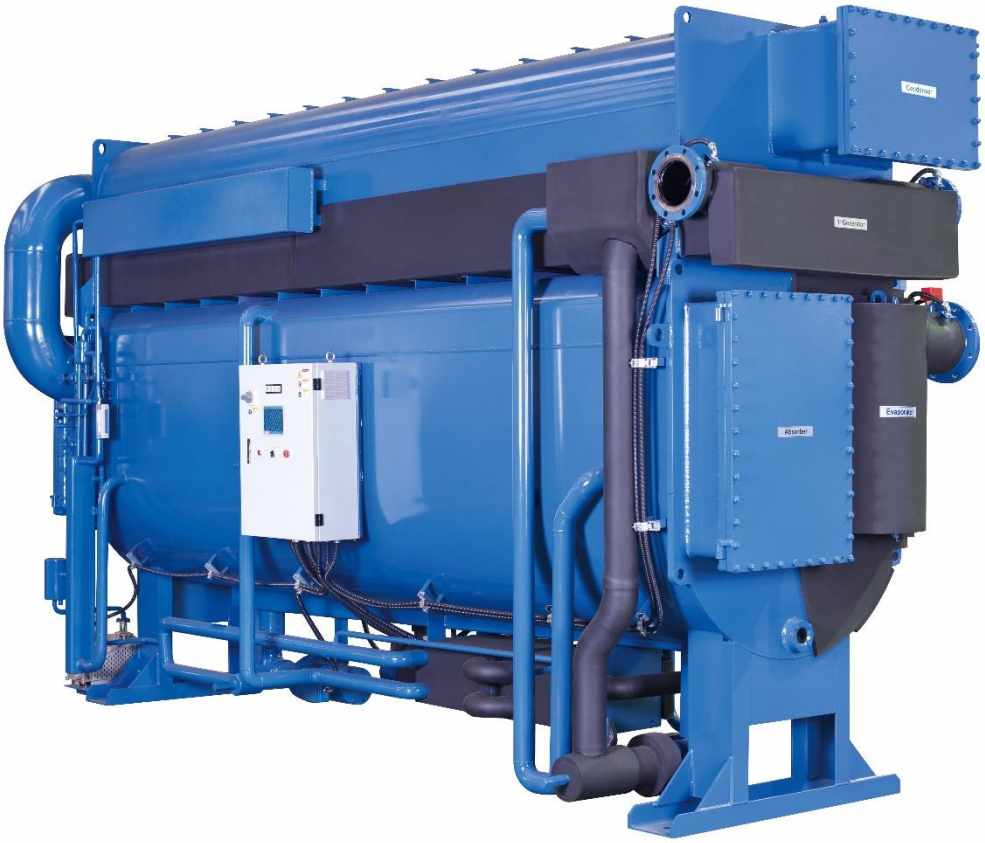
Product Data

HWAR-LHH (Marine) Hot Water Driven Absorption Chiller

Standard Cooling Capacity
105 ~ 4571 kW (30 ~ 1300usRT)



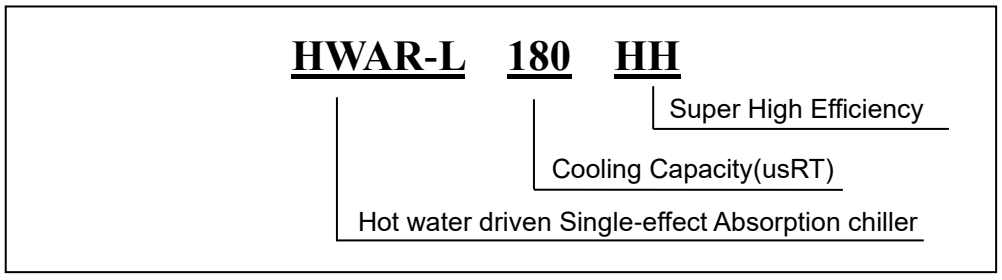
World Energy

HWAR-LHH, Hot Water Driven Absorption Chillers, Provides Vessel Engine Heat Recovery Water Chilling to CHP System and Heat Recovery Facilities.

- No CFC's and environmentally safe
- Quiet, vibration-free operation
- High reliability due to few moving parts

Table of contents

Model Name Nomenclature



World Energy Co., Ltd.
97, Gaeungongdan-gil, Gaeun-eup, Mungyeong-si, Gyeongsangbuk-do, 36995 Republic of Korea
Tel 82-31-501-2704, Fax 82-31-501-2705
http://www.worldenergy.co.kr

Features/Benefits

HWAR-LHH, Hot Water Driven Absorption Chiller utilizes hot water as its heat source, which can be made from waste heat of vessel engines. Also, it uses sea water as cooling water, which doesn't require a cooling tower and enables customers to greatly reduce energy consumption. HWAR-LHH is the most optimized cooling solution for CHP (Cooling, Heating and Power) System.

Application versatility Designed to suit a variety of applications - From comfort cooling to providing chilled water for process applications, the absorption chiller offers versatility for almost any job where hot water is available as the heat source, the LHH is sure to be the right choice for either new construction or retrofit applications.

Excellent part load performance – Standard concentration control system allows stable, part load operation at cooling water temperatures as low as 17℃ without the need for a cooling water bypass. For maximum efficiency, a variable frequency drive pump (option) automatically maintains optimum solution flow between generator and absorber at all operating condition. This will result in improved part-load efficiency. HWAR-LHH has a continuous operating range from 100% to 10% of rated machine capacity. Also, it is designed to stably provide chilled water even when the ship is rocking.

Location and installation savings

Ease of installation - HWAR-LHH Absorption chillers are completely fabricated, assembled and wired in the factory as single-piece units.
* It is possible that the sub equipment to supply chilled water and cooling water can be changed to all-in-one type according to customer's requirements.

Single-point box electrical connection - Installation costs are further reduced by eliminating field wiring between machine components. On units shipped as a single assembly, all unit-mounted electrical items are factory-wired to the chiller microprocessor control panel. Only a single-point electrical connection to the chiller from the building's electrical service is required. Voltage transformers, mounted in the chiller control panel, provide secondary, single-phase powers for the HWAR-LHH control.

Low noise and vibration allows location flexibility - Low sound and vibration levels are characteristic of absorption chillers, primarily due to the fact the only rotating parts are the refrigerant and solution pumps. The overall sound level of HWAR-LHH is typically 75dbA. This allows the machines to be installed near occupies spaces or in areas with strict sound requirements. Low vibration levels also make it possible to install the chiller on upper floors without special consideration for vibration dampening systems.

Low maintenance

Standard features allow simple maintenance procedures - Every HWAR-LHH has numerous standard design features that provide for convenient and simple maintenance. Hinged water box cover on the absorber, and condenser facilitate tube and water box inspection. All moving parts are easily accessible for inspection or replacement, as required.

Leak-proof hermetic pumps cut maintenance costs - HWAR-LHH solution and refrigerant pumps/ motors are leak-proof, completely self-contained, and hermetically sealed. The hermetic design eliminates the need for a separate, complicated, and possibly leak-prone seal water system while providing leak tightness and longer machine life. Specially designed bearings absorb both radial and axial thrusts to ensure correct fit at all times. There is no possibility of external contamination since the fluid being pumped lubricates and cools the pump and motor assemblies. In addition, both the rotor and the stator are separated by a stainless steel liner that protects the windings from the fluid being pumped. As an additional safety feature, thermal over-load switches are embedded in the stator to protect against high winding temperatures. The pumps are field serviceable. Inspection is recommended after 5 years or 20,000 hours of operation, whichever comes first. Pump isolation valves are included on LHH machines to make field service easy, if required.

Reliable operation

(Certification :IECEx, ATEX, UL, CE, ISO, PED)

HWAR-LHH control system can supply stable chilled water while controls temperature of each part, consistency of concentrated solution and control valve for heat source. All information is showed on the touch screen and an operator can check the condition simply.

Features automatic microprocessor control center continuously monitors machine operation, ensuring precise control – Each HWAR-LHH absorption chiller includes a factory mounted and wired

microprocessor control panel that is functionally tested prior to shipment. Continuous monitoring and control of machine operation are performed automatically. A touch screen type display on the front of the control panel identifies operational status and fault indication. All control panel components and the assembly will meet local codes including UL (Underwriters' Laboratories), and KS where appropriate and include a microprocessor CPU (central processing unit) board, molded case circuit breaker, pump contactors, ambient compensated 3-phase pump overload protection, control power transformers, and all other necessary safeties and controls.

As part of the start-up sequence, the chiller microprocessor control panel initiates a self-diagnostic system check to verify that all sensors are in range. Other standard features include a remote start/stop switch and a key-locked control panel door that protects against unauthorized access.

