HOYER
ALFA-LAVAL GROUP

INDEX
KF 1200 XC

THE HOYER TECHNICAL DOCUMENTATION IS ORGANIZED IN THE FOLLOWING WAY:

	CONTENTS	INTENDED FOR
1) ID INSTALLATION DATA	INSTALLATIONS, DIMENSIONAL SKETCHES, TECHNICAL DATA	PROJECT AND WORKS ENGINEER, DESIGNER, ELECTRICIAN
2) OM OPERATOR'S MANUAL	DAILY OPERATION AND MAINTENANCE	MACHINE OPERATOR
3) MR MAINTENANCE AND REPAIR	LUBRICATION CHART, MOUNTING, DISMOUNTING, ADJUSTMENTS, REPAIRS	OPERATING PERSONNEL
4) SPC SPARE PARTS CATALOGUE	DRAWINGS AND SPARE PARTS LIST	OPERATING PERSONNEL BUYER

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HOYER
ALFA-LAVAL GROUP

IMPORTANT SAFETY INFORMATION

This Hoyer machinery is specially designed and constructed to meet the large requirements of reliability of operation.

WARNING!

While the machinery is working, it must be operated by specially trained staff correctly placed at the individual operating sections. The staff must only operate the machinery by means of the handles, knobs, buttons, etc. in question.

- NEVER let any parts of the body (arms, hands, fingers, etc.) come into contact with moving parts/products while the machinery is working!
- In the event of any obstacles in the production flow, these must NEVER be eliminated by hand unless the external connections (air, power, etc.) of the machinery have been cut off!
- NEVER open to the inside of the machinery, NEVER remove protecting screens, and NEVER at all touch any moving parts - unless the external connections of the machinery have been cut off, and the machinery has stopped completely! All external connections are to remain cut off during the whole period of servicing!

NOTE!

The following conditions must be fulfilled before starting-up:

- All operators must be given thorough instructions and be informed of possible working and operating errors and their remedies.
- Special attention must be paid to critical points in the production cycle.
- All operators must be informed of the position of the emergency stop button and of other safety measures.
- All machine parts must only be used as specified in the instruction manual.

HOYER
ALFA-LAVAL GROUP

IMPORTANT
SAFETY INFORMATION

SAFETY FOR KF:

In addition to the general safety information on page 0 we draw special attention to the following points regarding the KF:

WARNING

1. It is dangerous to remove the inspection doors when the freezer is in the CIP program because the chain drive and belt drive will start without emitting signals.

2. If it requiered to inspect the belt drive or the chain drive, make sure that nobody starts the freezer.

LOCKS

As a further step to enchange safety, the side doors of this KF feature lock for effective locking off with key.

Furthermore, the rear inspection door above the belt drive is fitted with a door switch.

UNCOUPLING DURING OPERATION

If the rear inspection door is removed during operation, the main motor will stop.
KF-XC models: Error display will flash "98".

AUTO-THAWING (Optional)

In case "cold" has been in operation, the auto-thawing function is also started.

SERVICE

During installation of KF or if the main motor has been replaced, the main motor must run without inspection door because it is necessary to check the direction of rotation.
This work must only be carried out by an authorized electrician who can shortcircuit the door switch correctly at his own risk.

GENERALLY

This KF machine is built with a view to simplification of the daily/weekly/monthly maintenance.

This is why lifetime lubricated bearings have been used where it is proper (e.g. by the main shaft and to a certain extent electric motors and pumps) and thus the extent of lubrication has been decreased essentially.

Besides, the components of the KF are intended for min. 4000 hours' operation on the conditions that the maintenance instructions given are observed carefully.

Furthermore, we recommend the keeping of a REPORT BOOK for the machine. From such a book not only production irregularities, but also the reason for these and how they are remedied and the dates and the initials of the responsible persons involved can be seen.

Such a report book must be checked weekly, and irregularities, if any, are to be discussed with the persons involved, and facts established are to be registered, perhaps on a machine card for the machine in question.

THE COMMISSIONING PERIOD

During the first time, i.e. approx. 3 months at 40 hours' operation/week after the starting-up of a new machine (this partly also

applies after a radical overhaul), the operation must be supervised with sharpened attention and besides what is prescribed under point 1 the following must be taken care of:

a) AS REQUIRED
- Adjustments of mechanical as well as pneumatic functions.

b) DAILY
- Control of all functions (also e.g. possible leakages in the pipe systems) perhaps in concert with the person responsible for the machine (production personnel).

c) After 1-2 months' operation all screws and studs are to be checked and, if necessary, tightened up and also all the pipe connections as the vibrations of the machine, new temperature conditions, etc. may demand this.

THE OPERATION PERIOD

The following check list is based upon 8 hours' operation/day.
By 2- or 3-shift operation, the time intervals must be reduced correspondingly:

a) DAILY
- Cleaning in accordance with the instructions in the operators' manual ("OM").

- Air system (pressure, water content, purity, etc.)
- Lubrication acc. to the lubrication instructions.

b) WEEKLY
- The axial working clearance of the KF-pumps is to be checked and, if necessary, the pumps must be adjusted (consult the manual "KF-PUMPS", chapter "adjustment").
- Lubrication acc. to the lubrication instructions.
- Empty the refrigeration system of oil.

c) MONTHLY
- Inspection of the dasher, beater, and scraper blades to establish, if the cleaning is satisfactory, and how the condition of as well bushes as scraper-blades and the shaft seal is.
- Inspection of the gear-wheels inside the pumps to establish, if the cleaning is satisfactory and if the carbon bushes are in good condition (consult the manual "KF-PUMPS", chapter "carbon bushes").
- Lubrication acc. to the lubrication instructions.

d) EVERY 3 MONTHS
- Dismantling and manual cleaning of all internal, moving parts of the freezing cylinder and the pumps to remove remaining lime deposit from rinsing water

	if necessary (consult the manual OM, chapter "cleaning programme"). - Check if the level control system for the refrigerant-liquid supply is working satisfactorily. e) EVERY 6 MONTHS - Air filter to be cleaned. - Check and adjust all functions (mechanical, pneumatical, and electrical).
OUTSIDE THE OPERATION PERIOD	By a period of about 1 month or longer without any production the following must be observed carefully: - Check all functions (mechanical, pneumatical, and electrical). - Empty the oil from the refrigeration system. - Check the refrigeration system. - Lubricate all parts. - Check the oil level in the gear box on the pump drive. - Condensate in the external air system of the KF machine to be removed.
OVERHAUL	Can e.g. be done in accordance with below-mentioned instructions:

a) FREQUENCY

a.a) Approx. every 4000 operation hours.

- compressed-air system (sleeves, O-rings, etc.).
- critical wearing parts (sleeve bearings, sleeves, chains, etc.).

a.b) Every 10,000 operation hours.

- ball bearings.

a.c) As required (i.e. every 4,000-10,000 operation hours or more).

- special wearing parts (e.g. shaft seal on the dasher, knives, pump-wheels, etc.).
- parts (electric, air, or mechanical parts) which due to unnormal circumstances have become defective.

b) PROCEDURE

b.a) Necessary spare parts for the overhaul are determined as follows:

- close-down and other irregularities taken down in the REPORT BOOK OF THE KF to be analysed.
- the KF to be watched under normal operation conditions.
  Irregularities, if any, to be taken down and perhaps linked up with information from the operating personnel.
- when the KF is out of operation, possible reasons for this are to be confirmed or established.
  Besides, all movable parts are to be examined for wear (slackness in bearings and bushes, and perhaps cutt-

ings, etc.) and other conditions that may demand replacement or repair.

b.b) Necessary spare parts to be ordered.
The time for service and delivery will depend very much on the time of the order.
The shortest delivery time is obtained by order immediately before the end of the ice-cream season.
When ordering, please inform us of the following:
- number of the machine and year of manufacturing (see the name plate).
- Drawing number, position number, and part number of the spare parts in question and the number of these.

SEE ALSO THE "PREFACE" OF THE SPC.

b.c) Preparations for overhaul.
- Depends on whether the KF is already out of operation or whether it must be in operation as long as possible before the overhaul.

b.d) OVERHAUL
- Dismounting of the KF is to be done by the erector who is to take care of the overhaul (also if the erector comes from Hoyer).
- During the overhaul not only the erector who is responsible for the

overhaul but skilled and unskilled labour as well will be needed, depending on the extent and the character of the work.

b.e) Adjustment and test runs to be made. - partly without refrigeration and products.
- partly under normal operation conditions.

b.f) Transfer for production.
- When the KF has been checked and everything found in order.

DISCHARGING THE REFRIGERANT CHARGE

(See drw. No. TD 1-2 and Hoyer 5 or 6)
If repairs of the refrigerating system of the freezer are to be made, its refrigerant charge must be discharged.
Depending on the kind of refrigerating system the discharging can be made as follows:

WITH JOINT LIQUID SEPARATOR

a) PUMP CIRCULATION (freezer without drain tank, Hoyer 6)

- Every time the freezer is stopped (i.e. by instant stop or every time the selector is turned to another programme), the freezing is interrupted and the refrigerant completely discharged from the freezer.
- DISCHARGE CHECK is always to be done, to be sure that no refrigerant is left in the freezer (see below).

b) GRAVITY RECIRCULATION (freezer with drain tank, Hoyer 5)

- Raise the pressure in the freezer to 3-5 bar (43 - 72 psi) by using hot gas after which the hot gas valve (19) is to be closed.
  Please consult the OM Manual, paragraph "MANUAL THAWING".
- Open the evacuation stop valve (7).
- Wait till the pressure in the freezer has dropped to suction pressure.
- Close the stop valve (6) in the liquid line.
- Start freezing.

- DISCHARGE CHECK is always to be done, to be sure that no refrigerant is left in the freezer (see below).

WITHOUT ANY PROTECTION AGAINST LIQUID IMPACT AT THE COMPRESSOR

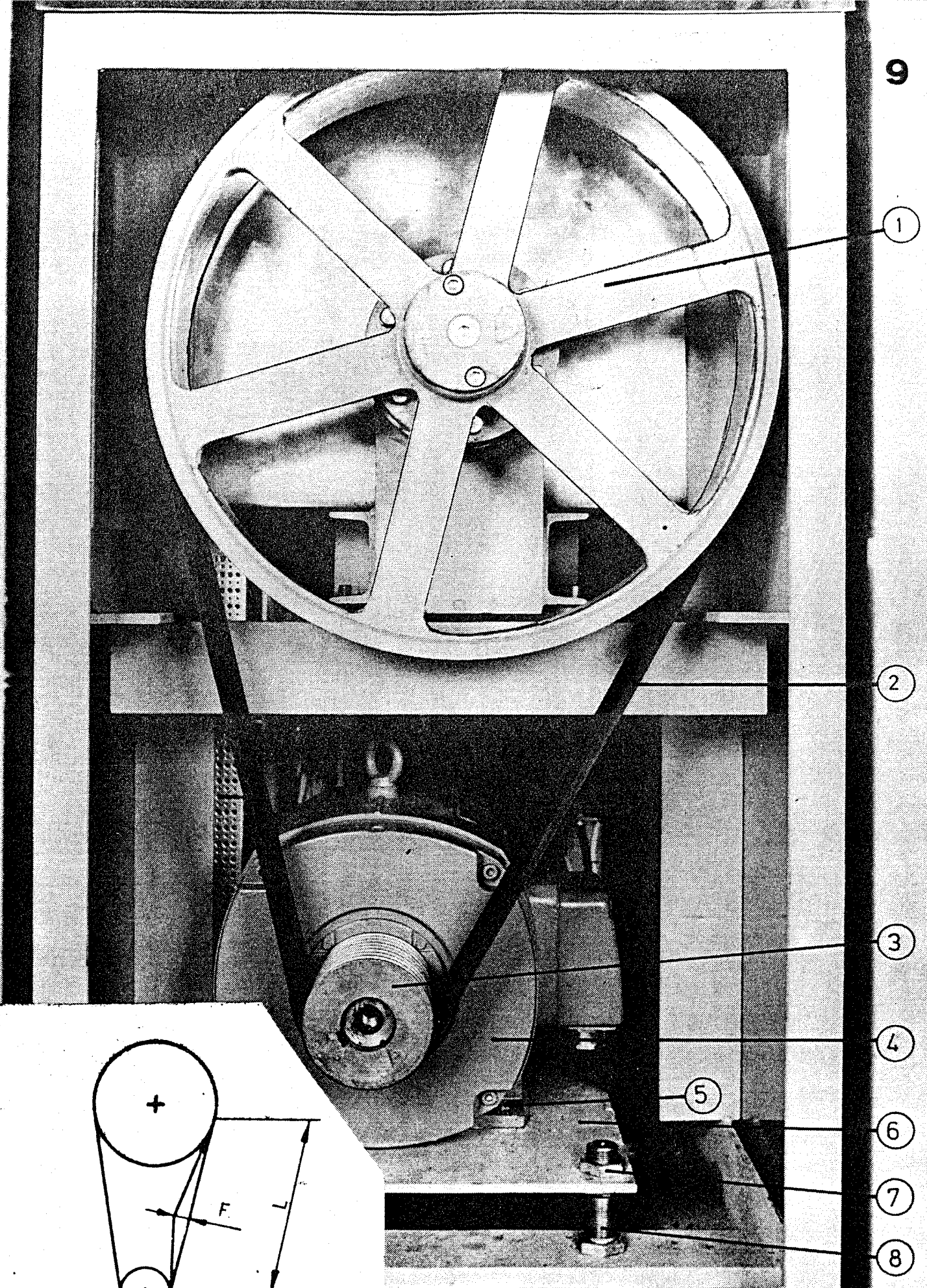
GRAVITY RECIRCULATION (freezer with drain tank, Hoyer 5).

- Close the liquid stop valve (6) and the hot gas stop valve (19).
- Start freezing.
- The time required for evacuation will be 10-15 hours.
- The evacuation can be accelerated by heating the cylinder, the emptying vessel and finally the bottom of the oil sump, using hot water.

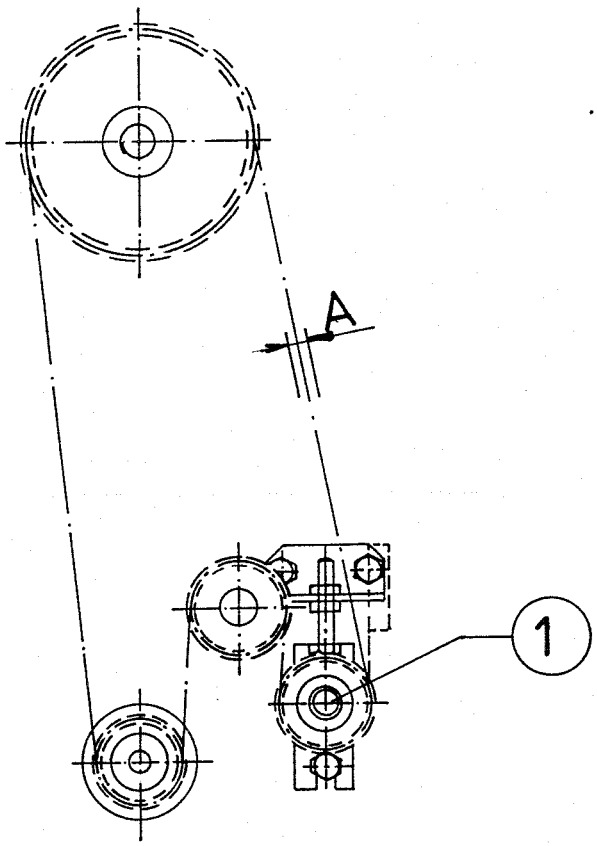
DISCHARGE CHECK

To be sure that no refrigerant is left in the freezer the following must be done:

- when the pressure is at suction value, see manometer, the discharge valve (drw. Hoyer 6 pos. 7) closes, and the pressure is noted.
- After about 5 minutes the pressure is to be read again.
- If the two values are identical, it can be established that there is no more refrigerant left in the freezer.
- If not, the discharge is to be opened and the check procedure is to be repeated.



MR 2



MR 1

ADJUSTMENTS:
CHAIN DRIVES:

(See drw. No. MR 1 on opposite page)

KF-PUMPS

It is important that the chain drive is always well adjusted.
The adjustment is to be made by the chain adjuster (pos. 1), when the value A exceeds 10 mm by the chain adjuster (pos. 1).

NOTE!

If the chain drive has been out of operation for a period of time, it will always be slacker than just after it has operated for some time, because lubricating oil in the chain makes it even tighter during operation. Thus adjustment is always to be done just after lubrication and after the chain has been in operation for a few minutes. After adjustment the value A must be about 6 mm.

SPEED REGULATION

If the slackness of this chain is too big (i.e. the A-value for this chain exceeds 15 mm), it must be replaced with a new chain.

V-BELT DRIVE

(See drw. No. MR 2 on opposite page)
In order that the V-belt drive can operate effectively and have a long life time, it is important that the belts have identical and correct belt tension.
Using spring scales, a belt is pulled F mm away from its position of rest, when it is pulled with a power K.

$$F = \frac{\text{Span } L}{67}$$

Ex. L = 600 mm.

$$F = \frac{600}{67} = 9\text{mm}$$

The table below shows Kmin and Kmax for the V-belt types in question:

	Kmin (kp)	Kmax (kp)
Conv. profile A	0,6	0,9
Profile SPZ	2	3
Profile SPA	4	5

For identifying the used V-belt type, see SPC manual.

