

DATE	REV.	DESCRIPTION	DWG	CHKD	APPD
2022.09.20	FIN.	ISSUED FOR FINISHED PLAN (HN5076)			

HN5076
STRYMON
FINISHED PLAN

DHSC


HULL NO.	IMO NUMBER
HN5076	9938030

Total () sheets with a cover

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HULL NO. HN5076	PROJECT SUN ENTERPRISES DWT 115,000 TON CRUDE OIL TANKER
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APPD BY <u>C.L. CHOI</u> CHKD BY <u>D.I. JEONG</u> CHKD BY <u>M.S. JU</u> DWN BY <u>I.W.HWANG</u> (TEL : 061-531-1326)	TITLE <div style="border: 1px solid black; width: 60px; height: 20px; margin: 0 auto; text-align: center;">S30</div> FRESH WATER GENERATOR
--	---

	DEPT	DATE	SCALE	DWG NO.	REV. NO.
	OUTFITTING DESIGN DEPARTMENT 2	2021.07.13	NONE	6U2840601	FIN.

PLAN HISTORY

NO.	DATE	REV. MARK	DESCRIPTION	DRAWN	CHECKED	APPROVED

CONTENTS

FOR FINAL

TITLE


DWG. NO.

25TON/DAY FRESH WATER GENERATOR(S)

DHFG-Y15200

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 <p>HEAD OFFICE & FACTORY 7, NOKSANSANDAN 261-RO, GANGSEO-GU BUSAN, KOREA MAIN PHONE : (051) 974-4704 FAX : (051) 970-1361</p>	CUSTOMER : D. H. S. C.	
	PROJECT NAME : HN5076	
	CLASS : DNV	APPROVED : S.C.Kim
	DATE : 2022.07.20	CHECKED : K.H.Kwon
REV. MARK : 0	DRAWN : H.C.Oh	
(TEL. 974 - 4704)		

SAVE NAME : LETTER

Installation Guide for FWG

1. Two type of FWG (fresh water generator)

Freshwater generator is one of the important machines that are mounted on the ship, freshwater generator has plate type and S & T type.



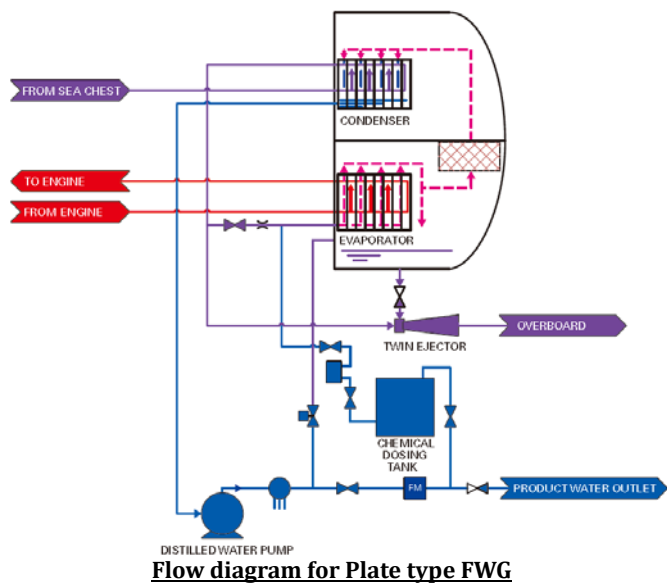
Plate type



S&T type

2. Distillation

Fresh water is generally produced on board using the evaporation method. There are two things that are available in plenty on ship to produce fresh water - Seawater and heat. Thus fresh water is produced by evaporating sea water using heat from any of the heat source. The evaporated sea water is then again cooled by the sea water and the cycle repeats.



Flow diagram for Plate type FWG

3. Installation description

Please check the installation drawing and technical specification, overhaul space in installation fresh water generator.

Be aware that it must be possible to read the value of thermometer and other gauge.

To avoid the unnecessary pressure drop, the connection pipe should be simple, because it could effect the specified pump efficiency and produced fresh water capacity.

Check the specified quantity of jacket water and sea water, steam flow through the evaporator properly.

The fresh water pipe should be connected to the fresh water tank of the ship.

It is recommended that the fresh water outlet line should be used stainless steel or non-ferrous piping material, because the produced water made by fresh water generator is of high purity, where dissolved oxygen concentration is of extremely low level. If dissolved oxygen's quantity is low then oxide film will not be developed by which it will be very unstable chemically. So this water tends to stabilize itself by resolving and contacting with other substances. As the result, the color of water may changes to be red or brownish.



Be caution!

Shipyard should consider designing pipe lines for below. If it is not satisfied, F.W.Generator maker doesn't guarantee for performance.

1. For this plant, please bear in mind that **the pressure of ejector inlet side should be Min. 3.5 bar in ballast** and around 4.5 bar in loading.

2. **The pressure of ejector outlet should not exceed 0.6 bar in laden condition.**

<See the Fig.1-1, 1-2>

3. The counter pressure in the fresh water outlet pipe should not exceed 1.8 bar and below 0.1bar.<See the Fig.2>

The combined ejector-sea water pump is designed to withstand on a level with and in close vicinity to the fresh water generator and for a maximum counter-pressure in the overboard piping of 0.6 bar. If this is impossible, it should be dimensioned for additional lifting height, and pipe resistance and ejector should be designed accordingly.

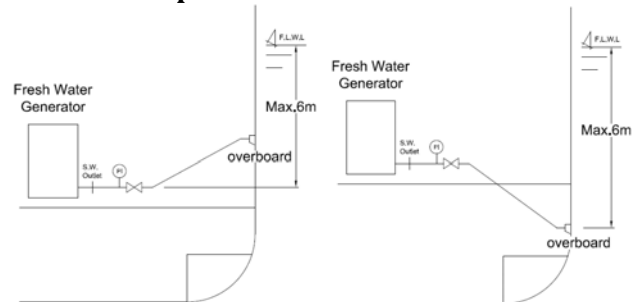
4. Installation description of the steam injector

If the back pressure is exerted on the discharge line of the steam drain of the steam injector, extraordinary vibration may occur in the injector and there is maximum possibility that the operation of the system may become impossible.

If the pressure after the steam injector exceed 1 bar, the safety valve will be opened to secure the plate.

If the supplied steam pressure is lower than the designed pressure, the vibration may be caused to the system. The fluctuation from the designed value must be within about $\pm 5\%$.

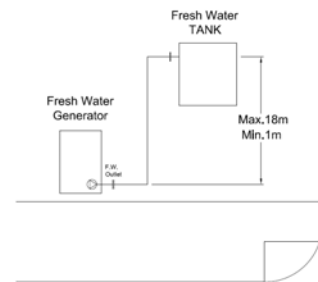
5. Installation position



< Fig 1-1 >

< Fig 1-2 >

Overboard position

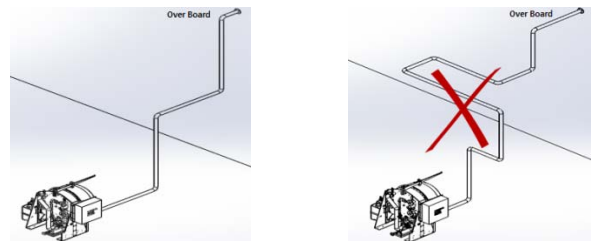


< Fig 2 >

Fresh Water Tank position

Note 1

This position is reference for height. Shipyard shell consider Sea Water Ejector pump head and Sea Water Piping system pressure drop additionally.



Fresh Water Generator Overboard Piping

Note 2

This piping arrange is reference for over board of sea water. Shipyard shall consider and adjust sea water piping pressure drop as like as sea water ejector pump head. Please contact us if the ejector outlet pressure calculation result exceeds 0.6 bar in laden condition

DongHwa Entec

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PREPARED BY	REVIEWED BY	APPROVED BY
H.C.Oh	K.H.Kwon	S.C.Kim

SPECIFICATION SHEET FOR DONGHWA ENTEC TURBULAR TYPE F.W.GENERATOR

1. Customer : D.H.S.C.
 2. Project : HN5076
 3. Rule : DNV

4. Particular

4-1	Model	DX-α-25	
-2	Capacity of Distillate	25 ton/day Max. Salinity : 10ppm	
-3		with the steam injector	
-4	No. of set per ship	1sets/ship	
-5	Cooling Sea Water Temp.	Inlet 32℃	
-6	Jacket Cooling Water Temp.	Inlet 85℃, 48,000kg/hr	
-7	Steam rate for Steam Injector	6bar, 1,045kg/hr	
-8	Distillate Pump & Motor	1.2M3/hr, 30mAq, 3Phase, 0.75kW	
-9	Ejector Pump & Motor	53M3/hr, 48mAq	
-10	Power source	Motor	AC 440Volt, 60Hz, 3Phase
-11		Salinity Indicator	AC 220Volt, 60Hz, 1Phase

5. Material

		Shell	Tube	Tube Sheet	Cover
5-1	Evaporator	Carbon Steel	~	~	Carbon Steel
-2	Condenser	Stainless Steel	AL-Brass	Naval-Brass	Cast Iron
-3	Heater	Carbon Steel	AL-Brass	Naval-Brass	Carbon Steel
-4	Water Ejector	Body : Cast Bronze, Nozzle : Stainless Steel			
-5	Deflector	Stainless Steel			
-6	Demister	Stainless Wire			
-7	Orifice	Stainless Steel			
-8	Pump	Casing	Impeller	Shaft	Shaft Seal
	Ejector pump	-	-	-	-
	Distillate pump	Cast Iron	Phosp. Bronze	Stainless Steel	Mech. Seal

6. Painting & Coating

		Shell	Cover
6-1	Evaporator	Neoprene Lining 3mm	Neoprene Lining 3mm(Top cover)
-2	Condenser		Neoprene Lining 3mm
-3	Heater	DWX 51	Neoprene Lining 3mm(Bottom cover)
-4	Body External	RAL 7032 (PEBBLE GREY)	

7. Accessories

7-1	Ejector Pump & Motor	1 set	Yard supply
-2	Distillate Pump & Motor	1 set	
-3	Water Ejector	1 set	
-4	Salinity Indicator	1 set	
-5	Solenoid Valve	1 set	
-6	Flow Meter	1 set	
-7	Gauge(Compound, Vacuum)	2/1 set	
-8	Thermometer	5 set	
-9	Chemical Dosing Unit	1 set	50liter
-10	Safety Valve for Evaporator	1 set	
-11	Control Panel	1set	Built on body

8. Spare & Tool(Refer to "Spare & Tool List")

1 2 3 4 5 6

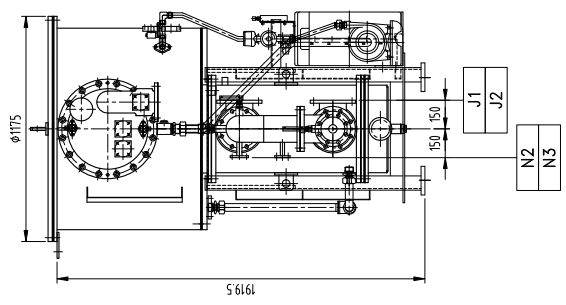
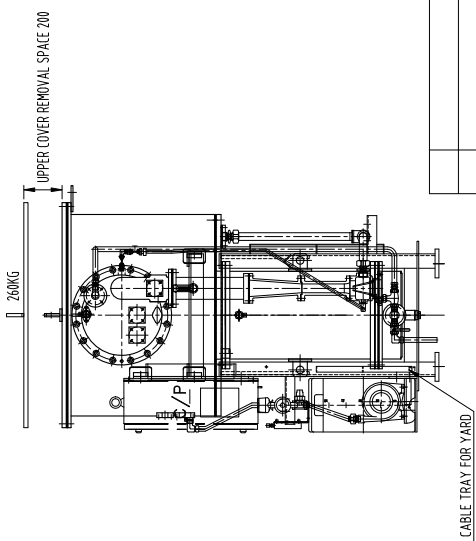
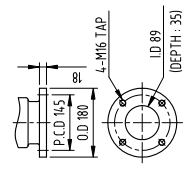
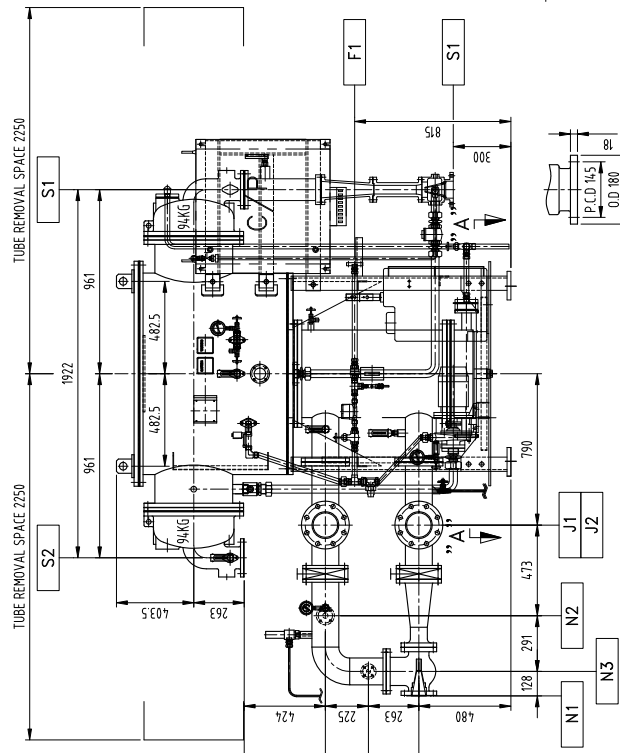
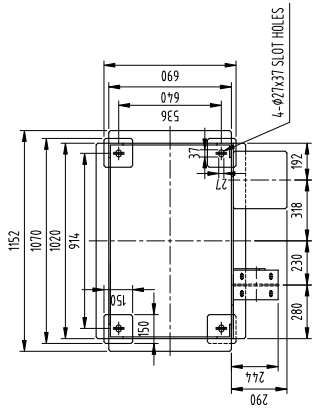
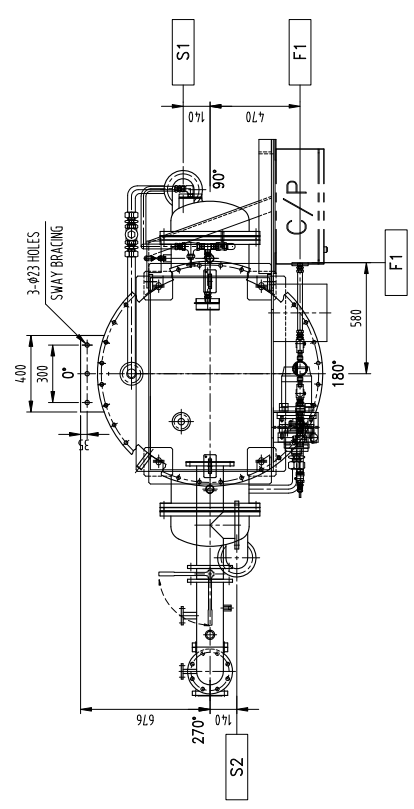
NO.	PART NAME	REMARK
S1	SEA WATER INLET	5K-80A
S2	SEA WATER OUTLET	5K-100A
J1	JACKET WATER INLET	10K-125A
J2	JACKET WATER OUTLET	10K-125A
F1	FRESH WATER OUTLET	5K-25A
N1	STEAM INLET	10K-80A
N2	CONDENSATE OUTLET	5K-25A
N3	PRIMING WATER CONN.	5K-15A

NOTES.

1. THE TUBES OF CONDENSER HAVE MAINTENANCE SPACE JUST ONE SIDE.
2. HEATER IS TO BE DISMOUNTED FOR REMOVAL OF TUBES.
3. TOLERANCE FOR EACH CONNECTION WILL BE APPLIED AS TEMA.

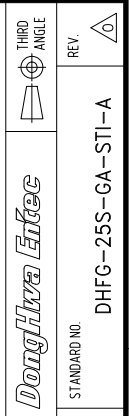
WEIGHT(kg)	
EMPTY	1275
WORKING CONDITION	1500

OPERATION PRESSURE(kg/cmG)	
SHELL	-750-630mmHg
COVER	15
HEATER	30
COVER	-750-630mmHg



MK.	DESCRIPTION	DATE	DWN.	CHK.	APP.

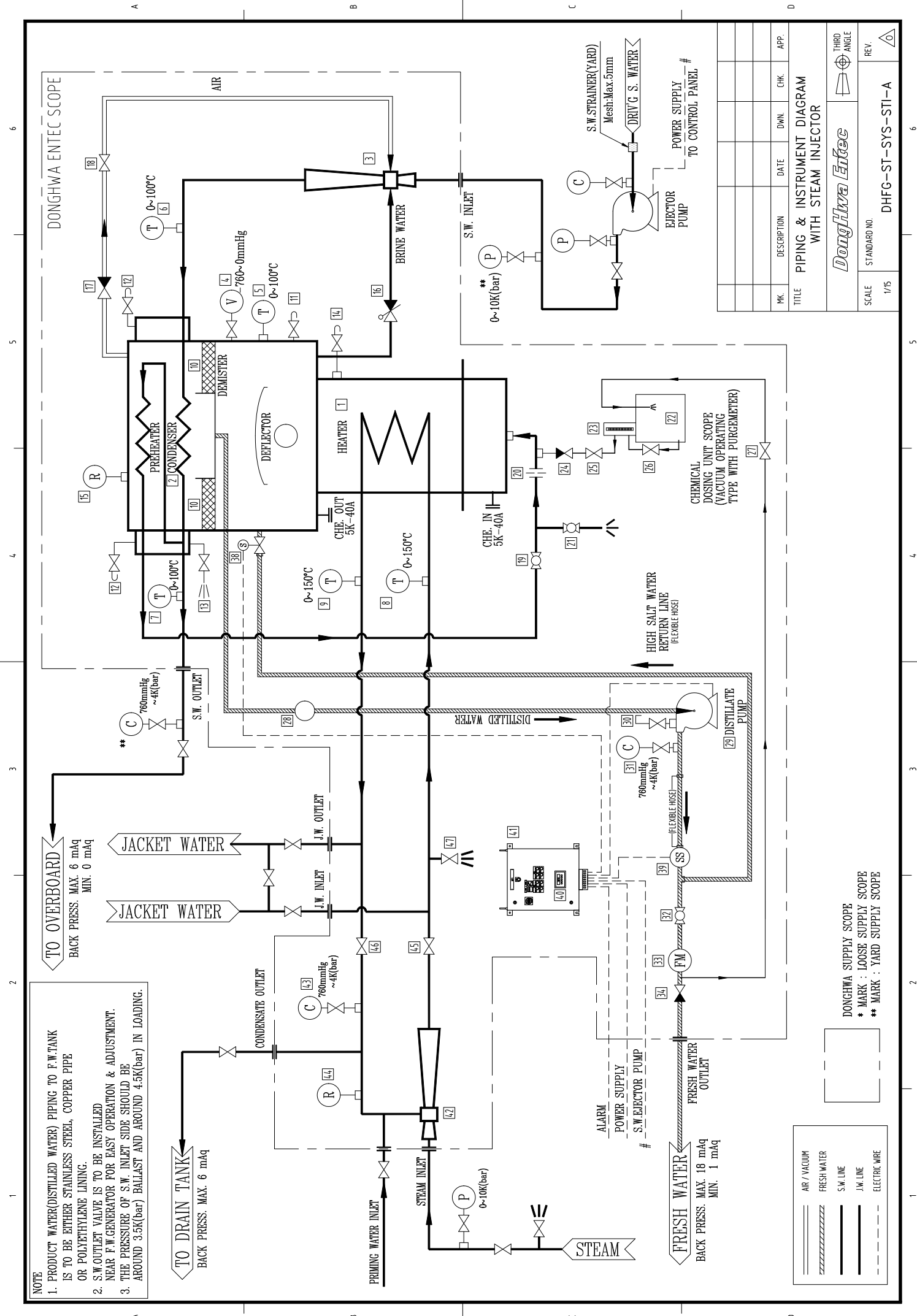
TITLE	25TON F.W. GENERATOR GENERAL ASSEMBLY WITH STEAM INJECTOR
SCALE	1/38
STANDARD NO.	DHFG-25S-GA-STI-A
REV.	



PREPARED BY	REVIEWED BY	APPROVED BY
H.C.Oh	K.H.Kwon	S.C.Kim

25TON SHELL & TUBE TYPE - PART LIST OF DIAGRAM

NO.	DESCRIPTION	SPEC.	Q'TY/UNIT	REMARK
1	HEATER	DX-a-25	1SET	
2	CONDENSER	DX-a-25	1SET	
3	WATER EJECTOR	DX-a-25	1SET	
4	VACUUM GAUGE FOR CHAMBER	-760~0mmHg	1	
5	THERMOMETER FOR CHAMBER	0 ~ 100 ℃	1	
6	THERMOMETER FOR SW INLET	0 ~ 100 ℃	1	
7	THERMOMETER FOR SW OUTLET	0 ~ 100 ℃	1	
8	THERMOMETER FOR JW INLET	0 ~ 150 ℃	1	
9	THERMOMETER FOR JW OUTLET	0 ~ 150 ℃	1	
10	DEMISTER	100t	1SET	
11	VACUUM BREAKER FOR CHAMBER	PT 3/8"	1	
12	AIR VENT VALVE FOR CONDENSER	PT 3/8"	2	
13	DRAIN VALVE FOR CONDENSER	PT 3/8"	1	
14	AIR VENT VALVE FOR HEATER	PT 3/8"	1	
15	RELIEF VALVE FOR CHAMBER	SET. 1.5K(bar)	1	
16	SWING CHECK VALVE FOR BRINE WATER LINE	PT 1 1/2"	1	
17	CHECK VALVE FOR AIR SUCTION LINE	PT 1/2"	1	
18	VACUUM ADJUSTING VALVE	PT 1/2"	1	
19	GLOBE VALVE FOR FEED LINE	PT 3/4"	1	
20	ORIFICE	O2A02-03	1	
21	DRAIN VALVE FOR FEED LINE	PT 3/4"	1	
22	CHEMICAL DOSING TANK	50LITER	1	
23	PURGE METER	RMA-33-TMV	1	
24	CHECK VALVE FOR CHEMICAL DOSING LINE	PT1/4"	1	
25	MANUAL VALVE FOR CHEMICAL DOSING	PT1/4"	1	
26	MANUAL VALVE FOR CHEMICAL TANK OUTLET	PT1/4"	1	
27	F.W.FILLING VALVE FOR CHEMICAL DOSING LINE	PT1/4"	1	
28	SIGHT GLASS	PF3/4"	1	
29	DISTILLATE PUMP	SEE THE ATTACHED DWG.	1SET	
30	AIR VENT VALVE FOR DISTILLATE PUMP	PT 1/4"	1	
31	COMPOUND GAUGE FOR DIST.PUMP DISCH.	-760mmHg~4K(bar)	1	
32	GLOBE VALVE FOR F.W.OUT	PT3/4"	1	
33	FLOW METER	PT1/2"	1	
34	CHECK VALVE FOR F.W.OUTLET LINE	PT3/4"	1	
35	BLANK			
36	BLANK			
37	BLANK			
38	SOLENOID VALVE FOR F.W.RETURN	PF3/4"	1	
39	SALINITY SENSOR	NSS 110AD	1	
40	SALINITY CONTROLLER	NSC 110AD	1	
41	CONTROL PANEL	SEE THE ATTACHED DWG.	1SET	
42	STEAM INJECTOR	DX-a-25	1SET	
43	COMPOUND GAUGE FOR STEAM LINE	-760mmHg~4K(bar)	1	
44	RELIEF VALVE FOR STEAM LINE	SET. 3.0K(bar)	1	
45	BUTTERFLY VALVE FOR INLET	5K-125A	1	
46	BUTTERFLY VALVE FOR OUTLET	5K-125A	1	
47	DRAIN VALVE FOR STEAM LINE	PT3/8"	1	



NOTE

1. PRODUCT WATER(DISTILLED WATER) PIPING TO F.W.TANK IS TO BE EITHER STAINLESS STEEL, COPPER PIPE OR POLYETHYLENE LINING.
2. S.W. OUTLET VALVE IS TO BE INSTALLED NEAR F.W GENERATOR FOR EASY OPERATION & ADJUSTMENT.
3. THE PRESSURE OF S.W. INLET SIDE SHOULD BE AROUND 3.5K(bar) BALLAST AND AROUND 4.5K(bar) IN LOADING.

