# INSTRUCTION MANUAL

## FOR

FRESH WATER GENERATOR

**HULL NO.: 1648**

<table>
<thead>
<tr>
<th>SEC. NO.</th>
<th>SHIP DESIGN OFFICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3D6</td>
<td>SHIP OUTFITTING DESIGN DEPT 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEL. NO.</th>
<th>SHIP NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3709</td>
<td>1648</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>APPROVED</th>
<th>CHECKED</th>
<th>DRAWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y. S. HAN</td>
<td>Y. E. HONG</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>SCALE</th>
<th>DRAWING NO.</th>
<th>CONSOLIDATED NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006. 4. 6</td>
<td>1</td>
<td>6U-2846-185</td>
<td>IM-22</td>
</tr>
</tbody>
</table>

**SHIP TYPE**

9,200 TEU CLASS CONTAINER CARRIER

**SHIP NAME**

CMA CGM FIDELIO  IMO 9299642

**NAME OF DRAWING**

FRESH WATER GENERATOR

**HYUNDAI HEAVY INDUSTRIES CO., LTD.**

ULSAN SHIPYARD, KOREA
FINAL DRAWINGS WITH INSTRUCTION MANUAL
FOR
FRESH WATER GENERATOR

HULL NO.: 1648

CUSTOMER: HYUNDAI HEAVY INDUSTRIES CO., LTD.
ALFA LAVAL REF NO.: NK-01742
DATE: 060103
## FINAL DRAWINGS LIST

**CUSTOMER:** HYUNDAI HEAVY INDUSTRIES CO., LTD.

**HULL NO:** 1648

**Freshwater Type:** DPU-36-C100

<table>
<thead>
<tr>
<th>No</th>
<th>Description</th>
<th>Document No.</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Instruction manual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Order Specification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>General description, freshwater generator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Technical data, freshwater generator</td>
<td>9.2.3.2-1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Technical data, pump and motor</td>
<td>9.2.3.2-2</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Dimension drawing, freshwater generator</td>
<td>985 16058</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Flow chart, excl./incl. options</td>
<td>985 17305</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Equipment specification</td>
<td>9.2.3.4-1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Vertical plant positioning</td>
<td>9.2.8-1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Assembly drawing, freshwater generator</td>
<td>985 19922</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Assembly scheme, plates</td>
<td>985 13474</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Outline drawing, motor for freshwater pump</td>
<td>985 16704-01</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Dimension drawing, Feed water treatment build-on</td>
<td>985 19815</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dimension drawing, feed water treatment</td>
<td>9.2.9.3-2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Dimension drawing, Salinometer build-on</td>
<td>985 17016</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Technical data/electric diagram, salinometer</td>
<td>985 17551</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>List of loose supply items</td>
<td>LOOSE</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Dimension drawing, thermometer</td>
<td>984 30365-01</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Dimension drawing, Y-type strainer (Size 10K-125A)</td>
<td>BYS-10-100-000</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Technical data, steel box for spare parts</td>
<td>9.2.9.2-3</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Standard spares included in the delivery</td>
<td>9.3.1.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dept</th>
<th>Date</th>
<th>Drawn</th>
<th>Checked</th>
<th>Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine &amp; Diesel</td>
<td>060103</td>
<td>SSKim</td>
<td>SSKim</td>
<td>SRJUNG</td>
</tr>
</tbody>
</table>
Instruction Manual
for Freshwater Generator
Type D-PU-36-C100
Alfa Laval reserve the right to make changes at any time without prior notice.

Any comments regarding possible errors and omissions or suggestions for improvement of this publication would be gratefully appreciated.

Copies of this publication can be ordered from your local Alfa Laval company.

Published by: Alfa Laval Desalt A/S
Maskinvej 5
DK-2860 Søborg
(Copenhagen) Denmark

© Copyright Alfa Laval Desalt.
This document and its content must not be copied, reproduced, transmitted or disclosed to any third party without consent of Alfa Laval Desalt.
Table of Contents

Safety Instructions and Warnings
1.0.0 Safety Instructions and Warnings ......................................................... page 7

Storage/Long Term Standstill
1.0.0 Storage ................................................................. page 9
1.1.0 Standstill ............................................................ page 9
1.1.1 Restart ............................................................... page 10
1.2.0 Long Term Standstill .................................................. page 10
1.2.1 Preservation Procedure for Freshwater Generator ................................ page 10
1.2.2 Restart Freshwater Generator ........................................ page 10
1.2.3 Preservation Procedure for Pumps ........................................ page 11
1.2.4 Restarting of Pumps ................................................ page 11
1.2.5 Preservation Procedure for Electric Motors .............................. page 11
1.2.6 Restarting of Electric Motors .......................................... page 12
1.2.7 Preservation Procedure for Electric Panel .............................. page 12
1.2.8 Restarting of Electric Panel .......................................... page 13
1.2.9 Solenoid Valves ...................................................... page 13

System Description
1.0.0 Working Principle ....................................................... page 15
1.1.0 Freshwater Quality ..................................................... page 16
1.2.0 Main Components ...................................................... page 17

Operating Instructions
1.0.0 Starting and Stopping Procedure ........................................ page 19
1.1.0 Starting ............................................................... page 19
1.1.1 Evaporation ........................................................ page 19
1.1.2 Condensation ........................................................ page 20
1.2.0 Adjustment of Hot Water Flow ....................................... page 20
1.3.0 Adjustment of Sea Cooling Water ..................................... page 21
1.4.0 Stopping the Plant ................................................... page 21
1.5.0 Long Term Standstill ................................................ page 22
## Table of Contents

### Maintenance

- 1.0.0 Why you need to perform regular maintenance duties ........................................ page 23
- 1.1.0 Overhaul Intervals .................................................................................................. page 23
- 1.2.0 Maintenance of Separator Vessel ........................................................................ page 24
- 1.3.0 Maintenance of Evaporator Section ..................................................................... page 25
- 1.4.0 Maintenance of Condenser Section ...................................................................... page 26
- 1.5.0 Renewal of Plate Heat Exchanger Gaskets ............................................................. page 27
  - 1.5.1 Removal of Old Gaskets ....................................................................................... page 27
  - 1.5.2 Cleaning .............................................................................................................. page 28
  - 1.5.3 Preparation of new Gaskets ................................................................................ page 28
  - 1.5.4 Fitting new Gaskets ............................................................................................ page 28
- 1.6.0 Pressure Testing Separator ................................................................................... page 31
- 1.7.0 Prevention of Scaling ........................................................................................... page 33
  - 1.7.1 Feed Water Ratio ............................................................................................... page 33
  - 1.7.2 Chemical Dosage ............................................................................................... page 33
    - 1.7.2.1 Scale Inhibitor Dosage Equipment for Feed Water ....................................... page 34
    - 1.7.2.2 Safety Precautions with the use of Chemicals ................................................. page 35
- 1.8.0 Test Sheet ............................................................................................................... page 37
  - 1.8.1 Trouble Shooting Table ....................................................................................... page 37

### Chemical Dosing of Scale Control Chemicals

- 1.0.0 Prevention of Scaling ........................................................................................... page 33
- 1.1.0 Feed Water Ratio ............................................................................................... page 33
- 1.2.0 Chemical Dosage ............................................................................................... page 33
  - 1.2.1 Scale Inhibitor Dosage Equipment for Feed Water ........................................... page 34
  - 1.2.2 Safety Precautions with the use of Chemicals ..................................................... page 35

### Trouble-Shooting

- 1.0.0 Test Sheet ............................................................................................................... page 37
- 1.1.0 Trouble Shooting Table ....................................................................................... page 37

### Maintenance of Freshwater Pump

- 1.0.0 Maintenance of Freshwater Pump Types PVVF 1525-1532-2040 ......................... page 41
- 1.1.0 Overhaul of the Pump ......................................................................................... page 41
  - 1.1.1 Clearance ........................................................................................................... page 42
  - 1.1.2 Dismantling Pump Shaft .................................................................................... page 42

### Maintenance of Ejector Pump

- 1.0.0 Maintenance of Ejector Pump .............................................................................. page 45
- 1.1.0 Overhaul of the Pump ......................................................................................... page 45
  - 1.1.1 Clearance ........................................................................................................... page 46
  - 1.1.2 Dismantling Pump Shaft .................................................................................... page 48
# Table of Contents

## Salinometer

1.0.0 Salinometer Type DS-20 ........................................ page 49  
1.1.0 Technical Specification ......................................... page 49  
1.2.0 Installation (for DS-20) ........................................ page 49  
1.3.0 Instructions for use .............................................. page 50  
1.3.1 Testing the Instrument ........................................... page 50  
1.3.2 Adjustment of Alarm Level ....................................... page 50  
1.3.3 Maintenance ....................................................... page 51

## Spare Parts

1.0.0 Ordering Spare Parts ............................................. page 53  
1.1.0 Alfa Laval Service ................................................ page 53

## Index
Safety Instructions and Warnings

Should you need further clarification regarding this manual, do not hesitate to contact your local Alfa Laval representative - or call Alfa Laval Desalt directly.

Telephone +45 (for Denmark) 39 53 60 00
Telefax +45 (for Denmark) 39 53 65 66

1.0.0 Safety Instructions and Warnings

The following symbols in this manual point out safety precautions. It means your attention is needed and your safety is involved.

WARNING

This symbol is used to indicate the presence of a hazard which can or will cause severe personal injury, if the warning is ignored.

CAUTION

Certain passages of the text will be marked with a caution mark. This mark indicates the presence of hazard which will or can cause property damage if the instructions are not observed.

NOTE

This type of instruction indicates a situation which, if not avoided, could result in damage to the equipment.

It is the owner’s and operator’s responsibility to see that any person involved with the use or operation of this equipment follow all safety instructions.

Read all safety instructions carefully and insist that they will be followed by those working with you and for you. Not following the instructions may cause severe personal injury or damage the equipment beyond repair.

Do not allow this equipment to be used if it is faulty or the operator does not understand the proper use.
Safety Instructions and Warnings

WARNING

The freshwater generator is not to be operated in polluted water or within 20 miles from the coast.

Freshwater must not be produced from polluted water, as the produced water can be unsuitable for human consumption.

If manuals are translated to local language the unit comply with the EEC Machinery Directive and EN 292-1/2 standards. For EEC land installations manuals MUST be available in local language before installing and operating the unit.

The unit also comply with EN 50081-2 and EN 50082-2 "Industry" with regards to the EMC directive from EEC.

WARNING

Noise hazards
• Use ear protection in noisy environments.

Crush hazards
• Use correct lifting tools.
• Do not work under hanging load.

Burn hazard
• Wear gloves to avoid burns by hot surfaces.

Cut hazards
• Wear gloves to avoid cuts by sharp edges when handling machined parts.
• Wear helmet to avoid cuts by sharp edges during maintenance of the equipment.

NOTE

• Max. ambient temperature for the equipment is 50°C (122°F).
• Min. ambient temperature for the equipment is 0°C (32°F).
Storage/Long Term Standstill

1.0.0 Storage

Unless otherwise agreed, Alfa Laval delivers the equipment ready to be put in service upon arrival and after installation.

However, should it be necessary to store equipment for a longer period (1 month or more), certain precautions should be made in order to protect and prevent unnecessary wear of the equipment.

The best solution is often to leave the equipment in the packing until it's time for installation. In this case Alfa Laval should be informed, in order that proper preparation can be done prior to packing.

Preferably, the equipment should be stored inside in a vibration free area at a temperature around 15 to 20 deg.C (59 to 68 deg.F) and humidity around 70%.

**NOTE**

There should ABSOLUTELY NOT be any OZONE PRODUCING equipment in the room, like operating electric motors or arc-welding, since ozone destroys many rubber materials.

