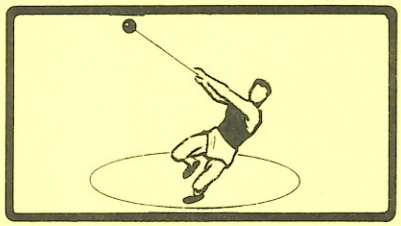
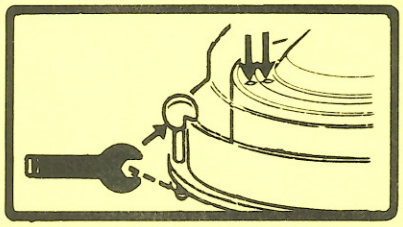
△ SAFETY PRECAUTIONS FOR CENTRIFUGAL SEPARATORS △

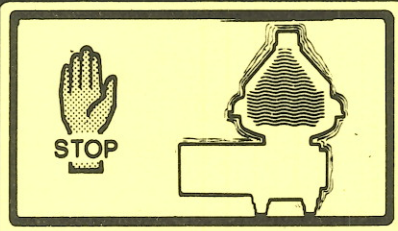


The bowl of a centrifugal separator rotates at a very high speed and great forces are generated.
To ensure your own safety, always carefully follow the instruction book(s) concerning installation, assembly of the components, operation and regular maintenance.
Always use Alfa-Laval spare parts and tools supplied with the machine.

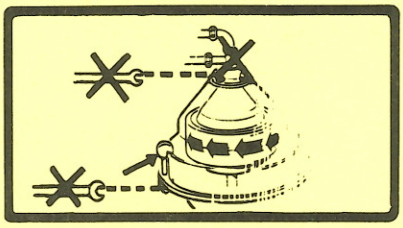
OPERATION



Never start the machine before the lock rings of the bowl inlet, outlet and other fastenings have been securely tightened. Note that the assembly marks Ø (arrowed) must be aligned or pass each other (due to thread wear) when the lock ring is fully tightened.

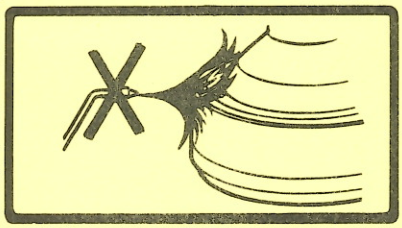


If excessive vibration occurs, IMMEDIATELY fill and keep the bowl full of liquid whilst stopping. Switch off and apply brakes, if fitted. After the bowl has stopped; dismantle, clean and check all parts carefully.



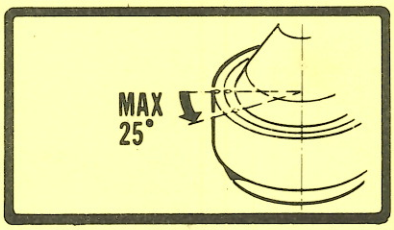
Never loosen any part of the machine until the bowl has completely stopped.

MAINTENANCE

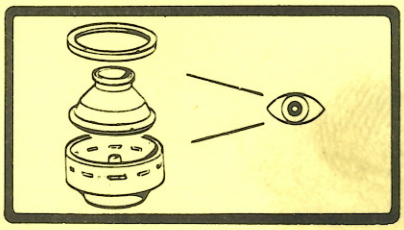


Never heat the bowl body, bowl hood or lock ring with a naked flame.

Never carry out any welding work on the components that rotate.



Never operate the machine when the Ø assembly mark on the lock ring can pass the corresponding mark on bowl body/bowl hood by more than 25 degrees. Consult your AL representative.



Check at regular intervals for damage due to corrosion and/or erosion. If in doubt, consult your AL representative.

- Switch off and disconnect the power supply to the machine before starting any dismantling work.
- Never use the machine for separating a liquid that is more corrosive or has a higher density, temperature, different characteristics of the solids, etc. than that for which the machine has been purchased.
  In case of doubt, consult your AL representative.
- A separator bowl is balanced as a complete unit. Do not interchange the components of a bowl with those of any other machine, even if it is the same type. Make sure that no parts are left out at assembly.
- Follow the safety instructions concerning inflammable, toxic or corrosive process media and cleaning agents. Affix information and warning notices in prominent places.

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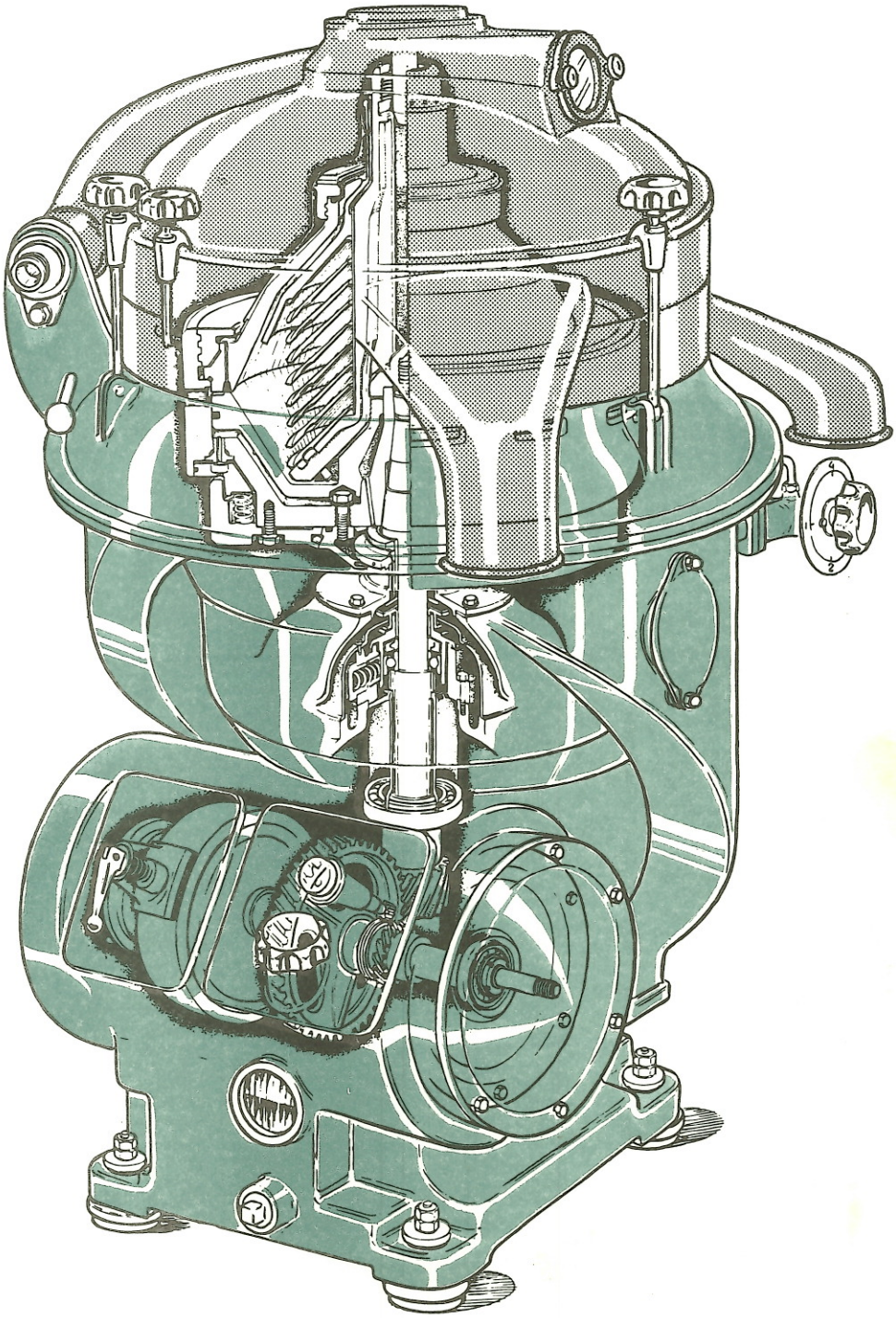