---	AIR / VACUUM
=====	FRESH WATER
-----	S.W. LINE
-----	J.W. LINE
----	ELECTRIC WIRE

DONGHWA SUPPLY SCOPE
 * MARK : LOOSE SUPPLY SCOPE
 ** MARK : YARD SUPPLY SCOPE

MK.	DESCRIPTION	DATE	DWN.	CHK.	APP.

TITLE: PIPING & INSTRUMENT DIAGRAM WITH STEAM INJECTOR

STANDARD NO. DHFG-ST-SYS-STI-A

SCALE: 1/15

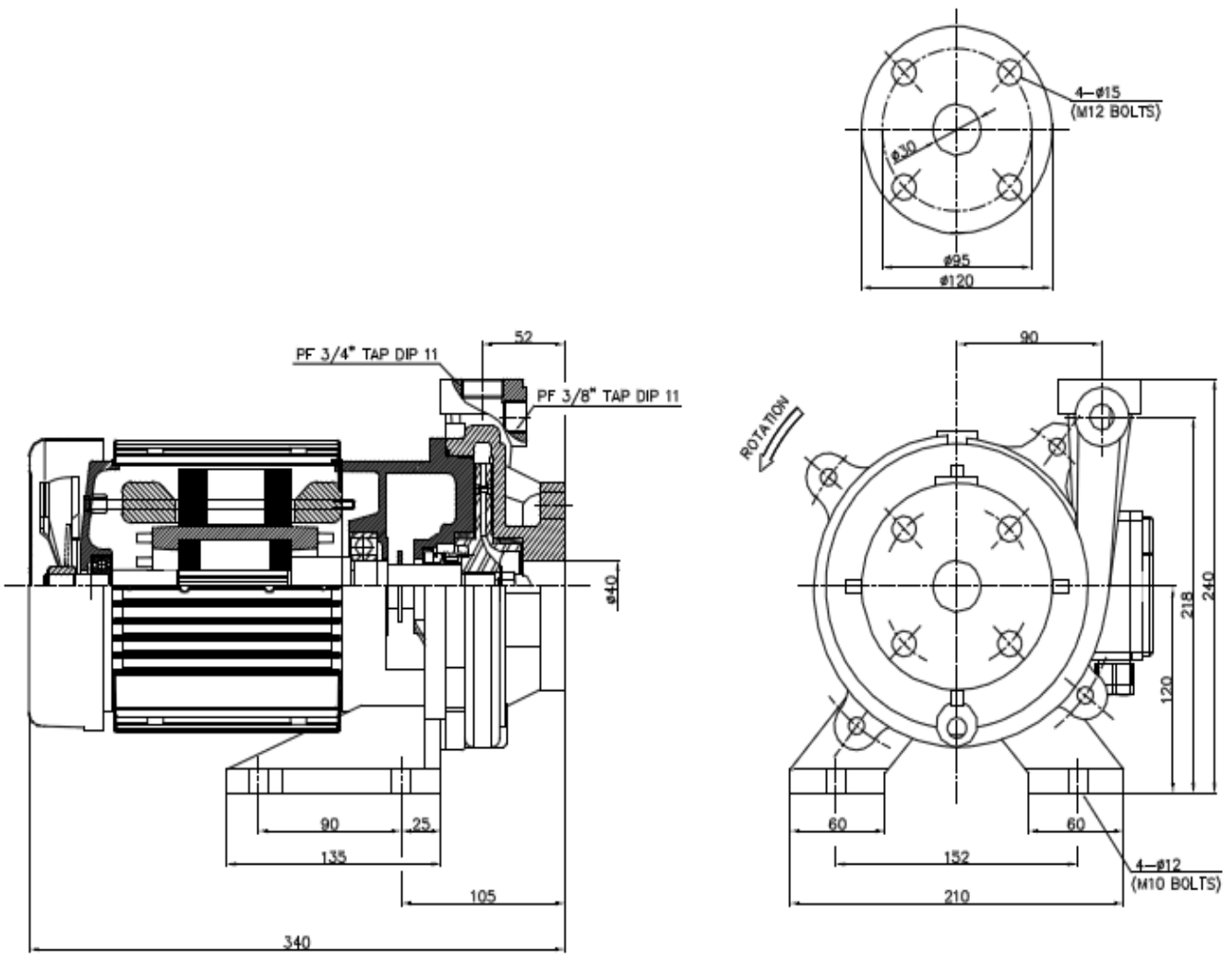
REV.

THIRD ANGLE

WILO

*OUTLINE DRAWING
of DH-DIS Type*

Sheet No.	
CUSTOMER	
ITEM No.	
DATE	



TYPE	DISTILLATE PUMP
MODEL	DH-DIS-01
SERVICE	
SCALE:N/S	

WILO

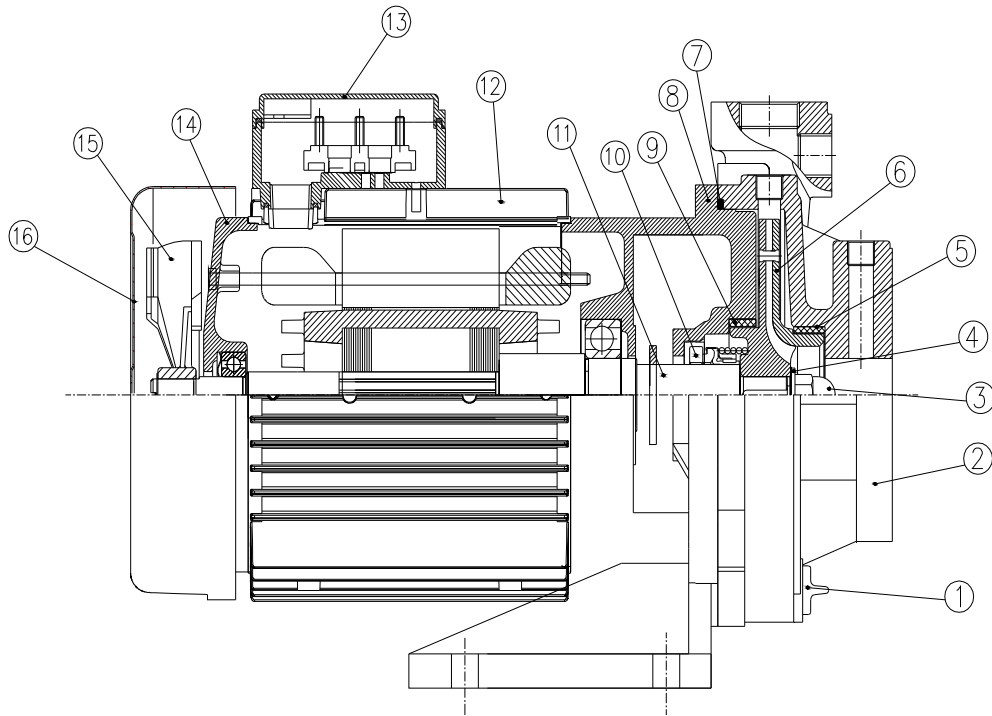
*SECTIONAL DRAWING
of DH-DIS TYPE*

Sheet No.

CUSTOMER

ITEM No.

DATE



NO.	PARTS NAME	MATERIALS		Q'ty(EA)
		SYMBOL	NOMINATION	
1	DRAIN PLUG	C3771	C3771BD	1
2	CASING	FC200	CAST IRON	1
3	IMPELLER NUT	SUS304	STAINLESS STEEL	1
4	IMPELLER WASHER	SUS304	STAINLESS STEEL	1
5	CASING RING	Bs	BRASS	1
6	IMPELLER	PBC	PHOSPHOR BRONZE	1
7	O-RING	-	RUBBER	1
8	END BRACKET(A)	GC200	CAST IRON	1
9	BRACKET RING	Bs	BRASS	1
10	MECHANICAL SEAL	-	EA560-25	1
11	SHAFT	SUS316L	STAINLESS STEEL	1
12	MOTOR	-	-	1
13	TERMINAL COVER	GC200	CAST IRON	1
14	END BRACKET(B)	GC200	CAST IRON	1
15	FAN	PBT	POLYBUTYLENE TEREPHTHALATE	1
16	FAN COVER	SCP1	SCP1	1

TYPE

DISTILLATE PUMP

MODEL

DH-DIS-01

SERVICE

SCALE:N/S



H754P2

Output :	0.75 kw	Voltage	440 V	Frequency	60HZ
Speed :	3485 O/min.	Current(In)	1.60 A	Mass	19.3 kg (Total: 26.3kg)
Torque :	2.1 Nm	Efficiency	82%	Duty	S1
Noise :	65 db(A)	Cos Φ	75%		
Ins.cl. :	F	Heater :	No	Cable gland : 20b	
Temp. rise	80K	Thermistor :	No	Cable size : Φ13.1~15mm	
		Bimetallic Contact :	No		

	Start Current	Start Torque	Max. Torque
Factor	10.89 A	7.18 Nm	7.44 Nm
Designed	11.98 A	6.46 Nm	6.7 Nm

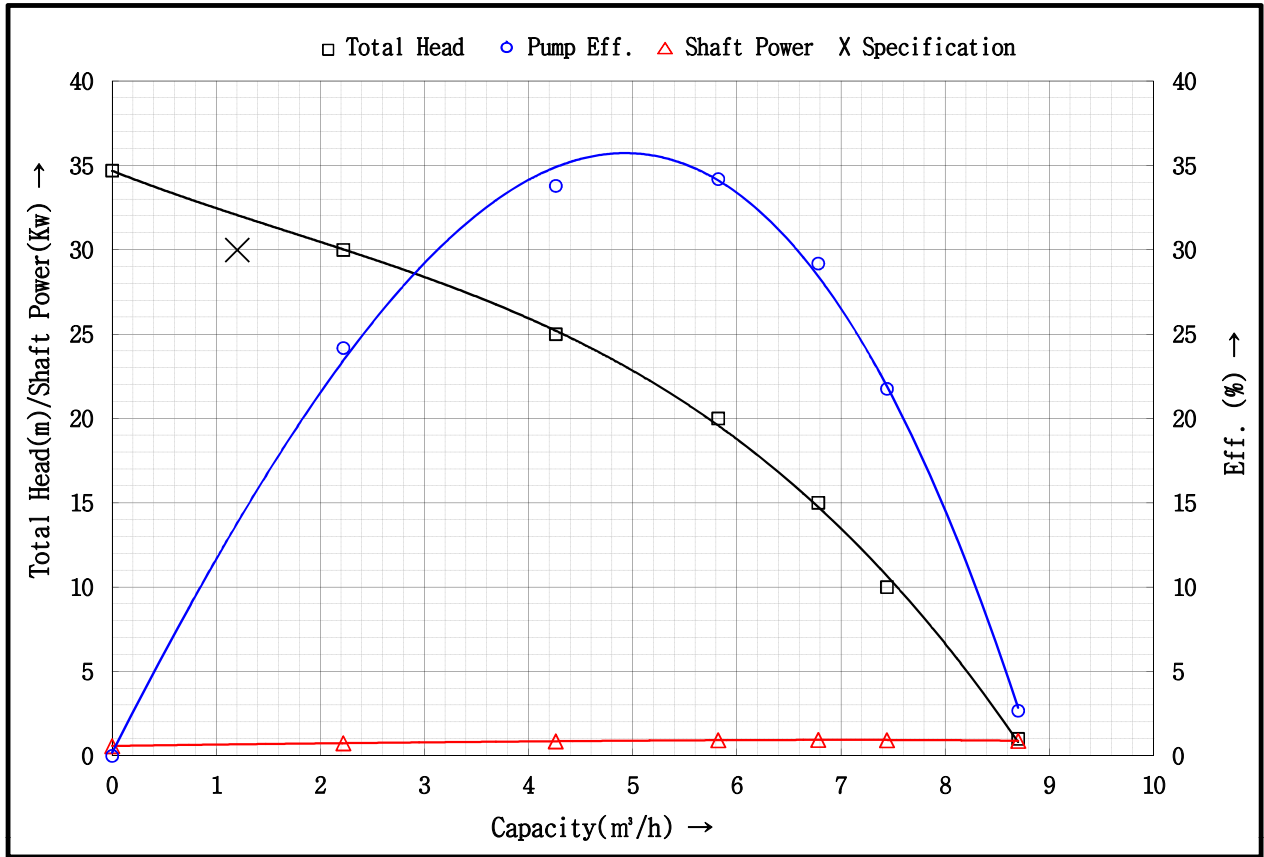
80 B5 Bearing : D.E 6206 2Z C3
N.D.E : 6202 2Z C3

KEY : 5 X 5mm
Protection degree:IP55

Customer :	Index :
Project :	Nr.:

PUMP TEST REPORT

■ PERFORMANCE CURVE



■ PERFORMANCE DATA

Capacity (m ³ /h)	0.00	2.22	4.26	5.82	6.78	7.44	8.70
Dis. Head (m)	34.70	30.00	25.00	20.00	15.00	10.00	1.00
Suc. Head (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Speed Head (m)	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Total Head (m)	34.70	30.00	25.00	20.00	15.01	10.01	1.01
Water Power (kW)	0.00	0.18	0.29	0.32	0.28	0.20	0.02
Shaft Power (kW)	0.58	0.75	0.86	0.92	0.95	0.93	0.89
Pump Eff. (%)	0.00	24.18	33.80	34.20	29.19	21.76	2.68
Speed (rpm)	3481	3441	3416	3396	3388	3391	3400
Voltage (V)	440	440	440	440	440	440	440
Current (A)	1.43	1.64	1.79	1.88	1.92	1.89	1.83
Motor Input (kW)	0.769	0.991	1.134	1.225	1.254	1.231	1.179
Motor Eff. (%)	75.5	75.5	75.5	75.5	75.5	75.5	75.5

■ SPECIFICATION FOR PUMP & MOTOR

PUMP SPECIFICATION		MOTOR SPECIFICATION			TEST CONDITION			
Capacity	1.2 (m ³ /h)	Phase (Φ)	3	Output (kW)	0.75	S/Pipe (mm)	D/Pipe (mm)	H/Diff. (m)
Total Head	30 (m)	Pole (P)	2	Freq. (Hz)	60	30	20	
Efficiency	24 (%)	Volt. (V)	440	Current (A)	1.6	Flow Meter	R.T (°C)	W.T (°C)
I/P Out-Dia	30 (mm)	Eff. (%)	75.5	Maker	WILO	Turbin	23	20
Item No.		Serial No.	X1	Inspector	I.H.GO	Run (Hr)	B/R (°C)	Test Date
Model	DH-DIS-01	Customer				0.5		2010.11.17
Checked By					Approved By			

WILOPumps Ltd.

MESSRS: DongHwa Entec CO., LTD

HULL NO:

TITLE : DIGITAL SALINITY CONTROLLER (DH-SAL-01)

TYPE : PANEL MOUNTING TYPE & TEE 1”

PLAN HISTORY

SYMBOL		DATE	DESCRIPTION			CHECKED
		DEC.12.2008	Prepared for F.W. GENERATOR			
REV.	DRAWN	CHECKED	APPROVED	RULE	10 SHEETS WITH COVER	
					DATE	DEC.24.2008
					DWG. NO.	DH-SAL-01-STANDARD
*	S.H.PARK		S.S.GO			

DONGHWA ENTEC

SPECIFICATION SHEET

1. SPECIFICATIONS

NO	DESCRIPTION		VALUE	√ : ENABLE
1	MODEL		DH-SAL-01	
2	MEASURABLE RANGE		0 – 200 ppm	
3	ACCURACY		± 2.5%	
4	TEMP. COMPENSATION RANGE		0 – 100 °C (± 1%)	
5	CELL OPERATION PRESSURE		5 kg/cm ²	
6	ALARM POINT		10 ppm	
7	A	ALARM CONTACT	FREE CONTACT (250V/5A)	√
	B	SOLENOID CONTACT	FREE CONTACT (250V/5A)	√
8	POWER SOURCE		AC 220V 1Φ 60 Hz 1W	
9	FINISHING COLOR		RAL 7035(LIGHT GREY)	
10	PROTECTION DEGREE		IP54	

2. THE SCOPE OF SUPPLY

NO	NAME OF PARTS	TYPE	Q'TY	REMARK
1	DIGITAL SALINITY CONTROLLER	DH-SAL-01	1	
2	SALINITY CELL WITH CABLE (OLFLEX-110,3C*0.5SQ* 2METERS)	DH-SAL-01-CA	1	
3	TEE 1"	DH-SAL-01-TEE	1	

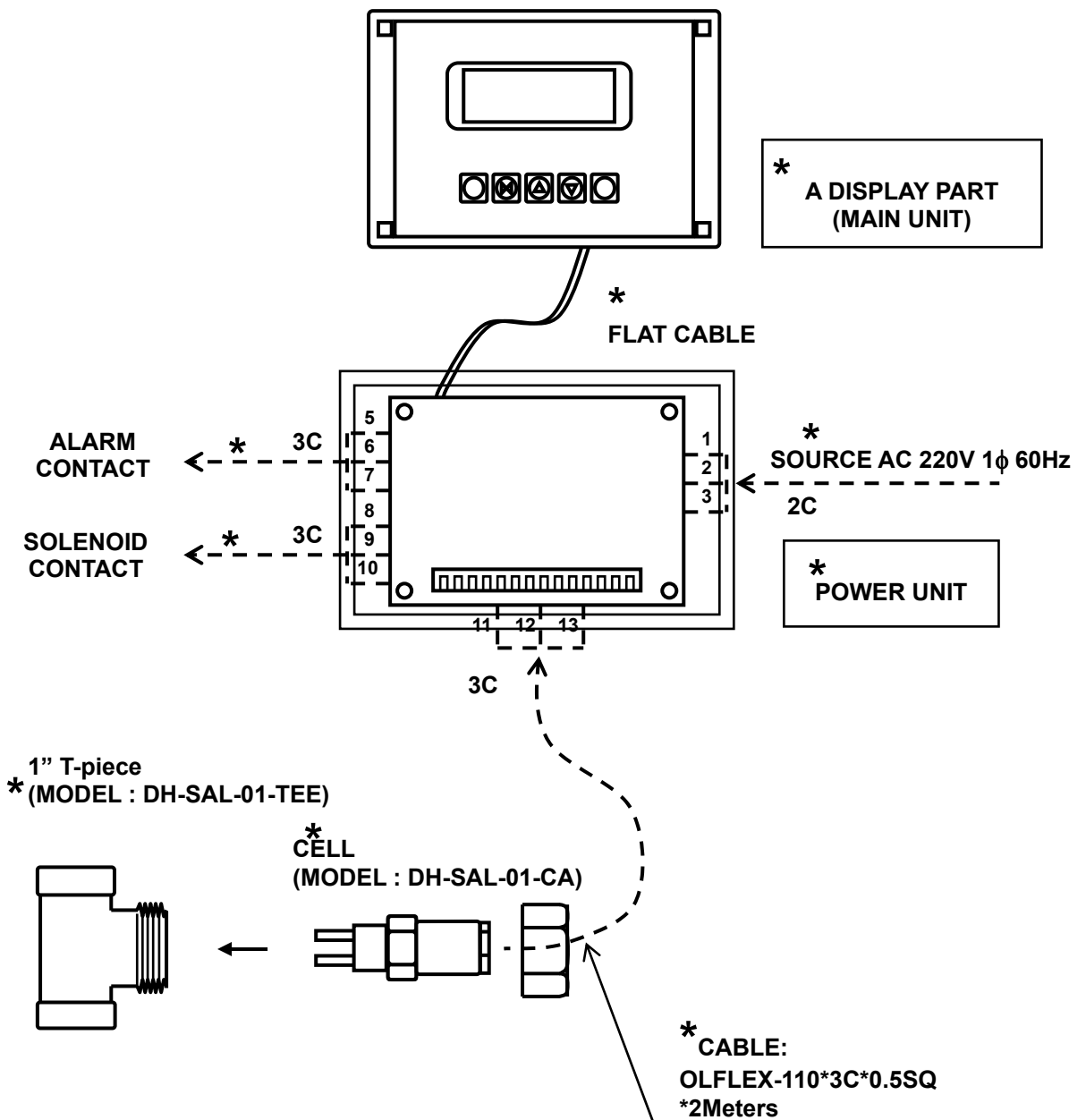
NOTE :

1. We would like to inform you that our salinity controller's color is RAL7035. So, it's difficult for us to change the color of salinity controller because it was extruded as the plastic.
Please understand our situation for this.