Do not store organic solvents or acids in the room.

Avoid heat and ultraviolet radiation.

If the equipment must be stored outdoor, the precautions mentioned above should be taken as far as practical. The need for protection against the climate etc. is of course even more important in this case.

1.1.0 Standstill

If the freshwater generator is out of operation for a period of 14 to 30 days:

- Close all valves in connection with the unit and it's pumps.
- Open drain valve on the freshwater generator.
- Open front cover and clean the unit inside with fresh water.
- Check that the anodes are functioning. If the anodes are not functioning or worn out replace them.
Storage/Long Term Standstill

- Let the unit dry out completely before closing and tighten the cover.
- Turn the pump/motor shafts once a week to avoid damaging the mechanical shaft seal and motor bearings.

**NOTE**

To preserve the natural protection of the inside of the vessel DO NOT scrape or scratch the inside surface.

1.1.1 Restart

Close drain valve on the freshwater generator and visually check outside for defects.

Before restart turn the pump/motor shaft by hand to check for any obstructions, after starting the pump watch the operation of the pump and electric motor for approx. 10 minutes.

1.2.0 Long Term Standstill

1.2.1 Preservation Procedure for Freshwater Generator

If the freshwater generator is taken out of operation for a period longer than 30 days.

- Close all valves in connection with the unit and it's pumps.
- Open drain valve on the freshwater generator.
- Open front cover and clean the unit inside with fresh water.
- Check that the anodes are functioning. If the anodes are not functioning or worn out replace them.
- Drain the unit and let it dry out completely before closing and tighten the cover.

1.2.2 Restart Freshwater Generator

Close drain valve on the freshwater generator and check visually outside for defects.

For other equipment in connection with the freshwater generator follow procedures as described below.
Remove the salinometer sensor in the freshwater pipe after the freshwater pump, clean the sensor and store it in the electric panel or in a dry place.

1.2.8 Restarting of Electric Panel

Before taking the panel into service, ensure that anti-condensation heater (if fitted) have been disconnected and removed.

- Check that no foreign matter is present in the panel.
- Remove all surface dust and dirt.
- Test the insulation resistance between phases and earth.

If an insulation resistance lower than one megaohm at 20 deg.C (68 deg.F) is measured, the panel must be dried out until a minimum of one megaohm is obtained.

Clean and mount the salinometer sensor in the freshwater pipe.

1.2.9 Solenoid Valves

Solenoid valves are removed, flushed with warm fresh water and stored in a clean dry ozone free area.

Before replacing, the valves are flushed again with warm fresh water and the function of the valve is checked by energizing the coil.
1.2.3 Preservation Procedure for Pumps

- Drain the pump through the bottom drain.
- Flush the pump with hot fresh water (maximum 60 deg.C, 140 deg.F), flushing can take place through the manometer connections.
- Let the pump dry out.
- Flush the pump with 'Mobil Arama 25' or similar quality.
- Mount drain plug and manometer connections.
- Turn the pump shaft once a week to avoid damaging the mechanical shaft seal.

1.2.4 Restarting of Pumps

- Fill the pump with hot fresh water through the manometer connections.
- Mount the manometer connections.
- Turn the pump shaft by hand to check for any obstructions.
- Open valves and check that the mechanical shaft seal is not leaking (if leaking start the pump and let it run for 1 to 2 minutes, if still leaking the mechanical seal must be replaced).
- Start the pump and watch the operation of the pump and electric motor for approx. 10 minutes.

1.2.5 Preservation Procedure for Electric Motors

Factory fitted bearings use a lithium based grease with a recommended shelf life of two years. If stored for a longer period, grease may need to be replaced.

Shielded bearings have a storage life of five years and a further two years operational life following the installation.

To avoid static indentation during long term standstill, the area should be vibration free.

Where exposure to some vibration is unavoidable, the shaft should be looked. Roller bearings may be fitted with a shaft locking device which should be kept in place during long term standstill.

Shaft should be rotated by hand, one quarter of revolution weekly.
Storage/Long Term Standstill

---

**WARNING**

Where anti-condensation heaters have been fitted, it is strongly recommended that they are energized.

In such case, prominent warnings of live terminals inside the terminal box must be posted inside and outside the motor terminal box.

Where anti-condensation heaters are not fitted, the use of desiccant is recommended.

---

1.2.6 Restarting of Electric Motors

Before taking a motor into service, ensure that anti-condensation heaters (if fitted) have been disconnected and isolate before starting the motor.

- Check that no foreign matter is present.
- Remove all surface dust and dirt.
- Test the stator insulation resistance between phases and also to earth.

If an insulation resistance lower than one megaohm at 20 deg.C (68 deg.F) is measured, the windings must be dried out until a minimum of one megaohm is obtained.

- Start the motor.
- Watch the operation of the electric motor for approx. 10 minutes.

---

1.2.7 Preservation Procedure for Electric Panel

The electric panel normally includes motor starters with thermal relays, transformer, contactors and salinometer.

The panel have to be disconnected from the main supply and kept clean and dry during the long term standstill period.

The panel is kept dry inside either by an anti-condensation heating element (25 W) or by use of a desiccant.

---

**WARNING**

If anti-condensation heater is used, prominent warnings of live terminals inside the panel must be posted inside and outside the panel.
System Description

1.0.0 Working Principle

The combined brine/air ejector driven by the ejector pump creates a vacuum in the system in order to lower the evaporation temperature of the feedwater.

The feedwater is introduced into the evaporator section through an orifice, and is distributed into every second plate channel (evaporation channels).

The hot water is distributed into the remaining channels, thus transferring its heat to the feedwater in the evaporation channels.

Having reached boiling temperature - which is lower than at atmospheric pressure - the feed water undergoes a partial evaporation, and the mixture of generated vapour and brine enters the separator vessel, where the brine is separated from the vapour.

Working principle:

The feed water is introduced into the evaporator section and the produced freshwater is extracted from the condenser and led to the freshwater storage tank.
and extracted by the combined brine/air ejector.

Having passed a demister the vapour enters every second plate channel in the condenser section.

The sea water supplied by the combined cooling/ejector water pump distributes itself into the remaining channels, thus absorbing the heat being transferred from the condensing vapour.

The produced freshwater is extracted by the freshwater pump and led to the freshwater tank.

1.1.0 Freshwater Quality

To continuously check the quality of the produced freshwater, a salinometer is provided together with an electrode unit fitted on the freshwater pump delivery side.

If the salinity of the produced freshwater exceeds the chosen maximum value, the dump valve and alarm are activated to automatically dump the produced freshwater to the bilge.

If there are no special requirements from the authorities, the produced freshwater can be used directly as drinking water.
1.2.0 Main Components

The freshwater generator consists of the following components:

1. **Evaporator section**
   The evaporator section consists of a plate heat exchanger and is enclosed in the separator vessel.

2. **Separator vessel**
   The separator separates the brine from the vapour.

3. **Condenser section**
   Just like the evaporator section the condenser section consists of a plate heat exchanger enclosed in the separator vessel.

4. **Combined brine/air ejector**
   The ejector extracts brine and incondensable gases from the separator vessel.

5. **Ejector pump**
   Normally, the ejector pump is delivered by Alfa Laval, and the ejector pump is a single-stage centrifugal pump. This pump supplies the condenser with sea water and the brine/air ejector with jet water as well as feed water for evaporation.

6. **Freshwater pump**
   The freshwater pump is a single-stage centrifugal pump. The freshwater pump extracts the produced freshwater from the condenser, and pumps the water to the freshwater tank.

7. **Salinometer**
   The salinometer continuously checks the salinity of the produced water. The alarm set point is adjustable.

8. **Control panel**
   Normally, the control panel is delivered by Alfa Laval. It contains motor starters, running lights, salinometer, contacts for remote alarm and is prepared for start/stop.
Operating Instructions

**WARNING**

DO NOT operate the plant in polluted water.

Freshwater must not be produced from polluted water, as the produced water will be unsuitable for human consumption.

1.0.0 Starting and Stopping Procedure

**CAUTION**

Before starting up please observe instructions for feedwater treatment, see “Chemical dosing of scale control chemicals”.

Please refer to PI-diagram (see “FWG Order Specification”).

1.1.0 Starting

1. Open valves on the suction and discharge side of the ejector pump PU-SC-01.

2. Open overboard valve for combined brine/air ejector.

3. Close air screw VA-E1-01 on the separator.

4. Start ejector pump PU-SC-01 to create a vacuum of min. 90%.

*Pressure at combined brine/air ejector inlet minimum 300 kPa (3.0 kp/cm²). Back pressure at combined brine/air ejector outlet maximum 60 kPa (0.6 kp/cm²).*

1.1.1 Evaporation

When there is a minimum of 90% vacuum (after maximum 10 minutes).

5. Open valve for feedwater treatment, if any.
Operating Instructions

6. Open hot water inlet and outlet valves.

7. Start hot water supply to distiller by adjusting bypass valve or hot water pump if any, step-wise 10°C, until the desired jacket water temperature is reached.

The boiling temperature now rises, while the obtained vacuum drops to approx. 85%.

This indicates that evaporation has started.

1.1.2 Condensation

After approx. 3 minutes the boiling temperature will drop again, and normal vacuum is reestablished.

8. Open valve to freshwater tank.

9. Switch on salinometer.


<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The freshwater pump discharge pressure will be between 120 and 160 kPa (1.2 - 1.6 kp/cm²).</td>
</tr>
</tbody>
</table>

After starting the freshwater pump the flow sight glass in the air suction pipe must be empty.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>If water remains in the flow sight glass in the air suction pipe, please refer to “Trouble shooting”.</td>
</tr>
</tbody>
</table>

1.2.0 Adjustment of Hot Water Flow

Please refer to “FWG Order Specification” for specified hot water flow.

In order to obtain the specified flow of hot water, it is necessary to adjust the bypass valve until desired flow is achieved.
Operating Instructions

The flow can be calculated as follows:

\[ M_{JW} = K_{JW} \times \frac{\text{Cap.m}^3/24\text{h}}{\Delta t_{JW}} = m^3/\text{h} \]

\( M_{JW} \) = Flow of hot water in one hour.

\( K_{JW} \) = Constant =25.6 for 1-stage freshwater generator.

\( K_{JW} \) = Constant =15.52 for 2-stage freshwater generator.

\( \Delta t_{JW} \) = Difference in temperature of hot water in and out.

\( \text{Cap.m}^3/24\text{h} \) = Freshwater production in 24 hours, i.e. production in 5 min. times 288.

Example: \( \text{cap. m}^3/24\text{h} = 15 \text{ m}^3 \)

\( T_{SW} = 32^\circ\text{C} \)

\( \Delta t_{JW} = 18.4^\circ\text{C} \)

\[ M_{JW} = 25.6 \times 15 = 20.9 \text{ m}^3/\text{h} \]

1.3.0 Adjustment of Sea Cooling Water

The sea cooling water flow is correct, when the pressure at the inlet side of the combined air/brine ejector is between 300 and 400 kPa (3.0 - 4.0 kp/cm²).

1.4.0 Stopping the Plant

1. Stop hot water supply to distiller.
2. Close valve for feedwater treatment, if any.
4. Switch off salinometer.
5. Stop ejector pump PU-SC-01.
6. Open air screw VA-E1-01.
Operating Instructions

7. Close valves on the suction and discharge side of the ejector pump.
8. Close overboard valve for combined brine/air ejector.
9. Close the valve to freshwater tank.

CAUTION

All valves must be shut, while the distiller is out of operation. Except air screw.

1.5.0 Long Term Standstill

If the distiller is out of operation for a period longer than 14 days.

