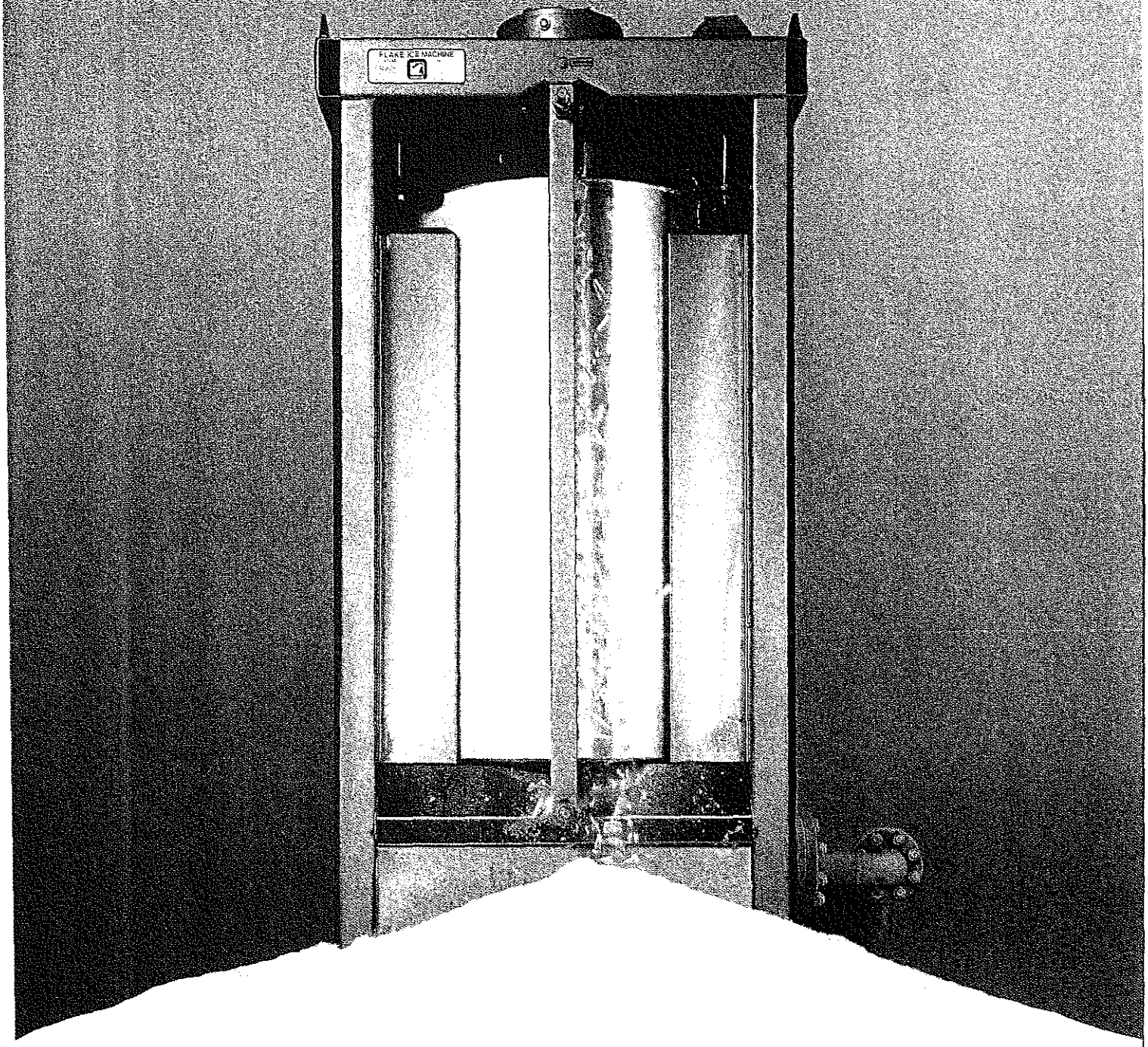
CSJ.

SABROE

Instruction



Vertical flake ice machines

Type V156. V316. V619. VD746 and VD1206

MN III

CSJ

INSTRUCTION

for

SABROE VERTICAL FLAKE ICE MACHINES

Type ATLAS V-156, V316, V619, VD-746 & VD-1206

TABLE OF CONTENTS

DRAWINGS

W A R N I N G

We draw attention to the fact that cleaning and flushing with steam or hot water of compressors, condensers, tanks, cooling units and other parts of a refrigeration plant filled with refrigerant may cause a violent explosion, for which reason it is highly dangerous.

Moreover, tanks and cooling coils which may be filled with refrigerant in liquid form, must never be completely closed before making sure that the units in question are not completely filled up with the liquid.

The drums of the ice machines connected to pump plants might inadvertently be completely filled with refrigerant. At rise of temperature, the generated pressure can burst the drum. Consequently, these ice machines should always be provided with a relieve valve.

In order to give the drum surface the best corrosion resistance possible it is coated with a thin metal layer. This layer is resistant to the ice scraping, but cannot stand sporadic mechanical stress from hard objects. Consequently, it is important to check that the knife does not touch the drum at ambient temperature, just as blows etc. on the drum surface must be avoided.

FLAKE ICE MACHINE TYPE V AND VD

Description

Where no other indications are made, the item numbers in brackets refer to the "sectional drawings" at the back of the book.

Machine type V has a horizontal, slowly rotating freezing drum, the rotation direction of which must always be counter clockwise when seen from the top. On machine type VD, which has 2 freezing drums, the left drum rotates clockwise and the right drum counter-clockwise. The drum is cooled internally by the evaporating refrigerant, while the outer surface is sprinkled with water from a distributing pipe (2.1). On the cold surface of the drum, part of the water is frozen to ice, and the surplus water runs down to a water reservoir (2.4). A water pump (2.11) draws the water from the reservoir and forces it to the distributing pipe (2.1).

Ice machines type VD with two drums are supplied with one water pump for each drum.

In order to obtain a dry, sub-cooled ice, water is not sprinkled on the last part of the surface of the drum direct in front of the knives (5.2).

The water level in the water reservoir is kept constant by the supply of water through a float valve (2.10). The water is led through a pipe to the nozzle (2.2), from where it is sprayed on the underside of the drum, ensuring that the underside of the drum is kept free of ice.

The ice layer on the surface of the drum is removed by means of a row of knives, which are fastened to a vertical knife holder (5.2) on the front edge of the frame. The ice slips off the drum in front outside the baffles and leaves the machine.

The drum is driven by an electric motor (6.12) with a V-belt variator (6.1) and a double worm gear (6.2 and 6.3), which transmits the power to the drum by a coupling (1.1). The number of revolutions is stepless variable during operation with the V-belt variator. (Thickest ice is produced at lowest speed.)

At the top, the freezing drum is guided by a spherical ball bearing (1.6), and below the axial thrust is absorbed by a groove ball bearing (4.2), which is lubricated with oil from the oil cup (4.39).

The sealing between the stationary and the rotating part is effected by special sealing rings (4.1) which are placed in the suction junction (4).

The flake ice machine is constructed to be used for ammonia (R717), R12, R22, and R502. (For possible later change in type of refrigerant, please consult SABROE.)

Control of the supply of refrigerant by level control is carried out automatically by means of a level control (3.1) with external pressure equalizing pipe (3.4) to the suction junction (4). The level control directs the solenoid valve (3.11) in the liquid line. The solenoid valve is equipped with a filter (3.12). In the flange connection (4.5) after the solenoid valve, a nozzle (3.8) is inserted, where the expansion of the refrigerant takes place.

The phial of the level control is placed in a phial housing (4.37). The phial (3.3) is equipped with a built-in electric heating element of 10 watts. The heating element is supplied with current from a transformer (3.2) with an output voltage of 24 V.

Above the phial housing (4.37) is placed an overflow pipe which leads the refrigerant to the phial, when the drum has obtained the correct charge. (See diagram of refrigeration control on page 5 and drawing "Suction junction".)

Control of the refrigerant supply by pump circulation is to be carried out by means of a hand regulated valve (3.14) in the liquid line.

FLAKE ICE MACHINES FOR SEAWATER

When producing ice of seawater, an ice knife (5.2), specially made for seawater, is fitted. The knife is suitable for salt concentrations down to 0.3 per cent.

As seawater is highly corrosive, attention should be paid to the paragraph dealing with corrosion protection on page 20. Moreover, at standstills exceeding 24 hours, the drum must be washed thoroughly with freshwater after the drum has been thawed-off. The thawing-off can be effected at the quickest by allowing pump and drum to run after having stopped the compressor.

FLAKE ICE MACHINES FOR OFF-SHORE INSTALLATIONS

(MARINE APPLICATIONS)

The float valve (2.10) is removed. Instead the water supply is controlled by a valve in the line for the inlet water.

From the water reservoir (2.4) an overflow pipe on branch "L" (2.6) must be installed, which partly ensure a constant water level, partly drains off a constant flow from the water reservoir.

The water supply to the machine is adjusted in such a way that the overflow will not exceed 0.2 litres/min., when the machine is operating.

PRODUCTION OF ICE ON FLAKE ICE MACHINE

Ice Made from Freshwater

When producing ice, the composition of the water will have a fairly large influence on the character of the ice. Consequently, ice produced from soft water (rain water) will be partly clear and stick heavily to the drum, for which reason it will be necessary to add a small amount of salt to the freezing water in order to make it possible for the ice to slip off the drum easily.

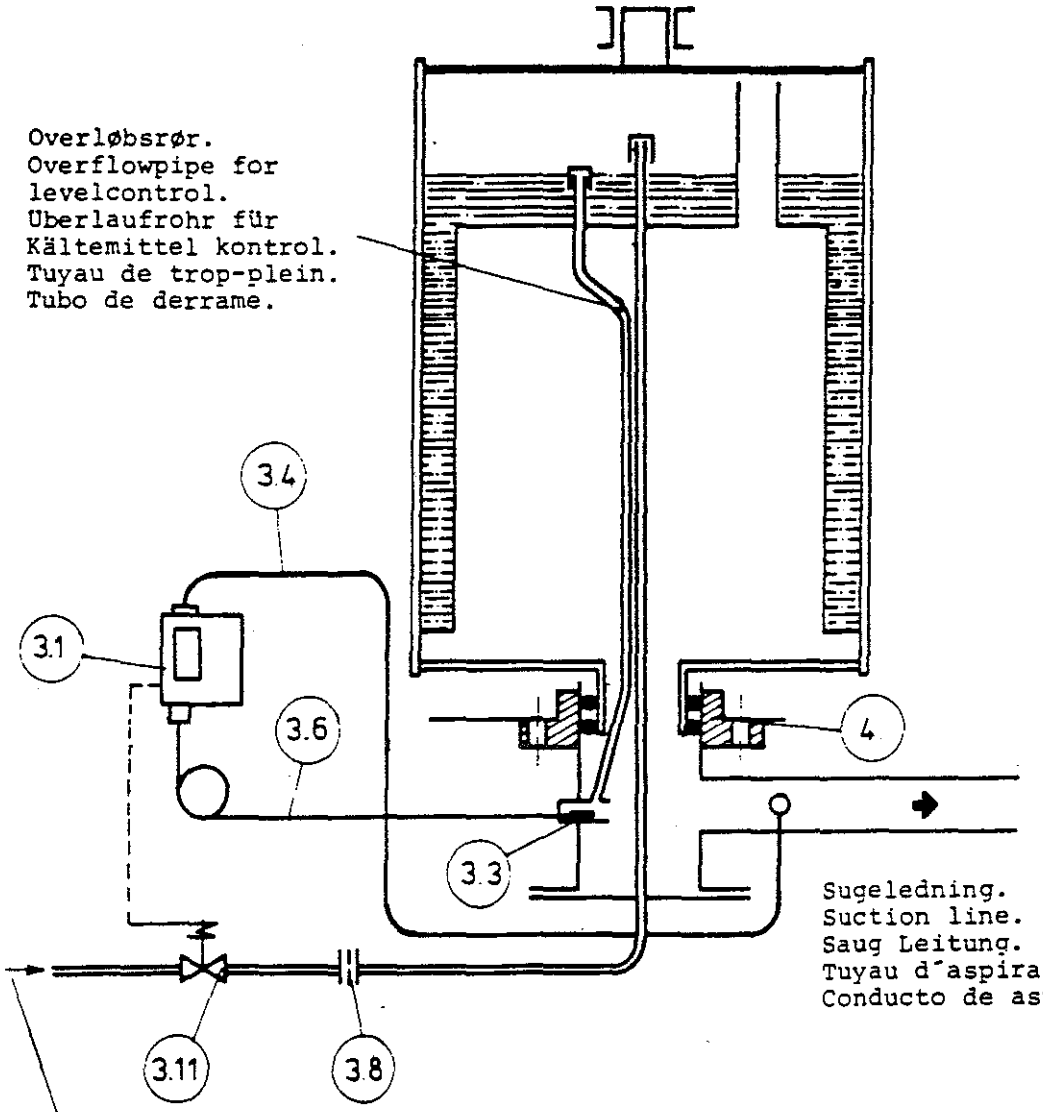
Very hard water (a high calcium content) will result in calcareous deposits on the drum, and this will make the ice stick to the drum, and consequently the knives will crush a great part of the ice. It is our experience that, when a small quantity of salt is added to the freezing water, the calcareous deposit will diminish and at the same time, the ice will get tougher, will not stick to the drum, and will fall off in big pieces.

In certain cases, it will thus be advantageous to use the salt dosing device which is included in our delivery as additional equipment free of charge, and which is described in the instruction "Salt Dosing Device" page 32. If there is easy access to seawater this may be added direct to the water reservoir.

The quantities of salt required are so insignificant that it cannot be tasted in the ice, and it has no influence on the application of the ice for foodstuffs.

Ice Made from Seawater

When producing ice from seawater, knives of a different type are used, as this ice is soft and tough.



	Princip tegning af kølemiddelregulering. Simplyfied diagram of refrigerant control. Prinzipzeichnung der Kältemittelreglung. Plan de principe de reglage du fluide frigorigene. Dibujo elemental de regulacion del agente frigorifico.	SABROE
12/2-87 mel		237694

INSTALLATION DATA

The position indications refer to the enclosed installation drawings and dimension sketches, pages 10-14

	Type		V-156	V-316	V-619	VD-746	VD-1206
	Capacity	tons/24 h	3-8	6-16	12-30	15-38	24-60
	Motor kW	Drum Pump	0,75 0,37	0,75 0,37	0,75 0,37	2x0,75 2x0,37	2x0,75 2x0,37
	Refrigerant charge kg	R717 R12 R22 R502	45 95 85 90	90 195 180 185	150 330 305 315	2x105 2x230 2x210 2x220	2x150 2x330 2x305 2x315
	Approx. net weight kg		1100	1360	1900	3350	4400
A	Liquid line connection with flanges for welding		1"	1"	1"	2x1"	2x1"
B	Suction line connection		4"	4"	4"	2x4"	2x4"
			Delivered with counter-flange with sealing cap protection during shipment. Cap to be cut off before connection				
C	Water connection with ext. pipe thread		1"	1"	1"	1"	1"
L	Branch for draining off surplus water, with ext. pipe thread (to be used only for marine-version machines)		1½"	1½"	1½"	1½"	1½"
M	Branch for drain from bottom tray with int. pipe thread		½"	½"	½"	½"	½"
N	Branch for drain from water tank		3/4"	3/4"	3/4"	3/4"	3/4"
			Pipe branch with rubber plug				
	Salt dosing		Salt dosing pump delivered separately (see description page 32).				

2.10 Water supply control:

Stationary machines:	Float valve
Marine machines:	Throttle valve - not included in the delivery.
Necessary pressure of make-up water:	1.0 kg/cm2.
Necessary minimum temperature of make-up water:	+10°C

4.40 Valve for draining of oil from the drum, branch with 7/8" ext. pipe thread.

2.11 Water pump. The pump is built in, and pipe connections are executed from factory.

4.38 Oil cup for bottom bearing.

4.5 External flange connection:

For level control:	Built-in expansion nozzle
For pump circulation:	The supplied throttle valve is to be installed

3.1 Level control.

3.2 Transformer for heating of phial.

Not included in the delivery are:

1 Liquid line with stop valve. To be sized for actual refrigeration requirement and refrigerant applied.

2 Suction line with stop valve. To be sized for actual refrigeration equipment and refrigerant applied.

3 Water piping for make-up water and, in case of non-stationary working, throttle valve for regulation of the amount of make-up water.

4 Possible screen in front of the machine to conduct the ice down into the outlet hole - see note No. XI, page 10.

7 Piping for drain from bottom of drip tray.

8 Drain pipe with visible overflow for control of surplus water, for marine versions.

9 Equipment for salt dosing pump, such as mixing tank and float valve. See page 32.

10 Floor drain.

11 Liquid separator with heat exchanger. Necessary for use in installations on board ships. For land installations, the separator is not necessary, but combined with an alarm for too high liquid level, it is an extra precaution for the whole plant.

If more than four drums are working at the same suction line, such a separator is recommended.

For the refrigerants R12, R22, or R502, a heat exchanger, for instance a double pipe heat exchanger, in the suction line is recommended.

13 Flange assembly on the suction line close to the machine - max. 1 metre (3 ft) for dismantling, facilitating access.

3.11 Solenoid valve for refrigerant. The installation must be in accordance with the supplier's instructions. The max. distance, between branch A and the solenoid valve, must not exceed 2 metres (6 ft). The solenoid valve may be ordered from SABROE as additional equipment.

WHEN PROJECTING AND INSTALLING THE FLAKE ICE MACHINES NOTE THE FOLLOWING:

I If space permits, the flake ice machine ought to be placed on a foundation with a height of approx. 150 mm. This is to ensure a good outlet from the bottom tray and drip tray M and of the surplus water L to the floor drain. If space does not permit this height, it can be reduced. The machine may be placed direct on the floor.

III Normally, as shown on the sketch, branches and connections are placed on the right-hand side of the flake ice machines type V.

On request, the following branches can be delivered placed on the left-hand side of the flake ice machines types V-156, V-316, and V-619:

A Liquid pipe branch

B Suction pipe branch

Note M The branch for drain from the bottom tray is placed on both sides as standard.

IV The machines must be placed in a room free of frost.

V All piping - especially the suction line - should be supported so that the machine will not be exposed to stress by tension in, or by the weight of, the piping.

VI NOTE:

If the suction line is not executed with an downward inclination after having left the flake ice machine, it must be furnished with a liquid lock as illustrated, irrespective of whether R717, R12, R22, or R502 are used as refrigerant.

VIa A suction line with a smaller diameter than that of the branch on the flake ice machine should be connected to the bottom of the cross-sectional area of the connecting branch.

VII The piping lay-out, as shown in the drawing, serves exclusively as an illustration. The piping should be made in accordance with the regular procedure used for pipe work of industrial refrigeration plants.

VIII The space required for inspection and maintenance indicated in the dimension sketches is normal practice.

IX Precautions must be taken to prevent the floor drain from freezing up, if the flake ice machine is placed on top of the ice silo.