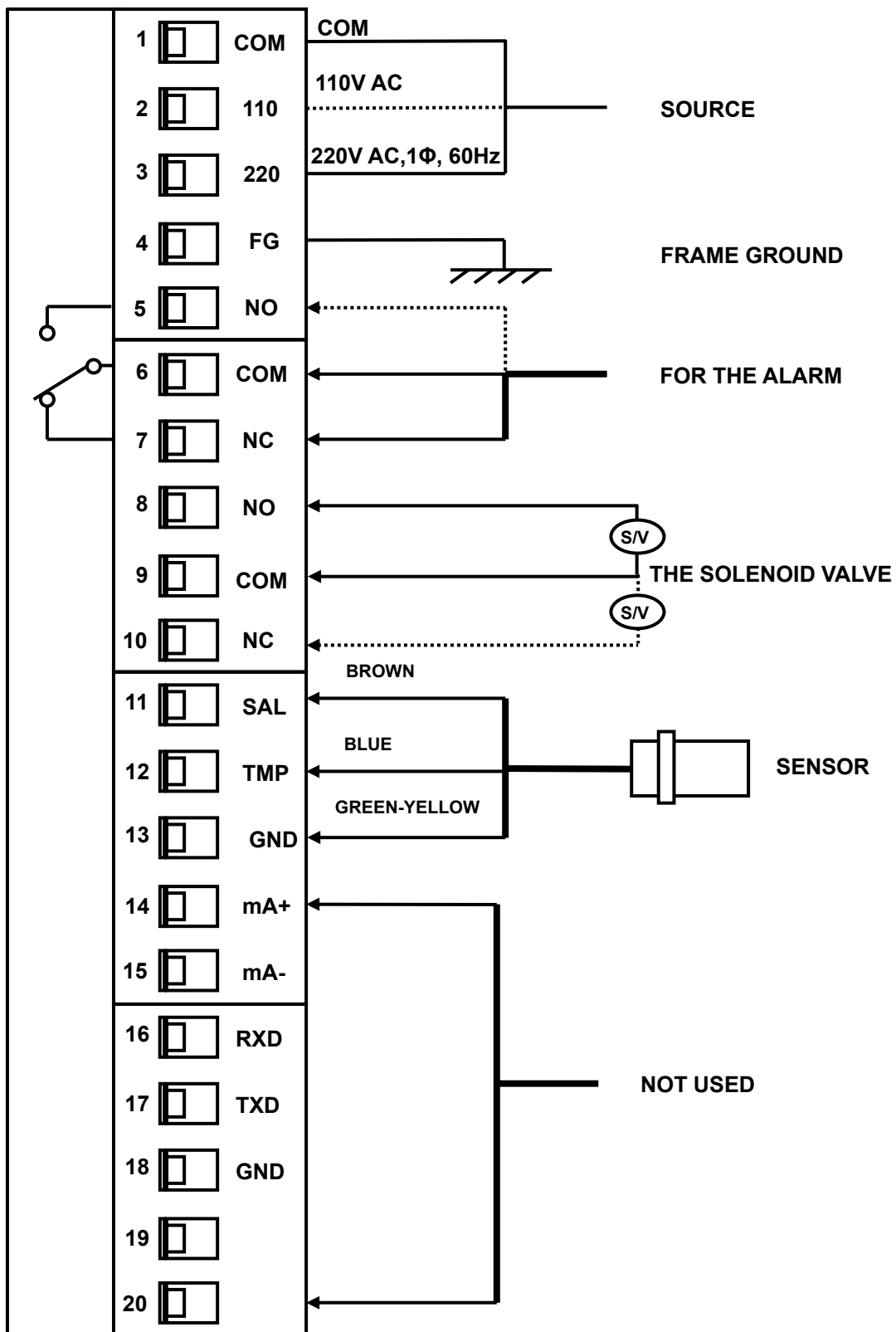
WIRING DIAGRAM

PANEL MOUNTING TYPE

NOTE:
 * MARK – MAKER SUPPLY
 * * MARK – YARD SUPPLY



CONNECTION DIAGRAM OF THE POWER UNIT

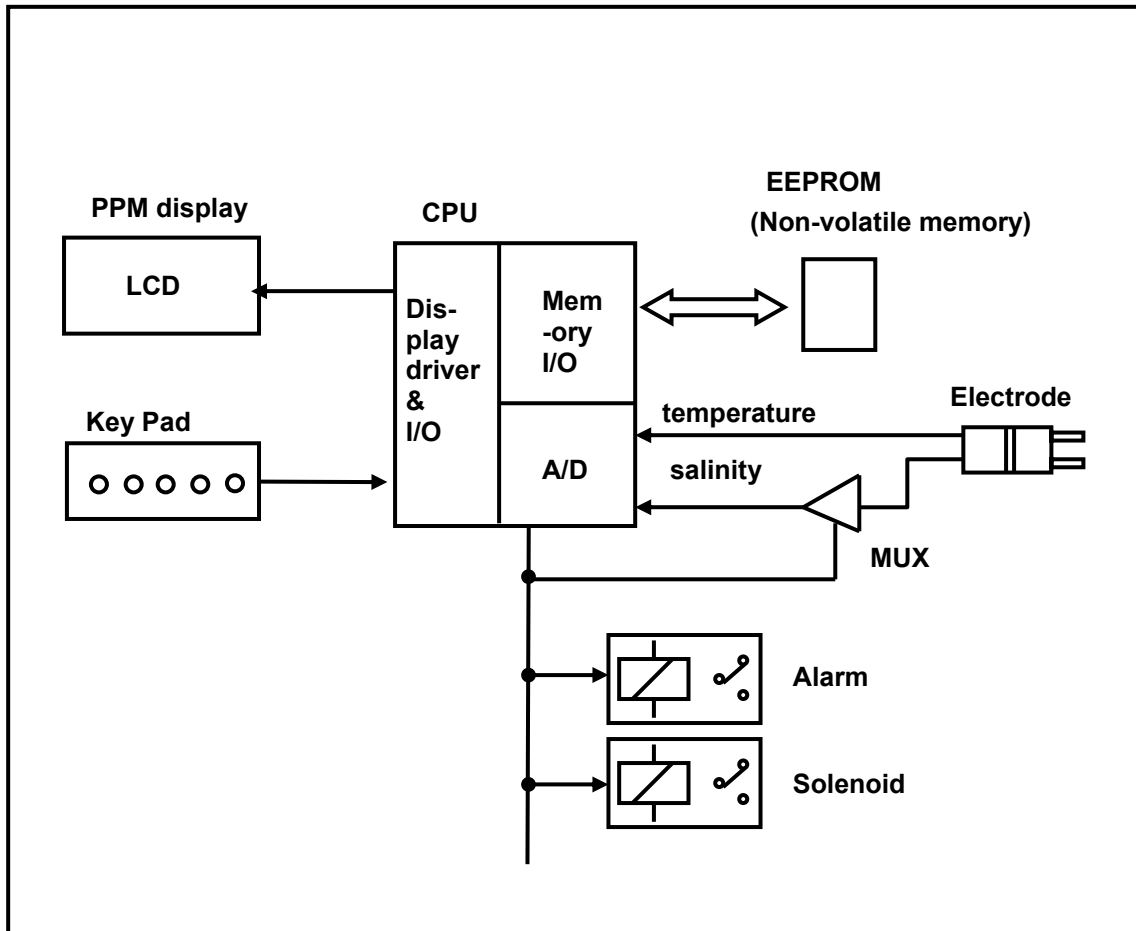


Drawing Of DH-SAL-01

SYSTEM OVERVIEW

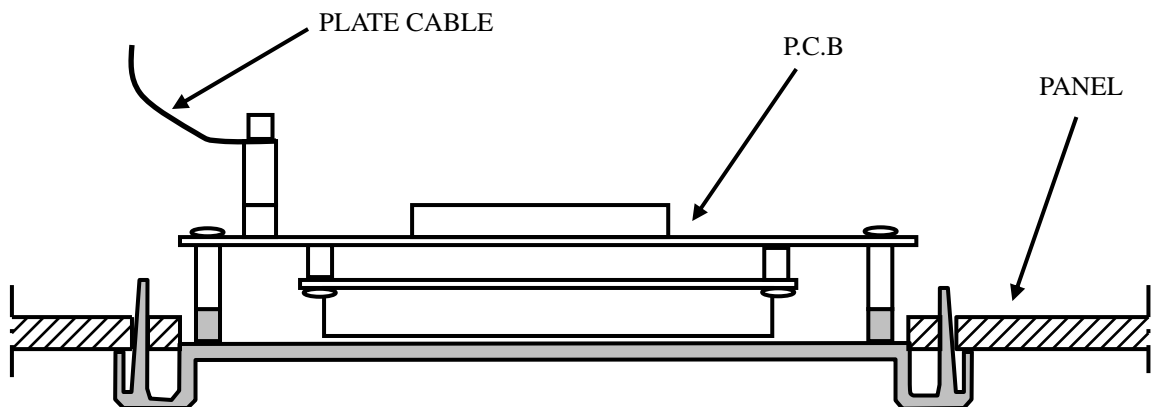
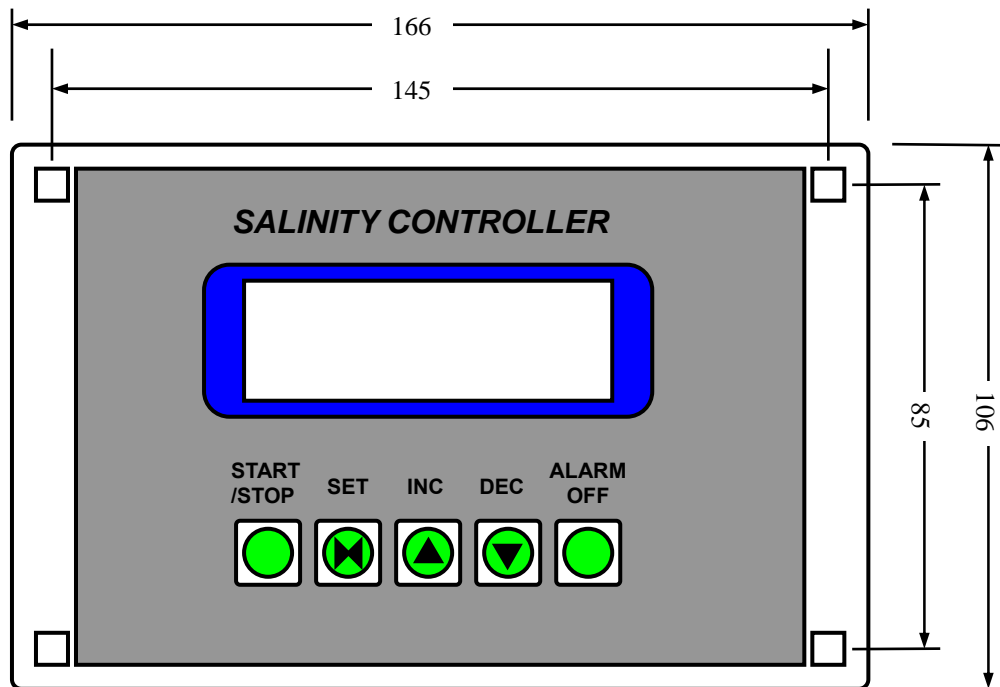
The operation flow for the **DH-SAL-01** system is shown in Figure 1.

FIGURE 1 : DH-SAL-01 BLOCK DIAGRAM



OUTER DIMENSIONS

CONTROLLER (DH-SAL-01) OF PANEL MOUNT TYPE



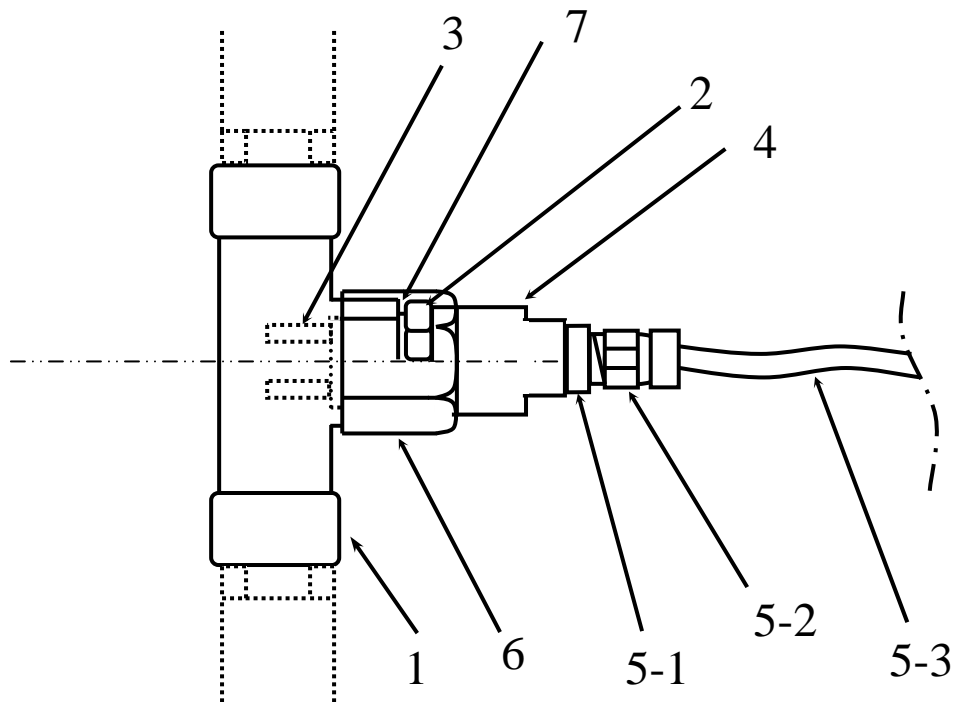
NOTE:

1. COLOR : RAL 7035(LIGHT GREY)
2. MATERIAL : POLYSTYROL
3. PROTECTION DEGREE : IP54



We would like to inform you that our salinity controller's color is RAL7035. So, it's difficult for us to change the color of salinity controller because it was extruded as the plastic. Please understand our situation for this

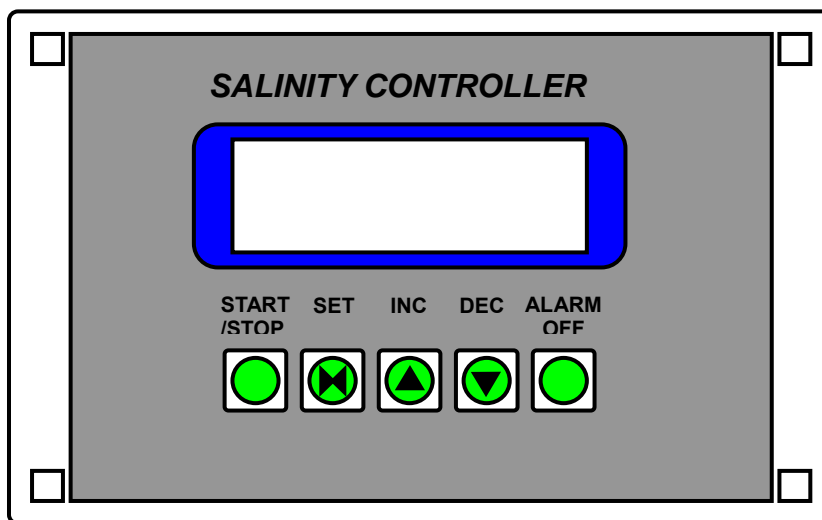
SENSOR(DH-SAL-01-CA) & FEMALE TEE



NO.	NAME	MATERIAL	Q'TY	UNIT	REMARKS
1	FEMALE TEE	1"PF BS	1	EA	SPECIAL TYPE
2	NIPPLE	BS	1	EA	
3	ELECTRODE	SUS-316	1	SET	
4	CAP	BS	1	EA	
5-1	RECEPTACLE	MS3102-10SL	1	SET	
5-2	PLUG	MS3106-10SL	1	SET	
5-3	CABLE	OLFLEX-110	5	m	
6	FIXING NUT	BS	1	EA	SPECIAL TYPE
7	GASKET	NON-ASB 1.5t	1	EA	

USER'S GUIDE OF DH-SAL-01 SALINITY CONTROLLER

Salinity Controller is an instrument, which measures the content of sodium chloride in the evaporated water from a fresh water generator displayed in PPM(parts per million), and ensures that water containing a higher level of PPM, than what has been keyed in at the salinity controller, is rerouted back to the fresh water generator.



Operating the Salinity Controller

When source(ac 220v) is applied to this controller, alarm set value(ex. 10 ppm) will be displayed and in a short time ,process value will be displayed.

On the front plate of the display part there are 5 keys(START/STOP, SET, INC, DEC, ALARM OFF)

Pressing the key SET down once calls up SOLENOID(magnetic valve) where the desired value for the fresh water is selected with the INC and DEC.

Pressing the key SET once more calls up ALARM where the permit limit is set with the INC and DEC keys.

If the INC or DEC key is pressed down for a moment the numbers will start counting rapidly.

Pressing the key SET the third time will show RUN HOUR, and show for how many hours the Salinity Controller has been used.

Pressing the key SET the fourth time will show temperature(°C) in the liquid.

Pressing the key SET the fifth time will show 10~11 ppm during 15sec if unit is normal.

Selection of alarm function

When “alarm off” switch is pressed once, the letter of “ alarm set:off ” is displayed on window of LCD.

In addition, the signal of alarm to AMS is offered.

It means that it is not applied the function of alarm buzzer sound.

When “ alarm off ” switch is pressed once more, the letter of “ alarm set: on ” is displayed on window of LCD. In this case ,function of alarm is applied.

Technical data

1. Model	: DH-SAL-01
2. Measurable Range	: 0-200ppm
3. Accuracy	: ±2.5%
4. Temp. Compensation Range	: 0-100°C(±1%)
5. Cell Operation Pressure	: 5kg/cm ²
6. Alarm Point	: 10 ppm
7. Alarm Contact	: Free Contact(250V/5A)
8. Solenoid Contact	: Free Contact(250V/5A)
9. Power Source	: AC 220V 1Φ 60Hz 1W
10. Finishing Color	: Ral 7035(Light Gray)
11. Protection Degree	: IP54

INSTALLATION OF DH-SAL-01 SALINITY CONTROLLER

Salinity Controller

Installation.

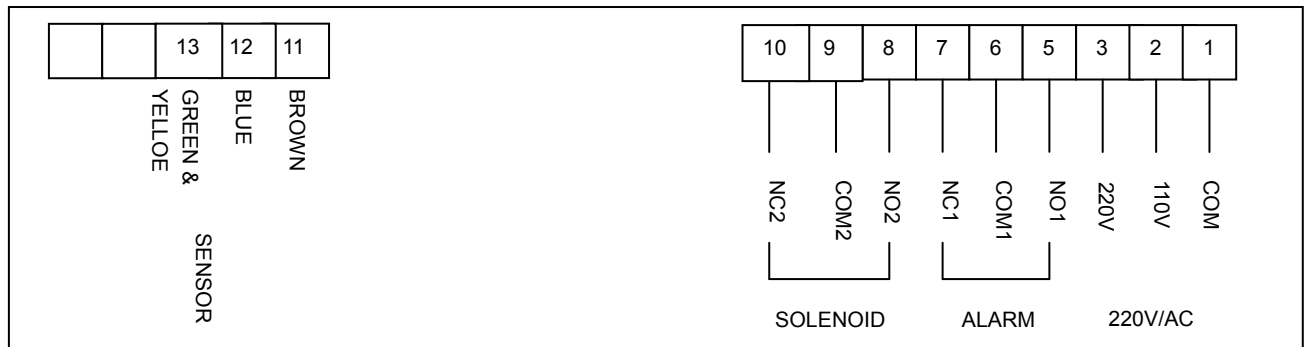
The Salinity Controller models consist of two parts:

A display part where from the connected sensors is shown as well as an installation part which is delivered in a plastic module in which power supply and connection clips are mounted.

The display part is delivered in a cabinet for front installation in the control cabinet and the enclosed shape can be used for the installation.

The display part is secured with the 4 included lock nuts.

The installation part is fastened. The included 20 poled flat cable is inserted between the display part and the installation part after which power and sensor can be connected.



Connection diagram for Salinity Controller type DH-SAL-01

The salt sensor.

It is important to the condition of the Salinity Controller that the sensor installed correctly, electrically as well as Physically.

The sensor is delivered separated into 6 parts:

1. Female Tee 1" PF(special)
2. Nipple
3. Sensor
4. Cap
5. Receptacle & Plug with cable
6. nut

The salt sensor is inserted in the enclosed Female Tee . The enclosed Female Tee must be used since the use of another type of Female Tee can affect the measuring results.

The sensory sticks of the salt sensor must be installed in a ninety degree angle compared to the flow-direction. On the salt sensor it is clear that the straight sides are parallel with the sensory sticks and that the entire sensor can be turned in the case of an error in the installation.

Push the salt sensor into the Female tee at its right position and then the salt sensor is fixed with the Nut. Finally the cable is to be connected through receptacle & plug to the sensor and the sensor must be connected to the terminal block, as described underneath.

Brown wire is connected to terminal 11 (Salt sensor)
Blue wire is connected to terminal 12 (Temp.compensating)
Green and Yellow wire is connected to terminal 13 (Ground)

The magnetic valve and the alarm is connected to the terminal blocks as illustrated above.
The relay switches are potential free N/O switch sets.
220 V/AC is connected as described above after which the system is ready for use.

Drawing Of DH-SAL-01

LIST OF DRAWING

DRAWING NO.	PAGE	CONTENTS
Y1520001 -01	1	LIST OF DRAWINGS
Y1520001 -02	2	PLAN HISTORY
Y1520001 -03	3	SYMBOL LEGEND
Y1520001 -04	4	PROJECT GENERAL SPEC.
Y1520001 -05	5 ~6	PANEL LAYOUT
Y1520001 -06	7	PART LIST
Y1520001 -07	8 ~ 10	WIRING DIAGRAM
Y1520001 -08	11	TERMINAL DIAGRAM
Y1520001 -09	12	RPB DRAWING

RULE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET/1SHIP
APPROVED	PROJECT	
K. Y. JEON	HNS076	
CHECKED	TITLE	F.W.G CONTROL PANEL LIST OF DRAWING
-	N/A	
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 01
	<i>DongHwa Engtec</i>	
		F
		REV.

PROJECT GENERAL SPEC.

PROJECT GENERAL		PANEL ENVIRONMENT		MOTOR RATING	MOTOR DATA, ETC
CUSTOMER DHSC HNS076 Y1520001 2022.07.18 DNV RUJ : RED SVI : WHITE TIW) :BLACK EARTH : GREEN YELLOW P : RED (or NUMBERING) N : BLUE (or NUMBERING) TEXT : BLACK BACKGROUND : WHITE RUN : GREEN STOP : RED POWER ON / STATUS : WHITE ALARM : RED HEATING ON : BLUE LAMP TEST & BUZZER STOP : BLACK	PANEL TYPE WALL MOUNTING STEEL (MILD STEEL) EXTERNAL PLATE : 2.3t INSIDE COMPONENT ARRANGE PLATE : 3.2t OUTSIDE : IP44 INSIDE : IP20 CABLE GLAND PLATE RAL 7032 AC40V 60Hz 3Ph AC220V 60Hz 1Ph / DC24V 45°C (x PROJECT REQUIREMENT) 95% (x PROJECT REQUIREMENT)	PANEL MATERIAL PROTECTION CABLE ENTRY PAINTING COLOR MAIN POWER CONTROL POWER AMBIENT TEMP HUMIDITY	MOTOR RATING EJECTOR PUMP : P=18.5kw / A=30.5A DIST. PUMP : P=0.75kw / A=1.6A		
PANEL STORAGE : PANEL IS INTENDED FOR USE INDOORS. THE EQUIPMENT MUST THEREFORE BE STORED UPRIGHT IN A DRY AND VENTILATED LOCATION, PROTECTED FROM RAIN, EXTREME TEMPERATURES, STREAMING, DUST AND CHEMICAL AGENTS. - NEVER STORE ESS PANEL OUTSIDE, EVEN UNDER A TARPAULIN - THE COLUMNS MUST PREFERABLY REMAIN PACKED UNTIL THEY ARE INSTALLED. SHOULD WORK BE IN PROGRESS NEARBY OR ON THE PREMISES, COVER THE COLUMNS WITH A COVER PROTECTING THEM EFFICIENTLY AGAINST DUST, GRAVEL, PAINT AND CEMENT -ACCEPTABLE STORAGE TEMPERATURE IS -10°C To +40°C -TO ENSURE EASY AND RISK-FREE HANDLING, THE COLUMNS, IN VIEW OF THEIR GREAT WEIGHT, MUST BE STORED ON A STABLE, RIGID FLOOR.					