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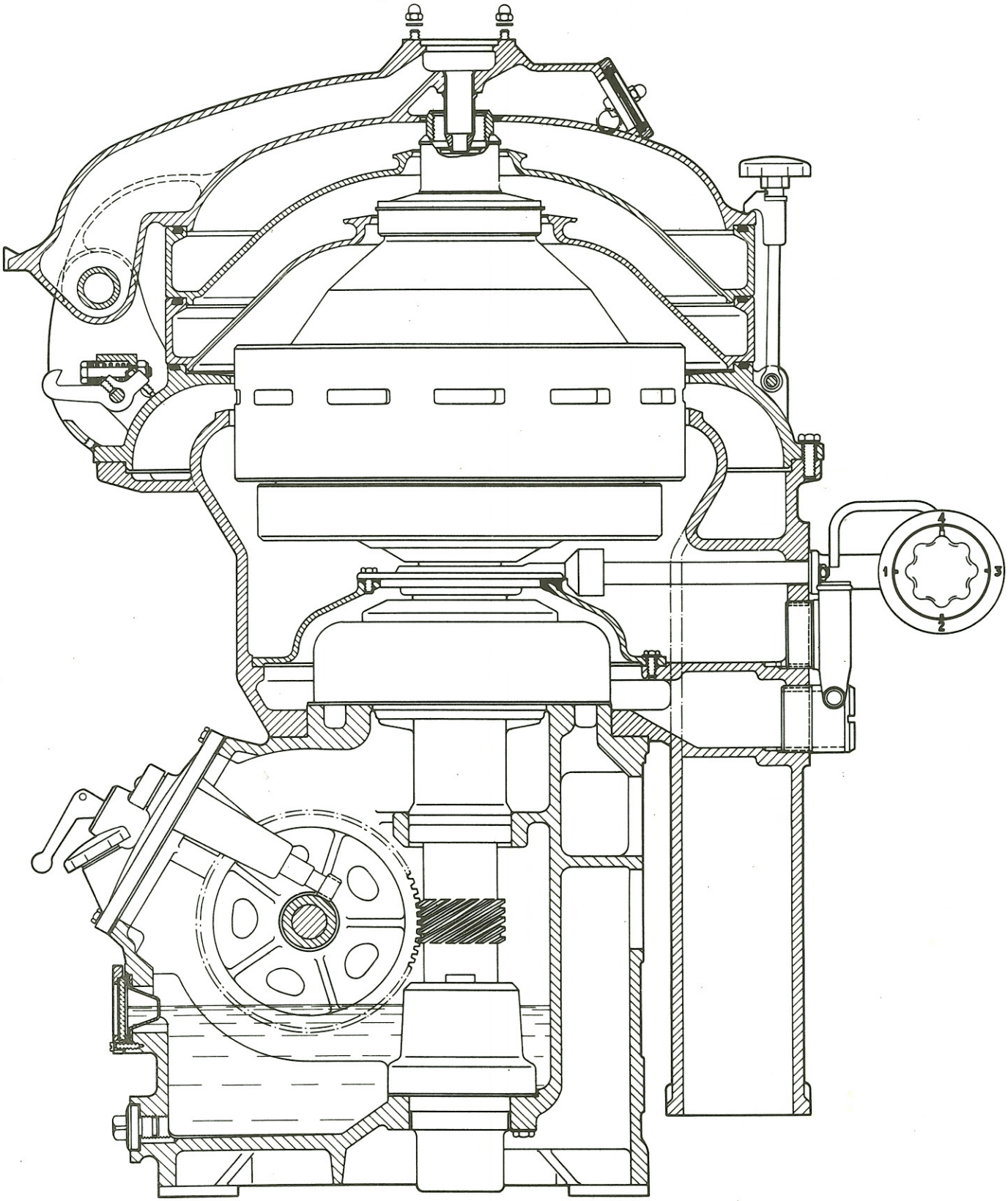
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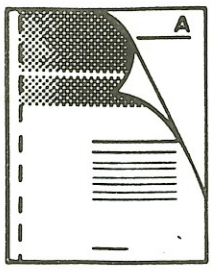
ALPHABETIC REGISTER

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).

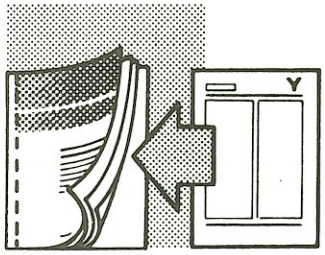
The Instruction Book deals not only with parts and devices included in the standard design, but also with special and alternative equipment. Parts incorporated in the deal are specified in the packing list accompanying the shipment.

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/DE LAVAL representative is always glad to provide advice and information beyond 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
mnmnmnmnmn	mnmn	m	
mnmnmnmn	mnmnm	m	
mnmnmnmnmn	mnmn	mn	
mnmnmnmn	mnmnm	mn	

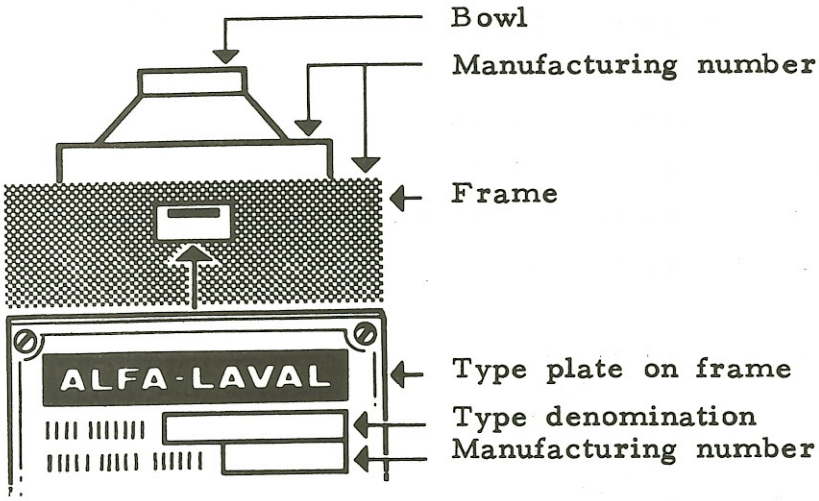
Correct ordering = Correct delivery in shortest time.

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)

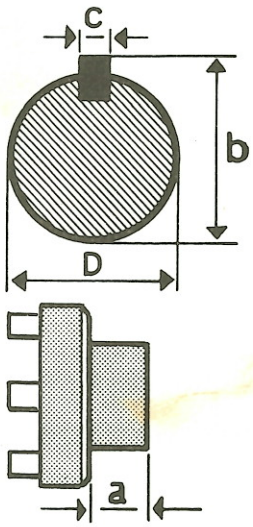


If the machine has been rebuilt after delivery, if the part number is not inserted in the Instruction Book, or when in doubt about the correct part number for other reasons, mention this in the order. In such cases correct statement of the TYPE DENOMINATION and the MANUFACTURING NUMBER indicated on the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

ABBREVIATIONS

h = hour

r.p.m. = revolutions per minute

c/s = Hz = cycles per second

ø = diameter

SAE-class = indication of oil viscosity according to Society of Automotive Engineers

SSU = Saybolt Seconds Universal: indication of oil viscosity

°E = degree Engler: indication of oil viscosity

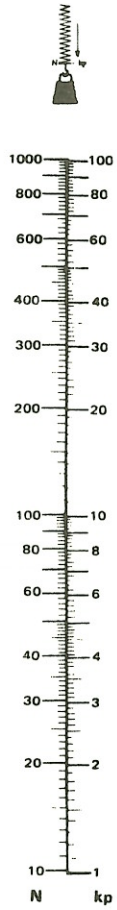
EP = Extreme Pressure: lubricants made capable of resisting high contact pressures through admixture of additives.

ASTM = American Society for Testing Materials.

NLGI-classes = classification of lubricating grease by means of penetration after processing according to National Lubricating Grease Institute, USA.

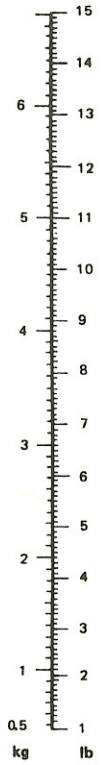
ISO = standards of processing according to International Organization for Standardizing.

Force



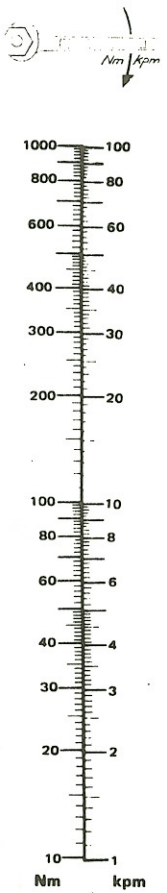
1 N = 0.102 kp

Mass



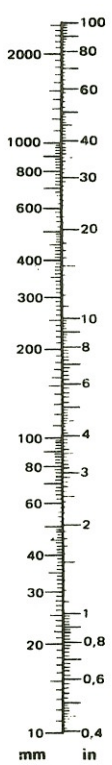
1 kg = 2.205 lb

Moment of Force



1 Nm = 0.102 kpm

Length



1 mm = 0.03937 in

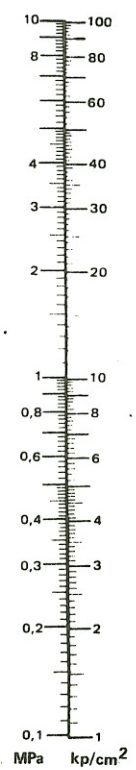
Power

1 kW = 1.36 hk

Pressure

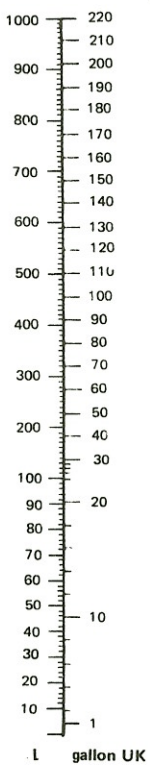
1 MPa = 145 psi

Pressure



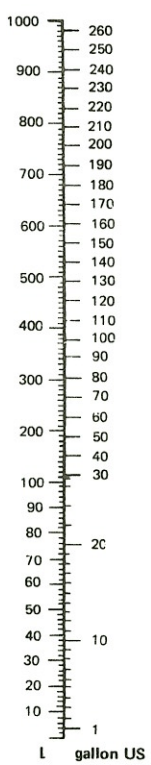
1 MPa = 10.20 kp/cm^2

Volume



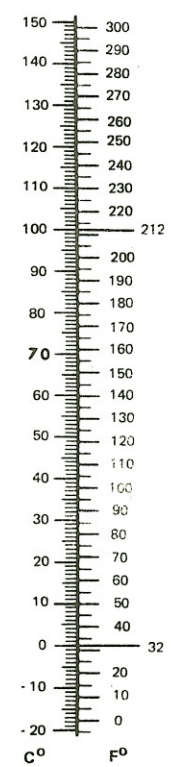
1 L = 0.220 gallon UK

Volume



1 L = 0.264 gallon US

Temperature



$^{o}C = 5/9\ (^{o}F - 32)$

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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.

