

- SILVA #398 -



OPERATION & MAINTENANCE
MANUAL
FOR
IRAS PV-SYSTEM 2800

Warning!

The text below relates to page 1 and 2

Hoses/suction noses:

When the equipment is operating the suction nose should stay lowered in water. When the equipment is operating you must avoid close contact with the suction nose, as the vacuum can cause injuries if personnel is sucked to the suction nozzle of the PV-system. The equipment may not be operating when suction-/pressure hose is dismounted the tank. By dismounting of air hose between the power-unit and tank(s), the equipment must be turned off. Fastening of hoses, where pressure occurs, have to be checked with proper interval. If a pressure hose jump off, it can cause injuries to personnel standing nearby the machine. During operation of the equipment you have to avoid close contact with the vacuum By-pass valve if it is completely or partly open. The open vacuum valve will give a strong suck, which can cause body damage.

Guidance of use of the electric installations:

1. The system may only be connected with the voltage, which is stated on the control board.
2. The control board may not be opened while the system is operating.
3. The protective shields may not be removed while the system is operating.
4. If errors occur in connection with the electric installations, or if a protective shield is broken, the electrical power must be turned off.
5. The system is made according to the specifications, stated in this manual.
6. When the system is not in operation, the main switch at the left side of the control box must be switched off "0".

Coupling/belt drive on power-unit:

1. The protective shielding of the belt drive may not be dismounted during operation of the equipment.
2. By all repairs/inspections of the equipment, the power supply must be disconnected.
3. By operation of the ball valves on the liquidring pump the equipment must be turned off.

Directions for use/maintenance of the hydraulic equipment:

1. The warnings and references/directions of the oil supplier must be followed.
 2. By renewal of the hydraulic oil, oil spills and oil squirt outs can occur.
 3. Therefore always wear eye protection and oil protective gloves.
 4. If a leak is found in the equipment, it must be stopped immediately and the fault must be repaired.
 5. By separation of the hydraulic equipment, there can, even though it is stopped, occur static pressure from the accumulator, compressed oil etc. This can cause sudden squirts outs of hydraulic oil.
- Note that after operation of the system the oil can be 70° degrees centigrade. This results in danger of burns.

ATTENTION

This manual covers IRAS PV-system for transport of pelagic fish as well as IRAS PV-system for transport of live fish.

Furthermore the manual describes the variously driven power units :

- Electric driven
- Diesel driven
- Hydraulic driven

Therefore take care you read the description applied to your system.

Electric driven:

Remember to check the direction of rotation of the motor and the liquidring pump when the power is connected to the control box (terminal screw RST is connected to each of its phases).

The direction of the rotation must be according to the arrow placed on the liquidring pump.

If the direction of rotation has to be changed, change two phases!

Hydraulic driven:

Remember to check the direction of rotation of the motor and the liquidring pump.

The direction of the rotation must be according to the arrow placed on the liquidring pump.

If the direction has to be changed, change the hydraulic hoses.

Information about airborne noise/din:

According to the (machine directive/directions) information about the noise level is demanded.

On an electric driven IRAS PV-system the energy equivalent, A-weighted sound pressure level is measured to 80

decibel (A).

The measurement is taken in a distance of 1 meter from the machine and in a height of 1,60 meters from the socket.
The working condition of the machine was normal speed.

Table of contents

Chapter 0	Specification of PV-system.....	Page 0.0
Chapter 1	Arrangement of power unit, V-belt driven	Page 1.1
	Arrangement of power unit, Direct driven - up to 15 Kw.....	Page 1.2
	Arrangement of power unit, Direct driven - from 22 Kw and upwards.....	Page 1.3
	Arrangement of power unit, Diesel driven	Page 1.4
	Arrangement of power unit, Hydraulic driven	Page 1.5
	Arrangement of principle of IRAS PV-system.....	Page 1.6
	Arrangement of PV-tank for unloading.....	Page 1.6
	Arrangement of PV-tank for live fish transport.....	Page 1.6
	Item list.....	Page 1.7
Chapter 2	General description	Page 2.1
	Description of function	Page 2.1
	Protection against corrosion.....	Page 2.1
	Water supply for liquidating pumps.....	Page 2.1
	When starting up.....	Page 2.2
	Adjustment the water supply system	Page 2.2
	Stopping the PV-system.....	Page 2.3
	Immediate re-starting	Page 2.3
	Regulating valves for filling / emptying speed.....	Page 2.3
	Reducing the inlet speed	Page 2.3
	Reducing the discharge speed.....	Page 2.3
	The liquidating pump in frosty weather	Page 2.3
	Prime water supply / quality	Page 2.3
	Arrangement of water supply.....	Page 2.4
	Item list.....	Page 2.5
	IRAS Master Control system (with back blow system - optional)	Page 2.6
	Control panel of IRAS Master Control panel.....	Page 2.7
	IRAS Cross Field system.....	Page 2.11
Chapter 3	Starting up the PV-system.....	Page 3.1
	The control panel.....	Page 3.1
	The start button.....	Page 3.1
	The stop button.....	Page 3.1
	Emptying button.....	Page 3.1
	By-pass button.....	Page 3.1
Chapter 4	Maintenance	Page 4.1
	The liquidating pump at standstill for longer period.....	Page 4.1
	Acid free oil.....	Page 4.1
	Dispersion of oil	Page 4.1
	LUBRICATION - General Information	Page 4.2

4-way valve.....	Page 4.2
The EI motor.....	Page 4.2
The liquidring pump.....	Page 4.2
The diesel engine.....	Page 4.2
Lubrication and check schedule.....	Page 4.3
Hydraulic pump unit for cylinder and valves.....	Page 4.4

Chapter 5

Simplified sketch for hydraulic controlled 4-way valve	Page 5.1
Hydraulic operated 4-way valve	Page 5.2
Item list.....	Page 5.3

Chapter 7

V-Belt transmission.....	Page 7.1
Coupling - direct transmission.....	Page 7.2

Chapter 8

Description of hydraulic pump unit.....	Page 8.1
Hydraulic pump unit.....	Page 8.1
Hydraulic accumulator.....	Page 8.1
Pressure switches	Page 8.1
Solenoid valves	Page 8.1
Arrangement of hydraulic pump unit - electric driven.....	Page 8.2
Arrangement of hydraulic pump unit - diesel driven	Page 8.3
Arrangement of connected hydraulic hoses.....	Page 8.4
Hydraulic diagram.....	Page 8.5
Item list.....	Page 8.6

Chapter 9

Description of the control system	Page 9.1
Automatic operation mode.....	Page 9.1
Semi automatic mode.....	Page 9.1
Flow diagram.....	Page 9.2
Flow diagram - description	Page 9.3
Diodes 1-12	Page 9.3
Description of the control panel.....	Page 9.4
Start button	Page 9.4
Stop button	Page 9.4
Bypass button	Page 9.4
Manuel filling.....	Page 9.5
Manuel emptying	Page 9.5
Turn function.....	Page 9.5
Remote controls, optional	Page 9.6
Remote control with wire.....	Page 9.6
Remote control, wireless.....	Page 9.6
Extension cable for receiver.....	Page 9.6
Remote control, bin control with wire.....	Page 9.7
Remote control, bin control wireless.....	Page 9.9
Extension cable for receiver.....	Page 9.10
Cable, double tank operation	Page 9.10

Chapter 12
Cleaning of stainless steel.

Chapter 11
Electrical diagrams Page 11.1

Chapter 10
Trouble shooting Page 10.1

The electric motors can not start up.....	Page 10.1
The automatic control out of order.....	Page 10.1
The system stops immediately after starting up.....	Page 10.1
The cycle of the PV-system stops.....	Page 10.1
The hydraulic operated valves are out of order.....	Page 10.2
The system has suddenly no- or reduced capacity.....	Page 10.2
Noisy operation of the liquidring pump.....	Page 10.2
The liquidring pump gets jammed.....	Page 10.2
Leakage of sealant liquid.....	Page 10.3

Chapter 9
Description of the control buttons inside the control panel..... Page 9.11

Semi/Full.....	Page 9.11
Full/Empty.....	Page 9.11
Timer.....	Page 9.11
Test system.....	Page 9.12
Changing of timers.....	Page 9.13
Adjustable timers available.....	Page 9.14
Sensors.....	Page 9.15
VNI.....	Page 9.16
Control panel, inside view - electric driven.....	Page 9.17
Control panel, inside view - hydr or diesel driven.....	Page 9.18
Parts list - electric driven.....	Page 9.19
Parts list - hydr or diesel driven.....	Page 9.20
Directions for use of electric boxes on machines.....	Page 9.21

Specification of PV-system

Date:	03.02.2006
-------	------------

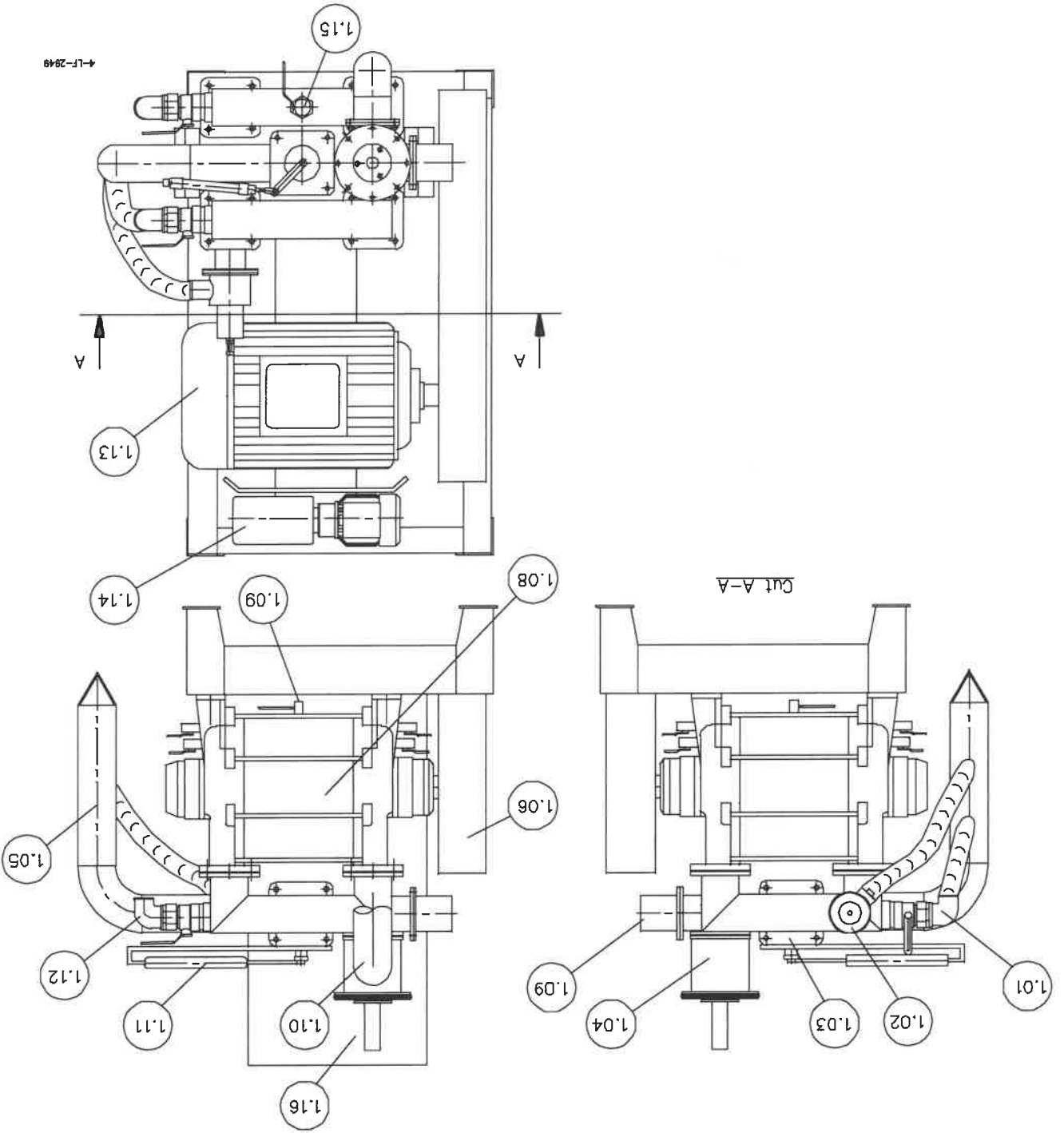
Buyer	SILVA #398
Customer order number	38344
Tank serie numbers	2891
Electric data	3 x 440 V, 60 C.
Type of motor	Høyer 37 kW, 1470 o/min.
Type of liquidring pump	Samson W11
Type of transmission for liquidring pump	HRC 180F

Specification, continued

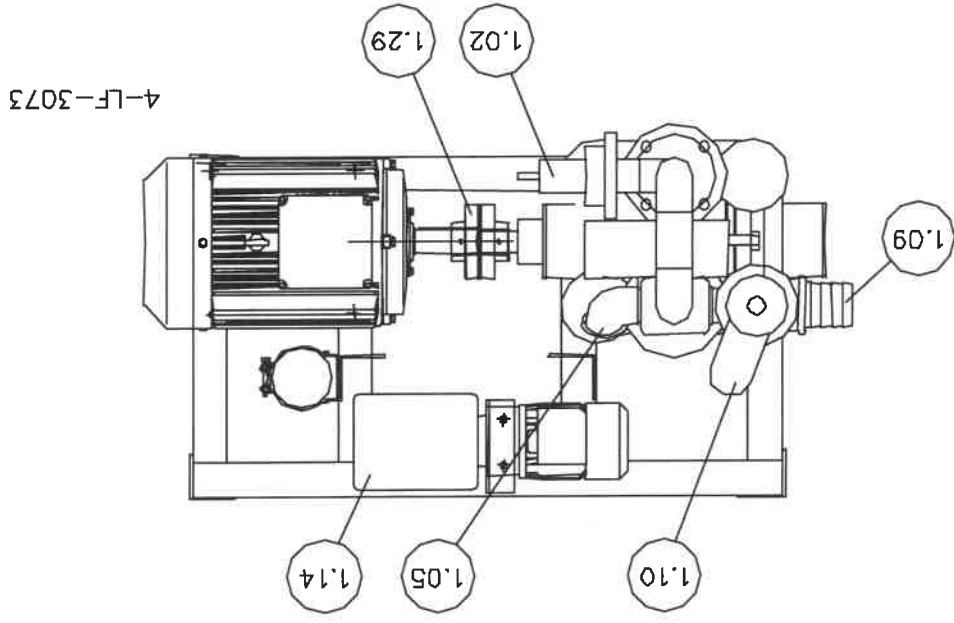
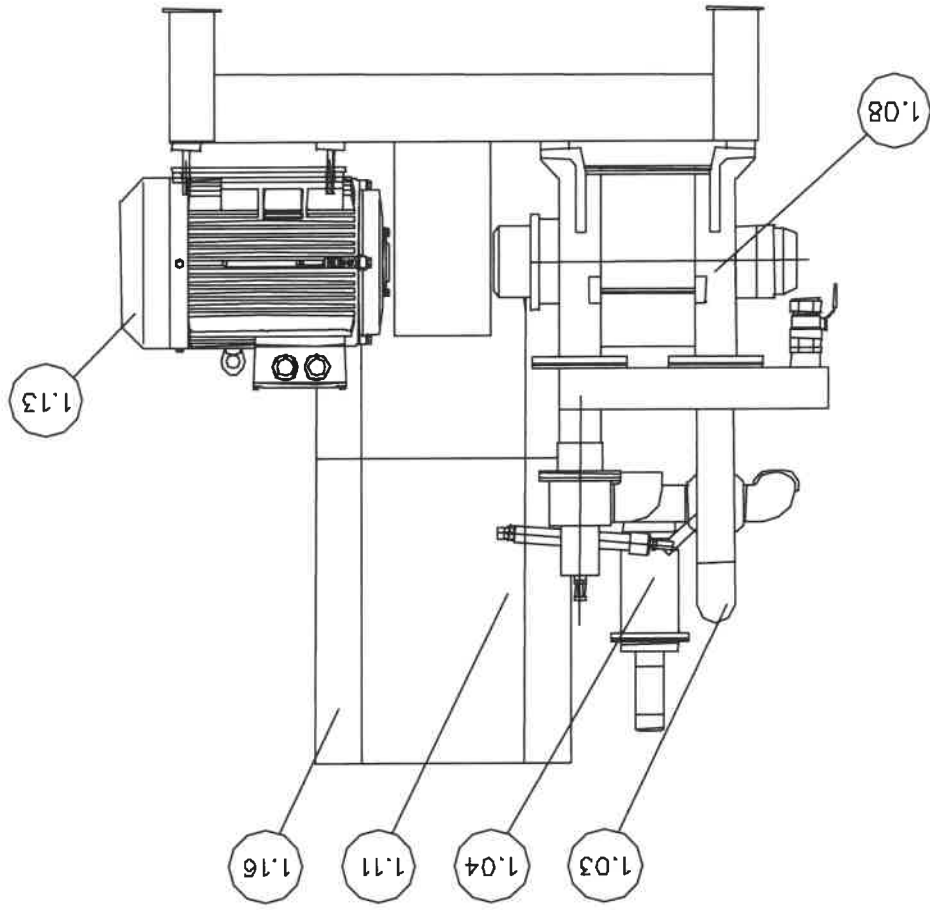
- hydraulic system.

Type of hydraulic pump	Danitech
Type of motor, hydraulic pump	0,37 Kw
Type of hydraulic accumulator	SAIP LA 1.5/18 bar
Type of flow control, 4-way valve	EGE SN450-1
Type of solenoid valve for 4-way valve	Duplomatic DS3-TA /10N 24VAC
Type of solenoid valve for by-pass vacuum	Duplomatic DS3-TA /10N 24VAC
Type of solenoid valve for supply water	Duplomatic DS3-TA /10N 24VAC
Type of cylinder, 4-way valve	SSH 25/12x150
Type of cylinder, by-pass	Klinkby DVGFS 40/20-60
Type of valve, supply water	3/4" SA931 Sanistal
Type of top sensors	E+H FTL 260 DC PNP
Type of bottom sensors	E+H FTL 260 DC PNP

Arrangement of power unit. - V-belt driven Electric driven.

