X.

BOWL SPINDLE: for 1420-1500r.p.m. -- 528115-80, for 1700-1800 r.p.m. -- 528115-81



Seal ring**
-- 33336
Protecting collar**
-- 525497-2
(left-hand thread)

Screw (3)**
-- 2211721-7

Protecting cap**
-- 519544-1

Screw (3)**
-- 2210941-2

Washer (3)**
-- 20758

Hood
-- 525496-2

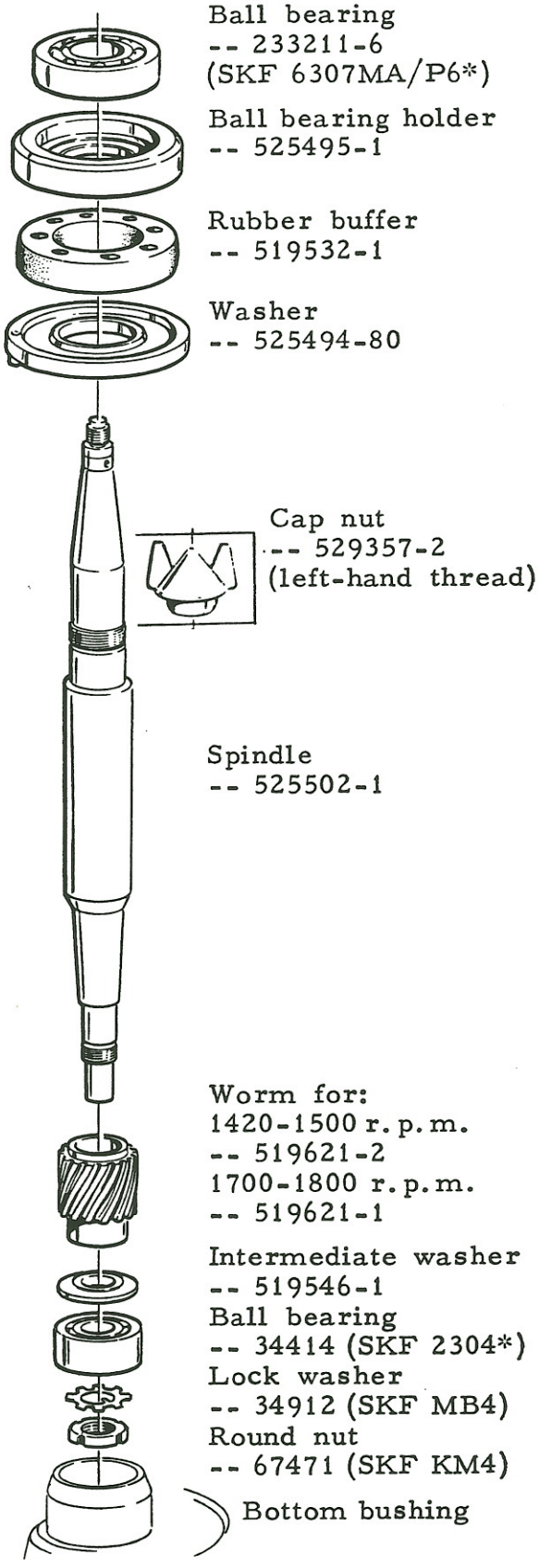
Seal ring**
-- 38411

Rubber buffer
-- 519532-1

Ball bearing holder
-- 525495-1

Seal ring**
-- 223408-4

Frame



Ball bearing
-- 233211-6
(SKF 6307MA/P6*)

Ball bearing holder
-- 525495-1

Rubber buffer
-- 519532-1

Washer
-- 525494-80

Cap nut
-- 529357-2
(left-hand thread)

Spindle
-- 525502-1

Worm for:
1420-1500 r.p.m.
-- 519621-2
1700-1800 r.p.m.
-- 519621-1

Intermediate washer
-- 519546-1

Ball bearing
-- 34414 (SKF 2304*)

Lock washer
-- 34912 (SKF MB4)

Round nut
-- 67471 (SKF KM4)

Bottom bushing

* or equivalent bearing of other make.

** not included in the complete-unit number.

(cont. S87528)

DISMANTLING and ASSEMBLY

The bowl body, control valve and paring disc device for operating liquid must be removed to make the parts accessible for dismantling
The parts in the left part of the illustration are dismantled while the spindle is still in place in the frame. For further dismantling the worm wheel must be removed and the bowl spindle lifted out of the frame.

Throw-off collar

The throw-off collar is unscrewed CLOCKWISE.

Lower ball bearing

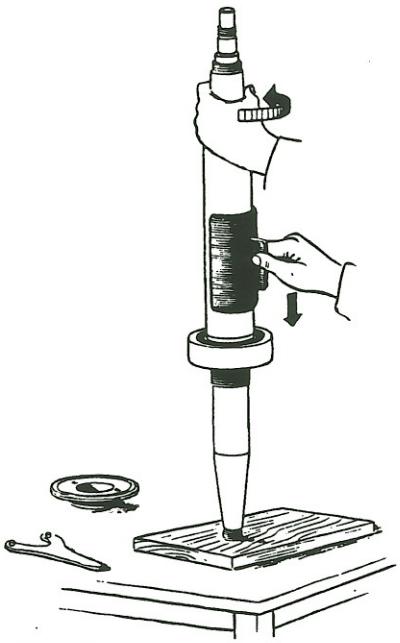
The bearing as well as the washer should be heated before assembling.