• Open front covers and clean unit inside with freshwater.
• Let the unit dry out completely, before closing covers.

Please observe "Maintenance of separator vessel".
**Maintenance**

1.0.0 *Why you need to perform regular maintenance duties*

Regular maintenance of the plant will improve performance and availability.

The maintenance schedule on the following pages will tell you how often service should be performed on the main components.

As the actual operating conditions of the plant are of major influence on the life time, the overhaul dates are not obligatory but only recommended intervals.

When the plant has been in operation for a longer period of time and experience has been established as to the actual performance, it will be possible to adapt the maintenance schedule.

For service on minor components please refer to component instructions.

1.1.0 *Overhaul Intervals*

<table>
<thead>
<tr>
<th>Component</th>
<th>Operating Hours</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporator section</td>
<td>As required</td>
<td>Clean in inhibited acid bath</td>
</tr>
<tr>
<td>Condenser section</td>
<td>As required</td>
<td>Clean with pure freshwater and brush</td>
</tr>
<tr>
<td>Combined ejector/cooling water pump with motor</td>
<td>8000 h</td>
<td>Measure seal ring and impeller. Examine mechanical shaft seal, cooling water pipe passage. Megger-test electric motor. Clean pump thoroughly before reassembly.</td>
</tr>
<tr>
<td>Freshwater extraction pump with motor</td>
<td>8000 h</td>
<td>See above</td>
</tr>
<tr>
<td>Combined air/brine ejector</td>
<td>8000 h</td>
<td>Measure nozzles and diffuser and compare to measurements in technical specification.</td>
</tr>
<tr>
<td>MV-valves</td>
<td>4000 h</td>
<td>Disassembly and inspect for damage.</td>
</tr>
<tr>
<td>Demister</td>
<td>8000 h</td>
<td>Clean in inhibited acid bath</td>
</tr>
</tbody>
</table>
1.2.0 Maintenance of Separator Vessel

The separator vessels and the pressure plates for the heat exchanger sections (evaporator and condenser) are made of stainless steel with a special chemical treatment. This treatment will reestablish normal surface oxidation after work-up at the factory. The preparation is a natural protection of the stainless steel.

CAUTION

To preserve this natural protection DO NOT scrape or scratch the inside surface of the separator vessels.

Further, there are isolating layers on the separator inside walls, where the heat exchanger sections are mounted. Whenever the sections are dismantled, these isolating layers must be checked for defects. Repair any defects according to the maintenance guide for glass flake coating.

Whenever the separator vessel is opened,

- check that the anodes are functioning

If the anodes are not functioning and/or worn, replace them.

NOTE

If the unit is stopped for a longer period than 14 days,

- Open separator covers and clean unit inside with freshwater.
- Let the unit dry out completely, before closing covers.
1.3.0 Maintenance of Evaporator Section

Clean evaporator as follows:

1. Remove bolts in front cover, and open.
2. Loosen the 6 nuts in plate stack gradually, so that no nut is carrying the entire load alone.
3. Remove plate stack.

**NOTE**

If some of the gaskets come loose on removing plate stack, please see section 1.5.2.

4. Submerge plates completely in a hot, inhibited acid bath at maximum 50°C. For further instructions see "Chemical dosing of scale control chemicals".

**WARNING**

Always follow carefully the suppliers instructions when using inhibited acids.

Remember to neutralize according to suppliers instructions.

5. Examine plates and gaskets for possible damage, and remove damaged plates and/or replace damaged gaskets.

6. If a defective plate is found, remove the plate together with one of the adjacent plates.

**NOTE**

The assembly measurements must be reduced with 5.4 mm per plate, if plates are removed from plate stack.
CAUTION

The ES and EE plate cannot be removed but must always be replaced, with a corresponding plate.

7. Reassemble evaporator section in accordance with assembly scheme.
8. Tighten plate stack to measurements stated in technical specification.
9. Pressure test evaporator section before closing front cover.

*The evaporator section is pressure tested by letting hot water circulate through the section with bypass valve for hot water in normal running position.*

10. When the evaporator section is found to be tight, close front cover and tighten bolts.
11. Retighten, when vacuum has been reestablished.

1.4.0 Maintenance of Condenser Section

Clean condenser as follows:

1. Remove bolts in front cover, and open.
2. Loosen the 6 nuts in plate stack gradually, so that no nut is carrying the entire load alone.
3. Remove plate stack.

NOTE

If some of the gaskets come loose on removing plate stack, please see section 1.5.2

4. Scrub plates with a soft brush and plain hot water at maximum 50°C.
5. Examine plates and gaskets for possible damage, and remove damaged plates and/or replace damaged gaskets.
6. If a defective plate is found, remove the plate and one of the adjacent plates.
NOTE

The assembly measurements must be reduced with 5.4 mm per plate, if plates are removed from plate stack.

CAUTION

The ES and EE plate cannot be removed, but must always be replaced, with a corresponding plate.

7. Reassemble condenser section in accordance with assembly scheme.
8. Tighten plate stack to measurements stated in technical specification.
9. Pressure test condenser section before closing front cover.

The condenser section is pressure tested by letting sea water from the combined cooling water/ejector pump circulate through the section.

CAUTION

Before starting the combined ejector/cooling water pump, the feed water must be sealed off.

10. When the condenser section is found to be tight, close front cover and tighten bolts.
11. Retighten, when vacuum has been reestablished.

1.5.0 Renewal of Plate Heat Exchanger Gaskets

1.5.1 Removal of Old Gaskets

Pull the old gaskets out of groove.

If the gasket cannot come off directly, heat the back of the gasket groove with a hot-air blower or butane gas burner.
Maintenance

Pay attention not to overheat the plates.

You will obtain a suitable temperature, if the flame is held 10 to 15 cm behind the plate.

![WARNING]

DO NOT use acetylene gas

1.5.2 Cleaning

Charred or loose glue and rubber remains must be removed, e.g. using a rotating stainless steel brush. The width should be adapted (Ø40-50 mm, width 8-10 mm). Thin layers of glue which are difficult to remove, may remain.

Clean the gasket groove with a clean cloth, dipped in a solvent (acetone, methyl ethyl ketone, trichlorethylene etc.).

![WARNING]

Be careful when handling these solvents, as they may be hazardous to your health. Observe suppliers' instructions.

Gaskets, that have loosened, can be glued on. Clean gasket groove carefully with a sharp tool. Then clean the loose part of the gasket with emery cloth or sandpaper. Finally clean groove and gasket with a solvent, and glue.

1.5.3 Preparation of new Gaskets

Dry new gaskets with a clean cloth that has been slightly moistened with a solvent.

1.5.4 Fitting new Gaskets

1. Apply a thin layer of glue to both gasket and groove.
2. Let the glue dry for 10-15 minutes.
3. Fit new gasket into groove.

Gaskets may sometimes be slightly short or long.
Short gaskets should be stretched before being fitted into the groove.

Long gaskets should be fitted into the grooves at the plate ends first and then gradually be pushed into the groove towards the middle.

If necessary, tape gasket into groove.
Pressure Test

1.0.0 Pressure Testing Separator

If there are leaks in the system, it will be necessary to carry out a pressure test in order to identify the leak:

1. Close valve on discharge side of combined cooling water/ejector pump.
2. Close discharge valve on overboard line from combined brine/air ejector.
3. Close valve on discharge line to freshwater tanks.
4. Open separator vessel in order to vent the vessel, when supplying water for pressure test.
5. Supply water (sea or freshwater) at the socket for the connection of feed water treatment.

CAUTION

Maximum pressure on the separator vessel is 150 kPa (1.5 kp/cm²) (21 PSI).
1.0.0 Prevention of Scaling

During the evaporation of sea water there is always a risk of scaling on the heating surfaces. This will lead to a reduction of the K-values of the heating surface and decreasing freshwater production and reduction of plant efficiency.

In order to effectively prevent scaling the operators must be aware of the factors influencing the scale formation.

1.1.0 Feed Water Ratio

The feedwater ratio is an extremely important factor. It is defined by the relationship between the feedwater amount fed into the plant and the produced amount of freshwater.

If the feedwater ratio is reduced, the concentration will rise in the plant subsequently resulting in scale formations.

Two things may shift the feedwater ratio: first of all direct adjustment of the feedwater system, and secondly exceeding the maximum freshwater production laid out for the plant. The operators must observe the following rules at all times.

CAUTION

DO NOT adjust feedwater system. Feedwater pressure min. 3.0 max. 4.0 bar g.

1.2.0 Chemical Dosage

In order to control scale formations on the heating surfaces and continuously ensure long operation periods without acid cleaning the plant, it is absolutely necessary to dose scale control additives to the feedwater. The operators must follow the instructions for chemical dosing given by the chemical supplier carefully.
Chemical Dosing of Scale Control Chemicals

CAUTION

If the distiller is operated at boiling temperatures above 45°C without chemicals, frequent cleaning of the evaporator will be necessary.

We recommend that you do not operate the freshwater distiller without recommended chemical dosage at boiling temperatures above 45°C. Even at lower temperatures it can be recommended.

1.2.1 Scale Inhibitor Dosage Equipment for Feed Water

Please refer to drawing, see “FWG Order Specification”.

- When adding chemicals mix thoroughly to ensure a homogenous blend of chemicals and water.

Use a fully soluble scale inhibitor, e.g. on polymer basis. The following products can be recommended:

NALFLEET Evaporator treatment 9-913
AMEROYALEVAPORATORTREATMENT
HEXAMETHAPHOSPHATE

1. Mix the required quantity for 24 hours operation in the tank according to maker's instructions.

2. Adjust flowmeter to cover the maximum freshwater output from the distiller.

3. Flush the dosage system regularly.
1.2.2 Safety Precautions with the use of Chemicals

WARNING

1. USE eye protection and gloves. Avoid direct skin contact, eye contact or contact with clothes.

2. CLEAN empty containers before disposal.

3. If chemicals are spilled on clothes, rinse with water and dispose off clothes.

4. If chemicals are spilled on the floor, rinse with water and suck remaining chemicals off with sand. Clean the spot immediately afterwards.

5. Scale inhibitor is hazardous, if consumed in a concentrated solution. If consumed by mistake, IMMEDIATELY SEEK MEDICAL ATTENTION.

6. If eyes get in contact with the chemicals, rinse for at least 20 minutes. IMMEDIATELY SEEK MEDICAL ATTENTION.
Trouble-Shooting

1.0.0 Test Sheet

Before taking any action, please fill in a test sheet to find possible causes of malfunctions.

Test sheets can be found in the back of this binder.