XI Recommendations for the design of screens, see sketch page 15:

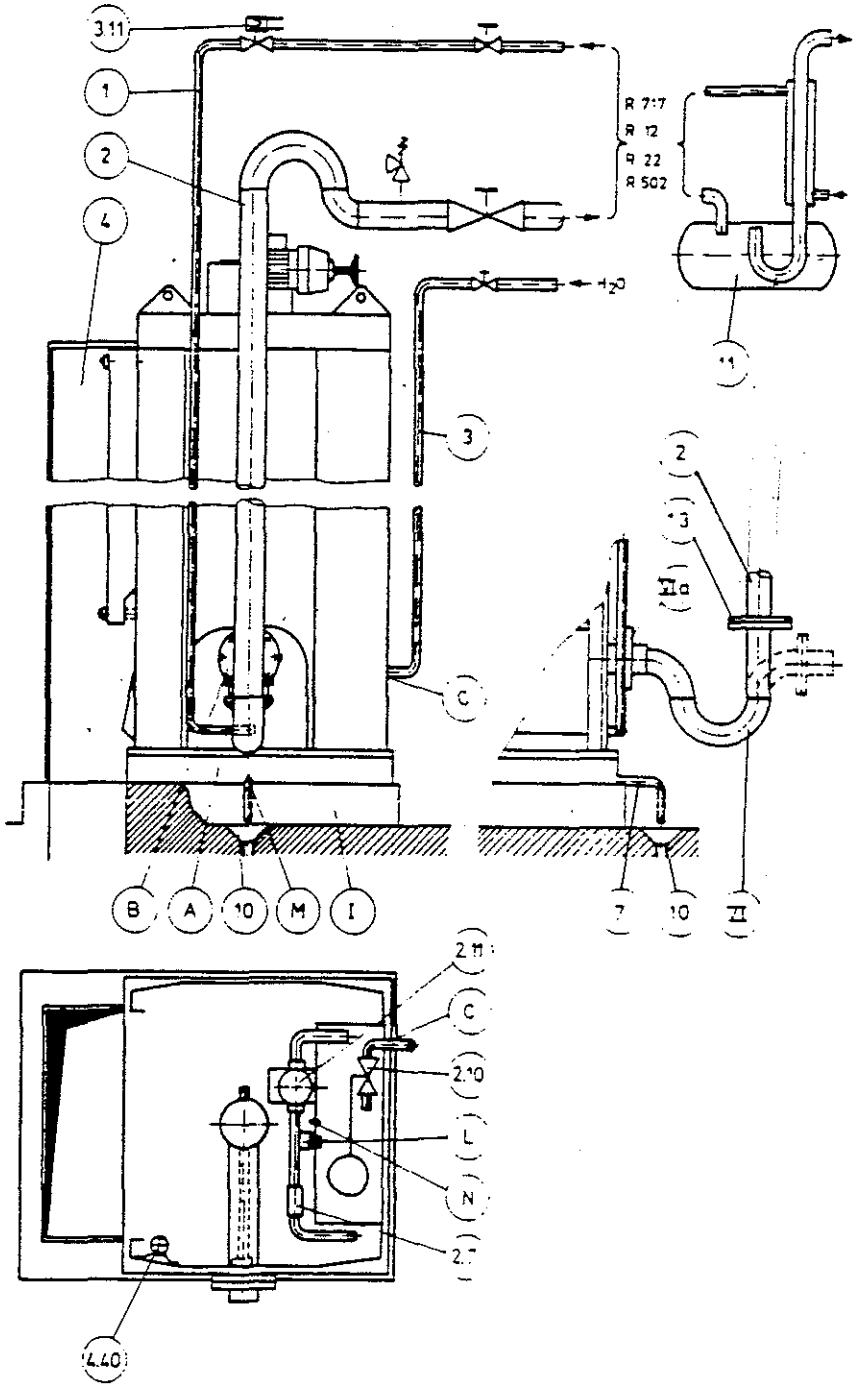
b) If the ice machine is placed above a cooled ice silo, the screen should be closed and have the same height as the entire machine. In other cases an open hopper with a height of approx. half of that of the ice machine would be preferable.

c) If the screen is made in sections, the joint between each section must be designed in such a way that ice accumulation is avoided.

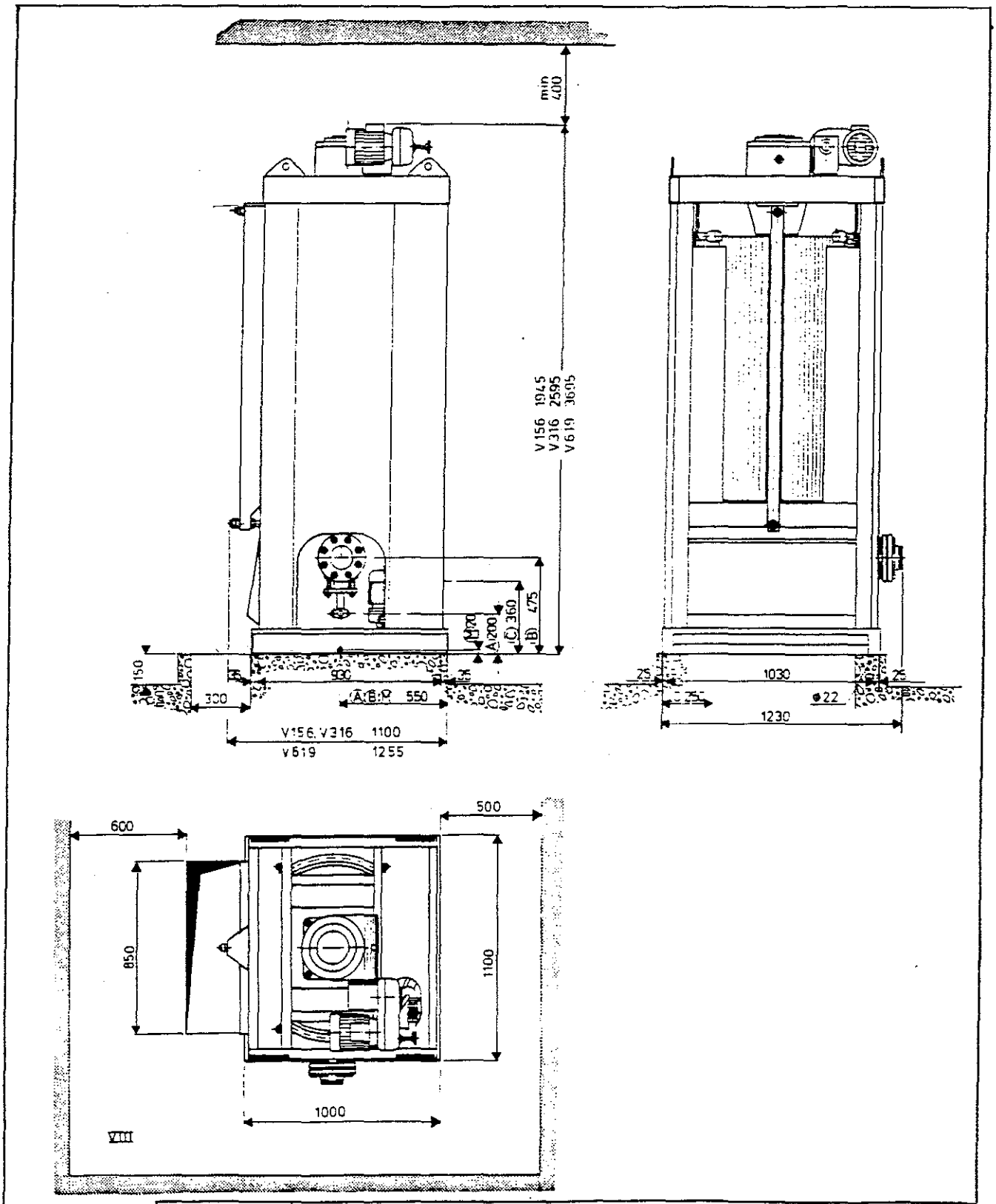
d) The screen should be equipped with an inspection hatch.

f) The ice outlet must be insulated on all sides. The insulation is covered with a waterproof plate ending below the ceiling in the silo room.

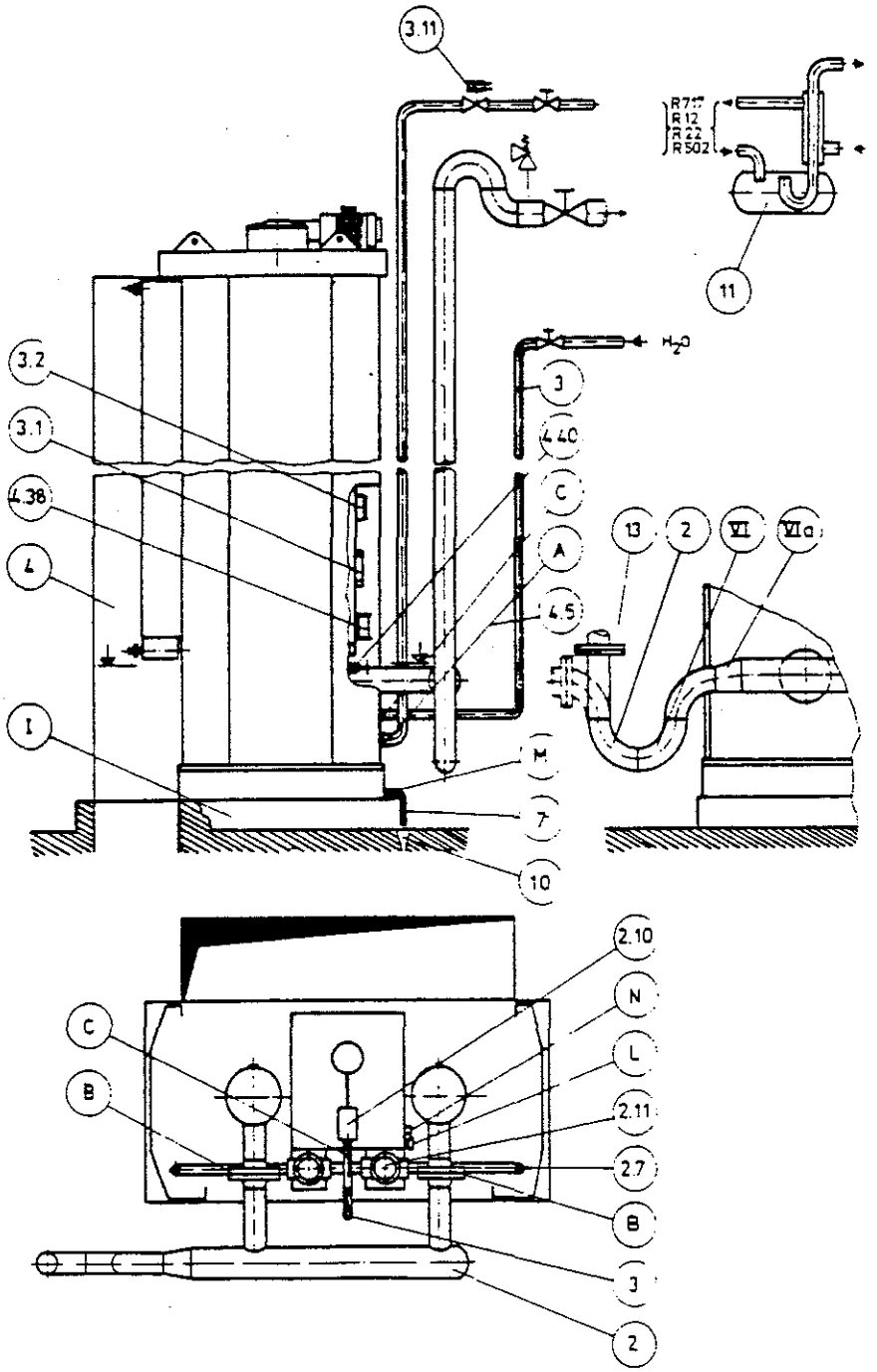
g) In case of condensate on the screen, this may be insulated.



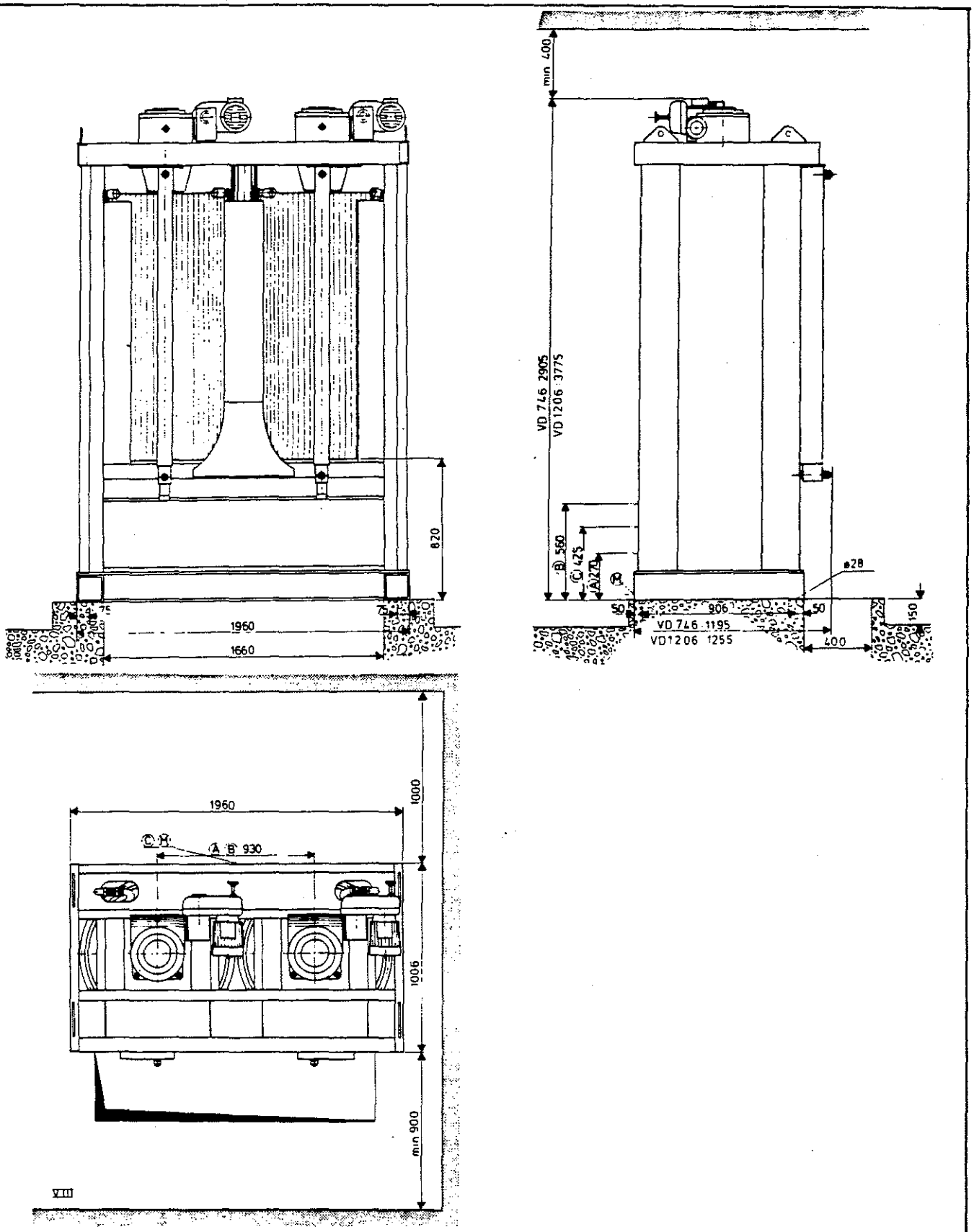
11/2-87 mel	Installationsskitse Installation sketch Installationsskizze V156 V316 V619 Croquis d´installation Diseño de instalación	SABROE 237691



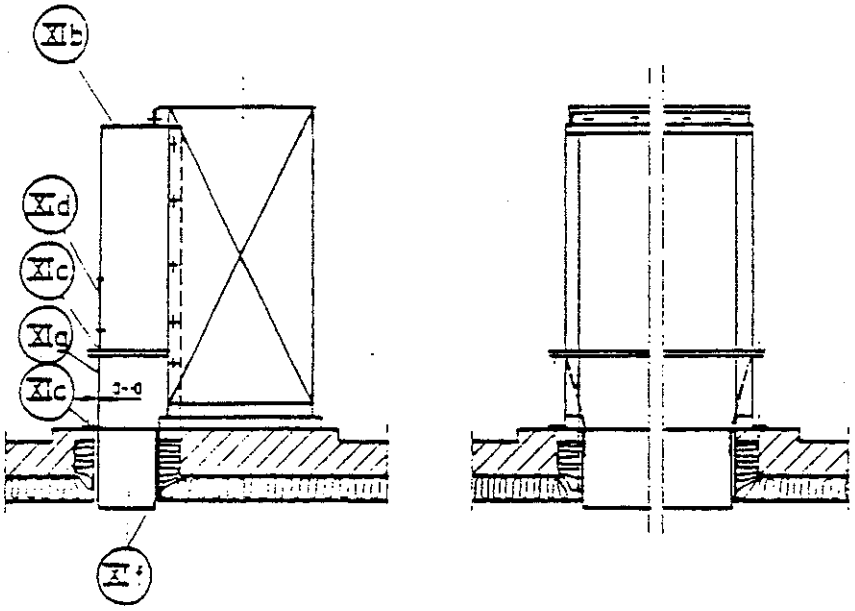
11/2-87 mel	Dimensions skitse Dimension sketch Mass Skizze Sketch de dimensions Diseño de acotacion	V156 V316 V619	SABROE 237692

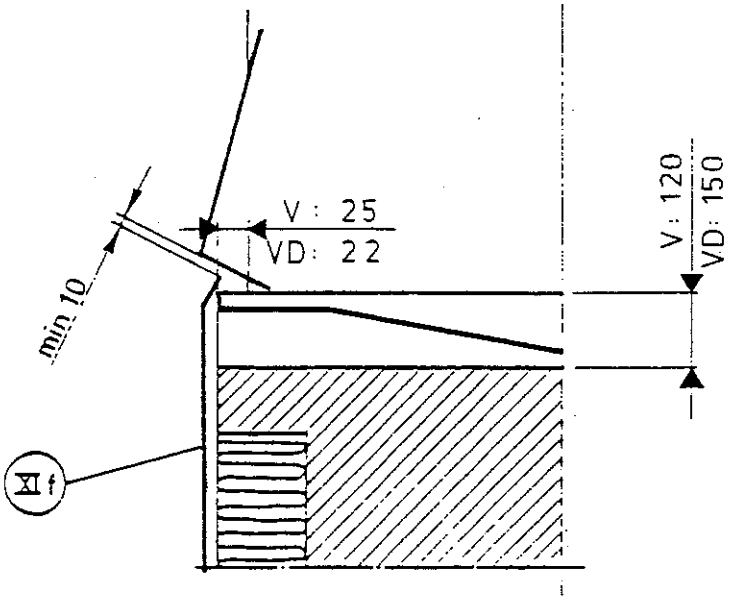


11/2-87 mel	Installationsskitse Installation sketch Installationsskizze Croquis d´installation Diseño de instalación VD746 VD1206	SABROE 237690



12/2-87 mel	Dimensions skitse Dimension sketch Mass Skizze Sketch de dimensions Diseño de acotacion VD746 VD1206	SABROE 237693





12/2-87mel	Udformning af skærm. Design of screen. Ausfertigung der Shirme. V & VD Dessin d´écran. Construccion de la pantalla.	SABROE 237695

ELECTRICAL KEY DIAGRAM

The diagram on page 18 shows a proposal for operation of flake ice machine type V-156, V-316 or V-619. For flake ice machines type VD-746 and VD-1206 having two drums, two level controls, and two water pumps, the control for each drum is made as shown in the diagram. Note: All machines are equipped with one salt dosing pump A16 only.

For flake ice machines with pump circulation of the refrigerant the circuits 8, 9, and 10 are left out.

In an exisisting plant the diagram can be extended, but it should be ensured that water pump and refrigerant supply is interrupted in position "automatic operation", if the drum motor stops.

If the ice machine delivers ice to a silo, it might be advantageous to delay the cutting-in of the water pump, in order to avoid getting wet ice in the silo. In these cases, a timing relay or a suction-pressure pressostate is inserted in the control circuit of the pump for automatic operation.

The diagram has been drawn in accordance with the IEC-norms and the following circuits will be described more detailed:

3 Control circuit for drum motor.
With the change-over switch S3 in position 2 "Man" the drum is running constantly. In position 1 "Auto" the ice machine is started and stopped by an external control signal °1). The signal may for instance come from a level sensor in the ice silo or from the cooling compressor.

5 H4 red lamp: "Overload drum motor"

6 H6 white lamp: "Running"

8 T8 transformer 220-240 V/24 V placed on the ice machine

9 E9 heating element in the sensor of the level control, 10 W - 24 V.

10 S10 level control placed on the ice machine.

Y10 solenoid valve for control of refrigerant supply to the ice machine.