Superior corrosion protection – Absorption chillers must be protected from the possibility of internal corrosion that is always present when lithium bromide solution is in contact with internal machine surfaces. HWAR-LHH absorption chiller incorporates a highly effective corrosion inhibitor to provide an extra margin of protection against internal corrosion. Other inhibitors may require the use of exotic tube materials in certain heat exchangers since they are less effective and require frequent maintenance and analysis. The superior corrosion protection of HWAR-LHH's inhibitor allows for the use of standard copper tubes throughout the machine. This results in long machine life and dependable operation.

Gravitational dropping refrigerant and solution distribution system (Evaporator, Absorber, Generator) – The refrigerant and solution distribution system in evaporator, absorber and generator is performed based on gravity and siphon phenomenon. This gravitational dropping distribution system adopts stainless steel tray to distribute refrigerant and solution regularly in rolling and allows uniform solution spray and continuous heat transfer. Different from nozzle spray type of distribution system, this system does not need external pumps to spray the solutions with nozzles and prevents nozzles from clogging.

Rugged machine construction – Every LHH absorption chiller offers numerous standard features designed to provide reliable, trouble-free operation. The machine is fabricated to meet stringent manufacturing and design requirements and is UL-listed to ensure product safety and machine integrity.

Automatic purge system extends machine life and ensures optimum efficiency and performance – The purge system of an absorption chiller is critical to ensuring efficient operation and long machine life. Even when machines are vacuum tight or properly inhibited, all absorption chillers generate hydrogen and other non-condensable gases in small quantities. Since these gases are present in sufficient volume to interfere with proper machine operation, they must be removed to protect the unit from internal corrosion, lithium bromide solution crystallization, and/or a reduction in chiller capacity. HWAR-LHH purge system protects the machines from these potential hazards by working continuously during machine operation.

During operation, non-condensable gas tends to accumulate in the absorber section, which operates at the lowest internal pressure. A slip-stream of lithium bromide solution from the solution pump discharge flows through an eductor, creating a suction that draws non-condensable gas from the absorber. The non-condensable gas is then entrained by the solution flowing through the eductor. The eductor discharges the solution and non-condensable gas into a separator in a purge chamber, where the non-condensable gas are separated from the solution. The non-condensable gas flows to a storage tank, while the solution returns to the absorber.

As non-condensable gas accumulates in the external storage tank, they are isolated from the chiller and cannot reenter the machine (even during shutdown). These gases must periodically be exhausted (as required) from the storage tank by a simple procedure performed while the machine is running. Evacuation can be performed by a unit-mounted vacuum pump that is connected to the purge evacuation valve.

The unit-mounted vacuum pump can also be used during chiller maintenance or service to remove non-condensable gas directly from the machine.

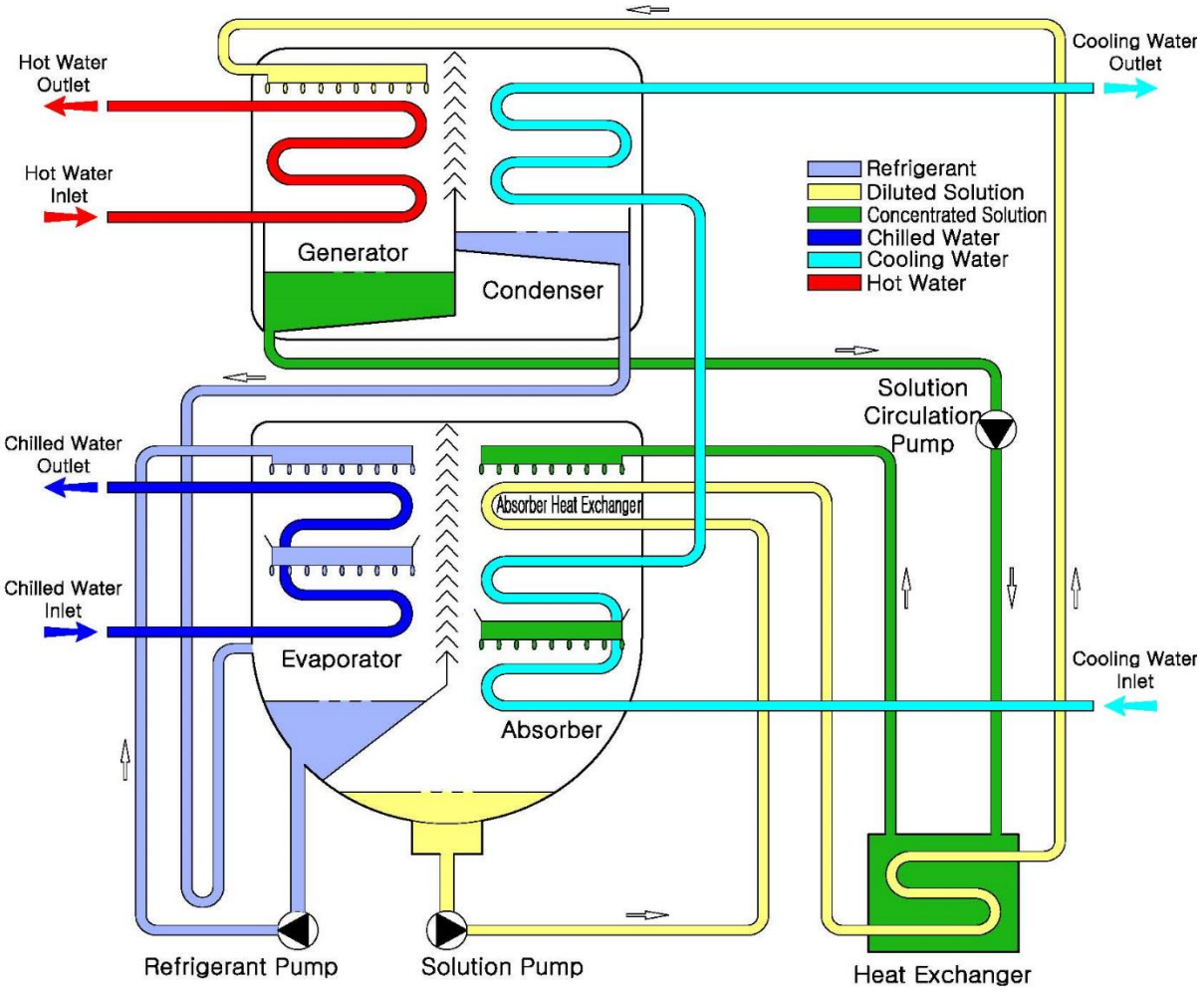
Single-effect Absorption Cycle

HWAR-LHH absorption chiller consists of an evaporator, absorber, condenser, generator, solution heat exchanger, absorber heat exchanger, refrigerant/ solution pumps, purge and controls. Water is used as the refrigerant in vessels maintained under low absolute pressure (vacuum). The chiller operates on the principle that under vacuum, water boils at a low temperature. In this case water boils at approximately 5.5℃, thereby cooling the chilled water circulating through the evaporator tubes. A refrigerant pump is used to circulate the refrigerant water over the evaporator tubes to improve heat transfer.