1.1.0 Trouble Shooting Table

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop in production.</td>
<td>Partially blocked feed water orifice and/or sludge deposits on hot water side.</td>
<td>Dismantle evaporator section, and clean evaporator and orifice.</td>
</tr>
<tr>
<td></td>
<td>Sludge on the heat exchanger plates on the sea water side.</td>
<td>Dismantle condenser section, and clean.</td>
</tr>
<tr>
<td></td>
<td>Inlet channel in evaporator/condenser plate stack blocked, e.g. with rust scales, gasket fragments etc.</td>
<td>Dismantle evaporator/condenser section, and clean.</td>
</tr>
<tr>
<td></td>
<td>Too low ejector pump pressure.</td>
<td>See instructions for &quot;Low Sea Cooling water/Ejector pump flow / pressure&quot;, below.</td>
</tr>
<tr>
<td></td>
<td>Leakages</td>
<td>Carry out a pressure test at max. 150 kPa (1.5 kp/cm²) (21.8 PSI).a</td>
</tr>
<tr>
<td></td>
<td>Foreign bodies in ejector nozzles.</td>
<td>Inspect nozzles, and clean. Replace nozzles, if damaged.</td>
</tr>
<tr>
<td></td>
<td>Too high back pressure on ejector outlet side. Max 60 kPa (0.6 kp/cm²) (8.7 PSI).</td>
<td>Check overboard pipe and valves for blocking / functionality.</td>
</tr>
<tr>
<td></td>
<td>Non-return valve in air extraction pipe defect.</td>
<td>Replace non-return valve.</td>
</tr>
<tr>
<td></td>
<td>Hot water temperature too high.</td>
<td>Reduce to specified temperature.</td>
</tr>
<tr>
<td></td>
<td>Defective water clock.</td>
<td>Examine water clock. Let the produced water flow through water clock into a 10 l pail, and check production with a stop watch.</td>
</tr>
</tbody>
</table>
# Trouble-Shooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Sea Cooling water/Ejector pump flow / pressure.</td>
<td>Too low ejector pump pressure.</td>
<td>Clean, or replace pressure gauge.</td>
</tr>
<tr>
<td>Minimum pressure 300 kPa (3.0 kp/cm²) (43.5 PSI). At inlet side of ejector.</td>
<td>Suction strainer blocked.</td>
<td>Clean suction strainer.</td>
</tr>
<tr>
<td></td>
<td>Valves on suction or pressure pipe defect.</td>
<td>Examine and overhaul defective valves.</td>
</tr>
<tr>
<td></td>
<td>Leakage from suction pipe to pump.</td>
<td>Repair.</td>
</tr>
<tr>
<td></td>
<td>Impeller / seal ring defective.</td>
<td>Check pump maximum clearance See &quot;Maintenance of Ejector Pump&quot;</td>
</tr>
<tr>
<td></td>
<td>Clocked up condenser plate stack.</td>
<td>Dismantle condenser plate stack and clean.</td>
</tr>
<tr>
<td></td>
<td>Pump rotating in wrong direction.</td>
<td>Interchange phases.</td>
</tr>
<tr>
<td>Sight glass overflow. Normal back pressure for freshwater pump is 120 - 160 kPa (1.2 - 1.6 kp/cm²) (17.4 - 23.2 PSI). Except for JWP-16-C40 generator type, where the max. back pressure is 80 kPa (0.8 kp/cm²) (11.6 PSI).</td>
<td>Suction pipe leakage.</td>
<td>Check suction pipe especially unions and connections. Repair.</td>
</tr>
<tr>
<td></td>
<td>Mechanical seal in freshwater pump defect.</td>
<td>Replace mechanical seal.</td>
</tr>
<tr>
<td></td>
<td>Impeller / seal ring in freshwater extraction pipe defect.</td>
<td>Check pump maximum clearance See &quot;Maintenance of Freshwater Pump&quot;</td>
</tr>
<tr>
<td></td>
<td>Pump rotating in wrong direction.</td>
<td>Interchange phases.</td>
</tr>
<tr>
<td></td>
<td>Valves to freshwater tank closed.</td>
<td>Check all valves.</td>
</tr>
<tr>
<td></td>
<td>Inlet filter for water dock blocked.</td>
<td>Clean filter.</td>
</tr>
<tr>
<td>Salinity too high (more than 2.0 ppm).</td>
<td>Demister not fitted correctly.</td>
<td>Check that demister is fitted against baffle and front cover.</td>
</tr>
<tr>
<td></td>
<td>Front cover gasket defect or not fitted correctly.</td>
<td>Replace front cover gasket.</td>
</tr>
<tr>
<td></td>
<td>Insufficient brine extraction.</td>
<td>See separate instructions for insufficient brine extraction, below.</td>
</tr>
<tr>
<td></td>
<td>Electrode unit defective or dirty.</td>
<td>Examine electrode unit for cracks. Check that it is fitted correctly. Clean, if necessary.</td>
</tr>
</tbody>
</table>

38
<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leakage in condenser section.</td>
<td></td>
<td>Open distiller and pressure test condenser. Max. 600 kPa (6.0 kp/cm²) (87 PSI). If there is a defective plate, remove together with adjacent plate assemble plate stack according to new plate number with reduced assembly measurements. Check plate gaskets and replace, if necessary.</td>
</tr>
<tr>
<td>Insufficient brine extraction - brine level in sight glass higher than 20 mm.</td>
<td>Ejector pump pressure too low.</td>
<td>See special instructions for &quot;Low Sea Cooling water/Ejector pump flow / pressure&quot;, above.</td>
</tr>
<tr>
<td></td>
<td>Foreign bodies in ejector nozzles.</td>
<td>Check nozzles, and clean. Replace damaged nozzles.</td>
</tr>
<tr>
<td></td>
<td>Too high back pressure downstream of ejector.</td>
<td>Examine overboard pipe and valves.</td>
</tr>
<tr>
<td></td>
<td>Wrong dimension of feedwater orifice.</td>
<td>Examine orifice dimension - check technical specification.</td>
</tr>
<tr>
<td></td>
<td>Non-return valve in brine suction pipe of ejector defect.</td>
<td>Examine valve and repair, or replace.</td>
</tr>
<tr>
<td>Frequent refill of freshwater expansion tank due to loss of hot water.</td>
<td>Leakage in evaporator section.</td>
<td>Open distiller and pressure test condenser. Max. 600 kPa (6.0 kp/cm²) (87 PSI). If there is a defective plate, remove together with adjacent plates assemble plate stack according to new plate number with reduced assembly measurements. Check plate gaskets and replace, if necessary.</td>
</tr>
<tr>
<td>Abnormal amperage consumption of ejector pump motor.</td>
<td>Ejector nozzles defective.</td>
<td>Replace nozzles.</td>
</tr>
<tr>
<td></td>
<td>Wrong dimension of feedwater inlet orifice.</td>
<td>Check dimensions on spare parts list, See List of spare part drawings&quot;, and replace if necessary.</td>
</tr>
<tr>
<td></td>
<td>Bearings in motor defective.</td>
<td>Examine with stethoscope, and replace bearings, if defective.</td>
</tr>
<tr>
<td></td>
<td>Contactor defective.</td>
<td>Examine and replace contactor set, if defective.</td>
</tr>
<tr>
<td></td>
<td>Breaking of phases.</td>
<td>Max. 5% difference in amperage between phases.</td>
</tr>
</tbody>
</table>
1.0.0 Maintenance of Freshwater Pump Types PVVF 1525-1532-2040

The following instructions must be carefully observed whenever it becomes necessary to overhaul or repair the freshwater pump.

Please refer to drawing for item references in the text.

1.1.0 Overhaul of the Pump

1. Remove the nuts 14 on the pump casing 1.
2. Lift motor with pump cover 4 and impeller 2 clear of pump casing 1.
3. Unscrew countersunk screw 20 (right hand thread).
4. Remove impeller. Normally, it can be removed without using dismantling tools.
5. Remove key 19.
6. Remove the mechanical shaft seal 22.
7. Inspect the ceramic ring, the carbon ring and the spring.
8. Replace mechanical shaft seal, if necessary. It is recommended to grease the shaft and seat for the ceramic ring with glycerine in order to make it easier to assemble the mechanical shaft seal. Please also observe separate instructions for mechanical shaft seal delivered together with the seal.
Maintenance of Freshwater Pump

9. Fit carbon ring, spring and spring holder on pump shaft.
10. Inspect impeller and the drilled sealing water channel for clogging, and clean.
11. Remember to replace gasket 3.
12. Reassemble in reverse order.

1.1.1 Clearance

In connection with the inspection be sure to measure the impeller and wear ring 17 in order to secure that the clearance is no more than 0.5 mm on the diameter.

CAUTION

- The pump shaft 11 must only be dismantled, if pump shaft or electric motor bearing has to be replaced.

In this case carefully observe “Dismantling pump shaft”.

1.1.2 Dismantling Pump Shaft

1. Dismantle the pump as described above.
2. Unscrew pointed screws 11.
3. Carefully insert two screw drivers behind the pump shaft, and loosen it.

*If the pump shaft does not come loose, use the special dismantling tools shown below.*

*The tool is not Alfa Laval Desalt supply.*
The tool consists of a pipe (A), a disc (B) with hole for the screw (C) and a nut (D), washer (E).

Please note that the length L must be longer than the length l.

Place pipe around the shaft. Fasten the screw with nut and washer into the threaded hole (M12) on the shaft end.

Loosen shaft by tightening the nut while holding on to the screw.

CAUTION

DO NOT grind the motor shaft.

4. Mount the new pump shaft on the motor shaft.

5. Make sure that the pump shaft fits the motor shaft without any obstructions, before final shaft fitting as follows:
   - Tap onto the end of the pump shaft slightly with a RUBBER hammer.

6. Tighten pointed screws 11 as follows:
7. Check the wobble of the pump shaft with a dial indicator.

8. Assemble the pump as described above.

**NOTE**

The torque should be 5 Nm (0.5 kpm) and the maximum wobble 60 μm.
1.0.0 Maintenance of Ejector Pump

(If supplied from Alfa Laval)

The following instructions must be carefully observed whenever it becomes necessary to overhaul or repair the above mentioned pump. Please refer to drawing for item references in the text.

1.1.0 Overhaul of the Pump

1. Remove the set screws 19 in pump cover 2.

   Motor with motor bracket 6, pump cover 2, and impeller 5 can now be lifted clear of the pump casing 1.

2. Unscrew the screw 22 (right-hand thread).

3. Remove impeller.
Maintenance of Ejector Pump

NOTE

Normally, the impeller can be removed without using dismantling tools.

If not, you can fit dismantling screws into the two threaded holes in the impeller.

4. Remove the key 26 and the mechanical seal 8 (including spring holder, spring and carbon ring).

5. Inspect the ceramic ring, the carbon ring and the spring. Replace, if necessary

   If mechanical seal has to be replaced, proceed as follows:
   • Unscrew set screw 20 to remove pump cover 2 from motor bracket 6 in order to gain access to ceramic ring.

   In order to make it easier to assemble the mechanical seal, the shaft and ring seat may be greased with glycerine. Please also refer to separate instructions for mechanical seal delivered together with the seal.

   • After fitting the ceramic ring, fit pump cover 2 to motor bracket 6.
   • Fit carbon ring, spring and spring holder.

6. Clean drilled cooling water channel in pump cover 2.

7. Inspect impeller and threaded holes for clogging.

8. Remember to change the O-ring 7.

9. Reassemble in reverse order.

1.1.1 Clearance

In connection with the inspection, the impeller 5 and wear rings 10 are measured in order to secure that the clearance is not larger than stated in the diagram below.
Maintenance of Ejector Pump

Wear ring Ø | Clearance maximum | Clearance minimum
--- | --- | ---
100 mm | 0.5 mm | 0.15 mm
150 mm | 0.6 mm | 0.2 mm
200 mm | 0.7 mm | 0.25 mm
250 mm | 0.8 mm | 0.28 mm
300 mm | 0.85 mm | 0.3 mm
350 mm | 0.9 mm | 0.3 mm

If the clearance is too big, replace wear rings as follows:

1. Unscrew **countersunk screws 25**.
2. Pull out wear (seal) rings.
3. Fit new wear rings and tighten countersunk screws.

**CAUTION**

The pump shaft may only be dismantled, if pump shaft or bearings, in the electric motor have to be replaced.

Carefully observe instructions for "Dismantling pump shaft".
1.1.2 Dismantling Pump Shaft

If the shaft 4 has to be dismantled due to a defect or if electric motor bearing has to be replaced, proceed as follows:

1. Unscrew pointed screws 16.
2. Remove shaft 4. Normally this can be done without using dismantling tools.

CAUTION

DO NOT grind the motor shaft.