12 Control circuit for water circulation pump.

14 H14 red lamp: "Overload water pump"

15 H15 white lamp: "Running".

16 A16 salt dosing pump. 1 phase 200-270 V, 50-60 Hz, 35 W. Placed at the ice machine. (The pump is left out if the ice machines are to make ice from seawater.)

Data for electric motors

The electric motors are three-phased squirrel-cage motors in totally enclosed execution.

Freezing drum 50 Hz

IEC-type:	MT80B
Protection class:	IP54
Number of revolutions:	1,400 r.p.m.
Power:	0.75 kW
Voltage:	380-420 V/220-240 V
Rated current:	2.1 A/3.6 A

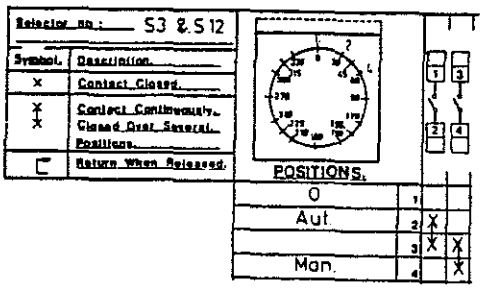
Water pump 50 Hz

Protection class:	IP44
Number of revolutions:	2,900 r.p.m.
Power:	0.37 kW
Voltage:	380 V/220 V
Rated current:	1.05 A/1.8 A

Note:

The ice machines type VD-746 and VD-1206 with two drums also have two drum motors and two water pump motors.

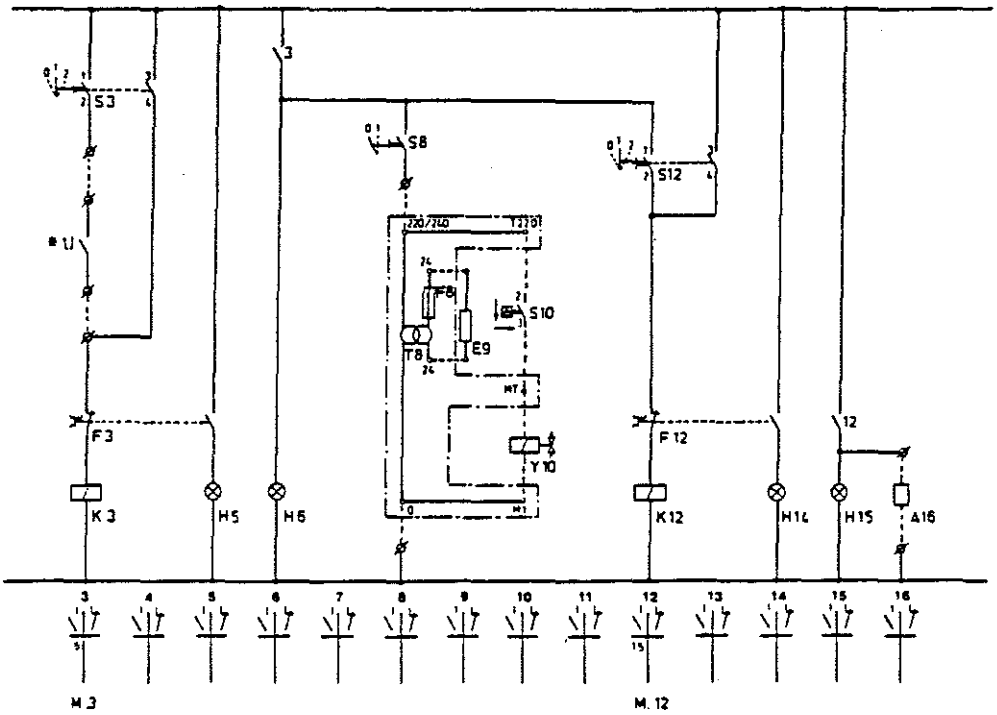
Omskifterfumktion
Switch operation
Umschalterfunktion
Fonction de commutateur
Funcionamiento conmutador



Tromlemotor
Drum motor
Trommel Motor
Moteur de tambour
Motor del tambor

Kølemiddelregulering
Regulation of refrigerant
Kältemittelreglung
Regulation de fluide frigorigene
Regulación del agente frigorífico

Vandpumpe
Waterpump
Wasserpumpe
Pompe à eau
Bomba de aqua



23/2-87 mel	El-diagram for ismaskiner El-diagram for flake ice machines Elektricher Schaltplan für Eismachinen Diagramme electrique pour machines a glace Diagramma electrico pafa maquinas de hielo	SABROE 237696

ERECTION AND START-UP

ERECTION

The flake ice machine is erected, and the pipe connections are made in accordance with the instructions given under "Installation Data" page 7-10.

NOTE The ice chute (7.4) made of stainless steel, guiding the ice from the machine, has a flanged edge below leading possible water drops to the bottom tray of the machine. Therefore, the chute must not be turned outwards when the machine is running, but must be kept in the position in which it was delivered.

It should be ensured that the pipe connections are adequately supported so that the machine will not be exposed to inadmissible stress.

During building activities the machine should be covered to avoid impurities in the water system.

Further, the following parts have to be mounted in machines with level control:

- Mount the expansion nozzle (3.8) into the external flange connection (3.10). By means of the table below please check that the machine is delivered with the correct nozzle. The number stated indicates the nozzle diameter in 1/10 mm.

Ice Machine Type	Nozzle No. for Refrigerant			
	R12	R22	R502	R717
V-156	45	35	40	17
V-316	63	49	58	24
V-619	87	68	79	35
VD-746	68	54	63	27
VD-1206	87	68	79	35

NOTE The nozzle is dimensioned for a liquid pressure corresponding to a condensing temperature of 25°C and -25°C suction. If the temperature differs very much from this, which for instance may occur in two-step expansion plants - the nozzle must be changed. Please contact SABROE.

- The electric cable from the solenoid valve (3.11) is connected to the terminal row in the transformer box (3.2) as shown in the drawing "Wiring Diagram for Regulation of Refrigerant".

- An electric cable is connected from the level control (3.1) to the terminal row in the transformer box (3.2). See drawing "Wiring Diagram for Regulation of Refrigerant".

  At the same time check that the level control is adjusted to the correct refrigerant.

Control

Check that gear and lower drum bearing have the correct oil charge:

Fill up the gear with oil until the oil is half visible in the oil level glass when the drum is stopped. Suitable oil types are mentioned on page 25.

The air-relief screw (4.41) of the lower drum bearing is unscrewed and the bearing is filled with oil through the oil cup (4.38) until the oil flows out of the hole at (4.41).

Let at least one cup of oil run out to make sure that all air has been relieved. Repeat the airing operation, if necessary.

For transport reasons, the vent holes in the oil cup and the gear box can be capped, for which reason it should be checked that there is free passage through the vent holes.

Water Pump

The direction of rotation of the pump is of no importance.

Before the initial start-up, the water pump (2.11) should be aired by means of the air screw (2.12) on the pump housing.

Operation Instructions

I The machine is started in the following working order

a) The pressure stop valve of the compressor is opened.

b) The suction stop valve of the compressor is carefully opened one or two turns.

c) All other stop valves, except the main stop valve in the liquid line, are opened.

d) The compressor is started as described in the compressor instruction book.

e) The suction stop valve is opened.

f) The main stop valve in the liquid line is opened.

g) By automatic level control the electric current to the transformer is switched on.

By pump circulation and manual control the liquid circulation pump is started.

h) The drum motor is started, when the drum has reached working temperature.

i) All stop valves in the water supply are opened.

j) The water pump and the salt dosing pump, (if any), are started.

II Adjustment

a) It is important that the ice is dry about 100 mm before the knives. This is indicated by the surface of the ice becoming opaque.

The water spraying on the drum is regulated by covering holes in the water distributing pipe as required.

If the ice does not leave when the drum is started, the water supply should be interrupted until the ice has been scraped off. This phenomenon can in most cases be avoided by adding a small handful of salt to the water in the water reservoir before start-up.

b) The water supply to the water distributing pipe (2.1) is regulated by means of a valve (2.8) in the water line between the pump and the distributing pipe. When the machine is run in, this valve is to be set once and for all in such a way that the water does not spray over the edge of the drum but is kept about 5 mm below the edge.

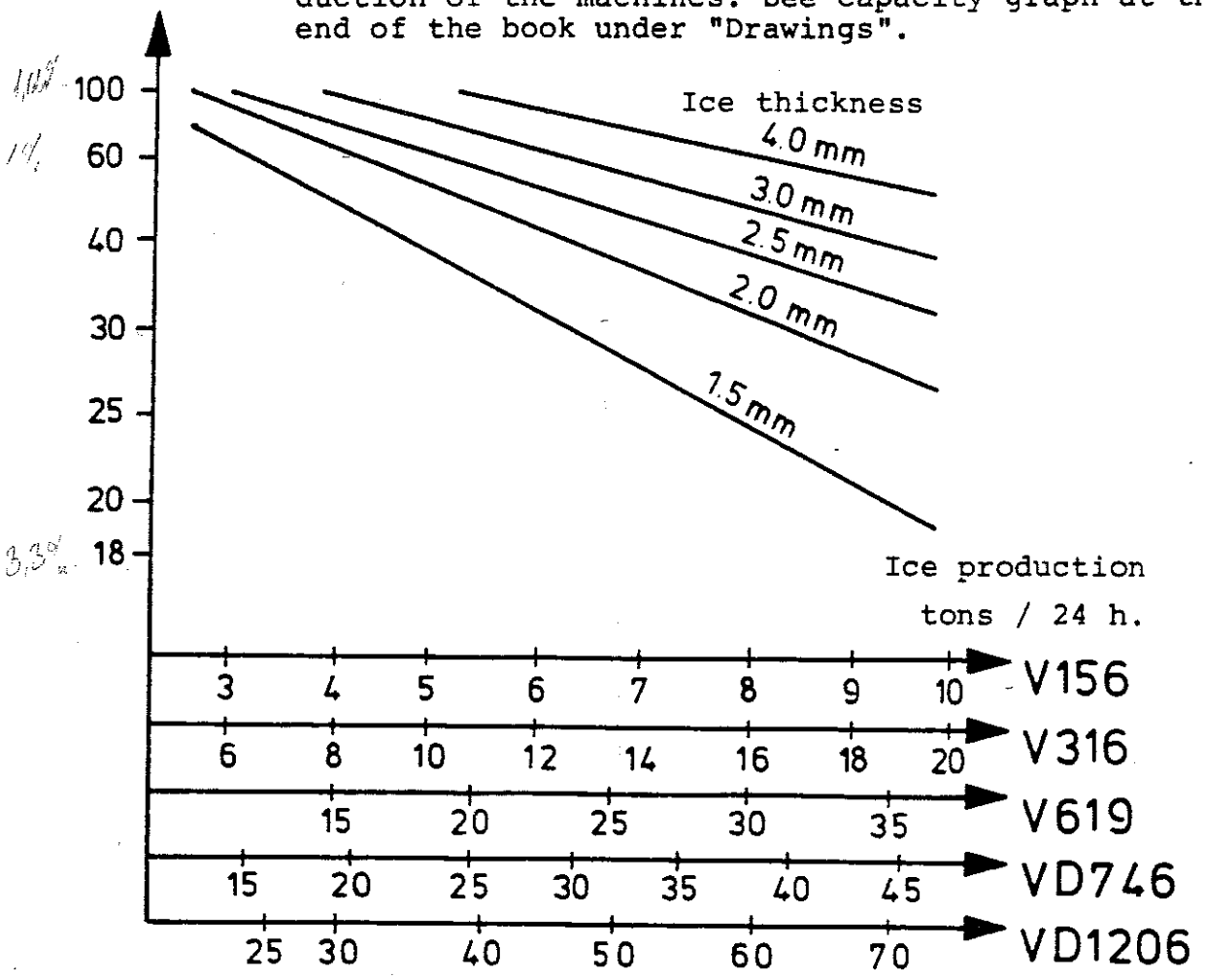
Note

The filter (2.7) between the water pump and the water distributing pipe, eliminating unnecessary blocking of the nozzles, must be cleaned frequently during the running-in period.

c) The drum speed is adjusted by means of the variable speed pulley until the ice has the desired thickness. (Low speed makes the thickest ice, but also a smaller ice production).

Note

It is the capacity of the refrigerating plant, i.e. the temperature of the freezing drum - for a given ice thickness - which decides the ice production of the machines. See capacity graph at the end of the book under "Drawings".



Adjustment of RT280 level control

See drawing "Refrigerant control" page 6.

1) If the refrigerant charge in the drum is too small (thin ice or no ice at all on the upper part of the drum), the liquid charge should be increased by adjusting the red indicator upwards on the RT280-scale. The indicator must only be moved in small stepes, for instance 1 mm, to avoid liquid overflow.

2) At too violent overflow from the ice machine, it can be reduced by adjusting the red indicator downwards on the RT280-scale.

3) At correct adjustment, the liquid injection is closed 1-3 minutes during each regulation period. After any change in the setting of the level control, conditions must be stabilized for instance for one hour, before making a new adjustment.

Adjustment of refrigerant for pump system

The supply of refrigerant is controlled by means of the regulating valve (3.14). On the VD-types, each drum has one regulating valve.

It is important that the regulating valve is not opened too much out of regard for the other evaporators in the system. Therefore, it is recommended to make the adjustment in the following way:

1) When all evaporators in the system are in operation, the regulating valve should be opened so much that closing by 1/2 - 1 turn will cause the flake ice machine to release the ice on the upper part of the drum after a while. After each adjustment the effect should be observed for about half an hour.

2) In case the flake ice machine does not produce ice all over the drum, even if the regulating valve is open, this is due to the fact that other evaporators receive too much liquid or that the circulation pump yields an insufficient amount of liquid.

3) If several flake ice machines receive liquid from the same pump, the regulating valves should be adjusted identically, so that a change of the adjustment takes place simultaneously on all machines.

Note

A liquid ratio of 3 to 5 as seen in many pump circulation systems does not improve the capacity and should be avoided. A ratio slightly above 1 is sufficient to give optimal ice capacity.

Flake ice machines for marine use:
Adjustment of make-up water supply

The supply of water to the machine is regulated so that the overflow reaches max. 0.2 l/min., when the machine is in operation.

III The machine is stopped by the following working order

a) The stop valve in the liquid line to the ice machine is closed.

b) The water pump is stopped (after 5-10 minutes on machines with level control operation).

c) The motor for the drum is stopped when all the ice has been removed from the surface.

d) The suction valve is closed.

e) The water supply is stopped.

MAINTENANCE INSTRUCTIONS FOR FLAKE ICE MACHINE

Lubrication of the gear

The gear (6.3) is lubricated with special gear oil, for instance one of the following types:

B.P.:	ENERGOL GR-XP 320
Castrol:	ALPHA-SP320
Chevron:	Non-leaded gear compound-320
Esso:	Spartan EP-320
Gulf:	EP-lubricant HD-320
Mobil:	Mobilgear-632
Shell:	Omala Oil-320
Texaco:	Meropa-320

The oil level should be controlled at least once a month. There should be so much oil in the gear that half of it is visible in the oil level glass, when the drum is stopped.

The first renewal of the oil should take place after approximately two months' operation, and then once a year at eight hours' operation. The oil is drained off when it still has operation temperature, and the gear is cleaned with rinsing oil, if necessary.

The filler plug (6.19) is equipped with a venthole. It must be checked regularly that this hole is not clogged up.

The upper bearing of the gear is lubricated with ball bearing grease through the lubricator nipple (6.20).

The inlet gear and the variable speed pulley have been greased for life.

Lubrication of bearings of the freezing drum

The upper ball bearing (1.6) has been filled with frostproof ball bearing grease at the factory and, therefore, it needs no further lubrication.

On the other hand, the groove ball bearing (4.2) under the drum must be lubricated with the same oil as used for lubrication of the refrigeration compressors, as the bearing is running at a very low temperature. The lubricating tube from the bearing is led to an oil cup (4.38) on the rear side of the frame.

Charging of oil must be carried out with great care as no oil must get into the water tray out of consideration for the purity of the ice.

At lease once a year it should be checked that there is connection between the oil cup and the bottom bearing. This is done by unscrewing the air-relief screw (4.41) and filling oil into the oil cup until the oil runs out of the venthole.

While changing or refilling oil only use new oil as it is important to avoid any sort of pollution in the oil system.

Even small particles and water will cause damage to shaft and shaft seal (4.1).

To prevent water from getting get into the oil, the oil seals (4.17 and 4.32) are lubricated with frost-proof grease. It is recommended to use a food machinery grease, for instance Castrol FM1.

A grease nipple (4.39), (two for VD machine) is located at the back of the machine and it is recommended to lubricate the machine before every start-up.

Lubrication of electric motor (6.12)

The electric motor on the ice machine has been lubricated at the factory and requires no further lubrication.

Lubrication of water pump (2.11)

The bearings of the water pump have been lubricated at the factory and requires no further lubrication.

Lubrication of coupling (1.1)

The coupling has been lubricated at the factory and requires no further lubrication.

Oil draining from the freezing drum

In ammonia plants, oil will deposit inside the freezing drum, which will reduce the ice production, and therefore, at intervals, oil draining must be carried out:

1) The machine is evacuated of refrigerant. Then wait for a while, preferably till the next day, allowing the oil to sink to the bottom of the drum.

2) The oil drain valve (4.40) is placed inside the frame under the drum. By turning the spindle a littre counterclockwise the valve is opened, - NB: it is of great importance that the valve is opened just a littre so that the oil gets forced out, due to the positive pressure in the drum.

In order to prevent the oil from polluting, a hose must be connected to the connecting piece. The hose is led to a bucket of water. When the oil has been drained out, the oil drain valve must be closed again immediately, as otherwise you risk to suck water into the drum. In order to remove as much oil as possible, the operation should be repeated a couple of times at intervals of about one hour.

R717 Obar ~33 Fobar ~20

If there is not enough pressure to force out the oil, it is possible to let in refrigerant through the suction line provided there is positive pressure in the line.

Note

For freon plants there should always be a blind cap on the exhaust branch of the oil drain valve.

Cleaning of the external surface of the drum

On the external surface of the drum a calcareous deposit might occur, which partly reduces the production of ice and partly makes the ice detachment from the drum more difficult.

This deposit can be removed by using a ~~fine abrasive or~~ inhibited organic acid, which, when mixed with additives, does not attack ~~zinc, chrome, or~~ aluminium.

It is recommended to follow the suppliers' instructions.

Note

For all media it applies that the personnel ought to attend to normal precautionary measures when working with corrosive liquids.

Furthermore, all corrosive media have a tendency to attack the galvanized parts.

Therefore, it is recommended to keep the drum turning, keep the float valve open, and then flush the water tray with a water hose simultaneously with the water reservoir being drained.

Then the liquid is applied by means of a rag or a brush so that the surface is moistened. After this treatment the water pump is started, and the system is flushed as mentioned above.

Besides, it is our experience that, with plants having special extensive calcareous deposits, it might be useful to add a little salt to the freezing water, and for this purpose SABROE supplies a salt dosing device when the machine is meant to product fresh-water ice.

Corrosion protection of the drum

In case the machine is to stand idle for some time, it is recommended to use a corrosion resistant medium for the surface, for instance "Rustban 392" (Esso), "Castrol DW Fluid No 1" or a similar product. These anti-corrosive agents can be applied to the surface by use of an insect sprayer. The liquid solidifies at -10°C, and for that reason the drum should have room temperature and the surface should be dry.

The anti-corrosive agent is not poisonous, and at start-up of the machine it is removed after a few rotations; the ice, which has been produced during the first rotations, can be removed if necessary. If it is considered necessary, the protective coating can also be removed with normal mineral terpentine.

Note

If the machine works with salt water, the surface of the drum should be rinsed with freshwater and protected against corrosion as mentioned above, when the machine is taken out of service for a period of more than 24 hours.

Corrosion protection of the frame

The frame is hot-dip galvanized and normally does not require further protection.

At chemical factories or in coast areas in the tropics it will be necessary to rinse the frame with freshwater from time to time because of abnormal corrosion conditions.