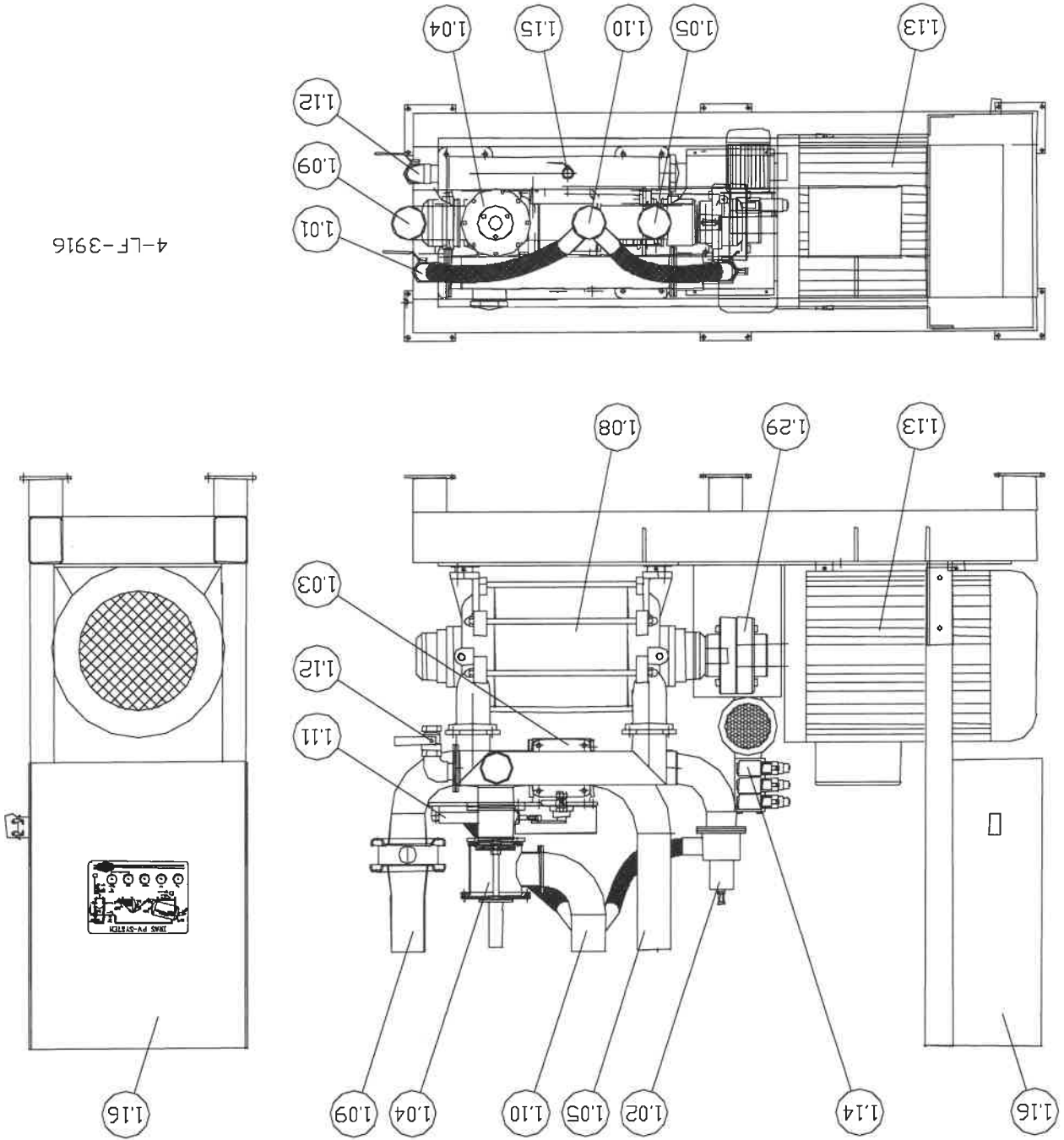


Arrangement of power unit.
 - Direct driven up to 15 Kw.
 Electric driven.



4-LF-3073

Arrangement of power unit.
 - Direct driven from 22 Kw and upwards.
 Electric driven.



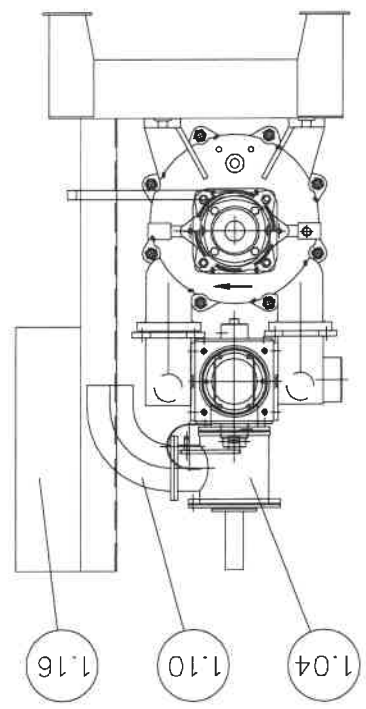
4-LF-3916

Diesel driven.

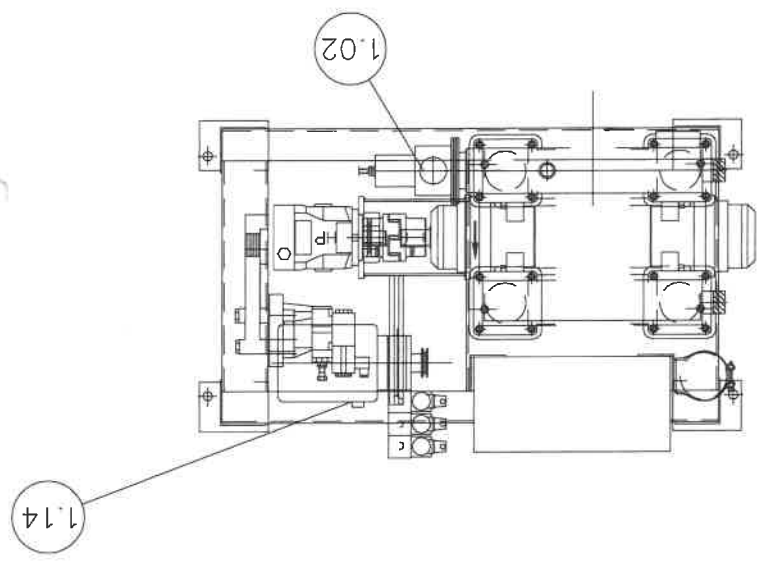
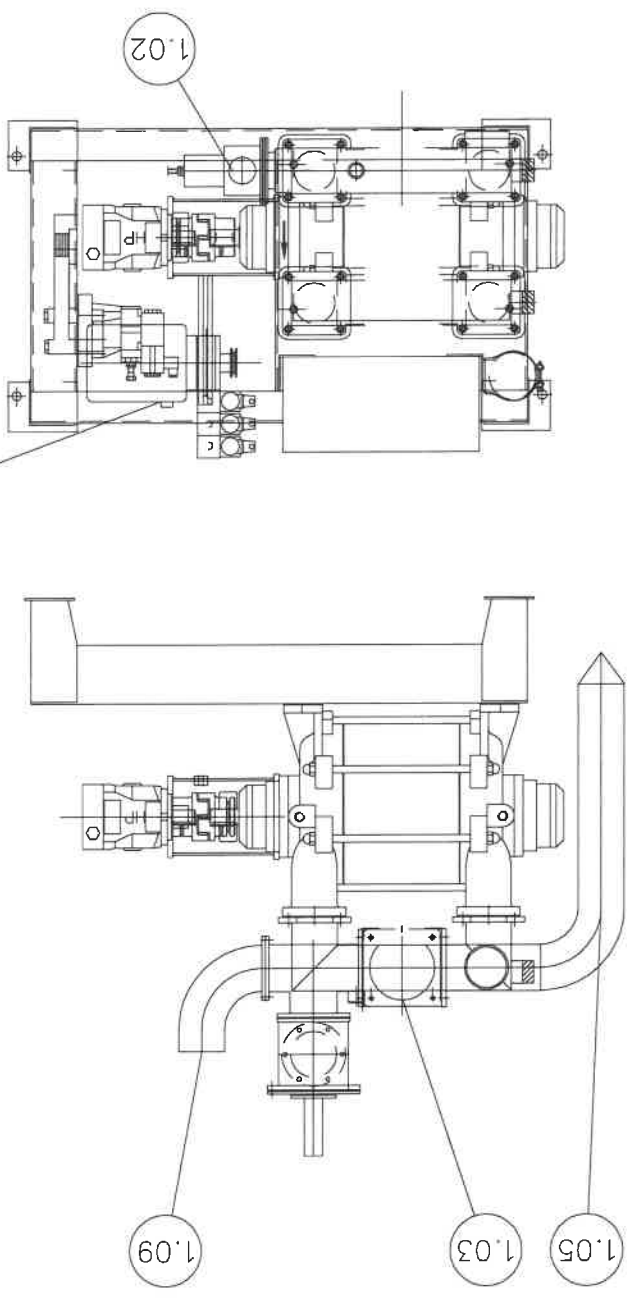


Arrangement of power unit.
- Direct driven

Hydraulic driven.

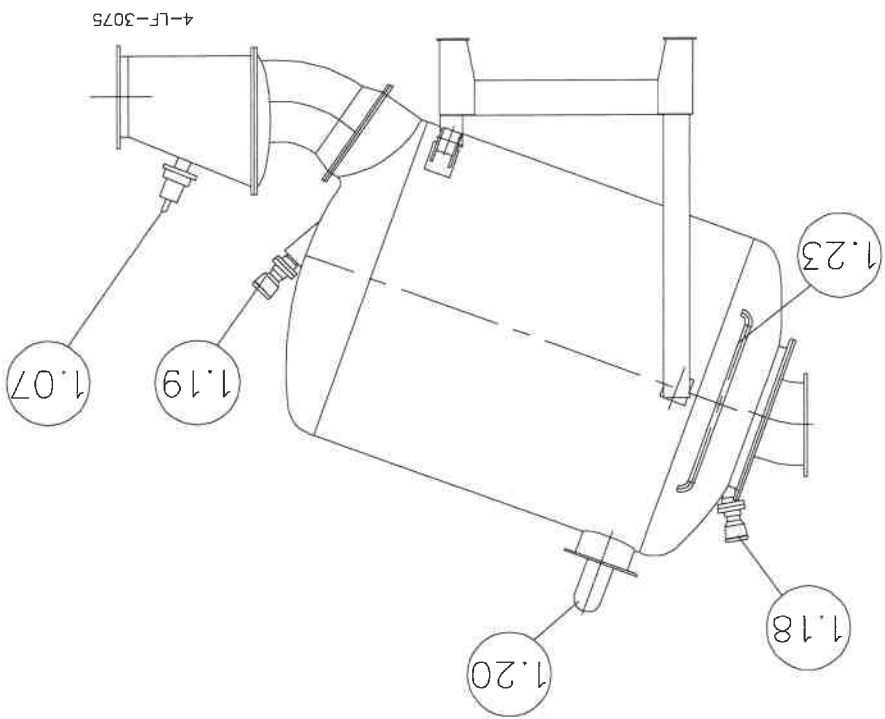


4-LF-3131

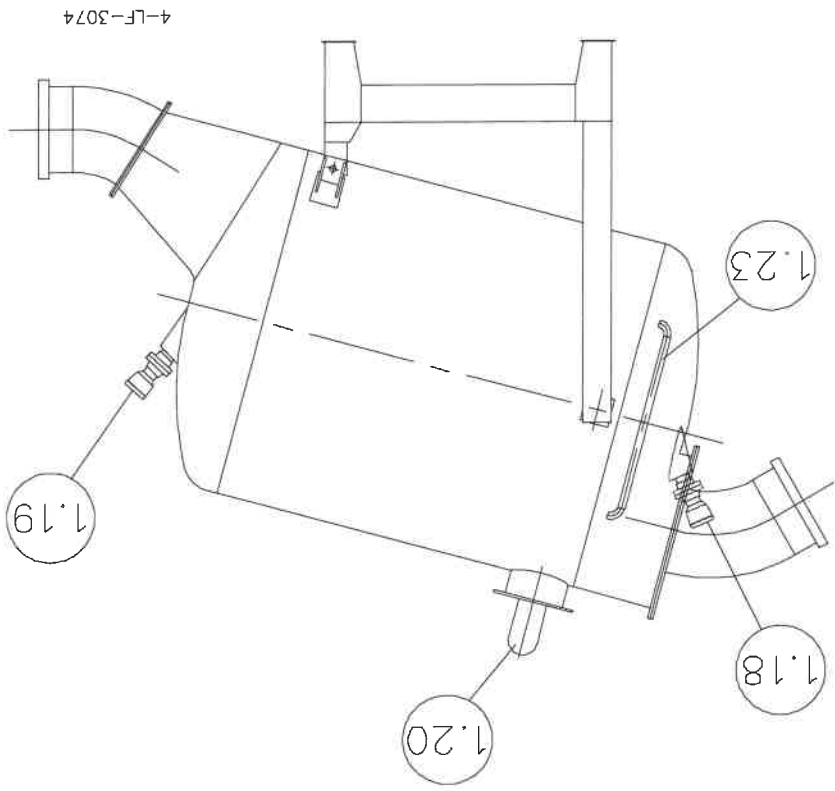


Arrangement of principle of IRAS PV-system.

- Arrangement of PV-tank for unloading



- Arrangement of PV-tank for live fish transport



Item list

Pos.	Description
1.01	Manual by-pass, pressure
1.02	Safety valve, pressure
1.03	4-way valve
1.04	By-pass valve, hydraulic
1.05	Exhaust
1.06	V-belt transmission
1.07	Release valve
1.08	Liquidring pump
1.09	Connection to PV-tank
1.10	Exhaust by-pass
1.11	Hydraulic cylinder for moving 4-way valve
1.12	Manual by-pass valve, vacuum
1.13	Electrical motor
1.14	Hydraulic power pack
1.15	Valve for oil
1.16	Control panel
1.18	Sensor, top - (FTL 260)
1.19	Sensor, bottom - (FTL 260)
1.20	Floating ball / Connection to power unit
1.23	Level hose
1.24	Silencer, dieselmotor
1.25	Exhaust cooling air
1.26	Batteri
1.27	Intake cooling air
1.28	Diesel engine
1.29	Shaft coupling

General description

Description of function:

The PV-system consists of a tank arrangement made in stainless steel and a power unit including an electric control for manoeuvring the system.

When starting up, the system starts the pumping cycle:

- 1) The tank is vacuumed; fish and water are sucked into the tank.
- 2) The top sensor at the tank register when the tank is full, the electric control change the 4-way valve for adding pressure instead of vacuum.
- 3) The tank is pressurized and emptied, water/fish is pumped to a de-watering box.
- 4) The bottom sensor at the tank register when the tank is empty and again the 4-way valve change to vacuum position. The system runs this cycle fully automatically.

Before delivery the PV-system is subjected to a factory run test with control of operating data and performances.

The tank is provided with an identification plate which shows the machine type and the production number.

Protection against corrosion.

During transport the liquidring pump is filled with oil. Therefore it is necessary to empty the pump for oil and to flush the pump thoroughly before the system is being used to transport fish.

Water supply for liquidring pump.

By knowing the characteristic of the supply water pump, the regulating valves have to be calibrated so, that the performance of the supply water pump is adequate to the consumption of the liquidring pump.

The consumption of water for the liquidring pump is shown in the scheme below:

Type of pump	Consumption of water per pump
Centra 50016	15 l/min. at 2 bar
Centra 65016	20 l/min. at 2 bar
Samson W9	20 l/min. at 2 bar
Samson W11	20 l/min. at 2 bar
Samson W16	25 l/min. at 2 bar

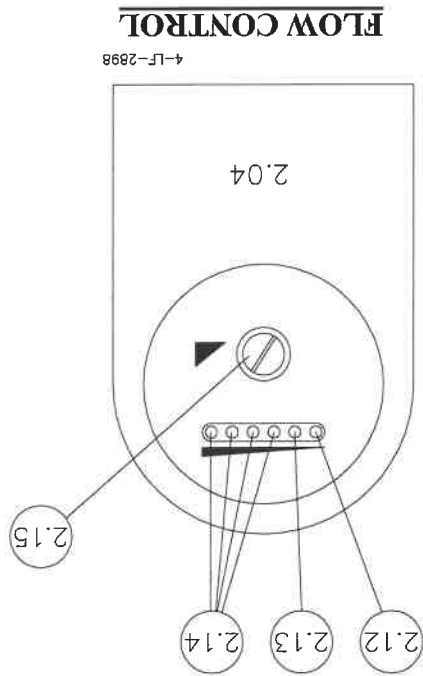
The values above are minimum values at disposal for the liquidring.

To ensure that the supply water pump have the right performance, the characteristic of the supply water pumps must be checked every 3 weeks.

Note: The function of the flow controls is only as supervision of a minimum flow of prime water to the liquidring pump as protection of the mechanical shaft sealings. The amount of prime water must be adjusted according to the following instruction.
If the system stops caused of too small water amount to the pump, check the water flow. Adjust and increase the water supply to the liquidring pump.

THE LIQUIDRING PUMP MUST NEVER BE OPERATED WITHOUT WATER, AS THIS WILL DAMAGE THE SHAFT SEALS.

When starting up with total drained liquidring pump.
Open one of the drain valves pos. 2.06 at the pump.
Ensure that valve pos. 2.03 is partly or total open.
Then open ball valve for manual water supply, pos. 2.02.
Check for water flow.
As soon as water flows out through the opened valve, pos. 2.06 the pump is primed.
Close the prime valve (pos. 2.02) and the drain valve (pos. 2.06), and the pump is ready for starting-up.
When re-starting the liquidring pump (the pump is still containing water) it is not necessary to prime the pump. When the pump have been totally drained out it must be primed before starting-up. The pump is ready for starting up.



The adjustment of water flow to the pump is done with valve pos. 2.03.
The four green diodes, pos. 2.14 shows the area of the right flow.
decrease.
be increased. If too small amount of water is added to the pump, the capacity of the system can
When the yellow diode, pos. 2.13 is illuminated, the water flow is on the absolut minimum and must
If the red diode, pos. 2.12 is illuminated, the water flow is to low and the pump stops automatically.
The flow-control is equiped with diodes showing the actual water consumption to the pumps.
control to the pump. (pos. 2.04).
To ensure that the liquidring pump get the right amount of water, the system is equiped with a flow-

Stopping the PV-system.

When stopping the pump, the valve, pos. 2.05 will close and stop the water supply to the liquidating pump.

Immediate re-starting.

If the liquidating pump at the starting-up procedure is filled up with too much water, it will require an additional supply of power to the electrical motor, which may not exist. In that case the motor will not start and it will be necessary to drain water out of the pump through the drain valve, pos. 2.06 until correct water level is reached.

The drain valves must be closed during operation.

The liquidating pump in frosty weather

If there is a risk of frosty weather, the liquidating pump must be emptied of water immediately after operation.

The following is done: Turn off the water supply. Remove hose connection for water supply, pos. 2.01. Open all ball valves, pos. 2.02, pos. 2.03, pos. 2.06 and pos. 2.07. It is absolutely necessary to

open all valves as otherwise a pocket of water will remain inside the pump.

Now "turn" the pump by activating the turn function (see description of the turn function in chapter 9) on the control panel.

The pumps will start up in a few seconds and then automatically stop again.

At the same time the main valve for water supply opens and drain out the arrangement of water supply.

It is emphasised that a pump damaged by frost is not covered by any guarantee.

Regulating valves for filling / emptying speed.

The power unit is equipped with two valves for regulating the in- and outlet speed (suction- and discharge speed). Normally the valves are closed.

For reducing the inlet speed open the by-pass vacuum valve, pos. 1.12.

For reducing the discharge speed open the by-pass pressure valve, pos. 1.01.

By adjusting the valves you will be able to regulate the capacity.

NOTE: If the by-pass valves are closed you will have the greatest capacity.