Worm

The worm is placed on a conical portion of the spindle and should be knocked loose by means of a tin hammer or a hammer and a soft drift. If the worm is exchanged, it is important that the worm wheel should be checked at the same time and also exchanged if necessary.
When mounting it is essential that the round nut is tightened properly.

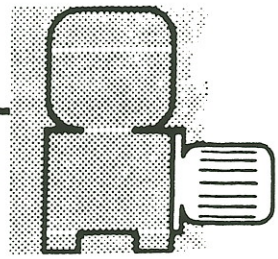
Upper ball bearing

To detach the ball bearing place the bowl spindle upside down on a soft base (wooden or similar) and knock lightly on the inner race of the bearing with the drive-off sleeve.
Heat the bearing before mounting it.



Check

After assembling, check that the bowl spindle turns when the worm wheel shaft is turned by hand.
Check the height adjustment of the control paring disc - see chapter L.



MOUNTING the MOTOR

General Drawing – Perspective Drawing with Part Numbers – Mounting.

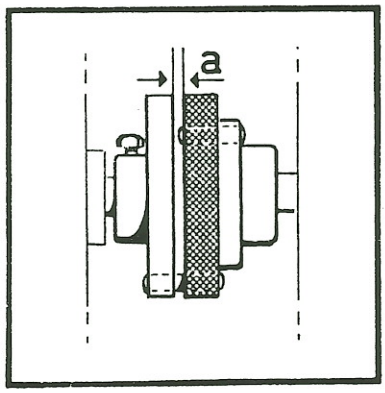
SPECIAL TOOLS see chapter G – LUBRICATION see chapter H – CLEANING see chapter L – MOTOR see special manual.

GENERAL HINTS

Motor

The speed prescribed for the ingoing shaft of the machine (the worm wheel shaft) and which must on no conditions be exceeded, is stamped on the type plate of the machine. The worm gear ratio and the friction blocks of the clutch are suited to this speed.
Check the number of revolutions by means of the revolution counter after installation and after exchange of motor.
For particulars concerning power requirement and speed see chapter C.

Coupling pulley or belt pulley



When the machine is delivered with motor, the pulley has been fastened in its correct position on the motor shaft. Score the position of the pulley before loosening it from the motor shaft. The axial play for the elastic plate - measurement "a" in illustration - should be about 2 mm (5/64").
When finishing a predrilled coupling pulley or belt pulley, the tolerance H7-J6 according to ISO should be applied.

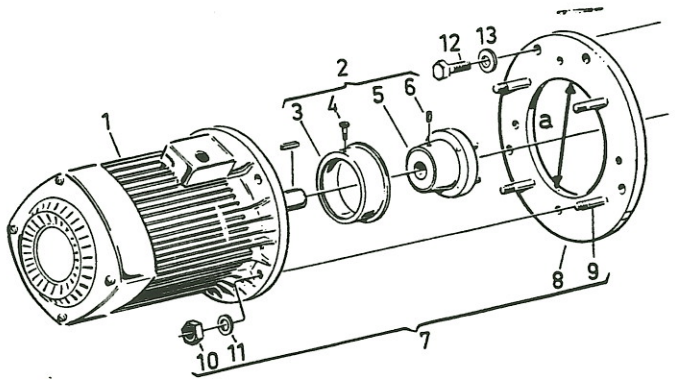
Electric cable

The electric cable to the motor should preferably have a free length allowing the removal of the motor without disconnecting the cable from the terminals.

Connection to mains

Connect the motor to mains so that the bowl will rotate CLOCKWISE.
The machine must never be started unless the bowl is placed on the spindle and the worm gear housing contains the prescribed quantity and quality of lubricating oil.

FLANGE MOTOR ("4" drive)

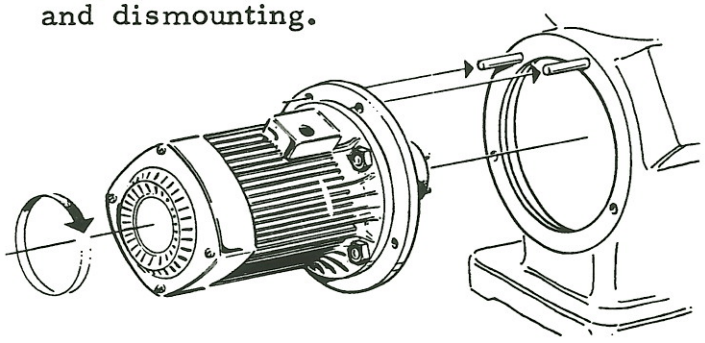


1. Motor - o
2. Coupling pulley, complete - 519612-80[x]
3. Hood - 519531-1
4. Screw - 2211721-8
5. Coupling pulley - 519530-80[x]
6. Set screw - 73539
7. Motor adapter, complete - part No. as per table depending upon the guide diameter "a".
12. Screw (4) - 72926
13. Washer (4) - 70492

	a = 130 mm	a = 180 mm
7. Motor adapter, complete -	519533-80	519534-80
8. Motor adapter -	519533-2	519534-2
9. Stud bolt (4) -	70485	2216261-1
10. Nut (4) -	73200	72946
11. Washer (4) -	20758	70492

Mounting the motor

Note that, as a rule, it is not necessary to loosen the motor and motor adapter from each other when mounting and dismounting.



Push the elastic plate on to the pins in the coupling pulley of the separator.