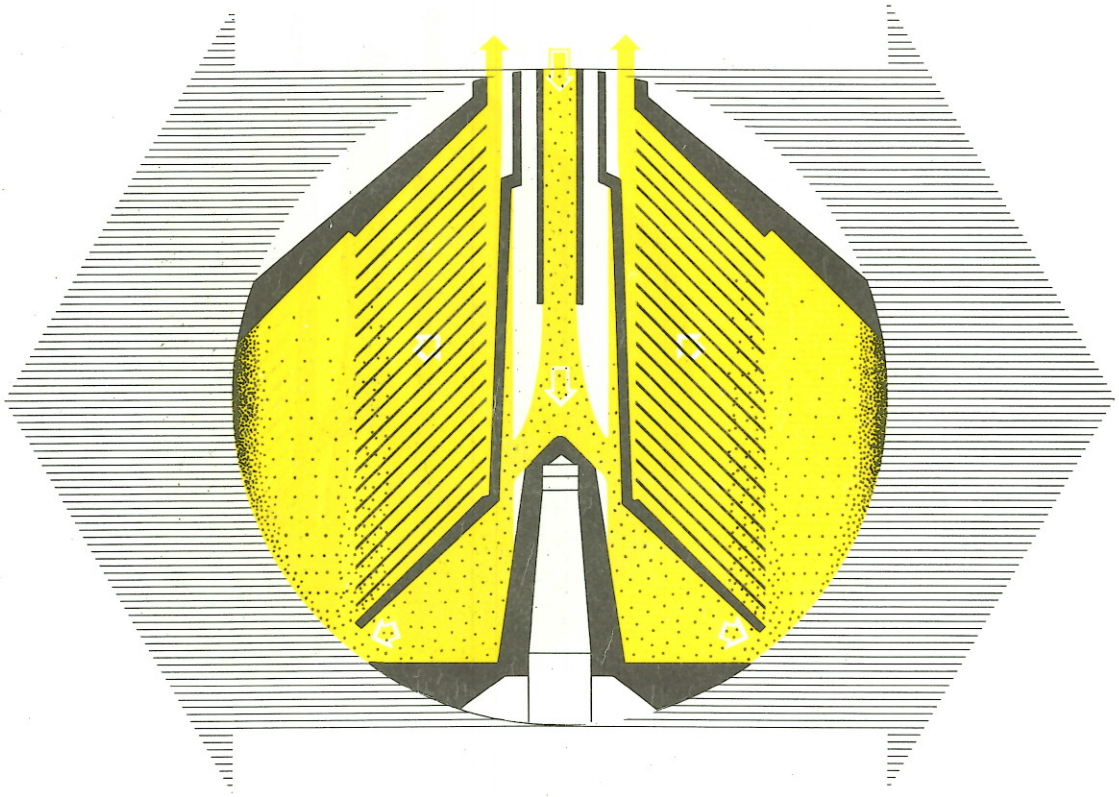
FUNCTION	The purpose of the operation is either to liberate a liquid from strange particles, or to separate two intermixed liquids.
DEFINITIONS	
Throughput	This means the quantity of liquid supplied per unit time. The throughput is given in cu. m/h or l/h (Imp. galls/h).
Reception ability	This means 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.

CLARIFICATION



Centrifugal force

Bowl parts

Liquid

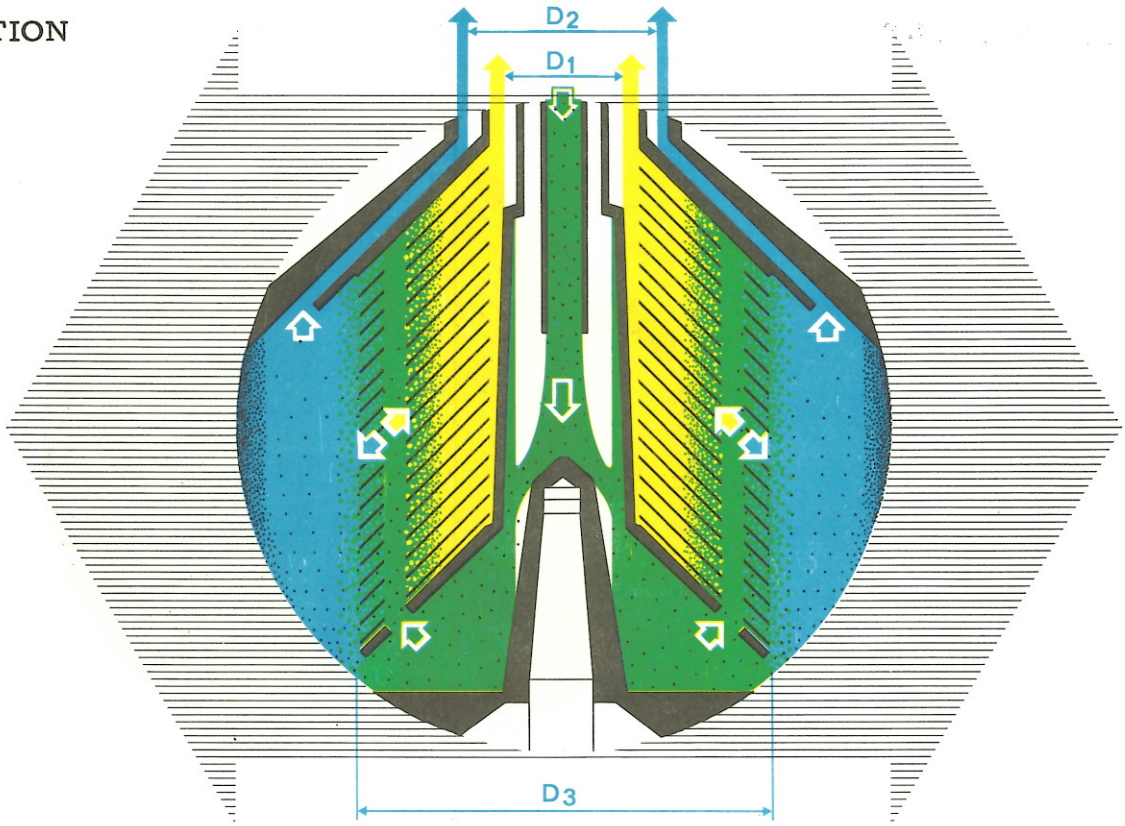
Solids

Clarifier bowl

This bowl has one outlet. The process liquid flows through the distributor to the interspaces between the bowl discs. Through the action of the centrifugal force the heavy particles move along the underside of the discs towards the bowl periphery, where they settle on the bowl wall. The liquid proceeds towards the bowl centre and discharges through the bowl hood.

The course of separation can be influenced e.g. by changes in the viscosity (rise in separating temperature) or in the throughput.

PURIFICATION



- Centrifugal force
- Bowl parts
- Process liquid
- Heavy liquid phase
- Light liquid phase
- Solids
- D1 — Diameter of inner outlet
- D2 — Hole diameter of gravity disc
- D3 — Diameter of interface

Purifier bowl

This bowl has two outlets. The process liquid flows through the distributor to the interspaces 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 hole in the top disc neck — the inner way (yellow in the illustration).

Liquid seal

In a purifier 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. Thus the bowl must be filled with sealing liquid before the process liquid is supplied. The sealing liquid is subsequently forced towards the bowl periphery so as to form a liquid ring confined inwardly by the so-called interface between the light phase and the heavy one. 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).

The sealing liquid:

- o Must be insoluble in the light phase.
- o May be soluble in the heavy phase.
- o Must not be heavier than the heavy phase.

Normally, the heavy phase is used as sealing liquid.

Note: Provided the content of heavy phase in the liquid mixture is sufficiently high (min. 25%), it may in some cases do to feed the process liquid to the bowl. The liquid seal will then build up automatically in some time.

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:

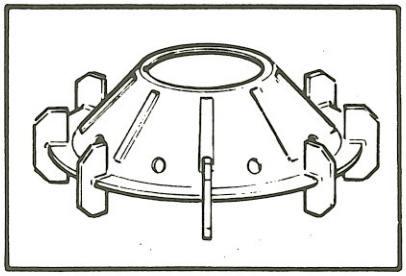
$$\frac{s_1}{s_2} = \frac{D_3^2 - D_2^2}{D_3^2 - D_1^2} \quad \ldots\ldots\ldots\ldots(1)$$

Disposition of interface

The purifier 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). The heavier or more viscous the light phase and the larger the liquid feed, the smaller the diameter should be. For this purpose a number of gravity discs with various hole diameters is delivered with the machine. Where to dispose the interface depends on which phase should be delivered 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, however not so far from the bowl centre that the liquid seal breaks (the gravity disc is too large).

If the heavy phase is wanted more free from the light one, the interface should be placed nearer the bowl centre, however not inside the outer edge of the discs (gravity disc too small), as this would prevent the liquid flow.

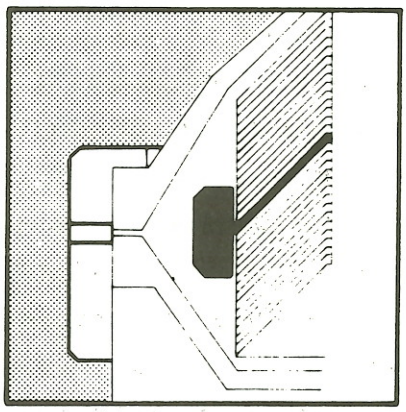
WINGED BOWL DISC



The winged bowl disc is supplied together with the machine (included in set of spares) and can be fitted in the bowl when required. To obtain the best result the machine should, under difficult separating conditions, be test-run both with winged bowl disc and without it.