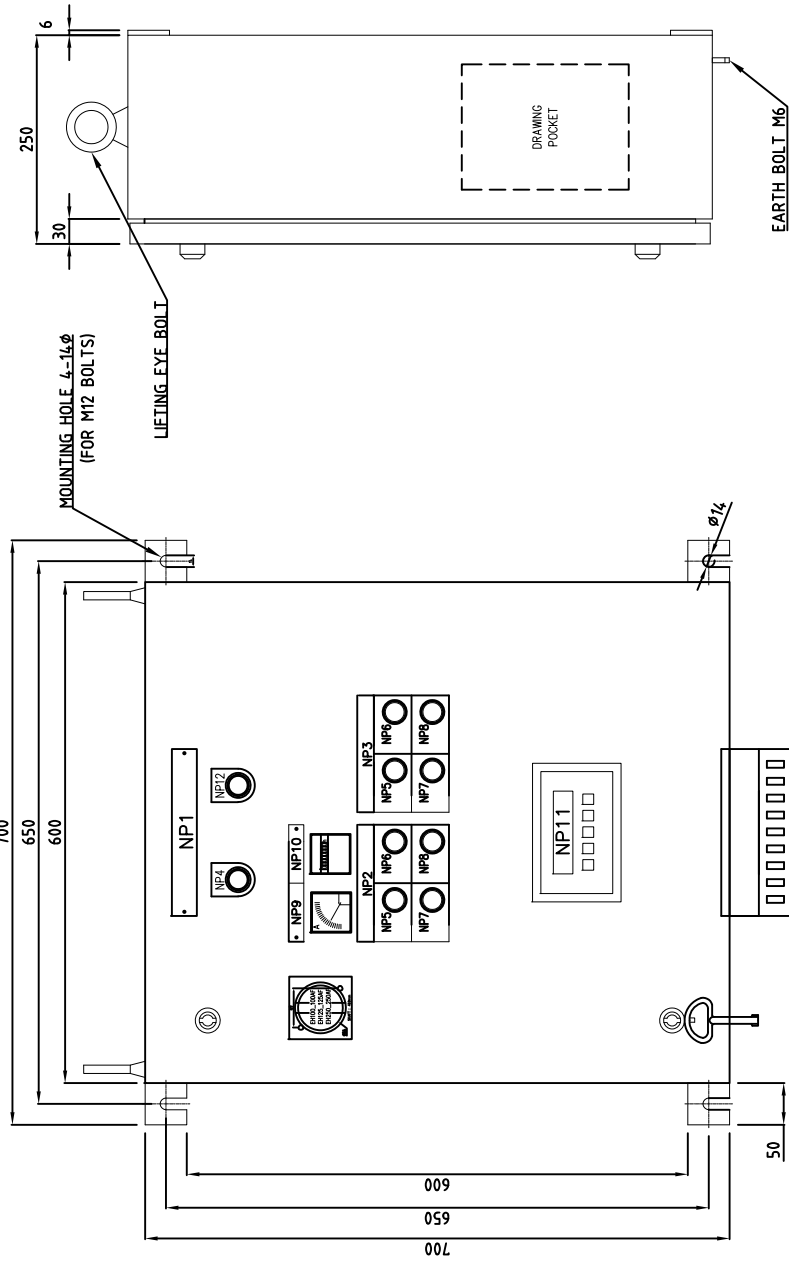
NOTE :

ROLE DNV	CUSTOMER DHSC	NO. REQUIRED 1SET/1SHIP
APPROVED K. Y. JEON	SCALE PROJECT	PROJECT HNS076
CHECKED -	TITLE N/A	F.W.G CONTROL PANEL PROJECT GENERAL SPEC.
DRAWN D. S. KIM	PROJECTION 3RD	DWG. NO. Y1520001 - 04

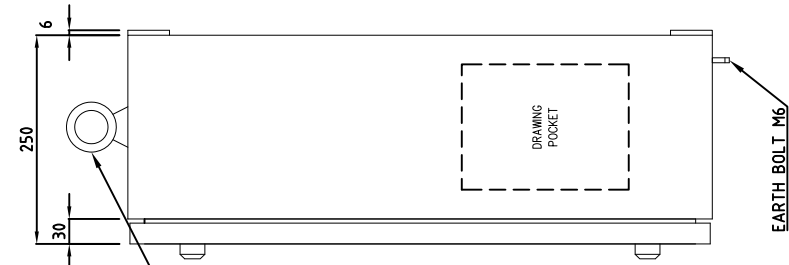
DongHwa Entec

NAME PLATE

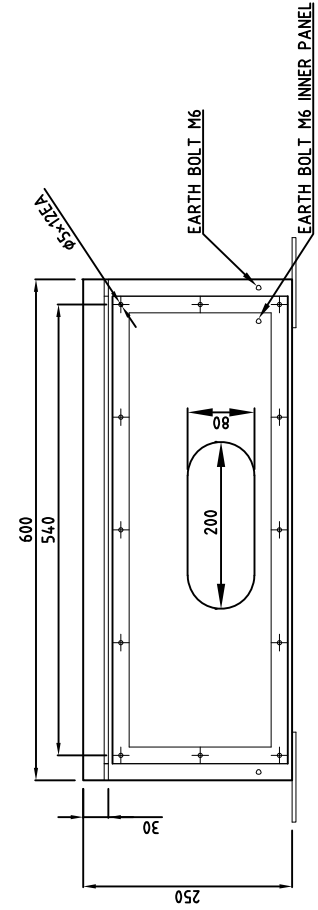
NO.	DESCRIPTION	REMARK
NP1	STARTER FOR F.W. GENERATOR	200x30mm
NP2	EJECTOR PUMP	140mm
NP3	DISTILLATE PUMP	140mm
NP4	POWER ON	WL11
NP5	RUNNING	GL11, GL12
NP6	OVERLOAD	RL11, RL12
NP7	START	PB11, PB13
NP8	STOP	PB12, PB14
NP9	H-METER	A11
NP10	A-METER	H11
NP11	F.W.G SALINITY CONTROLLER	U1
NP12	LAMP TEST	PB20



FRONT VIEW



SIDE VIEW



BOTTOM VIEW

PANEL SPECIFICATION

- PANEL MATERIAL : STEEL
- PANEL IP GRADE : IP44
- PANEL COLOR : RAL 7032
- WEIGHT : 80 Kg (abt)

NAME PLATE SPECIFICATION

- PLATE COLOR : WHITE
- LETTER COLOR : BLACK
- MATERIAL : PHENOL

ROLE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET / 1SHIP
APPROVED	SCALE	PROJECT
K. Y. JEON	N/A	HNS076
CHECKED	TITLE	F.W.G CONTROL PANEL PANEL LAYOUT
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 01

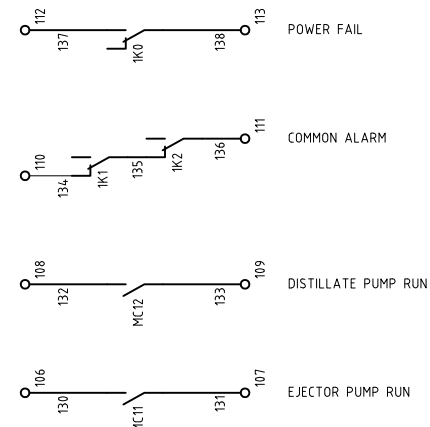
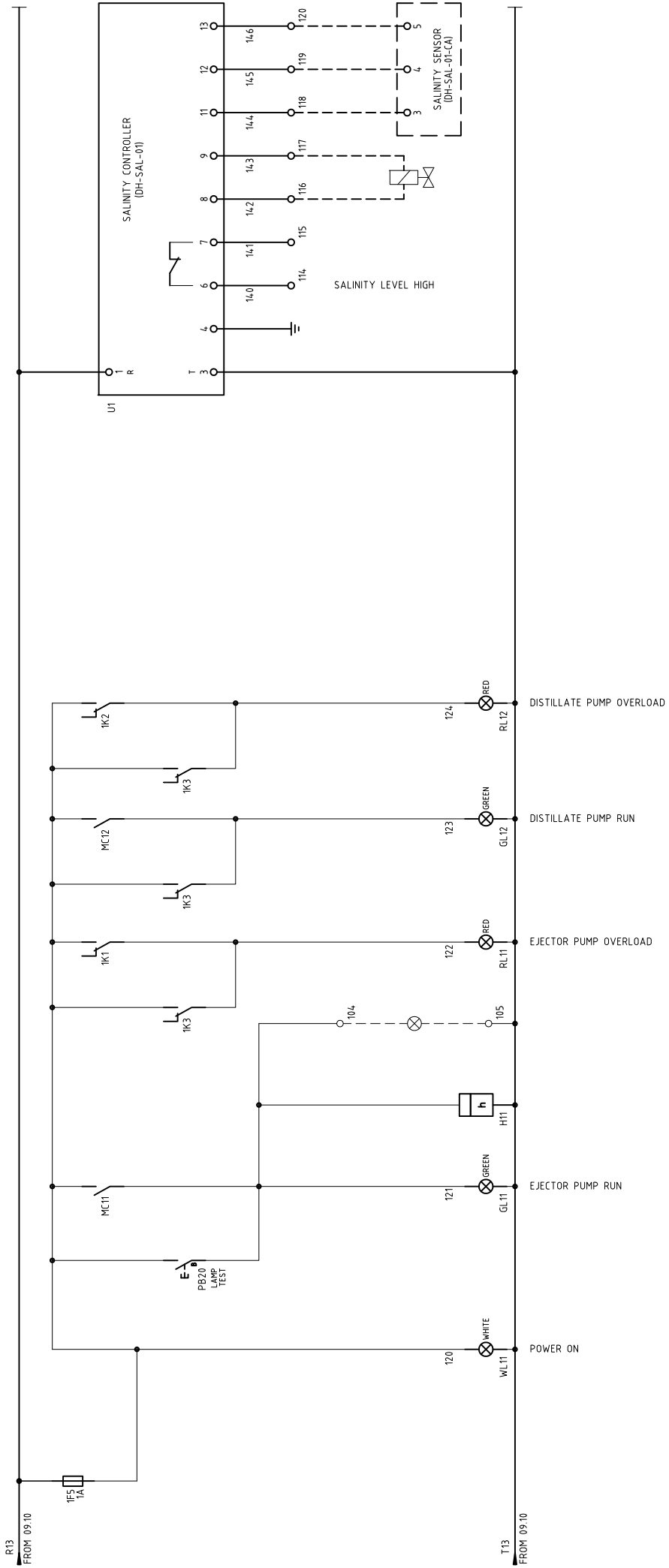


SPARE SHEET

RULE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET/1SHIP
APPROVED	PROJECT	
K. Y. JEON	HNS076	
CHECKED	TITLE	
-	N/A	F.W.G CONTROL PANEL PANEL LAYOUT
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 05
<i>DongHwa Eng'g</i>		REV.
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No.	Description	Maker	Type	Q'ty	Tag No.	Remark
1	MOLDED CASE CIRCUIT BREAKER + HANDLE + UVP	LS	ABS53c-50A	1	CB11	
2	MAGNETIC CONTACTOR	LS	MC-40a	1	MC11	
3	MAGNETIC CONTACTOR	LS	MC-09b	1	MC12	
4	OVER CURRENT RELAY	LS	MT-32/2H27	1	OCR11	
5	OVER CURRENT RELAY	LS	MT-32/2H2.1	1	OCR12	
6	1A FUSE	FERRAZ	FR10G50V1	5	1F1 ~ 1F5	
7	1P FUSE HOLDER	FERRAZ	CMS 101	5	1F1 ~ 1F5	
8	CONTROL VOLTAGE TRANSFORMER	LEEJEON	AC440/AC220V 150VA	1	TR11	
9	CURRENT TRANSFORMER (CT)	LIGHTSTART	KB25-50/5A	1	CT11	
10	A-METER	BEW	48X48 50/5A	1	A11	
11	CONTROL RELAY	WEIDMULLER	DRM570730L AC220V	4	1K0, 1K1, 1K2, 1K3	
12	HOUR METER	LEGRAND	49557	1	HH1	
13	WHITE INDICATING LAMP	HANYOUNG	MRP-TA0W	1	WL11	
14	GREEN INDICATING LAMP	HANYOUNG	MRP-TA0G	2	GL11, GL12	
15	RED INDICATING LAMP	HANYOUNG	MRP-TA0R	2	RL11, RL12	
16	GREEN PUSH BUTTON	HANYOUNG	MRP-TM2G	2	PB11, PB13	
17	RED PUSH BUTTON	HANYOUNG	MRP-TM2R	2	PB12, PB14	
18	SALINITY CONTROLLER	DONGHWA ENTEC	DH-SAL-01	1	U1	
19	SALINITY SENSOR WITH CABLE	DONGHWA ENTEC	DH-SAL-01-CA	1	-	
20	RPB	SCHNEIDER	REFER TO RPB DRAWING	1	-	
21	BLACK PUSH BUTTON	SCHNEIDER	MRP-TM2BK	1	PB21	
22						
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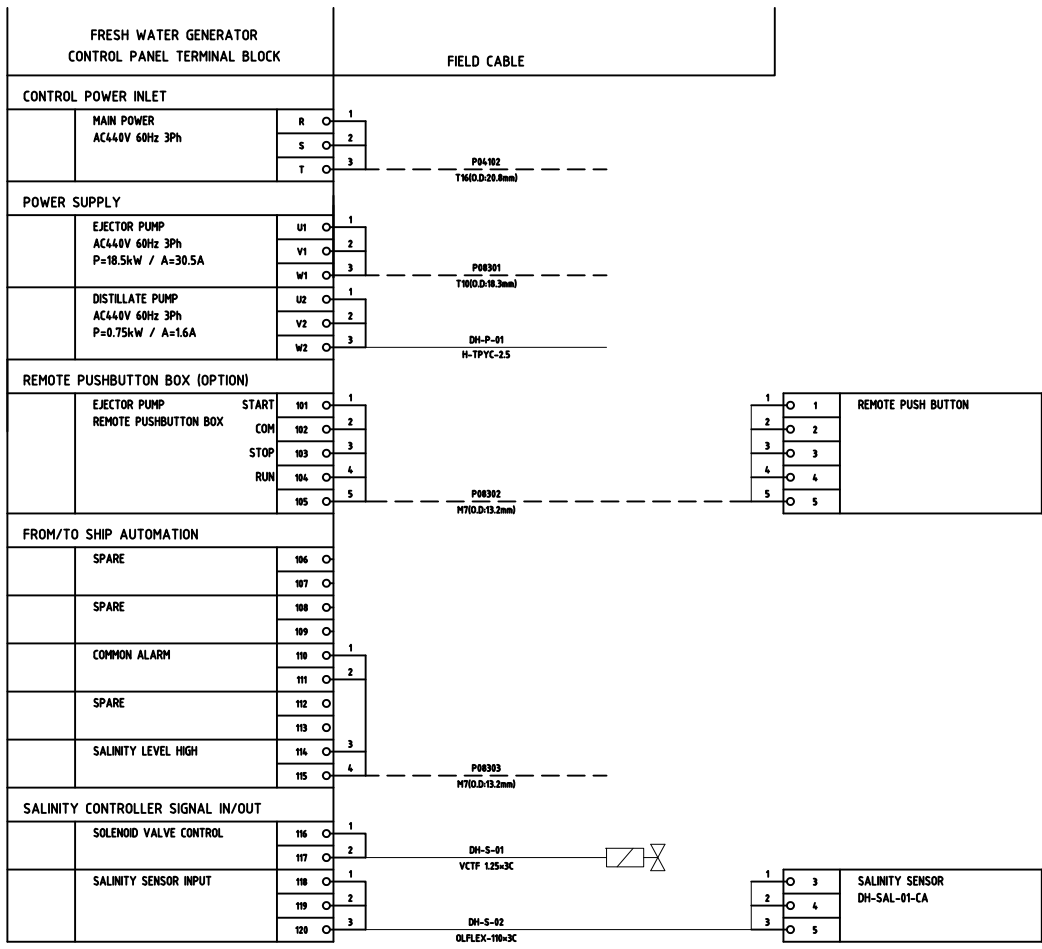
ROLE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET / 1SHIP
APPROVED	PROJECT	
K. Y. JEON	HNS076	
CHECKED	TITLE	F.W.G CONTROL PANEL PART LIST
-	SCALE	N/A
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 06
DongHwa Entec		
F	REV.	



ROLE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET/1SHIP
APPROVED	PROJECT	
K. Y. JEON	HNS076	
CHECKED	TITLE	
-	N/A	F.W.G CONTROL PANEL WIRING DIAGRAM
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 07
REV.		F



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YARD CABLE
MAKER CABLE

NO. REQUIRED	1SET / 1SHIP
CUSTOMER	DHSC
PROJECT	HNS076
SCALE	N/A
TITLE	F.W.G CONTROL PANEL TERMINAL DIAGRAM
PROJECTION	3RD
DWG. NO.	Y1520001 - 08
DATE	2022.07.18
DRAWN	D. S. KIM
APPROVED	K. Y. JEON
CHECKED	-
ROLE	DIV
REV.	F

DongHwa Entec

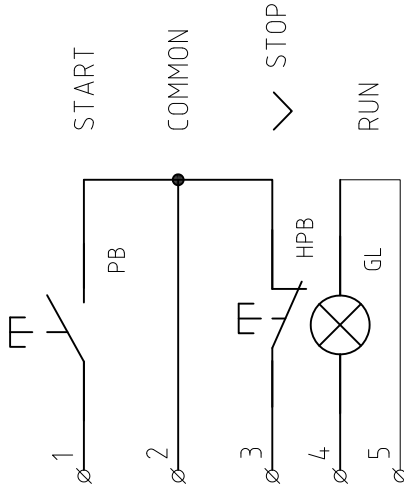
NAME PLATE

NO.	DESCRIPTION	REMARK
NP1	Ejector Pump for F.W.G	40x20
NP2	START&RUNNING / STOP HOLD	20x80
NP3	CABLE GLAND (CABLE O.D : 10.1 ~13mm)	OSNU20

PART LIST

NO.	DESCRIPTION	MAKER	MODEL
1	CASE	FIBOX	ABS C 85 G
2	RUN P/B WITH RAMP	SCHNEIDER	XB5-AW3M5
3	STOP HOLD P/B	SCHNEIDER	KH22012S
4	CABLE GLAND	OSOG	OSNU20
5	CABLE	SCP	1SQ

WIRING



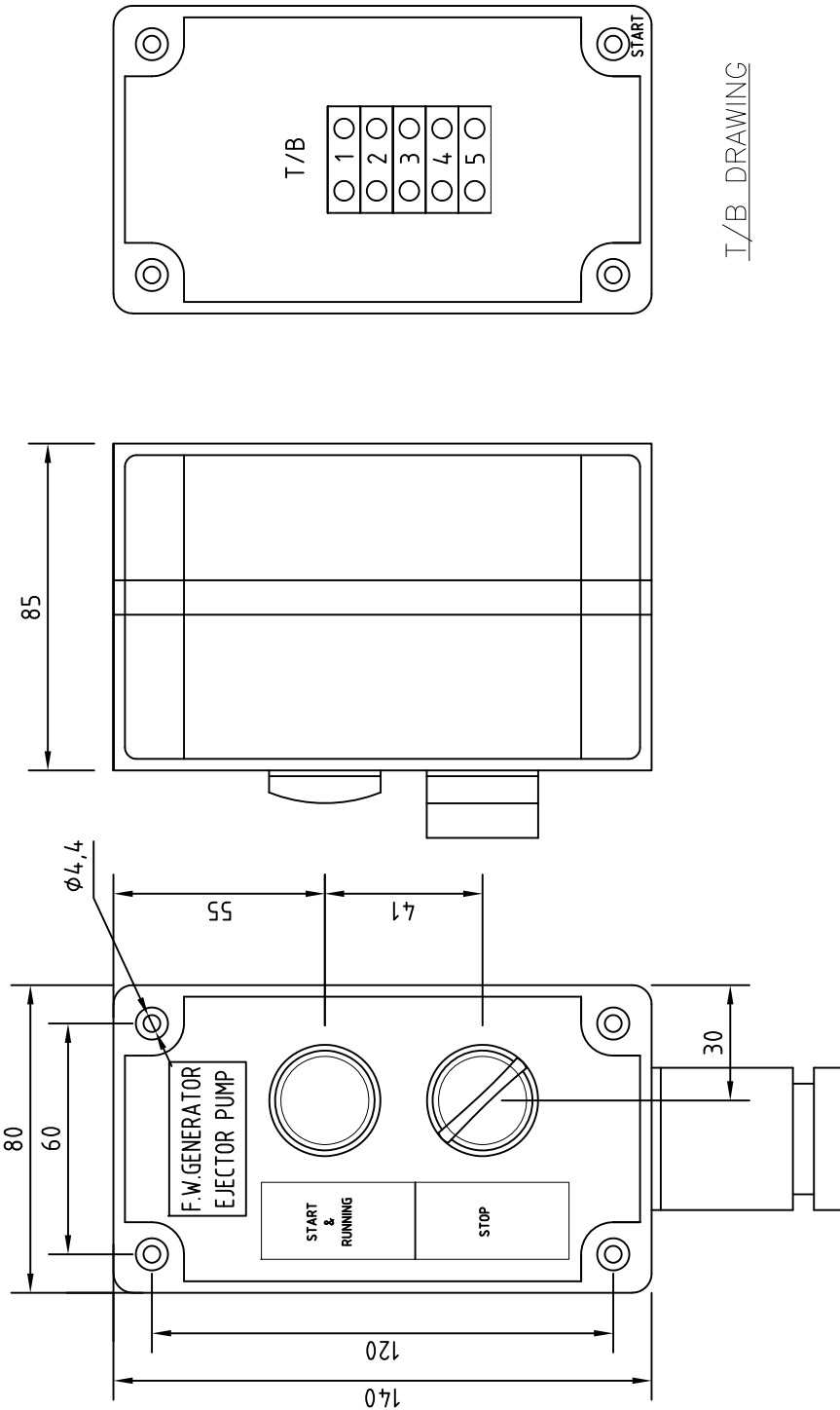
PANEL SPECIFICATION

1. BOX MATERIAL : ABS
2. PANEL IP GRADE : 44
3. PANEL COLOR : GREY
4. WEIGHT : 0.35 Kg (cbbt)
5. Q'TY : 1 SET

ROLE	CUSTOMER	NO. REQUIRED
DIV	DHSC	1SET/1SHIP
APPROVED	SCALE	PROJECT
K. Y. JEON	N/A	HNS076
CHECKED	TITLE	F.W.G CONTROL PANEL
-	-	FBP_DRAWING
DRAWN	PROJECTION	DWG. NO.
D. S. KIM / 2022.07.18	3RD	Y1520001 - 09

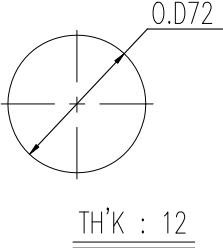
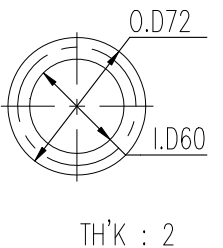
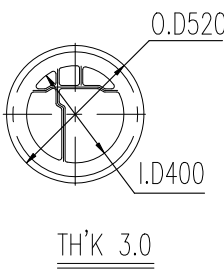
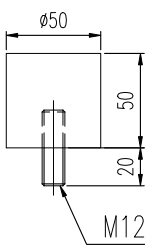
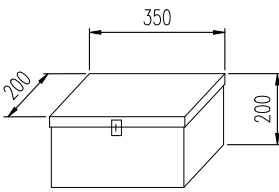
DongHwa Entec

F REV. PAGE NO. : 12



I/B DRAWING

LAYOUT

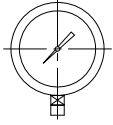
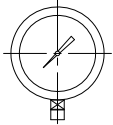
SPARE PARTS LIST							PAGE	1 / 2
25 TON/DAY F.W GENERATOR							USED FOR	
							BOX NO.	
NO.	NAME	SKETCH	MATERIAL	SUPPLY (per ship)		DRAWING		REMARK
				WORK	SPARE	NO.	PART NO.	
1	SIGHT GLASS		TEMPERED GLASS	1	1			FOR SIGHT GLASS CONN.
2	GASKET		NBR	2	2			FOR SIGHT GLASS CONN.
3	GASKET		NON-ASBESTOS	2	2			FOR CONDENSER COVER
4	PROTECTING ANODE		ZINC	6	12			FOR CONDENSER COVER LIFE TIME : 6 MONTHS (for 1 year)
5	SPARE PARTS BOX		STEEL		1			WITH LOCK & KEY
MFR'S NAME		<i>DongHwa Entec</i>						

SAVE NAME : SPARE 1 - 25ST

NOTICE !

THESE PLUS SPARE PARTS WILL BE PROVIDED ALONG WITH SPARE FOR FREE,
IN CASE OF ANY PROBLEM, YOU CAN USE THESE WITHOUT ISSUING CLAIM REPORT.

PAGE	2 / 2
USED FOR	
BOX NO.	

PLUS SPARE PARTS LIST FRESH WATER GENERATOR								
NO.	NAME	SKETCH	MATERIAL	SUPPLY (per ship)		DRAWING		REMARK
				WORK	SPARE	NO.	PART NO.	
6	COMPOUND GAUGE	 <u>4K(bar)-760mmHg</u>	SPCC		1			A TYPE PF1/4"
7	VACUUM GAUGE	 <u>-760~0mmHg</u>	SPCC		1			A TYPE PF1/4"
8								
9								
10								

NOTE : ABOVE PARTS ARE NOT INCLUDED TO OUR HEAT EXCHANGER'S PRICE.

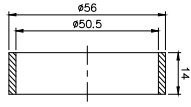

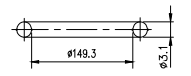
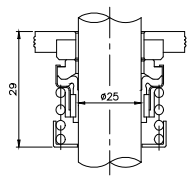
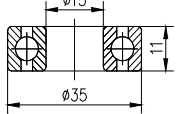
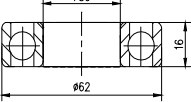
ABOVE PARTS ARE PROVIDED FOR FREE AND THE MAIN PURPOSE IS TO PREPAIR OF ANY POSSIBLE ISSUED CLAIMS
AGAINST ON PLUS SPARE PARTS AFTER SHIP'S DELIVERY. THUS WE HOPE ABOVE LIST COULD BE MUCH HELPFUL
WHEN PROBLEM HAPPENS ON PLUS SPARE PARTS DURING THE GUARANTEE PERIOD.

MFR'S NAME	<i>DongHwa Entec</i>
------------	----------------------

SAVE NAME : SPARE 2



SPARE PART LIST FOR DISTILLATE PUMP

NO.	NAME	SKETCH	MATERIAL	SUPPLY		DRAWING	REMARK
				WORKIN G/PUMP	SPARE /PUMP	PART NO.	
1	CASING RING		BRASS	1	1	3031608	
2	BRACKET RING		BRASS	1	1	3031610	
3	O-RING		RUBBER	1	1	3030465	
5	MECHANICAL SEAL		CARBON CERAMIC	1	1	3031838	
6	BALL BEARING END-B		SPECIAL STEEL	1	1	38301155	6202ZZ
7	BALL BEARING END-A		SPECIAL STEEL	1	1	38301180	6206ZZ

INSTRUCTION MANUAL

FRESH WATER GENERATOR (SHELL & TUBE TYPE)

DongHwa Entec

7, Noksansandan 261-ro, Gangseo-gu, Busan, 46753, Republic of Korea

TEL : + 82 51 970-1000 FAX : + 82 51 970 - 1105

Web Site : www.dh.co.kr

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2. SAFETY INSTRUCTION AND WARNING	4
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3-1. Working description with engine jacket cooling water heating	5
3-2. Working description with saturated steam heating	6
3-3. Installation description	7
3-4. Installation description of the steam injector	7
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4-2. Regulating the capacity	11
4-3. Stopping	12
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5-3. Stopping	16
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1. SAFETY INSTRUCTION

Before using this item, please read the INSTRUCTION MANUAL.