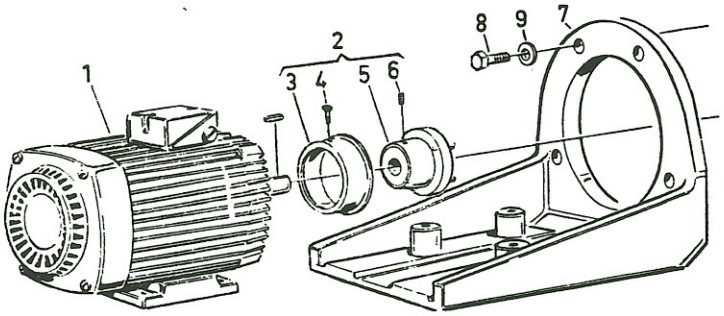
Screw the two guide bolts (see Chapter F) into the two upper, opposed screw holes in the frame flange.

Hang the motor (with the adapter fixed) on the guide bolts and push it into correct position, fitting the pins of the coupling pulley into the holes in the elastic plate. Fasten the motor and replace the guide bolts by screws. Tighten the screws alternately and check that the motor adapter enters the frame.

When dismounting see that the electric cable must not be loosened in the terminal block.

x) When ordering - follow the instructions given in Chapter A.

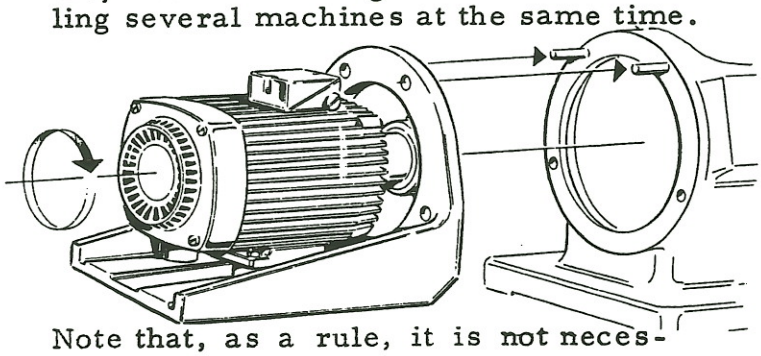
MOTOR on BRACKET ("9" drive)



1. Motor - o
2. Coupling pulley, complete -- 519612-80*
3. Hood -- 519531-01
4. Screw -- 2211721-08
5. Coupling pulley --519530-80*
6. Set screw -- 73539
7. Motor bracket (shaft height 5 5/16" (135mm)--523114-02
8. Screw -- 72926
9. Washer -- 70492

Mounting the motor

Motor and motor bracket are marked with the manufacturing number of the separator to which they belong. Note that they are mounted together when installing several machines at the same time.



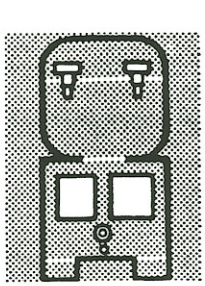
Note that, as a rule, it is not necessary to loosen the motor and motor bracket from each other when mounting and dismounting.

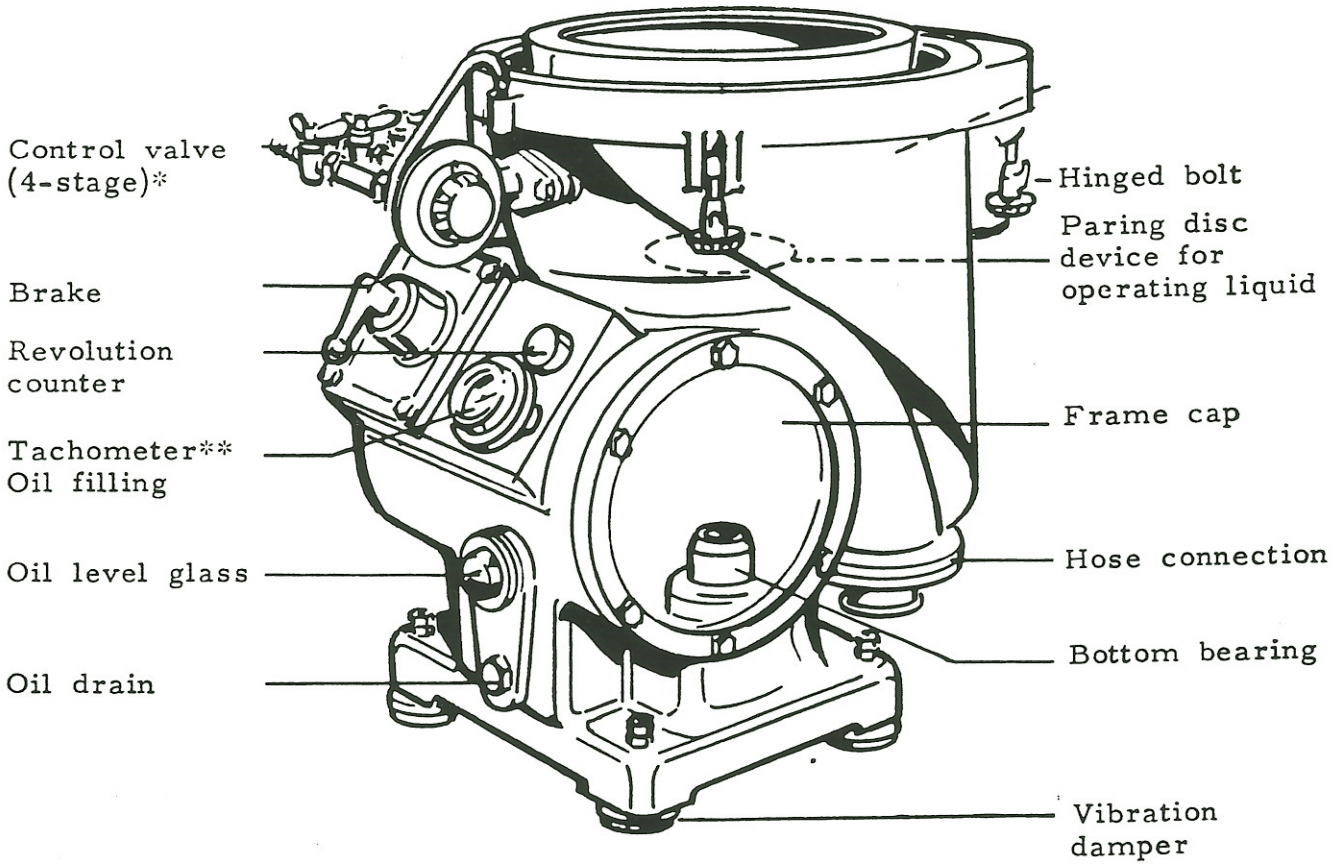
If the motor is not fastened to the bracket when delivered, put it on the base blocks, fix its position with the guide pins and fasten it with the screws