(The freezers KF 1150 and KF 1200 use V-belts of the types A and SPZ and the KF 1200XCE the SPA-type).

Belt tension adjustment is made by using the adjustment nuts (pos. 7) keeping the main motor plate. Whether the belts have identical tension is checked by measuring the power K, first on the outer belt and then on the inner belt. If the two measurings provide the same result, the belt tension is identical.

AIR FILTER

has to be replaced once a year.
(drw. No. Hoyer 8 or 9, pos. 20)

SCRAPER BLADES
MR 3

(See drw. No. MR 3 on opposite page)
In order that the freezer can operate at a satisfactory capacity and stability, the scraper blades must be sharpened correctly. The sketch on opposite page shows a scraper blade in working position in the cylinder. When the width of the scraping edge is larger than 0.5 mm, the scraper blades must be sharpened. The sharpening can only be done correctly by machine.

The scraping edge is not to be totally removed. 0.1- 0.2 mm is to be left.

The sketch MR 3 shows a correctly sharpened scraper blade.

CYLINDER

(See drw. No. Hoyer 3)
THE REFRIGERANT MUST HAVE BEEN DISCHARGED.
See sectional drawing of the freezing cylinder with rotor as well.

REMOVAL OF CYLINDER:

1) Remove the front cover and pull out the mutator carefully (consult the OM manual on the removal of the mutator).
2) Remove the rear cylinder cover.
- (KF 1200 only).
Remove also the lock ring (32), the clamp ring (31), the pack ring (29), the O-ring (28) and the neck ring (27).
3) Unscrew the sockets of the screws holding the front cover, and remove the cover ring and the O-ring.
4) Remove screws of the cylinder, eight screws with the inside hexagons through the cylinder flanges.
5) Using two 70 mm long set screws (thread = M14) screwed into the two extra threaded holes of the cylinder flange and thus acting as a jack, the cylinder is then pulled out of the cooling jacket.
The cylinder is to be rested on paper or similar to prevent it from damages.

REPLACING OF CYLINDER

Prior to replacing of the cylinder in the cooling jacket, the bearing surfaces must be cleaned and possible burrs removed, the O-rings must be greased with grease (Index 8), any faulty O-rings and gaskets must be renewed. To replace the cylinder, reverse the above procedure of removal.

NOTE!

Be careful not to damage the O-rings during replacement.

LUBRICATION: ROTOR AND BEATER

bearings are made of plastic and should consequently not be lubricated but be replaced when worn (by a play at max. 1 mm).

THE PUMPS

should be lubricated inside with coconut oil or similar each time dismantling has taken place.

Pump bracket and main shaft bearings are factory-lubricated bearings, to be inspected and lubricated with index 8, after every 3.000 hours of operation.

NOTE!

Concerning maintenance and repair, please consult the instruktion manual KF - PUMP.

THE MAIN MOTOR

are normally life-time lubricated (i.e. up to 10,000 hours) and is thus not equipped

	with grease nipples.
NOTE!	It can happen that the motor is equipped with grease nipples. If so it must be lubricated with index 8 every 6 months.
GEAR MOTOR	are lubricated according to the "Stöber" manual in SPC manual. Lubricant index 5.
PUMP CHAIN DRIVES	to be lubricated for every 500 hours of operation or every three months. SEE "LUBRICATION INSTRUCTIONS".

KF 1150XC and KF 1200XC

THE SYSTEM COMPRISES

a) Inlet
b) Operation (Overrun)
c) Starting-Up (Overrun)
d) CIP.

OPERATION DESCRIPTION

(consult the air diagram in ID):

a) INLET of compressed-air from the plant air system is effected through:

POS. 1 stop valve.

POS. 2 Filter with continuous draining of water via

POS. 3 throttle valve direct to the floor. The valve is adjusted for an air bleed-off of approx. 300 l/h.

POS. 4 Reduction valve for adjustment of the inlet pressure set at 7 bar in the workshop.
If the plant pressure is lower than prescribed, for instance 6.3 bar at the freezer, the reduction valve should be adjusted to prevent variations of pressure in the plant air system from influencing the air dosing for the overrun.
The inlet pressure is checked by

POS. 45 manometer.

POS. 16 Reduction valve for starting-up air is equipped with a continuous "bleed-off" of approx. 300 l/h to ensure safe operation.

b) OPERATION - system for dosing of air for the cylinder under normal production consists of the following:

POS. 8 Reduction valve for air for dosing of the air required for overrun.
The valve is of the same type as the reduction valve (4), but servo-controlled by a motor.
The air quantity dosed in l/h may be read on the display placed on the control panel (see appendix No. D). The corresponding pressure may be read on the pressure gauge. Air for overrun is ON-/OFF-controlled via the solenoid valve for production.

POS. 9 "Critical nozzle" (for low capacity) ensuring that a given pressure before the valve will provide a particular quantity of air.

POS. 10
POS. 11

POS. 27 "Critical nozzle" (additional at high capacity).

NOTE! (Re: pos. 11 and pos. 27)
A given pressure before the nozzle(s) will provide a particular quantity of air as long as the pressure after the throttle valve is low, i.e. below half the pressure before the valve.
When the pressure before the nozzles is changed, there will be a change in the air quantity dosed.
The nozzles are to be fitted in accordance with the arrow.
In case of wrong dosing of air through the "critical" air system, a leakage test must be performed.

POS. 12

When the air system is set for min. capacity (100 l/h for KF 1150 and 200 l/h for KF 1200), the pressure gauge should show a value less than or equal to half the pressure measured on (9).
If the pressure is higher, this may be due to the fact that the "critical" nozzle (11) has been adjusted incorrectly, or that the air compressor (13) has stopped or may be faulty.

POS. 13

The air compressor will provide the right pressure drop over the throttle valve (11).

POS. 14

During operation the pressure gauge for the control of the cylinder pressure should as a rule show 4.5 bar, but max. 6.5 - 7 bar.

POS. 15

The pressure control for the cylinder pressure is set at approx. 8 bar. When the pressure in the cylinder rises above this value, the freezer is automatically set at "INSTANT STOP".
The cylinder pressure may rise on account of:

- wrong pump gearing in relation to the actual overrun,
- failure of pump motor or pumps,
- blockage in the pipe lines.

c) THE STARTING-UP SYSTEM is used to obtain optimum overrun (approx. 50%) during the cooling of the first portion of mix to the temperature required.

POS. 16 The pressure of the air has on reduction valve for "AIR DURING STARTING-UP" (same type as (4)) been adjusted to a pressure of 2 bar, which is read on

POS. 17 pressure gauge for starting-up.

POS. 18 Solenoid valve for air during starting-up (same type as (5)).

POS. 19 Non-return valve for air during starting-up is used as the solenoid valve (18) will not seal against excess pressure at the outlet end.

NOTE! The following position numbers apply both to "STARTING-UP" and "OPERATION".

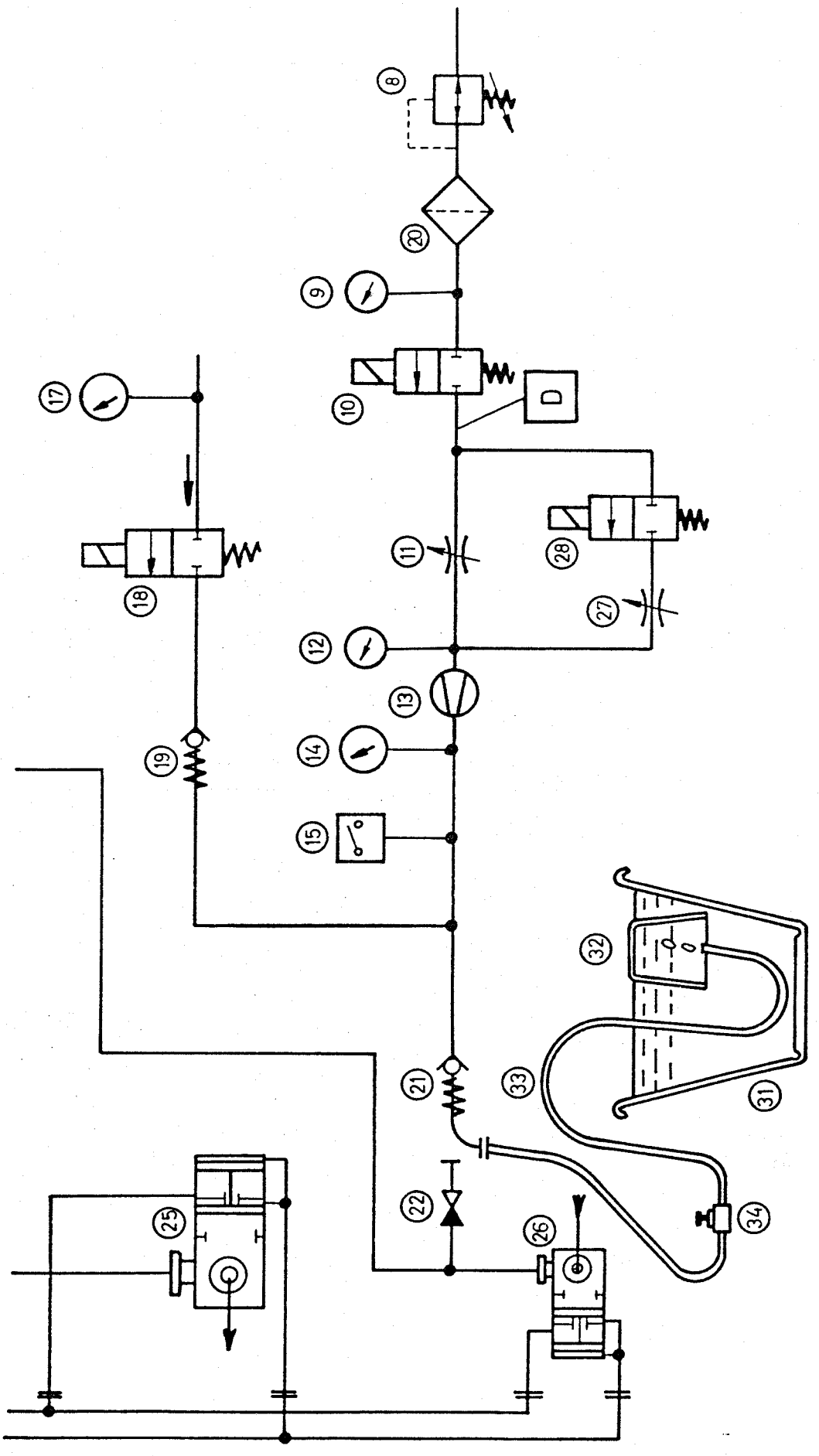
POS. 20 The micro filter type Balston DFU will filter the air of 0.6 micron particles of an effectiveness of 99.9999%. For comparison with the particle size of 0.6 micron we may mention that red corpuscules have a size of 3 micron (Do not forget that the filter should be replaced at least once a year).

POS. 21 The non-return valve is used for extra safety, if the non-return valve (22) should fail.

POS. 22 The milk check valve will prevent the mix from entering the compressed-air system.

POS. 23 d) CIP-system solenoid valve (two-way) for CIP-pumps.

POS. 27 "Critical nozzle" for additional use at high capacity (see pos. 11 and pos. 27 above).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POS. 28	Solenoid valve, which is automatically opened when pre-set capacity and overrun require an air-flow higher than: - 480 litres/h (KF 1200) - 240 litres/h (KF 1150).
POS. 33	M.P.S.-valve. A pneumatically activated valve, which has following functions: - when activated, it regulates the mix flow, - not activated, it bypasses the pumps, pos. 26 and pos. 32, for CIP operation.
POS. 36	Transducer by which the computer measures the inlet pressure at the "critical nozzles".
POS. 39	Contact manometer, which activates information code 12 "INSTANT STOP, OBSTACLES IN PIPING" and starts the instant stop function.
NOTE!	The pre-set value of pressure must never be higher than 1.5 times the minimum pressure of the air plant. At air-plant pressure 7 bar it makes: 1.5 x 7 = max. 10.5 bar.
CHECKING OF THE "CRITICAL AIR SYSTEM"	The following are built on to the panel for the pneumatic system (see the sketch on opposite page. Pos. 111 - Throttle hose clip. Pos. 112 - Tee connector Pos. 113 - Nylon hose. Pos. 114 - Connector. Pos. 115 - Plug.

SET UP

To be done without any voltage to the pneumatic system.

1) Disconnect the tube at "A".
2) Disconnect the other tube at "B".
   - Connector 114 and plug 115 are to be displaced from "C" to the disconnected tube.
3) Disconnect the tube of "D".
   - Connect instead the tube "E" (to the part "D" - "B".)

LEAKAGE TEST

Still without any voltage on the system.

1) Adjust the reduction valve, pos. 16, to 6 bar.
2) Read the pressure at manometer, pos. 17.
3) Clip the tube tight with the hoseclip pos. 111.
4) Adjust the reduction valve, pos. 16, to a minimum pressure.

If the pressure at manometer, pos. 17, keeps constant during 10 to 15 minutes, the system is quite tight. If not the system is leaky. All joints from "G" to "B" and from "B" to "A" are to be tested for leakage by means of soapy water.

After tightening the leakage(s) the leakage test is to be repeated.

NOTE!

If the pressure drops from 6 bar to 5 bar in 1 minute, it corresponds to a leakage waste of about 5 liter/h.

RE-ESTABLISHMENT

When leakage test is finished, following is to be done:

1) Open hose clip, pos. 111.
2) Disconnect tube "E" from point "D".
3) Replace 114 and 115 at "C".
4) Reconnect the tubes at "A" and "D".

If adjustment of the critical nozzle is not necessary, the tube is connected to "A" too.

If not see paragraph CHECK OF THE CRITICAL NOZZLE.

CHECK OF THE "CRITICAL NOZZLE"

The following is used (see the sketch on opposite page):

a) Approx. 1.5 m nylon (or plastic) hose (33).
b) One throttle hose clip (34).
c) One bucket with water (31).
d) One container with a known volume (between 1 and 2 litres (0.25 and 0.5 USG)) (32).
e) A clock with second hand.

SET-UP

The hose clip (34) is to be fitted around the middle of the hose (33).
The hose in the freezer air system is disconnected at the milk non-return valve (22) and is assembled in extension of the hose (33).

MEASURING

(See drawing No. TD 4-1).
Selector, pos. 11, is to be turned to step 7 "AIR L/H".
Knobs, pos. 6 and 8, are to be adjusted until display, pos. 7, shows:
- 300 litres/h (KFC 1200)
- 150 litres/h (KFC 1150).

Having set the freezer programme selector, pos. 1, in step 5 "MANUAL", and having activated the "START" button, the change-over switch for "AIR" is activated; thus, solenoid switch (10) will open, and the compressor will start. The hose clamp is then adjusted so that the pressure gauge (14) will show approx. 5 bar (= simulated cylinder pressure). After a couple of minutes when all pressure gauges are at rest, the container (32) is filled with water and kept, bottom up, down in the bucket (31).
The hose nozzle (33) is quickly inserted underneath (32), and it is measured how many seconds it takes to fill (32) with air (i.e. until air begins to bubble out at the edge of (32)).

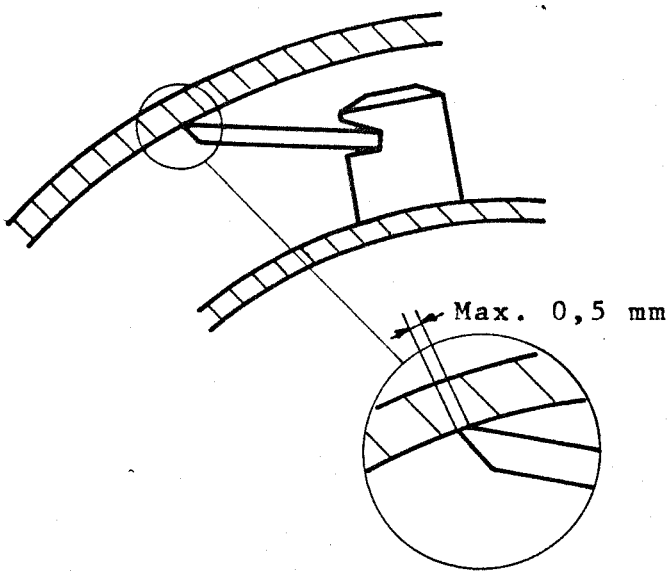
The air flow, measured in litres per hour, is calculated according to the following formula:

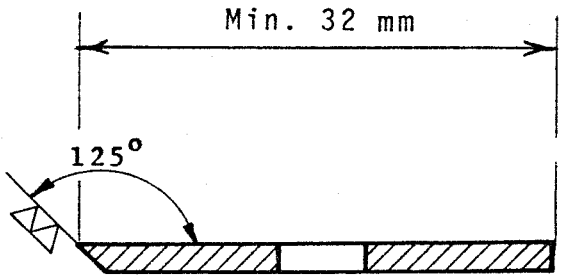
$$a = 0.92 \times 3600 \times \frac{v}{s}$$

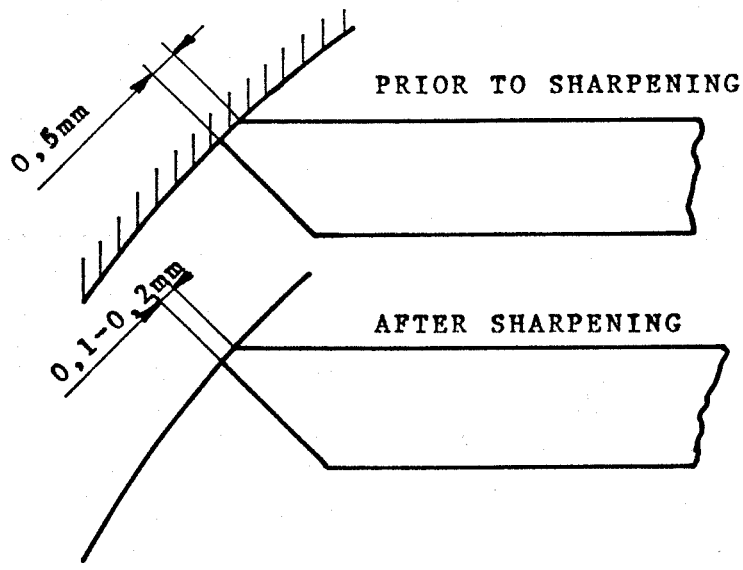
where s = time measured in secs.
v = volume of (32) in litres.
0.92 = correction factor for measuring temperature +20°C, against operation temperature -5°C.