Cleaning of water distribution pipe

At suitable intervals, the nozzles in the water distribution pipe (2.1) should be checked and cleaned, as blocked nozzles cause a reduced ice production and irregular freezing of ice on the drum. The ends of the pipe can be unscrewed which will facilitate the cleaning process.

Likewise, the filter before the water valve should be cleaned at regular intervals.

Setting of ice knives

The distance between the freezing drum and the knife shall be approximately 0.1 mm, when the drum has obtained normal room temperature.

The drum is never a hundred per cent round, and before the knife can be adjusted, the drum should be turned until the highest points are opposite to the knife. This point is found most easily by reading a dial meter placed different places on the knife holder, while the drum is turning.

The knives are set in the following order: loosen the bolts holding the clamping flange on top of the knive holder (5.3); then adjust the holder by means of the upper and lower nuts on the bolts (5.1) until the distance is 0.1 mm. After the fastening the distance is checked by means of a feeler gauge.

Defrosting of ice on the drum

If defrosting is necessary, it is recommended to close the liquid supply valve and the valve in the suction line and to keep the machine running with the water circulation and the drum working until the surface is free of ice.

It should be mentioned that this method may cause a little water to drip on the ice outlet tray below.

NOTE

Hot water or open fire must never be used for removal of the ice from the drum, as this may give rise to high pressure in the drum and a consequent risk of bursting.

Evacuation of the drum

When evacuating, close the valve in the liquid supply line and keep the machine running with the water circulation and the drum working, until no more ice is being formed on the surface of the drum.

Draining of water

Should the temperature in the operation room of the flake ice machine fall below freezing point, the machine should be stopped and the water drained from the water reservoir and from the water supply line.

The water pump should also be drained.

Normally, it would be the easiest to install a small heating element in the room to keep it frost-free during the winter.

Check-up of the suction junction

Should any leakages be observed in the suction junction (4.), this must be taken apart for checking, but first you should make sure that the leakage actually comes from the sealing rings (4.1) in the suction junction, and not from one of the nearby pipe and flange connections.

NOTE

Leakages in the sealing rings (4.1) are only shown when the refrigerant blows oil out of the oil cup (4.38).

Dismantling of the suction junction

for replacing sealing rings, ball bearing, oil seals or for taking out the drum.

The item number in brackets refers to the sectional drawing of the suction junction.

Stop the machine and evacuate the drum.

The motor of the drum is to be secured against erroneous start.

Support the drum between the drum bottom and the supporting profiles (7.2) in the lower bearing foundation (7.3).

Remove the water reservoir (2.4) and the ice chute in order to facilitate the admission to the stuffing box.

Any excess pressure (and oil) can be blown out through the oil drain valve (4.40). Then dismantle the connection pipe at (4.4).

Dismount the feeler (3.3) and the equalizing pipe (3.4) of RT280 (if level control is used).

Dismantle the flange of the liquid inlet pipe (4.5) and thus the intermediate pipe (4.6). Be careful not to damage the oil drain pipe (4.7) which may fall down when removing the intermediate piece.

Drain the oil of the bearing at the air-relief plug (4.41) and remove the connecting pipe for the oil cup (4.38).

Dismantle the vertical flange connection of the suction junction and take off the four nuts (4.8) in the horizontal connection.

NOTE

When lining up the drum, the factory used small metal plates (4.9) between the bearing housing (4.10) and the foundation plate (7.3). Be careful not to mix up these plates when removing the four nuts (4.8) which fasten the suction junction (4.11) and the bearing housing (4.10) to the foundation plate.

The suction junction can now be taken out by means of two dismantling screws in their M12 threaded holes. Take out the feed pipe (4.12) and the oil drain pipe (4.7).

By moving the bushing (4.14) upwards, it is possible to remove the circlip (4.15). The bushing can now be taken out and the O-rings (4.29) changed.

When taking out the bearing (4.2), remove the two conical (4.42) guide pins which keep the bearing housing in position in the bearing foundation (7.3). The guide pins are equipped with M8 threads for extraction. Screw off the lower stay bolt (5.7) of the knife off the bearing housing (4.10).

Take off the circlip (4.16) fixing the ball bearing (4.2). Then the bearing housing (4.10) with bearing can be removed from the shaft. For this purpose, two M12 holes are drilled in the bearing housing for the dismantling screws.

Now the ball bearing can be removed from the bearing housing and the oil seals (4.17, and 4.32) be taken out.

The shaft sealing rings (4.1) and the sealing ring for the feed pipe (4.13) are very sensible to scratches, for which reason great care has to be taken when handling and fitting of the rings.

If the shaft end or the whole drum has to be taken out of the frame, the shaft is dismantled with the 16 Allen screws (4.30). Four M10 threaded holes are located in the shaft, these can be used by the dismantling. Care must be taken not to damage the surface of this shaft.

Remounting is undertaken in the reverse order, as the faces of joint and fitting are inspected for any damage, which, if found, must be repaired.

All parts are to be cleaned carefully for impurities and all faces of joint are to be lubricated with pure refrigeration machine oil. It is recommended to exchange all packings with new ones, although the actual packings do not show any sign of wear.

NOTE

When remounting the intermediate ring (4.25) it is important that the ring is turned so that the cutout is placed above the hole for oil inlet.

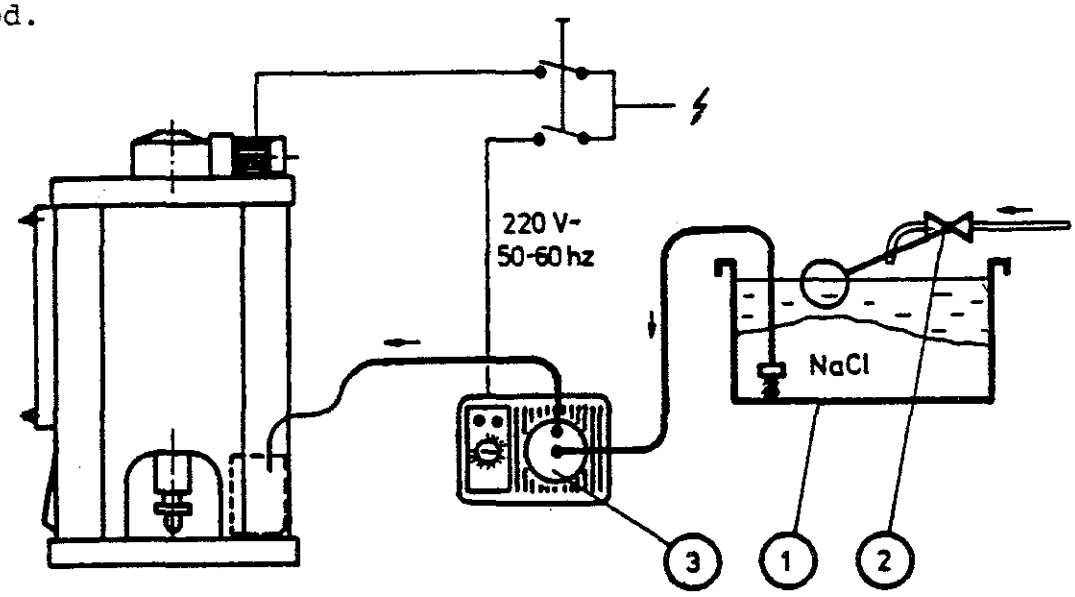
When remounting the feed pipe (4.12)/suction connection (4.11) it is important to make sure that the overflow pipe on the feed pipe (4.12) hits the phial pocket (4.37) on the suction connection.

When remounting the shaft pipe (4.23) always use new certified stainless M10 x 30 Allen screws (4.30) and new spring washers (4.31). The torque moment for the screws is 35 Nm and the thread has to be glued with Loctite 222e (or similar).

SALT DOSING DEVICE

By means of this device small amounts of salt are added to the freezing water, which causes the ice to fall off in larger pieces, at the same time reducing the calcareous deposit, which always occurs on the surface.

The quantity of salt to be added rates from 0-500 gram/ton ice or 0-0.05%. This salt content cannot be tasted and it has no influence on the applicability of the ice for cooling of food.



Installation:

Item 1 Mixing Tank

The mixing tank is to be made of salt water resistant material, for instance plastic. The size of the mixing tank depends on the type of machine in question, number of machines, and desired frequency of salt refilling.

As dimension indication, the below table can be used, but it must be noted that the figures are only approximate:

Type of machine	V-156	V-316	V-619	VD-746	VD-1206
Basic size, litres 1)	15	20	30	35	60
Suppl. volume, litres 2)	2	4	7.5	9	15

1) The basic size is based on daily refilling of salt for one ice machine.

2) The supplementary volume indicates the volume to be allowed for the time interval (number of days) between each refilling.

Example

For a V-619 ice machine, refilling is desired once a week. How many litres is the mixing tank to contain?

30 + 6 x 7.5 = 75 litres.

Item 2 Float valve to be fitted in the mixing tank and connected to the water pipe.

Item 3 The dosing pump(s) to be mounted in close proximity to, and below, the water level in the mixing tank to prevent valves and pump below from drying up during standstill.

The dosing pump to be connected so that it only works when its ice machine is working, see page 15.

The salt water pipe from the pump is to be fitted in the water reservoir of the ice machine in question, using the supplied non-return valve, which has been screwed into the connecting branch.

The suction filter of the pump is to be fitted to the bottom of the mixing tank. There is no need to make a hole in the tank, the filter can just be put down into the tank. However, as it has a tendency to float, it is recommended to fasten it to a rustproof ring, or the like, in order to keep it down.

CENTRAL SALT DOSING PLANT

Principle

Salt and water are mixed in a tank, the size of which depends on the amount of ice produced, the actual hydrologic conditions, and the intervals wanted between each filling with salt. A float valve ensures continuous dissolution of the salt.

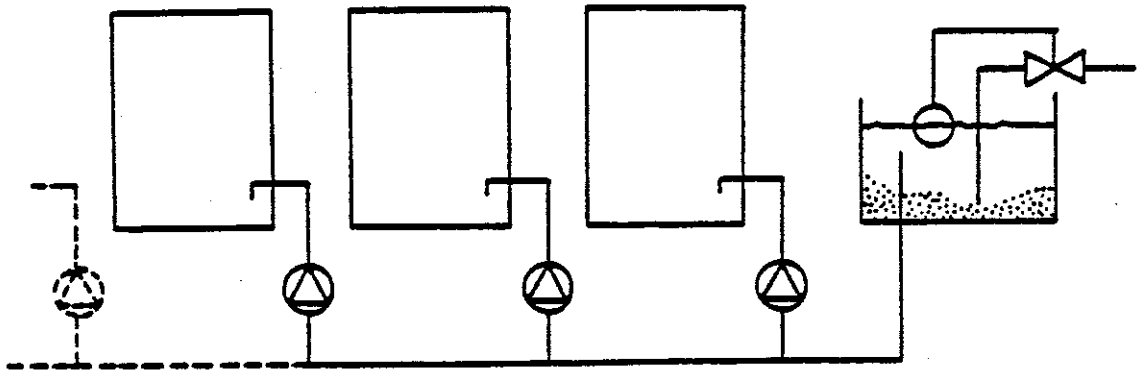
Each dosing pump is equipped with a variable timer for dosing the required quantity of salt solution to the flake ice machine in question.

If the flake ice machine is not in operation, the dosing pump will stop, as the ice machine and the dosing pump must work at the same time.

In cases where machines are placed in a high and not easily accessible position, e.g. above a silo, the mixing tank and the dosing pumps can be placed at a convenient point below the ice machine, for instance on the ground floor, in order to facilitate salt refilling.

The dosing pumps should always be filled with salt solution which is secured in the easiest way by placing these under the level of the mixing tank.

Experience has shown that the required amount of salt rates from 0 to 500 grams per ton of ice, corresponding to 0-2.2 litres of saturated salt solution per ton of ice.



INTERRUPTION OF OPERATION

In the below table, some of the operational difficulties, which might arise, are shown together with the effects they have on the machine and remedies for possible defects.

For all type of flake ice machines

Effect	Cause	Remedy
Uneven formation of ice, especially in vertical stripes.	Insufficient water supply	Control float valve and water supply Clean distribution pipe (2.1). Clean filter.
The ice is crushed because of difficulties with the ice slipping the drum.	Calcareous deposit on the drum.	Clean the drum. See instruction book under "Maintenance", page 27.
	Water to be frozen too soft.	Use the salt dosing device.
The movements of the drum are irregular and take place in small jerks.	Ice has formed under the drum around the shaft and the stuffing box; this brakes the movements of the drum.	Stop the machine and the compressor immediately. Defrost by flushing with a water hose under the drum. Do not start the machine until the ice under the drum has melted away, as otherwise the gear might break. Control that sufficient water is sprayed underneath the drum. An insufficient water spray could be caused by a too low water pressure (has to be above 1 bar) or by a leak in the hose (2.3) between the float valve (2.10) and the nozzle (2.02).

Effect	Cause	Remedy
		Furthermore, it has to be checked that the temperature of the inlet water is sufficiently high (above 10°C).
	Water to be frozen too soft.	Use the salt dosing device.
Refrigerant blows oil out of the oil cup (4.38).	Stuffing box is leaking	Replace sealing rings (4.1). See instruction page 30.

FOR PLANTS USING R717 (NH3) ONLY

Reduced production of ice. Spots with thinner ice occur on the surface of the drum.	Oil in freezing drum.	Drain out the oil. See instruction under "Maintenance" page 26.

FOR FLAKE ICE MACHINE
WITH PUMP CIRCULATION OF REFRIGERANT ONLY

No ice on the upper part of the drum.	Insufficient supply of refrigerant.	Control liquid level in receiver and separator. Regulating valve (3.14) is adjusted. See page 23.

FOR ICE MACHINES WITH LEVEL CONTROL ONLY

For adjustment of level control: see page 23.

Effect	Cause	Remedy
No ice production. Suction pressure is very low. The sensor is hot	Burnt coil on solenoid valve (3.11) Cracked capillary tube on the level control (3.1). Leaking sealing ring (4.13) or O-ring (4.29).	Replace all defective parts.
No ice on the upper part of the drum.	Insufficient refrigerant supply. The filter of the solenoid valve (3.12) is clogged up. Level control set for the wrong refrigerant. Nozzle too small or clogged.	Control liquid level in receiver and liquid supply. Check for flash gas in the liquid line. Evacuate the machine, dismount filter and nozzle and clean them. Control the size of nozzle. Check the adjustment of the level control (3.1). See page 23.
The ice disappears periodically from the upper part of the drum, and suction pressure is falling simultaneously.	Impurities in the regulation devices (the sprinkling pipe of the phial). Outlet from housing (4.37) around the phial (3.3) is clogged up.	Remove the phial (3.3). Clean phial pocket and sprinkling pipe.
Machine is overcharged with liquid. The compressor gets cold and liquid hammer will occur. The level control works irregularly.	The liquid flow from overflow pipe does not hit the phial (3.3). The phial is soiled with oil and dirt.	Place the overflow pipe at the right position above the phial. Remove the the phial and clean it.
The ice disappears periodically or there is no ice production. Suction pressure is very low. Phial is cold.	Lack of heat for the phial (3.3). Current supply cut off. Defective heating element (3.5) or transformer (3.2).	Replace defective parts.

SUMMARY OF ITEM NUMBERS AND SPARE PARTS LIST

The item numbers are placed in the following groups:

1. Top bearing system
2. Water system
3. Refrigerant regulation
4. Stuffing box
5. Ice scrapers (knives)
6. Gear unit
7. Frame
8. Salt dosing pump

To avoid mistakes and delays when ordering spare parts the ordering should be done as in the following example:

The flexible hose for water-return to the water reservoir (item 2.4, drawing 237430/237432) is broken. Your machine is a type V316 AFT (ammonia, freshwater, level control), serial no. 9999. Ordering example:

1 piece 2½" flexible hose for water reservoir L = 750 mm, Sabroe spare part no. 1241-003. Machine type V316 AFT, serial no. 9999.

1. TOP BEARING SYSTEM

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
1.1	237429	Toothed coupling	1	2	2125-314
1.2	-	Holder plate	1	2	2135-016
1.3	-	Thread bushing	1	2	2114-024
1.4	-	M10 screw	1	2	1413-114
1.5	-	Key	1	2	2123-016
1.6	-	Spherical ball bearing	1	2	1993-116
1.7	-	Ø110 circlip	1	2	1993-136
1.8	-	Ø110 oil seal	1	2	1993-115
1.9	-	M10 pointed screw	1	2	1413-252
1.10	-	M16 bolt	4	8	1424-110/1436-001/ 1432-072
1.11	-	Conical pin	2	4	1445-034
1.12	-	Bearing house	1	2	2134-013

For gear unit, please see under 7. Gear Unit.

2. WATER SYSTEM

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
2.1	237430	Water distribution pipe for V156:			
		Circular pipe	1		3284-238
		Vertical pipe	1		3284-236
	-	Water distribution pipe for V316:			
		Circular pipe	1		3284-238
		Vertical pipe	1		3284-237
	-	Water distribution pipe for V619:			
		Circular pipe	1		3284-238
		Vertical pipe	1		3284-246
	237432	Water distribution pipe for VD746:			
		Circular pipe, right	1		3284-238
		Vertical pipe, right	1		3284-245
		Circular pipe, left	1		3284-271
		Vertical pipe, left	1		3284-245
	-	Water distribution pipe for VD1206:			
		Circular pipe, right	1		3284-238
		Vertical pipe, right	1		3284-246
		Circular pipe left	1		3284-271
		Vertical pipe left	1		3284-246

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
2.2	237430/ 237432	Water spray nozzle	1	2	3284-193/1334-001
2.3	-	1/2" flexible hose for nozzle	1	1	2315-060
2.4	-	Water reservoir	1	1	V: 3283-196 VD: 3283-197
2.5	-	2½" flexible hose for water reservoir V:L = 750 VD:L = 200	1	2	1241-003
2.6	-	Overflow for marine machines	1	1	N.A.
2.7	-	Filter for water distribution pipe	1	2	1366-001
2.8	-	1" cock for water distribution pipe	1	2	1363-003
2.9	-	1 1/4" flexible hose for water distribution pipe L = 400	1	2	1241-004
2.10	-	Float valve*	1	1	V: 1364-052 VD: 1364-053
2.11	-	Water pump** (complete incl. motor)	1	2	1524-002
2.12	-	Vent. screw for water pump	1	2	N.A.