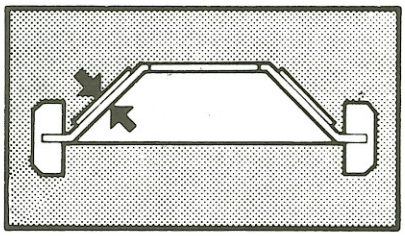
However, in the following cases the winged bowl disc should always be used:

1. When the machine has automatically controlled (programmed) sludge discharge.



The winged bowl disc provides for quicker distribution of the sealing liquid in the bowl so that a sufficient liquid seal is built up before the process liquid feed valve opens.

2. When a moderate increase of the throughput results in emulsion.



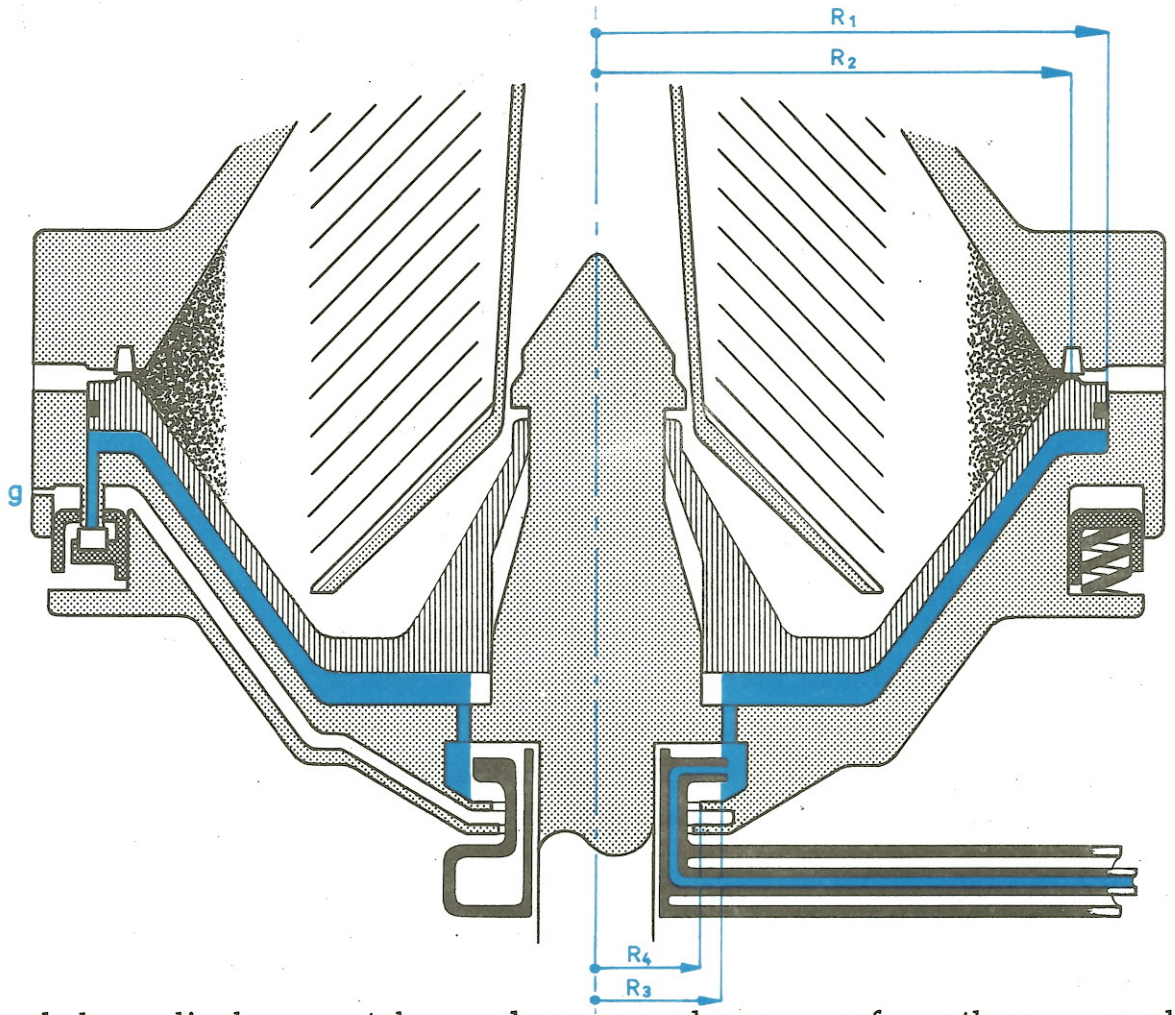
The winged bowl disc should be fitted in the existing bowl disc set so that the wings are located right in front of the sludge ports in the bowl wall. To avoid alteration of the pressure in the disc set, measure the thickness of the winged bowl disc including the caulks (spacers), establish the corresponding measure of the ordinary upper bowl discs, and remove the necessary number of the latter. With the disc set fitted in the bowl check the compression of the disc set according to directions in chapter L.

Part number of winged bowl disc

Machine type	Part number
MAPX 204T	532416-80
MAPX 205T	532417-80
MAPX 207S	526441-80
MAPX 309B	528077-80
MAPX 210T	532261-80
MAPX 313T	528140-80

Note: The winged bowl disc is not used in concentration.

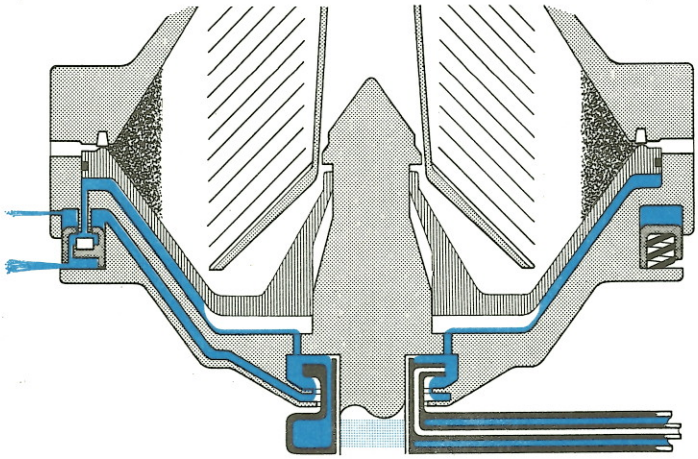
TOTAL SLUDGE DISCHARGE and COMBINED PROGRAMME



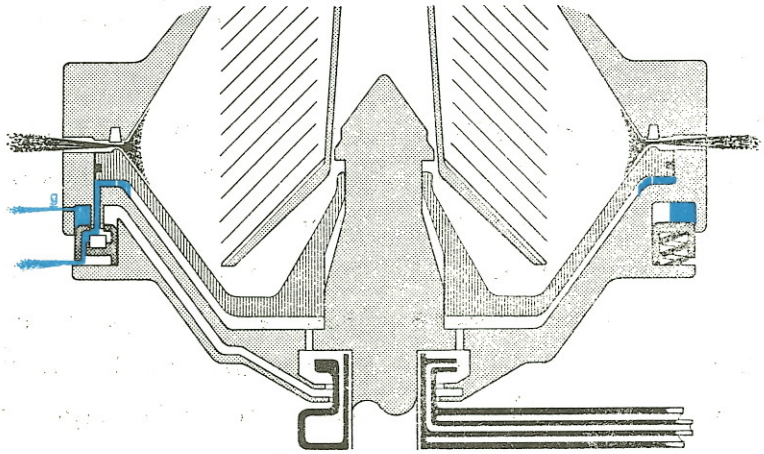
The sludge discharge takes place through a number of slots in the bowl wall. Between discharges these slots are closed by a large valve slide, the sliding bowl bottom, which constitutes an inner, sliding bottom in the separating space. The sliding bowl bottom is forced upwards against a seal ring by the liquid pressure acting on its underside. This pressure builds up during the rotation because of the centrifugal force and increases with the distance from the axis of rotation. The operating liquid exerts an upwards 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 and evaporation or leakage of operating liquid is continuously made up for. This is done through a paring disc device under the bowl which maintains a constant horizontal operating liquid level (radius R_3) under the bowl, as its pumping effect neutralizes the static pressure from the supply.

(cont.)

(Sludge Discharge ... page 2)



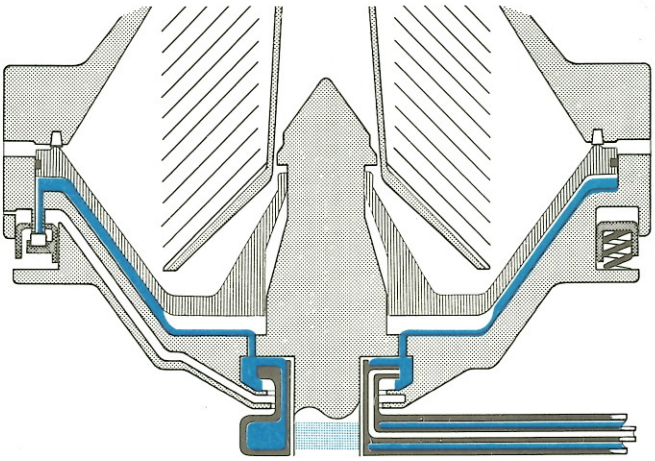
Operating liquid is now supplied through the outer wider tube so that it flows over the lower edge of the paring chamber (radius R_4) and continues through a channel out to the upper side of a sliding ring, the operating slide. Between discharges the operating slide is pressed upwards by coil springs.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



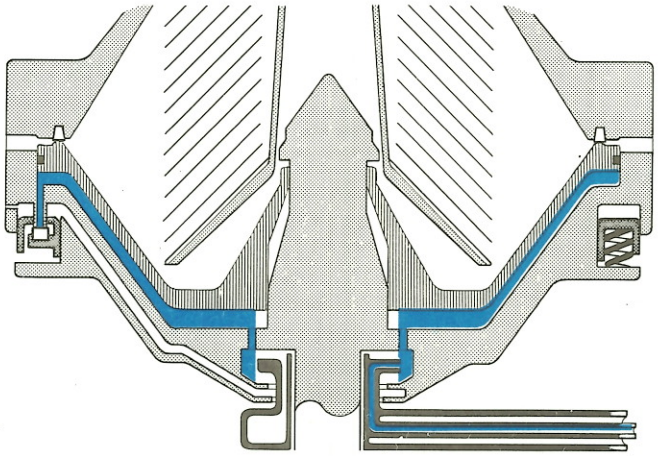
When the pressure exerted by the operating liquid against the underside of the sliding bowl bottom diminishes, the latter is forced downwards and opens so that the sludge is ejected from the bowl through the slots in the bowl wall. The operating liquid on the upper side of the operating slide flows out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

(cont.)