Follow warning label, instruction and caution procedure in order to use it correctly.

It is also highly recommended to always keep the INSTRUCTION MANUAL at the same place for easy access.

Transportation, installation, piping, wiring, operation inspection and maintenance work must be done by only a LICENSED and/or AUTHORIZED PERSON who has enough knowledge on health and safety rules and regulations as well as on his or her profession.

In any respect, we'll not guarantee for any death, injuries, damages and losses, which result in modification without our written authorization or using and assembling unauthorized parts.

During disposing, any accessories, used parts and oil, should be treated as general industrial waste.

WARNING LABEL and SIGN in the instruction manual are classified into WARNING, CAUTION and NOTICE as described below.

WARNING



Indicates potentially hazardous situation which, if not avoided, may result in death or serious injuries.

CAUTION



Indicates potentially hazardous situation which, if not avoided, may result in damage, defect or injuries.

NOTE



Indicates potentially hazardous situation which, if not avoided, could result in damage to the equipment.
It will be only used for protecting but not safety.

2. Safety instructions and warning



The user and operator must have to read these instructions and the attached documents and drawing before the installation, operation and inspection or maintenance of the plant, so it should be used properly.



1. In operating Steam Injector mode, Steam Condensate valve must be fully opened and Steam Inlet Valve must be slowly opened by operator.
2. No valve/cocks shall be fitted on steam drain discharge piping to prevent fresh water generator from being pressurized by steam.



1. Welding or other working with fire should be severely prohibited to prevent coating and gasket of the plant.
2. The Fresh Water Generator is not to be operated in polluted water or within 30 kilometers from the coast.
3. Observe the following items strictly for protection of tube sheets and cooling tubes of condenser from corrosion and erosion.
 - 3-1. While operating the plant, open cooling water inlet valve of condenser fully and regulate cooling water quantity by outlet valve only and keep the back pressure at minimum about 0.2~0.3 kg/cm²G.
 - 3-2. Regulate cooling water outlet valve so as to keep the prescribed temperature difference between inlet and outlet of condenser.(Please refer to the heat balance for this temperature difference.)
4. Carry out following items in order to prevent scale formations in heating tubes.
 - 4-1. Output should be kept at or less than normal capacity specified.

the deflector mounted on top of the evaporator and partly by a build-in demister. The separated water droplets fall back into the brine, which is extracted by the ejector pump.

The desalted vapour, which passes through the demister, will be sucked into vapour chamber where it will be condensed by means of incoming cold sea water.

The distilled water will be taken out by integral fresh water pump and controlled by salinometer and solenoid valve. If it is of high salt content, the solenoid valve recirculation work starts automatically to the shell or dumping line against high salt content.

Thermometers are installed for control of sea water to the condenser and engine cooling water to the evaporator. These thermometers permit control of both heating and cooling of these units.

The salinometer(salinity indicator) is connected to remote alarm so that very high salinity is registered immediately at the bridge of the ship or the engine control room.



1. For this plant, please bear in mind that the pressure of ejector inlet side should be around 3.5 bar.g in ballast and around 4.5 bar.g in loading.
2. The pressure of ejector outlet should not exceed 0.6 bar.
3. The feed water should be controlled by feed valve.

3-2. Working description with saturated steam heating.

In addition to engine jacket cooling water heating, saturated live steam can alternatively be used as heating medium for the fresh water generator.

The saturated live steam is being delivered to the heat exchanger of the fresh water generator through a steam injector.

This steam injector works as a circulating pump and heat up the circulated fresh water/steam condensate, which comes from the outlet branch of the heat exchanger of the fresh water generator.

As the heat exchanger of the fresh water generator is filled with clean fresh water or steam condensate by starting the steam heating process. The produced steam condensate from the supplied saturated live steam escapes from the socket in the vertical safety blow off pipe. This condensate is led back to the boiler feed water tank or hot well of the boiler through the condensate outlet placed on the safety blow off pipe.

3-3. Installation description

Please check the installation drawing and technical specification, overhaul space in installation fresh water generator.

Be aware that it must be possible to read the value of thermometer and other gauge.

To avoid the unnecessary pressure drop, the connection pipe should be simple, because it could effect the specified pump efficiency and produced fresh water capacity.

Check the specified quantity of jacket water and sea water, steam flow through the evaporator properly.

The fresh water pipe should be connected to the fresh water tank of the ship.

It is recommended that the fresh water outlet line should be used stainless steel or non-ferrous piping material, because the produced water made by fresh water generator is of high purity, where dissolved oxygen concentration is of extremely low level. If dissolved oxygen's quantity is low then oxide film will not be developed by which it will be very unstable chemically. So this water tends to stabilize itself by resolving and contacting with other substances. As the result, the color of water may changes to be red or brownish.



Shipyard should consider designing pipe lines for below. If it is not satisfied, F.W.Generator maker doesn't guarantee for performance.

1. For this plant, please bear in mind that **the pressure of ejector inlet side should be Min. 3.5 bar in ballast** and around 4.5 bar in loading.
2. **The pressure of ejector outlet should not exceed 0.6 bar in laden condition.**
<See the Fig.1-1, 1-2>
3. The counter pressure in the fresh water outlet pipe should not exceed 1.8 bar and below 0.1bar.<See the Fig.2>

The combined ejector-sea water pump is designed to withstand on a level with and in close vicinity to the fresh water generator and for a maximum counter-pressure in the overboard piping of 0.6 bar. If this is impossible, it should be dimensioned for additional lifting height, and pipe resistance and ejector should be designed accordingly.

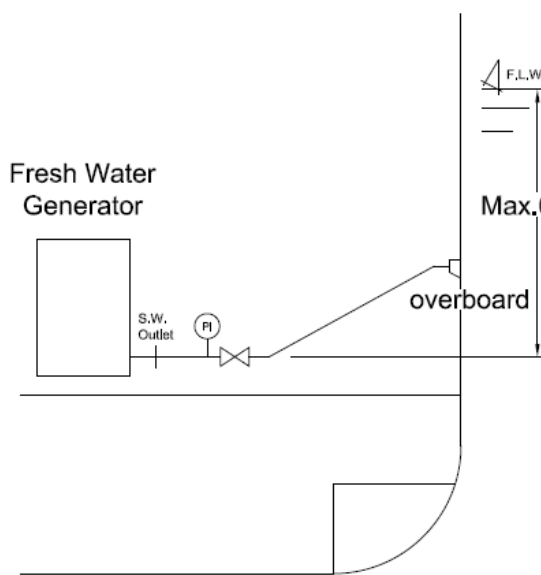
3-4. Installation description of the steam injector

If the back pressure is exerted on the discharge line of the steam drain of the steam injector, extraordinary vibration may occur in the injector and there is maximum possibility that the operation of the system may become impossible.

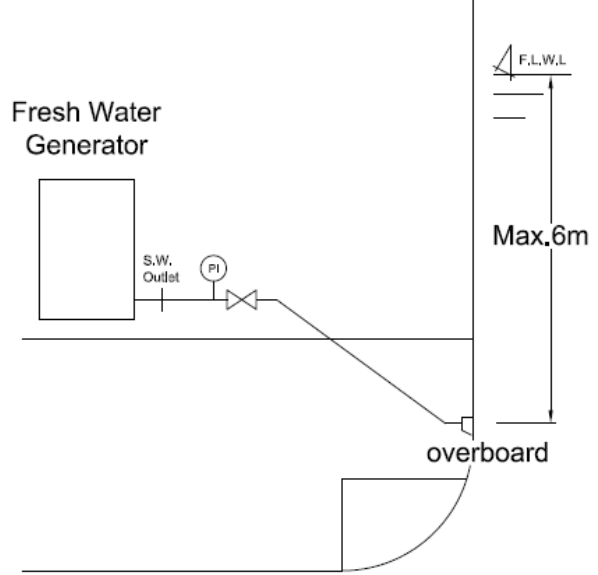
If the pressure after the steam injector exceed 1 bar, the safety valve will be opened to secure the plate.

If the supplied steam pressure is lower than the designed pressure, the vibration may be caused to the system. The fluctuation from the designed value must be within about $\pm 5\%$.

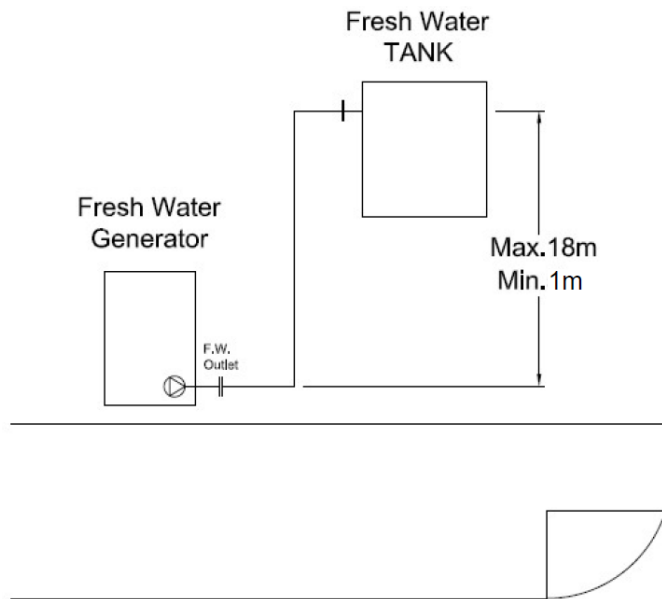
[FRESH WATER GENERATOR INSTALLATION POSITION]



<Fig.1-1>



<Fig.1-2>

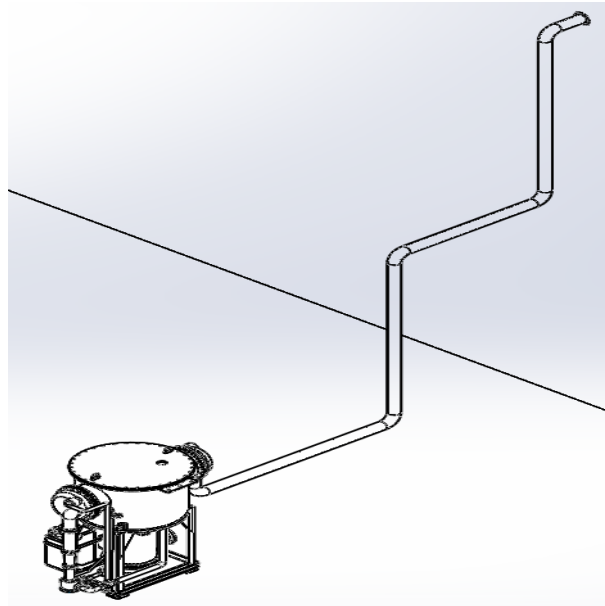


<Fig.2>

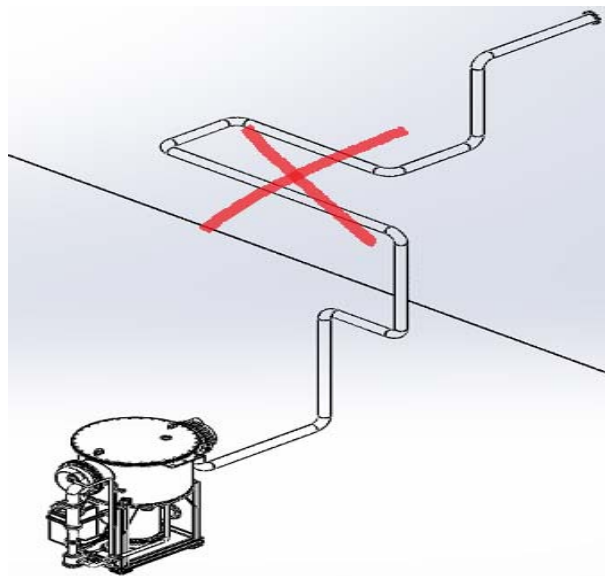


This position is reference for height. Shipyard shall consider S.W.Ejector pump head and S.W.Piping system pressure drop additionally.

[FRESH WATER GENERATOR OVERBOARD PIPING]



<Fig.2-1>



<Fig.2-2>



This piping arrange is reference for over board of sea water. Shipyard shall consider and adjust sea water piping pressure drop as like as sea water ejector pump head.

4. Operation(DX – α– Series) with Jacket Cooling Water

4-1. Starting up the plant



Before operation, please check the following matter

- Please observe instructions for feed water treatment, see “chemical dosing part.”
- Check the rotating direction of distillate pump.
- Close in/outlet valves for jacket cooling water of evaporator.
- Close vacuum breaker valve.
- Close feed water inlet valve for evaporator.
- Close outlet valve for distillate pump.
- Close the bottom drain valve.
- Open in/outlet valves for condenser cooling water.



1. Never start the fresh water generator's distillate pump under dry condition.
2. The S.W.Flow rate should be keep as specified rate.
(The flow rates depends on S.W.Ejector pumps's total head)

Step. 1 : Start the sea water ejector pump.

- ① Fully open the ejector pump suction valve as well as the overboard discharge valve.
- ② Start the ejector pump.
- ③ Slowly open the ejector pump discharge valve.

** Make Sure that the pressure at the water ejector inlet is 3 kg/cm² or more.

Step. 2 : Wait for sufficient vacuum.(about 92%)

Step. 3 : Open the feed water valve and feed sea water into the evaporator.

The feed water valve is to be fully opened to prevent formation of scale on the evaporate tube, but in case the salinity is some increased, the feed valve is to be closed a bit.

Step. 4 : When the vacuum in the fresh water generator keep up, open the inlet and outlet valves for jacket cooling water of the heat exchanger. The in/outlet valve for jacket water cooling water is to be opened slowly.



Avoid the thermal shock to your main engine. The inlet and outlet valves of jacket water cooling water to be opened and closed slowly and progressively. While the obtained vacuum drops to around 85%, the boiling temperature now rises. This indicates that evaporation has started.

Step. 5 : The air vent cock at the upper part of the heat exchanger should be opened whenever jacket cooling water passes through the heat exchanger and should be closed after confirmation of complete discharge of air in the shell.

Step. 6 : Salinity alarm should be operated in order to check the purity of the fresh water.

Step. 7 : When the distillate fresh water comes up to the sight glass of the suction pipe of distillate pump, start the distillate pump. The level should always be fixed(normal discharge pressure is 1.5~2.5 kg/cm²). Fresh water quantity is increased as the sea water temperature falls after adjusting to the fixed fresh water quantity. Naturally water level at the distillate pump suction side increases, produced water stays inside of the condenser, the effective heating area of the condenser decreases, evaporation quantity decreases accordingly. The operating condition should be properly balanced.

4-2. Regulating the capacity.

The capacity(quantity of produced water) of the fresh water generator is regulated by increasing or decreasing the quantity of jacket cooling water to the heat exchanger. The capacity of the plant is measured by the water meter. The quantity of the jacket cooling water is regulated by the by-pass valve until the item produces its normal capacity. In case the temperature of the jacket cooling water is lower than the prescribed value, the flow quantity passing through the heat exchanger should be increased bit more. The supply of cooling sea water to the condenser should be regulated such that the cooling sea water temperature rises to the prescribed value when passing through the cooling tubes of the condenser.

While the evaporation temperature is too low, which may occur at low sea water temperature area, the vacuum breaker valve should be opened a little or the quantity of the cooling sea water for the condenser should be decreased, which can rise the evaporation temperature. If the evaporation temperature is too high, which may occur at high cooling sea water temperature, the quantity of cooling sea water to the condenser is increased, which will make the evaporation temperature drop.

Too high evaporation temperature will increase the risk of scale formation in the tubes of the heat exchanger, and too low evaporation temperature will result in great vapor volumes mean a risk of sea water drop is brought to the condenser resulting in fresh water with too high salt content.

4-3. Stopping

When the vessel approaches a port, land or estuary the fresh water generator is desirable to be stopped because the sea water may be heavily infected with bacteria at such places and there is a risk that bacteria can be transferred to the produced fresh water.

The following steps should be followed sequentially for stopping operations.

Step. 1 : Open the bypass valve for engine cooling water slowly.

Step. 2 : Close the inlet and outlet valves for engine cooling water for the evaporator progressively.

Step. 3 : Close valve for feed water treatment.

Step. 4 : Stop the distillate pump.

Step. 5 : After cooling the evaporator side as below 50°C, close the feed water valve.

Step. 6 : Stop the ejector pump.

Step. 7 : Close the sea water valve before the ejector pump and the overboard valve
After the ejector.

Step. 8 : Open the vacuum breaker valve.

Step. 9 : Close the valve to fresh water tank.

Step. 10 : Open the drain valve on the branch line of sea water feed.



1. Supply the feed water for few minutes in order to cool the heat exchanger.
2. Never try to open the bottom blow off valve in order to make atmospheric pressure because sea water in the heat exchanger spout and strike the deflector.
3. In case the item is not operated for a long time, the sea water of heat exchanger should be drained out completely by opening the bottom blow off valve at the bottom of the heat exchanger.

4-4. Attention during operation

1) Regulating the capacity

The capacity of the fresh water generator is affected by regulating the amount of jacket cooling water to the heat exchanger.

Although when the tubes are clean, the fresh water generator can be able to produce fresh water in excess of its rated capacity. But we recommend to operate the item at the prescribed quantity of fresh water or less production with excess can involve the risk of scale formation.

2) The condenser

In order to condense all generated vapor in the heat exchanger, sea water flowing to the condenser should be as cold as possible and temperature difference of cooling sea water between inlet and outlet of condenser should be checked for regulating the amount of cooling sea water.

In case of supply of excess cooling sea water, turbulent corrosion may be caused due to too high velocity in the cooling tube of condenser.

On the contrary, when cooling sea water is insufficient, the capacity of produced fresh water will be decreased due to short cooling performance.

Calculation the quantity of cooling water of condenser should be according to below equation.

$$Q = (D \times 24.5) / (t_2 - t_1)$$

Where,

D	:	Capacity of produced fresh water (T/day)
t ₁	:	Inlet temperature of condenser
t ₂	:	Outlet temperature of condenser
Q	:	Capacity of cooling sea water

When the various data are recorded regularly, standard of comparison among all data can be done. In case of rise of any irregularities or troubles in connection with operation of fresh water generator, it results in recording of irregular data accordingly.

5. Operation(DX – α - Series) with Steam Injector

5-1. Starting up the plant



Do not open steam inlet valve for the steam injector operation before the ejector pump has been started and serving feed water to the evaporator.



- Open the priming valve and fill the evaporator section with fresh water. If any air is present in the shell inside. Such air can also cause abnormal noise or vibration due the cavitation or pulsating movement of inside water.

Do not open the steam valve rapidly. If so, water in the shell will pour into the drain tank and cause vibration.

If steam pressure is lower than the designed value, inside water will pulsate and cause abnormal noise and vibration.

The steam arrangement must be filled with fresh water from hydrophore system, before supplying steam to the system.

No valve at all should be fitted on the pipe from the safety valve as this pipe must be opened to the atmospheric pressure.

Max. back pressure in condensate discharge line is 0.6 bar.

When stopping the plant, check that the steam inlet valve is always completely closed.

This to avoid high temperature in the evaporator, as this might cause;

- Scale formation on the inside of the heat exchanger tubes.

Step. 1 : Close the inlet and outlet valves to jacket cooling water completely, and open the valves in the drain line for draining jacket cooling water.

Step. 2 : After blowing jacket cooling water, open the two butterfly valves in the steam injector circuit.

Step. 3 : Close the drain cock and steam drain line, open the air vent valve for evaporator and then fill up the plant with boiler feed water or clean fresh water until the priming water flow out through air vent valve for evaporator.

When you check it, open the steam drain valve and close air vent valve for evaporator.

Step. 4 : The cock at the top of the drain pipe should always be opened because it serves as a syphone breaker.(Syphone breaker is not necessary when a drain tank is installed on the higher location than fresh water generator or on the same floor.)

Step. 5 : Open the feed water valve and feed sea water into the evaporator. The feed water valve is to be fully opened to prevent formation of scale on the evaporate tube, but in case the salinity is some increased, the feed valve is to be closed a bit.

Step. 6 : After the above mentioned preparation, open the steam valve gradually before the steam injector in order to steam supply initial during 10 min. Fresh water in the piping is circulated as well as heated by steam. As heating fresh water is cooled in the evaporator section plate, steam drain goes up through the drain pipe and then it is exhausted into the drain tank.



The steam supplied to the steam injector must be saturated steam.

5-2. Regulating the capacity.

The fresh water production can be regulated by adjustment of the quantity of steam supplied to the steam injector.

The steam inlet pressure corresponding to the production of fresh water in question can be regulated either by means of a manually operated regulating valve (yard supply) or by an automatic reduction valve(yard supply).

DongHwa Entec recommended that you will operate the plant at the prescribed quantity of fresh water or less production but in excess hereof can involve the risk of scale formations.



Steam pressure must be in accordance with pressure stated in "FWG Order Specification."

5-3. Stopping.

Step. 1 : Fully close steam inlet valve(yard supply).

Step. 2 : After cooling the evaporator side as below 50°C, close the feed water valve.

Step. 3 : Stop the distillate pump.

Step. 4 : Stop the ejector pump.

Step. 5 : Close the sea water valve before the ejector pump and the overboard valve after the ejector.

Step. 6 : Open the vacuum breaker valve.

Step. 7 : Close the valve to fresh water tank.

Step. 8 : Open the drain valve on the branch line of sea water feed.



During the operating with steam injector, do not close the feed valve, if not so the saturated steam overboard to steam drain line. In that case, we'll do not **GUARANTEE FOR FORMATION OF ANY SCALE IN EVAPORATOR AND INJURIES.**

6. Inspection

At regular intervals, for instance twice a year, the top cover of the separator shell and the bottom cover of the heat exchanger should be removed in order to inspect any formation of scale in the tubes and the presence of exfoliation inside coating.

At the same time, the condenser covers should be removed in order to check that the condenser cooling tubes are not fouled with sludge or other foreign substances. The pumps should be inspected and cleaned regularly, and the corroded parts, if any, should be replaced with spare ones.

- 1) After inspection, if there is any difficulty in maintaining the vacuum a leak test should be carried out, as in course of time leaks may occur due to deterioration of packings and joints



This test procedure should be as follows.

- Step. 1 : Close the outlet valve of the distillate pump, vacuum breaker valve, bottom below off valve and feed water valve.
- Step. 2 : Inject air to evaporator shell.
- Step. 3 : Keep the shell pressure of about 0.5 kg/cm²G.
- Step. 4 : Spray soap solution to packing and joints.

- 2) Pressure test of the condenser and the heat exchanger

Condenser

Remove the water chamber of the condenser, keep the inside pressure of the shell about 0.5 kg/cm² by injection air to the inside of the evaporator and find out the presence of any leakage by spraying soap solution.

Evaporator(Heater)

Remove the bottom cover of the heater. Presence of any leakage can be found out by maintaining 4~5 kg/cm² water pressure on the shell side.

For finding presence of any tube cracks and pin holes, spread soap solution on the surface of tube plate and give the atmospheric pressure of 1.0 kg/cm² on the shell side.

7. Tube Cleaning (De-Scaling Method)

7-1. Cleaning interval for de-scaling

The fresh water generator is equipped with a heater, a condenser and a preheater.

Under normal operation, presence of scale generally forms mainly in the heating tubes of the heater and hardly found in the cooling tubes of the condenser.

Chemical cleaning of the whole system can be made by fitting adapter(option) to the thermometer connection of the inlet condenser water chamber. Sea water boils and evaporates in the heating tubes and consequently sea water touching the heating tubes is considerably concentrated and supersaturated. This is why scale is deposited in the heating tubes.

Cleaning(de-scaling) of the inside of the heating tubes should be made twice or three times a year in general. However, the time interval depend upon the operating conditions and the properties of sea water.

Therefore, the following phenomena should be noted as standards for judging the time period of cleaning.