3½ turns c/w

Sharpening of scraperblades







MR 3

If this calculation does not give the same air flow as the indication on the air flow meter, the throttle valve is to be re-adjusted and the measuring repeated.

IMPORTANT!

The distance-tube between the screw and the counternut is adapted to avoid destruction of the valve-seat and must never be removed.

NOTE!

The counter nut on the throttle valve must be tightened after the re-adjustment and prior to each new measuring.

The measurement above concerns only the "CRITICAL NOZZLE", pos. 11.
To control the entire airflow through both nozzles, pos. 11 and 27, the knobs, pos. 6 and 8, are to be adjusted so that display, pos. 7, shows:
- 1000 litres/h (KFC 1200)
- 500 litres/h (KFC 1150).

Subsequently, the airflow is to be measured as described above.

However, 100% harmony between the value adjusted and measured cannot be expected to be achieved.

Deviations up to 1% must be accepted (among others because of variations in barometric height).
The exact value of deviations up to 5% can only be established by considerable care.

NOTE!

If the actual airflow is lower than shown by display, pos. 7, the leakage test must be repeated.

FREEZER WITH GRAVITY RECIRCULATION AND HOT GAS THAWING (FREON)

(See drw.)

THE SYSTEM COMPRISES:

a) Liquid line
b) Suction line
c) Evacuation line
d) Hot gas line
e) Oil return line
f) Safety valve
g) Pressure measuring
h) Draining of refrigerating jacket.

DESCRIPTION OF REFRIGERATING SYSTEM

a) LIQUID LINE:
Liquid Freon (min. pressure 2 bar (29 psi)) is led through

*) POS. 6 stop valve
POS. 9 liquid level indicator, and
POS. 13 filter to
POS. 12 solenoid valve which is activated by means of the knob "FREEZING" on the front plate and controlled by
POS. 10 float switch which controls the liquid level.

*) WARNING!

Stop valve, pos. 6, must only be closed during repair and maintenance as the liquid contained in the pipeline between pos. 6 and pos. 12 may otherwise destroy solenoid valve, pos. 12, owing to thermal expansion.

POS. 11

is a throttle valve which controls the flow speeed.
The valve is to be adjusted when the freezer operates at max. capacity in such a manner that the solenoid valve will be open about 75% of the period (watch the lamp on the front plate).

b) The SUCTION LINE is connected to

POS. 4

stop valve and

POS. 3

suction pressure regulator, which is controlled by

POS. 2

pilot valve.
Suction pressure regulator and pilot valve control the pressure of evaporation in the following way:

1) KF 1150 N or KF 1200 N.
- The pilot valve must be operated by means of a handwheel on the front plate.

2) KF 1150 X or KF 1200 X.
- The pilot valve is motor-operated, and during normal working of the freezer it is controlled by the viscosistat in accordance with the pre-set value.
- Furthermore the pilot valve can be operated manually by means of the viscosity switch "COLDER"/"WARMER" on the control panel.

POS. 23

Filter which is to be cleaned every 6 months or at regular intervals according to experience.

POS. 1

Solenoid valve which is activated by means of the switch "FREEZING" on the front plate of the freezer.

POS. 31

Pilot valve which will open the suction pressure regulator if the pressure rises to 7 bar (100 psi) gauge pressure.

NOTE!

- The above valve protects safety valve, pos. 5.

c) THE EVACUATION LINE is connected to the suction line of the refrigerating compressor through

POS. 7 stop valve. Furthermore it is connected to the oil sump through

POS. 26 heat exchanger,
POS. 27 throttle valve,
POS. 25 solenoid valve, and
POS. 22 filter.

d) The HOT GAS LINE is connected to the lower part of the refrigerating system through

POS. 19 stop valve.

e) OIL RETURN LINE:
Each time solenoid valve, pos. 25, has been opened, oil return takes place through

POS. 22 filter (which is to be cleaned once a year),

POS. 25 solenoid valve,
POS. 27 throttle valve,
POS. 26 heat exchanger, and
POS. 7 stop valve (which must always remain open during the working of the freezer).

Finally the oil flows into the suction line.

POS. 10
POS. 29
POS. 30
POS. 28

The Freon liquid in the Freon liquid/oil mixture will be evaporated in the heat exchanger. So only a mixture of Freon gas/oil will be sucked into the suction line to the refrigerating compressor.
Solenoid valve, pos. 25, is controlled primarily by
float switch, and secondarily by
differential thermostat,
thermostat, and
pressure control.
When the float switch, pos. 10, is switched off, solenoid valve, pos. 25, will always remain closed.
When the float switch is switched on, the solenoid valve will only be opened if pos. 29, pos. 30, and pos. 28 are switched on as well.

Differential thermostat, pos. 29, must only be switched on, if the Freon liquid flowing into the freezer is at least 5°C warmer than the evaporating temperature. Thus differential thermostat, pos. 29, must be adjusted to switch off at a minimum difference of 5°C.
Thermostat, pos. 30, must only be switched on if the Freon gas/oil mixture is warmer than minus 23°C. Thus this thermostat must be adjusted to switch off at minus 23°C. Pressure control, pos. 28, must only be switched on if the pressure in the Freon gas/oil mixture is below 0.7 bar gauge pressure. Thus it must be adjusted to cut out at 0.7 bar gauge pressure.

Combined, pos. 30 and pos. 28 secure that only a Freon gas/oil mixture will be sucked into the suction line.
If one of the three above-mentioned devices is not switched on, solenoid valve, pos. 25, will not open even if float switch, pos. 10, is switched on.

The working of the oil-return system is checked on the control panel, drw. No. MR B, by means of pilot lamps, pos. 1, pos. 2, and pos. 3.
The lamps signal the following:

POS. 1 is a green pilot lamp which is switched on when the Freon gas/oil mixture is below 0.7 bar, controlled by the pressure control, drw. No. Hoyer 5, pos. 28.

POS. 2 is a yellow pilot lamp which is switched on when the Freon gas/oil mixture is warmer than minus 23°C, controlled by the thermostat, drw. No. Hoyer 5, pos. 30.

POS. 3 is a red pilot lamp which is switched on when the inlet temperature of the liquid is 5°C warmer than the evaporating temperature of the freezer.

Under normal conditions all three pilot lamps are switched on when "FREEZING" has been started on the freezer control panel.

POS. 5 f) The SAFETY VALVE has been set to open at a pressure of 12 bar (175 psi).

POS. 15 g) PRESSURE MEASURING is performed by using pressure gauge (TD 1-2, pos. 4) mounted on the freezer front plate, and the

piping system is equipped with three stop valves:
16A, 16B, and 16C.

The following pressure measurings can be made:

EVAPORATING PRESSURE (NORMAL WORKING POSITION)

POS. 16A is OPENED, whereas 16B AND 16C are CLOSED.

CHECK OF PRESSURE IN SUCTION LINE

POS. 16B is OPENED, whereas 16A and 16C are CLOSED.

CHECK OF PRESSURE IN LIQUID LINE

POS. 16C is OPENED, whereas 16A and 16B are CLOSED.

NOTE!

Immediately after the check of the pressure in the suction line or in the liquid line, the valves have to be set in normal working position.

h) DRAINING OF REFRIGERATING JACKET.

POS. 8

Solenoid valve is always closed during the freezing.
Each time the freezing is stopped, the

solenoid valve will open and the refrigerant charge in the refrigerating jacket will flow into the drain tank below.

CHECK OF OIL RETURN SYSTEM

The working of the oilreturn system is checked by means of 4 pilot lamps of which the red, the yellow, and the green lamps are mounted behind the left side plate of the freezer.
The blue pilot lamp is mounted on the freezer control panel.

LAMP COLOUR:	CORRESPONDS TO:
Blue	Float switch (10)
Red	Differential thermostat (29)
Yellow	Thermostat (30)
Green	Pressure control (28).

NOTE!

The blue pilot lamp on the freezer control panel, which shows that "FREEZING" has been actuated, must be switched on during the check (either it is constantly switched on or it flashes).

PILOT LAMPS: ON	OFF	INDICATES:
Blue	Green	Pressure control, pos. 28, has cut out because the pressure in the Freongas/oil mixture is higher than 0.7 bar.
Red		
Yellow		

Possible cause:
1) The refrigerating compressor has stopped. Start the compressor.
2) The capacity of the refrigerating plant is too low. The capacity must be increased, or the capacity of the freezer must be decreased.

Blue Red	Yellow Green

Thermostat, pos. 30, is switched off because the temperature of the Freon/oil mixture is below minus 23°C.
This is normal if the freezer is working at a low capacity.
Should it occur when the freezer is working at a high capacity, the cause of this is:
Throttle valve, pos. 27, has been opened too much so that Freon liquid flows through the oil return line.
The valve should be throttled a little bit more. If no effect is produced the first time, repeat the adjustment. The valve must only be throttled a little bit at a time, and it must never be totally closed.

PILOT LAMPS:	
ON	OFF
Blue	Red Yellow Green

INDICATES:

Differential thermostat, pos. 29, is switched off.
Possible cause:

The Freon liquid flowing into the freezer is less than 5°C warmer than the evaporating temperature.
This means that the oil return system has max. effect.

If the pilot lamps alternate between All on/All off (when the freezer is working at max. capacity) valve, pos. 27, has been throttled too much.

If the blue lamp is switched on all the time, the cause may be:

1) The flow of Freon liquid into the freezer has stopped.
   Check whether the refrigerant charge of the refrigerating plant is sufficient.
2) Throttle valve, pos. 11, has been throttled too much.
   Open it a little bit more.
3) Float switch, pos. 10, is switched on all the time even in case of too high a liquid level in the refrigerating system of the freezer.
   Find the cause and remedy it.

KF 1200EXC, KF 1150XC and KF 1200XC

This computerized freezer, type KF 1150 XC or KF 1200 XC, is equipped with different kinds of high-quality control devices to facilitate the operation of the freezer and to obtain a uniform product of a specified quantity and quality without any manual influence.

In the following you will find a short presentation of the computer system and the main functions.

CONTROL STATION

The control station makes it possible either to run the freezer fully automatically or manually.
The necessary, required information is in both cases shown on 3 displays.
In the following, you will find a detailed description of all devices of the CONTROL STATION (see drw. no. TD 1-1 and TD 4).

POS. 1

PROGRAMME SELECTOR SWITCH, by means of which 6 different programmes can be selected:
1 STOP
2 MANUAL
3 PRODUCTION
4 CIP
5 REMOTE
6 THAWING OUT.

POS. 32

Pushbutton "START" which is activated after each programme selection (except 2 "MANUAL") to start the programme.

POS. 29	Pushbutton "INSTANT STOP" by means of which the freezer is stopped instantly. The freezing and the pumps stop at once, but the main motor keeps running for another 2.5 minutes before stopping.
NOTE!	The time interval (position 4 in the programming diagram) is adjustable (cf. section "CONSTANTS").
POS. 30	Yellow pilot lamp "FLUID VALVE" which shines when "FREEZING" has been started. - Constant light indicates that fluid valve is open. (Liquid level low). - No light indicates that fluid valve is closed. (Liquid level high).
POS. 31	Pilot lamp "HOT GAS" shines when hot gas valve is open.
POS. 3	Potentiometer "VISCOSITY" by means of which the wanted viscosity is preset. Whether the freezer is controlled manually or by the computer, the viscosity will be automatically regulated in accordance with the preset value. (Programme 3).
POS. 2	Display showing the viscosity in question of the product inside the freezing cylinder, provided that the main motor is running.
POS. 6	Potentiometer "OVERRUN" by means of which the wanted overrun is preset. Based on this and the wanted capacity (see pos. 8), the computer will calculate the correct quantity of air and mixflow and

carry out the necessary adjustments to obtain these quantities.

POS. 4

Display for actual overrun (%) at normal production, (programme 3, pump motor running). In idle hours (pump motor not running), the display shows the set evaporating pressure value.

NOTE!

- Empty display indicates: computer is not in function.

POS. 5

Display pos. 4 gives additional important information in a 2-digit code:

Codes 01, 02 and 03 do not disappear unless the cause is remedied, and these codes suppress any additional information.

01 DEFROSTING
- The motor protection has cut out main motor.
- The hot gas valve is open.

02 DEFROSTING FINISHED
- The motor protection has cut out main motor.
- The hot gas valve is closed.

NOTE!

The freezer cannot be restarted until push-button "RESET" and overload relay for main motor has been activated.
Cf. "FAULT FINDING", page E1.

WARNING!

03 CIP IN ACTION
- Main motor and pumps may start without notice.

- Moreover, this also appears from flashing lamps for "MAIN MOTOR" and "PUMP MOTOR".

Codes 11-16 remain as long as the control station is untouched, even if the cause has been remedied.

11 INSTANT STOP, PUSHBUTTON
- Pushbutton (pos. 29) has been activated.

12 INSTANT STOP, OBSTACLES IN PIPING
- The pressure at the outlet pump has passed the max. limit (10 bar).

NOTE!

The freezer cannot be restarted, until pushbutton "RESET" has been activated.

13 INSTANT STOP, HIGH CYLINDER PRESSURE
- The cylinder pressure has passed the max. limit (7 bar).

NOTE!

The freezer cannot be restarted until pushbutton "RESET" has been activated.

14 INSTANT STOP, OVERLOAD MIX PUMPS
- The motor protection has cut out the pump motor.
- Restart is only possible after the overload relay has been cancelled.

15 INSTANT STOP, OVERLOAD AIR PUMP
- The motor protection has cut out the air compressor.

- Restart is only possible after the overload relay has been cancelled.

16 INSTANT STOP, REMOTE
- e.g. from filler machine in trouble.

Codes 21-42 disappear when the cause has been remedied. Different codes may occur alternatively at intervals of 2 seconds.

The information codes 21-26 show that the computer cannot make any further regulation in the wanted direction:

21 REFRIGERATION, UPPER LIMIT
- A colder evaporating temperature is not possible (limited by the pressure in suction line).

22 REFRIGERATION, LOWER LIMIT
- A warmer evaporating temperature is not possible.

23 OVERRUN, UPPER LIMIT
- Max. air flow.

24 OVERRUN, LOWER LIMIT
- Min. air flow.

25 MIX PUMP, UPPER LIMIT
- Max. pump speed.
- If this is not the case, it may be caused by a fault in the sensor of the revolution counter.

26 MIX PUMP, LOWER LIMIT
- Min. pump speed.

The following information codes are mainly informative:

31 PROCESS NOT YET STABILIZED
- First batch of products in the freezing cylinder has not yet been completely replaced by new products.

32 IMPENDING OVERLOAD
a) Motor load exceeds set value by *) 10%.
b) Refrigeration is cancelled automatically.
c) Evaporating pressure is increased at max. speed of the motor-driven pilot valve.

*) NOTE!

The X value (position 10 in the programming diagram) is adjustable (cf. section "CONSTANTS").

41 LACK OF REFRIGERANT
- Solenoid valve for liquid supply has been open for more than four minutes.

42 SURPLUS OF REFRIGERANT
- Solenoid valve for liquid supply has not been opened for more than four minutes.

POS. 8

Potentiometer "ICE CREAM l/h" by means of which the wanted capacity i.e. l/h is preset (see pos. 6).

POS. 7

Display for the position of selector switch, pos. 11.
Moreover, see section "CONSTANTS".

POS. 11	Selector switch for the display, pos. 7, of the values in question: 1 ICE-CREAM FLOW l/h 2 ICE-CREAM TEMP. °C 3 ICE-CREAM ACC. l 4 MIX FLOW l/h 5 MIX TEMP. °C 6 MIX ACC. l 7 AIR FLOW l/h 8 Start pumps 10% before preset viscosity 9 Vm 10 Viscosity preset 11 Overrun preset 12 Ice-cream preset
NOTE!	Reset: Pos. 3/6. - Depress "INSTANT STOP" pushbutton and "RESET" pushbutton (pos. 15). When the selector switch (pos. 1) is set at position 5 "MANUAL", it is possible to run the freezer manually by using the following devices.
POS. 28	Switch for start/stop of "FREEZING".
POS. 27	Pilot lamp "FREEZING", shines when freezing is started. - Constant light, when the float switch is "OFF". - Flashing light, when the float switch is "ON".
POS. 21	Switch for start/stop of "AIR".
POS. 19	Pilot lamp "AIR", shines when air is started. - Flashing light, when the freezer is during starting-up (air content not yet stable). - Constant light, when the pump starts (air content is going to be stabilized).