(Sludge Discharge --- page 3)

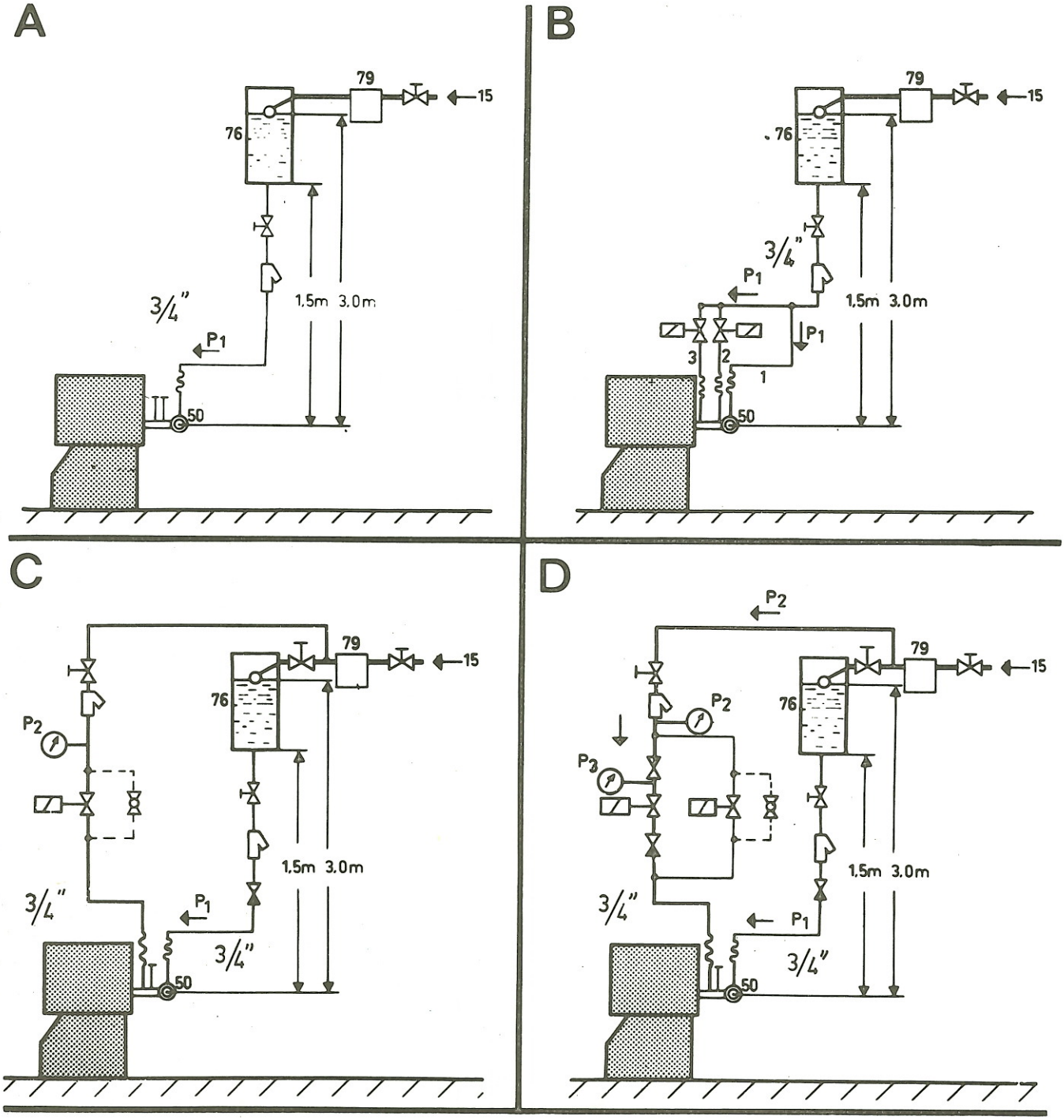


The coil springs again force the operating slide upwards, thus shutting off the discharge valves from the space below the sliding bowl bottom. Operating liquid is supplied through the outer, wide tube, but only enough to flow to the space below the sliding bowl bottom and force the latter upwards so that the bowl is closed. (If too much liquid is supplied, it will flow into the channel to the operating slide and the bowl will open again.)



The outer, wider inlet is now closed while the inner, narrower one is open. The paring disc device counter-balances 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.



Valve

Check valve

Pressure regulating valve

Solenoid valve

By-pass with cock

Compensator, e.g. rubber hose

Strainer

Pressure gauge

15 Operating liquid
50 Control valve
76 Operating liquid tank
79 Dehardening filter

p1=0.15-0.30 kg/sq.cm (2.2-4.2 psi)
p2=1.5-3.0 kg/sq.cm (22.0-42.0 psi)
p3=0.3-0.7 kg/sq.cm (4.3-10.0 psi)

OPERATING LIQUID SYSTEM

The figure shows four examples of operating liquid supply.

A = machine with bowl for total discharge; manual control.

B = machine with bowl for total discharge; automatic or manual control.

C = machine with bowl for partial discharge (with level ring) or rapid total discharge; automatic control.

D = machine with bowl for combined programme (combined partial and total discharge); automatic control.

The actual type of bowl discharge appears from the perspective drawing in chapter I, "Bowl", and indicates which one of the above examples that is applicable in the present case.

Operating liquid

Pure, soft water can be used as operating liquid. Hard water involves the risk of lime deposits, which may cause obstruction of the narrow channels in the operating liquid system and thus interruption of the service. The demands on the softness of the water increase with higher operating temperature, since lime precipitation is more liable to occur at higher temperatures. 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 hold 50-100 lit. (11-22 Imp.galls), must be placed so that the liquid level will be lying within the height measurement limits above the control valve stated in the figure. In case the head room is too small, the tank may be replaced by a reducing valve or the like. This may, however, be less reliable than the tank. Besides, the tank system saves liquid during operation, since the back pressure of the control paring disc is 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 Fig. A.
p1 – see figure.
Liquid at pressure p1 initiates all functions according to the setting of the control valve.
For automatic control, two solenoid valves are added to the system. These solenoid valves are provided in the conduits to the two inner connections on the control valve as shown in Fig. B.
As regards further equipment see directions for automatic control.
If it is wanted to change from automatic control to manual control, simply disconnect the automatic control device, whereupon the sludge discharge can be controlled in the usual manner by means of the control valve.
p1 – see figure.
Liquid supplied through conduit 1 closes the bowl when starting – this pipe must be shut off during operation.
Liquid supplied through conduit 2 keeps the bowl closed during operation – the solenoid valve must close when the solenoid valve in conduit 3 opens.
Liquid supplied through conduit 3 opens and closes the bowl during operation – when the solenoid valve closes, the solenoid valve in conduit 2 must open.

Bowl (with level ring) for partial discharge

The discharge mechanism of these bowls is designed for automatic control – see directions for automatic control. The system is arranged as shown in Fig. C.

Bowl for rapid total discharge

In an emergency, for instance if the automatic system fails, manual control is possible – see below.
p1 – see figure.
p2 – see figure.
Liquid at pressure p1 closes the bowl when starting and keeps the bowl closed during operation all according to the setting of the control valve.
Liquid at pressure p2 opens and closes the bowl at sludge discharge.

Bowl for combined programme

The discharge mechanism of this bowl is designed for automatic control with possibility of setting to various programmes of total and partial discharges – see directions for automatic control. The system is arranged as shown in Fig. D.
In an emergency, for instance if the automatic control device fails, manual control is possible but will give total discharges only.

p1 – see figure.
p2 – see figure.
p3 – see figure.
Liquid at pressure p1 closes the bowl when starting and keeps the bowl closed during operation, all according to the setting of the control valve.
Liquid at pressure p2 opens the bowl for total discharge.
Liquid at pressure p3 opens the bowl for partial discharge and closes the bowl after partial and total discharge. By means of the pressure-regulating valve the liquid flow quantity and thus the degree of partial discharge can be regulated.

MANUAL CONTROL OF AUTOMATICALLY OPERATED LIQUID SYSTEM

To allow manual control of the systems shown in Figs. C and D the solenoid valve in the conduit for high-pressure liquid must be by-passed.
Preferably, a manually controlled sludge discharge is carried out as follows: shut off the feed of process liquid and set the control valve to position 2 – open the valve in the by-pass and close it again immediately after accomplished discharge – set the control valve to position 3 and wait till the indication shows that the bowl is closed – set the control valve to position 4 and open for feed of process liquid.

Note

Manual control may necessitate a shortening of the interval between discharges.

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 before total discharge, flushing of the sludge cover).