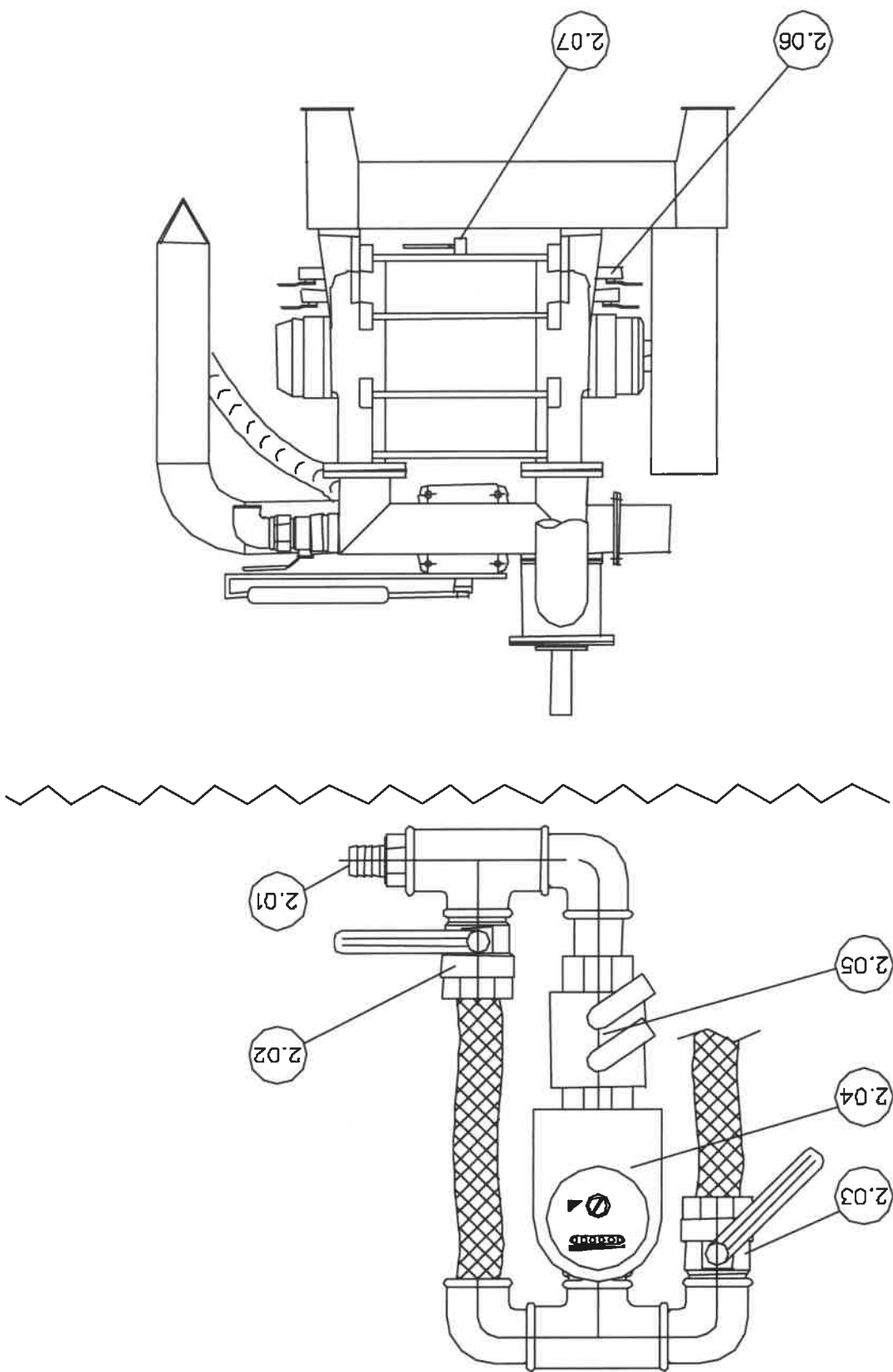
Prime water supply / quality.

Fresh water or sea water can be used. If sea water will be used, it is recommended to install a filter with max. 150 micron to protect the pump against abrasive particles. Required flow: 25 l/min. at 2.5 bar.

Note:

When using sea water, always flush the pump with fresh water, after use.

Arrangements of water supply.



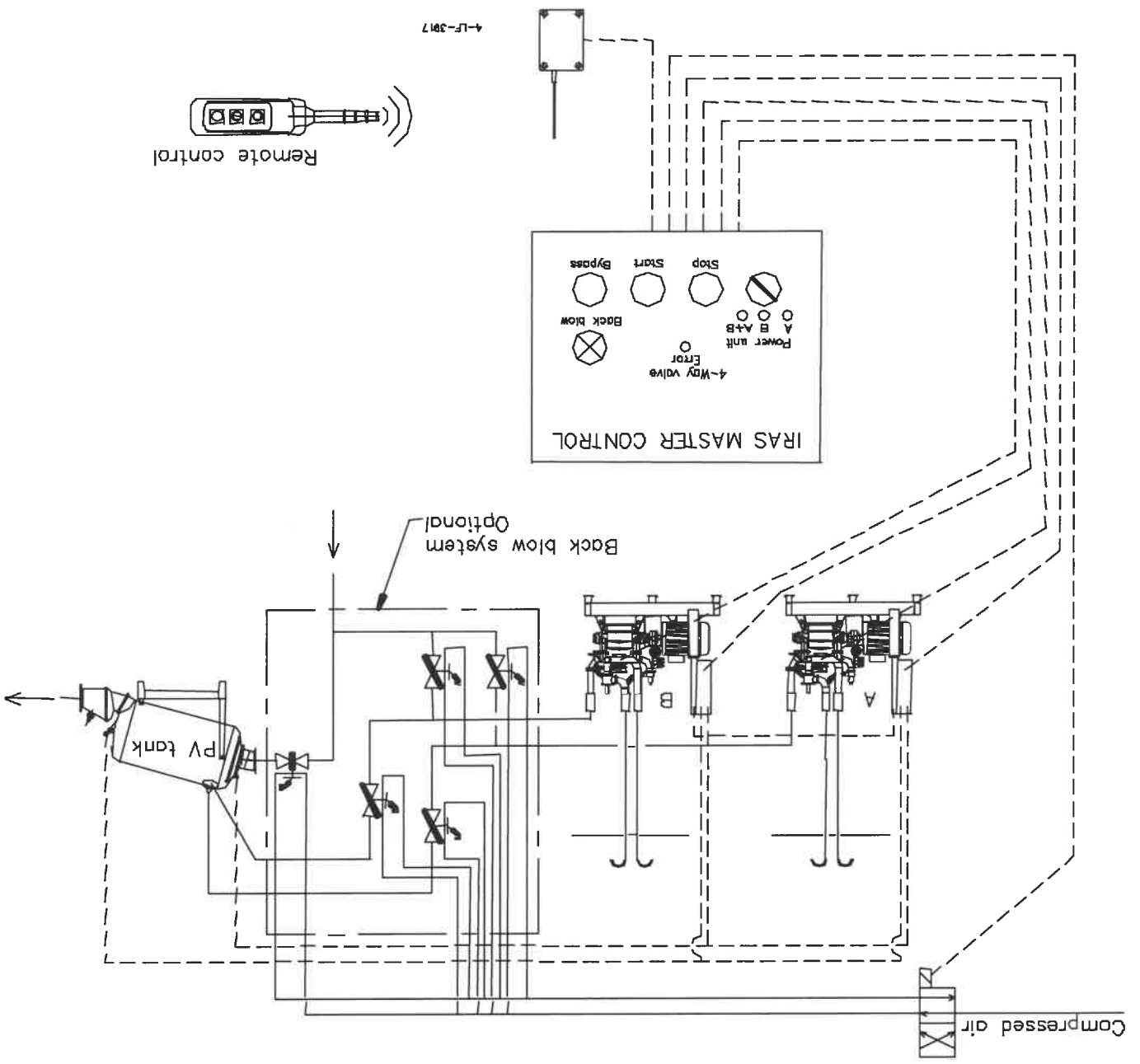
4-LF-2951

Item list.

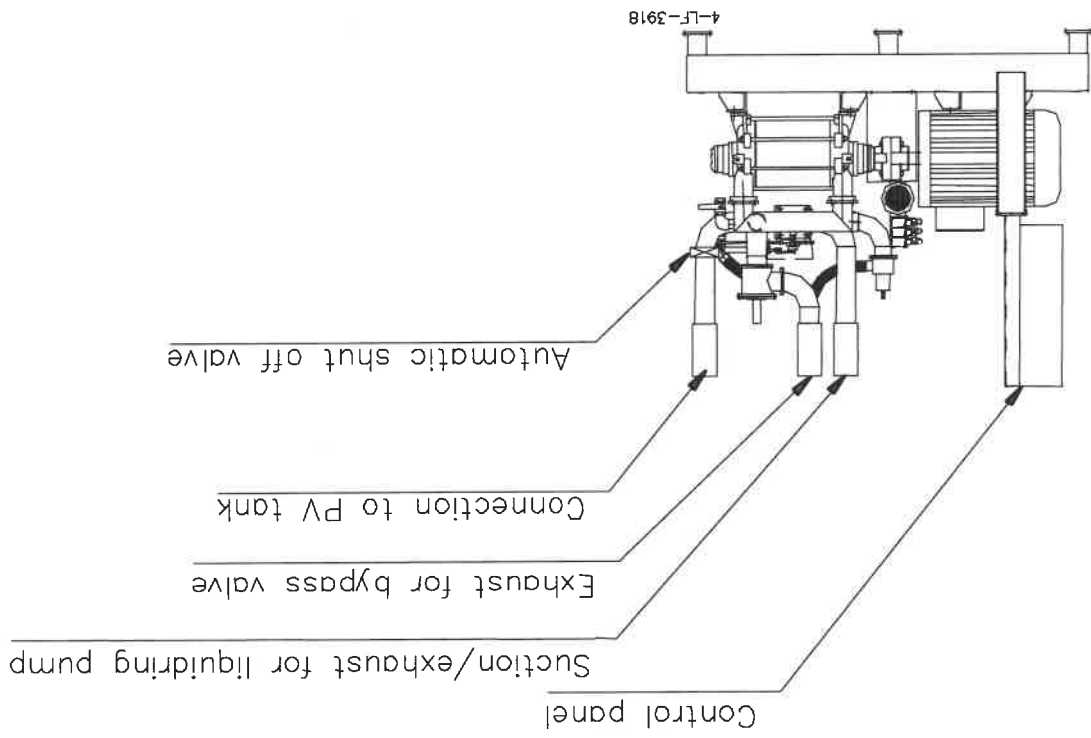
Pos.no.	Quant.	Description
2.01	1 pcs.	Connection for water supply
2.02	1 pcs.	Valve for priming the liquidring pump (normally closed)
2.03	1 pcs.	Valve for adjustment of water flow
2.04	1 pcs.	Flow-control
2.05	1 pcs.	Main valve for water supply, hydraulic operated
2.06	6 pcs.	Valve for draining the liquidring pump
2.07	(1) pcs.	Valve for draining the liquidring pump

IRAS Master Control system (with back blow system - optional)

The IRAS Master control system makes it possible to run the PV-system with one or two power units, depending on the demand of capacity. When running the PV-system with one power unit only, it is possible to run with both power units on individual basis. See following drawing.



IRAS Master Control system (with back blow system)





1. Adjusting knob for choice of drivunits (A, B, A+B)
Adjusting knob settle witch drivunites shall be running (A, B, A+B), choosing between A, B or doublet running A-B. the adjusting knob must be turn over to the required running
The drivunits is provide with a automatic shutoff-valve to run in single running, shutoff-valve
function full automatic and open automatic when the drivunits is started..

2. Start, stop and bypass
The functions of start, stop and bypass buttons, functions on the same way as running a single systems See previous section under single running.

3. Back blow
If the suction pipe is choked up the Master Control panel have a switch "Back blow", the function require that the pipe systems is prepared to back blow. With the switch "Back blow" is't possible fore the operator by changing a unit of valve, that the air supply from the drivunits is to pass out in the suction pipe and then remove the plug in the suction pipe. The PV-system must be turne off before starting in normal running again. When the "Back blow" is running are there light in the switch.

With the to drivunits running at the same time, monitoring the master control system exchangeof the function can be choosen on or off. Under normal running is the switch push in.

The 4-ways divergens is to secure a correct running, and then it always must be connect. This

5. 4-ways divergens ON/OFF

single system.

The remote control must also mount direct in the drivunit that are running, the systems function like a

drivunits. In this case adjusting knob(1) must be switch in position A+B

When the master control are of choice by rejection , the systems control take place from the single

force to run with on drivunit.

If a error turn up in the Master-control cabinet can you opt out the Master Control, and then you are

Control panel

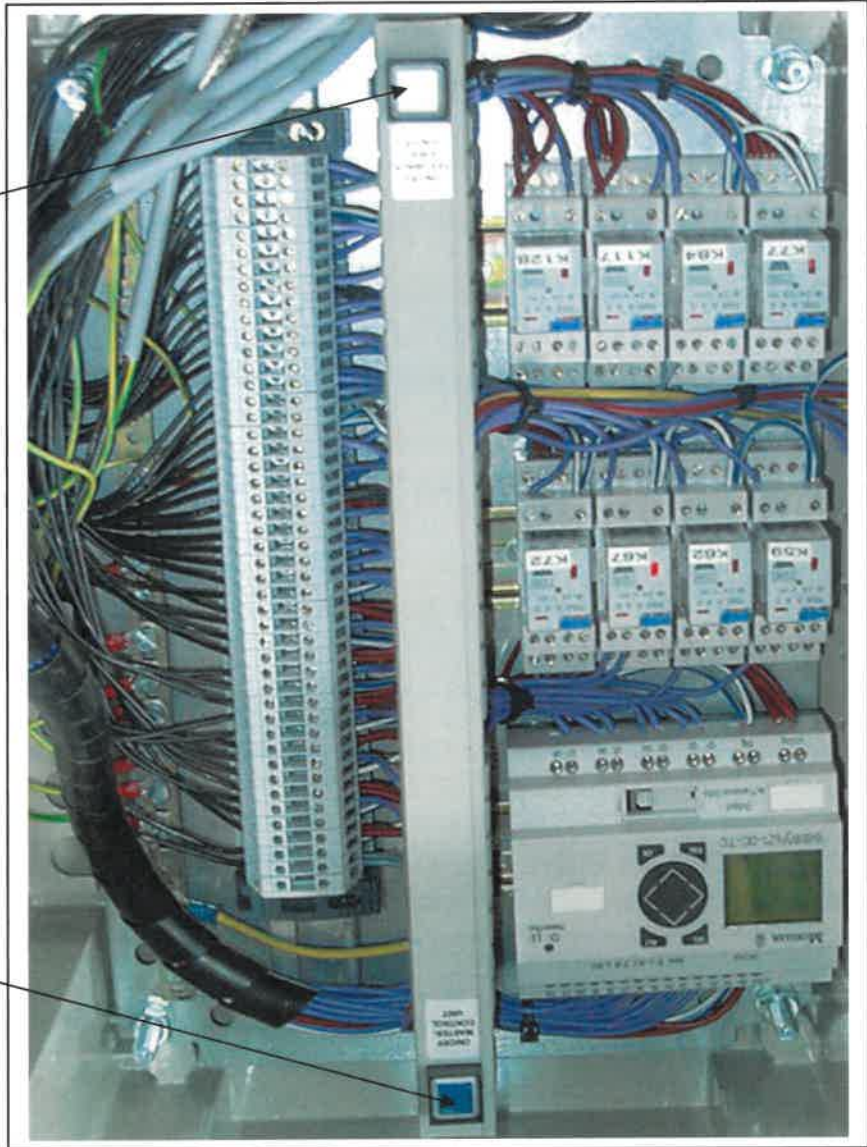
are take place from the Master Control cabinet, also the remote control receiver is mount in the Master

The Master Control function when the switches are in, at master running are all control and changing

ways divergens". Under normal running are both switches push in.

If you open the control cabinet there are to switches on the panel "Master Control ON/OFF" and "4-

4. Master Control ON/OFF:



5.
On/off
4-ways divergens

4.
On/off
Master control unit

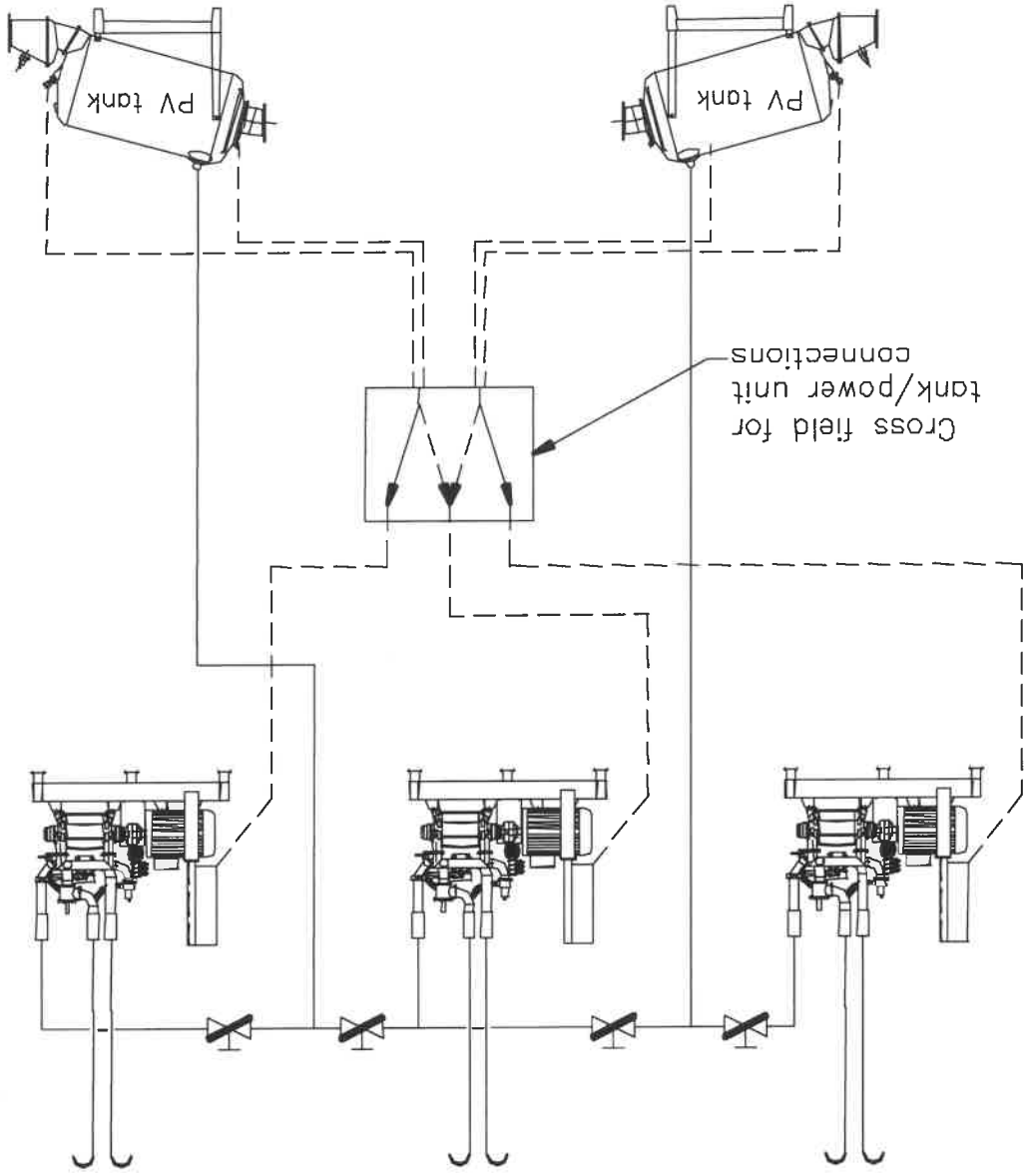
4-ways valve with help from a inductive sensor. If a error will occur in the placing of the 4-ways valves plug, will the P Y system shut down and leve a (4-Way valve error)- the diode shines red. By restarting, check what to cause the error, the error is sort out and starting again first by passing the stop button the diode do not more shine, and the start button function again.

You can run with out this function aktiv but it requiring constanting surveillance of the to drivunits and it's not advisabelt, because there can occur a divergens between the to drivunit. If there occur a 4-Ways divergens under these condition, will the drivunits oppose each other and the pumping will shut down with possible of damage the pumps!