POS. 9	Switch for start/stop of "PUMP MOTOR".
POS. 10	Pilot lamp "PUMP MOTOR". - Constant light: Pump motor is running. - Flashing light: "CIP" function is on, and pump motor consequently starts without warning.
POS. 12	Switch for start/stop of "MAIN MOTOR".
POS. 13	Pilot lamp "MAIN MOTOR". - Constant light: Main motor is running. - Flashing light: "CIP" function is on, and main motor consequently starts without warning.
	Manual regulation of different functions can be carried out in the following way, if position 5 is selected on the selector switch (pos. 1):
POS. 25	Switch for the regulation of "FREEZING": "WARMER"/COLDER".
POS. 26	Pilot lamp "WARMER", shines in the case of as well computer regulation as manual regulation towards warmer.
POS. 24	Pilot lamp "COLDER", shines in the case of as well computer regulation as manual regulation towards colder.
POS. 22	Switch for the regulation of "AIR" to "LOWER"/"HIGHER" capacity.

POS. 23	Pilot lamp "LOWER", shines in the case of as well computer regulation as manual regulation towards lower capacity.
POS. 20	Pilot lamp "HIGHER", shines in the case of as well computer regulation as manual regulation towards higher capacity.
POS. 18	Switch for the regulation of "PUMP MOTOR" to "SLOWER"/"FASTER" speed.
POS. 17	Pilot lamp "SLOWER", shines in the case of as well computer regulation as manual regulation towards slower speed.
POS. 16	Pilot lamp "FASTER", shines in the case of as well computer regulation as manual regulation towards faster speed.
POS. 14	Pushbutton "EMERGENCY STOP".
POS. 15	Pushbutton "RESET" by means of which the main motor is reset after INFORMATION CODE 02 (defrosting finished), 12 and 13 (INSTANT STOP) have been shown on display (pos. 5).
NOTE!	Resetting cancels the code. Before depressing the pushbutton "RESET", the rotor must be turned once manually in the direction of the arrow. Moreover, see section "CONSTANTS".

CONTROL BOX

The control system of this computerized freezer, type KF 1150 XC or KF 1200 XC, consists of high-quality components placed behind the panel of the control station (drw. no. TD 4-1).

From the electric wiring diagram (rack) the following will appear:

1) Placing of print cards and other components.
2) Numbers and function of print cards.

If any of the print cards fail, it will affect the whole system. So, in case of trouble to be traced to the control system, try replacing the print cards one by one by spare print cards until the cause is remedied.

The rest of the wiring system is equipped with ordinary electric components where fault-finding is carried out by conferring with the electric wiring diagrams in question (ladder as well as power).
If the fault-finding fails, call for assistance from O.G. HOYER.

For further information, see the electric wiring diagrams.

M.P.S. SYSTEM

The M.P.S. (Mix Pump Stabilizer) system consists of two inlet pumps and an equalizing valve (drw. No. TD 1-1).

1) PRODUCTION

The pump, pos. 1, is a booster pump of 20% higher capacity than the pump, pos. 2.
The M.P.S. valve, pos. 3, equalizes the inlet and outlet pressure of the pump, pos. 2.
The flow through this pump will thus be very independent of pressure, temperature and viscosity so that, combined with an electronic counter, drw. No. TD 7-2, and the computer, it is used as a flow meter.

NOTE!

The equalizing function of the MPS system requires that the pressure at the inlet of the mix pump is lower than the pressure in the freezing cylinder.
If this is not the case, the result may be fluctuations in capacity, overrun and/or viscosity.

2) CIP FUNCTION

The M.P.S. valve is, furthermore, used as a bypass for both booster pump and flow meter pump in the case of the CIP function.

Referring to the pneumatic diagram No. HOYER 9, the solenoid valve, pos. 23, shifts as well the mix pump, pos. 25, and the M.P.S. valve, pos. 33, when the freezer is set into the CIP function.

During the CIP period, the main motor and the pump motor start at an interval of 120 seconds and run for a period of 8 seconds. (For further information, see section "CLEANING" of the "OM" manual).

NOTE!

The above interval of 120 seconds and the above period of 8 seconds may be changed (see section "CONSTANTS").

CHECKPOINTS

(See drw. No. HOYER 9 in the "SPC" manual). The following checkpoints provide the computer with the necessary information:

1) MIX AND CREAM LINE

- Pressure in cream outlet line, pos. 39.
- Temperature in cream outlet line, pos. 40.
- Temperature in mix inlet line, pos. 41.

2) CRITICAL AIR LINE

- Pressure control, pos. 15, shows if the barrel pressure exceeds the permitted limit (7 bar).
- Transducer, pos. 36, registers the pressure in the "critical" air system.

3) REFRIGERATING SYSTEM

(See drw. No. HOYER 5 in the "SPC" manual).

- Fluid valve, pos. 12 (on/off).
  Signal from level control, pos. 10.
- Hot gas valve, pos. 21, (on/off).
  Signal from pressure control, pos. 17.

4) WATTMETER	(See the electric wiring diagrams in question, power and ladder). - Actual value of viscosity (regulation of evaporating pressure). - 10% lower than preset value (start of pumps). - 10% higher than preset value (protection against freeze-up).
NOTE!	Viscosity diff. (position 8 in the programming diagram) and the X value (position 10) are ajustable (cf. section "CONSTANTS").
5) MECHANICAL SYSTEM	See drw. No. TD 7-1. - Electronic counter.
6) SERVOMOTORS	- For pump motor. - Pilot valve at NH_3 suction line (drw. No. TD 8) and - pilot valve for critical air (drw. No. TD 6-3, pos. 8) have built-in contacts for maximum and minimum position.
7) OTHER CHECKPOINTS	Pilot valve (drw. No. TD 8) has the following other checkpoints: - Potentiometer, pos. 530, to give an analogous signal stating the actual position of the valve. The computer is normally preset at a skating point of 0.8 bar (-21°C). This value may be changed as required (see section "CONSTANTS".

REGULATION POINTS	Based on the information given, the computer system makes the necessary adjustments of the following components:
1) MIX QUANTITY	- Servo-controlled variable speed drive for pumps.
2) START-UP AIR	See drw. no. HOYER 9. - At the starting-up of the freezer, solenoid valve, pos. 18, is opened and the solenoid valves, pos. 9 and pos. 28, remain closed. - After the starting-up, pos. 18 is closed and pos. 9 and pos. 28 are opened.
3) AIR QUANTITY	- Servo-controlled pilot valve for "critical air" (drw. no. TD 6-3). - Solenoid valve (drw. no. HOYER 9, pos. 28) opens, when high capacity of air is wanted.
4) VISCOSITY	- Servo-controlled pilot valve for evaporating temperature.
SECURITY CHECKPOINTS	The following checkpoints are for "INSTANT STOP" of the freezer: - Overload pump motor - Overload compressor - Overload main motor - Upper limit af OUTPUT pressure (max. 9 bar) - Upper limit of BARREL pressure (max. 7 bar).

PROGRAMMING OF KFXC CONSTANTS, KF 1200 XC AND KF 1150 XC

DISPLAY SELECTOR + KS 1 "ON" (LOAD RAM ENABLE)

POS		RANGE	NOM.
1	CIP ON TIME	5 - 15 s	8 s
2	CIP OFF TIME	60 - 300 s	120 s
3			
4	INSTANT STOP TIME	120 - 600 s	180 s
5	SKATING POINT	0.5 - 1.3 bar	0.8 bar
6			
7			
8	VISKOSITY DIFF. (START-UP)	0 - 20%	10%
9	STROKE VOLUME		
	- KF 1200 XC	3790+/-10%	3790
	- KF 1150 XC	1110+/-10%	1110
10	VISKOSITY > PRESET + X%	5 - 20%	10%
11	TIME BEFORE Y → △	10 - 30 s	15s
12			

CONSTANTS

From the diagram on opposite page it appears which constants of the computer may optionally be set or changed within the ranges stated in the diagram.
Moreover, the diagram shows the nominal values of the constants which are to be considered as normative.

CHANGE OF CONSTANTS

1) Set key switch inside the box at "I".
2) Set selector switch (Drw. No. TD 4-1, pos. 11) at the wanted position.
   - Display (Drw. No. TD 4-1, pos. 7) shows the set value.
3) Depress the pushbutton "RESET" (Drw. No. TD 4-1, pos. 15).
   - The value of the display will now change according to the preset intervals as long as the pushbutton is depressed.
   - The change takes place either towards higher values or towards lower values.
   - If higher values are wanted and the change takes place towards lower values, stop depressing the pushbutton.

     When depressing again, the change will take place towards higher values.
     When redepressing, the change will take place towards lower values, etc.

4) When the new value wanted has been obtained, stop depressing the pushbutton "RESET".
   - The new constant has now been entered in the computer.

NOTE!

The computer "remembers" the constants even though the current for the freezer is cut off.

INFORMATION CODES: A) MEASURES TO BE TAKEN BY OPERATOR	For further information see section B: "CAUSES AND REMEDY".
CODE 01 DEFROSTING	No action required of the operator until CODE 02 appears.
CODE 02 DEFROSTING FINISHED	1) Turn off electrical power to the freezer and turn manually the large V-belt pulley once in the direction of the arrow. If this is possible, defrosting is finished (depress "INSTANT STOP" pushbutton). Special handle in spare part box.
NOTE!	Check that the machine cannot start during this test.
	2) Depress "RESET", pos. 15. Now the freezer is ready for start. - If the viscosity is set at nearly 100%, the selector switch must be set at a lower percentage. - If freeze-up is repeated, the cause must be remedied. Call for assistance from maintenance personnel.
CODE 03 CIP IN ACTION	Flashing lights for "MAIN MOTOR" and "PUMP MOTOR". Do not remove shields. Sprockets, chain, and pulleys start without warning. Remember to cancel CIP after cleaning to prevent heavy wear on pumps and barrel.

CODE 11 INSTANT STOP, PUSHBUTTON	The freezer is ready for restart.
CODE 12 INSTANT STOP, OBSTACLES IN PIPING	Causes: - Closed cock: Open the cock. - Heavy flow resistance from cream outlet pump to filler. Faulty pressure gauge. Remedies: - Decrease viscosity - Decrease capacity - Increase pipe diameter - Shorten pipe - Increase openings at filling machine - Increase opening time of filling machine. RESTART: - Only possible after depressing pushbutton "RESET".
CODE 13 INSTANT STOP, HIGH BARREL PRESSURE	- Decrease overrun. - Decrease size of sprocket wheel for cream outlet pump. RESTART: - Only possible after depressing pushbutton "RESET".

CODE 14 INSTANT STOP, OVERLOAD MIX PUMPS	RESTART: - Only possible after the overload relay has been cancelled. Call maintenance personnel.
CODE 15 INSTANT STOP, OVERLOAD AIR COMPRESSOR	RESTART: - Only possible after the overload relay has been cancelled. Call maintenance personnel.
CODE 21 REFRIGERATION, UPPER LIMIT	- If the evaporating temperature, according to the ammonia manometer, is colder than -30°C: Decrease capacity and/or viscosity. - If the evaporating temperature is warmer than -30°C: Call maintenance personnel.
CODE 22 REFRIGERATION, LOWER LIMIT	Check mix supply. Probably the mix tank is empty.
CODE 23 OVERRUN, UPPER LIMIT	Check the set points of overrun and capacity. If the calculated air flow is below 1600 l/h (KF 1200) or 800 l/h (KF 1150): Call maintenance personnel for check of pressure in air supply.

CODE 24 OVERRUN, LOWER LIMIT	Check the set points of overrun and capacity. If the calculated air flow is more than 80 l/h (KF 1200) or 40 l/h (KF 1150): Call maintenance personnel.
CODE 25 MIX PUMPS, UPPER LIMIT	Mix flow, based on set points for capacity and overrun is above max. (1.000 l/h for KF 1200, 500 l/h for KF 1150 etc.) Change set points.
CODE 26 MIX PUMPS, LOWER LIMIT	Mix flow, based on set points for capacity and overrun, is below min. (200 l/h for KF 1200, 100 l/h for KF 1150 etc.). Change set points.
CODE 27 OVERLOAD, SERVOMOTOR FOR MIX PUMP	Call maintenance personnel.
CODE 31 PROCESS NOT YET STABILIZED	Avoid adjustments. Until the barrel content is totally exchanged, neither the set values nor the displayed values are totally reliable.

CODE 32 IMPENDING OVERLOAD	1) A natural result of a drastic reduction of the set points of capacity or viscosity during production. 2) Check mix supply. Probably the mix tank is empty. 3) Main valve is stuck. Call maintenance personnel.
CODE 41 LACK OF REFRIGERANT	- Evacuation valve not closed. - Liquid receiver empty or liquid pressure too low. Call maintenance personnel.
CODE 42 SURPLUS OF REFRIGERANT	Liquid-supply solenoid valve or hot-gas solenoid valve leaky. Call maintenance personnel.
B) CAUSES AND REMEDIES	To be taken care of by maintenance personnel.
CODE 01 DEFROSTING	- If code 01 remains on for more than 1 minute: The hot-gas line contains liquid. The freezer is probably overflooded. After restart liquid enters suction line and pilot line thus causing poor back pressure regulation and repeated freeze-ups. - If code 01 remains on for more than 5 minutes: Defect in hot-gas supply. Probably a closed stop valve.

CODE 02 DEFROSTING FINISHED	Repeated freeze-up. Causes: 1) Liquid in hot-gas line, cf. code 01. 2) Leaky solenoid valves, pos. 8, 12, or 21. 3) Liquid level control, pos. 10, jammed in position "ON". 4) During servicing, main valve, pos. 3, has been exposed to moist atmospheric air and is jammed by ice in open position. Remedy: - Flush main valve with hot water. 5) Main valve is jammed in open position by stiff oil. Thus the suction temperature is too cold for the oil in the refrigerating plant. Remedies: - Adjust to warmer evaporating temperature (decrease refrigerating capacity). - Replace oil (difficult).
CODES 14 AND 15 INSTANT STOP, OVERLOAD, MIX PUMPS OR AIR COMPRESSOR	- Lack of a phase. - Defective motor. - Defective overload relay.
CODE 21 REFRIGERATION, UPPER LIMIT	- If the evaporating temperature is warmer than -30°C: Check suction temperature while the freezer is producing ice cream.

	- If the suction temperature is warmer than -33°C: Reduce viscosity and/or capacity of the freezer.
CODE 23 OVERRUN, UPPER LIMIT	- Check air-supply pressure. A minimum of 6 bar is required. - Probably the operator has exaggerated the set overrun value to compensate for a leak in the critical air system. - Check critical air system for leaks. - Check motor-driven air control valve.
NOTE!	See also section "OVERRUN CONDITIONS".
CODE 24 OVERRUN, LOWER LIMIT	Check motor-driven air control valve.
CODES 25 AND 26 MIX PUMPS, UPPER AND LOWER LIMIT	1) Check whether the pump motor does run at max. or min. speed while code 25 or 26 is "ON".
NOTE!	2) Control "MIX FLOW" Se section "MIX FLOW".

CODE 32 IMPENDING OVERLOAD	Revert to code 02. All causes for "repeated freeze-up" are valid for impending overload as well. Furthermore: If the suction pressure is temporarily too high, the viscosistat tries slowly and in vain to compensate. When the suction pressure returns to its correct level, the viscosistat reacts too slowly and IMPENDING OVERLOAD arises.
CODE 41 LACK OF REFRIGERANT	Causes: - Stop valve in liquid line closed. - Evacuation valve, pos. 7, leaky or open. - Liquid receiver empty. - Liquid pressure too low. Liquid is boiling in piping.
CODE 42 SURPLUS OF REFRIGERANT	Causes: - Solenoid valve, pos. 12, leaky. - Hot-gas valve leaky. - Liquid level control, pos. 10, jammed in position "ON".
OTHER USEFUL INFORMATION (WITHOUT INFORMATION CODE): PILOT VALVE POS. 2 MOTOR-DRIVEN	(See drw. No. Hoyer 5 or 6 in "SPC manual). While the freezer is not running, the evaporating pressure is displayed. The evaporating pressure depends on the actual position of the motor valve, which is measured by means of a potentiometer (see Drw. No. TD 4-1, pos. 4, and TD 8, pos. 530).

It is possible to compare display and ammonia manometer in this situation:

- Normal start, set value for evaporating pressure is above 1 bar, "START" button is depressed, but the viscosity has not yet reached the set value.

In case of any discrepancy between display and manometer:

- Check manometer. The manometer functions correctly if it shows 0 bar when exposed to atmospheric pressure.
  If this is the case: Alter engagement of gear wheel on potentiometer, drw. No. TD 8, pos. 530.
- The computer signals the "SKATING" point at 0.8 bar (-20°C).