If the automatic system is included in the delivery, the installation and operation is carried out according to the accompanying directions for the automatic control device, 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 may indicate a liquid loss. Such pressure drops will occur if the bowl does not close, or if it closes only partly. Whether the machine is automated or not, it is suitable, with closed system, to provide a guard such as a pressostat with alarm device in the pipe for treated liquid. The device should have means for blocking the alarm impulse from the pressostat when normal pressure drops occur, for instance in connexion with normal sludge discharge.

SLUDGE BLOCKAGE

If the nature of the sludge is such that it forms deposits in the upper frame or the sludge discharge bend, flushing should be provided to avoid sludge blockage. The flushing liquid should preferably be at the same temperature as the process liquid and is supplied through the connections provided for the purpose.

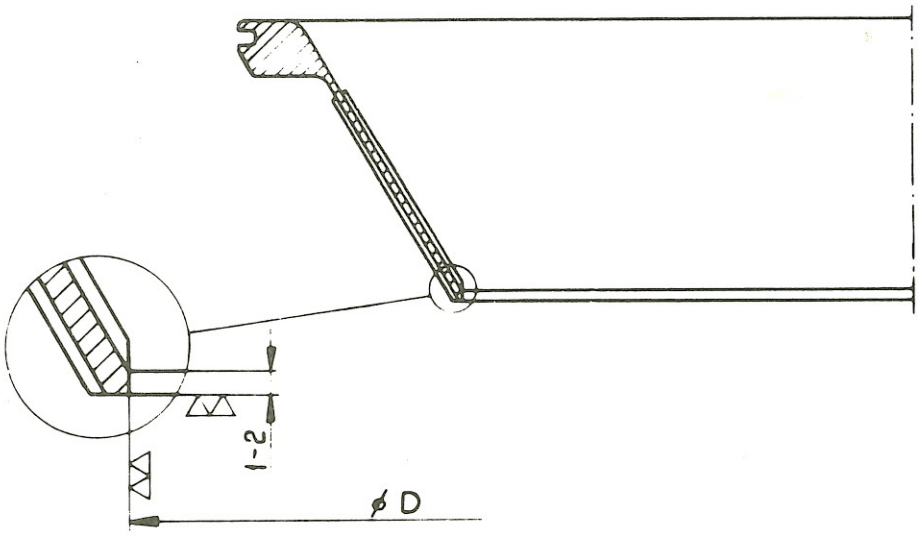
If the sludge may not be diluted with any liquid other than the process liquid or if it is of such a nature that it forms deposits in the bowl, the interval between discharges should be reduced.

Flushing of the sludge cover in the frame should begin immediately before and continue throughout the discharge cycle. With timer-controlled machines, the flushing operation is generally included in the programme – see separate instructions for automatic control. With manually operated machines a simple valve is sufficient.

Bowl with level ring

With partial discharge, the amount of sludge ejected on shooting can also be increased so that some of the process liquid will escape with the sludge and act as a flushing liquid.

To increase the quantity of sludge/liquid, the level ring is turned off to widen its inner diameter D.



It is best to do the turning by stages, e.g. 5-10 mm at a time until the desired discharge quantity is obtained. The edges must be smoothed after turning (see Fig.).

☆

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 REQUIRED

Suitable motor output: 8.8 kW (12 HP)
Starting power for machine equipped with pumps: 11 kW (15 HP)
Working power (depending on throughput and pump equipped): 4.5 - 7 kW (7.5 - 9.5 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**
Tachometer	1420 - 1500	1700 - 1800
Revolution counter	118 - 125	142 - 150

* 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.

ACCELERATION TIME

From 0 to operation speed: 7.5 - 8.5 minutes.

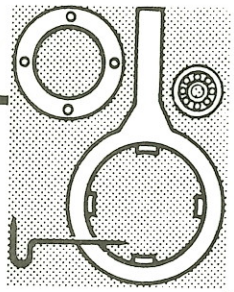
OPERATING LIQUID

Operating liquid system and pressure depend on the bowl type — see Operating liquid system, chapter B.

FLUSHING and SEALING LIQUID

Pressure: 2 - 4 kg/cm^2 (28.5 - 57 psi).
Temperature: max. 93°C (200°F).

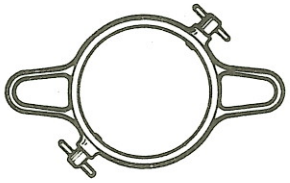
☆



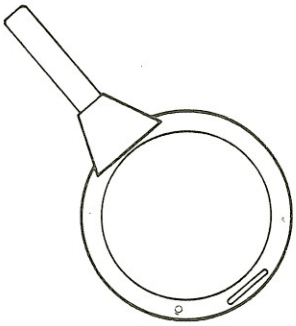
SET OF TOOLS

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. Notifications in this respect is not made where right-hand thread is concernd.

TOOLS FOR BOWL

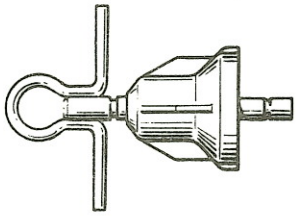


Spanner for small lock ring
-- 69006

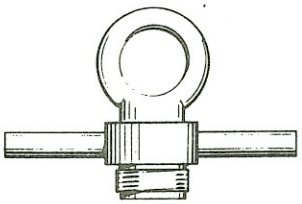


Spanner for large lock ring
-- 71889

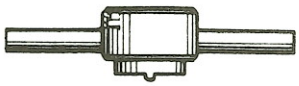
Tin mallet
-- 64324



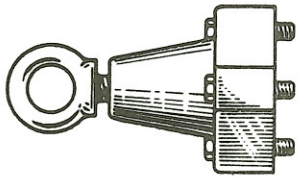
Lifting tool for bowl hood
-- 72155



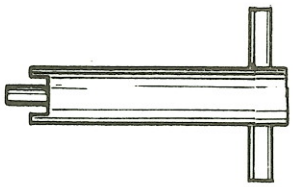
Lifting tool for distributor
-- 68988
(not for machine with lifting device)



Lifting tool for distributing cone.
Spanner for control paring disc
== 71893



Lifting tool for bowl body
-- 68991



Pin spanner for valve seat
-- 69008
(not for bowl for combined pro gramme)

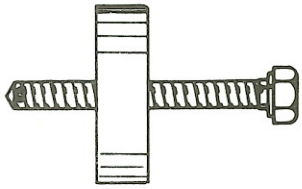
Only for bowl for partial discharge:

Lifting tool (2) for level ring
-- 516866-80

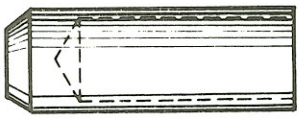
Only for bowl for combined pro-gramme:

Pin spanner for valve seat and holder for valve plug
-- 519370-80

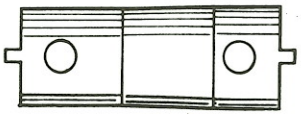
TOOLS for COUPLING and WORM WHEEL SHAFT



Puller for nave
-- 523249-80



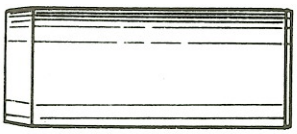
Driving-on sleeve for ball bearing
-- 65374



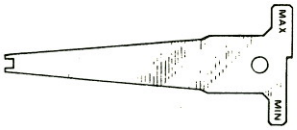
Pin spanner for round nuts
-- 72719

Lifting tool for bottom bearing
-- 37682

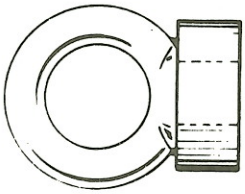
TOOLS for BOWL SPINDLE



Driving-out sleeve for ball bearing of the top bearing)
-- 65379

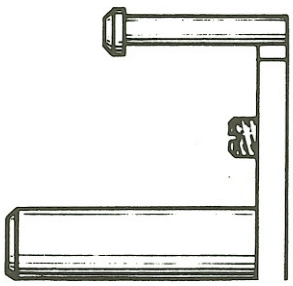


Templet for height adjustment
-- 71942



Lifting tool for bowl spindle
-- 68996

GENERAL TOOLS



Lining-up tool for motor
-- 65382
(Not included when motor has been lined up before delivery)

The set of spares listed below includes only parts belonging to the standard equipment of the machine. Spare parts for special equipment are found together with the description of the latter in chapter X. In both cases make it a rule always to keep consuming articles in stock. Avoid incorrect dispatch observe the ordering routine described in chapter A.

The figure in bracket indicates the quantity (if more than one).

INLET. OUTLET (comp. chapter I)

	Seal rings
67675	(3) for collecting covers
14238	(4) for hinge sleeve
67650	for connection piece

BOWL (comp. chapter I)

68657	Spring (5) for operating slide
-	Bowl disc -- see relevant bowl
528077-80	Winged bowl disc
	Seal rings
67587	for bowl hood
71440	for bowl hood
67566	(3) for operating slide
65594	(2) for bowl hood
65201	(2) for sliding bowl bottom

Additional parts depending on bowl type

Bowl for total discharge

71433*	Nozzle
68899	Valve plug (3)
67575	Seal ring(2) for sliding bowl bottom
68656	Valve seat (3)
69310	Seal ring (3) for valve seat

* for rapid total discharge -- 515133-1

Bowl for partial discharge

515133-1	Nozzle
68899	Valve plug (3)
67587	Seal ring (2) for level ring
67575	Seal ring (2) for sliding bowl bottom
68656	Valve seat (3)
69310	Seal ring (3) for valve seat

Bowl for combined programme

515133-3	Nozzle
518549-2	Valve plug (3)
536562-01	Valve seat (3)
223406-11	Seal ring (3) for valve seat
411823-3	Seal ring (2) for sliding bowl bottom

For bowls with erosion-protected sliding bowl bottom

520558-1	Liner for sliding bowl bottom
65133	Seal ring (2) for liner

CLUTCH COUPLING. WORM WHEEL SHAFT (comp. chapter P)

71627	Friction pad (3) incl. 9 screws No. 8341
223412-21	Seal ring for seal washer
73547	Lip-seal ring

BOWL SPINDLE (comp. chapter P)

65197	Spring (6) for top bearing
65190	Driver for worm
	Seal rings
65201	for throw-off collar
64104	for protecting cap

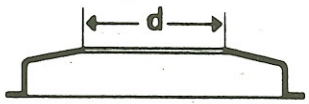
FRAME PARTS (comp. chapter S)

65227	Brake lining incl. 3 screws No. 8341
518859-82	Touch-up paint (tin 1/8 l)
	Seal rings
38259	for distributing ring(2), paring disc
64708	for paring disc
60739	for paring disc
67033	for raking door
	Packings
71320	for paring disc
71322	for paring disc

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.