IRAS Cross Field system

The IRAS Cross Field system enables three power units to be connected to two PV-tanks, with the over all purpose to keep one power unit as back up for the others. This is done by a box with multi plugs for quick change over all electrical connections between the power units and the PV-tanks.

The system includes a manifold with four manual operated butterfly valves for diverting the vacuum/compressed air from the power units to the tanks and the electrical cross field box.

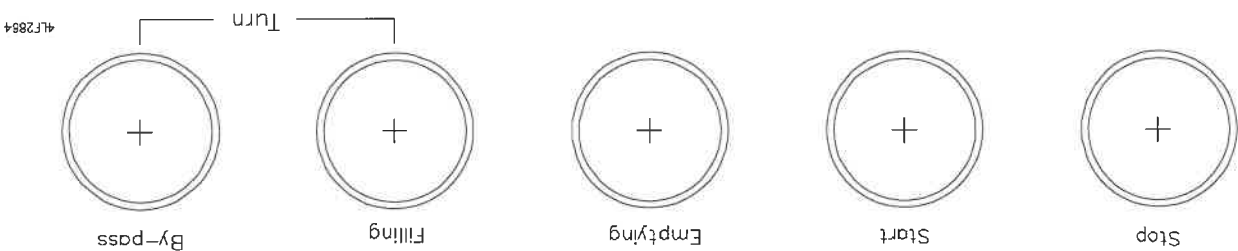


Starting up the PV-system.

Before starting up the PV-system you have to check the following:

- Check the external water supply connected to pos. 2.01.
- Check the external hose/pipe connections at in- and outlet at the system.
- Check that the multiplying pos. 9.05 is connected to the dummy pos. 9.06, or a remote control (option). Is the multiplying open, the system cannot start.
- Prime the liquidring pumps (see chapter 2.).
- Start the PV-system .
- Lubricate the 4-way valve (see chapter 5.)

The control panel:



The start button.

Push the button:

- The systems starts-up in the following order:
- The hydraulic pump starts
- The motor/liquidring pump starts
- The main valve for water supply opens.

The stop button.

Push the button:

- The system will stop immediately.
- The main valve for water supply will close.

Pushing the stop button will cause an immediate stop of the system independently of the cycle of the PV-system.

By-pass button.

For a temporary stop of the pumping sequence, push the by-pass button:

- The by-pass valve opens and the system make a break in the pumping sequence.

For continuing the operation, push the by-pass button again:

- The by-pass valve closes and the system will continue the operation.

This facility is used to create a temporary break of the pumping cycle if the PV-system has too big capacity and by manual filling of bins.

For further description of the control, see chapter 9.

Maintenance.

The liquidring pump at standstill for longer period.

In cases where the PV-system is not used for a certain period the following must be done:

1. All ball valves 2.06 and 2.07 are opened. When the pump is emptied, close all the valves.
2. Open the valve, pos. 1.15.
About 2.0 litre of acid free oil is poured into the pump, pos. 1.15.
Close the valve again and turn the pumps by the turn function.

Note: Turn the pump only once, as the shafts/sealings can be damaged by rotating without water!

This procedure ensures a trouble free starting-up process of the PV-system - even after a standstill for a long time.

When starting up after a period of storage the liquidring pump should be emptied of oil and thoroughly flushed with water. The tank itself should also be thoroughly flushed with water before it is used for transport of fish.

However, should the pump have become fixed and cannot be brought to rotation at the starting-up phase, the belt guard must be dismounted and the liquidring pump's shaft end manually rocked back and forwards until the pump again rotates freely. The belt guard is re-mounted and the PV-system is ready for operation.

LUBRICATION - General Information.

The PV-System needs almost no maintenance.

4-way valve:

The 4-way valve (page 5.5) should be greased after every 10 hours of operation. The 4-way valve should be greased through the two grease nipples, pos. 5.07 when it is in operation in order to obtain an optimal dispersion of the grease.

Suggested quantity: 6-10 shots into each nipple Type of grease: SHELL Calithia EP2 or SHELL Alvania EP2. If the system has not been used for a long period, the 4-way valve should be greased before starting-up.

The EI motor:

Note that there is a greasing nipple in each end of the motor. The nipples should be greased with SKF 65 grease or other common grease for ball bearings.

Periodical lubrication of bearings every 500 hours.

The nipples should be greased when the motor is running and they should be greased thoroughly until grease is coming out of the nipples.

The liquidring pump:

Note that there is a greasing nipple in each end of the pump.

Periodical lubrication of bearings every 500 hours.

Use SKF 65 grease or other common grease for ball bearings. The nipples should be greased when the pump is running. Grease quantity for every lubrication: 100 g.

The diesel engine:

See special operation & maintenance manual for the diesel engine.

Lubrication and check schedule.

Object: Check points	Daily	Once a week	Once a month	Every half year	Once a year	Various see spec. instructions	Actions	Comments
Hydraulic pump: Oil reservoir Oil reservoir			O	X			Oil level Change of oil, clean filter	Refill, if necessary. Recommended oil: SHELL Tellus T46, TEXACO Rando HD 2 46, MOBIL DTE 15 M.
							Grease thoroughly the nipples - valve house	Recommended grease: SHELL Calithia EP22 or ALVANIA EP2.
4-way valve: 2 pcs. nipples	X					X		
Liquidring pump: 2 pcs. nipples							Recommended grease: SKF 65 or other common grease for ball bearings. It is necessary to grease the pump when this is running. NOTE that there is a nipple in each end of the pump.	
Electric motor: 2 pcs. nipples							Recommended grease: SKF 65 or other common grease for ball bearings. It is necessary to grease the motor when this is running. NOTE that there is a nipple in each end of the motor.	

Legend:

O = Visual check-up

X = Change of oil/grease

*) We recommend that the motor and the pump is greased every month. - However, normally when the motor and the pump is running 8 hours per day, greasing every three months should be enough.

Hydraulic pump unit for cylinder and valves.

- A.

Oil check:

Once a month
- B.

Oil level:

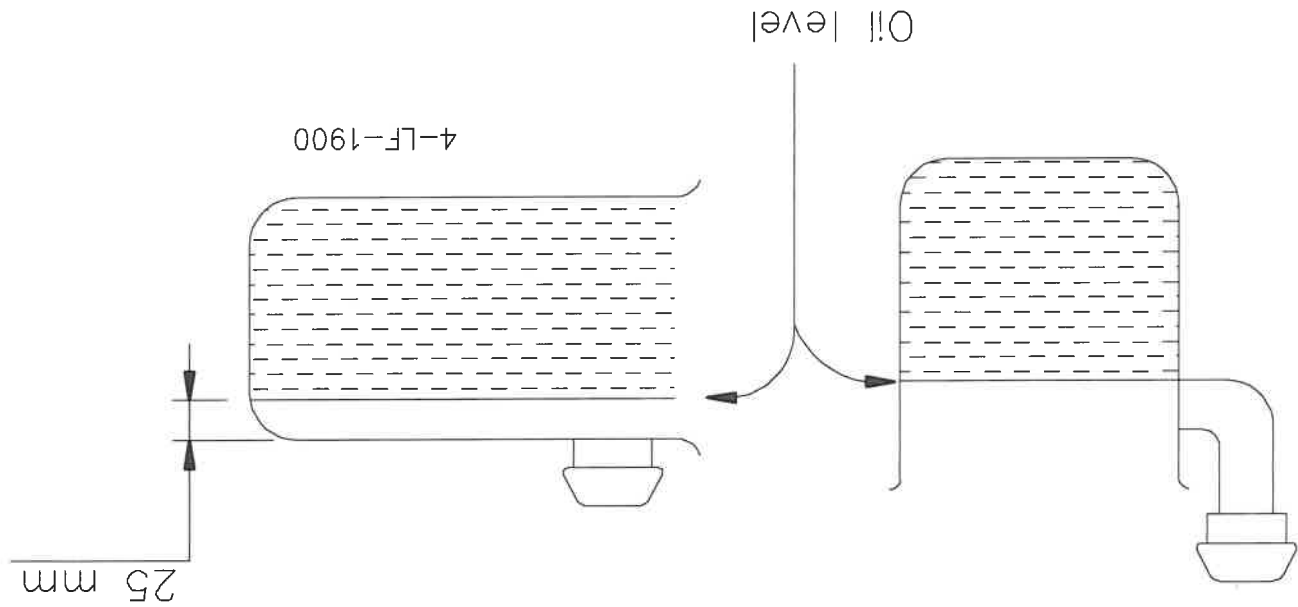
According to the plate on the pump station, see below drawing
- C.

Type of Oil:

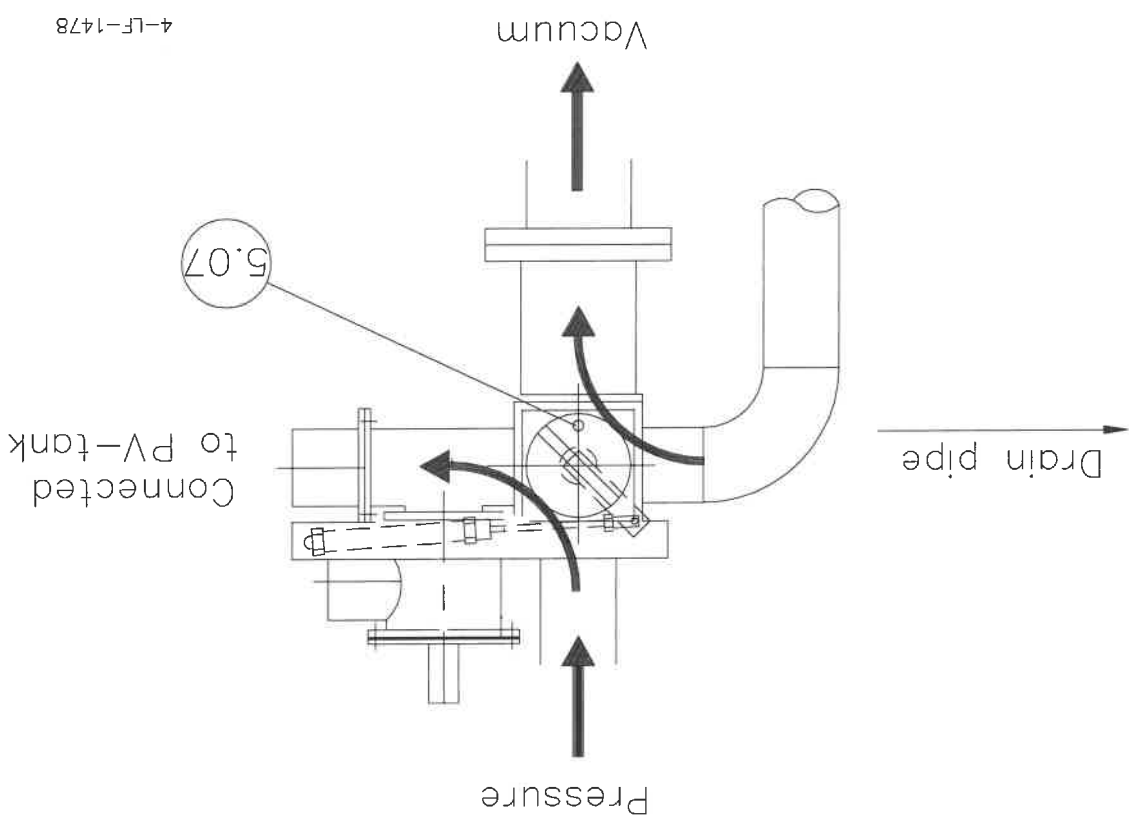
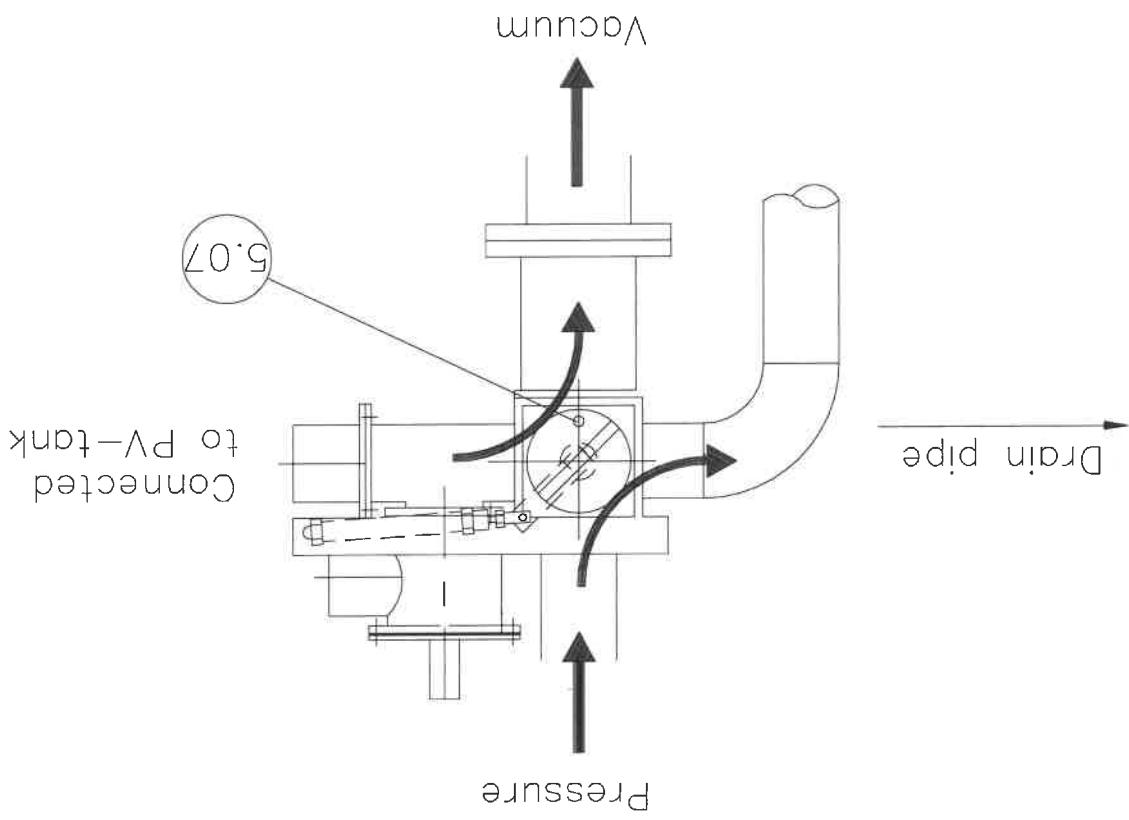
Ex. FINA HV 46 or SHELL TELLUS T46 or TEXACO Rando HD2 46 or MOBIL DTE 15 M
- D.

Oil pressure:

Should be in the range of 30 bar - can be seen on the pressure gauge.

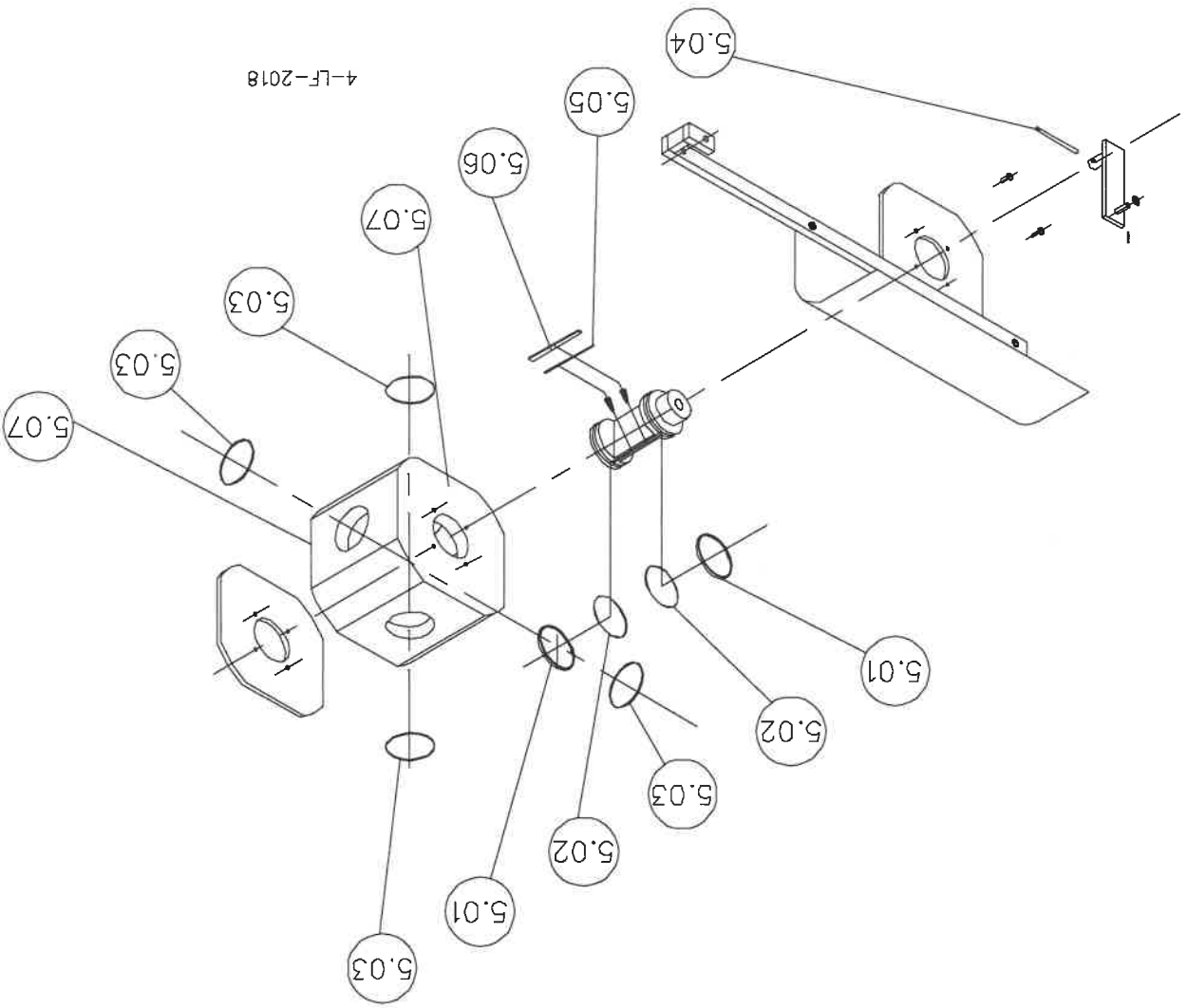


Simplified sketch for hydraulic controlled 4-way valve.



4-LF-1478

Hydraulic operated 4-way valve.