1) Quantity of jacket water cooling water can be estimated by temperature difference at the outlet and inlet of the heater. When the temperature in the shell is kept at or below evaporation temperature of the heat balance, much more jacket cooling water quantities required than that of the heat balance in order to produce the fixed capacity of fresh water.

$$QJ = (23.6 \times D) / T \text{ (T/h)}$$

Where,

- D : Capacity of produced fresh water (T/day)
 QJ : Jacket Cooling water quantity(T/h)
 T : Temperature difference at the outlet and inlet of the heater

2) When the vessel is fitted with steam injector, condition of scale formation can be easily found out. While the temperature in the shell is kept same as that of the heat balance as well as option 1), inlet temperature of jacket water cooling water is balanced at higher temperature than before.

When a steam injector is used, quantity of produced fresh water is not changed. If is necessary to keep operation log for checking of scale formation.

If any of the above mentioned phenomena is observed, remove the sight glass in front of the separator shell and condition for scale formation is to be checked by using other special tools.

7-2. Chemical Cleaning Method

Scales may be either peeled off by physical methods or dissolved by chemical methods, the former method includes the use of brush and drill, the rapid cooling method, injection of pressurized water etc., but it is rather difficult to remove scale completely by these methods. We will explain a method to use chemicals which prevails recently because it requires shorter cleaning time, hardly damage the tubes and is economical and effective.

- 1) Preparations for cleaning
 - a) Draw sea water in the shell from the bottom blow off valve.
 - b) Close the bottom blow off valves completely and remove the sight glass.

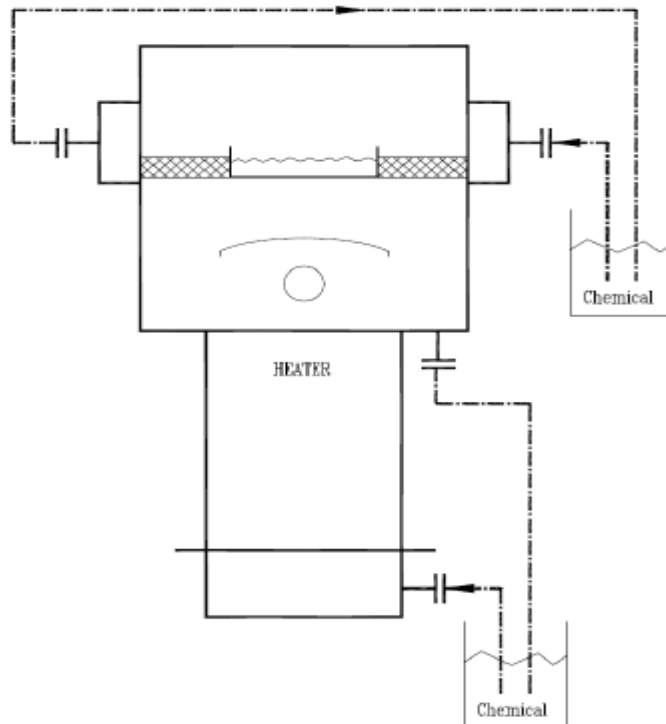
- 2) Making solution
 Make up solution in the drum.(In this case, be sure to pour water first into the drum and then add chemicals.)

- 3) Recommended types of chemicals and names of the manufacturers

Brand	Distribution
SAF – ACID	Drew chemical Corporation U.S.A.
D. S. C	Yokosuka Kase Co., Ltd. Japan
	Chiyoda Kignas Oil Co., Ltd. Japan
	Mitsukane Japan
GAMLEN XD	Gamlen Chemical Company U.S.A
ATLAS H-400	ATLAS preservative company U.K.

** Please refer to the catalogs for each manufacture for details.

- 4) Cleaning
 - a) Submerged Cleaning
 Pour solution into the heater through the sight hole until the upper tube plate is soaked and leave it as the time required for cleaning varies according to the thickness of scale. When the solution becomes saturation, it can't clean any more. In this case, interchange with new solution for few times.
 - b) Circulated Cleaning
 As per the below drawing, clean the whole system of heat exchanger by Fitting the adapter for the inlet of solution to the connection of thermometer at cooling water inlet nozzle of condenser water chamber, and using the socket f bottom cover for outlet of solution.
 Quantity of solution, required for each type is shown as below table.
 Density of solution shall be little bit higher than recommendable density by each maker. During circulated cleaning, the capacity of the cleaning tank should be prepared as the total quantity.



α- series		5	10	15	20	25	30	35	40
Submerge	Condenser	12	27	43	52	64	77	93	100
Cleaning	Heater	25	44	62	85	105	115	146	170
Circulate cleaning		37	71	105	137	169	192	239	270

5) Discharging solution after cleaning

After cleaning, solution should be discharged through the bottom blow-off valve fitted to the bottom cover of the heater. Since the above mentioned chemicals are for dissolving but not for peeling off, there is nothing to worry about damage to the impellers of the pump for clogging for the pipes.

6) Finishing cleaning by running sea water

After discharging solution, let the sea water run through the heater for the cleaning of the inside in the following way ;
Flow sea water into the heater through the feed water line. Then discharge it overboard through the ejector by operating the ejector pump. Repeat the pumping and discharging alternately until the inside of the heater becomes clean. In this case, proper care should be taken not to let sea water into the condenser.

7) Inspection after cleaning

Cleaning is usually finished when no scale is found at the upper part.
If the inside of the heating tube by putting the light from a flashlight on that part from the sight glass
However, scale forms mostly around at the part of 1/5 ~ 1/4 of the distance between the tube plate from the lower tube plate or at the lower part of the

vertical heating tube.

Therefore, make sure that the whole inside of the tube has been cleaned by thoroughly checking the lower part of the inside of the heating tube with electric light such that tube inside part can be completely viewed.

Never feed steam during the cleaning work as it can damage severely the inside coating of the fresh water generator.

7-3. Way to prolong the interval of de-scaling

In order to prolong the interval of de-scaling as long as possible, please keep the following items ;

- 1) To operate the fresh water generator with the capacity under the prescribed one.
- 2) To feed the sea water as much as possible the ejector can discharge.
- 3) If possible, not to operate the fresh water generator at the contaminated water area such as harbors, ports etc.
- 4) For stopping the plant, continue to feed water until the heat exchanger shell becomes enough cold to be able to touch by hands and fill the new sea water, which is not concentrated to the upper tube plate of the heat exchanger.

7-4. Continuous injection of feed treatment

The above mentioned cleaning method is to be applied periodically while the fresh water generator stops running.

On the other hand, the above mentioned method positively prevents formation of scale by continuous injection of the prescribed amount of feed treatment into the feed water line during the operation of the fresh water generator, thus lengthening the life-span of the plant without lowering its performance.

Recently many vessel have adopted this method due to its economical advantage.

1) Injection Method

Chemical tank piping is to be connected with the screw connection for scale inhibitor which is located behind feed water orifice, and chemicals should be supplied continuously during operation, and the feed rate can be controlled by purge meter.(Injection pump is not required because vacuum chamber is present after orifice.)

- 2) Proper care should be taken when pouring feed treatment continuously. Keep watch on the remaining quantity of solution in the tank and supply solution in proper time otherwise lest air will flow into the fresh water generator from the empty tank.

8. Repair of inside coating

If during on inspection of the fresh water generator it is found that the inside coating is damaged then repair should be done as followings ;
Damaged covering should be scraped off and surface thoroughly dried. By means of sandpaper coating, the steel surface with the width of 20mm from the damaged part is grounded and cleaned. So, coating is put on the steel surface and then Epoxy-resin is applied.

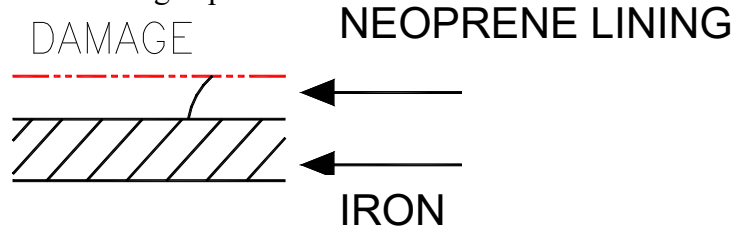
The way of coating is as following ;

1. Material for repair and its package

- Material 1) Epoxy-resin
- 2) Harder

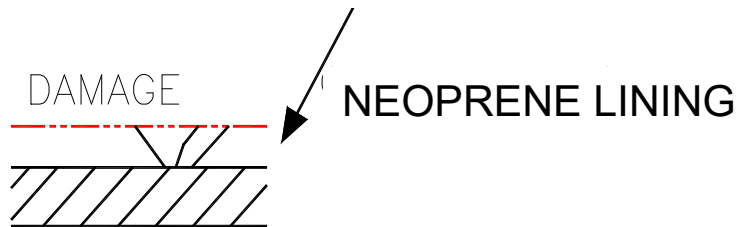
2. Method of repair

1) Kind of damaged part

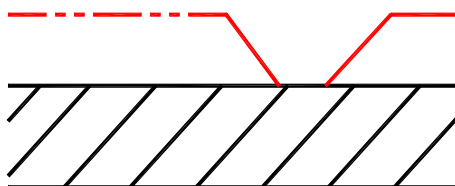


2) Method of repair

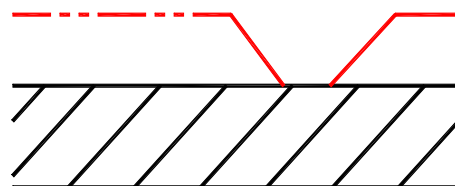
a. Grinding the damaged part by grinder.



b. Cleaning and drying.



CLEANING WITH GASOLINE



DRY WITH INFRARED RAY

Surface to be primed should be cleaned and dried. In order to clean and degrease, the surface should be wiped with a gasoline cloth. Other solvent of commercial paint can be used instead of gasoline.

- 3) Application of epoxyresin
After drying, Epoxyresin shall be applied.
Epoxyresin and curing agent should e mixed throughly.
The pot life of epoxyresin is decided on volume of the batch and the temperature. At room temperature, the pot life of the mixture of epoxyresin is about 40 minutes.
- 4) Curing of epoxyresin
Epoxyresin cures at room temperature by mixing of harder.
Curing generally completed for one or two days.

**Notice**

These material should be handled carefully. If the material touches skin, immediately wash the skin with water thoroughly.

9. Scale inhibition for fresh water generator

Mechanism of scale inhibition is to prevent scale deposits by dispersing as well as delaying reaction, which is called as threshold effect. Scale formation of calcium carbonate is produced by heating and enriching sea water into feed water. M-305 ensures stable fresh water production without long time cleaning.

10. Typical physical properties

Appearance : Light red yellow liquid
Specific gravity : 1.07 ± 0.03
PH : 10.4 ± 0.5

11. Dosage

Dosage is based on the standard of 30 gram per 1 ton produced water in case of submerged. Tube type distilling plant whose brine densities lower than 1.5 scale electromagnetic pump or vacuum injection system. Please refer to the attached chemical cosing chart.

12. Trouble Shooting

Problem	Cause	Consequence	Solution
Low Capacity	Low sea water feed rate	Scale on the heater tube	Fully open s.w feed valve & check the orifice & close the s.w outlet valve to increase the back press. Min 0.2 kg/cm ² & cleaning the plate.
	Solenoid valve is not working	Product water return to the chamber	Check the solenoid valve inside after power off
	Jacket water flow rate is not enough	The difference of J.W temp. is too high & S.W temp. is too low	Increase the J.W flow rate by by-pass valve or temp. control setting of J.W system.
	Sea water flow rate is not enough	The water ejector inlet press. is too low	Pls, check the sea water ejector pump & check the valve of s.w line as suc. & dis. & overboard line & discharge the remaining air of the pipe inside.
	Rotate direction is not correct of distillate pump	The discharge press. of distillate pump is too low	Change the distillate pump's phase.
	The outlet line valve of distillate water closed	The discharge press. of distillate pump is too high	Pls open the distillate water outlet line valve.
	The clogging the distillate water outlet line	The discharge press. of distillate pump is too high	Pls cleaning the distillate water outlet line by air.
	Vacuum condition is no good	Low vacuum	Pls check all of valves on the manual should be closed & more tight the bolt & nut of cover. Pls check the s.w ejector pump s the above. Pls check the water ejector as below.
	Hot water temp. is low		Increase the J.W temp. as spec. or our drawing.
	Flowmeter is clogging		Cleaing the flowmeter.
Non return valve is malfunction	Non condensable gas or brine is not extracted	Pls check the mounting direction and inside condition.	

Problem	Cause	Consequence	Solution
Water ejector malfunction	Inside nozzle released		Re-tight the nozzle of water ejector.
	The outlet press. is higher than 0.6 bar		Pls check the ejector outlet piping.
	Inside nozzle is worn or corroded		Change the new nozzle.
	The discharge press. of water ejector is negative		Close the overboard line valve and increase the press. as positive.
Salinity high	Leak on the condenser		Pls demount the condenser cover & do it the leak test in case there is leak, pls change the condenser tube
	Salinity indicator malfunction	Salinity fluctuating & wrong indicating	Pls check the salinity sensor & controller as manual
	Too much capacity		Reduced the capacity
	Evaporating temp. is too low		Open the vacuum breaker valve and increase the eva. temp.
	Demister is wrong position		Check the demister and remount it.
	Distillate water outlet clogging		Cleaning the distilled water outlet line by air
	Brine extraction is not sufficient		Check the water ejector as the above.
Overflow on the air suction line	Distilled water outlet line clogging		Cleaning the distilled water outlet line by air.
	Distillate pump is out of order		Check the distillate pump.
	Distilled water outlet line valve closed		Open the distilled water line valve.
	Leaking on the pipe line		Check the pipe line from con. to pump.
Evaporating temp. is low	Jacket water temp. is too low		Increase the jacket water inlet temp.
	Jacket water flow rate is not enough		Increase the jacket water flow rate.

Problem	Cause	Consequence	Solution
Evaporating temp. High	Water ejector mal-Function	Brine extraction is no good	Check the water ejector as the above.
	Distilled water line malfunction	Discharge of distilled water is no good	Pls check the distilled water outlet line.
	Condenser malfunction	Temp. difference of s.w side is too low	Pls check the condenser plate.
	S.W flow is not enough		Pls check the s.w line & ejector Pump.
Brine extraciton is not sufficient	Ejector pump is too low		Check the s.w ejector pump.
	The nozzle of water ejector release		Re-tightening the water ejector nozzle.
	Back press. is too high		Examine the check valve and direction.
	Orifice of s.w feed line is not corredt		Pls check the orifice inner Diameter.
Too low front Pressure of Ejector	Suction strainer is blocked		Clean the s.w strainer.
	Suc. & discharge valve closed		Examine the valve and full open
	Ejector pump is mal-Function		Check the s.w ejector pump.
	The rotate direction of s.w pump is opposite		Change the phase of s.w ejector pump
The pump does not run	The motor is out of order		Change the motor.
	The pump has seized		Change/repair the motor.
The specified flow rate is not reached	The pump sucks air		Repair the leaking part.
	The suction pipe and/or Strainer is clogged		Clean it.
	The impeller is clogged		Clean it.
	The direction of motor Rotation is reverse		Recover the normal direction of rotation.
The specified Is not reached	The pump sucks air		Repair the leaking part.
	The revolution speed Has reduced down		Check the power source.
	The casing ring is worn down		Replace it with a new one.
	The impeller is worn down		Replace it with a new one.

Problem	Cause	Consequence	Solution
At starting, water is discharged but stops soon	Air remain in the suction pipe		Discharge the remaining air out of pipe.
	The pump sucks air through the stuffing box		Check the mechanical seal.
The motor is Loaded excessively	The bearing is defective		Replace it with new one.
	The mechanical seal is damaged		Replace it with new one.
	The shaft connection is bad		Correct the alignment of the Shaft.
The pump vibrates abnormally	The impeller is unbalanced		Reassemble the pump properly.
	The bearing is assembled wrongly		Reassemble the bearing prpperly
	The shaft connection is bad		Correct the alignment of the Shaft.
	The shaft is bending		Replace it with a new one.
	The pump is not installed properly		Reinstalled the pump.
	The bearing is worn down		Replace it with new one.
The bearing is overheated	The bearing is assembled wrongly		Reassemble the bearing properly
	The shaft connection is bad		Correct the alignment of the shaft.
	The shaft is bending		Replace it with a new one.
	The thrust is increased		Reassemble the bearing.

13. Maintenance List

Item	Object	Contents	Interval			
			Every month	Every 3 month or 2000 hrs	Every 6 month or 4000 hrs	Every year or 8000 hrs
Eva-porator (Heater)	Tube	Exchanges when the wound on the both sides of the heat transfer tubes and tube sheet are confirmed and there is damage.				○ ※ 1
Condenser	Tube	Exchanges when the wound on the both sides of the heat transfer tubes and tube sheet are confirmed and there is damage.				○ ※ 1
	Protecting anode	If it is corroded substantially Replace it with a new one			○ ※ 2	
Chamber	Demister	Inspect them and if there is any abnormality, clean them and/or change the defective one				○
Feed water pipe	Feed water orifice & water inner pipe	Clean them and check their bore				○
Sight glass	Glass	Clean it				○
Non-return valves	Scale formations mobility of flap	Cover is removed, housing and non-return valve are controlled and cleaned				○
Flow meter	Suction strainer	Clean and inspect it				○
Water ejector	The inner surface of the nozzle & diffuser	Inspect and clean the inner surface, and if it is worn down or damaged substantially replace it with a new one				○

Item	Object	Contents	Interval			
			Every month	Every 3 month or 2000 hrs	Every 6 month or 4000 hrs	Every year or 8000 hrs
Salinity indicator	electrode	Clean it with care not to damage the element. Measure its insulation resistance, and treat it according to the instruction manual for it		○		
Ejector pump	Impeller	Clean and inspect it				○ ※3
	Casing ring	The gap shall be 2.3 mm or less				○
	Mechanical seal	Inspection or replacement				○
Distillate Pump	Impeller	Clean and inspect it				○
	Casing ring	The gap shall be 1.2 mm or less				○
	Mechanical seal	Inspection or replacement				○



1. The extent of scaling on the tubes and the cleaning interval there of depend on the operating conditions such as the evaporating temperature, capacity, feed water flow rate, type of chemicals solution, with or without injection, etc. Therefore, User will modify adequately the inspection schedule from time to time based on its own data and experience in the actual operations in the ship.

2. The extent of consumption of the Protection anode depends on the property of sea water and other conditions, so that the inspection schedule for it should be modified based on the experience and results of the actual operations in the ship.

3. If the material of the Ejector Pump is PBC, it will be worn down with increasing operating time and the surface of its impeller will get rough. As the pump continuous rotating at high speed, these phenomena are unavoidable.

User should take notice of these.

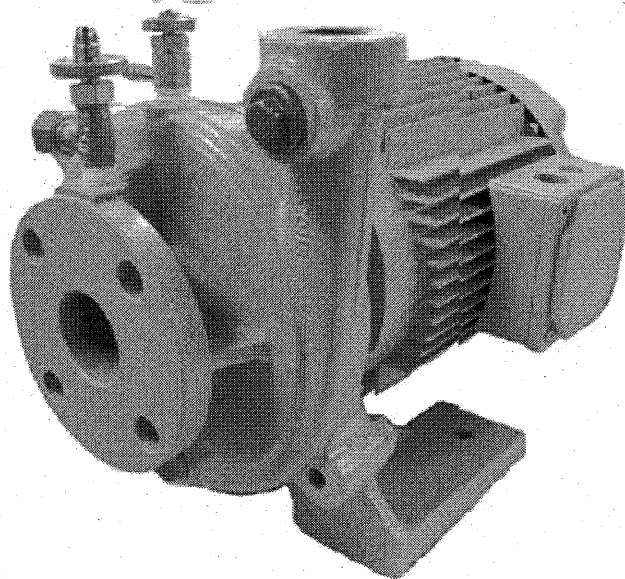
<i>DONGHWA ENTEC F.W.GENERATOR STARTING UP REPORT</i>						
<i>Date</i>		<i>If there is some problem of F.W.Generator, Please fill out this attached data sheet and send to us.</i>				
<i>F.W.Generator type</i>						
<i>Serial No.</i>						
<i>Name of Ship</i>						
<i>Hull No.</i>						
<i>Ship Yard</i>						
<i>Filled by</i>						
<i>Customer</i>						
<i>Owner</i>			<i>start</i>	<i>test 1</i>	<i>test 2</i>	<i>test 3</i>
<i>1. CHECKING TIME</i>	<i>From</i>					
	<i>To</i>					
	<i>Difference</i>	<i>hour</i>				
<i>2. FLOW METER</i>	<i>Start</i>	<i>liter</i>				
	<i>End</i>	<i>liter</i>				
	<i>Difference</i>	<i>liter</i>				
	<i>Capacity</i>	<i>TPD</i>				
<i>3. CONDENSER</i>	<i>S.W. temp. inlet</i>	<i>°C</i>				
	<i>S.W. temp. outlet</i>	<i>°C</i>				
	<i>Difference</i>	<i>°C</i>				
	<i>S.W. flow rate</i>	<i>m³/hr</i>				
<i>4. HEATER</i>	<i>J.W. temp. inlet</i>	<i>°C</i>				
	<i>J.W. temp. outlet</i>	<i>°C</i>				
	<i>Difference</i>	<i>°C</i>				
	<i>J.W. flow rate</i>	<i>m³/hr</i>				
	<i>Steam Press .back press.</i>	<i>kg/cm²G</i>				
<i>5. CHAMBER</i>	<i>Vessel Temp.</i>	<i>°C</i>				
	<i>Vacuum</i>	<i>mmHg</i>				
	<i>Salinity</i>	<i>ppm</i>				
	<i>Feed w. inlet pressure</i>	<i>kg/cm²G</i>				
<i>6. DISTILLATE P/P</i>	<i>Discharge pressure</i>	<i>kg/cm²G</i>				
<i>7.EJECTOR P/P</i>	<i>Suction pressure</i>	<i>kg/cm²G</i>				
	<i>Discharge pressure</i>	<i>kg/cm²G</i>				
<i>8.Twin Ejector</i>	<i>Suction pressure</i>	<i>kg/cm²G</i>				
	<i>Discharge pressure</i>	<i>kg/cm²G</i>				
<i>9. By-pass valve</i>	<i>Closed</i>	<i>%</i>				
<i>10. Main engine</i>	<i>Load</i>	<i>%</i>				



Instruction Manual for Distillate Pump

DH-DIS-01

DH-DIS-02



WILO Pumps Ltd.

SAFETY INSTRUCTION

CAUTION FOR YOUR SAFETY

Before Using this pump, read the INSTRUCTION MANUAL. Follow WARNING LABEL, INSTRUCTION and CAUTION PLATE in order to use it correctly.

It is also highly recommended to ALWAYS KEEP the INSTRUCTION MANUAL at the SAME PLACE for easy access.

TRANSPORTATION, INSTALLATION, PIPING, WIRING, OPERATION, INSPECTION and MAINTENANCE WORK must be done by ONLY a LICENSED and/or AUTHORIZED PERSON who has enough knowledge on health and safety rules and regulation as well as on his or her profession.

In any respect, we will NOT GUARANTEE and DEATH, INJURIES, DAMAGES AND LOSSES, which are result in modification without our written authorization or using and assembling unauthorized parts.

When DISPOSING a pump, any accessories, used parts and oil, they should be treated as a general INDUSTRIAL WASTE.

WARNING LABEL and SIGN in the instruction manual are classified into WARNING, CAUTION and NOTICE as described below

WARNING : Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION : Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE : Indicates a potentially hazardous situation which, if not avoided, may result in damaging or defecting a product.

WARINIG

TRANSPORTATION and INSTALLATION

* TRANSPORTATION work must be carried by only a LICENSED and/or AUTHORIZED PERSON who has enough knowledge on his or her profession.: special attention and caution are required when fitting a HANGING WIRE in relation to its weight and gravity center.

DROPPING or FALLING → DEATH or SERIOUS INJURY.

OPERATION and MANIPULATON:

- NEVER ALLOW an UNAUTHORIZED PERSON to operate the pump. DO NOT TOUCH or Contact to ROTATING parts or portion.
- ROTATING – ROLLED IN, BIT, PINCHED and SPILLED (contacted things).

CAUTION

OPERATION and MANIPULATION

* DO NOT TOUCH or contact to SEALING part or HOT parts while pump is IN OPERATION. HOT → BURNED and INJURED.