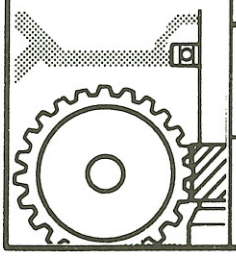
Gravity discs (comp. Chapter I)



The hole diameter expressed in mm is stamped on each disc

Hole diameter in mm	Part-number
95	75124
98	517242-8
102	74171
107	74174
116	74177
127	74180
140	75126

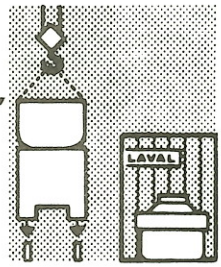
Power transmission (comp. Chapter P)



Speed of worm wheel shaft in r.p.m.	1420 - 1500	1700 - 1800
Worm wheel	528100-84	528100-85
Friction block (3) with pad and screws	71623	69892

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

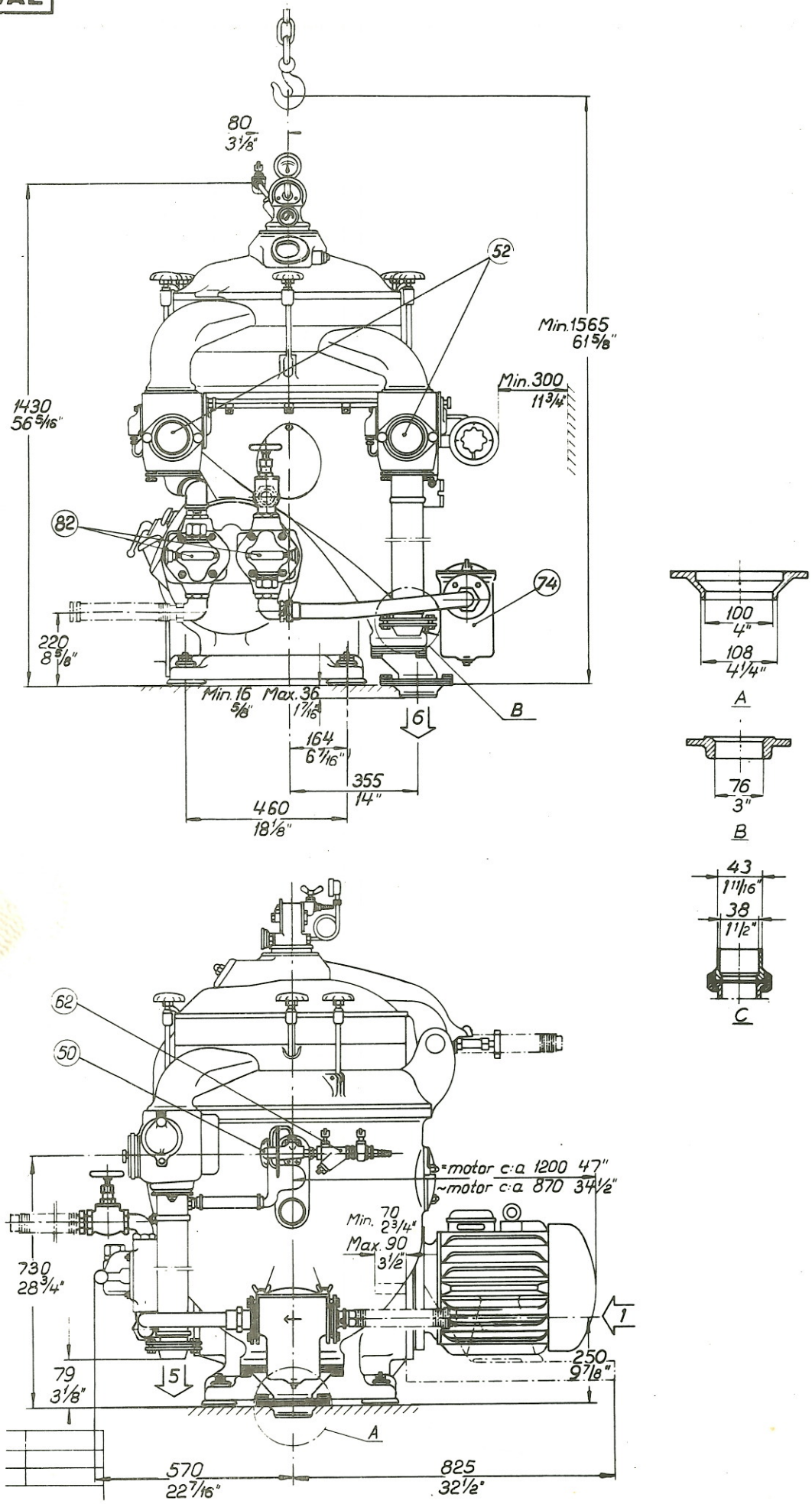
70 Protective gas
71 Electric connection
72 Cream
73 Thermometer
74 Strainer
75 Steam preheater
76 Operating water tank
77 Sludge tank
78 Sludge pump
79 Softening filter

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

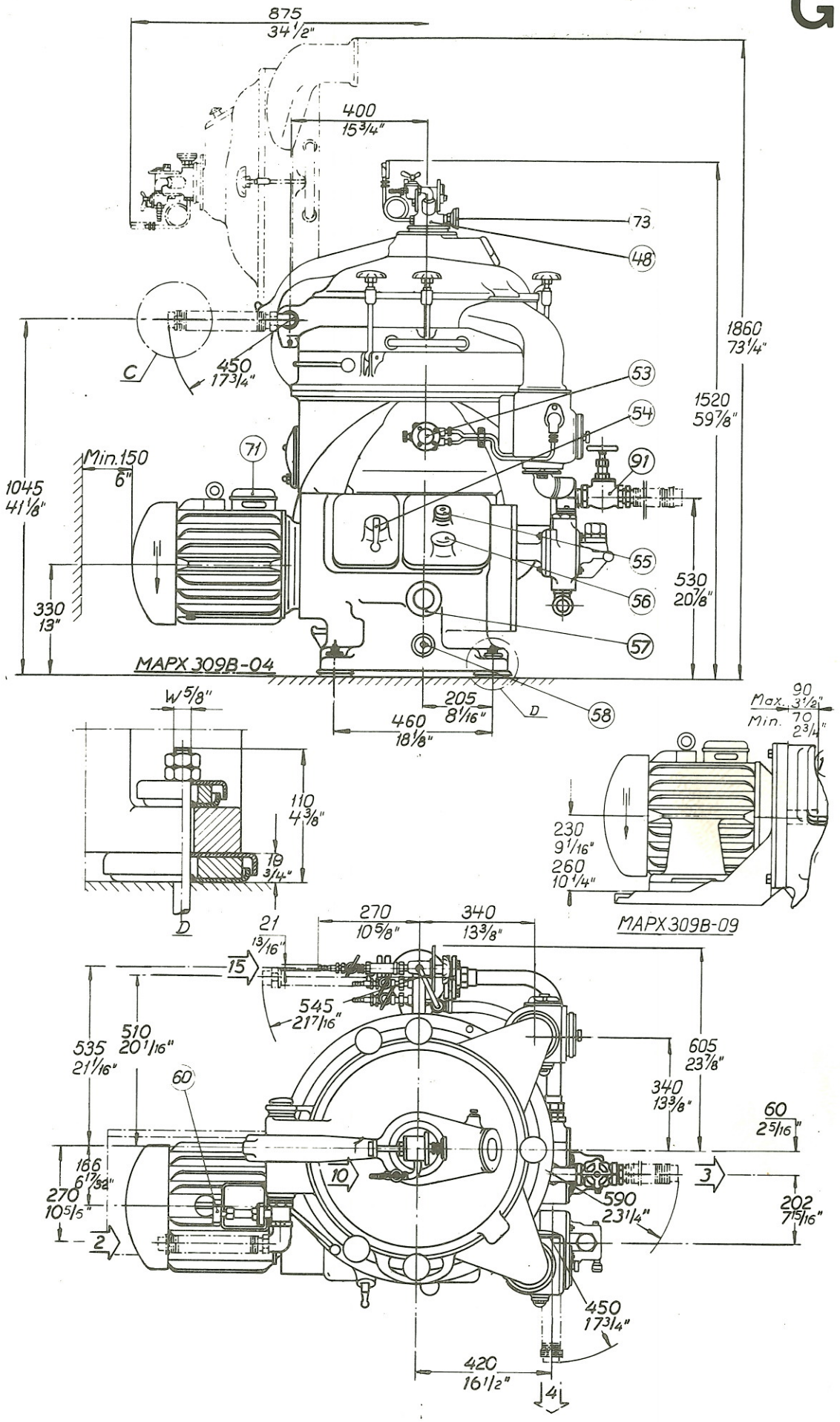
100 Cooling liquid
101 Compressed air
102 Vibration switch
103 Oil level switch
104 Protective gas
105 Protective gas

ALFA-LAVAL



531812 v.-sid. (4094-14)

G



531812 h.-sid. (4094-14)

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.