3. Fit shaft 4.
4. In order to make sure that the coupling is fitted correctly, tap slightly at the shaft end with a RUBBER hammer.
5. Tighten pointed screws 16 with a torque of 35 Nm (3.5 kpm).
Salinometer

1.0.0 Salinometer Type DS-20

1.1.0 Technical Specification

<table>
<thead>
<tr>
<th>Function</th>
<th>Measuring (Dot Bar) and supervising salinity of freshwater produced by seawater desalination.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>90-120 V or 200-240 V AC.</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Salinometer 10 VA.</td>
</tr>
<tr>
<td>Relay contacts</td>
<td>Max. load 100 VA.</td>
</tr>
<tr>
<td>Salinity display</td>
<td>0.5 - 20 ppm (Dot Bar).</td>
</tr>
<tr>
<td>Temperature correction</td>
<td>Automatic in the range 5 - 85°C.</td>
</tr>
<tr>
<td>Alarm level</td>
<td>Can be set to any value between 0.5 - 20 ppm.</td>
</tr>
<tr>
<td>Test</td>
<td>Can be checked by test switch, 10 ppm.</td>
</tr>
<tr>
<td>Output</td>
<td>4-20 mA Current Loop.</td>
</tr>
<tr>
<td>Max. ambient temperature</td>
<td>55°C.</td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP 54.</td>
</tr>
</tbody>
</table>

1.2.0 Installation (for DS-20)

1. Open front cover.
2. Select correct voltage select according to the main supply voltage 115 V or 230 VAC.
3. Screw salinometer on to bulkhead with six nuts.
4. Connect necessary cables to the terminals.
5. Close front cover.
6. Test salinometer function (see instructions for use).
Salinometer

1.3.0 Instructions for use

1. Switch on mains.

2. Switch on sec. alarm.

Green pilot LED should light up. Dot Bar displays the measured salinity.

1.3.1 Testing the Instrument

![WARNING]

The salinometer must be tested at least once a month, and the electrode unit must be cleaned.

Push TEST switch on.

*The Dot Bar should read 10 ppm.*

*If the alarm level is less than 10 ppm, the salinometer will give an alarm.*

1.3.2 Adjustment of Alarm Level

1. Switch “MAINS” on.

2. Push sec. alarm off.

3. Adjust Alarm Set to desired alarm level by using the switches.

4. Switch “Sec. Alarm” on.

The salinometer is now ready for use.

If the salinity exceeds the alarm level,

- The two red alarm LEDs flash.
- Solenoid valve is activated.
- Buzzer (if fitted) and external alarm system is activated.

Cancel buzzer and external alarm system by switching “Sec. Alarm” off. Solenoid valve is not affected.

Switch “Sec. Alarm” on as soon as the salinity is normal again; i.e. when the two red
LEDS are off.

1.3.3 Maintenance

CAUTION

Remove electrode unit and inspect/clean after every 1000 hours of operation. Use a clean and dry rag. Avoid touching the electrodes with the fingers.
1.0.0 Ordering Spare Parts

When ordering spare parts please always state:

1. Serial number.
2. Capacity.
3. Designation.
4. Spare parts drawing number.
5. Position number.
6. Article number.

In order to identify article numbers, please refer to FWG Order Specification and other drawings.

When ordering parts for pumps proceed as follows:

1. Find article number in the list of drawings.
2. Check spare part drawing and item list with corresponding article number to identify the item to be ordered.

1.1.0 Alfa Laval Service

The Alfa Laval group is represented in all major ports of the world.

DO NOT hesitate to contact your Alfa Laval representative if you have any questions, problems or require spare parts.
Index

A
Adjustment of alarm level ................................................. page 50
Adjustment of hot water flow .......................................... page 20
Adjustment of sea cooling water ..................................... page 21
Alfa Laval service ....................................................... page 53

C
Chemical dosage ............................................................ page 33
Cleaning ........................................................................ page 28
Clearance ....................................................................... page 46
Condensation ................................................................. page 20

D
Dismantling pump shaft ..................................................... page 48

E
Ejector Pump ................................................................ page 45
Evaporation .................................................................... page 19

F
Feed water ratio .............................................................. page 33
Fitting new gaskets ......................................................... page 28
Freshwater Pump Types PVVF 1525-1532-2040 ............... page 41
Freshwater quality ......................................................... page 16

I
Installation (for DS-20) ..................................................... page 49
Instructions for use ........................................................ page 50

L
Long Term Standstill ........................................................ page 10
Long term standstill ......................................................... page 22

M
Main components .......................................................... page 17
Maintenance .................................................................. page 51
Maintenance of condenser section ................................. page 26
Maintenance of ejector pump ......................................... page 45
Maintenance of evaporator section ............................... page 25
Maintenance of Freshwater pump ................................. page 41
Maintenance of freshwater pump types PVVF 1525-1532-2040 page 41
Maintenance of separator vessel .................................... page 24
### Index

**O**
- Operating Hours ........................................ page 23
- Ordering spare parts ........................................ page 53
- Overhaul intervals .......................................... page 23
- Overhaul of the pump ....................................... page 45

**P**
- Perform regular maintenance duties ...................... page 23
- Preparation of new gaskets ................................ page 28
- Preservation Procedure for Electric Motors ............ page 11
- Preservation Procedure for Electric Panel .............. page 12
- Preservation Procedure for Freshwater Generator ...... page 10
- Preservation Procedure for Pumps ....................... page 11
- Pressure testing separator ................................ page 31
- Prevention of scaling ...................................... page 33

**R**
- Removal of old gaskets .................................... page 27
- Renewal of plate heat exchanger gaskets ............... page 27
- Restart .......................................................... page 10
- Restart Freshwater Generator .............................. page 10
- Restarting of Electric Motors .............................. page 12
- Restarting of Electric Panel ............................... page 13
- Restarting of Pumps ........................................ page 11

**S**
- Safety instructions and warnings ......................... page 7
- Safety precautions with the use of chemicals .......... page 35
- Salinometer type DS-20 .................................... page 49
- Scale inhibitor dosage equipment for feed water ...... page 34
- Solenoid Valves ............................................. page 13
- Spare Parts .................................................. page 53
- Standstill ..................................................... page 9
- Starting ....................................................... page 19
- Starting and stopping procedure ........................ page 19
- Stopping Procedure ......................................... page 19
- Stopping the plant ......................................... page 21
- Storage ........................................................ page 9
- System description ......................................... page 15

**T**
- Technical specification .................................... page 49
- Telefax ....................................................... page 7
- Telephone .................................................... page 7
- Test sheet .................................................... page 37
- Testing the instrument ..................................... page 50
- Trouble shooting table ..................................... page 37
Index

W
Warning ........................................... page 7
Why you need to perform regular maintenance duties ......................... page 23
Working principle ........................................ page 15
**Order Specification**

Freshwater generator type: DPU-36-C100  
1 Set/Ship

Customer: HYUNDAI HEAVY IND. CO., LTD.

### Technical data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater generator size</td>
<td></td>
</tr>
<tr>
<td>Capacity [m³/24h]</td>
<td>40.0</td>
</tr>
<tr>
<td>Jacket water temperature</td>
<td></td>
</tr>
<tr>
<td>Inlet [°C]</td>
<td>78.0</td>
</tr>
<tr>
<td>Outlet [°C]</td>
<td>66.7</td>
</tr>
<tr>
<td>Jacket water flow/pressure drop</td>
<td></td>
</tr>
<tr>
<td>Flow [m³/h]</td>
<td>91.5</td>
</tr>
<tr>
<td>Pressure drop [bar]</td>
<td>0.3</td>
</tr>
<tr>
<td>Heat consumption from jacket water</td>
<td></td>
</tr>
<tr>
<td>[Mcal/h]</td>
<td>- or [kW]: 1192</td>
</tr>
<tr>
<td>Seawater temperature</td>
<td></td>
</tr>
<tr>
<td>Inlet [°C]</td>
<td>32.0</td>
</tr>
<tr>
<td>Outlet [°C]</td>
<td>42.4</td>
</tr>
<tr>
<td>Seawater flow/pressure drop</td>
<td></td>
</tr>
<tr>
<td>Flow [m³/h]</td>
<td>90</td>
</tr>
<tr>
<td>Pressure drop [bar]</td>
<td>0.3</td>
</tr>
</tbody>
</table>

### Basic data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main power</td>
<td>3x380V/50 Hz</td>
</tr>
<tr>
<td>Control voltage</td>
<td>100 V, 110-115 V, 220-230 V</td>
</tr>
<tr>
<td>Flange connection</td>
<td>DIN, ANSI, JIS</td>
</tr>
<tr>
<td>Painting colour</td>
<td>Blue C303-B, Munsell 7.5 BG 7/2, Munsell 2.5 G 7/2, RAL 6019</td>
</tr>
<tr>
<td>Classification society</td>
<td>Workshop certificate</td>
</tr>
</tbody>
</table>

### Scope of supply

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic equipment</td>
<td></td>
</tr>
<tr>
<td>Structure incl. freshwater pump, standard spares, standard packing and plates:</td>
<td>1</td>
</tr>
<tr>
<td>Additional equipment necessary for operation:</td>
<td></td>
</tr>
<tr>
<td>Electric motor for freshwater pump:</td>
<td>1</td>
</tr>
<tr>
<td>Feed water treatment:</td>
<td>1</td>
</tr>
<tr>
<td>Optional equipment / design:</td>
<td></td>
</tr>
<tr>
<td>Salinometer in a box:</td>
<td>1</td>
</tr>
<tr>
<td>Special painting: RAL6019</td>
<td>1</td>
</tr>
<tr>
<td>Water clock by-pass:</td>
<td>1</td>
</tr>
<tr>
<td>Return pipe to brine:</td>
<td>1</td>
</tr>
<tr>
<td>Steel box for spare part kit:</td>
<td>1</td>
</tr>
<tr>
<td>Other - Not standard:</td>
<td></td>
</tr>
<tr>
<td>Item 3 Thermometer with thermowell as loose supply</td>
<td>1</td>
</tr>
<tr>
<td>Item The root valves for pressure gauges to be provided</td>
<td>1</td>
</tr>
<tr>
<td>Item The name plates for all instruments to be fitted</td>
<td>1</td>
</tr>
<tr>
<td>Item Feed water treatment including FW filling line with valve build-on unit.</td>
<td>1</td>
</tr>
<tr>
<td>Item Salinometer mounted on left side as seen from cover side</td>
<td>1</td>
</tr>
</tbody>
</table>

**Comments:**
- Sea water strainer to be supplied. (Size JIS 10K-125A)
- Swimming pool connection C37.
- Temperature Transmitter on evaporator body.

Order Specification filled in by: DKS  
Name: DKS  
Date: 2003.12.19
Capacity range
The DPU-36-C series covers a capacity range from 10 to 55 m³/24h depending on the heating medium and cooling water temperatures.

The capacities shown in Fig. 1 are capacities at a cooling water temperature of 32°C.

The freshwater generator can be dimensioned to suit any jacket water temperature from 55-90°C at any cooling water temperature required.

The quantity of fresh water produced can be altered simply by varying the number of plates in the internal plate heat exchanger.

Working principle
See Fig. 2

The feed water to be distilled is taken from the sea cooling water outlet of the condenser (1). It enters the evaporator (10) where it evaporates at about 40-60°C as it passes between the plates heated by the heating medium.

The evaporating temperature corresponds to a vacuum of 85-95 %, maintained by the brine/air ejector (not shown on Fig. 2). The vapours generated pass through a demister where any drops of seawater entrained are removed and fall due to gravity to the brine sump at the bottom of the generator chamber. The clean freshwater vapours continue to the condenser (9) where they condense into fresh water as they pass between the cold plates cooled by the sea cooling water.