INSPECTION and MAINTENANCE

- When OVERHAULING the pump, carefully handle the HEAVY weighted parts; especially, fitting a HANGING WIRE.

DROPPING or FALLING → INJURY.

- Before STARTTING a MAINTENANCE work, clearly SIGN IN MAINTENANCE WORK and CUT ELECTRIC SUPPLY.

ELECTRIC SHOCK → DEATH, UNINTENDED ROTATION → ROLLED IN, BIT & PINCHED

NOTICE

OPERATION and MANIPULATION

- Without a specific purpose, do not manipulate the valves and cocks attached to or supplied for the pump.

WRONG MANIPULATION → DAMAGE or DEFECTING the pump

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1. PRE- INSTALLATION

1.1 Inspection of equipment

- (1) Immediately on receipt of the equipment, inspect and check it against the shipping manifest whether there are lack of any parts or not.
- (2) Examine the crate and wrapping before discarding. Parts or accessories are sometimes wrapped individually or fastened to the crate.
- (3) Report any damage or shortage to our company at once.

1.2 Storage

When it is necessary to store a pump before installation, take care of the following items.

- (1) Place a pump in a dry location and protect it thoroughly from moisture.
- (2) Do not remove protecting covers fastened to the suction and discharge nozzles at our factory in order to protect a pump against the entry of sand or other foreign matters. Also protect the bearings and the coupling against the entry of foreign matters.
- (3) Although the rust-prevent is lubricated to a pump, store a pump after having taken necessary actions to protect it in accordance with storage period, in case that it is stored for longer period than six months.

2. INSTALLATION

2.1 Minimize friction loss of suction piping in order to obtain proper suction performance.

- (1) Piping should be as short and direct as possible.
- (2) Minimize bending, expansion and branch.
- (3) Use one or two size longer pipes than pump suction nozzle size, if a long suction line is required.

2.2 Avoid air and gas pockets

- (1) Pipes should have a continuous rise towards the pump.
- (2) If reducers are used, install the eccentric reducers with the straight side on top.

2.3 Connect the pipe carefully so as not to suck air.

2.4 Direction of rotation.

On initial start up the pump, ensure that it is running in the direction indicated by the arrow fitted on the motor. If the rotation is incorrect, the wiring connections at the terminal box must be reversed.

2.5 Location of equipment

The pump should be placed so that it is easily accessible for inspection during operation while giving due attention to the desirability of simplifying the suction and discharge piping layout.

2.6 Foundation

The foundation must consist of any material that afford permanent, rigid support to the full area of the pump and driver supporting members and must absorb expected stresses and shocks and vibrations that may be encountered in service.

3. OPERATION

3.1 Checks before running.

Before running the pump for the first time after installation or maintenance, proceed as follows:

- (1) Check that the pump is free to rotate by turning the shaft by hand, through at least one complete revolution.
- (2) Ensure that the stop valves are opened in the suction pipeline.
- (3) Ensure that the stop valve is closed in the delivery pipeline.
(To reduce initial horsepower absorbed to a minimum.)
- (4) Check that the motor bearings have been lubricated accordance with the manufacturer's instructions.

3.2 Starting pump

- (1) Open the suction valve.
- (2) Close the delivery valve.
- (3) Prime the pump. (Never operate the pump in dry condition, particularly, special attention must be paid in case the pump is fitted with mechanical seal.)
- (4) Start the motor.
- (5) Slowly open the delivery valve.

3.3 Regulating flow from pump.

The quantity of fluid delivered by the pump is regulated by opening or closing the delivery valve to give the required rate of flow.

3.4 Stopping pump.

- (1) Close the delivery valve.
- (2) Stop the motor.

3.5 In case of auto running.

Notice: The pump should be provided with non-return valve or check valve at the delivery line.

Starting up pump.

- (1) Ensure the suction / delivery valve to be open.
- (2) Start the motor.

Stopping pump.

- (1) Stop the motor.
- (2) The suction / delivery valve to be kept at open condition.

4. MAINTENANCE

4.1 Periodic inspection intervals

To ensure unfailing operation over a prolonged period, comprehensive periodic inspections are essential. The standard intervals of periodic inspections are as follows ;

Operating conditions	Intervals of periodic inspections
Pumping good-quality liquid; Operation limited to within 8hours daily	Every other year
Pumping poor-quality liquid; (containing sand etc.)	Once a year
Continuous 24-hour operation daily	

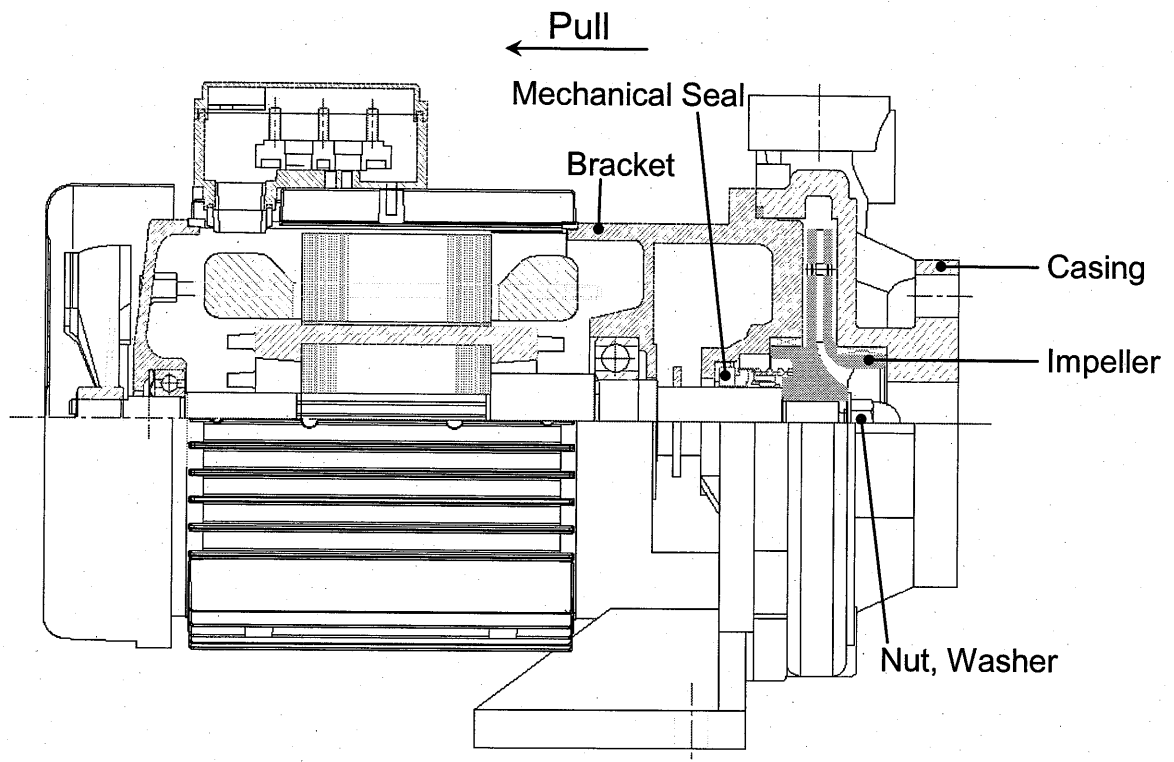
NOTE : For all periodic inspections, disassemble the pump, check the bearing metals, sleeve, liner ring, coupling bolt or rubber packing, for wear, and replace them as necessary. Be sure to replace circular rubber packings and the gland packing during every periodic inspection.

4.2 Dismantling

Before commencement of dismantling, the pump must be safeguarded in such a way that it cannot be accidentally switched on.

The isolating valves in the positive suction head line or suction lift line and in the discharge line must be closed. The pump casing must have cooled down to ambient temperature. The pump casing must be drained and pressure less. Dismantling and reassembly should always be carried out with the aid of the relevant sectional drawing.

- (1) Remove the bolts & nuts for suction & discharge piping flange and union. And remove the pump completely.
- (2) Disconnect the gauge from suction pipes & discharge pipes.
- (3) Remove the 4 bolts fastening casing to the bracket of motor.
- (4) Remove the impeller nut and washers.
- (5) Remove the impeller and impeller key from the shaft.
- (6) Remove the mechanical seal from bracket of motor.
- (7) Remove the nuts fastening casing cover to the casing.



Mechanical Seal

- (1) Since mechanical seals are expendable, ample spares must be provided.
- (2) A mechanical seal is considered in good condition when no leakage is detected over a 10-minute period during visual inspection. Pay attention to the volume of leakage through the mechanical seal during test operation.
- (3) The mechanical seal is vulnerable to intrusion of foreign matter, often resulting in wear breakdown in such an instance. Therefore, thorough flushing of the piping interior, providing a strainer at the suction port, and other necessary measures must be taken to prevent foreign matters from being sucked in by the pump.
Periodic inspections of the strainer mesh also be conducted to determine its clogged status.
- (4) Prior to restarting pump operation after a long out of service period, disassemble the pump and use a clean, soft cloth to wipe off all dust, sand, and rust--if any
-- from the sliding surfaces of the mechanical seal.
Inspect other pump components and parts at the same time.

4.3 Inspection after dismantling

Clean all parts thoroughly with a suitable solvent and wipe the shaft with an oily cloth.

Perform the following inspections and check if there are any parts which must be repaired or replaced.

NO.	Name of Parts	INSPECTION ITEM	REMARKS
1	Impeller	(1) Checks for abnormal erosion, corrosion, cracks and scars by visual or liquid penetrant inspection. (2) Check conditions of impeller bore and keyway.	Repair it by welding or replace it due to its condition. Dynamically balance it after any machine work.
2	Wearing ring (Casing, Bracket)	(1) Check for abnormal erosion, corrosion and scars by visual inspection. (2) Check running clearance.	Generally it is recommended rings be renewed when original clearance has doubled.
3	Casing	(1) Check for abnormal erosion, corrosion, cracks and scars by visual or liquid penetrant inspection. (2) Check "O" ring seal faces.	Slightly eroded parts can be repaired by welding.
4	Shaft and key	(1) Check for condition at impeller hub fit, under shaft sleeve and at bearings by visual or penetrant inspection. (2) Measure run-out of shaft. (maximum 0.05mm T.I.R) (3) Check keyway for distortion.	Replace them if it is bent or distorted.

4.4 Reassembling

- (1) The pump should be reassembled in accordance with the best engineering practice.
The fits of the individual components should be cleaned the contact part and the fitting part, and perform assembling uniformly in accordance with the match - mark.
- (2) As far as reassembling is concerned, assemble by reversing the disassembling procedure outlined above, but confirm whether each part of the related parts, especially the surface which is combined with other part is not blemished, and entirely wipe off dust, sand, rust, etc.
- (3) Clean the shaft and the surfaces of mechanical seal and do not push the mechanical seal strongly, at first, and adjust it watching its leaking status at the test operation.
- (4) Clamp the impeller washer firmly so that they are not loosened in the course of the operation.
- (5) After the impeller has been set in the shaft, rotate it with a hand in order to see whether it is smoothly rotated. In case the rotary is hit deflecting, investigate its cause carefully, that is, whether the casing clamping bolt is clamped deflecting.
- (6) Connect the suction and discharge pipes to the pump nozzles.
Adjust the pipes so that they do not transmit excessive piping force to the pump.

5. SPARE AND REPAIR PARTS

1. It is recommended to prepare and arrange at least following minimum spare parts required for the maintenance at the site.

The minimum number of spare parts which should be carried in stock at the site of the installation, should be determined due to the severity of the condition of service, the extent to which repairs can be carried out in the field and the number of unit installed.

RECOMMENDED STANDARD SPARE PARTS

NO.	NAME OF PARTS	Action	Every overhaul	One year	Two year	Two or three year
1	Casing rings	Inspect and Replace if necessary.	-	-	-	-
2	Bracket rings	Inspect and Replace if necessary.	○			
3	"O" Ring	Inspect and Replace if necessary.	○			
4	Bearing	Inspect and Replace if Necessary.				○
5	Mechanical seal	Inspect and Replace if necessary.		○		

6. FAULTS AND CAUSES

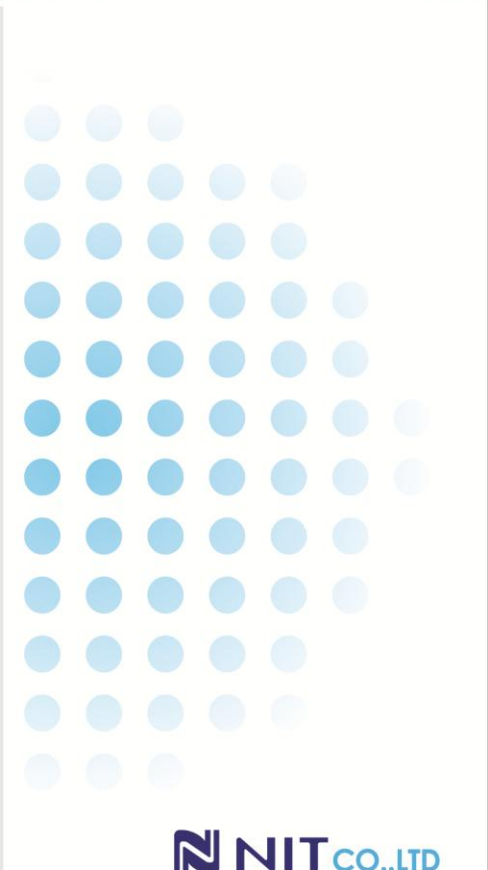
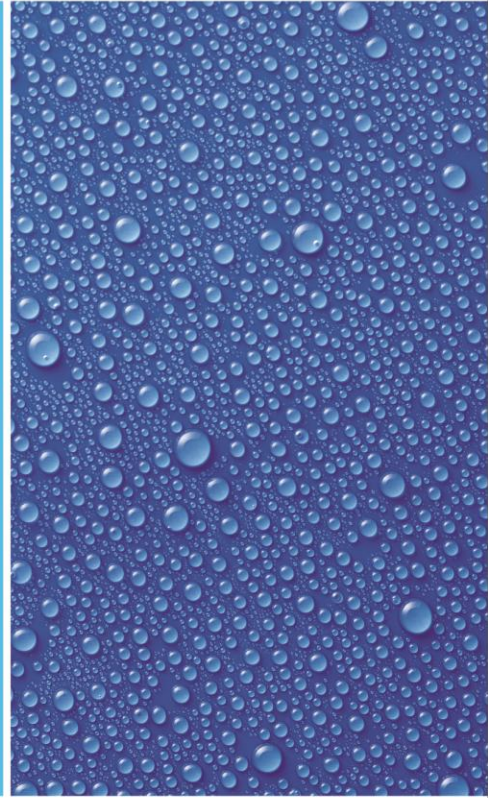
Insufficient lubrication oil and deteriorated and foreign matter mixed with the oil								<input type="radio"/>	<input type="radio"/>	
Weak foundation						<input type="radio"/>				
Metal is loose or worn out						<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	
Rotating unit dose not move										<input type="radio"/>
Shaft is bent						<input type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wear ring is worn out		<input type="radio"/>	<input type="radio"/>							
Wrong rotating direction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							
Excessive pressure(lift head)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							<input type="radio"/>
Impeller is damaged		<input type="radio"/>	<input type="radio"/>			<input type="radio"/>				
Impeller is clogged and unbalanced	<input type="radio"/>	<input type="radio"/>				<input type="radio"/>			<input type="radio"/>	
Impeller is smaller than the required size.			<input type="radio"/>							
Insufficient RPM.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>							
Excessive RPM.							<input type="radio"/>			<input type="radio"/>
Air and gas are mixed in the liquid			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
Viscosity of the liquid is higher than specified value.		<input type="radio"/>	<input type="radio"/>							<input type="radio"/>
Specific gravity of the liquid is larger than the specified value										<input type="radio"/>
The pump inlet is not fully submerged in water	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>			
Clearance between the pump intake and tank is too small	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	<input type="radio"/>				
Cause	Faults or Phenomena									
	Liquid (water) is not discharged	Liquid (water) discharged rate is less than the specified rate	Liquid (water) discharged rate is less than the specified pressure	Discharge pressure is less than the specified pressure	Insufficient liquid (water) after operation of the pump	Vibration	Noise	Bearing is overheated	Metal wears rapidly	Overloaded motor

7. MOTOR BEARING NO.

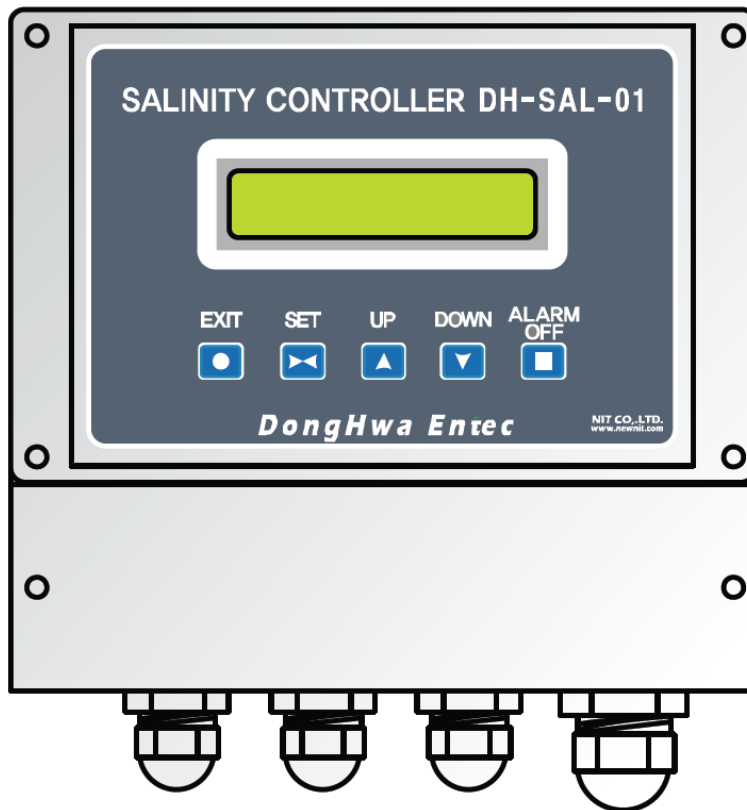
NO.	Output (kW)	Bearing No. (Drive / OPP.D)	Remark
1	0.75	6206zz / 6202zz	DH-DIS-01
2	1.5	6206zz / 6202zz	DH-DIS-02

NSC110AD Manual

SALINITY CONTROLLER



USER'S MANUAL
SALINITY CONTROLER
(Model : NSC110AD)







CAUTION

1. Please read the whole manual before using it.
2. Be sure to follow the cautions for safety.
3. Please connect to ground for safety.
4. Don't disassemble, repair and remodeling except service technician.
5. Must not be used to over rated output capacity.
6. The contents of this manual can be changed to improve products version and quality without notice.

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Section 1 Warnings and Cautions

Logo	Description
 Caution	If you do not follow the instructions, this may result in death or serious injury.
 Warning	If you do not follow the instructions, personal injury, fire, or explosion, can result in equipment damage or malfunction.



1. Warnings

- 1) Do not operate the product with wet hands.
- 2) Please be grounded for safety.
- 3) Do not install in the place where humid and rain, snow place.
- 4) Don't disassemble, repair and remodeling except service technician.
- 5) Must be followed rated output capacity.



2. Precautions

- 1) Be sure to check the product specifications.

Section 1 Installation

1. Check specification

1) Specifications

Items	Contents
Power	AC210~AC230V 50/60 Hz
Current	50mA
LCD	16×01 C LCD
Appearance	165mm(W)×160mm(H)×88mm(D)
Range	0~200PPM
Accuracy	±2.5%
Coverage	0~100°C(±1%)
Operating Pressure	5Kg/cm ²

2. Before Installation



Warning

1. Before installing the product, read the instructions and follow the installation environment.
2. Installing on the panel of metal and non-combustible.
3. Do not install in direct sunlight.
4. Do not install near flammable.
5. Do not install in a location where vibration.
6. Fixing all four sides of the product to tighten the bolts.
7. Do not allow foreign objects to enter the wire, pieces of steel, wire, and dust.
8. Do not install in hot and humid plase.

3. Dimensions

1) Dimensions of the product



Make sure product shape and make enough space for ventilation.

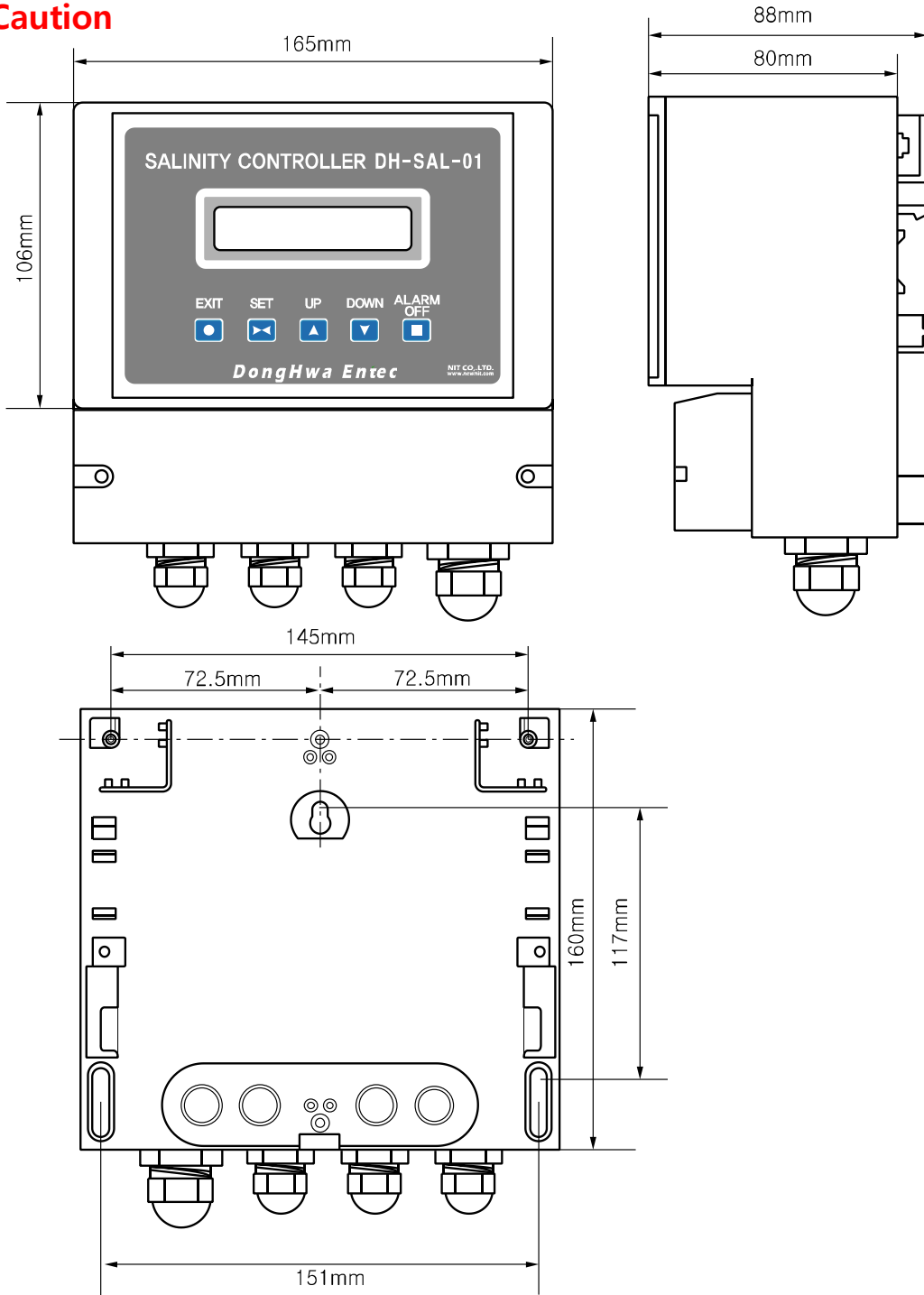


Figure - Dimensions

4. Connections

1. Connections



Before connections, the power is must turned off.