* Marine versions are supplied without float valve

** Specificaitons for electrical motor, see p. 17

3. REFRIGERANT REGULATION

Level Control:

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
3.1	V: 237430 VD: 237432	Level control (complete incl. heating element and packings)	1	2	1993-023
3.2	-	Transformer for heating element	1	2	1993-031
3.3	-	Phial for level control	1	2	N.A.
3.4	-	Equalizing pipe for level control V:L = 1400 VD:L = 1900	1	2	1112-101
3.5	-	Heating element for phial	1	2	1993-021
3.6	-	Capillary pipe for level control	1	2	N.A.
3.7	-	Packing for phial	1	2	1336-001
3.8	-	Nozzle*	1	2	3432-T01
3.9	-	Packing for liquid supply pipe	2	4	1993-154
3.10	-	Counter flange for nozzle	1	2	3432-089
3.11	-	Solenoid valve	1	2	N.A.**
3.12	-	Filter for solenoid valve	1	2	N.A.**

* In case of order, always state size of orifice (see page 19)

** Not included in the supply.

Pump Circulation:

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
3.7	V: 237430 VD: 237432	Packing for phial housing	1	2	1336-001
3.9	-	Packing for liquid supply pipe	1	2	1993-037
3.13	-	Counter flange for pump circulation	1	2	1344-131
3.14	-	Hand regulating valve for liquid supply	1	2	2415-T20

4. STUFFING BOX

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
4.1	237437 228496	Ø148 sealing ring	2	4	1332-116
4.2	-	Grooved ball bearing	1	2	1511-002
4.3	-	O-ring PRP 203	2	4	1331-214
4.4	-	Screwed connection	1	2	
4.5	-	Flange for liquid supply	1	2	3284-120
4.6	-	Intermediate piece (incl. screwed connection)	1	2	3284-233
4.7	-	Oil drain pipe	1	2	3283-214
4.8	-	M24 bolt	4	8	1424-025/1432-053
4.9	-	Liner plates	+	+	N.A.
4.10	-	Bearing house (stuffing box)	1	2	3284-232
4.11	-	Suction junction	1	2	V: 3283-211 VD:3283-231
4.12	-	Feed pipe	1	2	1332-116
4.13	-	Ø60 sealing ring	1	2	1332-115
4.14	-	Bushing	1	2	3284-224
4.15	-	Ø80 circlip	1	2	1437-160
4.16	-	Ø150 circlip	1	2	1437-231
4.17	-	Ø170 lower oil seal	1	2	1332-003
4.18	-	O-ring PRP 204	2	4	1331-215
4.19	-	O-ring PRP 269	1	2	1331-109
4.20	-	O-ring PRP 360	1	2	1331-173
4.21	-	Flat packing for intermediate piece	2	4	1993-154

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
4.22	237430 237432	Flat packing for suction flange	1	2	2356-295
4.23	237437	Shaft pipe	1	2	3284-223
4.24	-	Intermediate ring	1	2	3284-226
4.25	-	Fastening ring	1	2	3284-225
4.26	-	Ø200 circlip	1	2	1437-178
4.27	-	M6 Allen screw	8	16	1431-341
4.28	-	Spring washer for M6 Allen screws	8	16	1437-022
4.29	-	O-ring PRP 333	2	4	1331-040
4.30	-	M10 certified Allen screw	16	32	1413-396
4.32	-	Ø170 upper oil seal	1	2	~~1332-003~~ 3284-234
4.33	-	Washer for M24 bolt	4	8	1436-007
4.34	-	M16 stud bolt	4	8	2112-112
4.35	-	M16 nut	4	8	1432-072
4.36	-	O-ring PRP 329	1	2	1331-035
4.37	-	Phial housing	1	2	N.A.
4.38	237430 237432	Oil cup	1	2	3284-119
4.39	-	Grease nipple (incl. connection)	1	2	2314-076/1516-001/ 1349-084
4.40	-	Oil drain valve (complete incl. connections)	1	2	V: 3283-218 VD:3283-219
4.41	-	Air relief screw	1	2	1349-161/1349-182
4.42	237437	M8 conical pin	2	4	1446-007

5. KNIVES

Freshwater

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
5.1	237432 237430	M24 x 1.5 adjusting nut	6	12	1436-007
5.2	237430	Knife stanchion for V156	1		3282-038
	-	Do. for V316	1		3282-039
	-	Do. for V619	1		3282-040
	237432	Do. for VD746		1	L: 3282-041 R: 3282-042
	-	Do. for VD1206		1	L: 3282-043 R: 3282-044
5.3	237432 237430	M12 bolt (type V) M16 bolt (type VD)	3	 6	1424-214/1432-056 1424-256/1432-072
5.4	-	Washer for M12 bolt (type V) Washer for M16 bolt (type VD)	3	 6	1436-005 1436-001
5.5	-	M24 nut	1	2	1432-053
5.6	-	M24 guide nut	1	2	2113-022
5.7	237430	Set of stay bolts for V156	1		2112-114/2112-115
	-	Do. for V316	1		2112-116/2112-117
	-	Do. for V619	1		2112-118/2112-119
	237432	Do. for VD746		2	2112-126/2112-127
	-	Do. for VD1206		2	2112-122/2112-123

Seawater

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
5.1	237432 237430	M24 x 1.5 adjusting nut	6	12	1436-007
5.2	237430	Knife stanchion for V156	1		3282-051
	-	Do. for V316	1		3282-052
	237432	Do. for VD746		1	L: 3282-032 R: 3282-033
	-	Do. for VD1206		1	L: 3282-035 R: 3282-036
5.3	237432 237430	M12 bolt (type V) M16 bolt (type VD)	3	 6	1424-236/1432-056 1424-263/1432-072
5.4	-	Washer for M12 bolt (type V) Washer for M16 bolt (type VD)	3	 6	1436-005 1436-001
5.5	-	M24 nut	1	2	1432-053
5.6	-	M24 guide nut	1	2	2113-022
5.7	237430	Set of stay bolts for V156	2		2112-113
	-	Do. for V316	2		2112-113
	237432	Do. for VD746		2	2112-126/2112-127
	-	Do. for VD1206		2	2112-124/2112-125

6. GEAR UNIT

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
6.1	237435	Belt variator SE13	1	2	- 1993-184
6.2	-	Worm gear SU250A	1	2	-
6.3	-	Worm gear SVF600L	1	2	-
6.4	-	Sealing ring 426210BA	2	4	1993-185
6.5	-	Ball bearing 6209	2	4	1993-186
6.6	-	Worm wheel S-256/20	1	2	1993-187
6.7	-	Ball bearing 6304	2	4	1993-188
6.8	-	Worm S-257/20	1	2	1993-189
6.9	-	Sealing ring 204710BA	2	4	1993-190
6.10	-	Rubber belt 22/610	1	2	1993-184
6.11	-	Handwheel with spindle	1	2	-
6.12	-	Electric motor* MT80B	1	2	1993-191
6.13	237434	Sealing ring 407210BA	1	2	1993-192
6.14	-	Taper roller bearing 30308	2	4	1993-193
6.15	-	Taper roller bearing 30214	2	4	1993-194
6.16	-	Worm wheel S616150	1	2	1993-195
6.17	-	Sealing ring 7010010BA	1	2	1993-196
6.18	-	Worm S620A50	1	2	1993-197
6.19	-	Filler plug	1	2	-
6.20	-	Lubrication nipple	1	2	-

1524 ord.

* Standard motor only (see p. 17). For other voltage/ frequency please state type, flange type, frequency, voltage, and effect.

7. FRAME

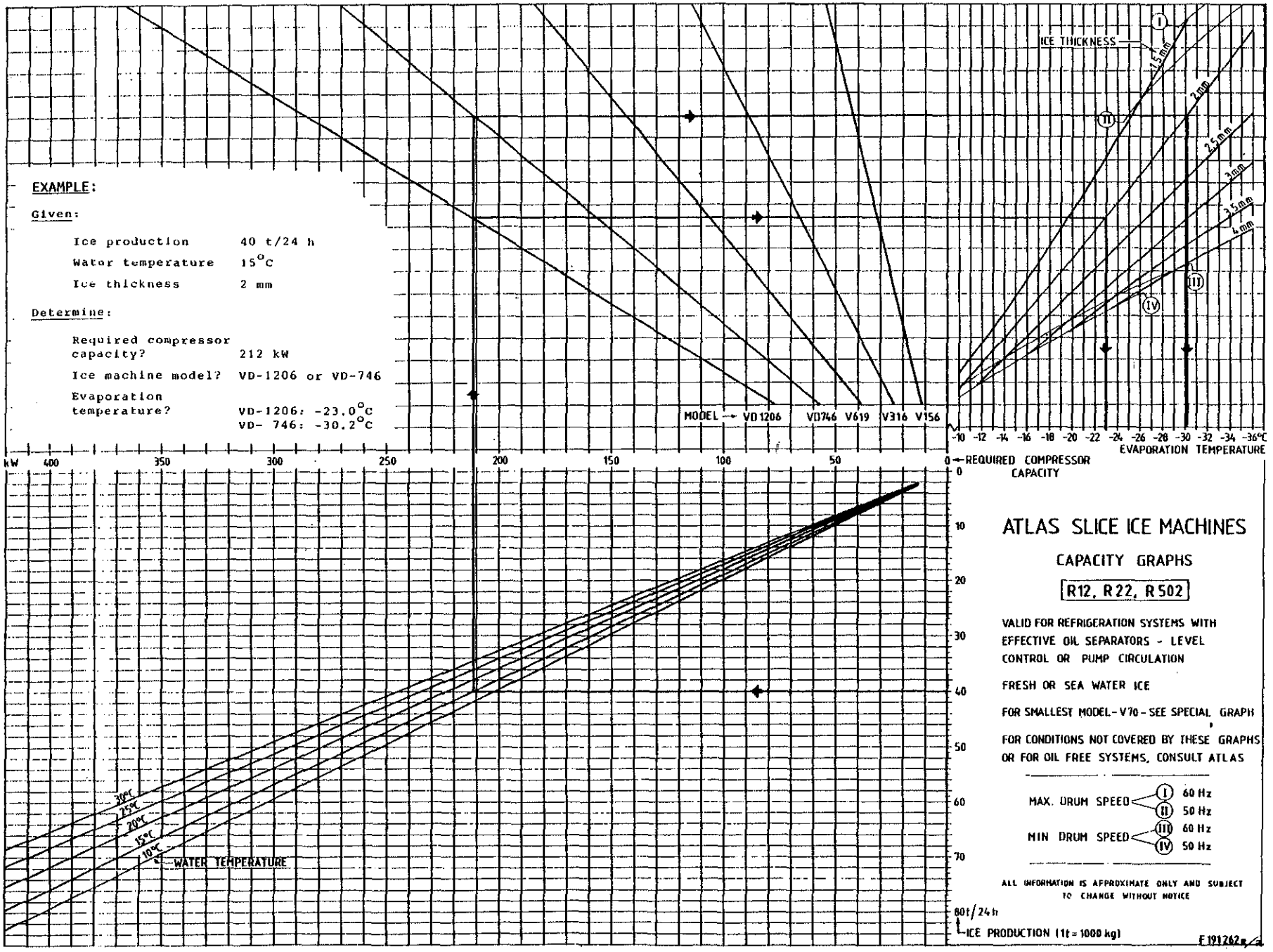
Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
7.1	237430	Frame for V156	1		-
	-	Do. for V316	1		-
	-	Do. for V619	1		-
	237432	Do. for VD746		1	-
	-	Do. for VD1206		1	-
7.2	-	Bearing profiles			N.A.
7.3	-	Bottom bearing foundation			N.A.
7.4	-	Ice chute	1		V: - VD:-
7.5	-	Side baffle:			
		V156	2		3284-259
		V316	2		3284-260
		V619	2		3284-261
		VD746		2	3284-247
		VD1206		2	2384-248

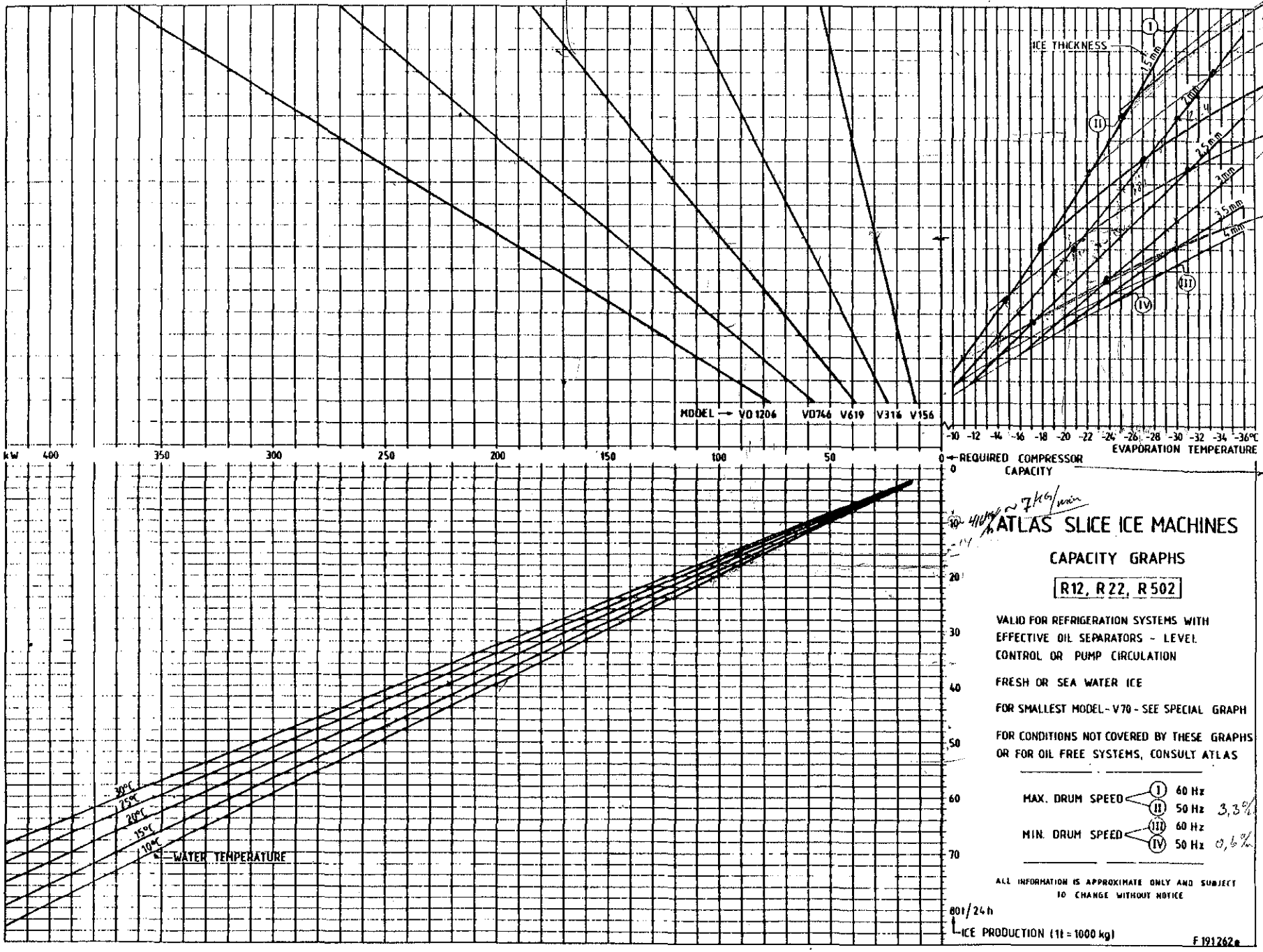
32

8. SALT DOSING PUMP

Item No.	Shown on drawing	Subject	Qty V	Qty VD	SABROE Spare Part No.
8.1	237438	Diaphragm C	1	1	1993-166
8.2	-	Magnet C	1	1	1993-167
8.3	-	Dosage nipple AP	1	1	1993-168
8.4	-	Filter fixture	1	1	1993-169
8.5	-	Nipple AB	1	1	1993-170
8.6	-	Union nut AB	2	2	1993-171
8.7	-	Valve	2	2	1993-172
8.8	-	Dosing valve AP	2	2	1993-173
8.9	-	Valve seat	2	2	1993-174
8.10	-	O-ring AB	2	2	1993-175
8.11	-	O-ring	1	1	1993-176
8.12	-	Suction hose	1	1	1993-177
8.13	-	Pressure hose	1	1	1993-178
8.14	-	Fuse 0.315 A	1	1	1993-179
8.15	-	Circuit board C	1	1	1993-180
8.16	-	Filter fixture	1	1	1993-181
8.17	-	Weight	1	1	1993-182
8.18	-	Filter cartridge	1	1	1993-183

salt dosing pump 1993-105


EXAMPLE:
Given:
Ice production 40 t/24 h
Water temperature 15°C
Ice thickness 2 mm
Determine:
Required compressor capacity? 212 kW
Ice machine model? VD-1206 or VD-746
Evaporation temperature? VD-1206: -23.0°C
VD- 746: -30.2°C
MODEL → VD1206 VD746 V619 V316 V156
kW 400 350 300 250 200 150 100 50 0 ← REQUIRED COMPRESSOR CAPACITY
30°C 25°C 20°C 15°C 10°C WATER TEMPERATURE
ICE THICKNESS
I 1.5mm
II 2mm
2.5mm
3mm
III 3.5mm
IV 4mm
-10 -12 -14 -16 -18 -20 -22 -24 -26 -28 -30 -32 -34 -36°C
EVAPORATION TEMPERATURE
0 10 20 30 40 50 60 70
80t/24h
ICE PRODUCTION (1t = 1000 kg)
ATLAS SLICE ICE MACHINES
CAPACITY GRAPHS
R12, R22, R502
VALID FOR REFRIGERATION SYSTEMS WITH EFFECTIVE OIL SEPARATORS - LEVEL CONTROL OR PUMP CIRCULATION
FRESH OR SEA WATER ICE
FOR SMALLEST MODEL - V70 - SEE SPECIAL GRAPH
FOR CONDITIONS NOT COVERED BY THESE GRAPHS OR FOR OIL FREE SYSTEMS, CONSULT ATLAS
MAX. DRUM SPEED I 60 Hz II 50 Hz
MIN DRUM SPEED III 60 Hz IV 50 Hz
ALL INFORMATION IS APPROXIMATE ONLY AND SUBJECT TO CHANGE WITHOUT NOTICE
F 191262 e



ATLAS SLICE ICE MACHINES

CAPACITY GRAPHS

R12, R22, R502

VALID FOR REFRIGERATION SYSTEMS WITH EFFECTIVE OIL SEPARATORS - LEVEL CONTROL OR PUMP CIRCULATION

FRESH OR SEA WATER ICE

FOR SMALLEST MODEL - V70 - SEE SPECIAL GRAPH

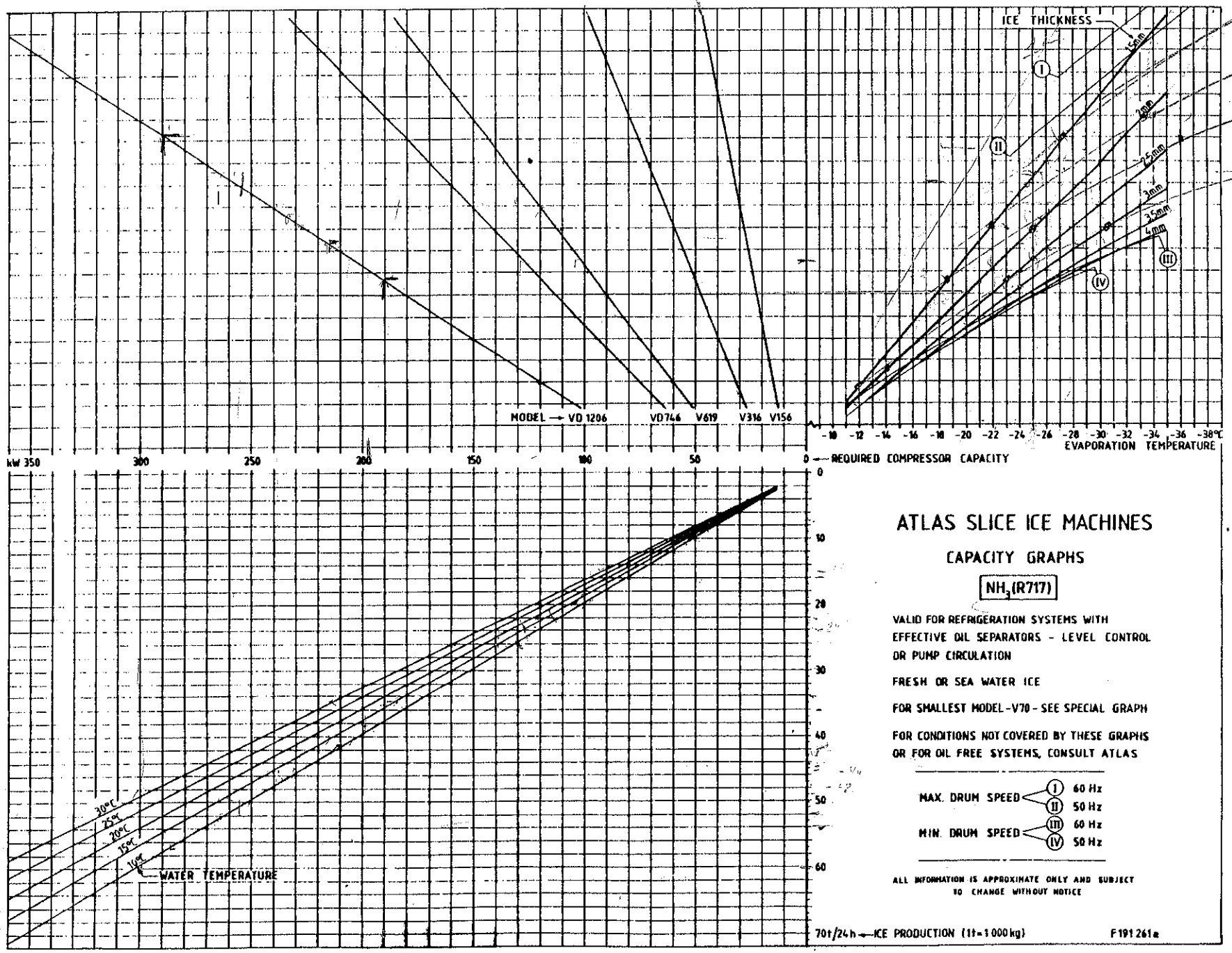
FOR CONDITIONS NOT COVERED BY THESE GRAPHS OR FOR OIL FREE SYSTEMS, CONSULT ATLAS