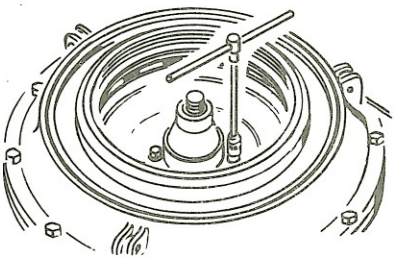
BOWL. INLET. OUTLET

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.

ACCESSORIES

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 at least 500 lit. (110 Imp. galls). The pipe must extend vertically from the sludge outlet of the machine.

ALFA-LAVAL
THE ALFA-LAVAL DE LAVAL GROUP
STOCKHOLM-TUMBA SWEDEN

DE LAVAL SEPARATOR TYPE MAPX 309 B-20

FLOW CHART FOR INSTALLATION SEPARATE FEED PUMP

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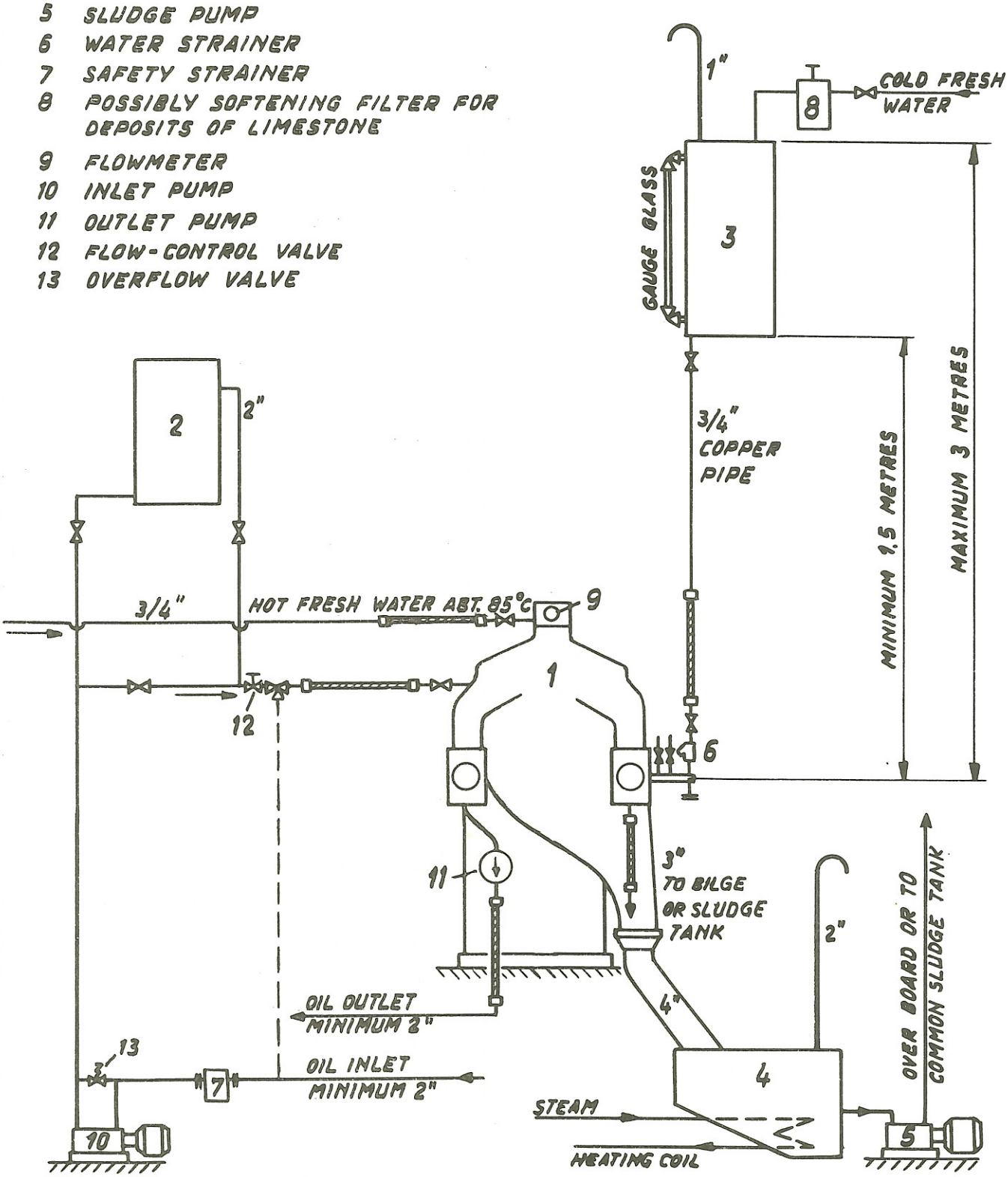
Ant. bl. No. of sheets	Blad nr Sheet No.
	Utgåva Edition
Reg.	

1 DE LAVAL SEPARATOR MAPX 309 B-20
2 HEATER
3 OPERATING (MANOEUVRING) WATER TANK
4 SLUDGE TANK
5 SLUDGE PUMP
6 WATER STRAINER
7 SAFETY STRAINER
8 POSSIBLY SOFTENING FILTER FOR DEPOSITS OF LIMESTONE
9 FLOWMETER
10 INLET PUMP
11 OUTLET PUMP
12 FLOW-CONTROL VALVE
13 OVERFLOW VALVE



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FLOW CHART FOR INSTALLATION

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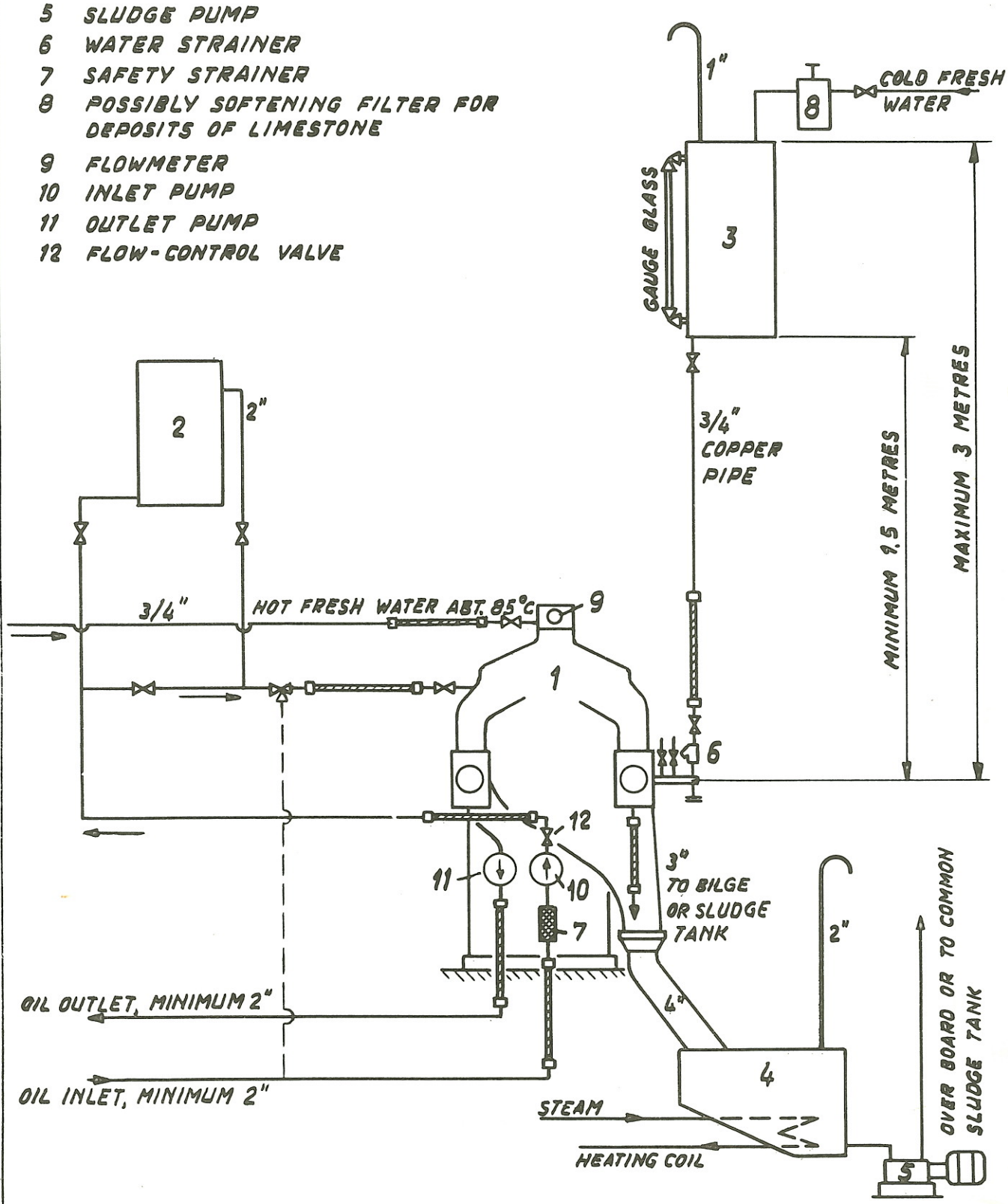

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