The skating point can be altered (see MR. D, section "CONSTANTS"):

LIQUID LEVEL CONTROL

(See drw. No. Hoyer 5 or 6 in "SPC" manual, pos. 10).
The float movement of the level control (see drw. No. TD 6-2) is transmitted through a non-magnetic diaphragm by the principle of repulsion of equal polarity. This ensures that the float magnet imparts a snap action on the switch element. In addition, due to the glandless construction, these switches are leakproof and the liquid cannot

penetrate into the switch chamber.
During production, any moisture which has entered the dry side will gradually condense and freeze on the coldest place, the diaphragm and finally jam the lever.
The dry side is never warmer than room temperature. Consequently, moisture can never escape; it is trapped.
Keep the dry side hermetically sealed from the surroundings.

- If it is opened:
  Make sure that it is dry and warm before sealing.
- It is recommended to lubricate gasket B with silicone oil.

OVERRUN CONDITIONS

The optimum cylinder pressure for obtaining stable overrun conditions is more or less depending on the mix composition and must be found by experience.

NOTE!

The pressure values in this chapter (called cylinder pressure) are the values observed at the manometer, drw. no. Hoyer 8 or 9, pos. 14 (measured in gauge pressure).
Because of the pressure drop through the non-return valves pos. 21 and 22, the real cylinder pressure is about 1 bar less.
At delivery the freezer is equipped with a sprocket wheel rim (53 teeth) at the outlet pump.

3 additional sprocket wheel rims with 49, 57 and 61 teeth are delivered as spare parts.

At a cylinder pressure of 6 bar, the normative overrun will be approx. as follows:

No. of teeth	Overrun %
49	200
53	150
57	90
61	50

The present overrun values may differ from the above-mentioned values, depending on: pressure drop, viscosity of mix, mix-supply pressure and/or counter-pressure at outlet pump.
These four sprocket wheels permit selection of optimum cylinder pressure within an over-run range of approx. 10% to 150% (in special cases even more).
The following considerations may be useful:

- The cylinder pressure during normal production conditions must max. be approx. 7 bar.
- The lower limit of cylinder pressure must be found by experience but must never be lower than 1 bar as a vacuum in the cylinder must not occur.

So, if the cylinder pressure is too high, change to a sprocket wheel rim with fewer teeth.
If it is too low, change to one with more teeth.

DASHER SPEED, RPM	Normally the freezer is supplied with a motor pulley for standard speed.
NOTE!	KF 1200 only: A pulley for lower speed is supplied as normal accessory. - The optimum speed depends on the mix recipe. Low speed increases the refrigerating capacity left for chilling and freezing of the product.
DISCREPANCY BETWEEN PRODUCT AND DISPLAYS APART FROM SMALL START-UP IRREGULARITIES	1) Viscosity too high. - Normally derived from "IMPENDING OVER-LOAD", see code 32. 2) Viscosity too low. - Probably "Channelling" (i.e. the mix runs through the centre area of the dasher). Pull dasher out immediately after "IN-STANT STOP" and examine it for deposits and lumps of segregated water ice and churned fat. - The cause may be the recipe or a defect in homogenization. Change of dasher speed or barrel pres-sure may help.

3) Overrun too high.
   Causes:
   - Defects in mix supply.
   - Air in mix.
   - Defect in mix pump.

4) Overrun too low:
   - Leak in critical air system.

5) Capacity too high:
   - Combination of poor adjustment of end clearance in mix pump and a mix-feed pressure above barrel pressure.

6) Capacity too low:
   - Causes similar to 3): "overrun too high".

FLUCTUATION VISCOSITY, OVERRUN, AND CAPACITY

Usually fluctuations in one value affects other values. Consequently, they are treated in common.

1) Suction pressure is temporarily too high, but the periods are too short to cause "IMPENDING OVERLOAD".

2) Air-plant pressure is temporarily too low, but the period is too short to cause "OVERRUN, MAX. LIMIT".

3) Mix supply temporarily contains air.

4) "Channelling". Segregated frozen water ice and churned fat deposits on dasher surface resulting in that the mix runs through the centre area.

5) Defective back-pressure regulation.

6) Liquid in pilot line.

LACK OF CAPACITY

Oil layer on exterior surface of barrel.
In oil-free refrigerating plants the refrigerating capacity of the freezer is 120 %. In plants containing oil, the capacity gets steady after a couple of weeks at 100 %, provided that:

a) Oil content in ammonia liquid is max. 30 ppm.
b) Oil type is correct for the suction temp. in question
c) Water content is negligible.

REMEDY:
Check that the oil type is correct and improve installations and/or maintenance of oil separators in the refrigerating plant.

CHECK:
At an oil content below 30 ppm, no oil is normally segregated in the receiver of the refrigerating plant.

At the average (KF 1200): 200 grammes of oil is drained from valve, pos. 14, after 40 hours' production at max. capacity, on the basis of 30 ppm of oil in ammonia liquid.

In the case of KF 1150 the corresponding average is 100 grammes of oil.

NOTE!

Expected capacities depending on the oil layer on barrel surface:

Capacity %	Oil layer mm
120	0
100	0.02
50	0.1

MIX FLOW

The mix flow is measured by a M.P.S. system and a R.M.P. Counter.

CONTROL OF MIX FLOW (l/h)

(See drw. no. TD 4-1).
The mix flow is calculated in the computer, and the calculated flow is displayed at pos. 7, with the display selector switch, pos. 11, at position 4. The formula for this calculation is:

$$Q_{mix} = \text{rpm.} \times \frac{Vm}{1000} \text{ l/h}$$

Vm = the stroke volume of the mix pump in cc/h/rpm is displayed at pos. 7, with the selector switch, pos. 11, at position 9.

Nominal values:

VM for KF 1200 = 3790 cc/h/rpm.
VM for KF 1150 = 1110 cc/h/rpm.

Due to the change of important conditions (wear of the pump, etc.) the Vm value can be fine adjusted within +/-10%.
(See MR.D, section "CONSTANTS").

The number of revolutions of the mix pump is controlled by reading the calculated flow and Vm value. The number of revolutions will amount to:

$$n = \frac{1/h \times 1000}{Vm}$$

CHECK OF MIX FLOW (l/h)

If the mix flow does not correspond to the displayed mix flow, it may be due to the fact that there are errors in the M.P.S. system or that the Vm is to be adjusted.

- If the mix flow in question is higher than the one displayed, the Vm must be higher.
- If the mix flow in question is lower than the one displayed, the Vm must be lower.

The new value of Vm can be found as follows:

EXAMPLE

1) Specific density of mix = 1.09.

2) Actual mix flow = 916 kg/h.

or $\frac{916}{1.09}$ = 880.4 l/h.

3) Displayed mix flow = 831 l/h.

4) Display for Vm shows = 3788 cc/h/rpm.

The new value of Vm is now calculated:

$$Vm = 3788 \times \frac{840.4}{811} = 3831 \text{ cc/h/rpm.}$$

After adjustment of Vm to the new value the actual and the displayed mix flow will be identical.

REMAINING ERRORS

MAY BE DUE TO:

1) Air bubbles in mix.
2) Mix inlet pressure too high (equal to or higher than the pressure in freezing cylinder).
3) Errors at MPS-valve.

m/c does not start
All displays showing
No signal to selector switch

Code 98
Computer

lamp fuse blown on computer panel. power supply board.

NORMAL FUNCTION

is to be checked at the signallamp, FREEZ-ING.
During production the level control will change between "ON" and "OFF" several times per minute, indicated as follows:
- constant light, "OFF"
- flashing light, "ON"

The switch (drawing no. TD 6-2) of the LI-QUID LEVEL CONTROL is based upon interaction of two magnetic poles of equal polarity se-parated by a diaphram made of not magnetic material.

This gives two advantages:
1) Quick action of the switch.

NOTE!

Slow motion ruins the micro switch.
2) Possible magnetic dirt is repelled from zone in question.

NOTE!

Poles of different polarity rapidly built a bridge of magnetic dirt.

The above mentioned diaphram devides the le-vel control in a WET SIDE and a DRY SIDE.
- WET SIDE with the float level system con-tains refrigerant.
- DRY SIDE is the switch box, which, correctly fitted, is moisture tight. So if any moisture is left in the box, it cannot escape. The coldest part (i.e. the diaphram) will during production gradual-

ly be covered by an ice-layer, which blocks the system without warning.

NOTE!

Consequently the box must be carefully dried and sealed after possible opening to the switch system. Do not open a cold level switch.
At any circumstance, it must be warm, before it is closed again.

MALFUNCTION

Errors outside the liquid level control:
1) Liquid stop valve closed?
2) Receiver empty?
3) Gas bubbles in liquid line due to lack of subcooling?
4) Solenoid valve in liquid line leaky or not functioning?
5) Insufficient pressure in the liquid line?

Errors inside the liquid level control:
1) Contact tips in micro-switch tend to stick together?
- Replace the micro-switch.
2) The two magnetic poles at the membrane have different polarity, so attracting each other as well as magnetic dirt?

NOTE!

Different polarities makes "slow action", which ruins micro-switch.
- Make sure the two poles have equal polarity and repell each other, so magnetic dirt is repelled and "snap action" imposed on the micro-switch.

3) Moisture has entered the "dry side", which acts as a "Moisture trap", so ice on the menbrane is blocking the action of the magnetic lever?
- "Dry side" is dried completely and sealed again.

NOTE!

We recommend to lubricate gasket "B" with silicone oil or the like.

GENERALLY

The KF machines are constructed in such a way that the lubrication is limited as much as possible, among other things by an extensive use of ball bearings and ball joints with dobble gasket and self lubricating bushes.

Certain parts, however, must be lubricated regularly, and in the following instruction it is indicated where you must lubricate and how often we recommend you to lubricate and which lubricant must be used.

The machines have been lubricated with GULF-lubricants before the test run in our workshop. Corresponding lubricants of another brand can of course also be used (See the "GENERAL CHART").

The following lubricants are used:

Index no.	Type
2	Harmony 100 AW
5	EP Lubricant HD 150
6	Lubcote Molly
8	Gulflex MP Grease

NOTE!

For lubrication of the internal parts in pumps and freezing cylinder coconut oil is used.

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INDEX	VARIOUS	GULF	SHELL
1		Harmony 15 AW	Tellus Oil T-15
2		Harmony 100 AW	Tellus Oil S-100
3		Harmony 32 AW	Clavus Oil 32
4		Harmony 320 E	Omala Oil 320
5		EP Lubricant HD 150	Omala Oil 150
6		Lubcote Molly	Cardium Fluid D
7	Alfalub LGLT*)	Lowtempe-rature Grease	Aeroshell Grease 7
8		Gulflex MP Grease	Alvania EP Grease
9	Rocol**)		

*) Fa. SKF, Sweden
**) Fa. Rocol Ltd, Leeds - U.K.

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LUBRICATION INSTRUCTION

114M04E	05021
KF	ENCL 1-3

Number of lubrication points		Index	Lubricating methode	Weekly	Monthly	Every X month
	PUMPDRIVE					
1	Gearmotor, check the oil level	5	Oil can	X		
1	Chain	6	Brush		X	
	SPEED-REGULATION OF THE PUMPDRIVE					
1	Bevelgears	6	Brush		X	
1	Chain	6	Brush		X	
	BRACKET FOR MIX- AND CREAM-PUMPS					
2	Ball bearings	8	By dis-mantling			12
1	Thread on the adjus-ting parts	8	By dis-mantling			12
	MAIN SHAFT					
2	Ball bearings	8	By dis-mantling			12
	MAIN MOTOR					
2	Ball bearings (only when the motor is fitted with nipples)	8	Grease gun			6

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TECHNICAL UNITS

79.02.20
TD/HO/GH

Dimension	Symbol	Unit (SI)	Conversion
Length	L, l	m	
Area	A	m^2	
Volume	V	m^3	
Time	t	s, min., h	
Mass	m, M	kg, t (ton)	
Force	F	N	1 kp = 9.80665 N
Temperature	t, T	^oC, ^ok	$T = t + 273.15^oC$
Pressure	p, P	bar, N/m^2, mmH_2O	1 bar = $10^5 \frac{N}{m^2}$ = 1.019 $\frac{kp}{cm^2}$
Density	ϱ	kg/m^3	
Mass rate of flow	G	kg/s, l/s, t/h	
Work, energy	W	kJ	1 kcal = 4.1868 kJ
Quantity of heat	Q	kJ	1J = 1 Nm = 1Ws = 1 kg m^2/s^2
Heat flow rate	q, Q_S	kW, J/s	1 kcal/h = $1.1628 \cdot 10^{-3}$ kW
Power	p, N	kW	860 kcal $\cong$ 1 kWh = 3600 kWs
Thermal conductivity	λ	W/m ^oC	1 W/m ^oC = 0.86 kcal/mh ^oC
Specific heat capacity	c_p	kJ/kg ^oC	1 kpm = 9.80665 J
Heat capacity	C_p	kJ/Nm^3 ^oC	
Specific enthalpy	i, h	kJ/kg, kJ/Nm^3	
Volume rate of flow	V_S	m^3/s, m^3/h	
Frequency	ω, f	s^{-1}, h^{-1}	
Efficiency	η		

Prefixes:

tera:	$T = 10^{12}$	hecto:	$h = 10^2$	milli:	$m = 10^{-3}$
giga:	$G = 10^9$	deca:	$da = 10$	micro:	$\mu = 10^{-6}$
mega:	$M = 10^6$	deci:	$d = 10^{-1}$	nano:	$n = 10^{-9}$
kilo:	$k = 10^3$	centi:	$c = 10^{-2}$	pico:	$p = 10^{-12}$

Re: Symbols used on electrical- and air-diagrams.
(see apendix 3a, 3b, 4a, and 4b).

In order to make easier the understanding of our electrical- and air-diagrams for our customers, we have worked out surveys of symbols to be inserted in our instruction manuals.

Most of the symbols correspond to the international standard symbols. The exceptions are partly due to the fact that some of our old diagrams contain divergency symbols (e.g. silencer and lubricator) and partly that in some cases a changed symbol may facilitate the understanding (e.g. piston valve versus poppet valve).

In order to get the full advantage of the symbols, the following basic rules must be known:

1. Electric wiring diagram (Appendix 1).

- All components are shown in the positions they have when the electrical system is dead.

- All switches have been drawn unactivated (e.i. pressure control without pressure, thermostat without heat, microswitch without activated roll, lever, etc).

- In the diagram all the electrical components (relays, timers, etc.) are referred to by their actual position as well as by where in the diagram their respective sets of contacts (make and break contacts) are used (Example: d5 has two sets of make contacts in use, on set used in column Nr. 6 and one used in colum No. 11).

2. Compressed-Air Diagram

All valves are shown as 2 squares, or, when the valve has 3 posi-

.../2

tions, it is shown as 3 squares. Each square indicates one function.

- Each square shows the function of the valve, when the valve is activated by the "activation element" (lever, coil, etc.) shown on the arrangement of squares.

- Connections are made to the sqare, which in the position shown is the actual function of the valve.

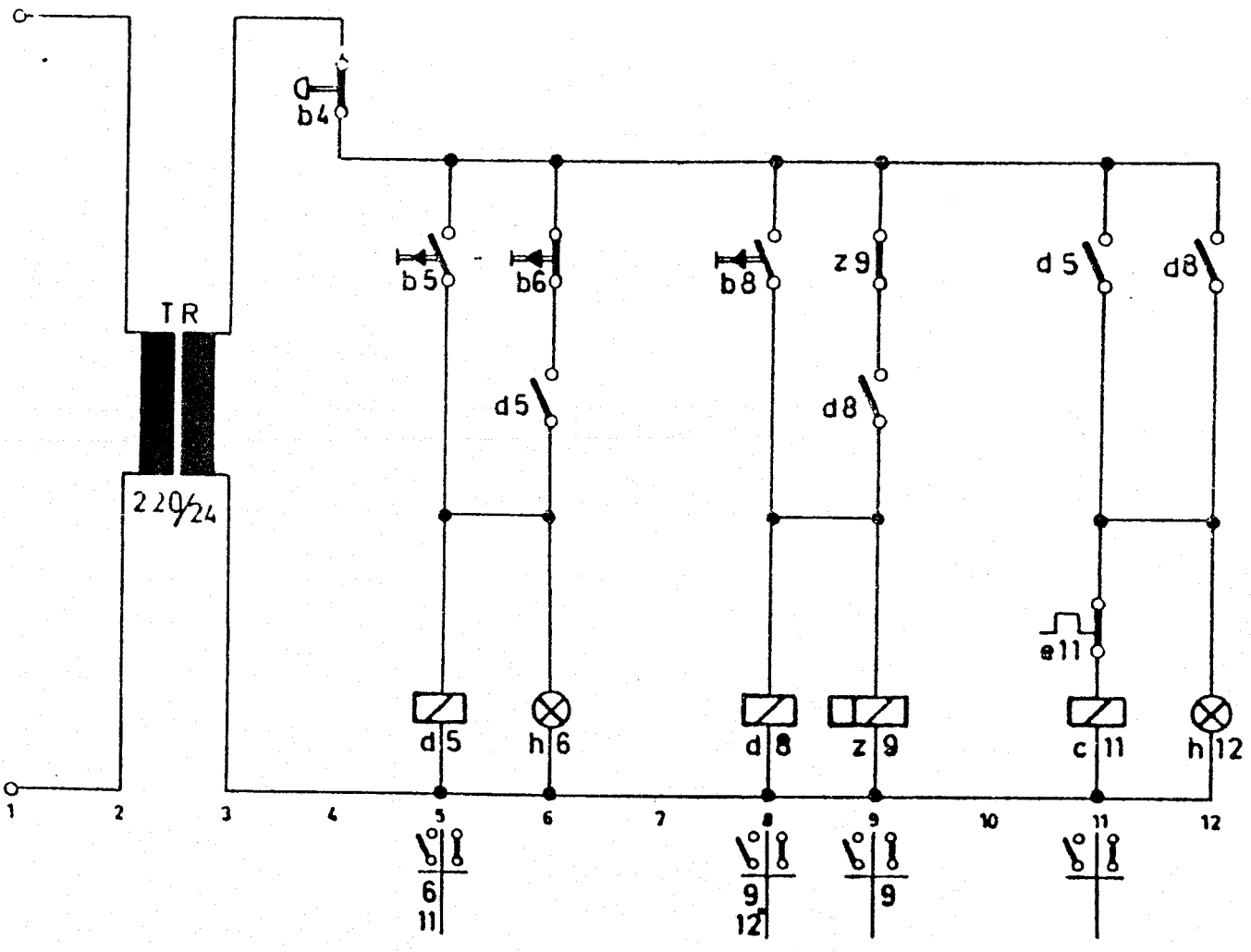
- Solenoid valves and similar components are shown in the positions when they are dead.