Push the elastic plate on to the pins of the separator coupling pulley and screw the two guide bolts (see Chapter F) into the two upper, opposed screw holes in the frame flange.

Hang the bracket with motor attached on the guide bolts and push it into correct position, fitting the pins of the motor coupling pulley into the holes in the elastic plate. Fasten the bracket and replace the guide bolts by screws. Tighten the screws alternately and check that the bracket enters the frame

*) When ordering - follow the instructions given in Chapter A.





* For MAPX machine 205T: Two-stage control valve with two plug cocks.

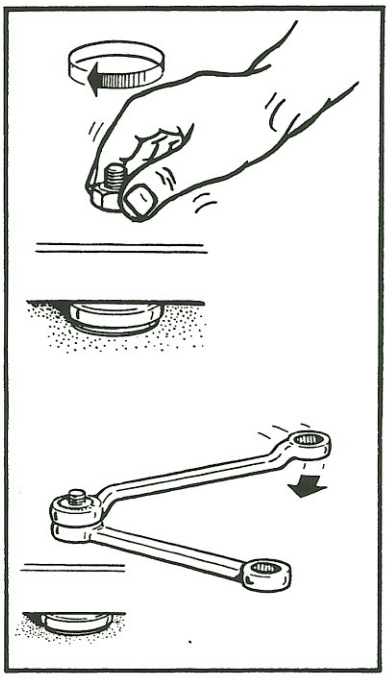
** For oil filling screw off the tachometer. If the machine is not provided with tachometer, an oil filling plug has been fitted instead.

FRAME ERECTION

Mount the frame, or the base plate if any delivered, on vibration dampers as illustrated on next page.

Mount the frame (base plate) without cushions in its place and check:

- that the bolts do not press against the edges of the holes. If one or more bolts press against the edges of the holes, the resilient mounting of the frame will be impeded.
- that the frame (base plate) is horizontal and that all feet rest on the base. If adjusting washers are needed, they should have the same diameter as the base cushions.



Lift the frame (base plate), slip the elastic cushions onto the bolts, lower and check that the bolts so not press against the edges of the holes.

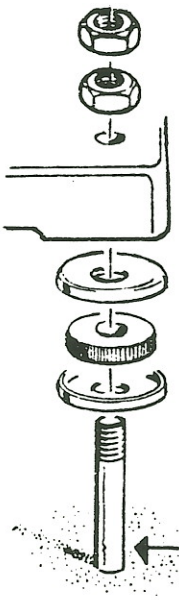
Screw down the nuts till they touch the washers and tighten a further half-turn.

Hold the nuts firmly and secure with lock nuts.

Mounting the frame on base plate

In this case the frame and motor are mounted on a common base plate. This plate is predrilled and like the motor marked with the manufacturing number of the separator to which it belongs. Mount the frame on the base plate, fix its position with the guide pins and fasten the frame rigidly without cushions to the base plate.
The part numbers of base plate, screws and guide pins are given in chapter R.

VIBRATION DAMPER



Nut (2)*

Frame (Foundation plate)

Cup cover -- 71126

Rubber washer -- 11667

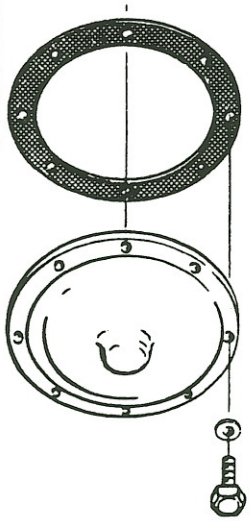
Cup -- 71125

Stud bolt*

Adjusting washer*

* Not included in delivery.