MAX. DRUM SPEED (I) 60 Hz (II) 50 Hz 3,3%

MIN. DRUM SPEED (III) 60 Hz (IV) 50 Hz 0,6%

ALL INFORMATION IS APPROXIMATE ONLY AND SUBJECT TO CHANGE WITHOUT NOTICE

F 191262e



ATLAS SLICE ICE MACHINES

CAPACITY GRAPHS

NH_3(R717)

VALID FOR REFRIGERATION SYSTEMS WITH EFFECTIVE OIL SEPARATORS - LEVEL CONTROL OR PUMP CIRCULATION

FRESH OR SEA WATER ICE

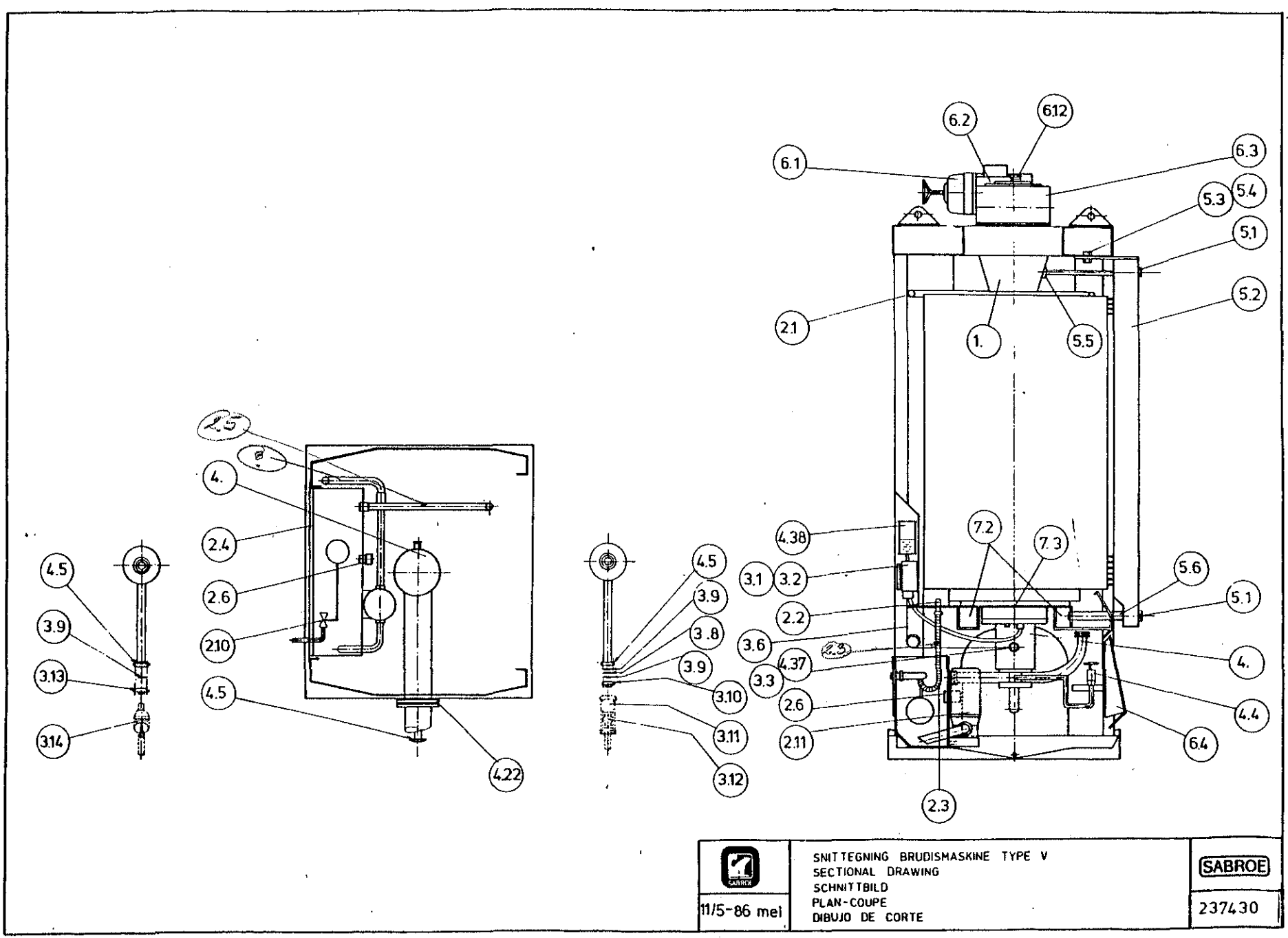
FOR SMALLEST MODEL - V70 - SEE SPECIAL GRAPH