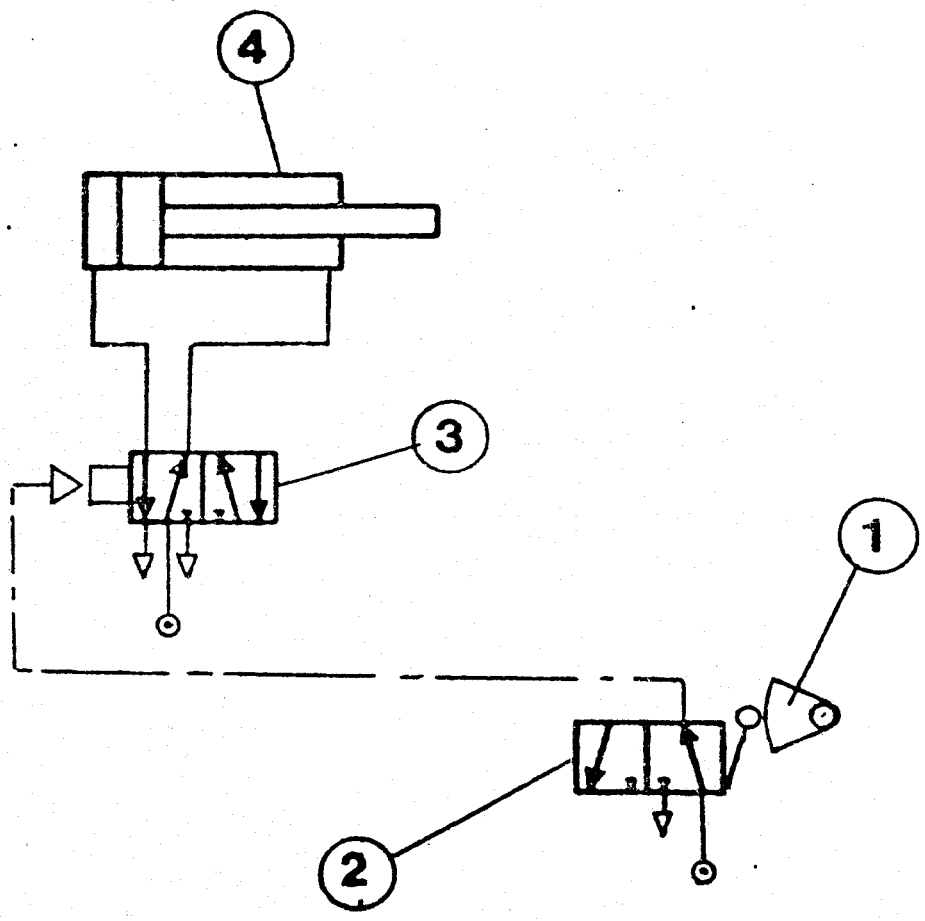
- All other components are shown in the positions which appear natural in the relevant situation.

Example: Appendix 2:

If a cam disc (1) is shown in a position where the corresponding impulse valve (2) is activated, the valve is shown in its activated position. The pilot valve (3) thus will receive control air and is shown in the relevant position.

HOYER	ELECTRICITY DIAGRAM (EXAMPLE)	HO/GH	TI - 131
			APPENDIX 1




4
3
1
2

HOYER ALFA-LAVAL GROUP	ELECTRICITY SYMBOLS	HO/GH	TI - 131
			APPENDIX 3a

	Tidlig sluttekontakt	Early make contact (NO)	Früh schliesser
	Sluttekontakt	Make contact (N.O.)	Schliesser
	Sen brydekontakt	Late break contact (N.C.)	Spät öffner
	Brydekontakt	Break contact (N.C.)	Öffner
	Nødstop	Emergency stop	Not aus
	Trykknap (slutte)	Pushbutton make contact	Drucktaster (schliesser)
	Trykknap (bryde)	Pushbutton break contact	Drucktaster (öffner)
	Mikroswitch	Limitswitch	Endtaster
	Termostat	Thermostat	Thermostat
	Pressostat	Pressure control	Pressostat
	Omskifter 2 faste pos.	Selector switch 2 pos.	Wahltaster 2 stellungen
	Omskifter 3 faste pos.	Selector switch 3 pos.	Wahltaster 3 stellungen
	Termokontakt	Overload relay	.Motorschutzrelais
	Nøgle omskifter	Key switch	Schlüsseltaster
	Induktiv føler	Inductive proximity switch	Annäherungsschalter Induktiv
	Kapacitiv føler	Capacitive proximity switch	Annäherungsschalter Kapazitiv
	Relæ- og kontaktorspole	Relay-and contactorcoil	Relais-und motorschutz
	Indkoblingsforsinket relæ	Delayed on operate	Anzugverzögert
	Taktgiver	Recycle timer	Taktgeber
	Interval relæ	Interval timer	Impulsrelais
	Magnetventil	Solenoid valve	Magnetventile
	Sikring	Fuse	Sicherung
	Programværk	Programme unit	Programm schalter

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ELECTRICITY SYMBOLS

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APPENDIX 3b

a	Effektafbryder	Main switch	Leistungsschalter
b	Betjeningsknap	Push - button	Befehlsgeräte
c	Kontaktor (med eller uden motorværn)	Contactor (with or without motorprotection)	Schütz (mit oder ohne Hilfsschütze)
d	Styrerelæ	Relay	Steurrelais
e	Termorelæ	Thermal - relay	Bimetallrelais
g	Måleinstrument	Measuring instrument	Meßinstrument
h	Kontrollampe	Pilot lamp	Leuchtmelder
k	Kondensator	Capacitor	Kondensator
m	Motor	Motor	Motor
n	Ensretter	Rectifier	Gleichrichter
r	Modstand	Resistance	Widerstand
s	Magnetventil	Solenoid valve	Magnetventile
z	Tidsrelæ	Timer	Zeitrelais
E	Mikroswitch	Limitswitch	Endtaster
T	Termostat	Thermostat	Thermostat
P	Pressostat	Pressure control	Pressostat
TR	Transformator	Transformer	Transformator
V	Varmeelement	Heating element	Heizelement

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COMPRESSED-AIR SYMBOLS

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APPENDIX 4a

RØRLEDNINGER

	Trykluftledning	Main air supply	Druckleitung
	Impulsledning	Pilot line	Steuerleitung
	Lufttilgang	Supply source	Hauptluftanschluß
	Udblæsning til atmosfære	Exhaust	Ablüftung

MANØVREVENTILER

	2-vejs ventil	2-way valve	2-Wege ventil
	3-vejs ventil (glider) 3-vejs ventil (sæde)	3-way piston valve 3-way poppet valve	3-Wege Kolbenschieberventil 3-Wege Sitzventil
	4-vejs ventil (glider) 4-vejs ventil (sæde)	4-way piston valve 4-way poppet valve	4-Wege Kolbenschieberventil 4-Wege Sitzventil
	4-vejs ventil med tilgang-spærret midtstilling	4-way valve (midposition with blocked supply)	4-Wege Ventil (Durchfluß-stellung in Mittelstellung)
	4-vejs ventil med helt spærret midtstilling	4-way valve (completely blocked in midposition)	4-Wege Ventil (Sperrstellung in Mittelstellung)
	4-vejs enkelimpuls	4-way (single-impuls)	4-Wege (Einzelimpuls)

VENTILPÅVIRKNING

	Trykknap	Pushbutton	Druckknopf
	Håndtag	Lever	Hebel
	Rullebetjent	Roller	Tastrolle
	Lettrykstype	High sensitive	Leichtdruck
	Fjeder påvirkning	Spring	Feder
	Stødknap	Plunger	Stößel (Taster)
	Luftimpuls	Air pressure	Druckbeaufschlagung
	Vacuumstyret membran	Diaphragm (vacuum)	Membran (Vacuum)
	Differentialventil	Difference - pressure	Differenz - Druckbetätigung
	El-impuls	Solenoid	Elektromagnet

HOYER
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COMPRESSED-AIR SYMBOLS

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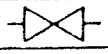
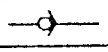
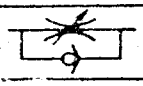
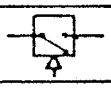
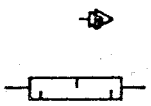
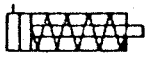
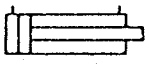
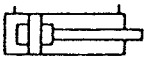
APPENDIX 4b

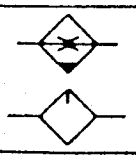
HJÆLPEVENTILER

	Stopventil	Shut off valve	Absperrventil
	Kontraventil	Non-return valve	Rückschlagventil
	Dobbelt kontraventil	Shuttle valve	Doppelrückschlagventil
	Hurtigafblæsningsventil	Quick exhaust valve	Schnellentlüftungsventil
	Drøvleventil i ventilens afblæsningsåbning	Flow regulator (in valve exhaust port)	Drosselventil (in Ablüft-öffnung des ventils)
	Drøvleventil med kontra-ventil	Flow regulator (undirectional)	Drosselrückschlagventil
	Sekvensventil (anv. som signalforstærker)	Pressure switch (used as signalamplifier)	Druckschalter (wird als signalverstärker verwendet)
	Reduktionsventil	Pressure regulator	Druckregelventil
	Pressostat	Pressure switch	Druckschalter
	Lyddæmper	Silencer	Schalldämpfer

LUFTCYLINDRE

	Enkeltvirkende luftcylinder	Single acting cylinder (spring return)	Einfachwirkender Zylinder mit Rückholfeder
	Dobbeltvirkende luftcylinder uden bremse	Double acting cylinder (non cushioned)	Doppelwirkender Zylinder ohne Dämpfung
	Dobbeltvirkende luftcylinder med luftbremse	Double acting cylinder (air cushioned)	Doppelwirkender Zylinder mit Luftdämpfung
	Dobbeltvirkende luftcylinder med mekanisk bremse	Double acting cylinder (mechanical cushioned)	Doppelwirkender Zylinder mit mechanisch Dämpfung

LUFTBEHANDLING

	Filter (manuel aftapning)	Filter (manuel drain)	Filter mit Kondensatentleerer (Handbetätigt)
	Filter (automatisk aftapning)	Filter (automatic drain)	Filter mit Kondensatentleerer (Automatisch)
	Smøreapparat	Lubricator	Öler

HOYER
ALFA-LAVAL GROUP

LIST OF DRAWINGS

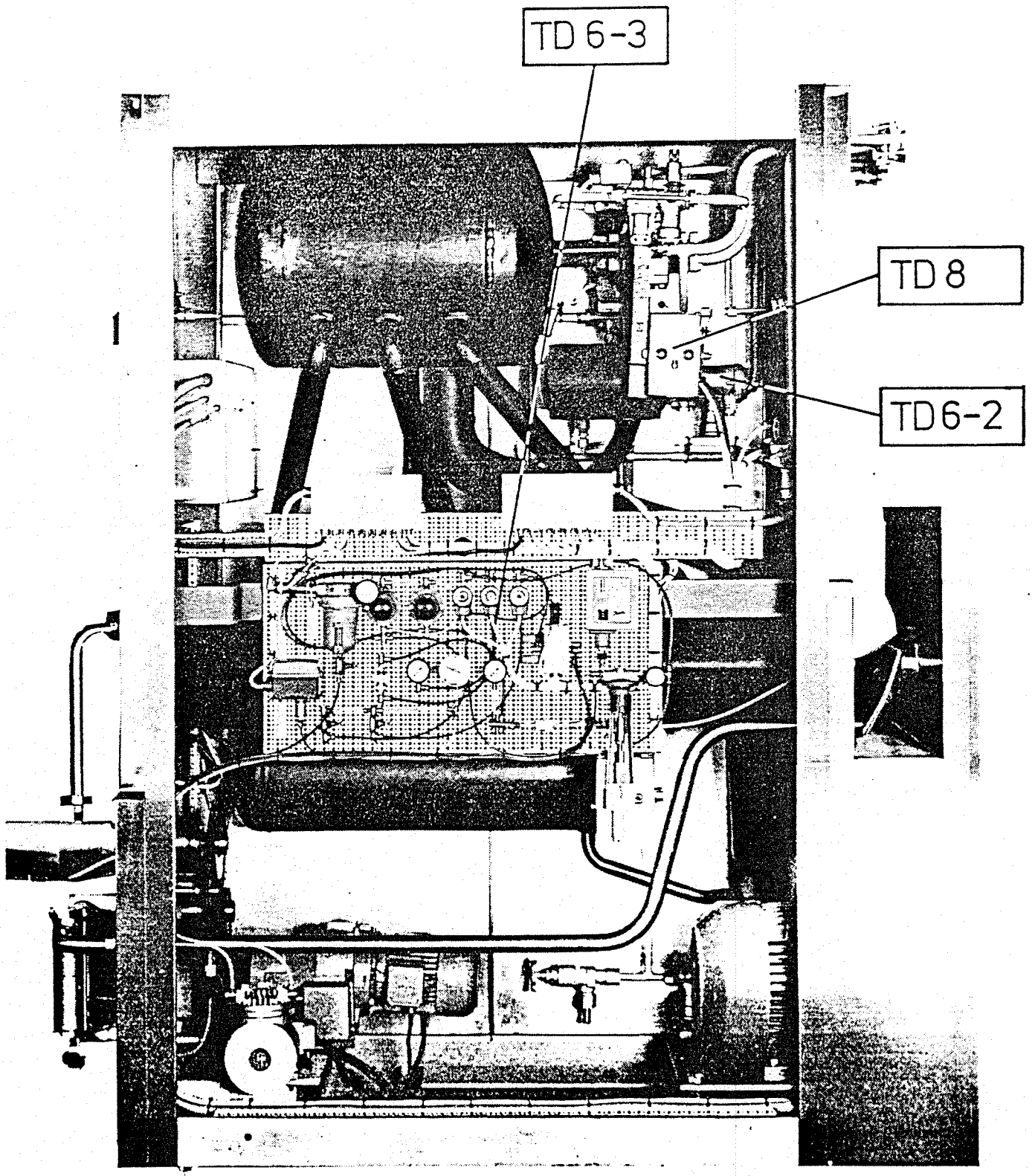
114M04E	07022
KF-XC	

TD 1-1	Outside view of freezer
TD 1-2	M.P.S. - system
TD 2	Dasher, scraper blades, beater etc. (arrangement)
TD 4-1	Control panel
TD 4-2	Control panel
TD 4-3	Control box
TD 5	Shaft sealing
TD 6-1	Inside view of freezer
TD 6-2	Liquid level switch (principle)
TD 6-3	Pneumatic parts (arrangement)
TD 7-1	Pump drive (general view)
TD 7-2	Pump drive (electronic counter)
TD 8	Pilot-valve (NH_3-suction line)