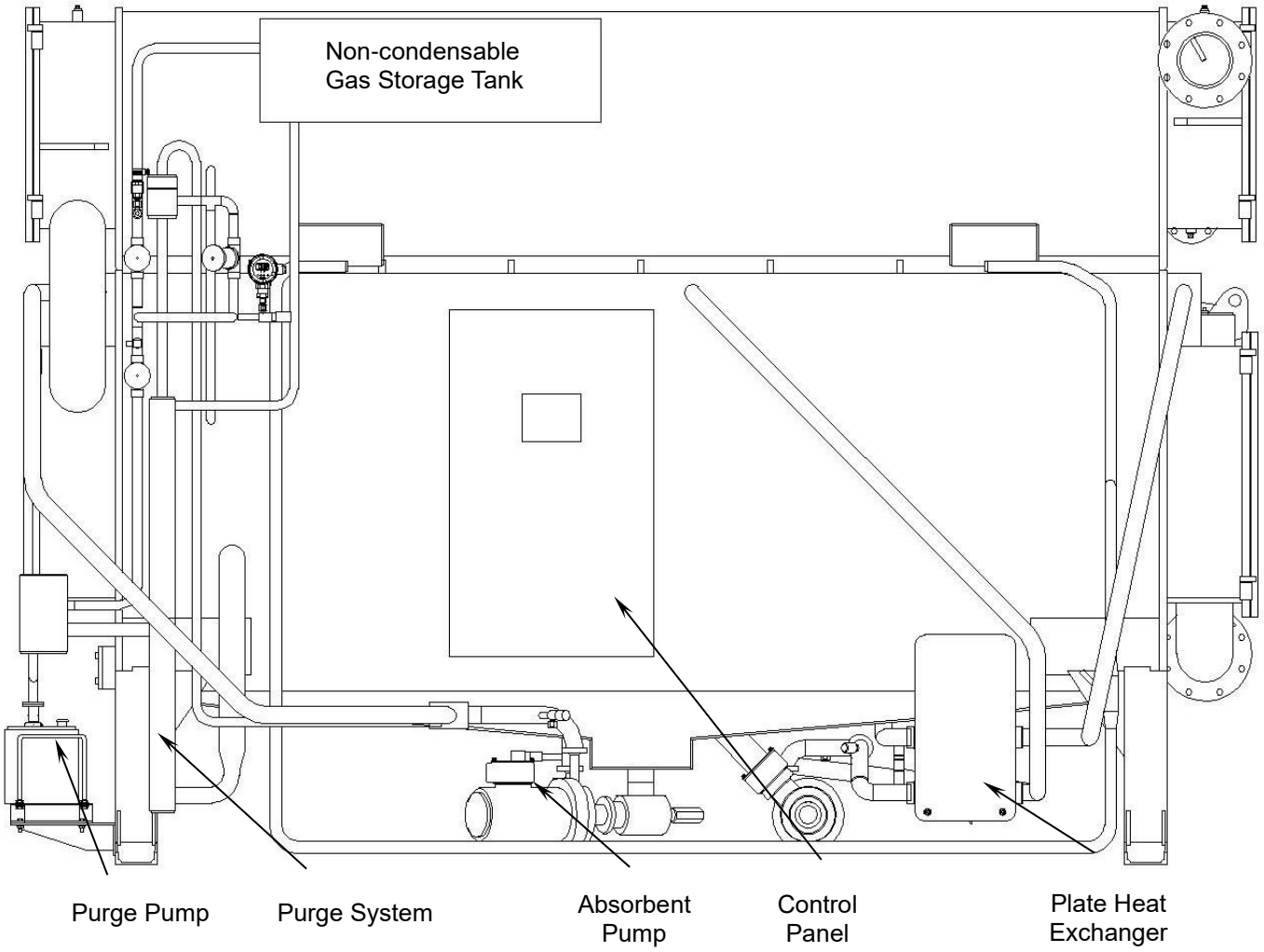
To make the cooling process continuous, the refrigerant vapor must be removed as it is produced. For this, lithium bromide solution (which has a high affinity for water) is used to absorb the Refrigerant vapor.

As this process continuous, the lithium bromide becomes diluted, reducing its absorption capacity. A solution pump then transfers this weak (diluted) solution to the generator where it is concentrated by hot water. The Refrigerant vapor released in the shell side of the generator, enters the condenser to be cooled and returned to a liquid state. The refrigerant water returns to the evaporator to begin a new cycle.

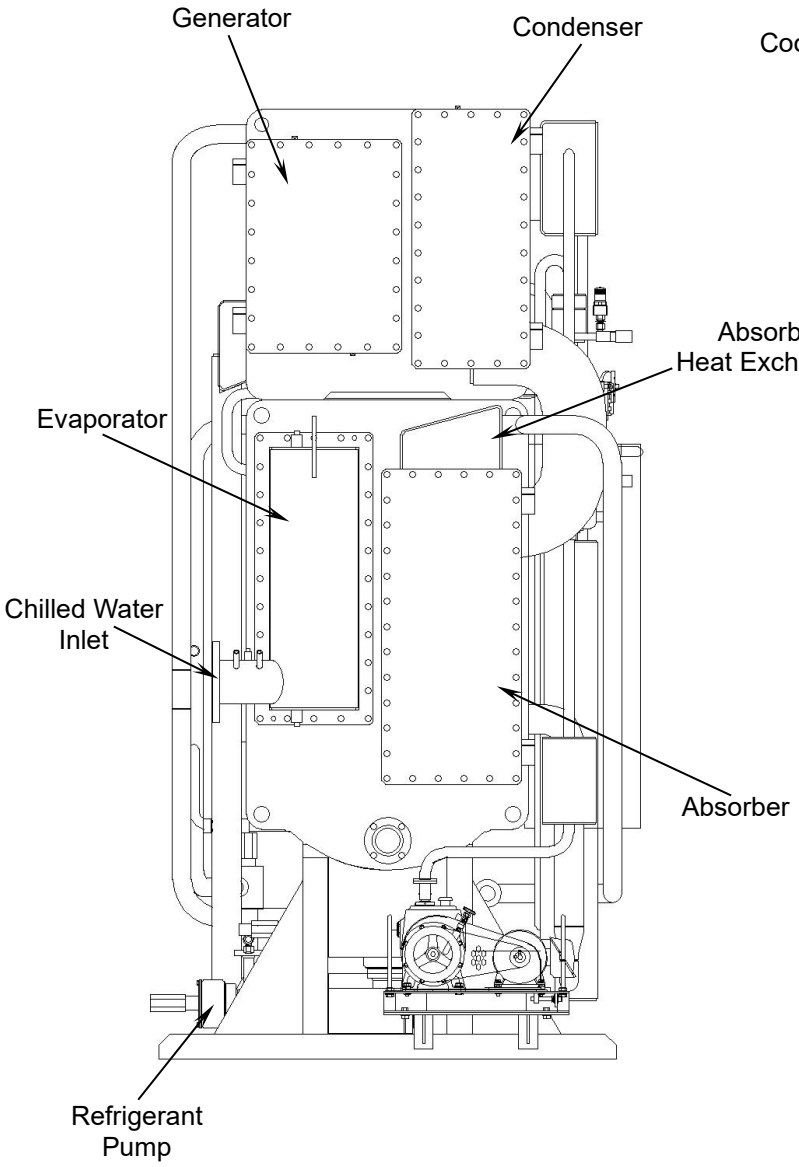
To remove heat from the machine, relatively cooling water from a cooling tower or other source is first circulated through the tubes of the absorber to remove the heat of vaporization. The Cooling water is then circulated through the tubes of the condenser. The strong solution from the generator flows back to the absorber to begin a new cycle. For efficiency reasons, the strong solution from the generator is passed through the heat exchanger to preheat the weak solution while pre-cooling the strong solution.



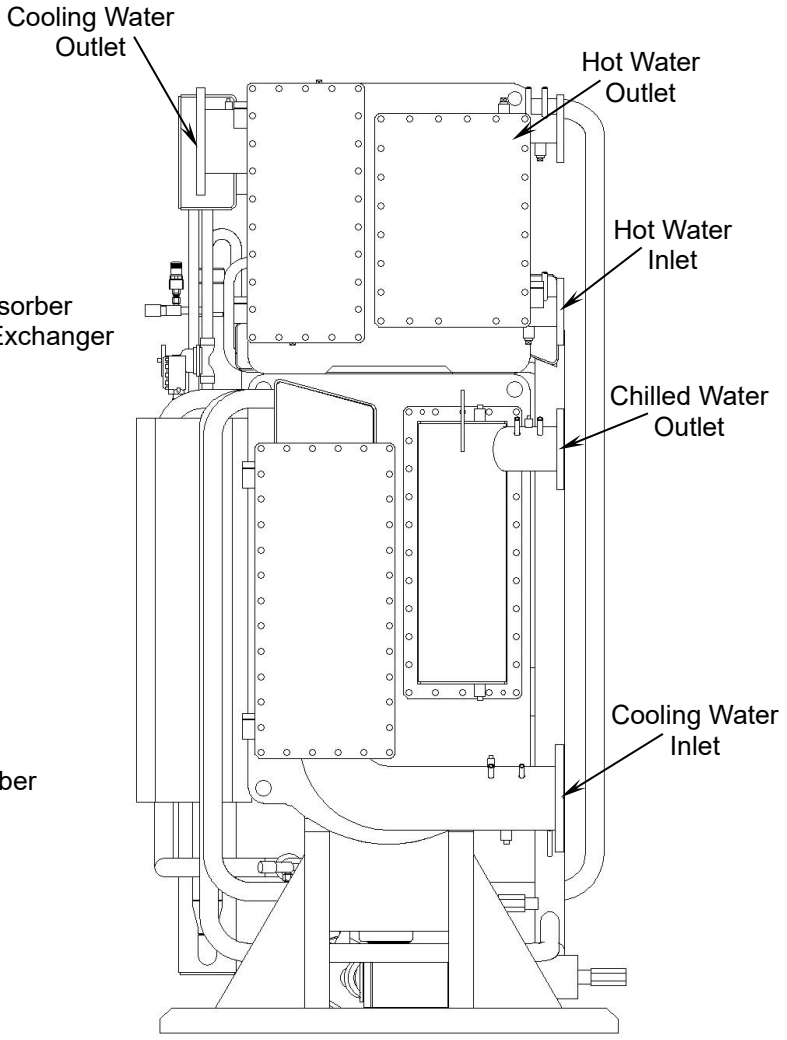
OUTLINE



<Control Panel Side>



<Left Side View>



<Right Side View>

Product Specification

HWAR-LHH Hot Water Driven Absorption Chiller

Capacity Range: 30 ~ 1300 usRT (105 ~ 4571kW)

1. SYSTEM DESCRIPTION

Electronically controlled, LHH series absorption chiller utilizing hermetic refrigerant and solution pumps, lithium bromide solution as the absorbent, and water as the refrigerant. Hot water shall be supplied to the generator as the heat source.