Installation
The DPU-36-C freshwater generator is designed for automatic operation in periodically unmanned engine rooms and other automated operations.

The heating medium is either engine jacket cooling water or a closed circuit heated by steam.

The ejector pump is separately installed and has separate suction from the sea. This pump supplies coolant in the form of seawater to the condenser, feedwater for evaporation and jet-water for the combined brine/air ejector.

The fresh water produced is pumped to the tank by the built-on freshwater pump.

The separately installed control panel, with motor starters and salinometer, supplies electrical power to the ejector and freshwater pumps as well as control voltage to the salinometer and dump valve.

Fig. 1 Capacity range for DPU-36-C generators size 100 and 125.

Fig. 2 Cross-section through Alfa Laval Desal freshwater generator chamber.
Power consumption
Freshwater pump: 60 Hz
0.75 kW

Pressure
<table>
<thead>
<tr>
<th></th>
<th>bar(g)</th>
<th>lbs/in²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. jacket water pressure:</td>
<td>4.0</td>
<td>58</td>
</tr>
<tr>
<td>Max. back pressure to freshwater tank:</td>
<td>1.6</td>
<td>23</td>
</tr>
<tr>
<td>Max. seawater pressure to inlet condenser:</td>
<td>4.0</td>
<td>58</td>
</tr>
<tr>
<td>Min. seawater pressure to ejector:</td>
<td>3.0</td>
<td>43</td>
</tr>
<tr>
<td>Max. back pressure at ejector outlet:</td>
<td>0.6</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Temperature
Seawater temperature: 0-32 °C
Jacket water temperature: 55-95 °C

Flow
Seawater flow: 90 m³/h
Jacket water flow: 40-110 m³/h

Materials
<table>
<thead>
<tr>
<th>Part</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separator</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Front cover</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Bed frame</td>
<td>Steel (hot dip galvanized)</td>
</tr>
<tr>
<td>Pipe for brine discharge</td>
<td>SG-iron (hot dip galvanized)</td>
</tr>
<tr>
<td>Evaporator/condenser plates:</td>
<td>Titanium</td>
</tr>
<tr>
<td>Demister</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Pipe for seawater</td>
<td>CuNi 90/10</td>
</tr>
<tr>
<td>Pipe for fresh water</td>
<td>CuNi 90/10</td>
</tr>
<tr>
<td>Combined brine/air ejector housing:</td>
<td>Red brass</td>
</tr>
<tr>
<td>Combined brine/air ejector nozzle:</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Flange for evaporator/condenser:</td>
<td>SG-iron (hot dip galvanized)</td>
</tr>
</tbody>
</table>

Shipping data
Freshwater generator, complete with ejector pump, electrical panel, dosing unit and standard spares.
Weight: net: 1480 kg, gross: 1950 kg
Dimensions: (l x w x h) 1900 x 2400 x 2090 mm
Volume: 9.5 m³

Illustrations, indications of material, dimensions and weights etc. herein, do not constitute any commitment on our part. We reserve the right to change such specifications when necessary.
### 9.2.3.2 Technical data, Pump and Motor for D-PU-36-C100

<table>
<thead>
<tr>
<th>No. of plates NE/NK:</th>
<th>34/34/48/48</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pump function</strong></td>
<td>Freshwater</td>
</tr>
<tr>
<td><strong>Pump Type</strong></td>
<td>PVVF-2040</td>
</tr>
<tr>
<td><strong>Motor type</strong></td>
<td>71 B</td>
</tr>
<tr>
<td><strong>Nom. flow x pressure</strong></td>
<td>2.1 x 28</td>
</tr>
<tr>
<td><strong>Impeller size</strong></td>
<td>60 Hz: mm²</td>
</tr>
<tr>
<td><strong>Rotating speed</strong></td>
<td>60 Hz: RPM</td>
</tr>
<tr>
<td><strong>Rated output power</strong></td>
<td>KW</td>
</tr>
<tr>
<td><strong>Consumed power</strong></td>
<td>KW</td>
</tr>
<tr>
<td><strong>Current (full load)</strong></td>
<td>A-</td>
</tr>
<tr>
<td><strong>Current (start)</strong></td>
<td>A</td>
</tr>
</tbody>
</table>

Illustrations, indications of material, dimensions and weights etc. herein, do not constitute any commitments on our part. We reserve the right to change such specifications when necessary.
## 9.2.3.4-1 Equipment specification, D-PU-36-C100

### Equipment supplied by Alfa Laval:

<table>
<thead>
<tr>
<th>Tag No.</th>
<th>Description</th>
<th>Article No.</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>EW-ES-01</td>
<td>Ejector</td>
<td>984 35686-00</td>
<td>1/2&quot; BSP</td>
</tr>
<tr>
<td>FG-ES-01</td>
<td>Flow sight glass</td>
<td>985 42600-04</td>
<td>3/4&quot; BSP</td>
</tr>
<tr>
<td>RT-FE-01</td>
<td>Orifice</td>
<td>984 30297-00</td>
<td>1/4&quot; BSP</td>
</tr>
<tr>
<td>PH-ES-01</td>
<td>Pressure gauge</td>
<td>984 30308-00</td>
<td>3/8&quot; BSP</td>
</tr>
<tr>
<td>PI-ES-01</td>
<td>Pressure gauge</td>
<td>984 30298-00</td>
<td>1/4&quot; BSP</td>
</tr>
<tr>
<td>PU-FR-01</td>
<td>Freshwater pump</td>
<td>See specification</td>
<td></td>
</tr>
<tr>
<td>PU-SC-01</td>
<td>Ejector pump</td>
<td>See specification</td>
<td></td>
</tr>
<tr>
<td>QT-FR-01</td>
<td>Electrode unit</td>
<td>984 22500-00</td>
<td></td>
</tr>
<tr>
<td>TI-ES-01</td>
<td>Thermometer</td>
<td>984 30366-00</td>
<td>1/2&quot; BSP</td>
</tr>
<tr>
<td>TI-ES-02</td>
<td>Non return valve</td>
<td>984 35501-01</td>
<td>DN 50</td>
</tr>
<tr>
<td>VA-ES-01</td>
<td>Ball valve</td>
<td>984 35683-00</td>
<td>1/2&quot; BSP</td>
</tr>
<tr>
<td>VA-ES-02</td>
<td>Air screw</td>
<td>984 40939-02</td>
<td>3/8&quot; BSP</td>
</tr>
<tr>
<td>VA-ES-03</td>
<td>Safety valve</td>
<td>984 35360-00</td>
<td>1&quot; BSP</td>
</tr>
<tr>
<td>VA-ES-04</td>
<td>Spring loaded valve</td>
<td>984 35535-00</td>
<td>DN 40</td>
</tr>
<tr>
<td>VA-ES-05</td>
<td>Ball valve</td>
<td>984 35683-00</td>
<td>1/2&quot; BSP</td>
</tr>
<tr>
<td>VA-ES-06</td>
<td>Solenoid valve</td>
<td>See specification</td>
<td></td>
</tr>
<tr>
<td>VA-ES-07</td>
<td>Spring loaded valve</td>
<td>984 35166-00</td>
<td>1/2&quot; BSP</td>
</tr>
<tr>
<td>VA-ES-08</td>
<td>Non return valve</td>
<td>984 35672-00</td>
<td>1&quot; BSP</td>
</tr>
</tbody>
</table>

Illustrations, indications of material, dimensions, weights etc. herein do not constitute any commitment on our part.
We reserve the right to change such specifications when necessary.
In order to minimize the pressure drop in the system, it is recommended to avoid the use of sector valves in the system, which should account for normal installations.

If the 0.1 bar (1.5 lbs/in²) is exceeded, the heights must be diminished accordingly.

### Table 1: Vertical Plant Positioning

<table>
<thead>
<tr>
<th>Generator Type</th>
<th>H1 (mm)</th>
<th>H2 (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-16</td>
<td>1500</td>
<td>1100</td>
</tr>
<tr>
<td>P-26</td>
<td>913</td>
<td>500</td>
</tr>
<tr>
<td>P-53</td>
<td>3000</td>
<td>2000</td>
</tr>
</tbody>
</table>

### Diagram 1

- Highest plant installation position in reference to highest water line (GW).
- Lowest plant installation position in reference to lowest water line (BW).

The stated installation heights are given under the conditions that the line pressure drop does not exceed 0.1 bar (1.5 lbs/in²), which should account for normal installations. If the 0.1 bar (1.5 lbs/in²) is exceeded, the heights must be diminished accordingly.
## Bill Of Material

**Parent item no.:**
985 18920-80 R: 02

**Drawing no.:**
985 19922-R00

**Date:**
20040114

### Description:
- **Mounting Drawing**
- **Freshwater Generator**
- **DPU-36-C100 DIN/JIS**

<table>
<thead>
<tr>
<th>BUBL</th>
<th>QTY</th>
<th>U/M</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.000000</td>
<td>EA</td>
<td>00000000 EA</td>
</tr>
<tr>
<td></td>
<td>0.000000</td>
<td>EA</td>
<td>Motor for Ejector Pump</td>
</tr>
<tr>
<td></td>
<td>0.000000</td>
<td>EA</td>
<td>Control Panel</td>
</tr>
<tr>
<td>1</td>
<td>1.000000</td>
<td>EA</td>
<td>Caution Plate for Ejector Pump</td>
</tr>
<tr>
<td>2</td>
<td>2.000000</td>
<td>EA</td>
<td>Screw M16 x 65 DIN 933</td>
</tr>
<tr>
<td>3</td>
<td>74.000000</td>
<td>EA</td>
<td>Washer M16 DIN 125 A</td>
</tr>
<tr>
<td>4</td>
<td>18.000000</td>
<td>EA</td>
<td>Screw M16 x 55 DIN 933</td>
</tr>
<tr>
<td>5</td>
<td>1.000000</td>
<td>EA</td>
<td>Brine Pipe</td>
</tr>
<tr>
<td>6</td>
<td>1.000000</td>
<td>EA</td>
<td>Bed Frame</td>
</tr>
<tr>
<td>7</td>
<td>8.000000</td>
<td>EA</td>
<td>Screw M16 x 65 DIN 933</td>
</tr>
<tr>
<td>8</td>
<td>1.000000</td>
<td>EA</td>
<td>Gasket Ø 162 / Ø 99 x 2</td>
</tr>
<tr>
<td>9</td>
<td>46.000000</td>
<td>EA</td>
<td>Screw M16 DIN 934</td>
</tr>
<tr>
<td>10</td>
<td>4.000000</td>
<td>EA</td>
<td>Screw M16 x 60 DIN 933</td>
</tr>
<tr>
<td>11</td>
<td>0.000000</td>
<td>EA</td>
<td>Combined Brine/Air Ejector</td>
</tr>
<tr>
<td>12</td>
<td>1.000000</td>
<td>EA</td>
<td>Separator with Insulation Area</td>
</tr>
<tr>
<td>13</td>
<td>1.000000</td>
<td>EA</td>
<td>Safety Valve 1&quot; BSP</td>
</tr>
<tr>
<td>14</td>
<td>1.000000</td>
<td>EA</td>
<td>Flange Ø 100 D/AJ Coated</td>
</tr>
<tr>
<td>15</td>
<td>1.000000</td>
<td>EA</td>
<td>Gasket Ø 17 for Front Cover and Separator</td>
</tr>
<tr>
<td>16</td>
<td>1.000000</td>
<td>EA</td>
<td>SeaWater Pipe AISI 316 L from Condenser</td>
</tr>
</tbody>
</table>