FRAME SHIELD



Packing -- 521787-1

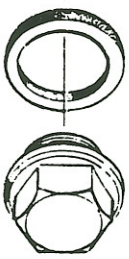
Shield* -- 526710-2

Washer (7) -- 20758

Screw (7) -- 2210941-17
(72933)**

* Not for machine with pump
** For machine with pump support

OIL DRAIN



Packing -- 518470-1

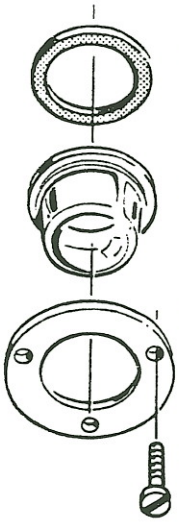
Screw -- 520529-2

OIL FILLING

Screw* -- 526686-2

* Not for machine with tachometer

OIL GAUGE GLASS



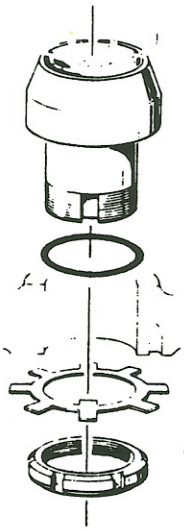
Packing -- 1104

Glass -- 8859

Fixing ring -- 9175

Screw (3) -- 2211721-8

BOTTOM BUSHING for BOWL SPINDLE



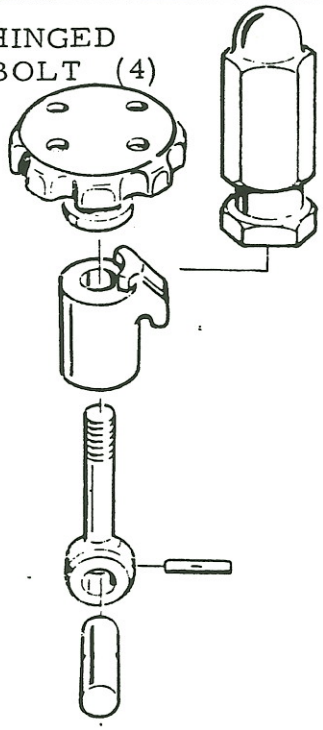
Bushing -- 519535-2

Seal ring -- 14238

Lock washer
-- 38720 (SKF MB8)

Round nut
-- 67475 (SKF KM8)

HINGED BOLT (4)



Hand wheel
--524392-80

Cap nut
--536704-02

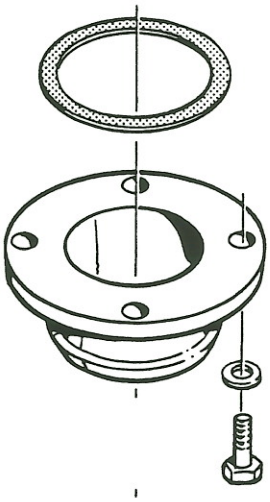
Clamping shoe
--71391

Hinged bolt
--225444-04

Pin --72474

Hinge pin
--72680

HOSE NIPPLE



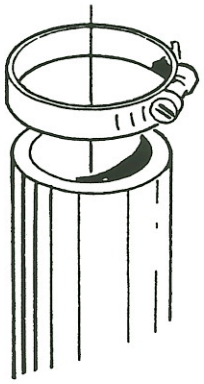
Packing
--68987

Hose nipple
--521850

Washer (4)
--223101-50

Screw (4)
--72926

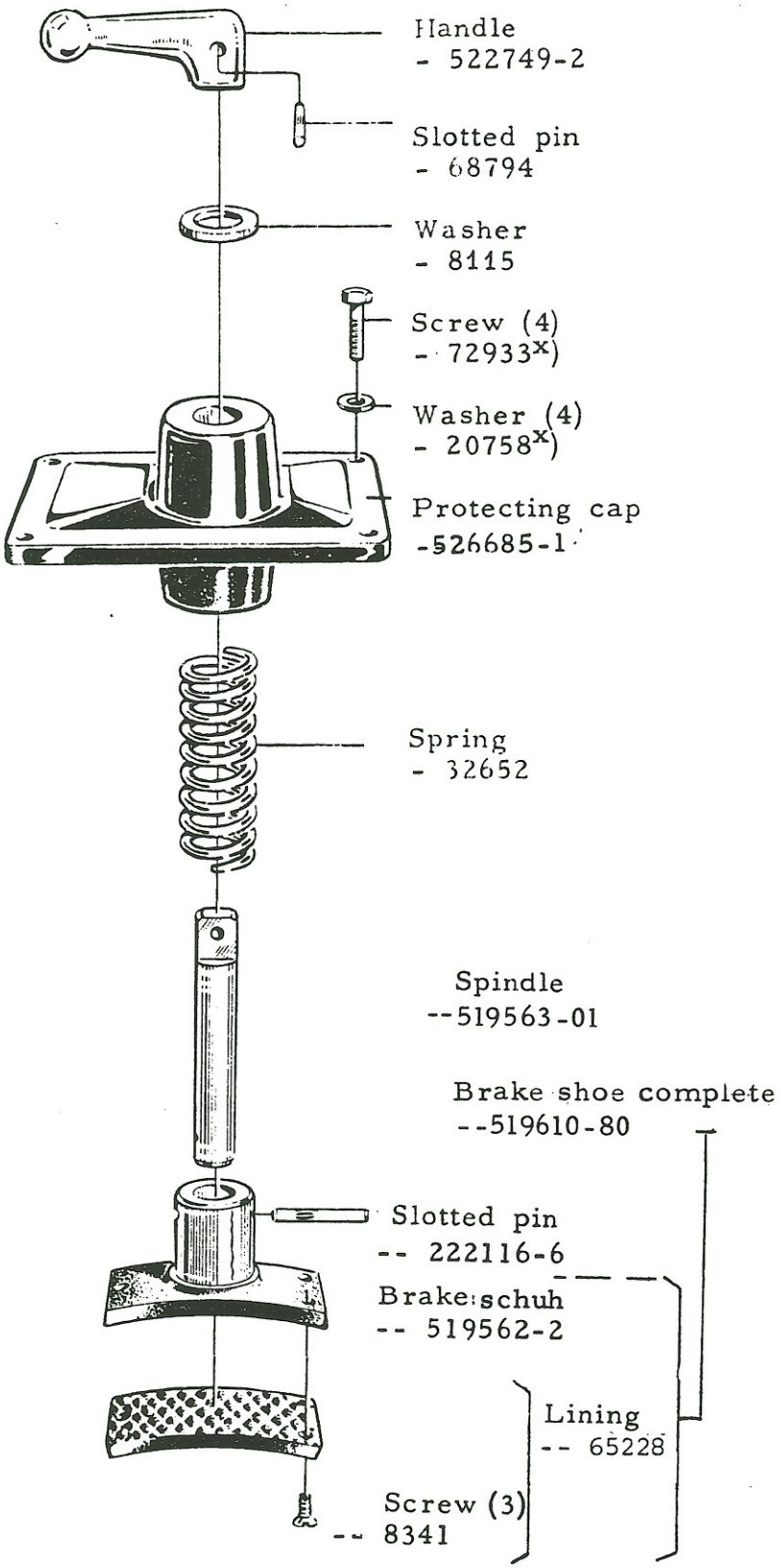
HOSE (3" L=345 mm)