2. QUALITY ASSURANCE

A. Chiller performance shall be rated in accordance with ARI Standard 560 (latest edition).

B. Chiller shall be manufactured in accordance with ANSI/ASHRAE 15 (latest edition), Safety Code for Mechanical Refrigeration or KS B 6271 (Korea Standard), as applicable.

C. Chiller shall be designed and constructed to meet applicable requirements and shall bear the UL or CE or ATEC or IECEx label (if required).

D. Each chiller shall undergo a series of standard factory tests to ensure that the unit is leak tight, that all electrical components operate as intended, and that every aspect of the unit fabrication meets stringent quality standards in accordance with good practice and the manufacturer's quality assurance requirements.

1) The shell side of each chiller shall be leak tested by pressurizing to 76 kPa with nitrogen and then checked by spraying a soap/water mixture on all welds, tube joints, and/or gasket joints to identify any major leaks. Afterward, a mass spectrometer test shall be performed by evacuating the unit to 0.001mmHg absolute, covering the machine with a vinyl tent, and introducing helium gas under the tent. Any remaining leaks will allow the helium to be drawn into the shell side of the machine. The acceptable leak rate as measured by the mass spectrometer test shall not exceed 0.00001 cc/sec standard air.
2) The tube side of the evaporator, absorber, generator and condenser shall be hydrostatically tested at 1.5 times rated design pressure and held for 30 minutes.
3) The refrigerant and solution pump/motors shall undergo standard factory tests to ensure proper head flow, and motor output characteristics.
4) All machine wiring shall undergo an insulation resistance test. The chiller control center and all electrical components shall also be functionally tested to verify continuity and proper electrical operation.
5) Final assembly inspection shall consist of verifying that all valves, controls, instrumentation, pumps, purge components, and all other machine components have been properly installed on the machine.
6) Each unit shall be checked for overall appearance and dimensional accuracy.
7) Final inspection shall be performed on each unit to check that painting of the unit is as specified, name-plate data is correct, and that all accessories are furnished as required.

3. EQUIPMENT

A. General:

Absorption chiller shall include evaporator, absorber, condenser, generator, solution heat exchanger, absorber heat exchanger, refrigerant/solution pumps, purge system, piping, wiring, controls and auxiliaries. Shipment of the machine shall be in one piece. Initial charge of lithium bromide can be included with the chiller for charging at the jobsite.

B. Heat Exchangers:

1) All heat exchangers shall be of shell and tube construction with shells, tube sheets, tube support sheets, and water boxes fabricated of carbon steel. All heat exchangers shall incorporate straight tubes. All tubes for generator, absorber, evaporator, condenser are expanded into grooved tube sheet.

2) Water boxes.

The evaporator, absorber, condenser and generator water boxes shall be designed for 1034 kPa working pressure. Nozzle-in-head (NIH) type water boxes shall be supplied on the evaporator while the absorber-condenser and generator water boxes shall be marine type. All water boxes shall be provided with vent and drain connections. If the customer informs flange information, we can assemble proper flange to water box nozzle.

* Special coating will be applied inside of the water box in case when saluted water is used.

3) Plate heat exchanger.
A solution heat exchanger shall be an integral part of the machine to increase efficiency by pre-heating weak solution on the tube side with strong solution on the shell side. The plate heat exchanger is made of stainless steel to prevent corrosion. Plate heat exchanger is built-up by a plate package of corrugated channel plates surrounded by front and rear cover plate packages. The heat plate makes channel passing two kinds of fluid. The corrugated shape formed on heat plate makes fluid turbulence and supports plates against pressure difference between two fluids.

4) Absorber heat exchanger.
Absorber heat exchanger is newly added in LHH series absorber, so efficiency of LHH series is much greater than the previous series.

5) Tray and dripper system.
Tray and dripper system for the evaporator, absorber, and generator shall be of a non-clogging design, specifically designed for the intended duty, and shall be fabricated of a corrosion-proof material to ensure continuous, high-efficiency operation.
Evaporator and absorber of LHH series has double tray and dripper system, chiller capacity is greatly increased by this system.

6) Material.
Heat exchanger material and minimum wall thickness shall be contingent on the type of corrosion inhibitor used in the machine. For lithium molybdate systems, the following tube specifications shall apply to ensure long machine life and continuous operation:

Evaporator……copper or stainless steel
Absorber…….....copper or stainless steel
Condenser..……copper or stainless steel
Generator……copper or stainless steel

* Special tube material like Cupronickel, Titanium, Stainless Steel, Duplex can be used as an option, if required.

C. Pump/Motors:
Refrigerant and solution pump/motors shall be self-contained, leakproof, hermetic type, with isolation valves, and internal seal water system to minimize air leakage into the machine. Lubrication and cooling shall be accomplished by the fluid being pumped; auxiliary water piping for cooling and lubrication shall not be acceptable. Pump/motor assemblies shall be designed for a minimum of 5 years (or 20,000 hours) normal operation between inspections.

D. Purge System
An automatic purge system shall be furnished to provide a continuous purging action whenever the chiller is in operation to assure long machine life and efficient performance. Non-condensable gas shall be removed from the absorber by a liquid eductor, which shall use flow from solution pump to create a suction. Non-condensable gas shall be stored external to the unit and shall be prevented from diffusing back into the machine when the unit is not operating. Evacuation of the external storage tank shall be accomplished by the use of a unit-mounted vacuum pump. The vacuum pump shall be factory mounted on the chiller and wired to the control panel by the chiller manufacturer.

E. Controls:
1) General
The Hot water absorption chiller contains a microprocessor-based control panel that monitors and controls all operations of the machine. The microprocessor controls system matches the cooling capacity of the machine to the cooling load while providing state of machine protection. The system controls cooling capacity within the set point plus the deadband by sensing the leaving chilled water and regulating the hot water control valve via a mechanically linked actuator motor.
The control system controls the operation of the machine by monitoring all operating conditions. The microprocessor control panel can diagnose a problem and let the operator know what the problem is and what to check. It promptly positions the hot water control valve to maintain leaving chilled water temperature. It can interface with auxiliary equipment such as pumps and cooling tower fans. It continually checks all safeties to prevent any unsafe operating condition.

2) Safety Control
The Control panel monitors all safety control inputs and if required shuts down the chiller or stops solution pump to protect

the chiller from possible damage from any of the critical conditions. The controller screen displays the messages if the controller starts safety controls to stop, the alarm relay operates and alarm indicator is brink. The alarm is saved in the controller alarm table to correct the problems.

3) Remote Start/Stop Control
A remote device, such as a time clock which uses a set of contacts, may be used to start and stop the chiller.

4) Spare Safety Inputs
Normally closed (NC) digital inputs for additional field-supplied safeties may be wired to the spare protective limits input channel in place of the factory-installed jumper. (Wire multiple inputs in series.) The opening of any contact will result in a safety shutdown and controller display.

5) Tower-Fan Relay
The tower-fan relay can be controlled when cooling water inlet temperature is low. The temperature setting point is adjustable in the range 16 ~ 40℃.

6) Auto Restart After Power Failure
If the control power is interrupted during operation, the chiller stops immediately without the normal shutdown sequence and dilution. Solution crystallization can occur if the concentration is high (chiller was operating with a relatively large load). The machine will start automatically when the power is back on.

F. Machine Safety Devices:

1) Machine safety and limit devices shall be included as follows:
   a. Low chilled water temperature
   b. Low chilled water flow
   c. Low cooling water flow (optional)
   d. High Generator temperature
   e. High motor winding temperature – refrigerant / solution pumps
   f. High motor amperage – refrigerant / solution pumps

G. Electrical Requirements:

1) Power supply to the unit shall be 3-ph, 60Hz with voltages of 220, 380, 400, 440, 460 / 3-ph, 50Hz with 220V, 380V, 400V, 440V, 460V as specified on the equipment schedule. A multi-tap transformer shall provide 24V single-phase and 24 DC secondary power for the control panel

2) Contractor shall supply and install the electrical power line and all auxiliary electrical protection devices per local code requirements and as indicated necessary by the chiller manufacturer.