FOR CONDITIONS NOT COVERED BY THESE GRAPHS OR FOR OIL FREE SYSTEMS, CONSULT ATLAS

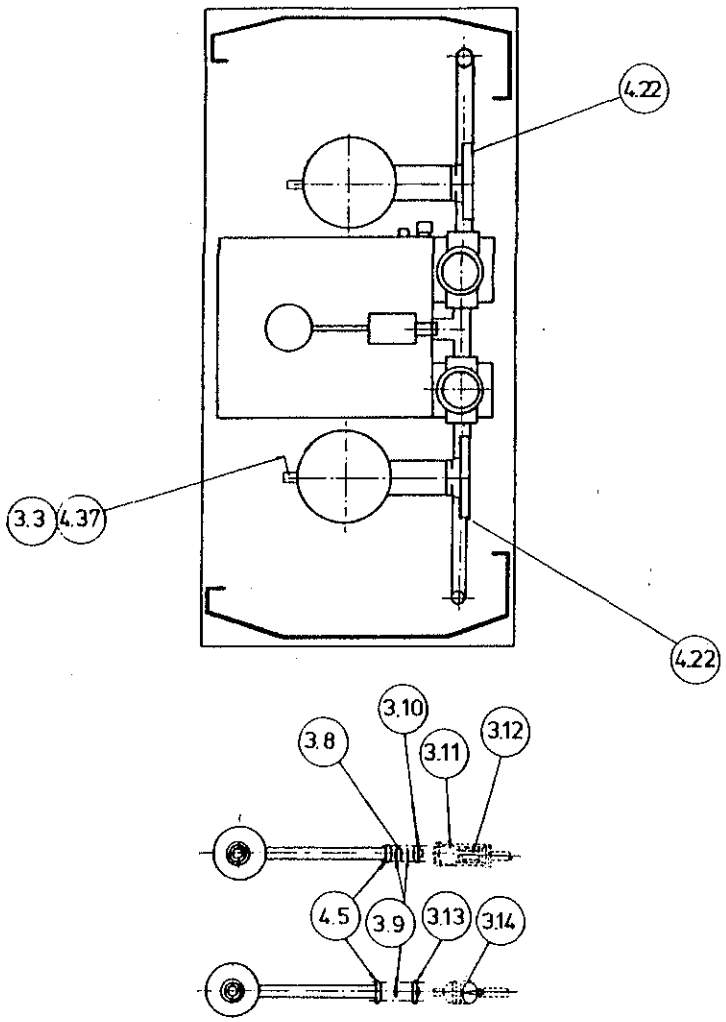
MAX. DRUM SPEED — I 60 Hz, II 50 Hz

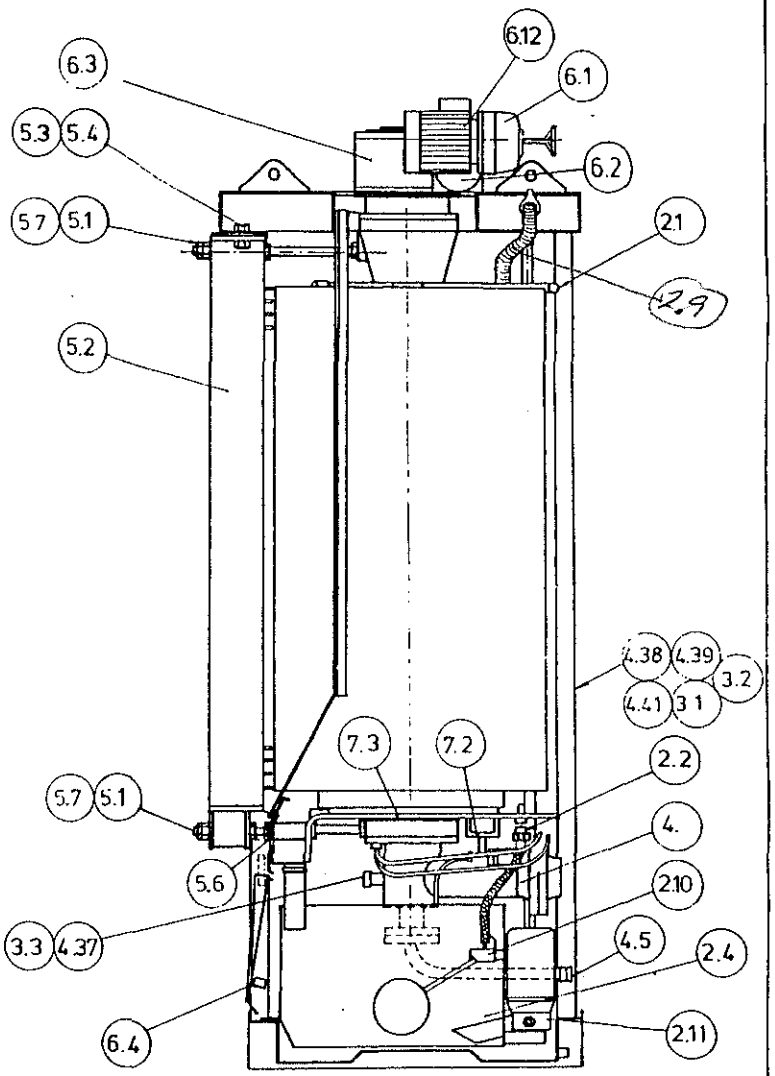
MIN. DRUM SPEED — III 60 Hz, IV 50 Hz

ALL INFORMATION IS APPROXIMATE ONLY AND SUBJECT TO CHANGE WITHOUT NOTICE

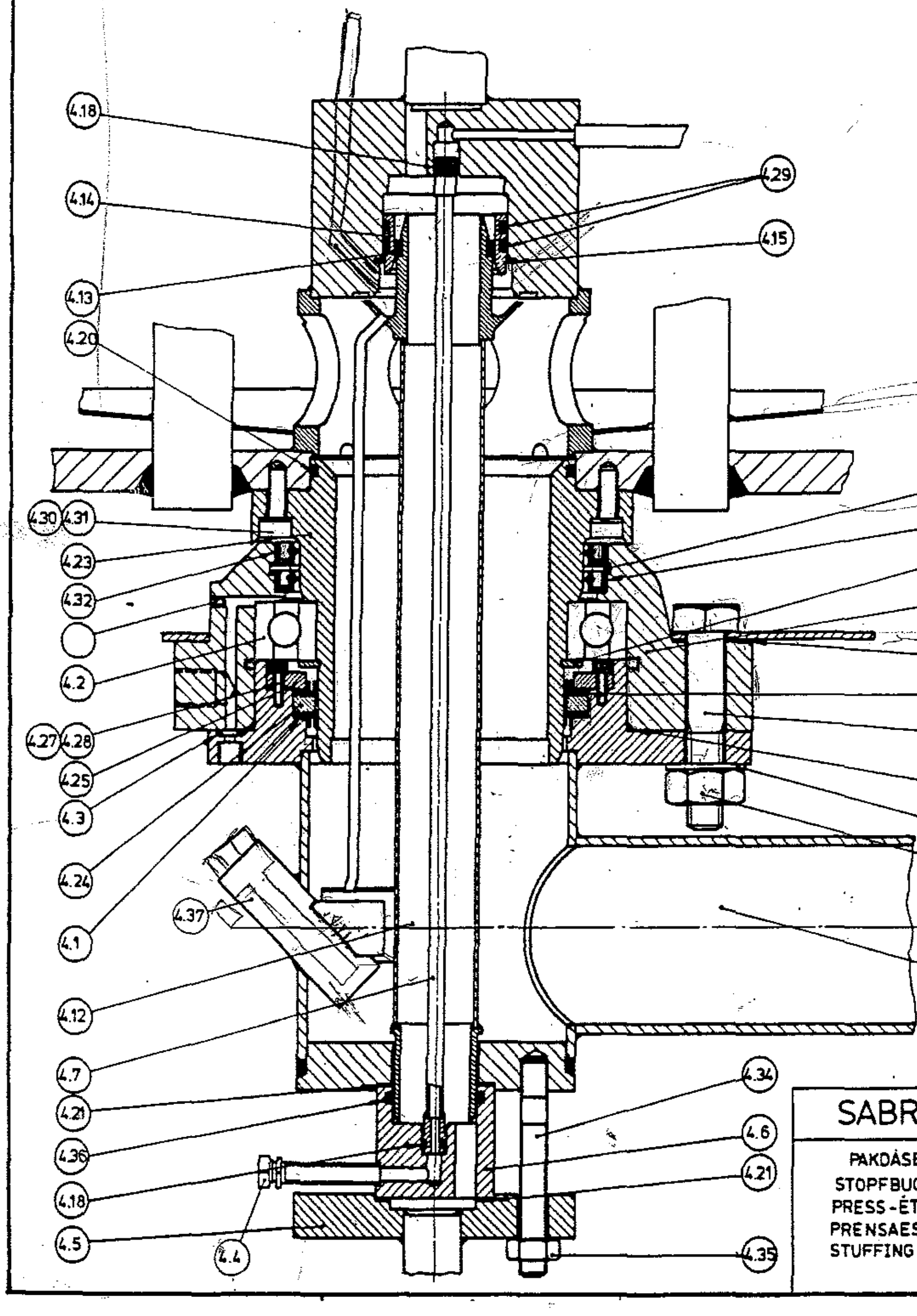


11/5-86 mel	SNITTEGNING BRUDISMASKINE TYPE V SECTIONAL DRAWING SCHNITTBILD PLAN-COUPE DIBUJO DE CORTE	SABROE 237430

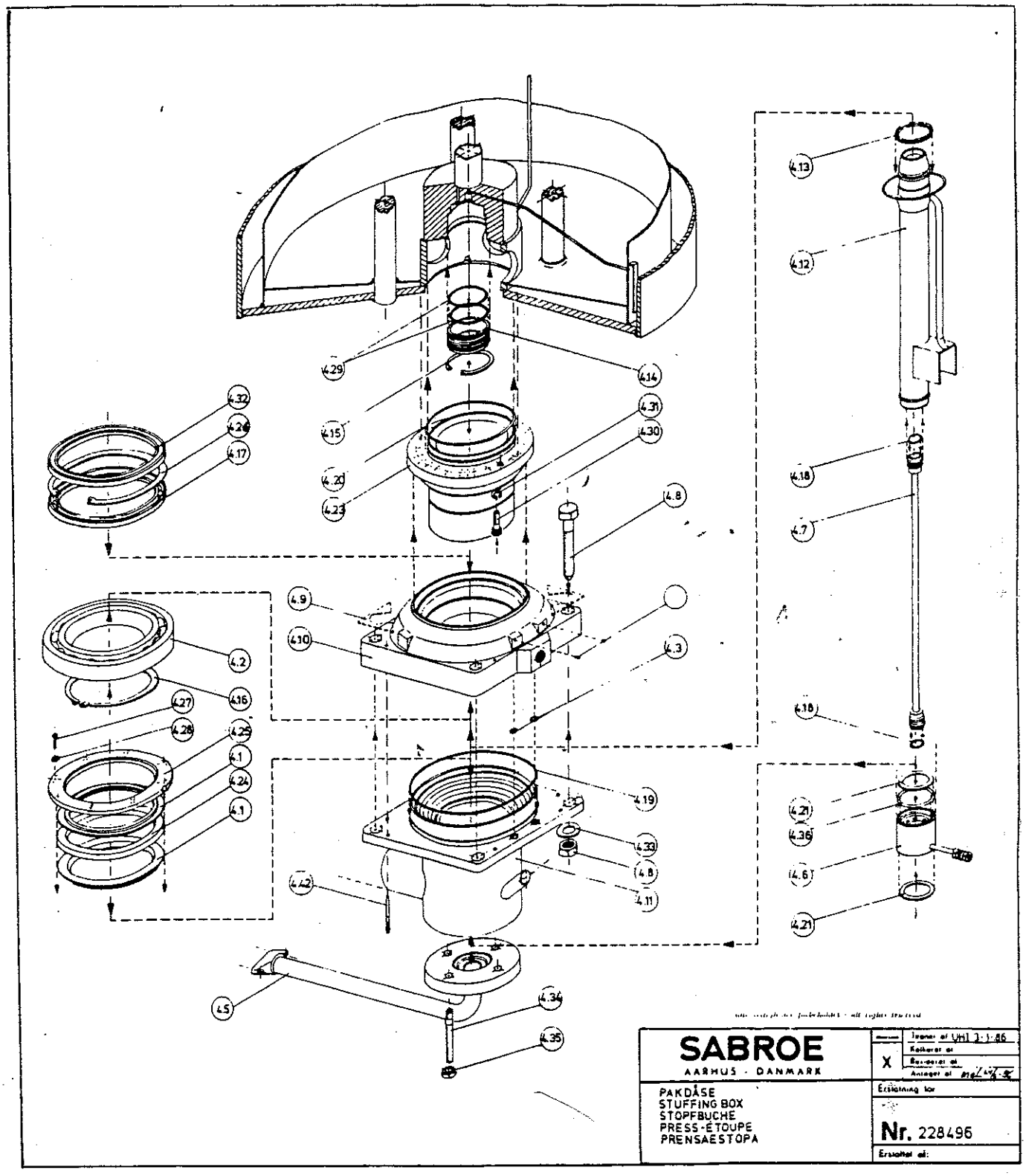


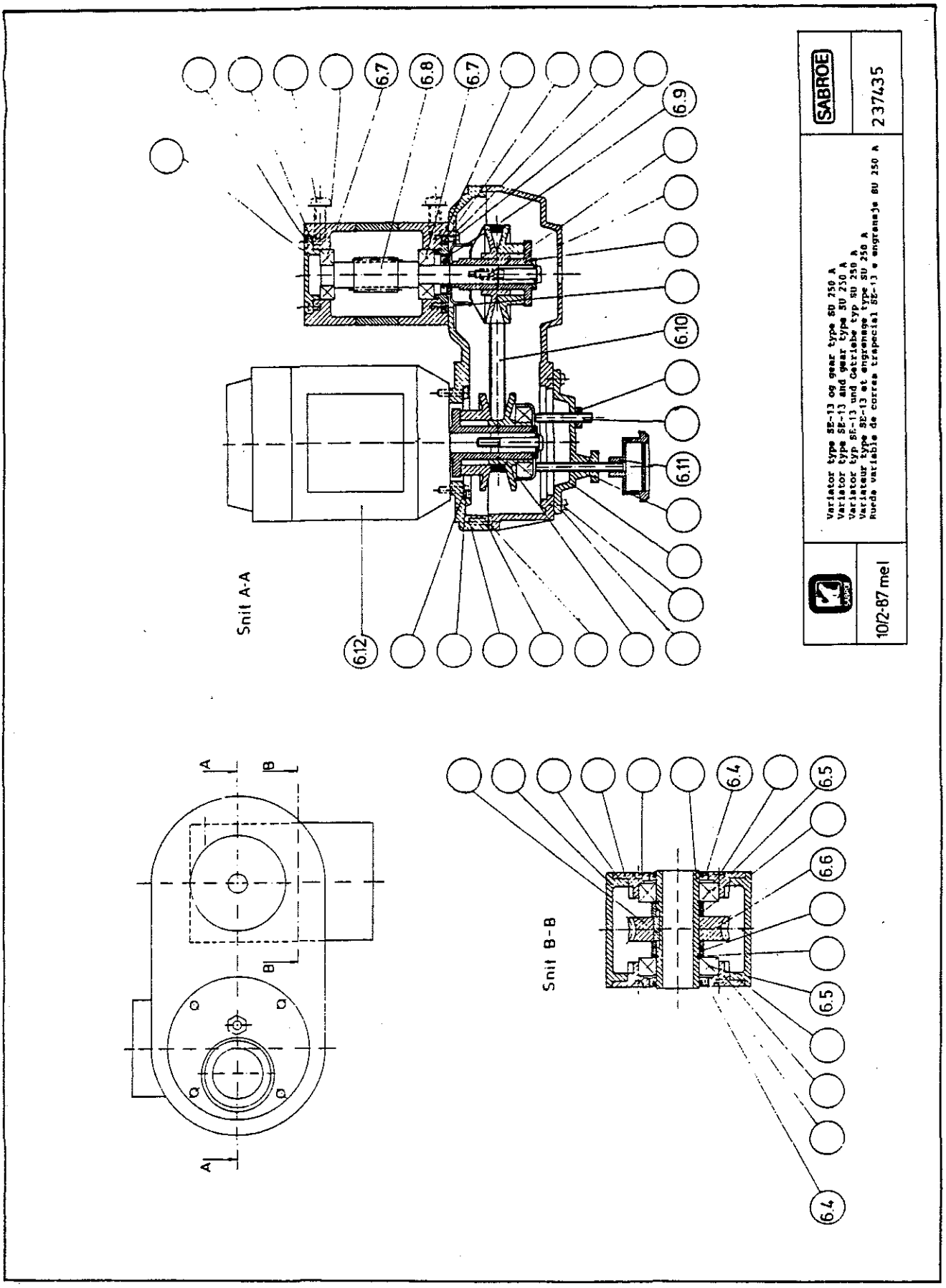


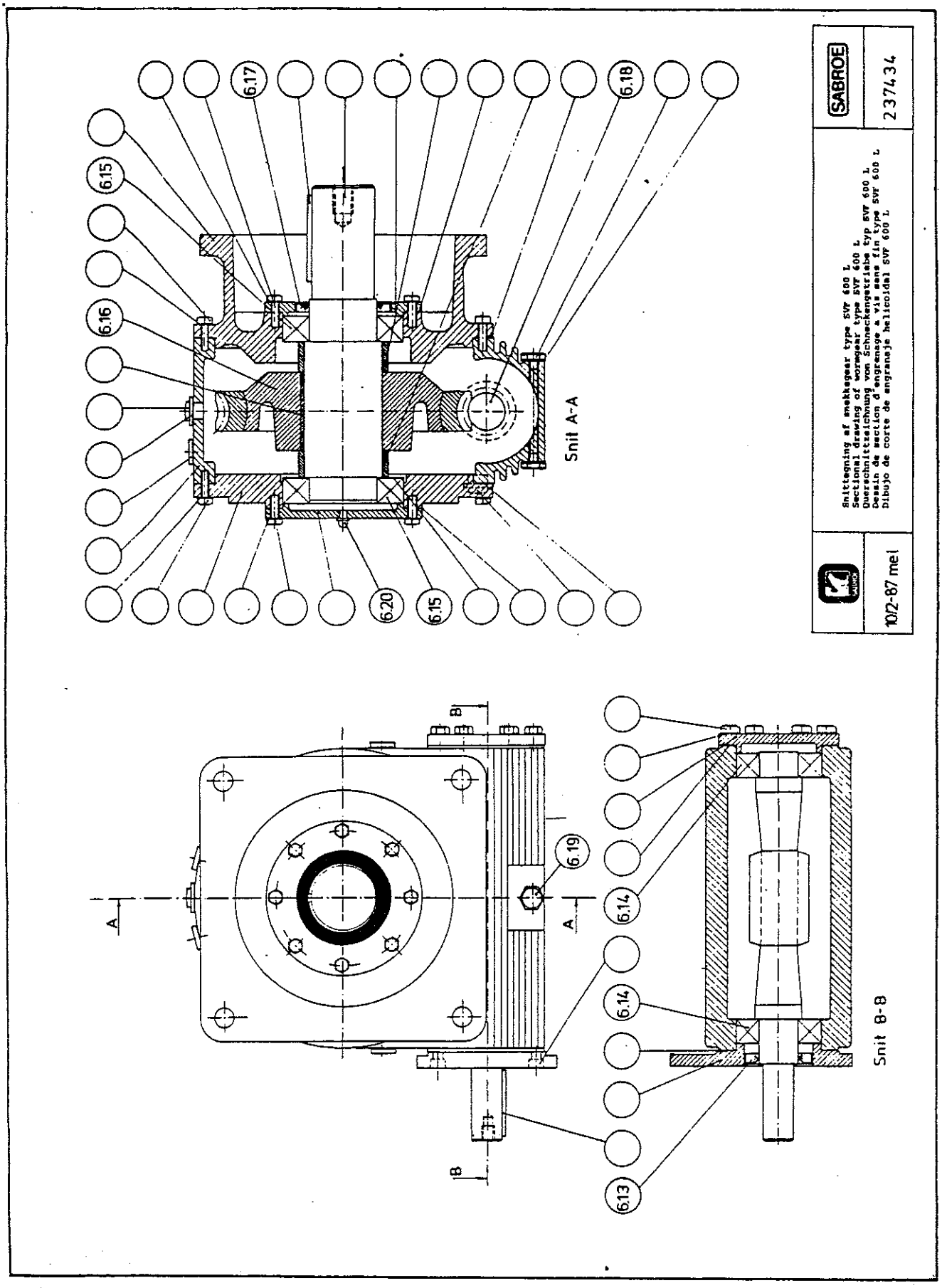
11/5-86 mel	SNITTEGNING BRUDISMASKINE TYPE VD SECTIONAL DRAWING SCHNITTBILD PLAN-COUPE DIBUJO DE CORTE	SABROE 237432

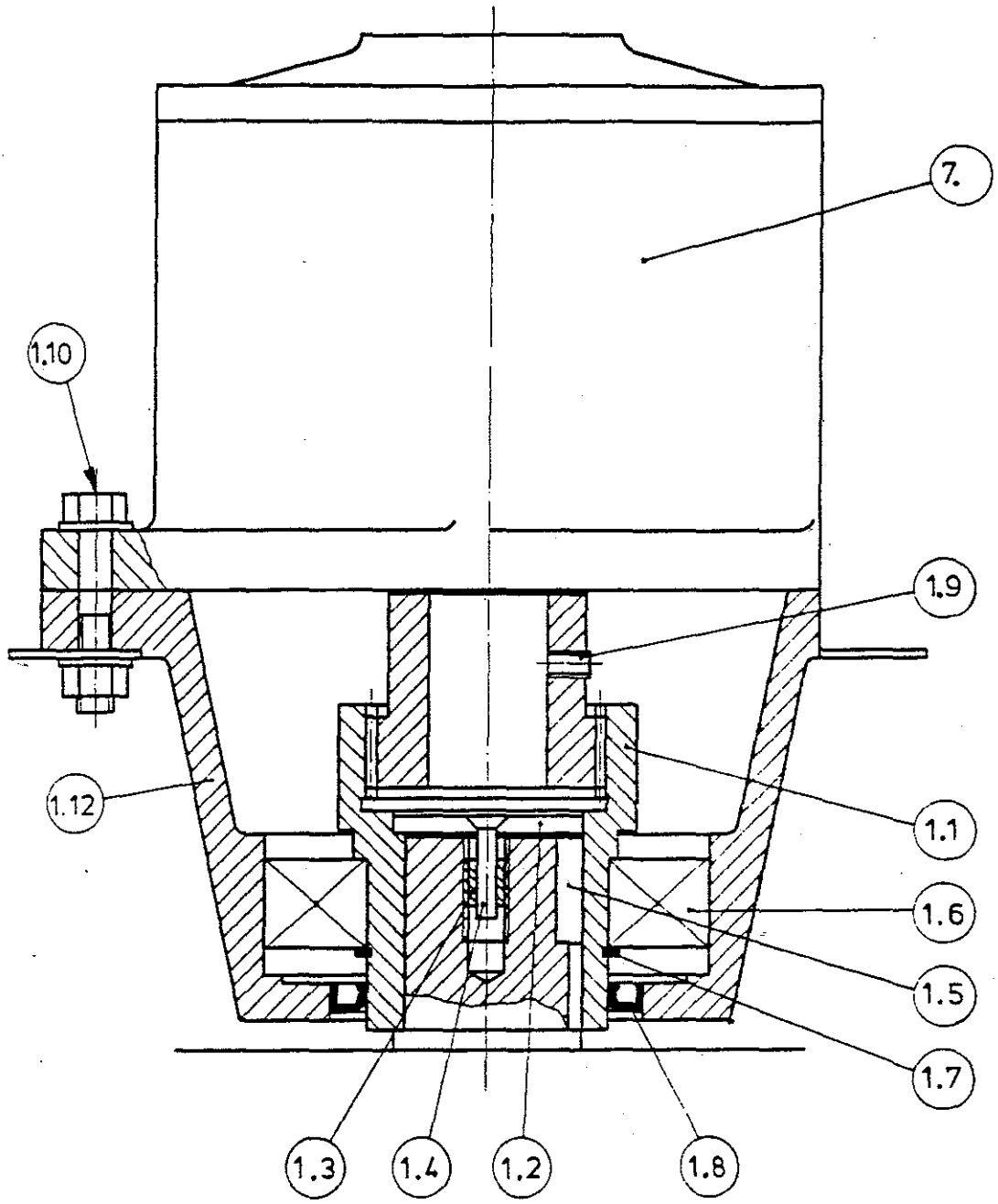


SABROE	Målestok	Tegn. af	
	×	Kalk. af	
		Rev. af	
		Ant. af	
PAKDÅSE STOPFBUCHSE PRESS-ÉTOUPE PRENSAESTOPA STUFFING BOX	Erstatning for		
	Nr. 237437		
	Erstattet af		


4.13
4.12
4.29
4.14
4.32
4.26
4.17
4.15
4.31
4.30
4.20
4.23
4.8
4.18
4.7
4.9
4.10
4.3
4.2
4.16
4.27
4.28
4.25
4.1
4.24
4.1
4.18
4.19
4.33
4.8
4.11
4.42
4.21
4.36
4.6
4.21
4.5
4.34
4.35
SABROE
AARHUS · DANMARK
PAKDÅSE
STUFFING BOX
STOPFBUCHE
PRESS-ÉTOUPE
PRENSAESTOPA
X
Nr. 228496


Snit A-A
Snit B-B
A
B
6.4
6.5
6.6
6.7
6.8
6.9
6.10
6.11
6.12
SABRØE
237435
Variator type SE-13 og gear type SU 250 A
Variator type SE-13 and gear type SU 250 A
Variator typ SE-13 und Getriebe typ SU 250 A
Variateur type SE-13 et engrenage type SU 250 A
Rueda variable de correa trapecial SE-13 y engranaje SU 250 A
10/2-87 mel


6.17
6.18
6.15
6.16
6.20
6.15
Snit A-A
SABROE
237434
Snittegning af snekkegear type SVF 600 L
Sectional drawing of worm gear type SVF 600 L
Querschnittszeichnung von Schneckengetriebe typ SVF 600 L
Dessin de section d'engrenage à vis sans fin type SVF 600 L
Dibujo de corte de engranaje helicoidal SVF 600 L
10/2-87 mel
B
A
6.19
A
B
6.14
6.14
6.13
Snit B-B



SABROE
ÅRHUS - DANMARK

Mærenr.: Tegnet af MBD 86.05.11
Kalkuleret af
Revideret af
Anlaget af

Snittegning af øverste leje og kobling
Sectional drawing of top bearing and coupling
Querschnittzeichnung von oberlager und kupplung
Dessin de section de palier superieur et accouplement

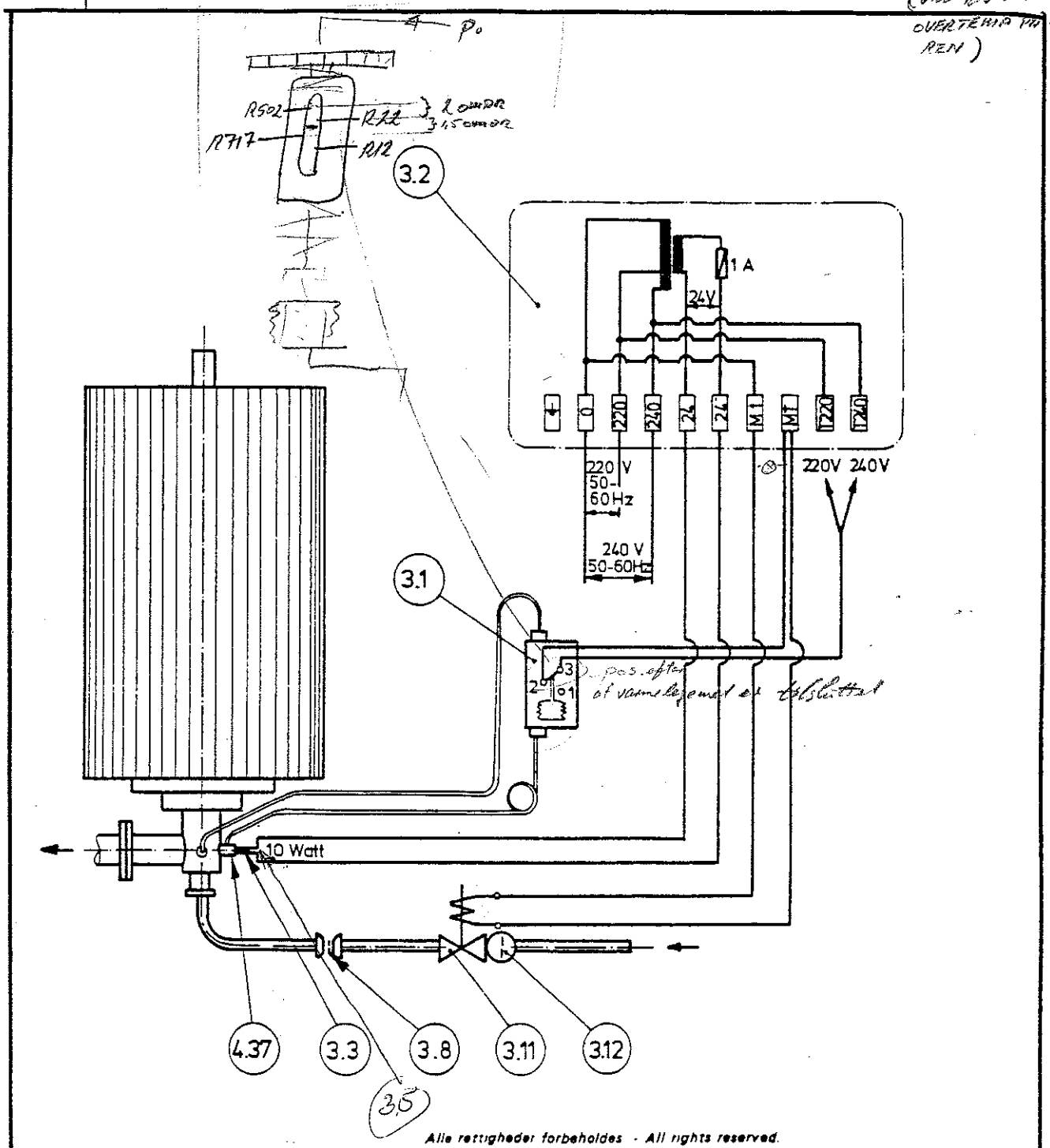
Erstatning for ATLAS. F200888

Nr. 237429

Erstatning af

Dibujo de corte del cojinete superior y acoplamiento

FOR: FJEDERSPÆNDING AFTAGER → VENTILEN ÅBNER HURTIGERE (UDEN EN MINDRE OVERTEMP PÅ FØLEREN)



SABROE
ÅRHUS · DANMARK

Målestok	Tegnet af MBO 861111
	Kalkuleret af
	Revideret af
	Anlagt af

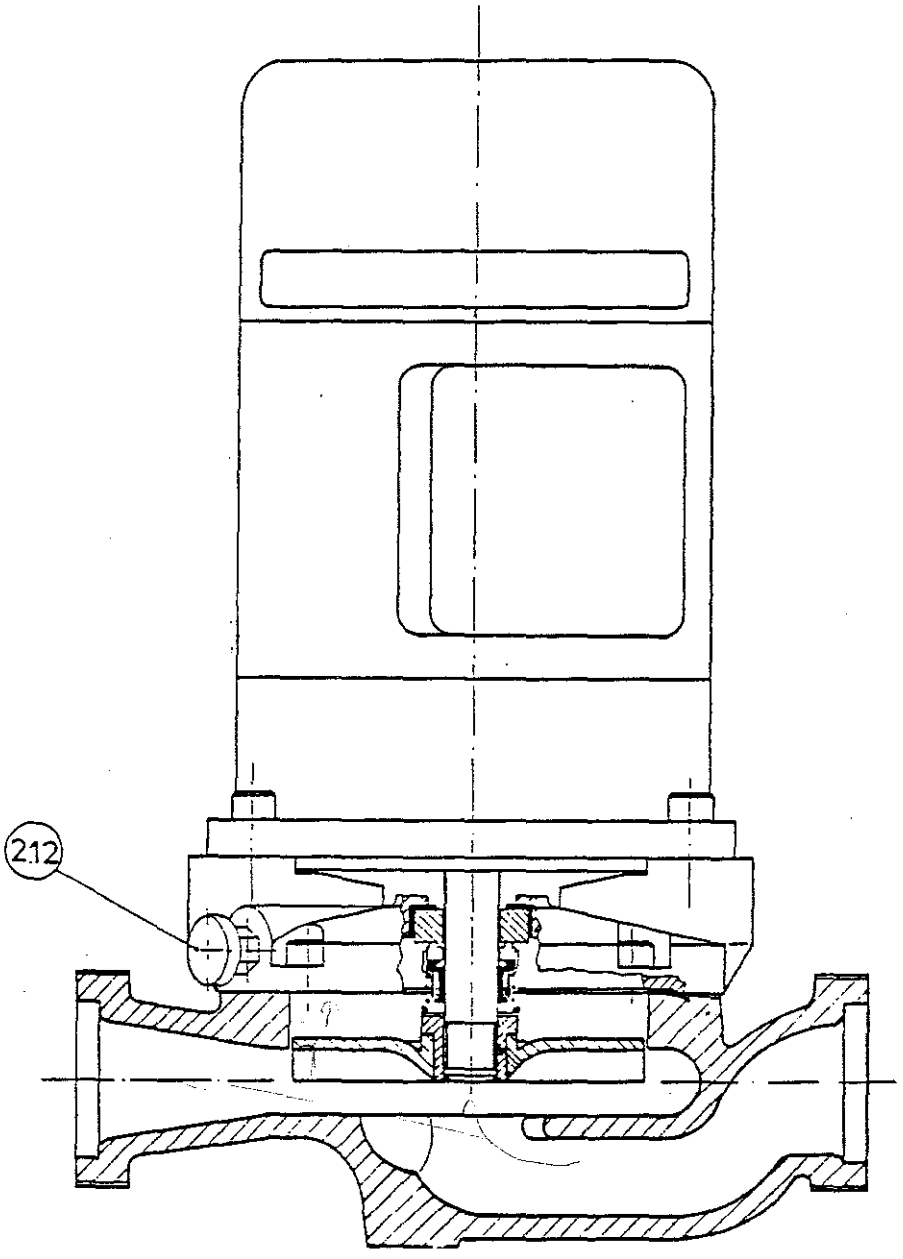
El-Diagram for kølemedieregulering
Wiring Diagram for regulation of refrigerant
Schaltschema für kältemittelregelung
Diagrama electrico para regulacion del medio refrigerante
Schema des connexons pour reglage de eluide frigorigene