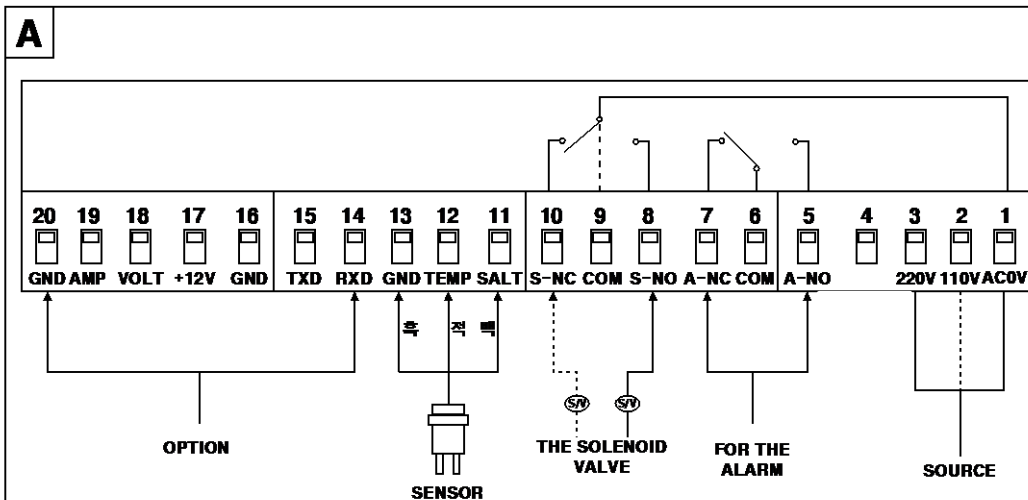
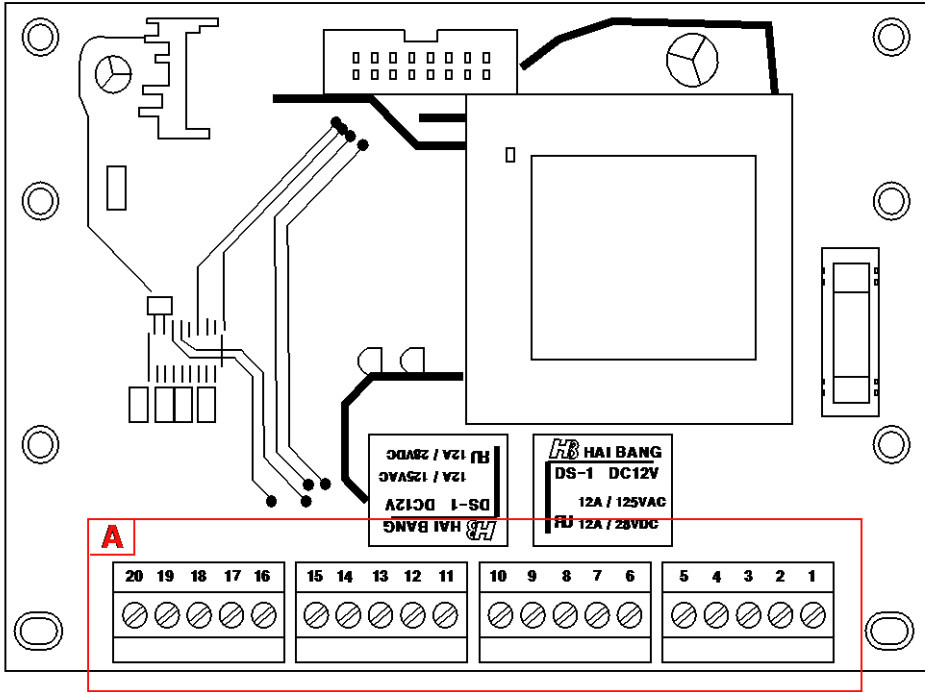


Figure-Dimensions

1) Power input connections

The connector numbers 1, 2, 3 are used to connect according to power source AC220V, AC110V

- a. Power AC220V connects number 1, 3.
- b. Power AC110V connects number 1, 2.

2) Sensor Connections

Salinity sensor has Salinity sensor lines and Temperature sensor lines, GND line

- a. 11(SALT) : Salinity Sensor wiring(White)
- b. 12(TEMP) : Temperature Sensor wiring(Red)
- c. 13(GND) : GND wiring(Black)

3) Alarm Connections

In case of need to connect to alarm, connect to terminal 5, 7 for controller.

4) Solenoid connections

Solenoid wiring should connect to terminal 8, 9, 10 for controller.

5. Features and Description

a. Key Features

Salinity controller is a equipment for measuring salinity of distilled water from fresh water generator.

And Salinity controller is sensing salinity of distilled water.

In case distilled water is higher than salinity setting ppm value, The solenoid valve is controlled by salinity controller.

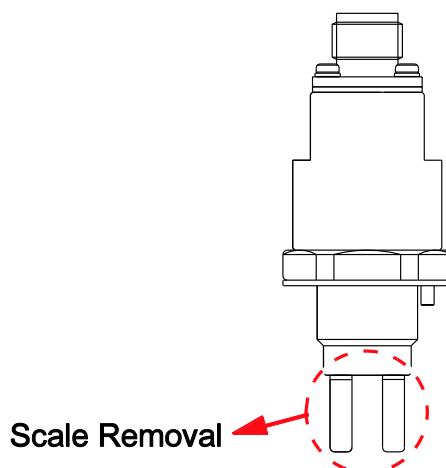
The solenoid valve returns the distilled water to fresh water generator.

In case distilled water is lower than salinity setting ppm value.

The distilled water is supplied by solenoid valve.

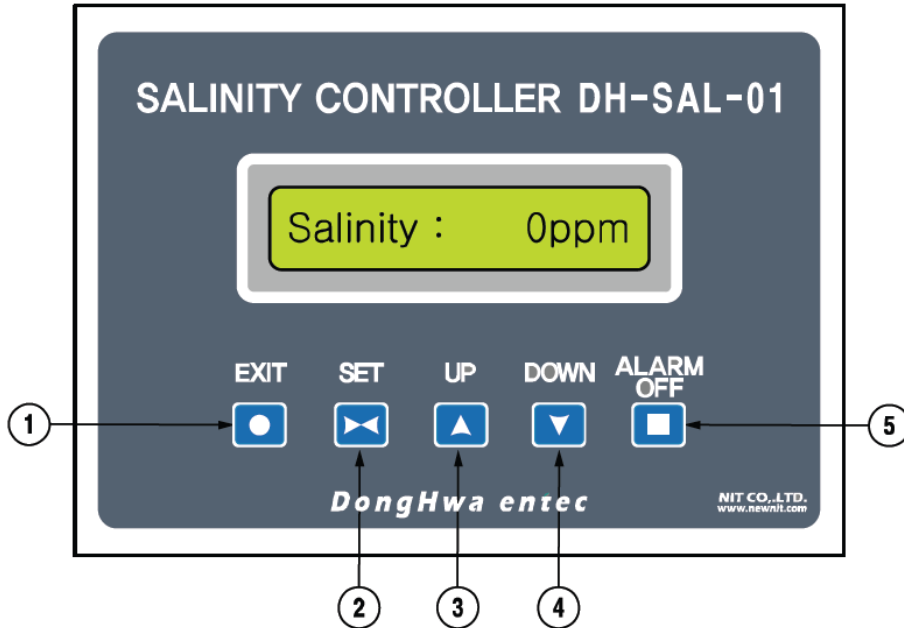
b. Periodic Checks

Irregular or Error can occur due to scale adhesion, the Probe must be kept clean.



1. Operation and driving

1) Button Function



No.	Contents	Description
①		The button is used to return to first screen, after each function setting
②		SET button is used to select to change setting value or test. Solenoid and Alarm , Run Hours, Temperature. When SET button is pressed, the display is changed. If EXIT button is pressed, display is moved to first screen from each setting mode.
③		UP button is used to Increase setting value when the screen moved to setting screen by SET button.
④		DOWN button is used to decrease setting value when the screen moved to setting screen by SET button.
⑤		ALARM OFF is used to alarm setting button for on and off. In case ALARM OFF is setting as off, the alarm relay does not work.

2) LCD Main Configuration

a. Solenoid(Unit : ppm)

a) This is used to change the solenoid value.

b) When the sensing value is excess than Solenoid value,
The Relay is works.

b. Alarm(Unit : ppm)

a) This is used to set Alarm ppm.

b) When excess than alarm ppm setting value,
The alarm relay is works.

c. Run Hour(Unit : hour)

a) Total operation hour will be displayed.

d. Temp(Unit : °C)

a) Distillate water temperature will be displayed.

e. Test Salt(Unit : ppm)

a) This is used to test the controller condition.

Explanation of LCD Main screen configuration

Button	For Display	Description
	Salinity : 0ppm	1. The initial screen When the power turned on, The controller is display the sensing value of salinity sensor.
SET	Solenoid : 0ppm	2. SOL V/V work settings Press SET button one time, Solenoid value is changed by ▲▼ keys. (Setting range : 0~200ppm) ex) In excess of ppm, Solenoid Relay is worked
SET	Alarm : 15ppm	3. Alarm operation settings Press SET button two times, Alarm value is changed by ▲▼ keys. (Setting range : 0~200ppm). ex) In excess of ppm, alarm Relay is worked
SET	Run Hour: -1h	4. Total Operation Hour (Run Hour) SET button is pressed three times, the total operation time is displayed.
SET	Temp : 0dig	5. The current temperature SET button is pressed four times, the current temperature is displayed .
SET	TestSalt : 0ppm	6. Test On TestSalt mode after pressing set button five times, The ppm value can be changed by ▲▼ button, Alarm and relay in the controller can be check to work (When the setting value is larger than Alarm and solenoid setting value, The relay in the controller will be operated.)

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2. Concordance

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Product		Model	
Serial NO.		Purchase	
Your dealer	Name		
	Address		
	Telephone		

Warranty Period and Scope

- Warranty is 1 year from the date of purchase.
- The meaning of the guarantee is limited to the purchase of products.
Damages caused by the product purchased will be excluded from the warranty and Warranty is valid only in the Republic of Korea

Free Service

- In case the products are out of order in terms of guarantee, The products will be repaired at our designated service center with free.

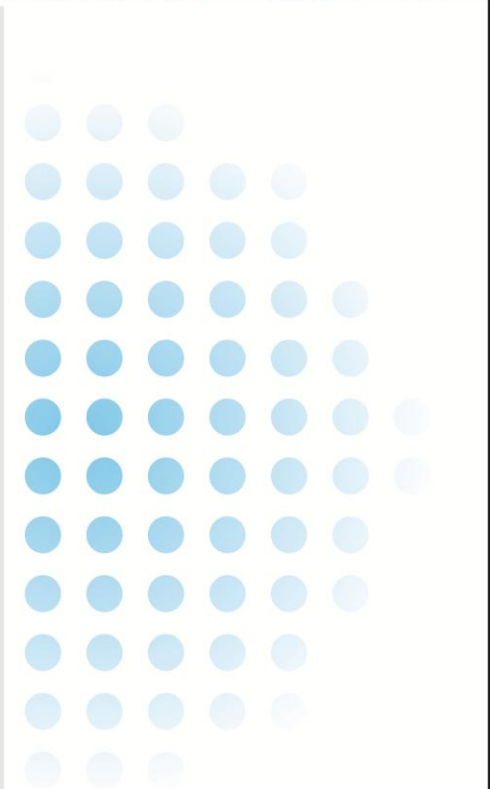
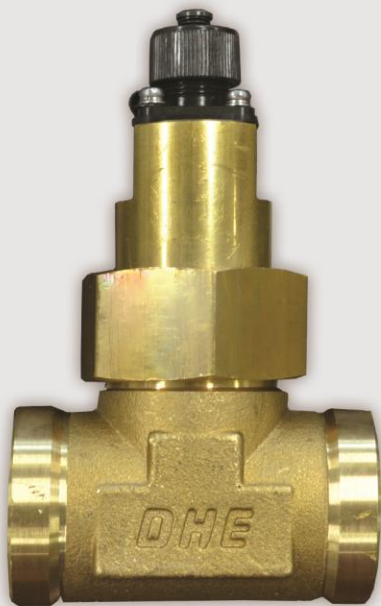
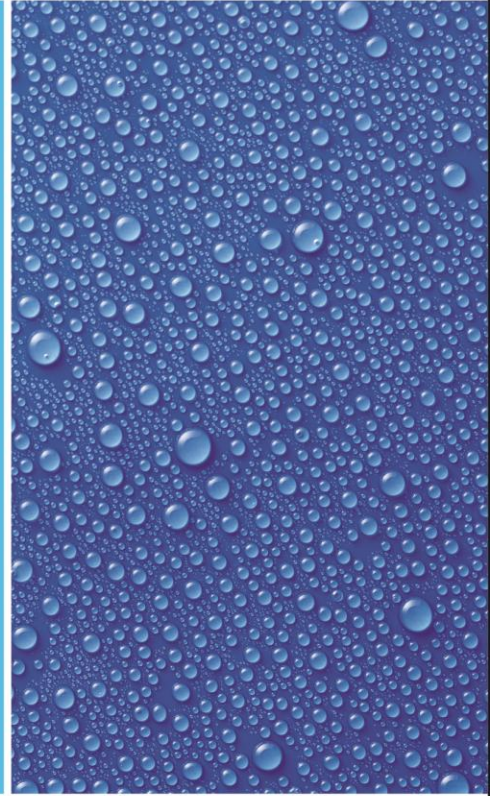
Paid Services

Incorrect use of the product, or any failure caused by bad maintenance and service must be paid for damage.

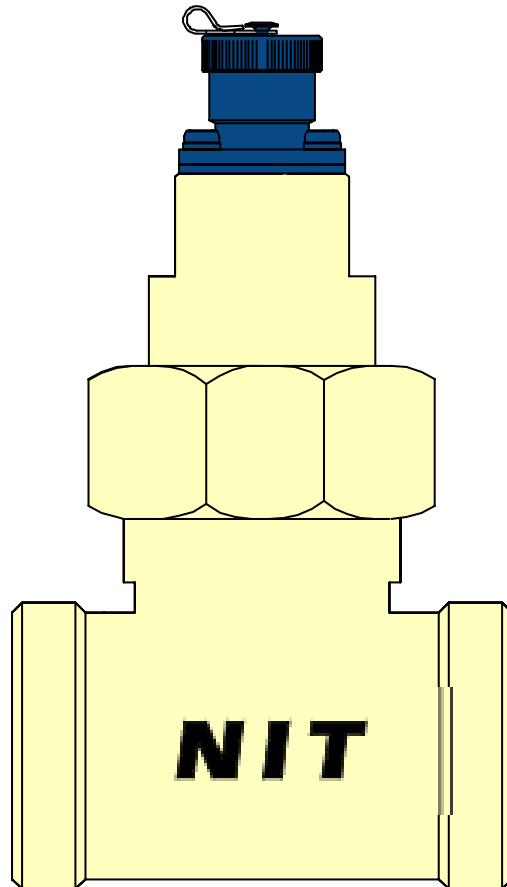
- A person who is not specified, the repairer will repair the product or service failures caused by
- Careless handling of consumers in the event of failure to
- Manual does not comply with the warnings and precautions in the event of failure
- If a fault occurs by natural disasters.(Fire, earthquake, flood, lightning, flood, etc.)
- Free service period has elapsed.

NSS110AD Manual

SALINITY SENSOR



User Manual
SALINITY SENSOR
(Model : NSS110AD)





CAUTIONS

1. Before using the product, please read all instructions.
2. Be sure to observe the safety precautions, please.
3. Person other than service technicians disassemble, modify, repair, do not.
4. Should be used to NSC110AD CONTROLLER.
5. The contents of this manual version and improve the quality of the product may be changed with out prior notice.

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Section 1 Warnings and Cautions

Logo	Explanation
	If you violate the instructions people can result in death or serious injury.
	If you violate the instructions or injure d people, fires, explosions, property damage or breakdown Injury.

**1. Warnings**

- A. Person other than service technicians disassemble, modify, repair, do not.
- B. Can not be used other than NSC110AI CONTROLLER.

**2. Warnings**

The. Please be sure to check the product specifications.

Section 1 Installation

1. Check specification



The. Specifications

Item	Description
Appearance	75mm(W)*130mm(H)*43mm(D)
Range	0~200PPM
Operating pressure	5Kg/cm ²

2. Before Installation



1. Before installing the product, please read the instructions at the installation, please observe the environment.
2. Wire, metal sculpture, wire, dust and debris do not enter.

3. Dimensions

The. Dimensions of the product

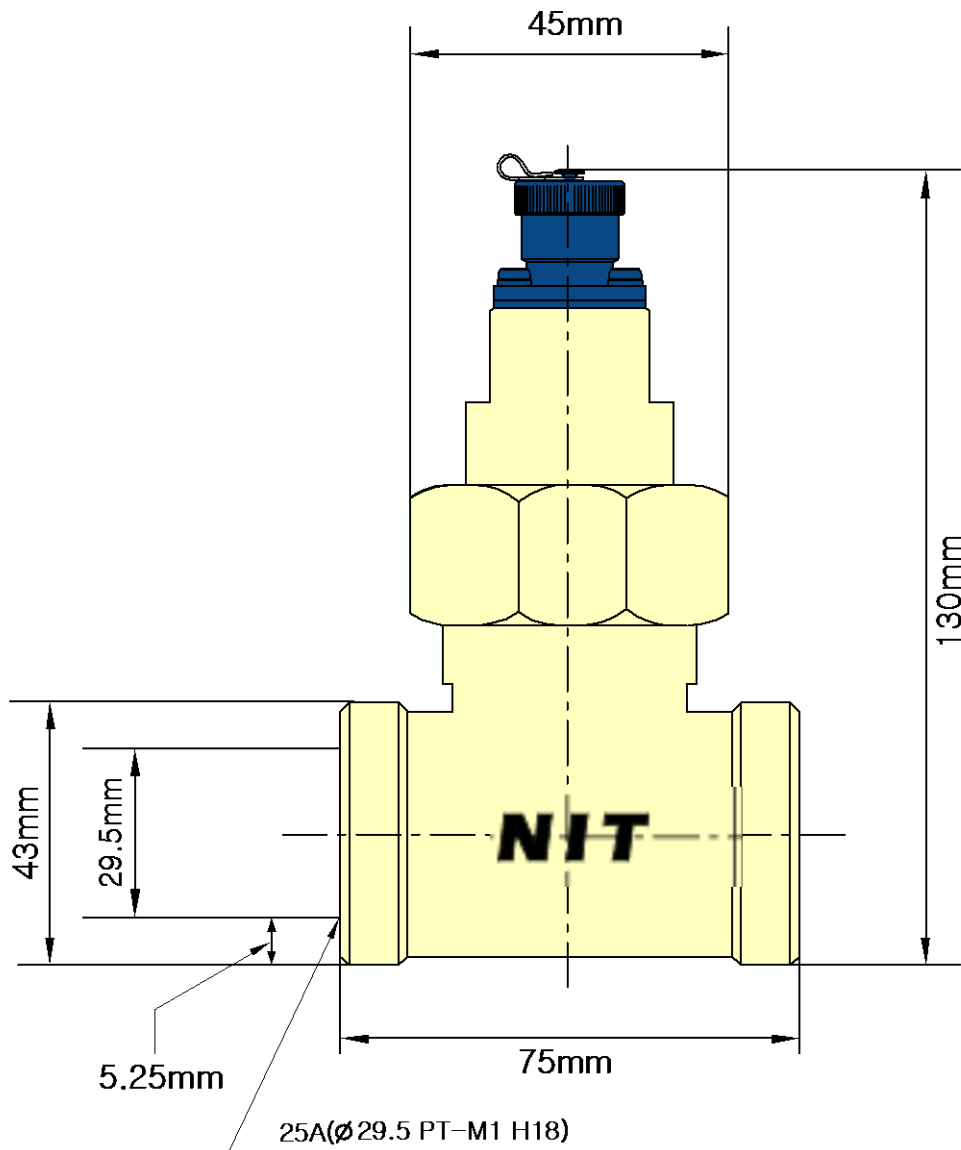


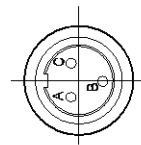
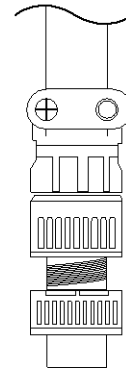
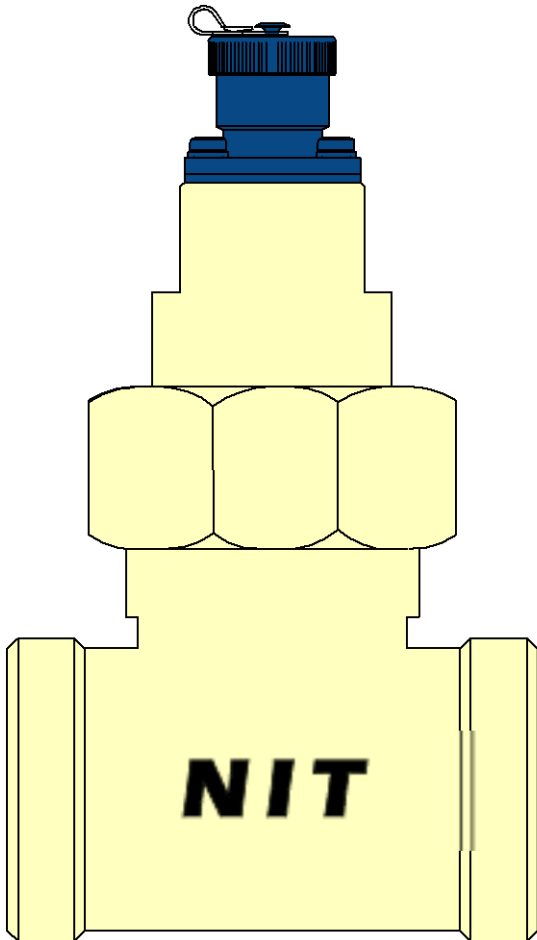
Figure - Dimensions

4. Connections

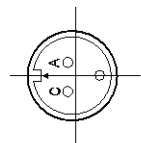
The. Connections Refer to the wiring diagram for the sensor wiring to connect the wiring.



Be sure the power is off before wiring work to make sure.



SALINITY CONTROLLER



SALINITY SENSOR



Picture-Diagram

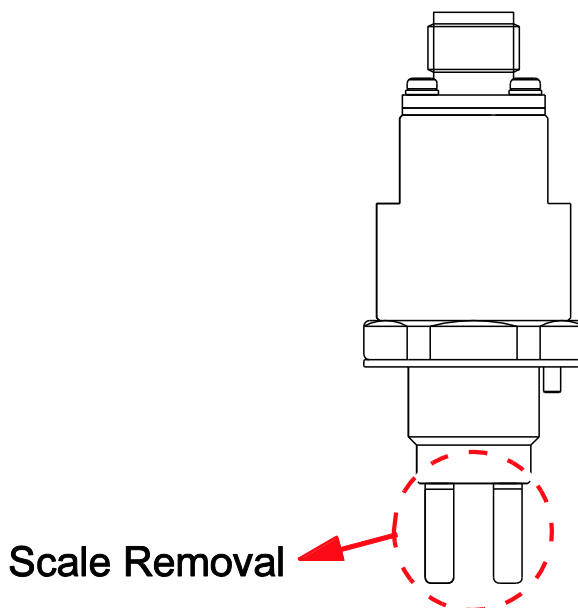
5. Features and Description

a. Key Features

Salinity Sensor is made from fresh steam generator facility Sodium chloride in the water room of the amount of this component is a device for measuring the degree. Salinity Controller matter content of sodium chloride to a device that transmits signals.

b. Periodic Checks

Irregular or Error can occur due to scale adhesion, the Probe must be kept clean.



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Product		Model	
Serial NO.		Purchase	
Your dealer	Name		
	Address		
	Phone		

Warranty Period and Scope

- Warranty period of one year after the purchase.
- The meaning of a guarantee of warranty with respect to the purchase by the product itself, the damage caused by the purchase of the product is excluded from warranty coverage. In addition, the warranty is only valid in the Republic of Korea

Free Service

- In normal use within the warranty period if a failure occurs at a designated service center, our services are available free of charge.

Paid Service

Incorrect use of the product, or any failure caused by incorrect maintenance and service must be paid for damage.

- A person who is not specified, the repairer to repair the product or service failures caused by
- Of careless handling by the consumer, if a fault occurs
- Owner's manual warnings and precautions, if any trouble occurs, do not keep
- If a fault occurs by natural disasters (fire, earthquake, flood, lightning, flood, etc.)
- If the free service period has elapsed,