H. Contractor shall supply and install electrical wiring and devices required to interface the chiller controls with the building control system, if applicable.

I. Piping Requirements:

1) Piping and instrumentation for the chilled water, cooling water and hot water shall be supplied and installed by the contractor / owner.

2) Chilled water flow switch shall be factory supplied and factory installed in the evaporator water nozzle. Cooling water flow switch shall be field installed or factory installed if customer requires and supplied by either the chiller manufacturer or the contractor/owner.

J. Thermal Insulation:
Insulation of cold or hot surfaces shall be field supplied and field installed on the machine. Chiller manufacturer shall specify the recommended material and surface area to be insulated.

K. Sound Level:
The overall sound pressure level of the chiller shall not exceed 75 dbA when measured per ARI Standard 575 (latest edition).

L. Start-up:

1) Unit manufacturer shall provide a factory-trained service representative, employed by the chiller manufacturer, to perform and/or supervise chiller pressure test (when required), charge chiller with refrigerant (water) and lithium bromide solution, place unit into operation, and calibrate all controls in accordance with the manufacturer's written start-up, operating, and maintenance instructions.

2) After unit start-up has been performed, the same factory representative shall be available for a period of instruction (not to exceed 4 hours) to instruct the owner's personnel in the proper start-up, operation, and maintenance procedures.

3) Manufacturer shall provide the following literature:
   a. Installation Instructions
   b. Start-up, Operating and Maintenance Instructions
   c. Field Wiring Diagrams

Options and Accessories:

1) High-Pressure Water boxes:
   Water boxes rated for 1724 kPa or 2068 kPa working pressure shall be furnished when specified on the equipment schedule.
2) Special Tubing:
   Tubing of non-standard materials and/or wall thickness shall be provided when specified on the equipment schedule.
3) Isolation Package:
   A vibration isolation package consisting of machine soleplates and neoprene isolation pads shall be furnished for field installation when specified on the equipment schedule.
4) Cooling Water Flow Switch:
5) A cooling water flow switch, rated for either 1034 kPa or 2068 kPa shall be field installed or factory installed if customer requires and supplied by either the chiller manufacturer or the contractor/owner

Test Method

Performance Test
in Pitching Condition

Performance Test
in Rolling Condition

Test Result

Item	Rated spec.	Land operating cond. (℃)	Marine operating conditions								
			Trim 1.5˚		Pitching 7.5˚	Heel 1.5˚		Rolling 7˚	Rolling 11˚	Rolling 15˚	Rolling 22.5˚
			Rear	Front		Star board	Port side				
Chilled water Temp. inlet	12.0 ℃	12.2	12.1	12.3	12.4	12.1	12.0	12.1	11.8	12.0	13.0
Chilled water Temp. outlet	7.0 ℃	7.3	7.5	7.5	7.9	7.5	7.5	7.4	7.5	7.6	9.5
Cooling water Temp. inlet	32.0 ℃	31.6	31.6	31.7	32.2	32.2	32.1	32.0	32.0	32.1	32.6
Cooling water Temp. outlet	37.0 ℃	36.3	36.0	36.3	37.0	36.8	36.7	36.9	36.5	36.7	37.3
Cooling capacity ,%	100 %	98.4	92.3	96.5	90.5	92.0	90.0	93.4	85.9	87.9	69.9
Capacity gap,%			△6.1	△1.9	△7.9	△6.4	△8.4	△5.0	△12.5	△10.5	△38.5
Chiller Operation		O.K	O.K	O.K	O.K	O.K	O.K	O.K	O.K	O.K	O.K

WORLD ENERGY ABSORPTION CHILLERS EUROPE LTD.
MINUTE OF FACTORY ACCEPTANCE TEST

Date of the test	March 03. 2017
Test location	WORLD ENERGY CO., LTD. 97, Gaeungongdan-gil, Gaeun-eup, Mungyeong-si, Gyeongsangbuk-do, Korea
Chiller model	HWAR-L160HH
Chiller serial number	WE1702012

ATTENDEES ("WITNESSES")

Surname	Name	Organization
Zhang	Roger	Novenco (Shanghai) Commercial & Trading Co., Ltd.

PURPOSE OF THE FACTORY ACCEPTANCE TEST ("FAT")

The purpose of this FAT is to verify that the performance of the aforementioned absorption chiller are within the allowable values stated hereinafter.

DEFINITIONS

Cooling Capacity	The cooling capacity, expressed in **kW** is calculated with the following formula: **Qe = [Ve x (Tei – Teo) x 1000] / 860** – where: • Qe: Cooling Capacity [kW] • Ve: chilled water volume flow rate [m³/h] • Tei: temperature of the chilled water entering the chiller • Teo: temperature of the chilled water leaving the chiller
Heat Input	The thermal power, expressed in **kW** used by the chiller to generate the Cooling Capacity and calculated with the following formula: **Qg = [Mh x (Tei – Teo) x 1000] / 860** – where: • Qg: Heat Input [kW] • Mh: hot water mass flow rate [ton/h] • Tei: temperature of the hot water entering the chiller • Teo: temperature of the hot water leaving the chiller
COP	COP = Coefficient of Performance. It is the ratio between the Cooling Capacity and the Heat Input calculated with the following formula: **COP = Qe / Qg** – where: • COP = Coefficient of Performance • Qe = Cooling Capacity • Qg = Heat Input

DESIGN DATA OF THE TESTED CHILLER

Cooling capacity	550 kW	Chilled water in/out temperatures	12/7 °C
Chilled water flow rate	94.6 m³/h (94.6 ton/h)	Cooling water in/out temperatures	32/37 °C
Cooling water flow rate	209.7 m³/h (209.7 ton/h)	Hot water in/out temperatures	95/85 °C
Hot water flow rate	59.6 m³/h (57.6 ton/h)	COP	0.822

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<Factory Acceptance Test Witnessed by Korea Institute of Industrial Technology>

Approval Certificate

DNV·GL

DNV GL SE • P.O. Box 11 16 05 • 20416 Hamburg • Germany

World Energy Co., Ltd.
10,24 Beon-gil, Dacya 1-ro
Gunpo-si, 435-060
Republic of Korea

DNV GL SE
Maritime
Brooktorkai 18
20457 Hamburg
Germany

Phone +49 40 36149-0
Fax +49 40 36149-200
leedoffice@dnvgl.com
www.dnvgl.com

Your reference	Your e-mail of	Our reference	Extension	Date
	2015-12-29	15-069607/KAEM	+49 40 36149-5093	2016-03-21

Certification of Hot Water Driven Absorption Chiller: HWAR – L & LH & LHH-Series, Approval Certificate: 42 195-15 HH; our order-no: 9064 15 12623 199

Dear Mr. Hwang,

Enclosed please find the original of the approval certificate.

The electrical documents and the pressure vessel drawings are stamped separately and confirmed by approval letter additionally.

The certificate will be published under

- https://approvalfinder.dnvgl.com/

Yours faithfully,
for DNV GL SE

i.V.
Olaf Drews

i.A.
Christian Kaemmer

Specification Data (SI unit)