4-LF-2018

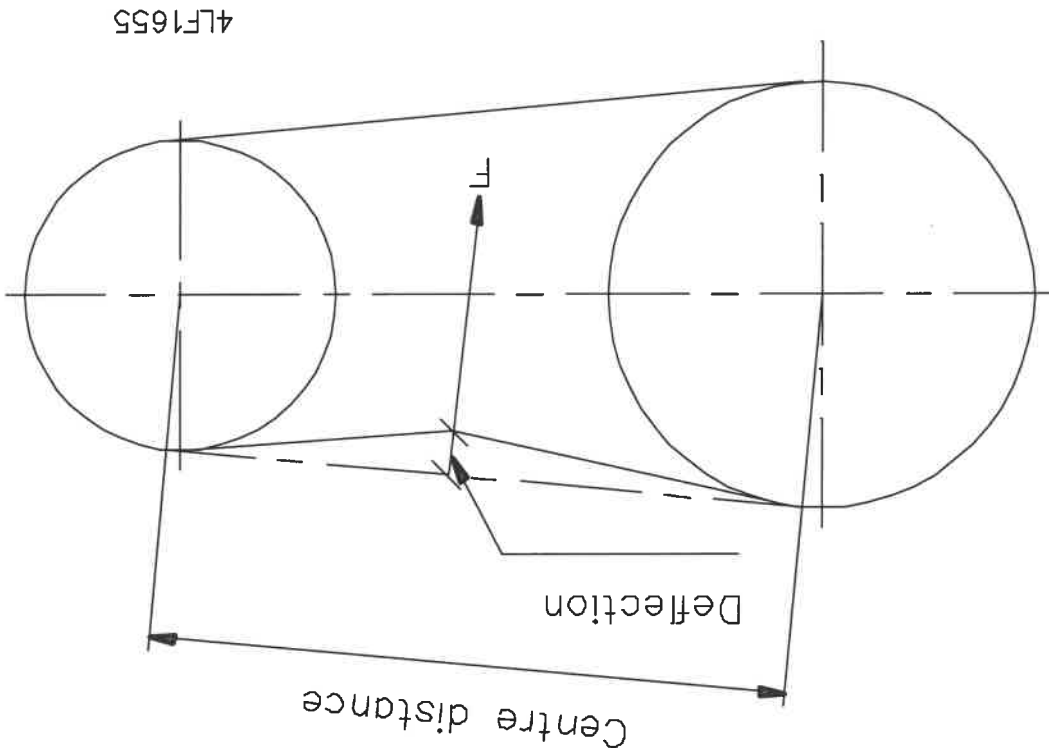
Item list.

Pos. No.	Quant.	Description
5.01	2 pcs.	Shamban Roto Glyde Ring
5.02	2 pcs.	O - Ring
5.03	1 pcs.	O - Ring
5.04	1 pcs.	Pin (4-LF-1032)
5.05	2 pcs.	O - Ring
5.06	2 pcs.	Shamban Slyd Ring
5.07	2 pcs.	Grease Nipple

V-Belt transmission.

The pulley alignment shall be carried out using a line or a rule.
The parallelism of the shafts is confirmed when the taut line or the rule is in contact with the pulley areas

The tensioning can be made according to the following procedure:



Force on each belt for 15 mm. deflection per 1000 mm. centre distance.
For guidance follow the scheme below.

E = Deflection for each belt.
F = Force at each belt.

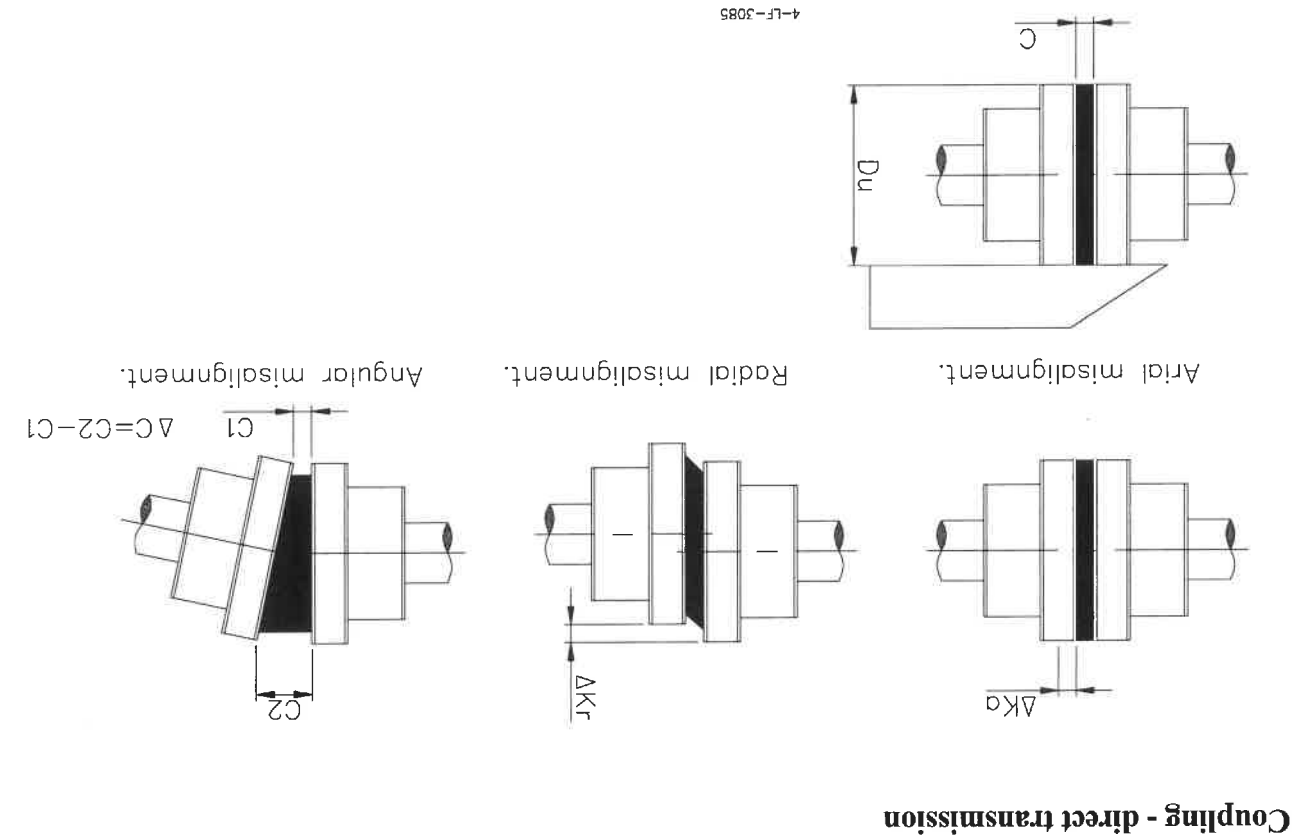
V-belt	E	F
SPA	10 mm.	0.5 - 0.7 Kgs
SPB	10 mm.	0.6 - 0.8 Kgs

Check and re-tension the belts, if required, regularly (for example every month).
If the belts are just replaced, check and re-tension after 30 minutes, then after 24 hours of operation.
When replacing V-belts, never use force. First you have to slacken the transmission, then replace the belts, and tighten up again the belts.
The rotation is shown by an arrow on the pump casing.

Size of coupling	ΔK_a	ΔK_r	ΔC
104	$\pm 3.0 \text{ mm}$	0.1 mm	0.2 mm
105	$\pm 3.0 \text{ mm}$	0.1 mm	0.3 mm

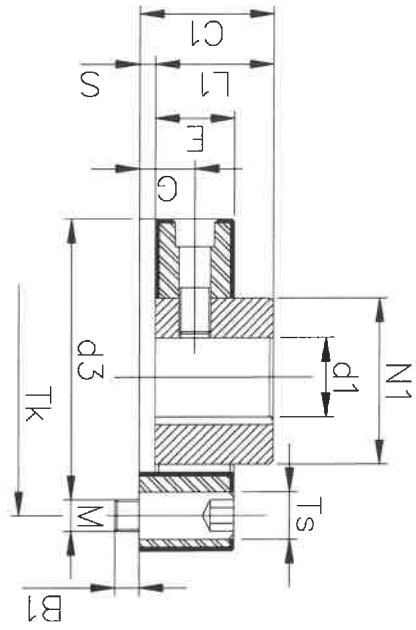
LB coupling.

The coupling halves must be correctly mounted and aligned accurately before start-up. The couplings are bored by using diameter **Du** for setup. Ensure that the nuts on the bolts are loosened before installation, so that the rubber bushes are not tightened. When mounting take care, that dimension **C**, as mentioned in the tables of the particular coupling is maintained, in order to ensure the axial mobility of the coupling. Alignment may be carried out by means of a vernier caliper and a slide bar placed on the outside coupling diameter **Du**. Couplings are machined to a tolerance of IT 8. Alignment is carried out in two alternate 90° levels. The couplings are capable of compensating either a radial or angular misalignment. The mentioned permissible misalignments are suggested maximum. A careful and accurate alignment will always increase the working life of the coupling.





4-LF-3142



Description of hydraulic pump unit.

The PV-system is provided with a hydraulic pump unit, pos. 8.05 for operating the 4-way valve, the by-pass valve and the valve for water supply. Furthermore the hydraulic system contain a hydraulic accumulator pos. 8.13, which ensure a hydraulic operating pressure all the time. This pressure is able to actuate the by-pass valve, the 4-way valve and the valve for water supply.

Signals from the electrical control are operating solenoid valves, pos. 8.06, 8.07, and 8.08.

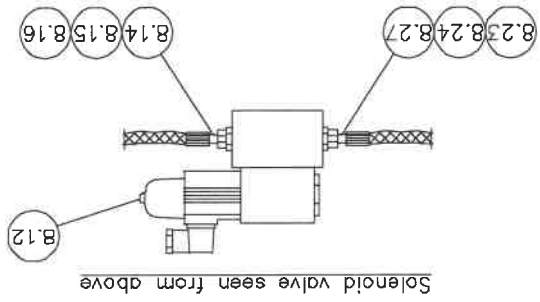
The hydraulic pressure is adjusted from manufacturer to 30 bar.

If a situation arise so you have to adjust the pressure, the hydraulic escape valve is located at the hydraulic pump unit, underneath a cap.

Note: If you need to dismount any part at the hydraulic system, it is necessary to neutralize the hydraulic pressure to zero. This is done by activating one of the solenoid valves in the end (see pos. 8.12).

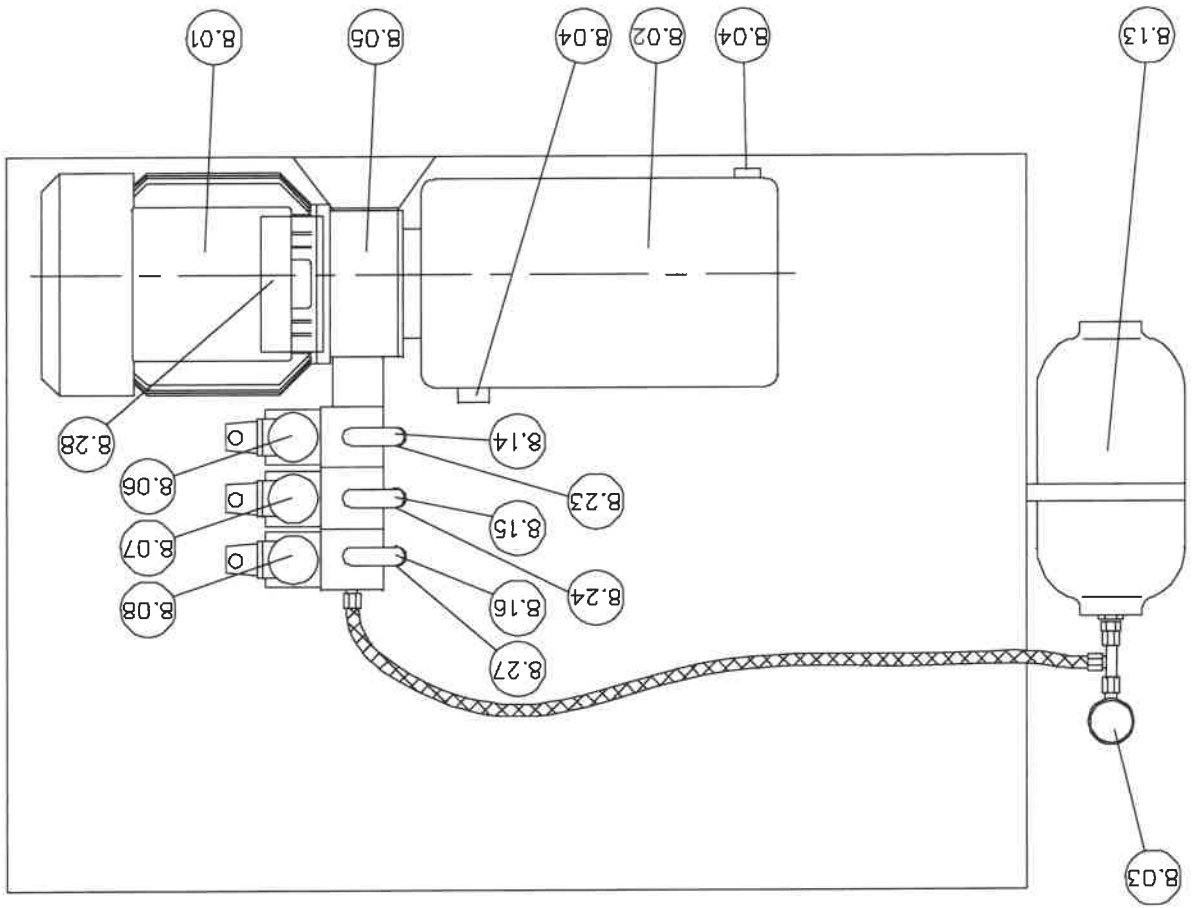
Press several times until the hydraulic pressure goes to zero. (Check on pressure gauge pos. 8.03).

- for electric driven power unit



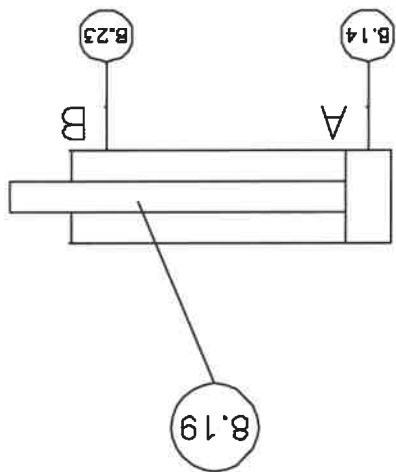
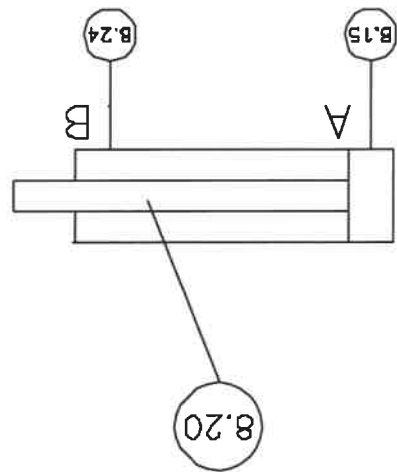
4-1F-2956

Arrangement of hydraulic pump unit. - for diesel driven power unit



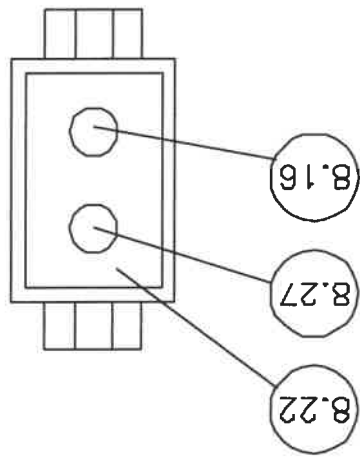
Solenoid valve seen from above

4-LF-2956



4-way valve

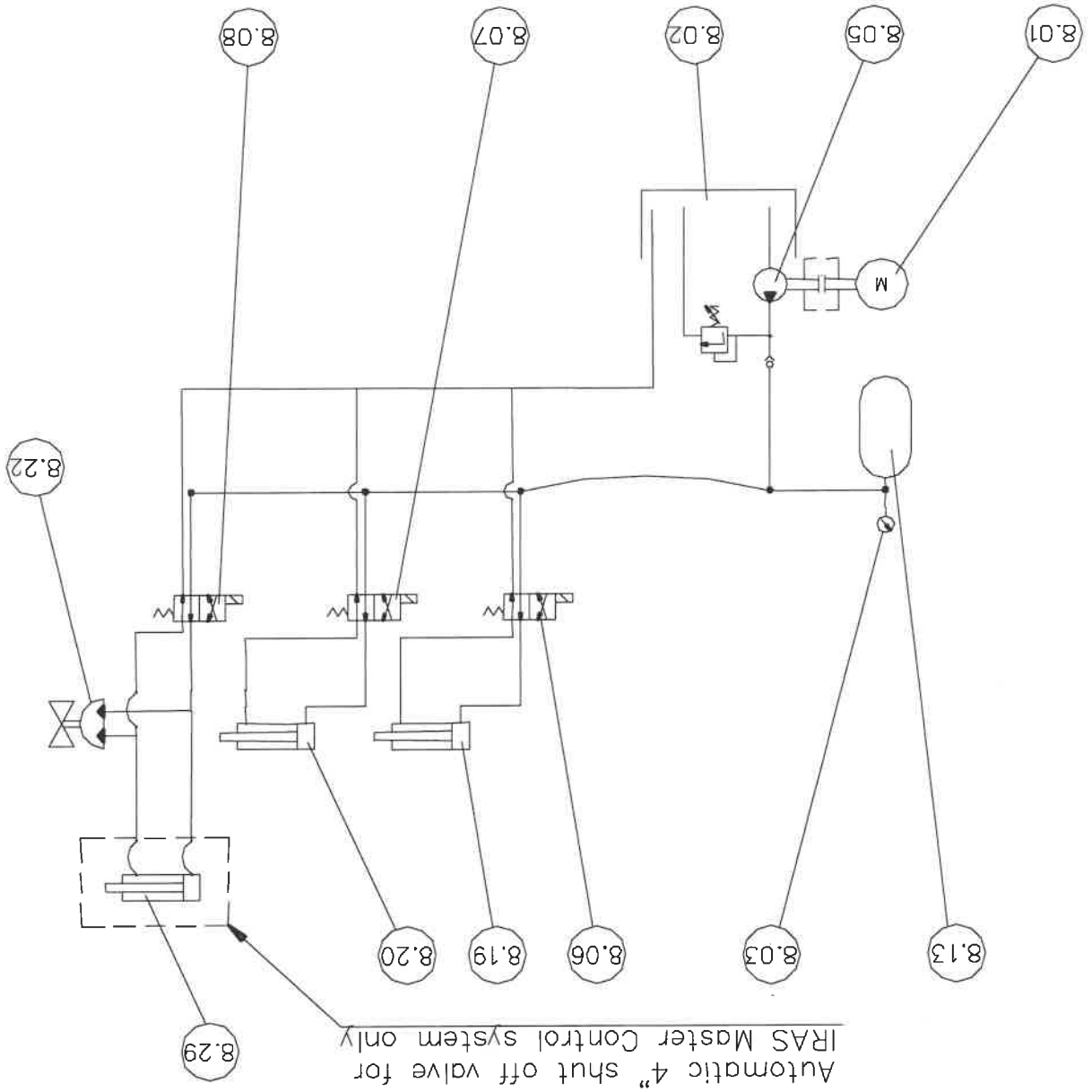
By-pass valve



Main water valve

4-LF-3086

Hydraulic diagram.



4-LF-2952b

Item list.

Pos. no.	Description
8.01	Electrical motor
8.02	Hydraulic tank
8.03	Pressure gauge, hydraulic pressure
8.04	Filler cap
8.05	Hydraulic pump unit
8.06	Solenoid valve, By-pass valve
8.07	Solenoid valve, 4-way valve
8.08	Solenoid valve, main valve water supply
8.12	Tap for manual activating of solenoid valve
8.13	Accumulator
8.14	Hydraulic hose, By-pass valve
8.15	Hydraulic hose, 4-way valve
8.16	Hydraulic hose, main valve, water supply
8.19	Cylinder on By-pass valve
8.20	Cylinder on 4-way valve
8.22	Cylinder for main valve, water supply
8.23	Hydraulic hose, By-pass valve
8.24	Hydraulic hose, 4-way valve
8.27	Hydraulic hose, main valve, water supply
8.28	V-belt transmission
8.29	Cylinder for automatic 4" shut off valve

Description of the control system:

The PV-system can be operated directly at the control panel or by means of different kinds of remote controls (optional, see description of remote controls):

The PV-system has two levels of operation **Automatic** and **Semi automatic** mode.