HOYER
ALFA LAVAL GROUP

COMPUTERIZED FREEZER

KF 1200XC

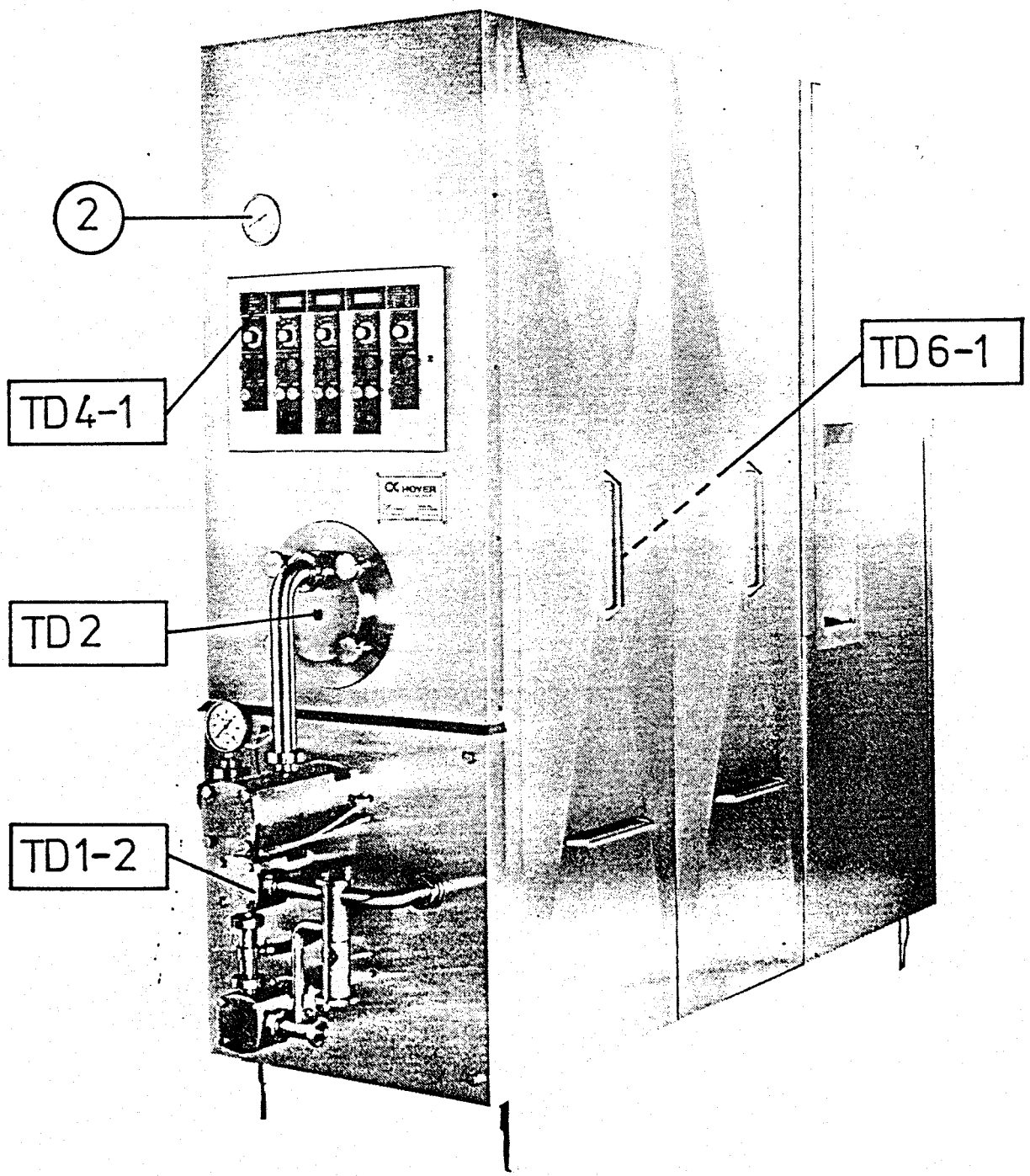


TD 6-1

COMPUTERIZED FREEZER

TYPE KF 1200XC

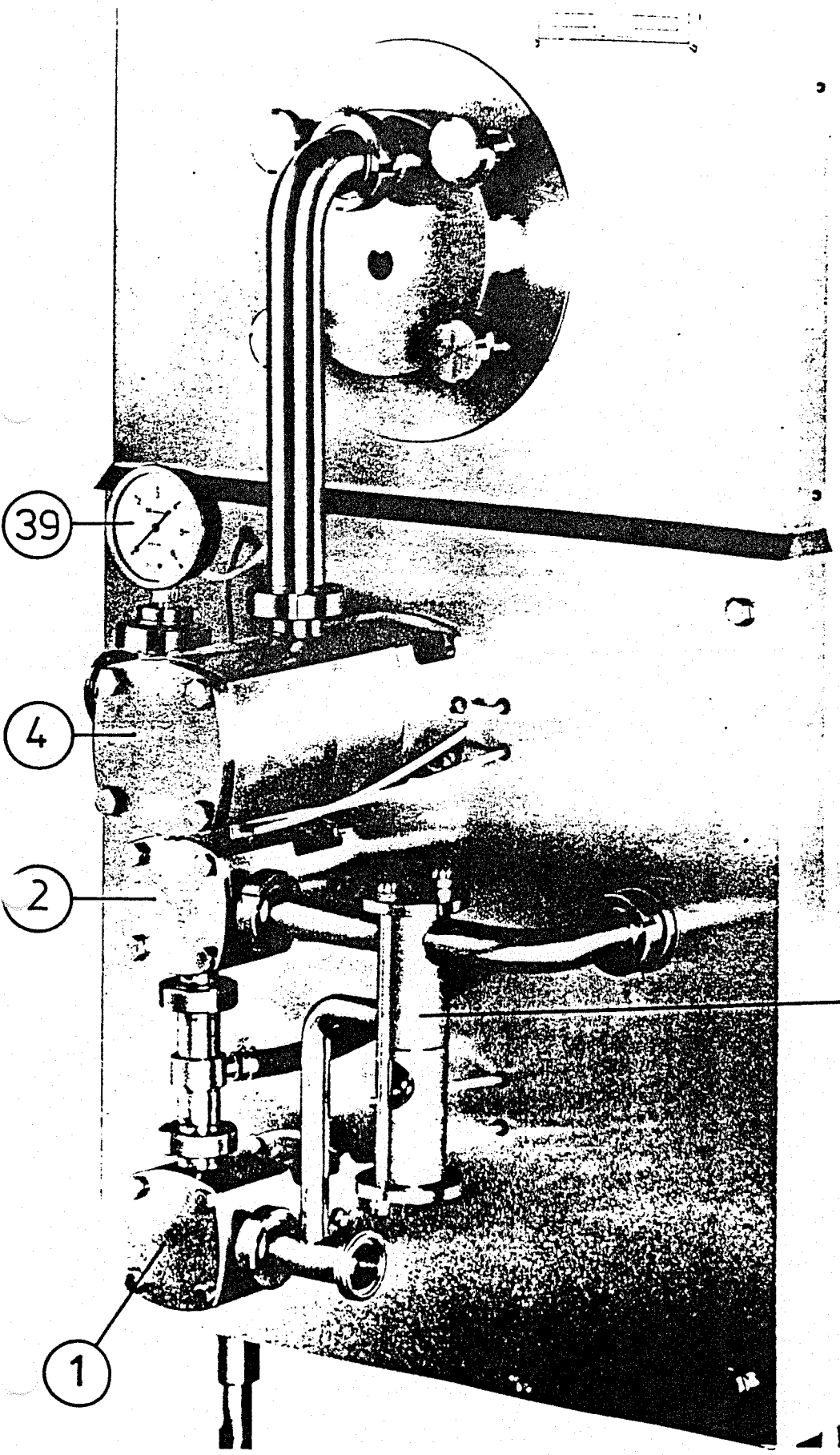
HOYER
ALFA-LAVAL GROUP



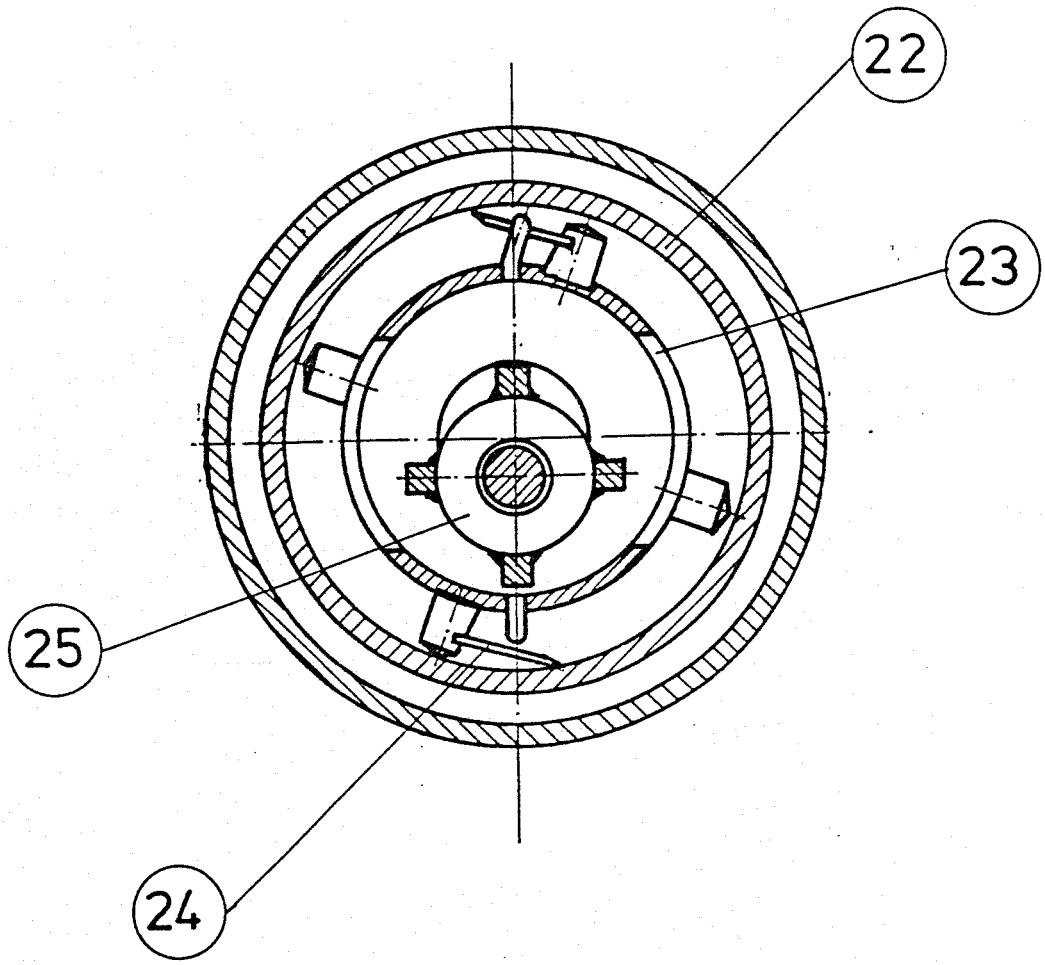
TD 1-1

HOYER
AL-A-LAVAL GROUP

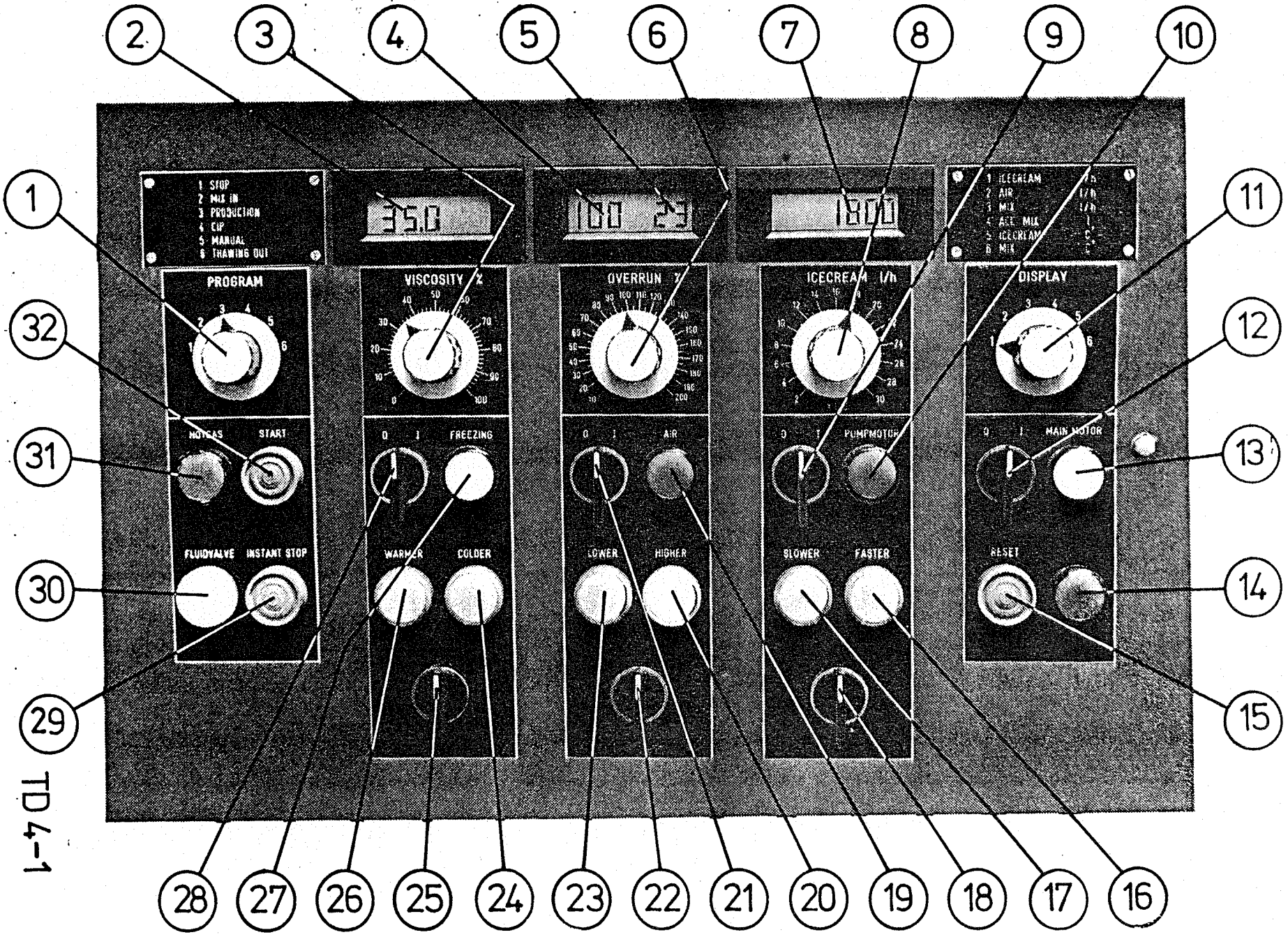
M.P.S.-SYSTEM



TD1-2



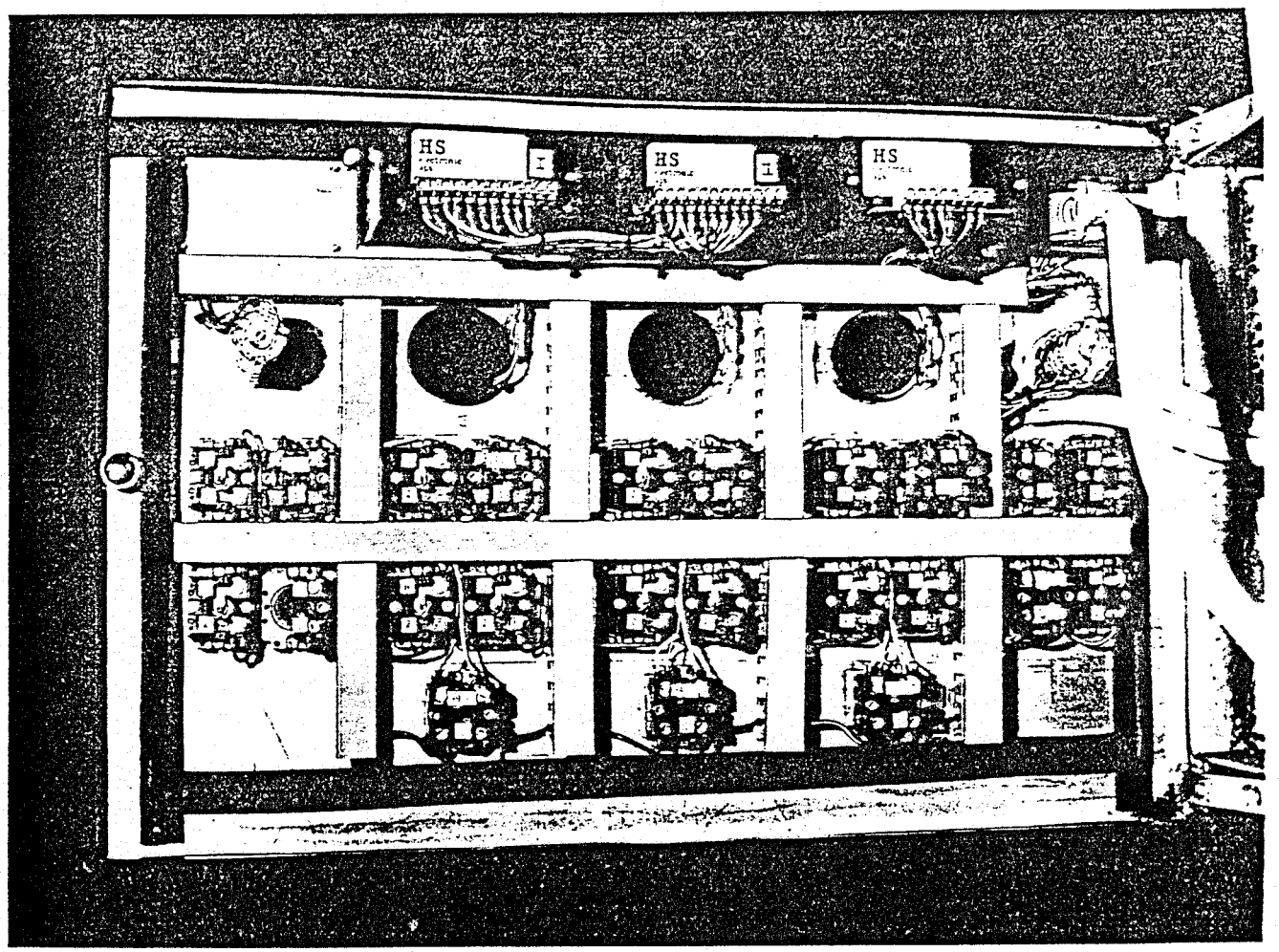
TD 2

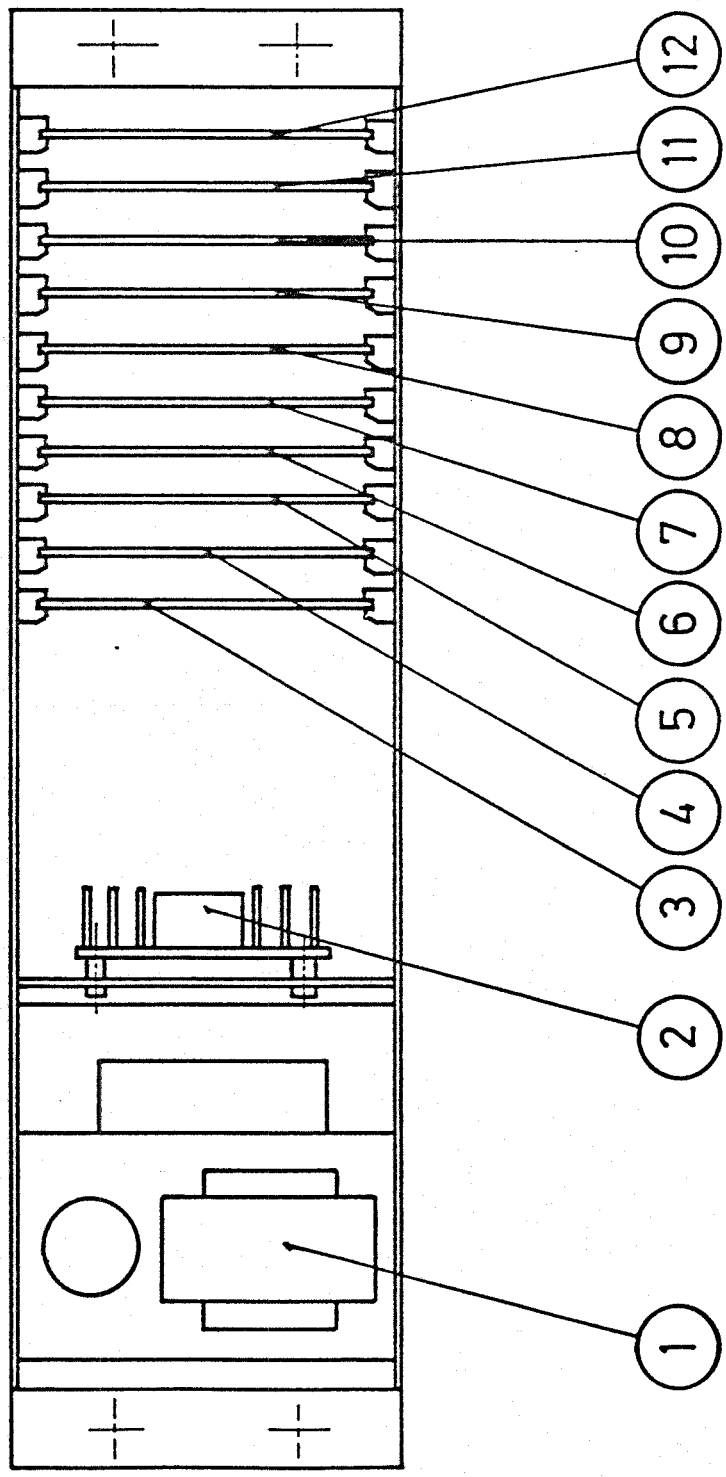