Model			unit	HWAR-L30HH	HWAR-L40HH	HWAR-L50HH	HWAR-L60HH	HWAR-L75HH	HWAR-L90HH	HWAR-L110HH	HWAR-L135HH	HWAR-L155HH	HWAR-L180HH
Cooling Capacity			kW	105	141	176	211	264	316	387	475	545	633
			usRT	30	40	50	60	75	90	110	135	155	180
Chilled water	Temp.		℃	13 / 8									
	Flow rate		m^3/h	18.1	24.2	30.2	36.3	45.4	54.4	66.5	81.6	93.7	109
	P. Drop		mH_2O	4.6	5.2	6.1	6.8	6.7	6.9	4.6	4.9	4.5	4.5
	Connection		mm	65				80		100		125	
Cooling water	Temp.		℃	31 / 36.5									
	Flow rate		m^3/h	36.6	48.9	61.1	73.3	91.6	110	134	165	189	220
	P. Drop		mH_2O	4.2	4.2	6.2	6.4	6.2	6.5	8.1	8.8	8.8	8.7
	Connection		mm	100				125		150			
Hot water	Temp.		℃	95 / 80									
	Flow rate		ton/h	7.3	9.8	12.2	14.6	18.3	21.9	26.8	32.9	37.8	43.9
	Pressure Drop	Shell	mH_2O	2.2	2.8	3.1	4.0	2.0	2.3	4.8	5.4	2.3	2.6
		Control Valve	mH_2O	4.0	2.8	4.4	2.4	3.7	2.1	3.2	1.9	2.5	3.4
	Connection		mm	50				65		80			
	Control Valve		mm	40		50		65		80			
Electric	Power source		-	3Φ, 400, 50Hz									
	Abs. Pump		kW(A)	1.5 (5.4)								1.8 (6.2)	
	Ref. Pump		kW(A)	0.2 (1.1)								0.3(1.4)	
	Purge Pump		kW(A)	0.4 (1.4)									
	Control Panel		kW(A)	0.2 (0.5)									
	Total Power		kW	2.3								2.7	
	Total Ampere		A	8.4								9.5	
Size	Length (L)		mm	2,110		2,610		2,658		3,678		3,728	
	Width (W)		mm	1,237				1,307				1,400	
	Height (H)		mm	2,091				2,473				2,705	
Weight	Rigging		ton	2.1	2.2	2.6	2.7	3.6	3.7	4.6	4.8	5.5	5.8
	Operation		ton	2.3	2.5	2.9	3.1	4.1	4.2	5.2	5.5	6.4	6.8
Clearance, Tube Removal			mm	1,900		2,400				3,400			

General conditions

1. Available max. working pressure of chilled water/cooling water/hot water : 1.0MPa.
2. Fouling factor 0.000044 m^2 ℃/W for Absorber and Condenser, 0.000018 m^2 ℃/W for Evaporator and Generator.

Specification Data (SI unit)

Model			unit	HWAR-L210HH	HWAR-L240HH	HWAR-L270HH	HWAR-L300HH	HWAR-L340HH	HWAR-L375HH	HWAR-L420HH	HWAR-L470HH	HWAR-L525HH
Cooling Capacity			kW	738	844	949	1,055	1,196	1,319	1,477	1,653	1,846
			usRT	210	240	270	300	340	375	420	470	525
Chilled water	Temp.		℃	13 / 8								
	Flow rate		m^3/h	127	145	163	181	206	227	254	284	318
	P. Drop		mH_2O	9.9	9.7	10.2	10.2	9.2	9.7	4.4	5.9	5.6
	Connection		mm	125		150		200				
Cooling water	Temp.		℃	31 / 36.5								
	Flow rate		m^3/h	256	293	330	366	415	458	513	574	641
	P. Drop		mH_2O	7.1	6.8	6.9	7.0	7.1	7.1	6.1	8.2	6.6
	Connection		mm	200				250				300
Hot water	Temp.		℃	95 / 80								
	Flow rate		ton/h	51.2	58.5	65.8	73.1	82.9	91.4	102	115	128
	Pressure Drop	Shell	mH_2O	4.1	4.1	3.9	4.1	3.9	4.0	2.7	3.6	3.5
		Control Valve	mH_2O	4.6	2.4	3.0	3.7	4.8	2.2	2.8	3.5	4.4
	Connection		mm	100				125				150
	Control Valve		mm	80	100				125			
Electric	Power source		-	3Φ, 400, 50Hz								
	Abs. Pump		kW(A)	1.9 (6.2)		2.4 (7.9)		2.4 (8.0)		2.8 (8.5)		4.5(12.3)
	Ref. Pump		kW(A)	0.3 (1.4)				0.4 (1.4)				
	Purge Pump		kW(A)	0.4 (1.4)								
	Control Panel		kW(A)	0.2 (0.5)								
	Total Power		kW	2.8		3.3		3.4		3.8		5.5
	Total Ampere		A	9.5		11.2		11.3.		11.8		15.6
Size	Length (L)		mm	4,748		4,854		4,872		5,414	5,912	6,012
	Width (W)		mm	1,400		1,460		1,645		1,728		1,951
	Height (H)		mm	2,705		2,781		2,947				3,168
Weight	Rigging		ton	6.8	7.1	8.8	9.2	10.5	10.9	12.3	13.7	17.2
	Operation		ton	7.9	8.4	10.4	10.9	12.5	13.1	14.8	16.4	20.8
Clearance, Tube Removal			mm	4,600						5,200	5,700	

General conditions

1. Available max. working pressure of chilled water/cooling water/hot water : 1.0MPa.
2. Fouling factor 0.000044 m^2 ℃/W for Absorber and Condenser, 0.000018 m^2 ℃/W for Evaporator and Generator.

Specification Data (SI unit)

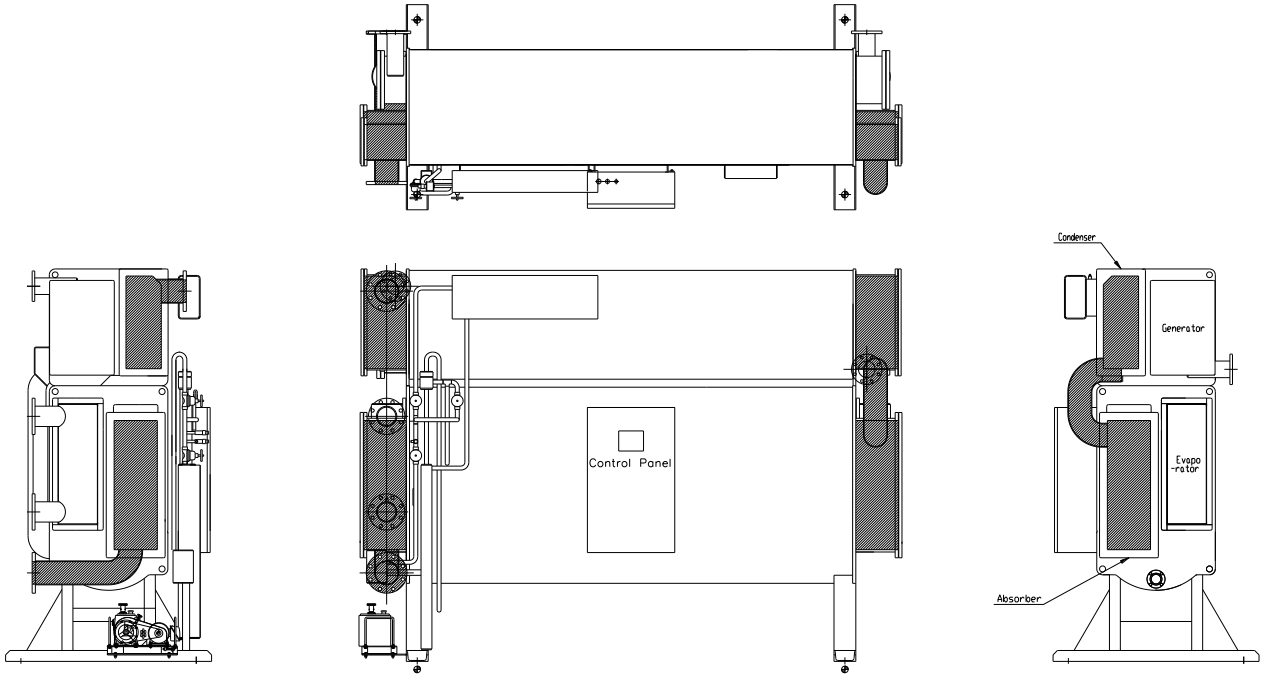
Model			unit	HWAR-L580HH	HWAR-L630HH	HWAR-L680HH	HWAR-L750HH	HWAR-L820HH	HWAR-L900HH	HWAR-L975HH	HWAR-L1050HH	HWAR-L1125HH	HWAR-L1300HH
Cooling Capacity			kW	2,039	2,215	2,391	2,637	2,883	3,165	3,428	3,692	3,956	4,571
			usRT	580	630	680	750	820	900	975	1050	1125	1300
Chilled water	Temp.		℃	13 / 8									
	Flow rate		m^3/h	351	381	411	454	496	544	590	635	680	786
	P. Drop		mH_2O	7.4	9.2	5.5	7.1	9.1	6.9	8.6	5.2	6.4	9.5
	Connection		mm	200		250			300				
Cooling water	Temp.		℃	31 / 36.5									
	Flow rate		m^3/h	708	769	830	916	1001	1099	1191	1282	1374	1588
	P. Drop		mH_2O	8.6	10.8	6.7	8.7	11.0	8.3	10.3	7.1	8.7	10.4
	Connection		mm	300		350			400				
Hot water	Temp.		℃	95 / 80									
	Flow rate		ton/h	141	154	166	183	200	219	238	256	274	317
	Pressure Drop	Shell	mH_2O	4.5	5.7	3.3	1.8	2.3	3.7	4.7	3.6	4.4	2.5
		Control Valve	mH_2O	2.4	2.8	3.3	4.0	4.7	1.7	2.0	2.3	2.7	3.6
	Connection		mm	150					200				
	Control Valve		mm	150					200				
Electric	Power source		-	3Φ, 400, 50Hz									
	Abs. Pump		kW(A)	4.5 (12.3)		4.5 (13.3)			5.0 (15.2)		6.7 (20.0)		
	Ref. Pump		kW(A)	0.4 (1.4)		1.5 (4.0)					1.5(4.3)		
	Purge Pump		kW(A)	0.4 (1.4)				0.75 (2.2)					
	Control Panel		kW(A)	0.2 (0.5)									
	Total Power		kW	5.5		6.6		7.0	7.5		9.2		
	Total Ampere		A	15.6		19.2		20.0	21.9		27.0		
Size	Length (L)		mm	6,537	7,037	6,114	6,639	7,139	6,749	7,249	6,966	7,466	8,466
	Width (W)		mm	1,951		2,272			2,548		3,289		
	Height (H)		mm	3,168		3,474			3,937		4,000		
Weight	Rigging		ton	19.0	20.6	21.7	23.9	26.0	28.5	30.8	33.1	35.4	40.0
	Operation		ton	22.9	24.9	26.3	29.0	31.6	34.6	37.5	40.3	43.2	49.0
Clearance, Tube Removal			mm	6,200	6,700	5,700	6,200	6,700	6,200	6,700	6,300	6,800	7,800