**Remarks**
- Quality 8.8; Delta-Magni
- See Specific.H
- See Specific.I
- See Specific.P
- A4

---

**Alfa Laval Copenhagen A/S**

**Bank:**
SEB, Landemartek 10, Copenhagen

**BIC/SWIFT:**
ESSEDKKK

**Accounts:**
DKK IBAN Acc. DK57529500100008069
EUR IBAN Acc. DK4552950013000738
## Bill Of Material

<table>
<thead>
<tr>
<th>BUBL</th>
<th>QTY</th>
<th>U/M</th>
<th>DESCRIPTION</th>
<th>DRAWING NO.</th>
<th>ARTICLE NO.</th>
<th>MATERIAL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>1.000000</td>
<td>EA</td>
<td>F.W. PIPE TO PUMP</td>
<td>985 13911-80-ROO</td>
<td>985 13911-80-ROO</td>
<td>CuNi</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1.000000</td>
<td>EA</td>
<td>NAME PLATE</td>
<td>985 13505-04</td>
<td>985 13505-04</td>
<td>NavnasKilt ALFA LAVAL A/S Copenhagen</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>1.000000</td>
<td>EA</td>
<td>FRONT COVER C100</td>
<td>985 19800-RO6</td>
<td>985 19800-RO6</td>
<td>CuNi10Fe</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>2.000000</td>
<td>EA</td>
<td>THERMOMETER W/POCKET - ANGLE 83 MM</td>
<td>984 30368-RO1</td>
<td>984 30368-RO1</td>
<td>CuNi10Fe</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1.000000</td>
<td>EA</td>
<td>PRESSURE GAUGE 0-6 BAR</td>
<td>984 30297-RO1</td>
<td>984 30297-RO1</td>
<td>CuNi10Fe</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>1.000000</td>
<td>EA</td>
<td>NON RETURN FLAP Ø 50 MED TEXTILINDLÆG</td>
<td>984 57281-RO3</td>
<td>985 00036-39</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>25</td>
<td>1.000000</td>
<td>EA</td>
<td>SCREW M16 X 45 DIN 912</td>
<td>985 00111-36</td>
<td>985 00111-36</td>
<td>CuNi10Fe</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>4.000000</td>
<td>EA</td>
<td>RUBBER SLEEVE H=20 MM</td>
<td>985 13921</td>
<td>985 13921-01</td>
<td>Nitrile rubber</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>1.000000</td>
<td>EA</td>
<td>HEAT EXCHANGER-CONDENSER</td>
<td>984 35635-01</td>
<td>984 35635-01</td>
<td>RG 5</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>4.000000</td>
<td>EA</td>
<td>GASKET Ø84/46 X 2</td>
<td>984 58335-RO1</td>
<td>984 58335-RO1</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>29</td>
<td>0.000000</td>
<td>EA</td>
<td>ORIFICE FOR FEED WATER</td>
<td>985 00111-32</td>
<td>985 00111-32</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>30</td>
<td>4.000000</td>
<td>EA</td>
<td>SCREW M10 X 50 DIN 912</td>
<td>985 13931-ROO</td>
<td>985 13931-ROO</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>31</td>
<td>12.000000</td>
<td>EA</td>
<td>WASHER M10 DIN 125 A</td>
<td>985 32512-14</td>
<td>985 32512-14</td>
<td>A4</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>1.000000</td>
<td>EA</td>
<td>SPRING LOADED VALVE MVK-40-2.5</td>
<td>984 35769-RO1</td>
<td>984 35769-RO1</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>33</td>
<td>4.000000</td>
<td>EA</td>
<td>GASKET Ø84/46 X 2</td>
<td>984 58335-RO1</td>
<td>984 58335-RO1</td>
<td></td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>34</td>
<td>0.000000</td>
<td>EA</td>
<td>SEAL RING Ø 108/60 54</td>
<td>984 57269-RO1</td>
<td>984 57269-RO1</td>
<td></td>
<td>NITRIL</td>
</tr>
<tr>
<td>35</td>
<td>0.000000</td>
<td>EA</td>
<td>CONNECTION FOR FEED WATER</td>
<td>985 13931-01</td>
<td>985 13931-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>0.000000</td>
<td>EA</td>
<td>RUBBER SLEEVE FOR FEED WATER</td>
<td>985 13918-01</td>
<td>985 13918-01</td>
<td></td>
<td>ISO 428/2/83 ; CU ZN39 PB3</td>
</tr>
<tr>
<td>37</td>
<td>0.000000</td>
<td>EA</td>
<td>GASKET DN100 Ø162/115 X 1,5 MM DIN 2690 PN10</td>
<td>984 35635-01</td>
<td>984 35635-01</td>
<td></td>
<td>FERJOSFAL ALFA LAVAL Copenhagen</td>
</tr>
<tr>
<td>38</td>
<td>1.000000</td>
<td>EA</td>
<td>SEAL RING Ø 108/60 54</td>
<td>984 57269-RO1</td>
<td>984 57269-RO1</td>
<td></td>
<td>NITRIL</td>
</tr>
<tr>
<td>39</td>
<td>1.000000</td>
<td>EA</td>
<td>GASKET Ø107/61 X 2</td>
<td>984 35635-01</td>
<td>984 35635-01</td>
<td></td>
<td>NITRIL</td>
</tr>
</tbody>
</table>

---

**Alfa Laval Copenhagen A/S**

Maskinvej 5
DK-2860 Seborg, Denmark
CVR No. 10134285, VAT No. 14645647

---

**Bank:**

SEB, Landemarket 10, Copenhagen

**BIC/SWIFT:**

ESSEDKXX

**Accounts:**

DKK IBAN Acc. DK5752950010008069

EUR IBAN Acc. DK45529500130000735
<table>
<thead>
<tr>
<th>BUBL</th>
<th>QTY</th>
<th>U/M</th>
<th>DESCRIPTION</th>
<th>DRAWING NO.</th>
<th>ARTICLE NO.</th>
<th>MATERIAL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>8.000000</td>
<td>EA</td>
<td>SCREW M12 X 25 DIN 933</td>
<td>984 40910-40</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>2.000000</td>
<td>EA</td>
<td>FITTED BOLT M12 - 18 X 40</td>
<td>HFC 728</td>
<td>984 40912-32</td>
<td>STEEL ; KVAL. 12.9</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>4.000000</td>
<td>EA</td>
<td>WASHER Ø 16 MM</td>
<td>HFC 1207</td>
<td>984 40901-28</td>
<td>BRASS</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>2.000000</td>
<td>EA</td>
<td>HINGE</td>
<td>985 13932-R02</td>
<td>985 13932-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>2.000000</td>
<td>EA</td>
<td>WASHER Ø 12 MM</td>
<td>HFC 1207</td>
<td>984 40901-27</td>
<td>BRASS</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>2.000000</td>
<td>EA</td>
<td>LOCK NUT M12</td>
<td>HFC 840</td>
<td>984 40900-38</td>
<td>8.8</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>4.000000</td>
<td>EA</td>
<td>SCREW M12 X 35 DIN 912</td>
<td>985 40904-R02</td>
<td>985 40904-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>4.000000</td>
<td>EA</td>
<td>WASHER M12 ISO 887/83</td>
<td>985 32512-16</td>
<td>ISO 887/83 ; TYPE 20A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>2.000000</td>
<td>EA</td>
<td>GASKET Ø75/43 X 2</td>
<td>984 58093-R02</td>
<td>984 58093-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>2.000000</td>
<td>EA</td>
<td>FLANGE Ø 100 DIN/ANSI/JIS P-36-C</td>
<td>984 58793-R08</td>
<td>984 58793-03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>6.000000</td>
<td>EA</td>
<td>SCREW M16 X 25 DIN 933 HOT DIP GALVANIZED</td>
<td>984 58093-R02</td>
<td>984 58093-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>8.000000</td>
<td>EA</td>
<td>NUT M10 DIN 934</td>
<td>984 40900-27</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>2.000000</td>
<td>EA</td>
<td>GASKET Ø84/48 X 2</td>
<td>984 58335-R01</td>
<td>984 58335-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>1.000000</td>
<td>EA</td>
<td>PRESSURE GAUGE 0-3 BAR LB/IN2,BAR = KGF/CM2,063,1/4&quot;N</td>
<td>984 30298-R01</td>
<td>984 30298-00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>8.000000</td>
<td>EA</td>
<td>SCREW M10 X 35 DIN 933</td>
<td>984 40910-38</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>1.000000</td>
<td>EA</td>
<td>FRESHWATER PIPE FROM PUMP</td>
<td>VVS 40 5501-003</td>
<td>984 40939-02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>1.000000</td>
<td>EA</td>
<td>AIR VALVE 3/8&quot; BSP</td>
<td>985 13912-R00</td>
<td>985 13912-80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>1.000000</td>
<td>EA</td>
<td>PIPE FOR FEED WATER</td>
<td>985 42985-05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1.000000</td>
<td>EA</td>
<td>ELECTRODE (FOR SL-3000,DS-20) SIGHT GLASS WITHOUT INNER PART</td>
<td>984 57862-R03</td>
<td>984 57862-02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>1.000000</td>
<td>EA</td>
<td>NUT M24</td>
<td>984 57822-R01</td>
<td>984 57822-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>1.000000</td>
<td>EA</td>
<td>DEMISTER 0.5 M2</td>
<td>985 13680-R00</td>
<td>985 13680-01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>1.000000</td>
<td>EA</td>
<td>WASHER M24 ISO 887/83 316L</td>
<td>995 32510-28</td>
<td>ISO 887/83 ; TYPE 20A AISI 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Alfa Laval Copenhagen A/S

Bank: SEB, Landemarket 10, Copenhagen
BIC/SWIFT: ESSEDKKK
Accounts: DKK IBAN Acc. DK5752950010000869
 EUR IBAN Acc. DK4652950012000035

Maskinvej 5
DK-2890 Seborg, Danmark
CVR No. 10134285, VAT No. 14646647
<table>
<thead>
<tr>
<th>BILL BL</th>
<th>QTY</th>
<th>U/M</th>
<th>DESCRIPTION</th>
<th>DRAWING NO.</th>
<th>ARTICLE NO.</th>
<th>MATERIAL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>2.000000</td>
<td>EA</td>
<td>DEMISTER CLAMP</td>
<td>985 13919-R01</td>
<td>985 13919-01</td>
<td>985 15917-01</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>66</td>
<td>1.000000</td>
<td>EA</td>
<td>ASSEMBLY PLATE</td>
<td>985 13909-R01</td>
<td>985 13909-01</td>
<td>985 15917-01</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>67</td>
<td>2.000000</td>
<td>EA</td>
<td>PRESSURE PLATE</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>68</td>
<td>1.000000</td>
<td>EA</td>
<td>COMPOUND GAUGE -100% - 2 BAR</td>
<td>985 13920-R01</td>
<td>985 13920-01</td>
<td>985 00013-56</td>
<td>QUALITY 8.8 ; DELTA MAGNI</td>
</tr>
<tr>
<td>69</td>
<td>8.000000</td>
<td>EA</td>
<td>SCREW M16 X 35 DIN 912</td>
<td>985 13920-R01</td>
<td>985 13920-01</td>
<td>985 00013-56</td>
<td>QUALITY 8.8 ; DELTA MAGNI</td>
</tr>
<tr>
<td>70</td>
<td>1.000000</td>
<td>EA</td>
<td>VACUUM PIPE D-PU-36-C</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>71</td>
<td>1.000000</td>
<td>EA</td>
<td>PRESSURE GAUGE COCK 1/4&quot; BSP</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>72</td>
<td>1.000000</td>
<td>EA</td>
<td>NIPPLE 1/4&quot; BSP</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>73</td>
<td>2.000000</td>
<td>EA</td>
<td>TRANSPORT IRON L=400 MM</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>74</td>
<td>2.000000</td>
<td>EA</td>
<td>HINGE</td>
<td>984 30308-R01</td>
<td>984 30308-00</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>75</td>
<td>0.000000</td>
<td>EA</td>
<td>SOLENOID VALVE</td>
<td></td>
<td></td>
<td></td>
<td>UPPER MOUNTED</td>
</tr>
<tr>
<td>76</td>
<td>4.000000</td>
<td>EA</td>
<td>SCREW M16 X 30 DIN 912</td>
<td>985 13920-R01</td>
<td>985 13920-01</td>
<td>985 00013-56</td>
<td>QUALITY 8.8 ; DELTA MAGNI</td>
</tr>
<tr>
<td>77</td>
<td>1.000000</td>
<td>EA</td>
<td>BUSHING 3/4&quot; X 1/2&quot; BSP</td>
<td>B 3241</td>
<td>985 52720-06</td>
<td>984 57903-R05</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
<tr>
<td>78</td>
<td>1.000000</td>
<td>EA</td>
<td>BALL VALVE 3/8&quot; BSP</td>
<td></td>
<td></td>
<td>984 30308-R01</td>
<td>QUALITY 8.8 ; DELTA-MAGNI</td>
</tr>
</tbody>
</table>