Automatic operation mode:

In automatic mode the PV-system is doing continuous pumping. Tank filling and emptying successively. The cycle will change over by means of the 4-way valve.

Semi automatic mode:

In semi automatic mode the PV-system is pumping in batches, meaning that the system is waiting for the operator to call for fish. This is done by pressing the By-pass button on either the control panel or the remote control.

Depending on the position of the change-over switch "Full/Empty" inside the control panel, the PV-system will stand by with a full/empty tank. If the need is immediate fish when calling, the switch must be put in "Full" position and the PV-system will be ready to discharge immediately hereafter. By pumping live fish it is not advisable to leave PV-system in stand by with a full tank as the fish will be unnecessarily stressed by the stay in the tank.

NOTE: In semi automatic mode the bypass button is working as a call for fish.

Double operation mode, optional:

Two PV-systems can work in double operation mode by connecting the "Cable, double operation" in the multiping of both systems.

Double operation mode is appropriated when using two PV-systems pumping into one joint discharge pipe.

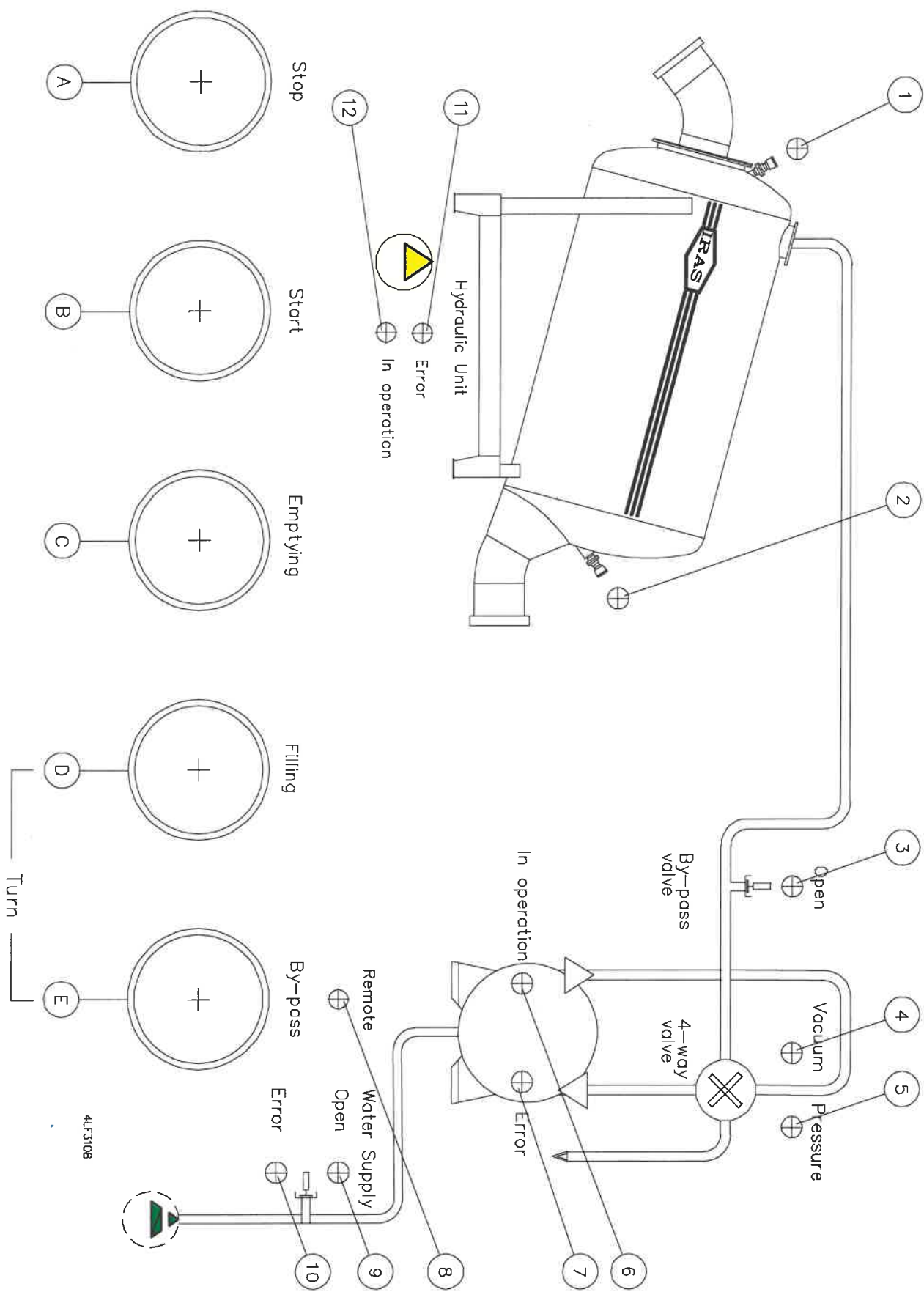
Then only one PV-system will discharge at a time.

The two independent PV-systems then operates as one double system.

Even the double operation cable is connected, a bin control or a remote control can be connected and control both systems.

Note: To run double operation mode, the switch, pos. 9.04 must be positioned to standby with empty tank - push the lever downwards.

Flow diagram:



Flow diagram: - Description

- A. Red button
- B. Green button
- C. Blue button
- D. Blue button
- E. Blue button
- D+E. Blue button

Diodes 1-12:

- 1. Green diode
 - 2. Green diode
 - 3. Green diode
 - 4. Green diode
 - 5. Green diode
 - 6. Green diode
 - 7. Red diode
 - 8. Green diode
 - 9. Green diode
 - 10. Red diode
 - 11. Red diode
 - 12. Green diode
- Top sensor activated
 - Button sensor activated
 - By-pass valve open
 - 4-way valve in filling position
 - (vacuum in tank)
 - 4-way valve in emptying position
 - (pressure in tank)
 - PV-system in operation, motor is started
 - Error, motor
 - Remote control connected
 - Main valve, water supply open (Flow sensor)
 - Error, water supply (Flow sensor)
 - Error, hydraulic pressure
 - Hydraulic pressure is ok

- Stop PV-system
- Start PV-system
- Manual emptying of tank
- Manual filling of tank
- By-pass valve, open/close
- Turn function

Description of the control panel:

All tank sensors are shown by a light diode in the flow diagram indicating the water/fish level in tank. Furthermore the position of all hydraulic manoeuvred valves: 4-way valve, By-pass valve, and water valve, is shown by light diodes in the flow diagram. The electrical motors (liquidring pump, hydraulic pump) are shown with two diodes: operation and thermal failure. The light diodes for the flow controls are indicating the status of the thermal flow controls installed for supervision of the amount of prime water. In the event of poor water supply, the flow control will stop the PV-system automatically. The diode "Remote" indicates that a remote control (receiving bin) is installed.

Start button

- Electric driven

When pressing the start button the hydraulic pump starts up, and after a few seconds the liquidring pump starts up in star-delta connection, and the pump system goes into operation mode.

- Diesel driven

When pressing the start button the diesel engine starts up and as the hydraulic pump unit is brought into operation, the hydraulic pressure builds up and the pump system goes into operation mode.

NOTE: The system is equipped with a communication plug Pos. 9.05. From the factory, this plug is delivered with a dummy Pos. 9.06. (Standard equipment).

If this dummy is removed, the PV-system will not be able to operate unless it is replaced by either, a remote control or a bin control.

Stop button

When pressing the stop button the PV-system stops immediately.

Bypass button

The function of the bypass button is to stop the pumping process without shutting down the pump system intirely.

When pressing the bypass button the pumping process will stop by means of the bypass valves opening to the surroundings.

When pressing the bypass button again, the bypass valves will close and the pumping cycle continues.

The By-pass function can be activated in semi automatic - as well as in fully automatic mode.

Pushing the By-pass button continual in more than 2 sec. will change an emptying to filling cycle. When the top sensor is activated the cycle change automatic again.

Pushing the By-pass button in this way meanwhile the top sensor is activated will change the cycle to filling. After 3 sec. of filling meanwhile the top sensor is activated, the cycle change to emptying.

Note: Only push the By-pass button in this way once, if the top sensor is activated, as the PV-tank can be over-filled and cause overload of the system.

The By-pass function can be activated at the elpanel - as well as at the remote control (option).

Manual filling

By pushing the button "manual filling" one overrules the fully automatic control. If the system is in the emptying cycle, the cycle changes over to filling by pushing the button.

Do not continue pushing the manual filling button if the PV-tank is already full, as this button overrules the control. By doing this one overrules the top sensor and result in over-filling the PV-tank.

Manual emptying

By final use of the PV-system the button can be activated to empty position. This button overrules the actual programme for totally emptiness of PV-tank and discharge pipe.
If one let the button go, but not switch off the PV-system at that stage, the programme will continue the cycle by filling the tank.
Pushing the empty button continual in more than 5 sec. keeps the programme in empty cycle - even one let the button go. The system continues blowing. Pushing the filling button interrupts the continuously blowing and change to filling cycle.
The manual filling and emptying button overrules the fully automatic- as well the semi automatic programme.

If the programme in one or another reason do not start up the cycle. Activate the button to filling or emptying. Then let the button go and the PV-system again will run the choosen programme.

Turn Function

- Electric driven:

When the system is stopped and one push the buttons "filling" and "By-pass" at the same time the turn function is activated.
The function of the turn function is to disperse oil (or other preservative) in the pump housings of the liquidring pump.
If the pump is going to be out of use for a longer period of time (a week or more), add an adequate amount of preservative into the liquidring pumps (through the oil fill caps on top of the manifold system). Activate the turn function. The vacuum pump will start up for a few seconds and the turn cycle is finished. Let go of the turn button!

When the PV-system is operative, the turn button is inactive.

- Diesel driven:

The turn function is not active.

To turn the pump:

Switch off the main switch at the left side of the control box. Push the start button, but only few seconds to disperse the oil inside the liquidring pump.

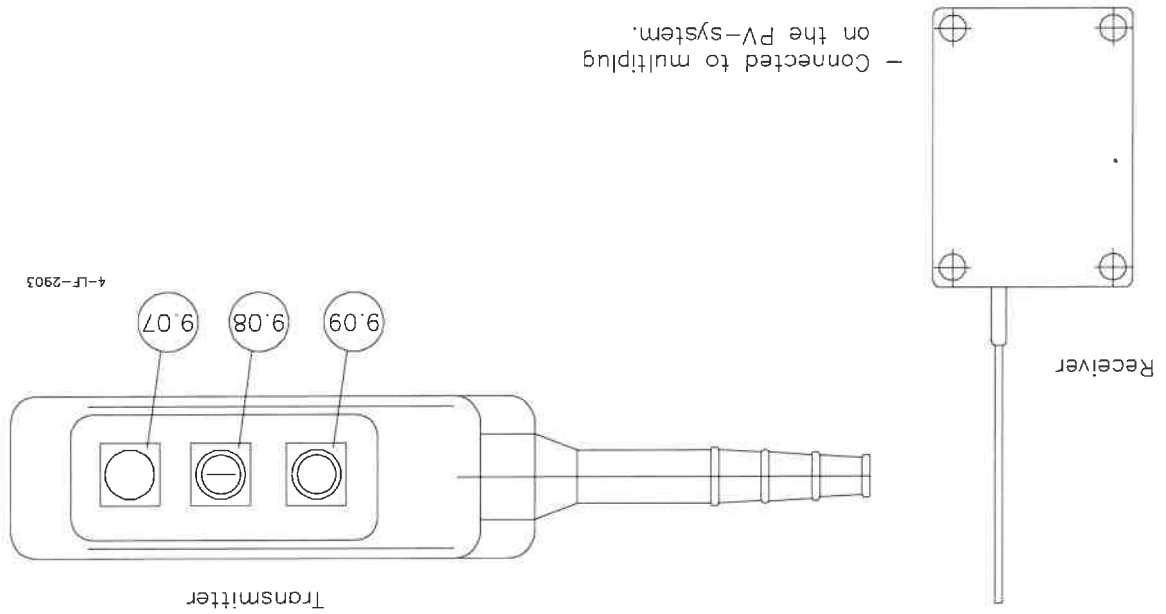
NOTE:

When the system is not in operation, the main switch at the left side of the control box must be switched off "0".

2. Extension cable for receiver.
Is the PV-system installed at a place where the surroundings prevent the radio signal to reach the receiver (e.g. underneath deck on a vessel) the extension cable can be used to install the receiver in a suitable place.

- a. Start button for start of the system. Pos. 9.08
 - b. Stop button for stop of the system. Pos. 9.07
 - c. Bypass button for stopping the pumping process. Pos. 9.09
- All buttons have the same function as the ones on the control panel.

The wireless remote control is equipped with three buttons.

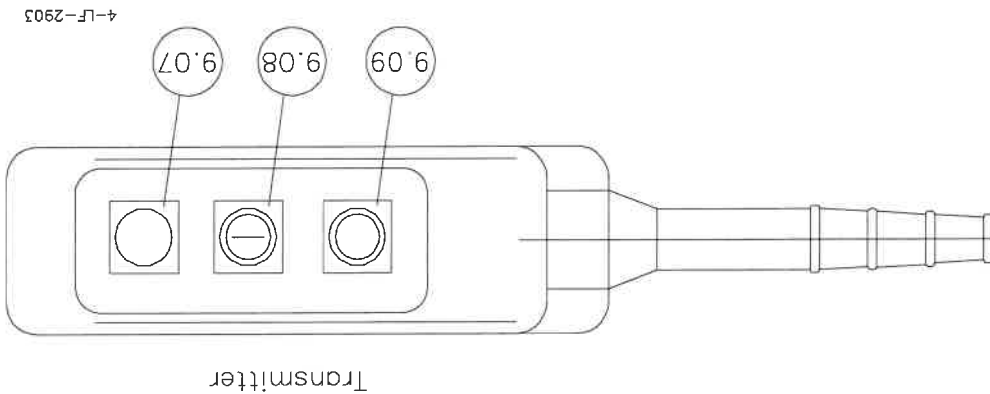


1. Remote control, wireless.

The indication lamp for bypass mode is lightening when the pump system is in bypass mode. All buttons have the same function as the ones on the control panel.

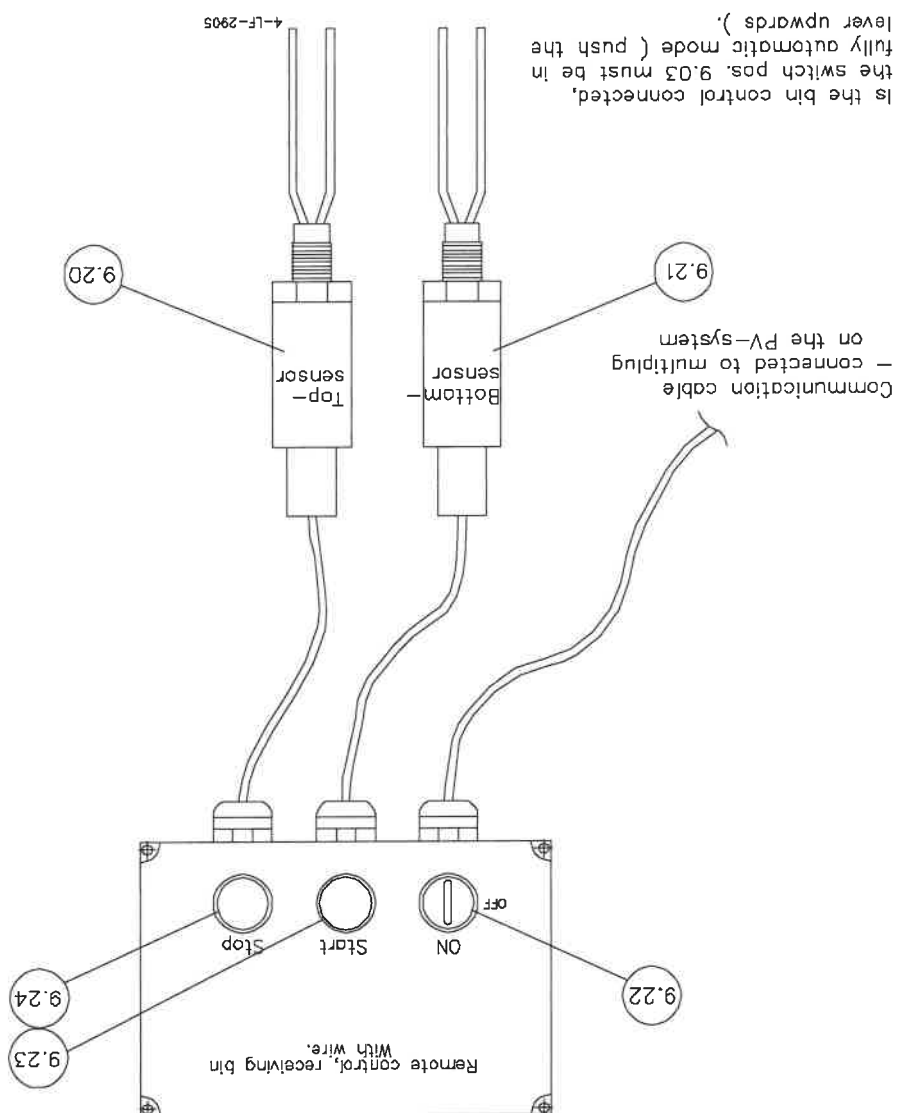
- a. Start button for start of the system. Pos. 9.08
 - b. Stop button for stop of the system. Pos. 9.07
 - c. Bypass button for stopping the pumping process. Pos. 9.09
- The remote control is equipped with three buttons and one lamp.

Remote control with wire:



Remote controls, optional.

Remote control; bin control with wire.



The remote control for receiving bin is equipped with two sensors, Start/stop button and one turn button for on/off position.

- a. The function of the top sensor Pos. 9.20 is as an emergency stop to prevent overflow. As the sensor is installed in the top of the receiving bin a signal from the top sensor is a demand of an immediate stop of the pumping process.
- b. The function of the bottom sensor Pos. 9.21 is to control the level in the receiving bin. Is the

immediate stop of the pumping process.

bottom sensor de-activated, the sensor gives signal to the PV-system: Continue pumping.

When the sensor become activated the sensor gives signal to the PV-system: Stop pumping. In

filling position. Depending on the position of the “Full/Empty tank” switch inside the control panel, the PV-system will go into bypass mode with empty tank or the PV-system will fill up the

tank and then go into bypass mode.