TD 4-1

KF 1150XC
KF 1200XC

CONTROL PANEL INSIDE




12
11
10
9
8
7
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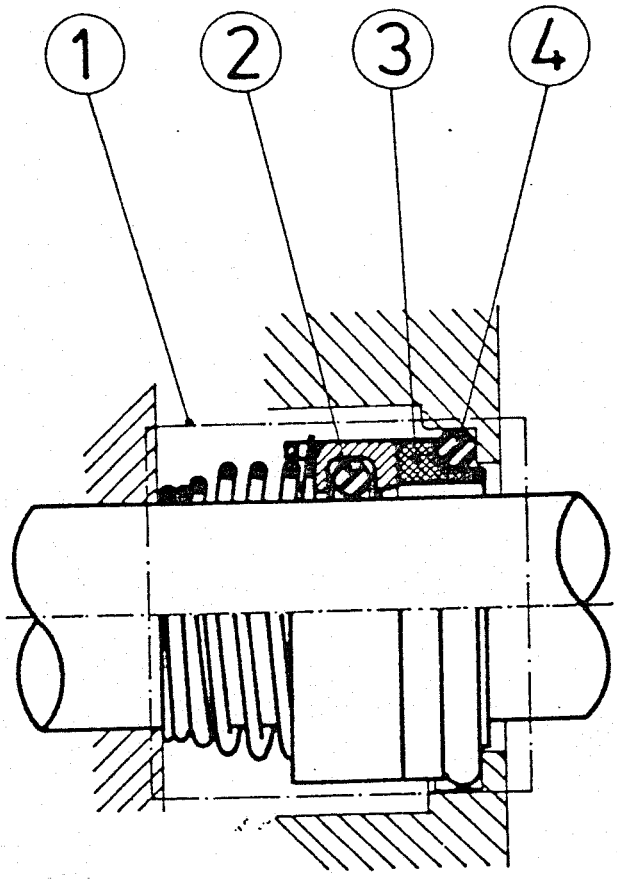
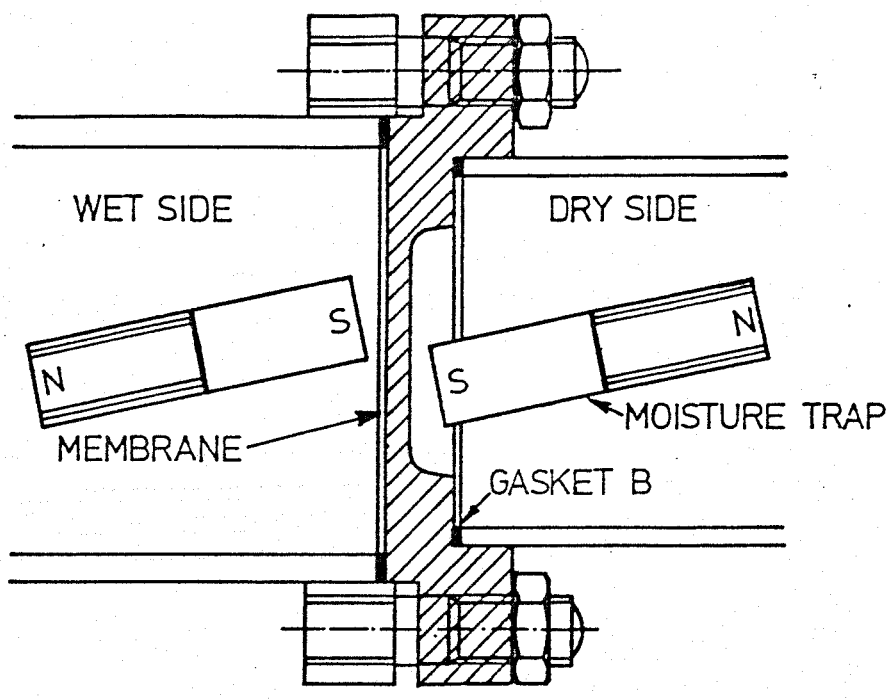
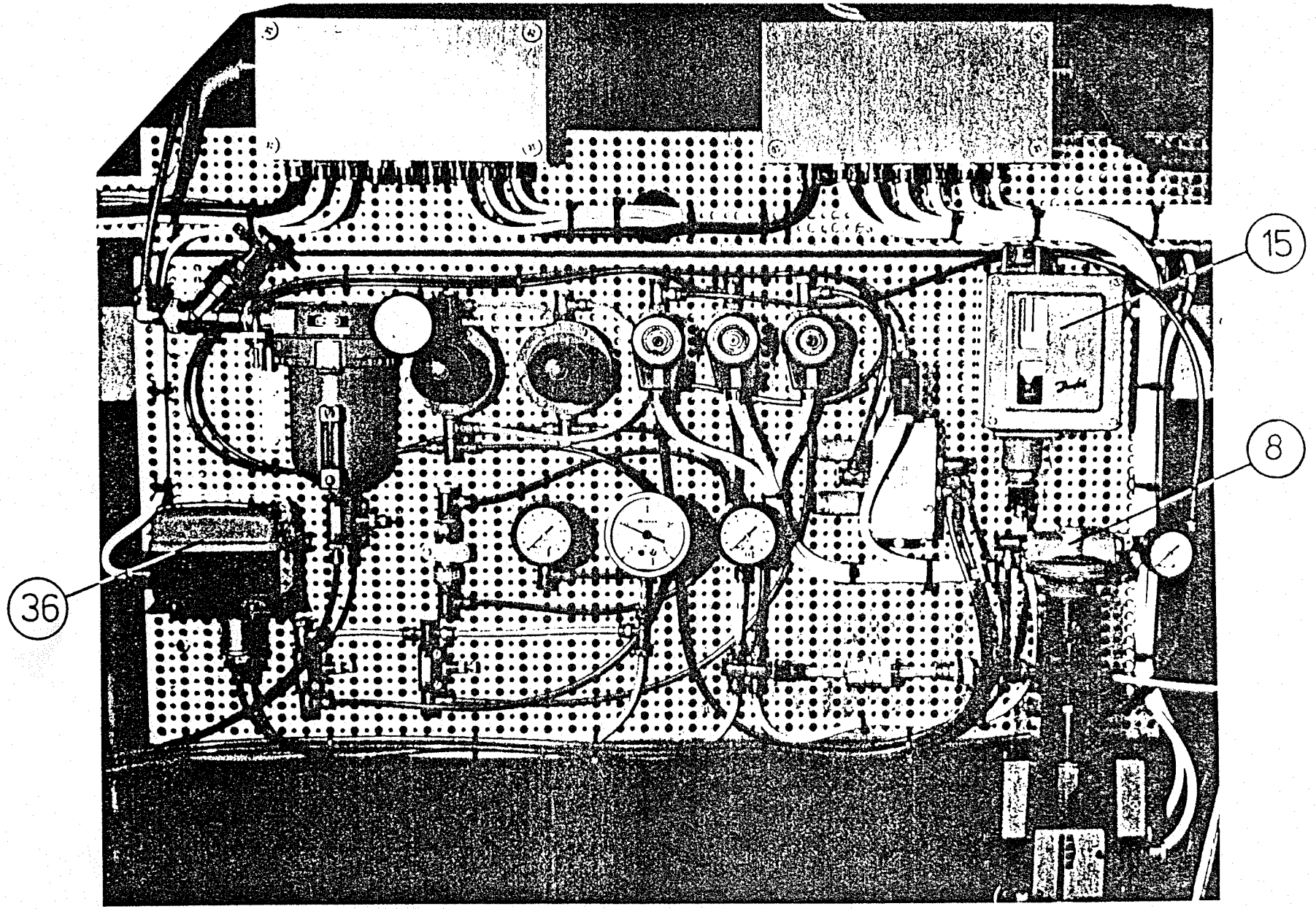
4
3
2
1

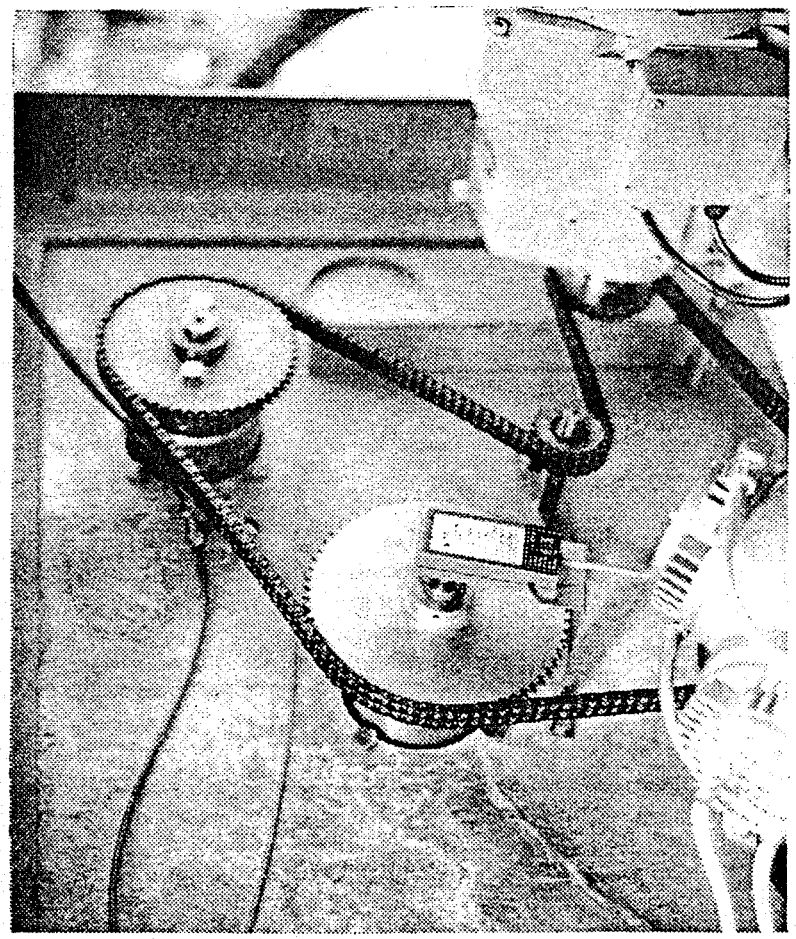


TD 5

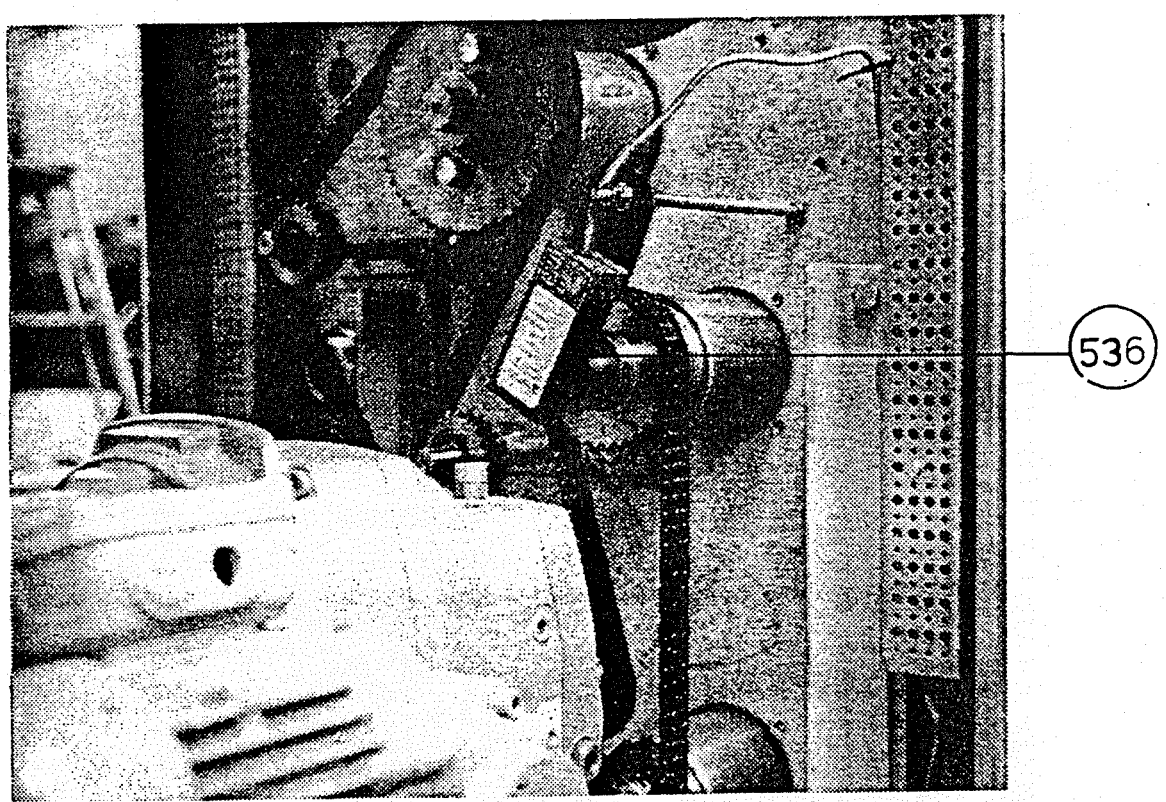

WET SIDE
DRY SIDE
N
S
S
N
MEMBRANE
MOISTURE TRAP
GASKET B

AIR REGULATION





KF - XC



KF→XC