General conditions

1. Available max. working pressure of chilled water/cooling water/hot water : 1.0MPa.
2. Fouling factor 0.000044 m²℃/W for Absorber and Condenser, 0.000018 m²℃/W for Evaporator and Generator.

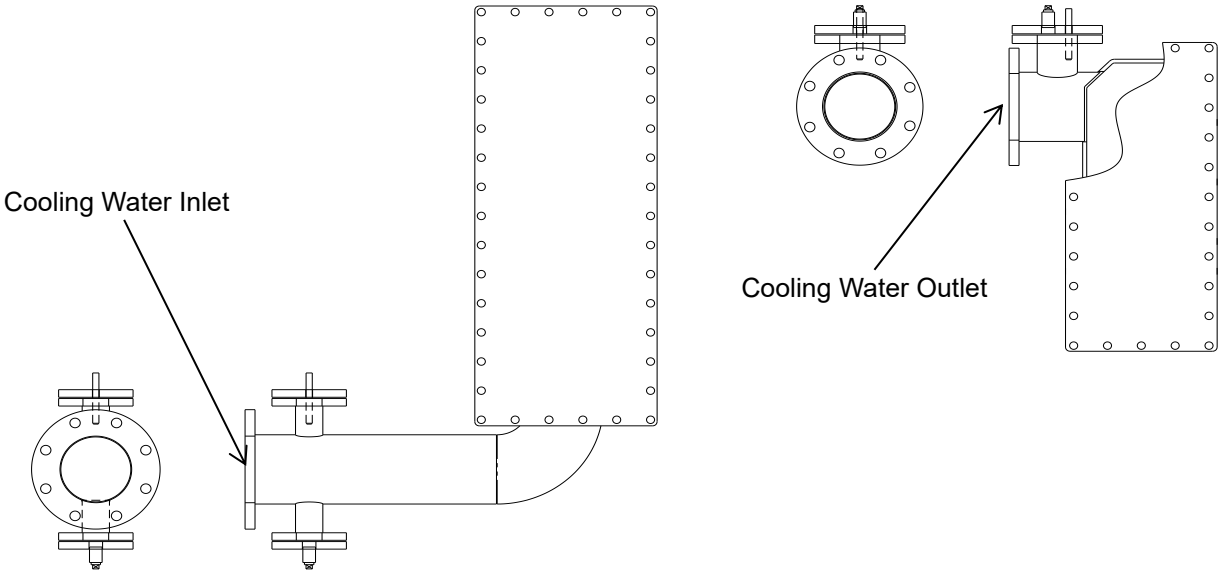
Painting

As shown below, if a material of W/B & tube sheet which is contacted with seawater is made of carbon steel, the part should be covered with Belzona coating. The Hatching part uses seawater for cooling water, the inside of the part is covered with Belzona coating.



<Belzona coating parts >

The Air vent and Drain parts of W/B inlet/outlet nozzle which are touched seawater are treated with inner coating after attaching about 40mm flange to avoid corrosion from seawater and maintain simply.



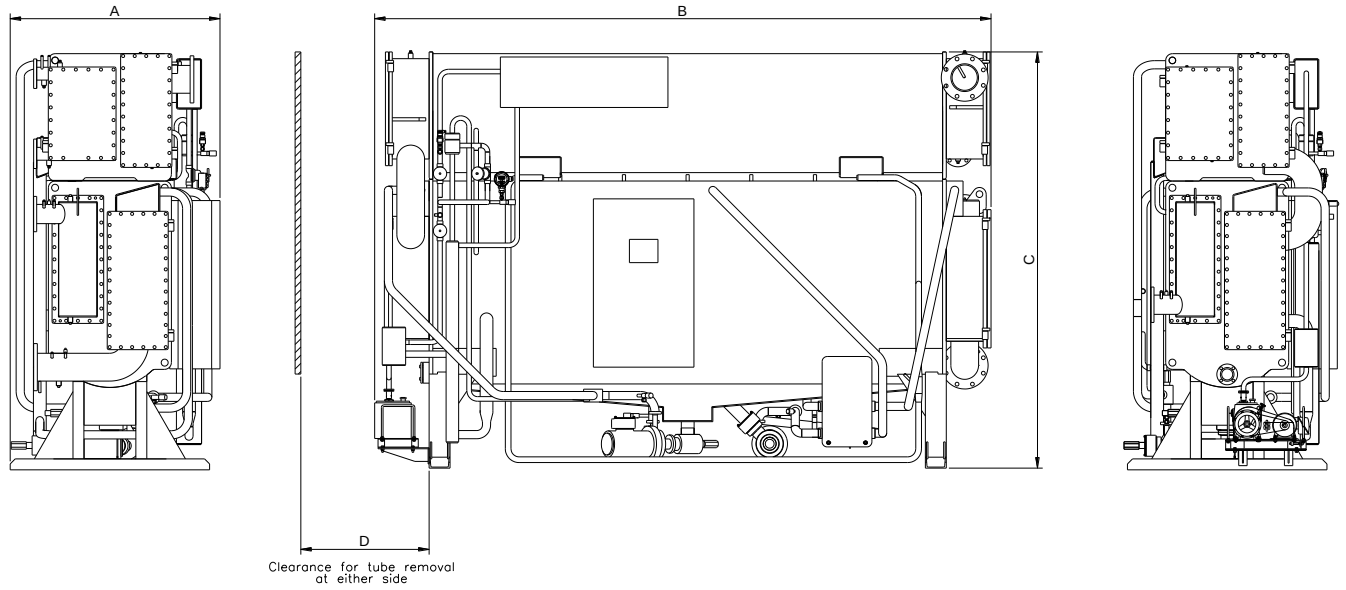
< Coating for Cooling water inlet/outlet air vent & Drain Socket >

Dimensions

HWAR-LHH

Unit : mm

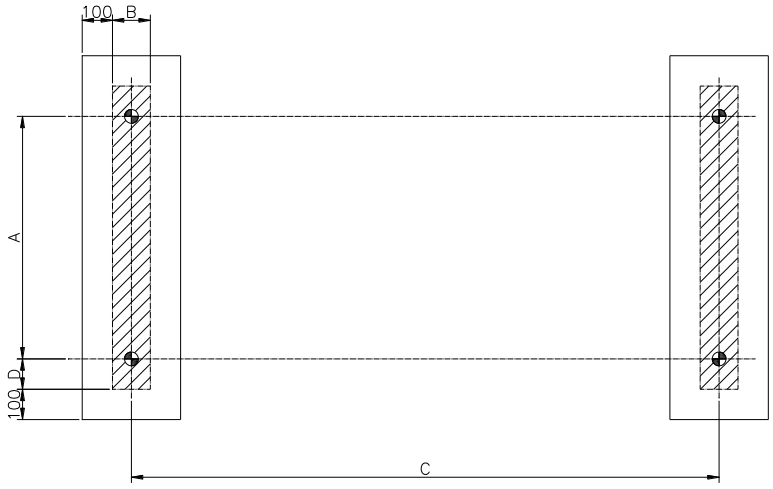
NOTES
1. ⊕ INDICATES THE POSITION OF ANCHOR BOLTS.
2. ALL EXTERNAL WATER PIPING WITH WELDED FLANGES ARE TO BE PROVIDED BY THE CUSTOMER.
3. ⇧ INDICATES THE POSITION OF THE POWER SUPPLY WIRING CONNECTIONS TO CONTROL PANEL.
4. INSTALLATION AND SERVICE CLEARANCE AS FOLLOWS:
   LONGITUDINAL DISTANCE : 1 m
   TOP : 0.2 m
   CONTROL PANEL : 1.2 m
   OTHERS : 0.5 m