When the bottom sensor loses the signal, the PV-system will leave bypass mode and continue

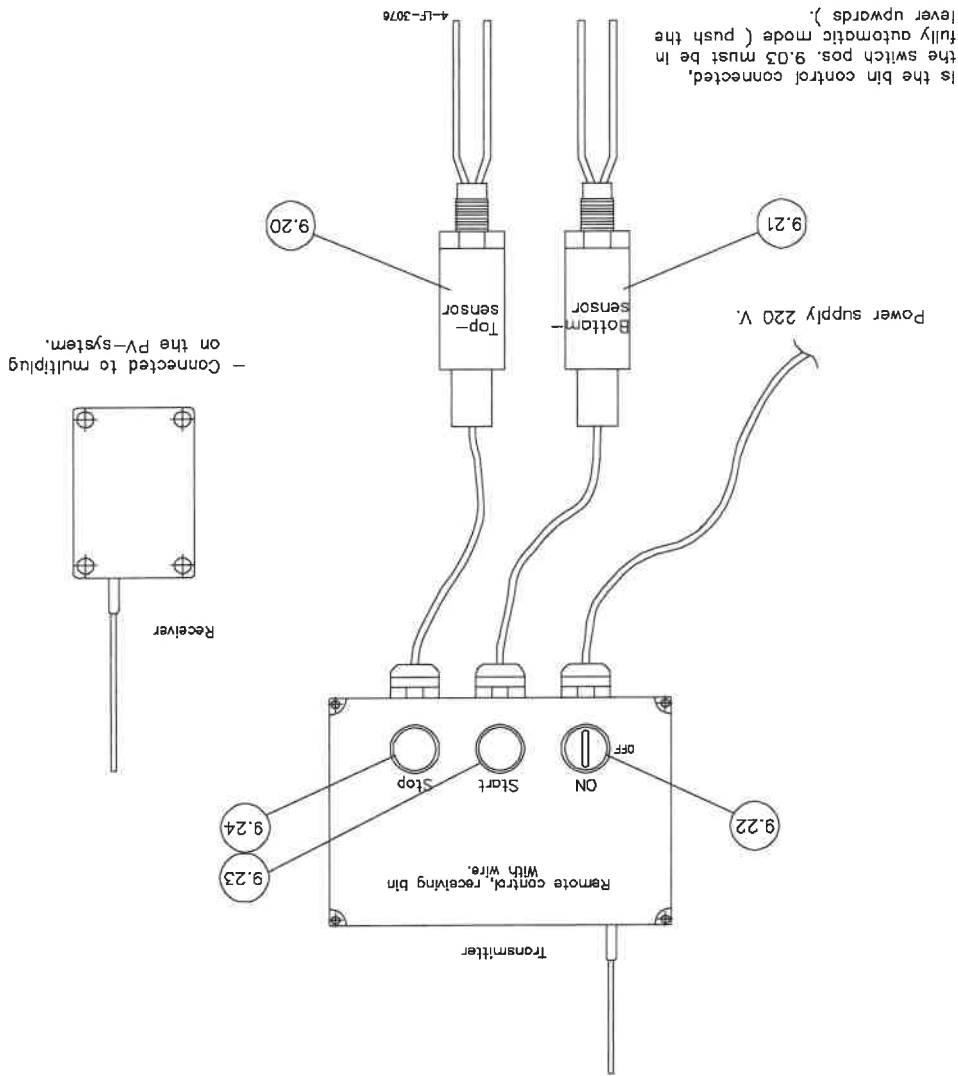
• Zuidwoud

- c. The turn-button Pos. 9.22 has two positions On/Off. In **on** position the PV-system is operated automatically and is filling the receiving bin until the level reaches the bottom sensor. In **off** position the control panel is given a false bottom sensor signal. This will stop the pumping process as described in section b.
- c. By pressing the start button Pos. 9.23 the PV-system will start up. (Working in parallel with the start button at the control panel).
- d. By pressing the stop button Pos. 9.24 the PV-system will stop. (Working in parallel with the stop button at the control panel).

Note: The change over switch "Semi/Aut" is inactive as the receiving bin control system is controlling the pumping process: When the bottom sensor in the receiving bin is free, the PV-system is pumping continuously until the bottom sensor level is reached. After that the PV-system will go into semi automatic operation mode and wait for the bottom sensor to call for fish.

At the front panel on the PV-system a diode "Remote" is lighting when the operation of the PV-system is controlled of e.g. a bin control.

Remote control; bin control wireless.



The remote control for receiving bin is equipped with two sensors, start/stop button and one turn button for on/off position.

- The function of the top sensor pos. 9.20 is as an emergency stop to prevent overflow. As the sensor is installed in the top of the receiving bin a signal from the top sensor is a demand of an immediate stop of the pumping process.
 - The function of the bottom sensor pos. 9.21 is to control the level in the receiving bin. Is the bottom sensor de-activated, the sensor gives signal to the PV-system: Continue pumping. When the sensor become activated, the sensor gives signal to the PV-system: stop pumping. In practice the PV-system will continue its emptying cycle and the 4-way valve will change over to filling position. Depending on the position of the "Full/Empty tank" switch inside the control panel, the PV-system will go into bypass mode with empty tank or the PV-system will fill up the tank and then go into bypass mode.
 - When the bottom sensor loses the signal, the PV-system will leave bypass mode and continue pumping.
- The turn-button pos. 9.22 has two positions On/Off. In on position the PV-system is

- operated automatically and is filling the receiving bin until the level reaches the bottom sensor. In **off** position the control panel is given a false bottom sensor signal. This will stop the pumping process as described in section b.
- By pressing the start button pos. 9.23 the PV-system will start up. (Working in parallel with the start button at the control panel).
- By pressing the stop button pos. 9.24 the PV-system will stop. (Working in parallel with the stop button at the control panel).
- d.

Note: The change over switch "Semi/Aut" is inactive as the receiving bin control system is controlling the pumping process: When the bottom sensor in the receiving bin is free, the PV-system is pumping continuously until the bottom sensor level is reached. After that the PV-system will go into semi automatic operation mode and wait for the bottom sensor to call for fish.

At the front panel on the PV-system a diode "Remote" is lighting when the operation of the PV-system is controlled of e.g. a bin control.

Extension cable for receiver.

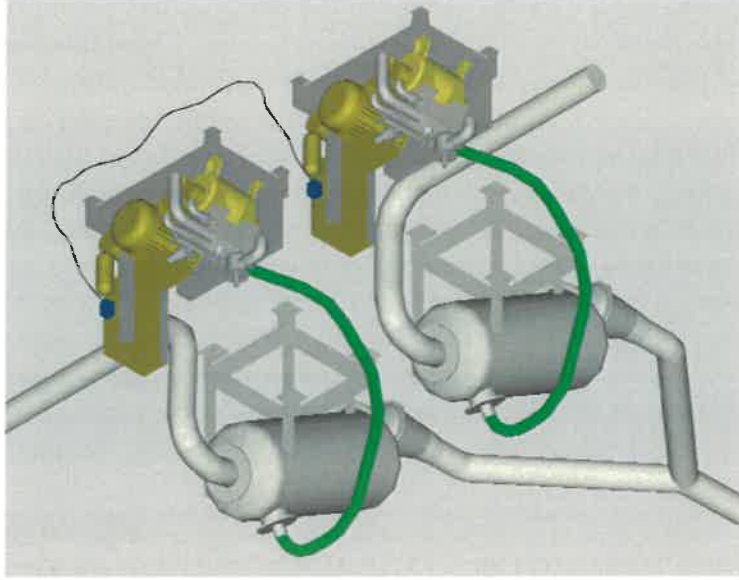
Is the PV-system installed on a place where the surroundings prevent the radio signal to reach the receiver (e.g. underneath deck on a vessel) the extension cable can be used to install the receiver in a suitable place.

Cable for double tank operation.

The carefully prepared control of the IRAS PV-system can be connected to a cable for double tank operation. That means that two IRAS PV-systems can be connected with the cable and then operates as one double system. The cable ensures, that only one PV-system will discharge at a time.

The cable for double tank operation is ready for connection to the multiplugs on the controls of the PV-systems.

Furthermore a remote control or a bin control can be connected to one of the systems at the same time.



Description of the control buttons inside the control panel.

Inside the control panel four control switches can be found.

Semi/Full:

Referring to the description of the Automatic/Semiautomatic operation mode, this switch pos. 9.03 is used for the change over between these two types of operation.

Running semi automatic mode, push the lever downwards.
Running fully automatic mode, push the lever upwards.

Full/Empty:

Referring to the description of the Semi automatic operation mode, this switch pos. 9.04 is used for the change over between standby with full tank and standby with empty tank.

Standby with full tank, push the lever upwards.
Standby with empty tank, push the lever downwards.

Timer:

If one or more tank sensors are defect it is possible to continue pumping by the means of the timer mode. In order to switch into timer mode, do the following:

1. Activate the "Test" switch, pos. 9.01 - push lever downwards.
2. Activate the "Timer" switch, pos. 9.02 - push lever downwards.
3. Press the start button. The PV-system is now operated by a timer. The timer setting can be changed (See chapter: Changing of timers)

4. When operating in timer mode all sensors are out of operation. This means that it is up to the operator to calibrate the filling/emptying speed of the tanks by means of the manual bypass valves (bypass vacuum Pos. 1.04 and bypass pressure Pos. 1.01) in such a way that the emptying cycle is a little shorter (air is entering the discharge line) than the filling cycle. At the same time the operator must take care that the tank is filled up, at least to a level visible in the level hose, but never complete full as this can cause overload to the liquidring pump.
5. Note: The timer operation mode is for emergency only. The optimum capacity can only be achieved in sensor operated automatic mode.

Test system:

Electric driven PV-systems only are provided with the test system.

The PV-system is equipped with a test system for checking all vital components. In order to run the test, do the following:

1. Put the switch pos. 9.01 in the control panel in test position. Push lever downwards.

NOTE: TIMER operation mode can not be active while running the test. Push timer lever

upwards.

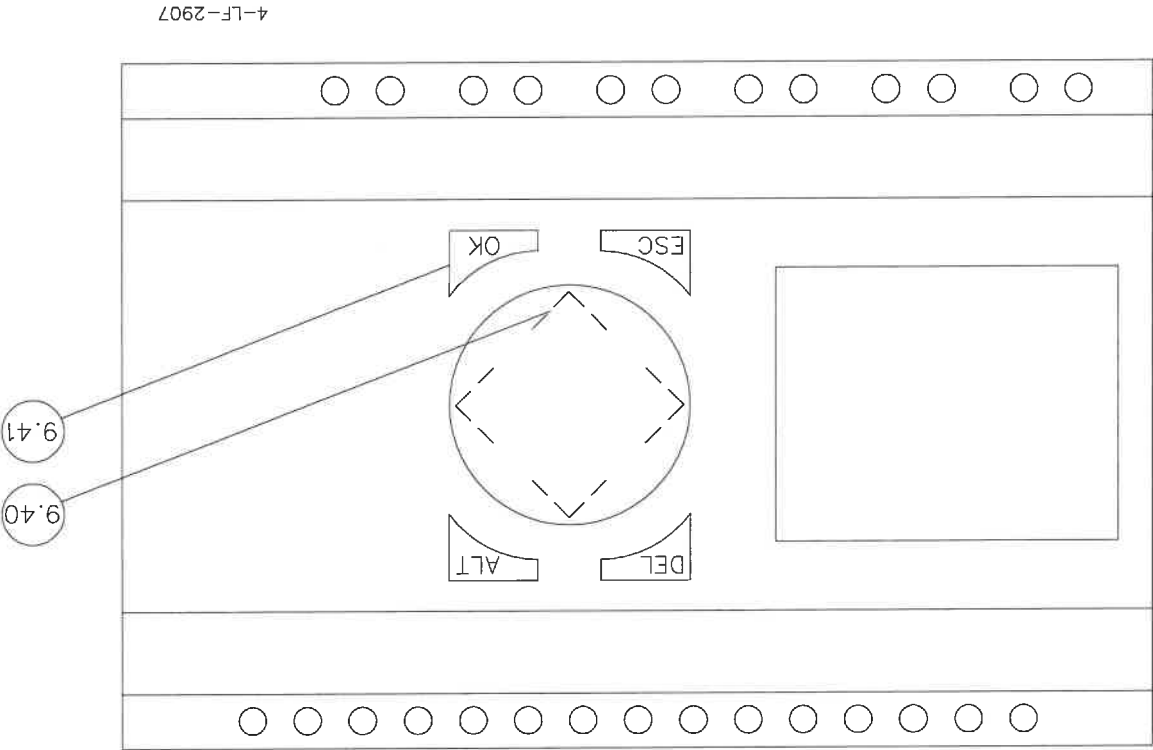
2. Press the start button. The hydraulic power unit starts.
3. Press the bypass button (step 1): The 4-way valve moves filling to emptying.
4. Press the bypass button (step 2): The 4-way valve returns to filling position, and bypass valve opens.
5. Press the bypass button (step 3): The bypass pressure valve close and water valve opens.
6. Press the bypass button (step 4): The water pressure valve returns to closed position.
7. By pressing the bypass button the test cycle will start all over again, from step 1 and further on.

Note: the test function can only work with the dummy plug or a remote control installed in the communication plug. (The test system can not operate with a bin control connected).

Diesel- and hydraulic driven are not provided with the test system.

Changing of timers:

- The timers in the control system can be changed according to the following procedure:
1. Put the system into Test mode by means of the test button, pos. 9.01.
 2. Press the Start button at the control panel. The hydraulic power unit starts up.
 3. Press the "OK" button, pos. 9.41 at the front panel of the PLC-unit.
 4. Press on the lower part of the big button, pos. 9.40 - "parameter" is flashing in the display.
 5. Press on the "OK" button, pos. 9.41 - it is now possible to change the timers.
 6. Press on the big button, pos. 9.40 - on the lower/upper part until the timer number, which has to be changed, is shown in the display.
 7. Press on the big button, pos. 9.40 - on the left part.
Now the actual timer setting is shown
 8. Adjust the timer setting by means of the big button
Pushing the upper part of the button will increase the settings.
Pushing the lower part of the button will decrease the settings.
 9. When one has made the timer setting press the button "OK", pos. 9.41.
- See available timer settings in the scheme next page.



4-LF-2907

Adjustable timers available.

Timer	Function	Factory setting
T2	Bypass time, vacuum (Time for ensuring a relief of the vacuum in the suction line before change over of the 4 way valve to pressure)	0 sec.
T3	Bypass time, pressure (Time for ensuring a relief of the accumulated pressure air in the tank before change over of the 4-way valve to vacuum).	0,5 sec.
T5	Top sensor delay (Time of delay for the top sensor for optimum filling of the PV-tank - must be adjusted to the actual working conditions, but normal setting is 0 sec.)	0,5 sec.
T6	Bottom sensor delay, normal opr. (Time of delay for the bottom sensor for optimum emptying of the PV-tank – must be adjusted according to the actual working conditions).	2 sec.
T7	Emptying time (Timer mode) (Time for the fixed emptying time in timer operated mode - must be adjusted according to actual working conditions).	15 sec.
T8	Filling time (Timer mode) (Time for the fixed filling time in timer operated mode - must be adjusted according to actual working conditions).	20 sec.

When having adjusted the timers, press the stop button at the control panel of the PV-system.
Switch the "Test" button pos. 9.01 into "off" position.
Restart the PV-system. The system is now operative with the new parameter settings.
It is recommended not to change the parameters unless the working conditions of the PV-system on site makes it necessary.

Sensors

Fork sensor, type E+H.

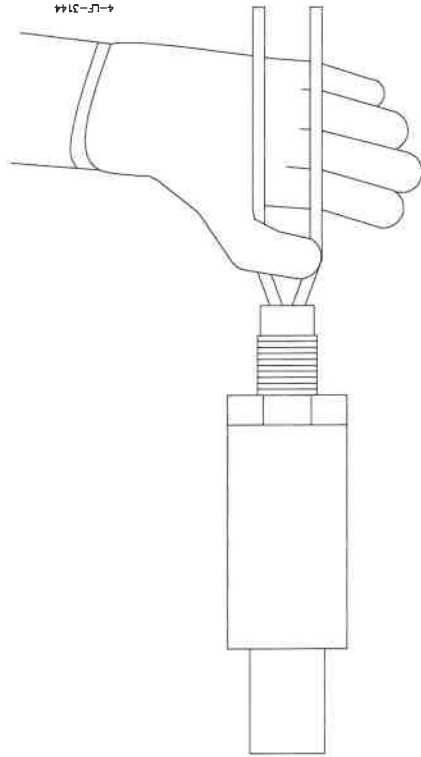
The working principle of the sensor is like a tuning fork.

A set of Piezo-electrical elements is bringing the forks in vibrations. Another set of Piezo-electrical elements is sensing the amplitude of the vibrations. When the sensor gets in contact with water (Water+fish), the oscillations of the forks are damped. This is registered by the sensing Piezo-electrical element and converted into a signal.

The sensor is equipped with two light diodes placed on top of the sensor housing close to the Hirschmann connection plug. The green diode is indicating that the sensor is with tension and the red diode is indicating the output signal. (Red diode lightening = No signal).

The sensors needs no particular maintenance, except from cleaning the sensor forks when a fish or parts of fish is hanging in the forks.

It is recommendable that the function of the sensors is tested frequently. This can be done by actuating the sensor by the hand and read the signal on the control panel of the PV-system.



4-UF-3144

VNI sensor:

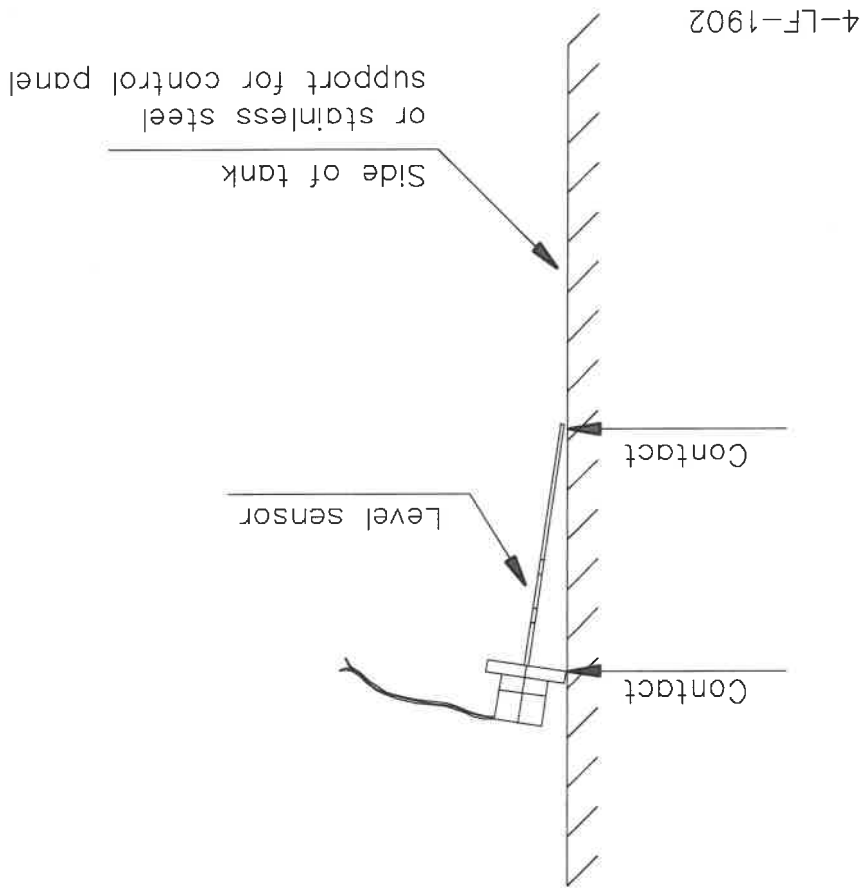
The working principle of the sensor is like a conductivity sensor. When water level inside the tank reach the VNI sensor a small electrical voltage goes through the water to the stainless steel tank.

The sensor need no particular maintenance.