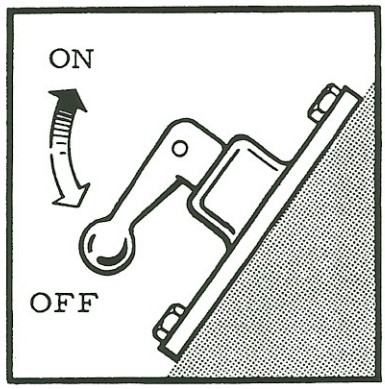


Hose clip (2)
--2245101-01

Hose
--520687-01

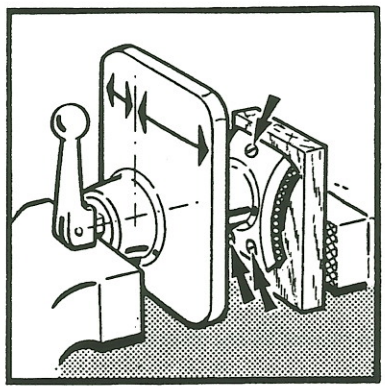
BRAKE -- 519609-81 (*-marked parts are not included in the complete number)





Exchange of lining

Check that brake is released and remove the cap. Exchange the lining. Note that the screws are slotted at both ends (use an angle driver). Fasten the cap with the handle pointing downwards.