Alfa Laval Copenhagen A/S

Bank: SEB, Landemarket 10, Copenhagen
BIC/SWIFT: ESSEDKKK
Accounts: DKK IBAN Acc. DK5752950010008069
EUR IBAN Acc. DK4552950013000735

Alfa Laval Copenhagen A/S

Maskinen 5
DK-2860 Seborg, Danmark
CVR No. 10134285. VAT No. 14646647
Recommendation

Use fully soluble scale inhibitor for instance on polymere basis. Mix quantity required for 24 hours operation in tank according to maker's instruction and adjust dosage to cover max. freshwater output from distiller. Flush regularly.

1. Flowmeter incl. reg. valve
2. Nipple 3/8" x 1/8"
3. Non return valve 3/8"
4. Hose connection 3/8" x 10
5. Hose clip
6. Hose 3/8" (4000 mm)
7. Connection 3/8" x 1/4"
8. Connection 1/8" x 10
9. Connection 1/2" x 10
10. Ball Valve 1/2"
11. PE tank (130 l)

Flowchart:

- Fresh water from F.W. Hyd. tank
- Tank for solution of scale inhibitor. Not to be placed lower than distiller foundation.
- Connect according to flow chart
<table>
<thead>
<tr>
<th>BUBL</th>
<th>QTY</th>
<th>U/M</th>
<th>DESCRIPTION</th>
<th>DRAWING NO.</th>
<th>ARTICLE NO.</th>
<th>MATERIAL</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.000000</td>
<td>EA</td>
<td>SALINOMETER DS-20 IN BOX</td>
<td>985 17894-R00</td>
<td>984 22520-00</td>
<td>985 61350-40</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2000.000000</td>
<td>MM</td>
<td>CABLE 2X1.5MM LSM-HF</td>
<td>HFC 1790</td>
<td>984 40906-19</td>
<td>985 61320-02</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
<tr>
<td>3</td>
<td>3.000000</td>
<td>EA</td>
<td>SCREW M6 X 16 DIN 912</td>
<td></td>
<td></td>
<td>985 61320-02</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
<tr>
<td>4</td>
<td>300.000000</td>
<td>MM</td>
<td>CABLE TRAY 20-70 MM</td>
<td></td>
<td></td>
<td>985 30470-50</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
<tr>
<td>5</td>
<td>2.000000</td>
<td>EA</td>
<td>SCREW M6 X 50 DIN 84</td>
<td></td>
<td></td>
<td>985 61320-02</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
<tr>
<td>6</td>
<td>800.000000</td>
<td>MM</td>
<td>CABLE TRAY 20-70 MM</td>
<td></td>
<td></td>
<td>985 30470-50</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
<tr>
<td>7</td>
<td>4.000000</td>
<td>EA</td>
<td>SCREW M6 X 50 DIN 84</td>
<td></td>
<td></td>
<td>985 30470-50</td>
<td>ISO 683/13/86 ; TYPE 20A</td>
</tr>
</tbody>
</table>
LEGEND:
1 Gland PG 13.5 (3 pcs.), Cable outer diameter 6.5-13.5
2 Blind fitting BL 13 (2 pcs.)
3 Box

CHARACTERISTICS:
- VOLTAGE: 220V
- FREQUENCY: 60 HZ ±2%
- PROTECTION DEGREE: IP 44
- MAX. AMBIENT TEMPERATURE: 50°C
- WEIGHT: APPROX. 3 KG.

EXTERNAL CONNECTIONS:
- EXTERNAL METER
- ELECTRODE UNIT
- EXTERNAL ALARM - NC
- EXTERNAL ALARM - NO
- BUZZER
- MAIN SUPPLY
Main supply (220V, 60 Hz)

Alarm hot (220V)

Normally closed Solenoid Valve

Normally open Solenoid valve

External Alarm NC Contact

External Alarm NO Contact

Electrode Unit

Salinometer signal 4-20 mA

The shield must be connected to the computer shield.
**Equipment specification**
**Freshwater generator DPU-36-C100**

## List of loose supply items

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Drawing No.</th>
<th>Article No.</th>
<th>Set(s)/Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Thermometer W/pocket L=100mm</td>
<td>984 30355-01</td>
<td>985 00037-24</td>
<td>2</td>
<td>J.W Inlet/Outlet</td>
</tr>
<tr>
<td></td>
<td>Thermometer W/pocket L=160mm</td>
<td></td>
<td>985 00053-69</td>
<td></td>
<td>S.W Inlet</td>
</tr>
<tr>
<td>2</td>
<td>Y type, Strainer</td>
<td>BYS-10-100-000</td>
<td></td>
<td>1</td>
<td>10K-125A</td>
</tr>
</tbody>
</table>

---

**DEPT** | **DATE** | **DRAWN** | **CHECKED** | **APPROVED** | **DOCUMENT NO.**
---|---|---|---|---|---
Marine & Diesel | 030609 | DKS | DKS | YHM | LOOSE.XLS
### General Specifications:

1. **Applicable Fluid:**
   - S&W

2. **Max. Working Temp.:**
   - According to JIS B 2201-84

3. **Max. Working Pressure:**
   - According to JIS B 2201-84

4. **Nominal Dia.:**
   - See Table

### Dimensions Table (5K)

<table>
<thead>
<tr>
<th>No.</th>
<th>d</th>
<th>C</th>
<th>D</th>
<th>I</th>
<th>n-h</th>
<th>L</th>
<th>H</th>
<th>A</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15A</td>
<td>15</td>
<td>60</td>
<td>9</td>
<td>4-12</td>
<td>114</td>
<td>60</td>
<td>34</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>70A</td>
<td>20</td>
<td>65</td>
<td>10</td>
<td>4-17</td>
<td>122</td>
<td>74</td>
<td>40</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>25A</td>
<td>32</td>
<td>90</td>
<td>12</td>
<td>4-15</td>
<td>157</td>
<td>96</td>
<td>51</td>
<td>7.8</td>
<td></td>
</tr>
<tr>
<td>40A</td>
<td>40</td>
<td>95</td>
<td>12</td>
<td>4-15</td>
<td>172</td>
<td>103</td>
<td>84</td>
<td>9.1</td>
<td></td>
</tr>
<tr>
<td>50A</td>
<td>50</td>
<td>105</td>
<td>14</td>
<td>4-15</td>
<td>198</td>
<td>115</td>
<td>78</td>
<td>11.9</td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions Table (10K)

<table>
<thead>
<tr>
<th>No.</th>
<th>g</th>
<th>C</th>
<th>D</th>
<th>I</th>
<th>n-h</th>
<th>L</th>
<th>H</th>
<th>A</th>
<th>Weight (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15A</td>
<td>15</td>
<td>70</td>
<td>9</td>
<td>4-15</td>
<td>120</td>
<td>70</td>
<td>34</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>20A</td>
<td>20</td>
<td>75</td>
<td>10</td>
<td>4-15</td>
<td>130</td>
<td>74</td>
<td>40</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>25A</td>
<td>25</td>
<td>90</td>
<td>12</td>
<td>4-15</td>
<td>150</td>
<td>83</td>
<td>46</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>32A</td>
<td>32</td>
<td>100</td>
<td>12</td>
<td>4-15</td>
<td>175</td>
<td>96</td>
<td>54</td>
<td>8.1</td>
<td></td>
</tr>
<tr>
<td>40A</td>
<td>40</td>
<td>105</td>
<td>16</td>
<td>4-15</td>
<td>180</td>
<td>103</td>
<td>64</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>50A</td>
<td>50</td>
<td>120</td>
<td>16</td>
<td>4-15</td>
<td>200</td>
<td>115</td>
<td>78</td>
<td>14.7</td>
<td></td>
</tr>
<tr>
<td>65A</td>
<td>65</td>
<td>140</td>
<td>18</td>
<td>4-19</td>
<td>260</td>
<td>167</td>
<td>130</td>
<td>20.9</td>
<td></td>
</tr>
<tr>
<td>80A</td>
<td>80</td>
<td>150</td>
<td>18</td>
<td>8-19</td>
<td>290</td>
<td>198</td>
<td>150</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>100A</td>
<td>100</td>
<td>165</td>
<td>20</td>
<td>8-19</td>
<td>370</td>
<td>230</td>
<td>160</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>125A</td>
<td>125</td>
<td>200</td>
<td>22</td>
<td>8-19</td>
<td>420</td>
<td>307</td>
<td>220</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>150A</td>
<td>150</td>
<td>230</td>
<td>25</td>
<td>8-19</td>
<td>457</td>
<td>350</td>
<td>270</td>
<td>51</td>
<td></td>
</tr>
</tbody>
</table>

---

**BY** Berm Young Valve
9.2.9.2-3 Steel box for spare part kits

General

Spare part box storing spare parts and tools of machinery on ships. Made of steel and hinged in one side. Provided with a chain with hook and a lock with two keys. Made in accordance with Japanese standard JIS F 0902-1978.

Dimensions

![Diagram of steel box](image)

Dwg.no. 985 17526 R:00

Materials

<table>
<thead>
<tr>
<th>Box</th>
<th>Steel (painted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Painting</td>
<td>Munsell 7.5 BG 7/2</td>
</tr>
</tbody>
</table>
9.3.1.1 Included in delivery

Description

Content:

a) 1 Rubber joint for front cover

b) For each of the pumps:
   1 Mechanical seal

c) For each electric motor:
   1 Ball bearing (D-end)
Ensure correct total gluing

Tolerances: ISO 3302 and DIN 7715 Part 3

Material: Gasket material #17 AL 113 3034-71
<table>
<thead>
<tr>
<th>NO.</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>MECH. SEAL 16 MM</td>
<td>BALL BEARING FOR MOTOR D-END</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SKETCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Sketch Diagram]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CARBON CERAMIC</th>
<th>NO. 6203-22/C3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>WEIGHT (kg)</th>
<th>0.05</th>
<th>0.07</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>SUPPLY PER SHIP</th>
<th>WORKING</th>
<th>SPARE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DRAWING NO.</th>
<th>PART NO.</th>
<th>PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>984 10230-08</td>
<td>984 20645-00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REMARKS</th>
</tr>
</thead>
</table>

**Page Pump:** PVVF 2040
**Motor:** 71 B

**Title:** SPARE PART KIT FOR FRESHWATER PUMP

**Revision:**

**Drawing No.:** 985 17946-03

**Drawing No.:** 985 17946-03