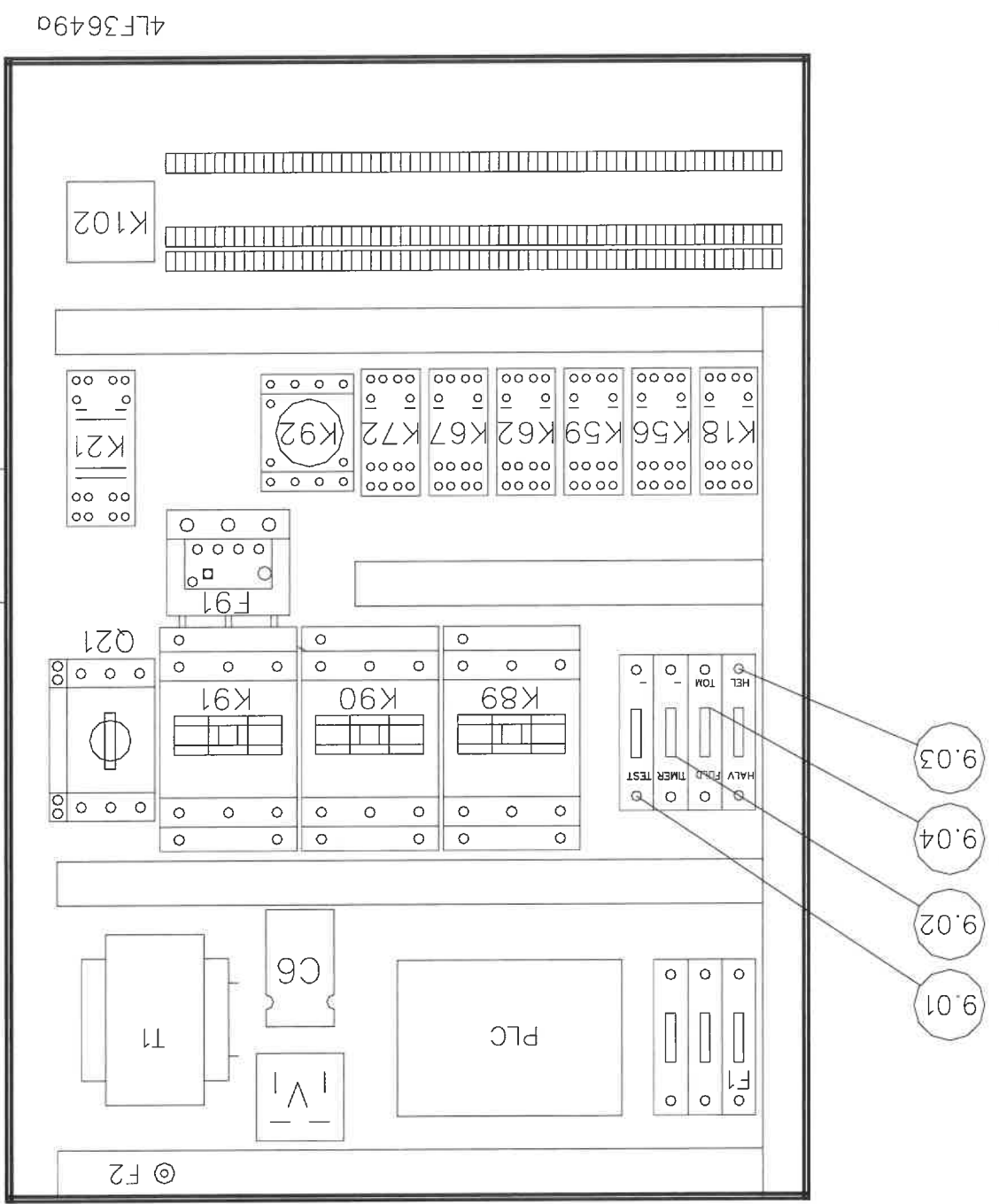
It is recommendable that the function of the sensor is tested frequently. This can be done in the following way:

1. Dismount the sensor
 2. Start the PV-system
 3. Press the sensor against the outer surface of the tank. Ensure there is contact between the alu-coupling/tank and sensor-end/tank.
 4. This contact result in signal to the sensor relay and the diode "Relay on" is lightening.
 5. Remove the sensor from the tank.
- Now the diode "Relay on" will switch off.

The above description confirm a correct function of sensor and sensor relay.

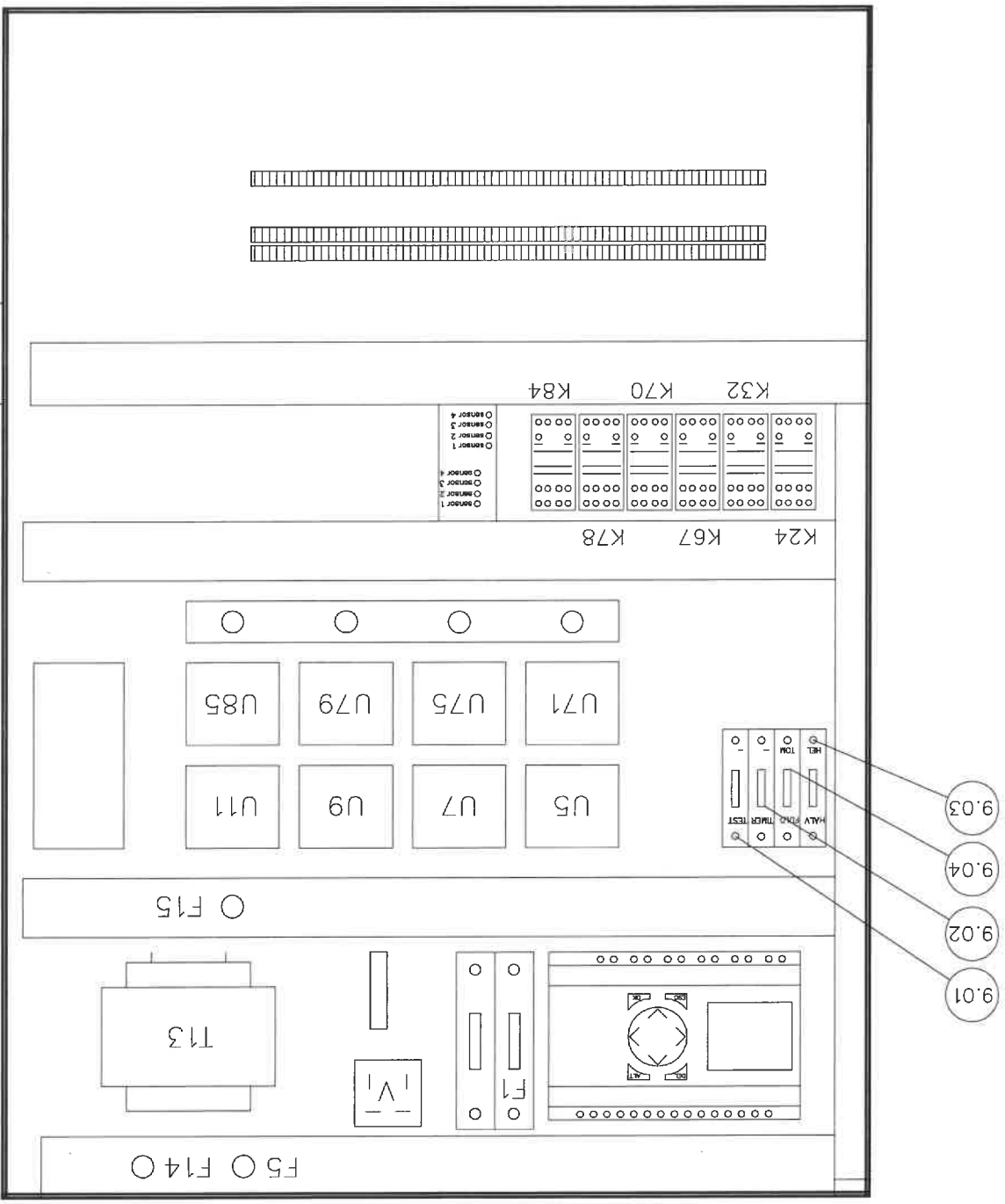


Control panel, inside view.
- electric driven



4LF36490

Control panel, inside view.
- hydraulic driven or diesel driven



4LF2993

F1:	Aut. Fuse
F2:	Aut. Fuse
K18:	24 V DC relay 14-poles, start/stop
K21:	24 V AC DIL OOM contactor, hydraulic pump
K56:	24 V DC relay 14-poles, test
K59:	24 V DC relay 14-poles, vacuum pump
K62:	24 V DC relay 14-poles, water supply
K67:	24 V DC relay 14-poles, 4-way valve
K72:	24 V DC relay 14-poles, by-pass
K89:	24 VAC power contactor, Y-vacuum pump
K90:	24 VAC power contactor, D-vacuum pump
K91:	24 VAC power contactor, main-vacuum pump
F91:	Thermal overload relay, vacuum pump
K92:	Timer 0.15 - 6 sec., Y/D-time
K102:	Dummy relay, for (fork sensor) PFR 4, level control relay, for (VNI sensor)
Q21:	Circuit breaker PKZM 0 - 1.6, hydraulic pump
T1:	Transformer
V:	Bridge coupling
C6:	Condensator
PLC:	PLC control unit
9.01:	Switch, test
9.02:	Switch, timer
9.03:	Switch, full/empty tanks
9.04:	Switch, fully-/semi automatic
9.05:	Multi plug
9.06:	Dummy

Parts list.

- Ref.: 4-LF-2993.

- diesel driven or hydraulic driven.

F1: Aut. Fuse 12 V. DC for supply 25 Amp.

F5: Fuse 12V. DC for converter 5 Amp.

F14: Fuse 5 Amp. for 24 V. DC

F15: Fuse 24 V. AC 1 Amp.

U5: Solid state relay converter

U7: Solid state relay converter

U9: Solid state relay converter

U11: Solid state relay converter

U71: Solid state relay for fuel valve

U75: Solid state relay for water supply

U79: Solid state relay for 4-way valve

U85: Solid state valve for by-pass valve

K24: Relay oil pressure

K32: Relay start PV-system

K67: 24 V DC relay 14-poles, 4-way valve

K70: Relay fuel valve

K78: Relay 4-way valve

K84: Relay by-pass

T13: Transformer

V: Bridge coupling

9.01: Switch, test

9.02: Switch, timer

9.03: Switch, full/empty tanks

9.04: Switch, fully-/semi automatic

9.05: Multi plug

9.06: Dummy

A1: Electric converter AC/DC

K112: Level sensor relay

Directions for use of electric control boxes on machines:

1. The machinery must only be connected to voltage and type of current marked on the control panel.
2. The machinery must not be connected to electricity until extra protection according to law has been established.
3. The control box must not be opened when under voltage.
4. No covers of electrical parts must be opened when the machinery is under voltage.
5. If the machinery has defects or open covers to electrical parts, or if the machinery has defects or opened covers to electric control boxes, the machinery MUST NOT be connected to electricity.
6. Further, reference is made to the operation instructions valid for the machinery.

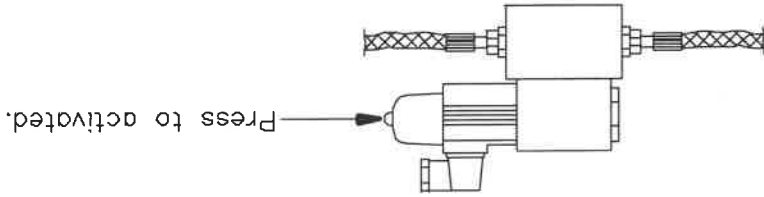
Trouble shooting.

1. **The electrical motors can not start up.**
 - a. Check the flow diagram on front of the control box. If a red diode (thermal failure), Pos. 11/7 is lightening, it means that the electrical motor has been overloaded.
 - Reset the thermal relay/max. breaker.
 - b. If the thermal failure is repeating.
 - The reason can be excessive water supply to the liquidring pump. Adjust the water supply.
 - Voltage drop. Check the actual voltage!
 - The star/delta relays may be worn out. Check and replace if necessary!
 - c. The stop circuit is a NC circuit. If this circuit is open the system can not start up.
 - Check the wires at the back of the front panel of the control box.
 - d. Check that the multi plug Pos. 9.05 is connected with either a dummy or a remote control. NOTE: If the dummy/remote control is missing, the system can not operate.
2. **The automatic control out of order (fully or partly)**
 - a. Check the power supply to the PLC unit.
3. **The system stops immediately after starting up.**
 - a. Check the flow diagram on front of the control box. If a red diode Pos. 11/7 (thermal failure) is lightening, it means that the electrical motor has been overloaded. See point 1.
 - If diode for water supply Pos. 10 is lightening it means, that the flow control Pos. 2.04 has stopped the system because of too little water supply to the pump.
 - Check the water supply
 - Reset the flow control by pushing the stop button "A"
 - Start up the system again
 - If the error repeat
 - Dismount the flow control and clean the pin of the sensor.
 - Repeat point b.
 - b. If the error repeat
 - Check the diodes on the flow control, Pos. 2.04. Adjust the flow control by turning the screw Pos. 2.15 - See chapter 2.
 - c. **Note:** Before adjusting the flow control ensure that the water supply is 100% satisfactory.
4. **The cycle of the PV-system stops.**
 - a. One of the sensors is out of order. The function of the sensor might be disturbed by a fish, or parts of fish hanging in the sensor forks. Clean the sensor.
 - b. Put the control system in test mode and press the start button once.
 - Clean the sensor and check by actuating the sensor forks manually while watching the diodes on top of the sensor housing. The green diode indicates power supply. The red

- diode indicates no signal (No red diode means signal). If everything is OK, press the stop button and switch back from test mode to normal operation mode.
- c. Check cables and connections to the sensors by watching the respective level sensor diode at the flow diagram on front of the control box.

5. The hydraulic operated valves are out of order.

- a. Check the oil level in the hydraulic pump unit.
- b. Check the hydraulic system for possible leaks.
- c. Check oil pressure at pressure gauge. Pressure must be in the range of 30 bar.
- d. Check cables and plugs connected to the coils of the hydraulic solenoid valves.
- e. Note: Do not dismount a coil from a solenoid valve and apply tension to the coil at the same time, as this will destroy the coil immediately.
- f. For testing, the solenoid valves can be actuated manually, see following instruction:



4-LF-3109

The system has suddenly no- or reduced capacity.

- a. Check all hose connections between the power unit and the tank system.
- b. Check the water supply for the liquidring pumps. If it is too poor the capacity of the PV-system will decrease.
- c. Make sure that the manual bypass valves are closed. Bypass pressure Pos. 1.01 and bypass vacuum Pos. 1.12.
- d. If the hydraulic pressure is too low (must be in the range of 30 bar) the hydraulic bypass valves may leak. This will affect the capacity considerably.

6. Noisy operation of the liquidring pump.

- a. Check the water supply. If the amount of prime water is excessive, the capacity of the liquidring pump will decrease and the liquidring pump will start making noise. Adjust (reduce) the amount of prime water.
- b. If a mechanical seal whistles, the seal may be worn out, check and replace if necessary.
- c. If a bearing makes noise, the bearing is worn out and must be replaced.
- d. The V-belt transmission makes noise. Re-tighten the belts.
- e. The couplings transmission makes noise. Replace parts worn down.

7. The liquidring pump gets jammed.

- a. The impeller is jammed against the port plates of the pump housing because of oxidation. The pump has not been protected against oxidation, ref. Chapter 5, maintenance.

Fill up the pump with a solution of phosphoric acid (1 liter acid + 2 liters of water) for about one hour. Drain and rinse the pump. Start up the system.

Leakage of sealant liquid.

8.

If water is leaking from a drain below the bearing housing, the mechanical shaft sealing is leaking. Dismount the bearing and check the shaft sealing. It is possible that the dynamic part of the sealing has stuck to the shaft, and by that lost its ability to keep tight. Clean the shaft and reinstall.
If the sealing is worn out, it must be replaced as the leak water may penetrate the bearing and destroy it.

a.

Electrical diagrams.
- following pages

Cleaning of stainless steel.

January 1997.

Description of stainless steel:

Stainless steel containing 18% Chrome and appr. 8% Nickel is normally resistant to rust attacks. Certain factors in the surrounding environment are able to attack the surface though. Therefore cleaning of the stainless surface becomes necessary.

The chrome in the steel reacts with the oxygen in wet surroundings and builds up a very thin chromic oxide film, which protects the material against corrosion. If this film is attacked, mechanical or chemical, it will regenerate spontaneously. This happens if or when the oxygen reaches the surface; even in low concentrations as in freshwater. The higher the chrome-content, the higher the resistance is.

Causes to rust attacks/discolouring:

The stainless steel can be discoloured by rust if it meets a more aggressive environment, than it is meant for, e.g:

- Very polluted air "industrial atmosphere"
- Saline solution and hydrochloric-acid.
- Cleaning products containing chlorides ¹⁾

Iron setoffs caused by moisture, e.g:

- Steel package wires
- Truck forks
- Ordinary steel tools
- Touching by ordinary carbon steel

In this case particles from the carbon steel get on the stainless surface. Already after few days of moisturing the rust will be visible, if the surface is contaminated.

Preventive arrangements:

By delivery from factory the weldings are cleaned and all surfaces are the same. The stainless steel then generates a corrosion resistant oxid film on the entire surface. To protect the corrosion resistancy, following instructions regarding installation and daily use has to be followed:

- Use stainless steel screws, bolts etc.
- Avoid the risk of galvanic corrosion between components of stainless steel and carbon steel, on places where the materials faces moisture or water.
- Use clean tools, without rust and iron particles.
- NEVER use steel brushes or steelwool of carbon steel. Only use materials which not contaminates the surface.
- If blasting the surface, never use sand or glas that have been used for carbon steel.
- Do not use hydrochloric-acid for removal of e.g. concrete.

Preventive water cleaning:

Stainless steel equipment placed outside is normally kept clean by the rain. In geographic areas where it seldom rains and indoor installations were the equipment does not automatically receive freshwater, it becomes necessary to water it periodically. Systematic freshwater washing removes dirt and prevents corrosion attacks. The more polluted the environment are, the more often the freshwater cleaning should be!

¹⁾ In industries, where there are a daily use of chlorid cleaning products, the stainless surfaces has to be rinsed totally clean with cold freshwater. If not, the chlorids in the moisturing environment will destroy the stainlessness in the steel.

Washing methods:
The best washing is achieved by using a sponge and warm soapy water, with a mild cleaning product, followed by thorough rinsing with cold freshwater.
This above is valid for both indoor and outdoor installations

Removal of stains and discolourings:

If the stains or the discolouring of the surface is so bad that ordinary washing does not help, then following methods can be recommended:

Type of damage	Cleaning product/method
Fingerprints	Clean with alcohol, thinner or acetone. Rinse afterwards with cold water, and dry it.
Oil and grease	Clean with dissolvent of above type wash with soap or mild cleaning product. Rinse then with cold water and dry it.
Stains and discolouring	Clean with a mild grinding product and rub in the same direction as the structure in the surface, or: Wash with 10% phosphor-acid dissolvent. Wash afterwards with ammonium dissolvent and cold water last.
Removal of marking colour	Clean with acetone.
Removal of PVC-film	Clean with alcohol.
Oxidizing colours and worse stains	Wash with grinding cleaning product or: Scotchbrite sponge along the surface structure. Rinse with cold freshwater and dry it.
Discolouring by rust	Wet the surface with oxalacid dissolvent. Leave the dissolvent for 15-20 min. Rinse with cold water and dry it. Eventually combine with above.
Paint	Clean with varnish remover and wash with cold fresh water.
Scratches on grinded or brushed surfaces	Polish with a rotating emery wheel. Grind along the structure of the surface, wash with soapy water or mild cleaning product. Wash afterwards with cold water and dry it.