Erstatning for ATLas nr. F 162587

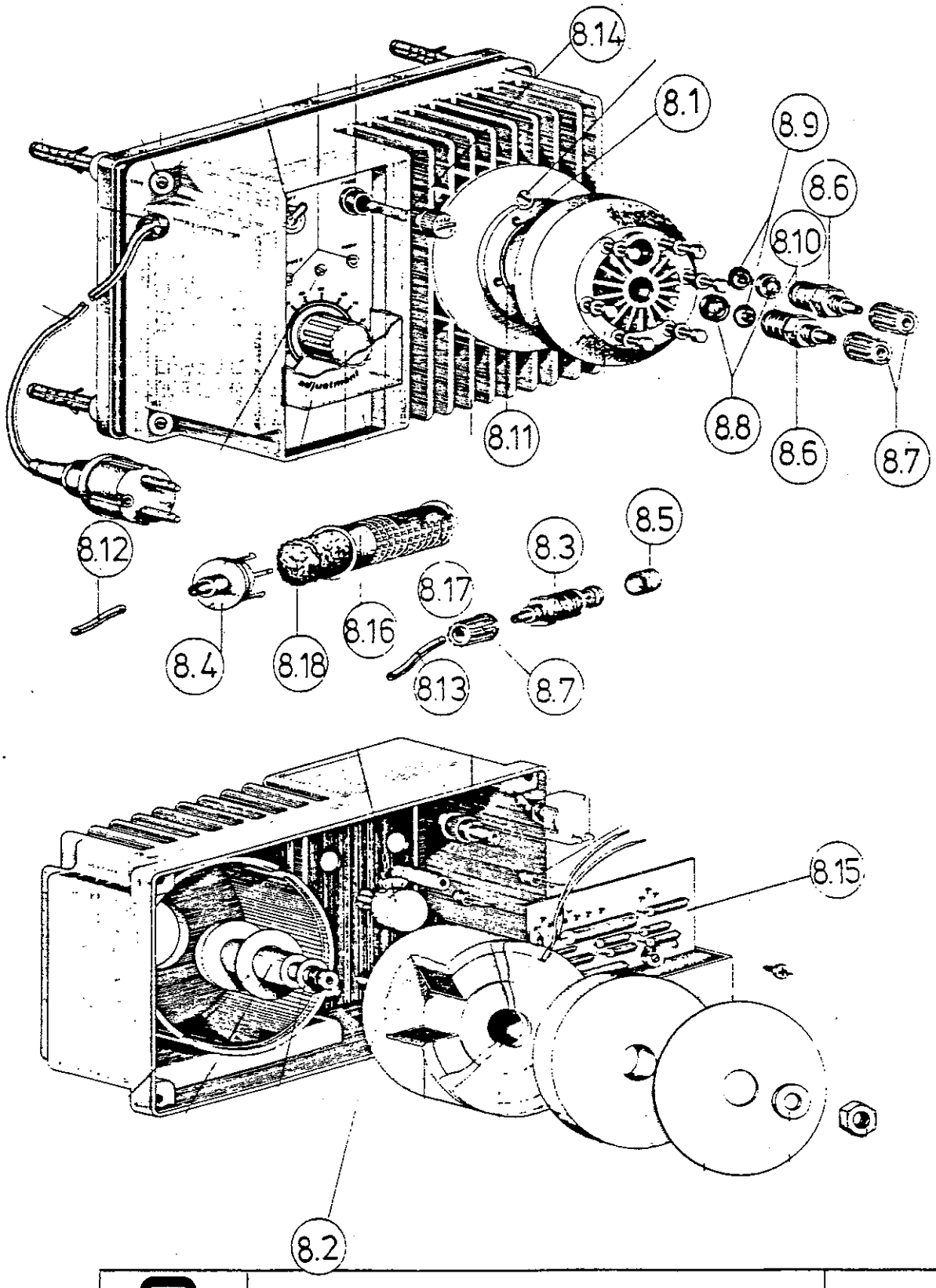
Nr. 237433

Erstatning af

1993-031



	Snittegning af vandpumpe type 200 T Sectional drawing of waterpump type 200 T Querschnittzeichnung von Wasserpumpe typ 200 T Dessin de section de pompe a eau type 200 T Dibujo de corte de bomba de agua 200 T	SABROE
10/2-87 mel		237431



	Saltdoseringspumpe type C 05 10 Salt dosing pump type C 05 10 Salzdosierungspumpe typ C 05 10 Pompe de dosage de sel type C 05 10 Bomba de dosificacion de sal C 05 10	SABROE
9/2-87 mel		237438

INSTRUCTIONS

RT 280A

17R9516

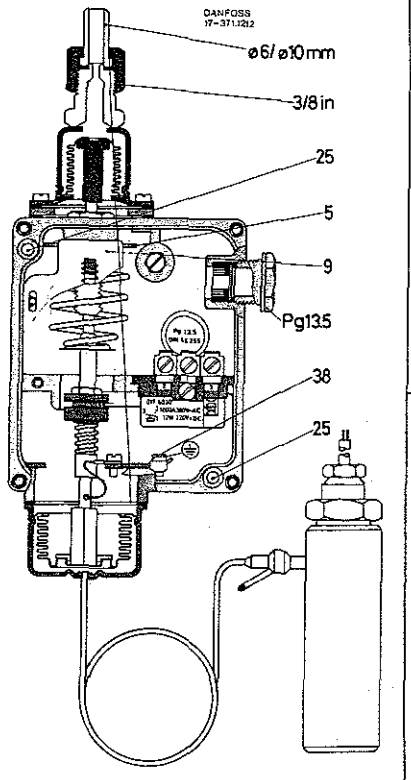


Fig. 1

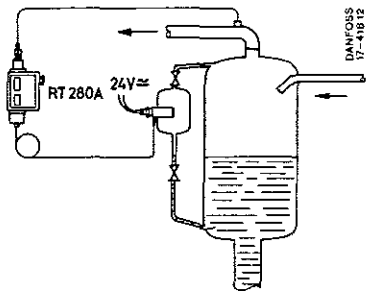


Fig. 2

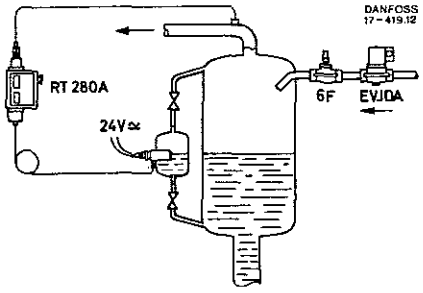


Fig. 3

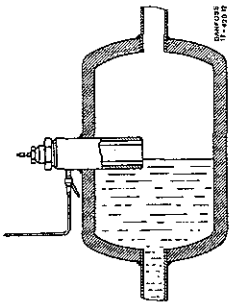


Fig. 4

	R ~ Ohmsk	L ~ Induktiv	⎓
3 / 2 / 1	10 A 380V	4 A* 380V	12W 12-220V

* START 30A

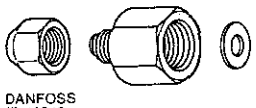
Ⓓ Ⓝ Sähkötarkastuslaitos, Suomi.

DANFOSS
17-447.10

Fig. 5

Pg 13,5 × 3/8 in – UNF: **631X4547**

Fig. 6



3/8 in × 1/4 in: **993N3551**

Fig. 7

DANSK

Sikkerhedsafbryder Niveauregulator

TEKNISKE DATA

1. Generelt
Kølemidler: R 12, R 22, R 502, R 717 (NH_3)
Funktionsområde:
R 12: −50°C – +10°C
R 22, R 717: −50°C – 0°C
R 502: −65°C – − 5°C
Niveaudifferens: max. ± 40 mm
Kapsling: IP 66 i h. t. IEC 144 og DIN 40050.
Kontaktbelastning: Se fig. 5
START 30 A = max. belastning ved indkobling af motor.
Kontaktsystemet opfylder betingelserne som anført i VDE, klasse II.*

* VDE = Verband Deutscher Elektrotechniker.

2. Termostatisk element
Adsorptionsfyldning
2 m kapillarrør
Max. till. følertemp.: +60°C.

3. Varmefører
Varmelegeme 15 W for 24 V jævn- og vekselstrøm 1,5 m tilslutningskabel.

4. Trykelement
Tryktilslutning: 3/8 RG med ø6/ø10 mm svejsenippel
Max. prøvetryk: 25 ato.

MONTERING. Se fig. 2, 3 og 4

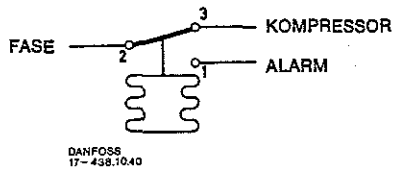
Benyt monteringshullerne (25).
Svejsebøsningen monteres vandret, således at følerens underkant er i højde med max. tilladeligt væskeniveau (fig. 2) eller ved anvendelse som niveauregulator i højde med det ønskede væskeniveau (fig. 3).

Følerens varmelegeme tilsluttes 24 V jævn- eller vekselstrøm. Det vil derfor i de tilfælde, hvor 24 V jævn- eller vekselstrøm ikke er til rådighed, være nødvendigt at anvende en transformer.
Vigtigt: Følerens varmelegeme skal være konstant indkoblet, når strømforsyningen til anlægget er sluttet.
Ved opstart af anlægget efter driftsstilstand anbefales det at lade varmelegemet være indkoblet i få min., inden kølekompressoren startes.
Er fordampningstemperaturen – og dermed referencetrykket – større end max. områdetemperatur, vil RT 280A registrere dette, som om væskeniveauet er for højt.
Trykelementet tilsluttes således, at elementtrykket (referencetrykket) svarer til trykket i den beholder, hvor varmeføleren er anbragt.
Af hensyn til eventuelle pulsationer hidrørende fra væskeindsprøjtningen bør tryktilslutningen placeres længst muligt væk fra væsketilgangsrøret.
Tilslutningen anbefales monteret direkte på beholderens top eller på sugeledningen umiddelbart efter beholderen.
Under forhold, hvor kraftige pulsationer kan forekomme, anbefales det at indskyde en dæmpedyse i trykledningen til elementet.

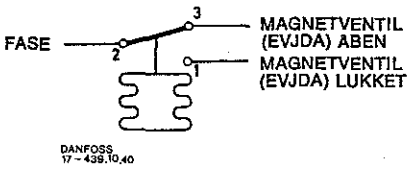
TILBEHØR. Se fig. 6 og 7

EL-TILSLUTNING

a. Sikkerhedsafbryder fig. 2):



b. Niveauregulator (fig. 3):



Kabeldiameter: 6 til 14 mm
Jordforbindelse tilsluttes jordskruen (38).

INDSTILLING

Indstillingen til det ønskede kølemiddel foretages ved at dreje den indvendige indstillingsskive (5) ud for det på skalaen (9) angivne mærke for det pågældende kølemiddel.

ENGLISH

Safety cut-out Liquid level control

TECHNICAL DATA

1. General
Refrigerants: R 12, R 22, R 502, R 717 (NH_3)
Function range:
R 12: −50°C – +10°C
R 22, R 717: −50°C – 0°C
R 502: −65°C – − 5°C
Liquid level differential: Max. ± 40 mm (± 1½ in)
Enclosure: IP 66 to IEC 144 and DIN 40050.
Rating: See Fig. 5.
START 30 A = max. rating during inrush.
The switch complies with conditions as specified in VDE, Class II.*

* VDE = Verband Deutscher Elektrotechniker.

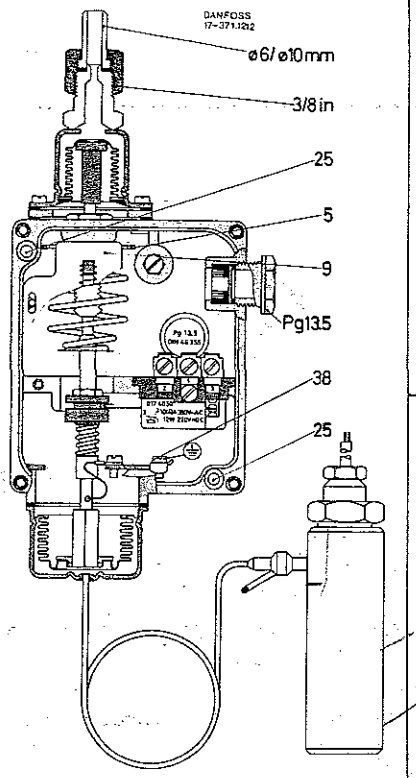


Fig. 1

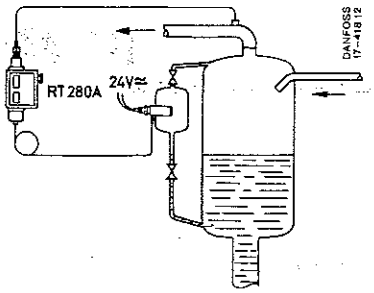


Fig. 2

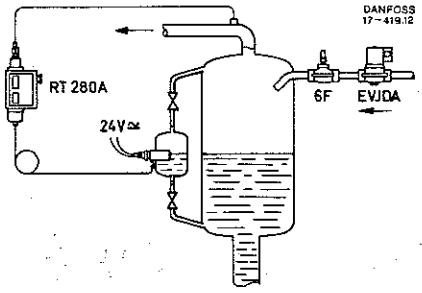


Fig. 3

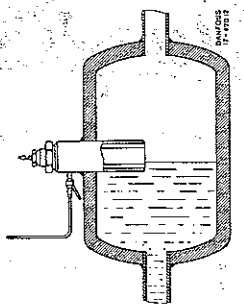
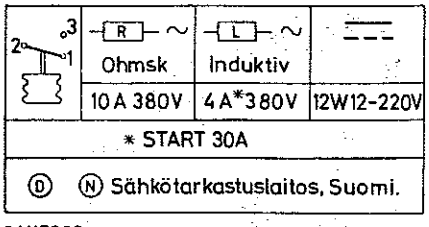


Fig. 4



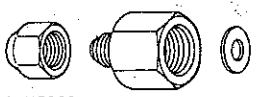
DANFOSS
17-447.10

Fig. 5

DANFOSS
17-149.10

Pg 13,5 × 3/8 in – UNF:
631X4547

Fig. 6



DANFOSS
17-146.10

3/8 in × 1/4 in: **993N3551**

Fig. 7

2. Power element
Adsorption charge
2 m (6.6 ft) capillary tube.
Max. permissible bulb temperature:
+60°C (+140°F)

3. Heat-sensing element
Electric heater 15 W for 24 V d. c. and a. c.
1.5 m (5 ft) cable.

4. Pressure element
Pressure connection: 3/8 BSP with ø6/ø10 mm (ø15/64 to ø25/64 in) weld nipple.
Max. test pressure: 25 atm.g. (356 psig).

FITTING. See Figs. 2, 3, and 4

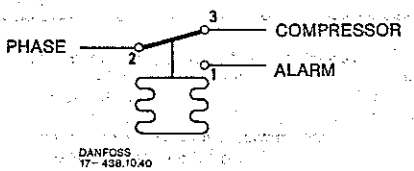
Use the mounting holes (25).
The weld bushing should be mounted vertically so that the lower edge of the bulb is at the same height as the max. permissible liquid level (Fig. 2) or, when used as a liquid level control, at the same height as the liquid level required (Fig. 3).

The electric heater of the bulb should be connected to 24 V d. c. or a. c. When 24 V d. c. or a. c. is not available, it will, therefore, be necessary to use a transformer.
Important: The electric heater of the bulb must be constantly cut in when the current supply to the system is on.
To start up the system after standstill, it is recommended that the electric heater should be cut in for a few minutes before starting the refrigeration compressor.
If the evaporating temperature – and with it the reference pressure – is greater than the max. range temperature, the RT 280A will register this as if the liquid level were too high.
The pressure element should be connected in such a way that the element pressure (reference pressure) corresponds to the pressure in the vessel in which the heat-sensing element is located.
With regard to any pulsations originating from the liquid injection, the pressure connection should be located as far away from the liquid supply pipe as possible.
It is recommended that the connection should be directly to the top of the vessel or the upper side of the suction line immediately after the vessel.
Under conditions where strong pulsations may occur, it is recommended that a damping orifice should be inserted in the delivery line to the element.

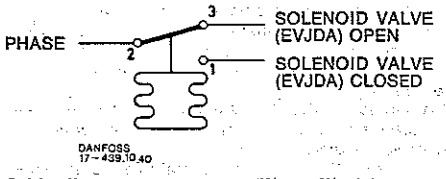
ACCESSORIES. See Figs. 6 and 7

MAINS CONNECTION

a. Safety cut-out (Fig. 2):



b. Liquid level control (Fig. 3):



Cable diameter: 6 to 14 mm (15/64 to 36/64 in).
The earth terminal (38) should be connected to earth.

ADJUSTMENT

Adjustment to the refrigerant required is effected by setting the internal setting disc (5) at the mark indicating the refrigerant in question on the scale (9).

DEUTSCH

Sicherheitsschalter Niveauregler

TECHNISCHE DATEN

1. Allgemeines
Kältemittel: R 12, R 22, R 502, R 717 (NH_3)
Funktionsbereich:

R 12:	−50°C – +10°C
R 22, R 717:	−50°C – 0°C
R 502:	−65°C – + 5°C

Niveaudifferenz: max. ± 40 mm
Schutzart: IP 66 nach IEC 144 oder DIN 40050.
Kontaktbelastung: Siehe Abb. 5
START 30 A = max. Belastung beim Einschalten des Motors.
Das Kontaktsystem genügt den Bedingungen der Prüfklasse II nach VDE.

2. Das thermostatische Element
Adsorptionsfüllung
2 m Kapillarrohr
Max. zul. Fühlertemp.: +60°C

3. Heizkörperfühler
Heizkörper: 15 W, für 24 V Gleich- und Wechselstrom.
1,5 m Anschlusskabel.

4. Druckelement
Druckanschluss: R 3/8 mit ø6/10 mm Schweissnippel.
Max. Prüfdruck: 25 atü.

MONTAGE: Siehe Abb. 2, 3 und 4

Montagelöcher benutzen (25).
Die Schweissbuchse ist waagerecht zu montieren, wobei die Unterkante des Fühlers in der Höhe des max. zulässigen Flüssigkeitsniveaus (Abb. 2) oder, bei Verwendung als Niveauregler, in der Höhe des gewünschten Flüssigkeitsniveaus (Abb. 3) liegen soll.
Der Heizkörper des Fühlers ist an 24 V Gleich- oder Wechselstrom anzuschliessen. In Fällen, wo kein 24 V Gleich- oder Wechselstrom verfügbar ist, wird es also notwendig sein, einen Transformator einzuschalten.
Wichtig: Der Heizkörper des Fühlers muss konstant eingeschaltet sein, wenn die Stromversorgung der Anlage geschlossen ist.
Bei der Inbetriebsetzung der Anlage nach einem Betriebsstillstand wird empfohlen, den Heizkörper einige Minuten vor dem Anlassen des Kältekompressors einzuschalten.
Ist die Verdampfungstemperatur – und somit der Referenzdruck – höher als die max. zulässige Bereichstemperatur, so wird RT 280A dies so registrieren, als ob das Flüssigkeitsniveau zu hoch wäre.
Das Druckelement ist so anzuschliessen, dass der Elementdruck (der Sollwertdruck) dem Druck im Behälter, in dem der Heizkörperfühler angebracht ist, entspricht.
Aus Rücksicht auf etwaige von der Flüssigkeitseinspritzung herrührende Pulsationen sollte der