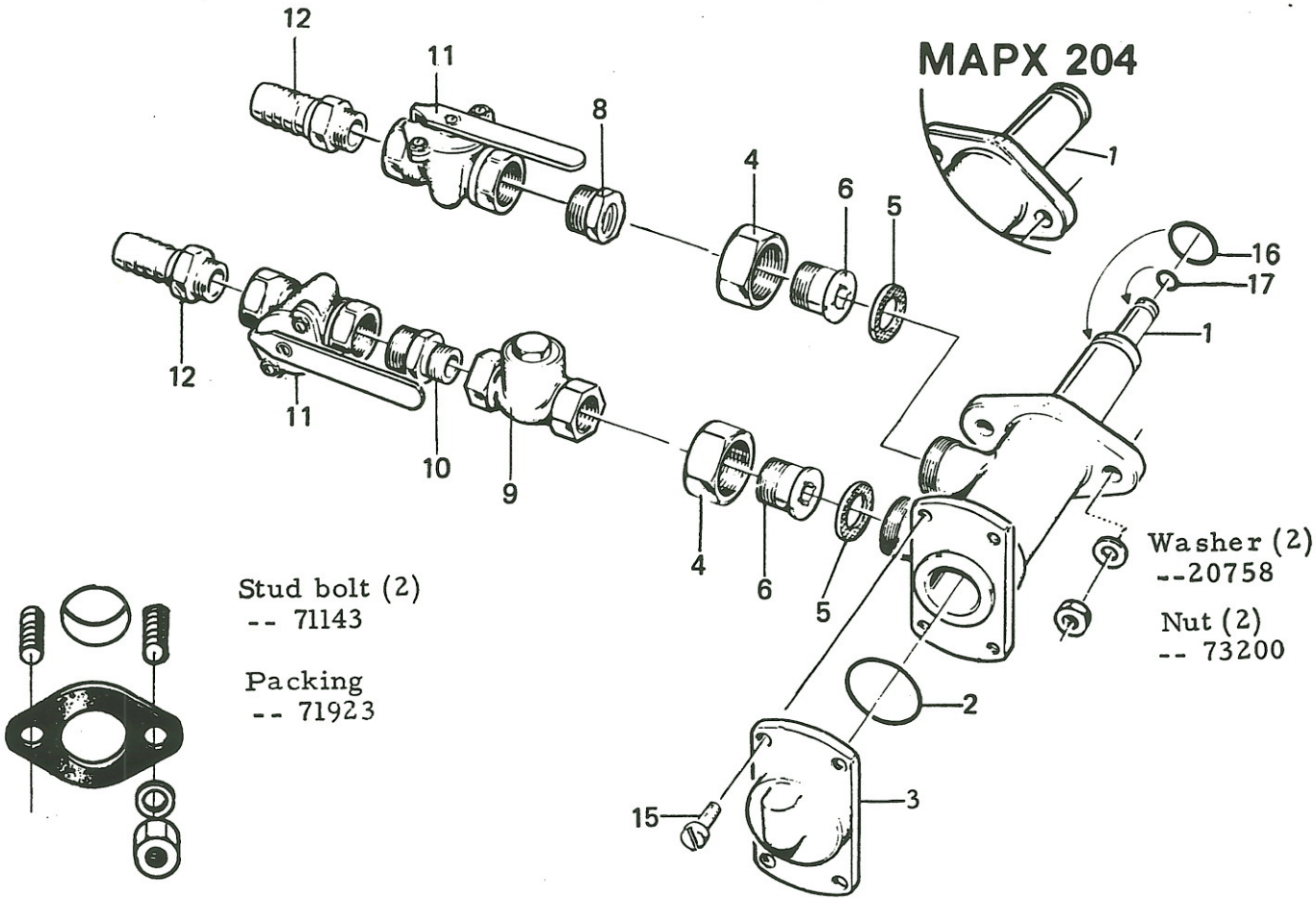


Dismantling. Assembling

Clamp the cap in a screw vice, apply the brake, and remove the handle.

See that the cap, handle and brake shoe are turned as shown by the arrows in the figure. Fasten the cap to the machine with the handle pointing downwards.

CONTROL VALVE, complete -- see table



Machine type	MAPX 204 WSPX 204	MAPX 205	MAPX 210	MAPX 313
CONTROL VALVE	526778-83	526778-82	526778-80	526778-81
1 Connection piece	529352-80	516114-84	516114-89	516114-90
16 Seal ring	223406-46	67035	67035	67035
17 Seal ring	--	223404-06	223404-06	223404-06

1 Connection piece
-- see table

2 Seal ring
--64708

3 Cover
--526662-02

4 Coupling nut
--71343

5 Packing
--223310-04

6 Connecting nipple
--71342

8 Bushing
-- 526329-07

9 Check valve
--2545150-05

10 Hexagonal nipple
--526353-08

11 Ball valve
--526826-02

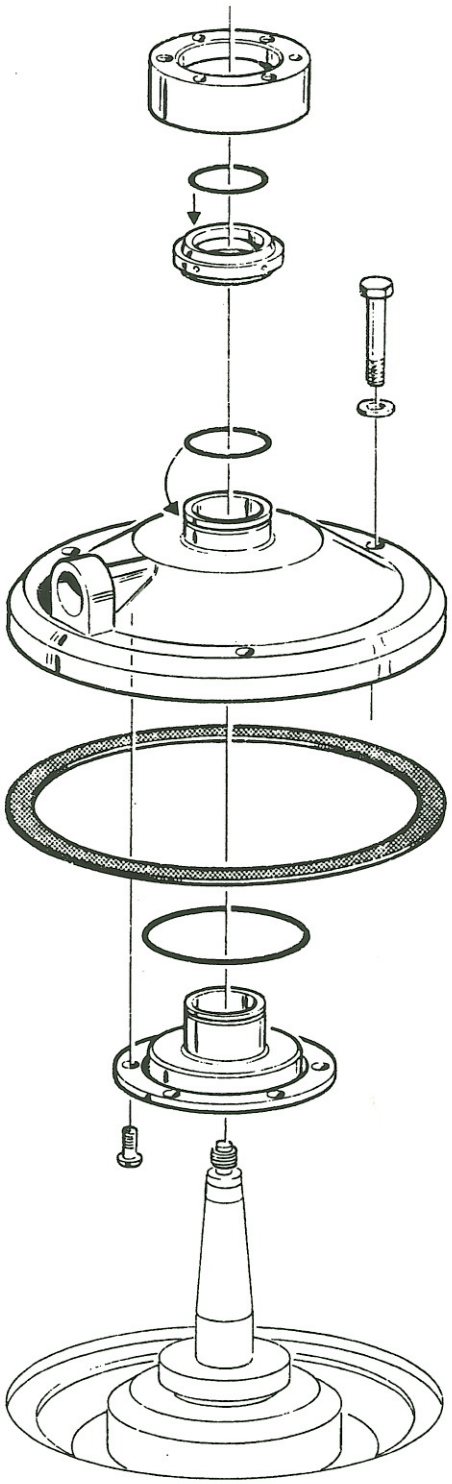
12 Hose nipple
--68956

15 Screw (4)
--2211722-25

16 Seal ring
--see table

17 Seal ring
--see table

PARING DISC DEVICE for OPERATING LIQUID -- 528116-80



Distributing ring
-- 528119-80

Seal ring
-- 223404-47

Paring disc
-- 528121-1

Screw (6)*
-- 2210941-6

Washer (6)*
-- 22405

Seal ring
-- 223404-47

Distributing cover
-- 528117-2

Height adjusting ring (1-5)*
-- 223336-3

Seal ring
-- 223406-14

Sleeve
-- 528118-2

Screw (6)
-- 2211721-7

Bowl spindle

The distributing ring rotates, the other parts are non-moving.

Dismantling

For dismantling the bowl see chapter I. The distributing ring is fastened to the bowl body by screws. These screws must be removed before the bowl body can be lifted off from the spindle. Remove the control valve.
Take out the distributing cover and dismantle the parts in the sequence apperaing from the illustration. Use the special tools.

Cleaning

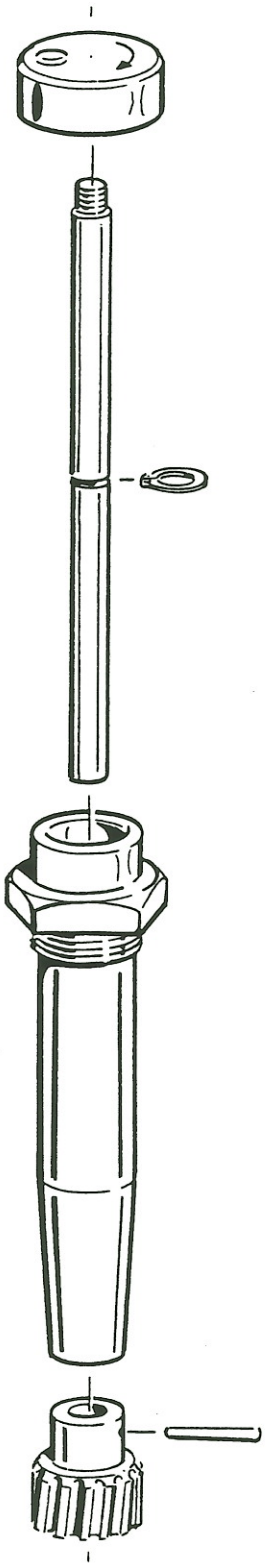
Make sure the parts (particularly all holes and channels) are carefully cleaned — for cleaning agents see chapter L.

Assembling

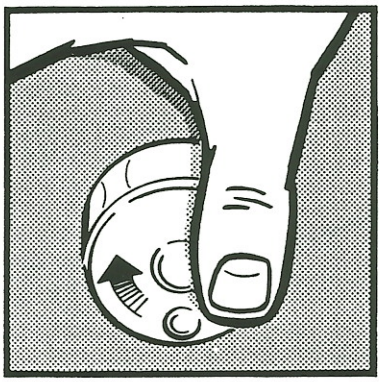
Fit the parts in the distributing cover. Make sure that the height adjusting rings are put in place, that the parts are placed in the positions defined by the guides, and that the holes in packing and distributing cover face each other. Check the height position (see chapter L) and fit the control valve. Supply operating liquid and check throughflow according to directions in chapter L.

* Not included in the complete-unit number.

REVOLUTION COUNTER
-- 526712-80



The number of revolutions of the worm wheel shaft is transferred via a reduction gear to the revolution counter.



By holding a finger against the rotating protecting cap and counting the number of revolutions for a minute, the number of revolutions of the worm wheel shaft can be checked. Speed data are given in chapter C.

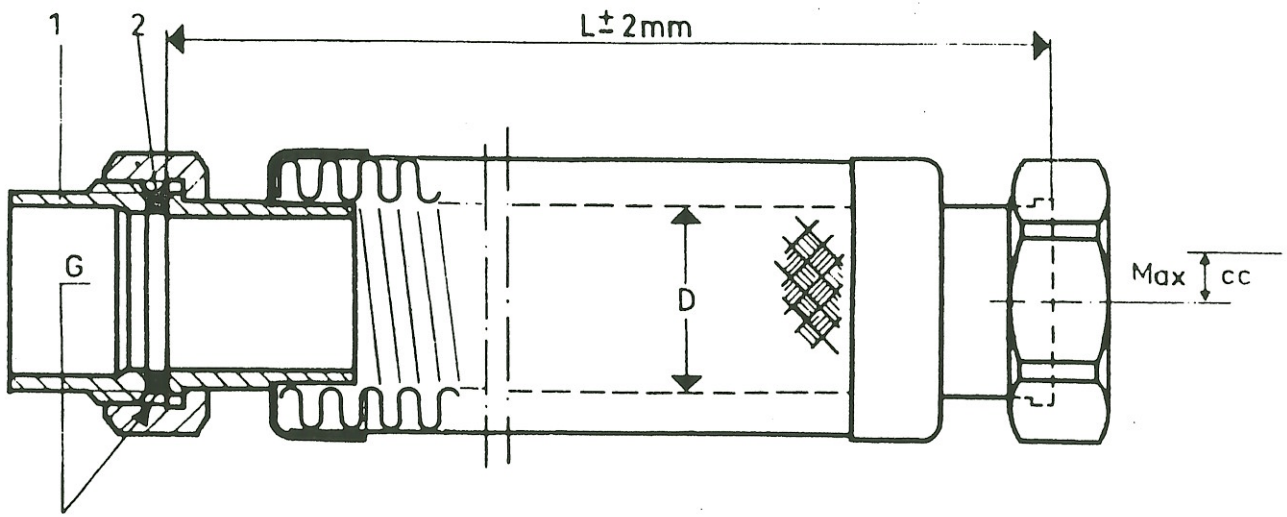
Mounting

Lubricate the shaft and pinion with gear housing oil. See that the bushing is screwed home entirely.

S87576E-6

ALFA-LAVAL

FLEXIBLE STEEL HOSE FOR OIL



COMPLETE HOSE	Packing (2)	Nipple (1)	Hose, only	Lenght (L)		Inner diameter (D)		Thread (G)	Max. cc	
				mm	inch	mm	inch		mm	inch
534114-81	223318-06	526566-1	534114-80	400	15 3/4	32	1 1/4	R 1 1/8	13	1/2
526561-81	68592	526567-1	526561-80	400	15 3/4	38	1 1/2	R 1 1/2	13	1/2
526860-81	223435-12	527944-1	526860-80	400	15 3/4	50	2	R 2	13	1/2
538270-82	223433-17	526566-1	538270-80	400	15 3/4	25	1	R 1 1/8	13	1/2
534115-81	68592	525667-01	534115-80	400	15 3/4	38	1 1/2	R 1 1/2	13	1/2

STEEL HOSE

X

1230884