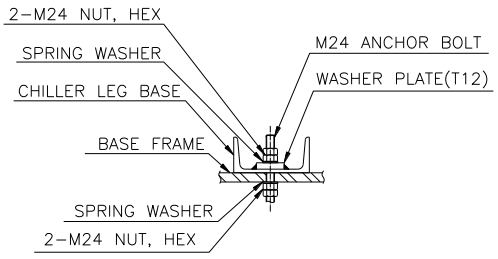


	HWAR-L30HH	HWAR-L40HH	HWAR-L50HH	HWAR-L60HH	HWAR-L75HH	HWAR-L90HH	HWAR-L110HH	HWAR-L135HH	HWAR-L155HH	HWAR-L180HH	HWAR-L210HH	HWAR-L240HH	HWAR-L270HH	HWAR-L300HH
A	1,237					1,307			1,400				1,460	
B	2,110		2,610		2,658		3,678		3,728		4,748		4,854	
C	2,091				2,473				2,705				2,781	
D	1,900		2,400				3,400				4,600			

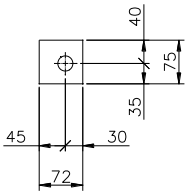
	HWAR-L340HH	HWAR-L375HH	HWAR-L420HH	HWAR-L470HH	HWAR-L525HH	HWAR-L580HH	HWAR-L630HH	HWAR-L680HH	HWAR-L750HH	HWAR-L820HH	HWAR-L900HH	HWAR-L975HH	HWAR-L1050HH	HWAR-L1125HH	HWAR-L1300HH
A	1,645		1,728		1,951			2,272			2,548		3,289		
B	4,872		5,414	5,912	6,012	6,537	7,037	6,114	6,639	7,139	6,749	7,249	6,966	7,466	8,466
C	2,947				3,168			3,474			3,937		4,000		
D	4,600		5,200	5,700		6,200	6,700	5,700	6,200	6,700	6,200	6,700	6,300	6,800	7,800

Foundation





CHEMICAL ANCHOR BOLT DETAIL



SQUARE WASHER

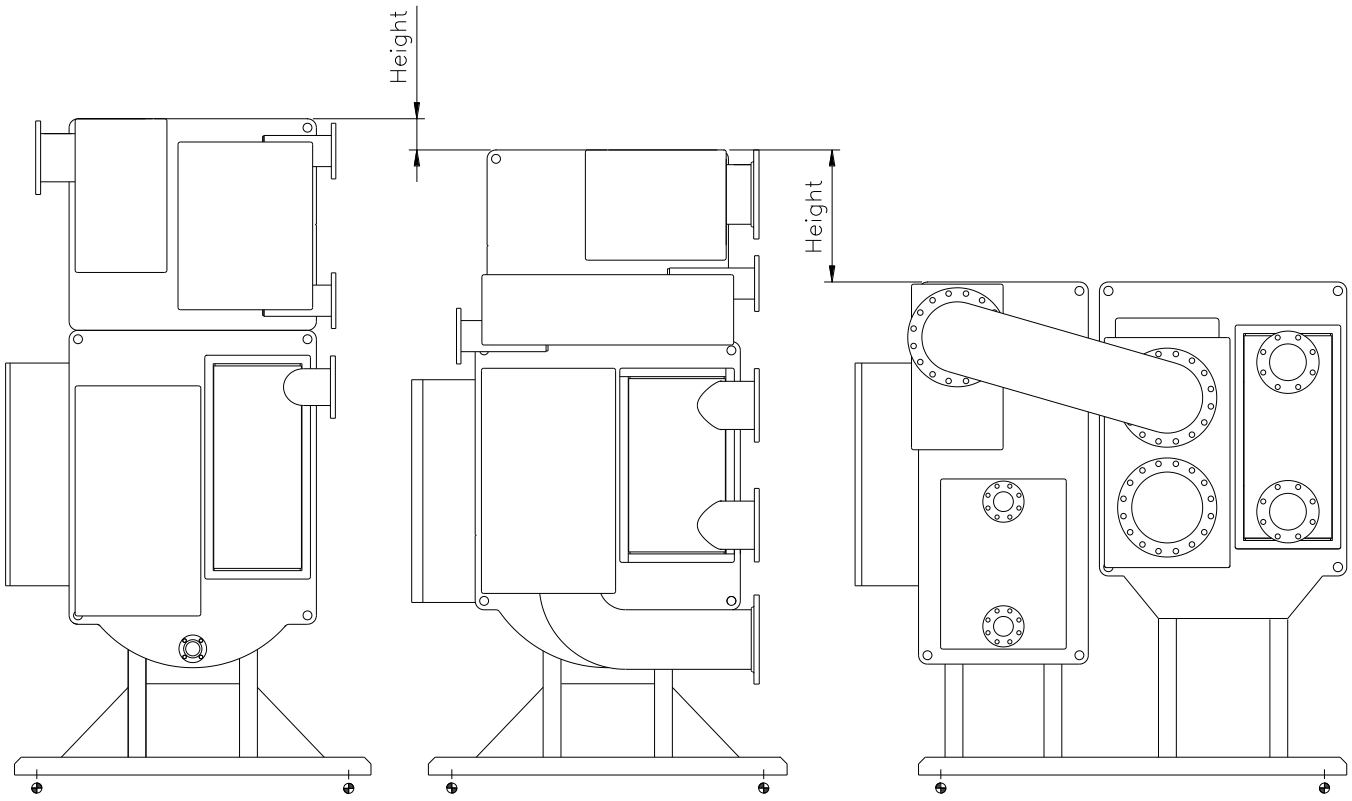
NOTES
1. THERE SHOULD BE A DRAIN AROUND THE FOUNDATION.
2. THE FLOOR SURFACE SHOULD BE MADE AS WATER PROOF FOR EASY MAINTENANCE WORK. (HORIZONTAL LEVEL BELOW 1 mm/1000 mm)
3. DIG ANCHOR BOLT HOLES AT THE EXACT LOCATION ACCORDING TO SPECIFICATIONS. MORTAR CEMENT IS TO BE POURED INTO THEM. # ANCHOR BOLT ARE NOT SUPPLIED WITH THE UNIT.
4. ▨ INDICATES POSITION OF LEG BASE.
5. ⊕ INDICATES POSITION OF ANCHOR BOLT HOLE.

unit : mm

Model	A	B	C	D
L30HH&L40HH	1,000	125	1,441	100
L50HH&L60HH			1,941	
L75HH&L90HH	1,100		1,941	
L110HH&l135HH			2,961	
L155HH&L180HH	1,200	150	2,936	
L210HH&L240HH			3,956	
L270HH&L300HH		200	3,906	
L340HH&L375HH	1,400		3,906	
L420HH	1,500		4,448	
L470HH			4,946	
L525HH	1,600	250	4,896	
L580HH			5,421	
L630HH			5,921	
L680HH	1,700	300	4,846	
L750HH			5,371	
L820HH			5,871	
L900HH	1,800		5,371	
L975HH			5,871	
L1050HH	2,300		5,371	
L1125HH			5,871	
L1300HH			6,871	

Customized Design for Installation

- Our product is able to be customized design according to height, width and length in the footprint. The picture below shows that the upper part (low & high Temp. Generator & Condenser) deploys next to the lower part (Evaporator & Absorber) for customized design.



Controls

Microprocessor-based Unit Controller is factory mounted, wired and tested to ensure a protection of the Machine and efficient capacity control. The program logic provides proper Start/Stop of the Machine and also enables a communication interface with others.

Component Test and Diagnostic Check
- Touch Screen Interface for Status Display, Set-point Control, and System Configuration
- Primary and Secondary Status Messages
- Individual Start/Stop Schedules for Local Mode
- Recall of Up to 200 Alarm and Alert Messages with Diagnostic Help
- Extensive Diagnostic and Service Capabilities
- Advanced Crystallization Protection

Safety Cutouts
- Solution Pump Motor Overload/High Temperature
- Refrigerant Pump Motor Overload/High Temperature
- Low Chilled Water Temperature Cutout
- Low Refrigerant Temperature Cutout
- Low Cooling Temperature Cutout
- Low Chilled Water Flow Cutout
- Low Cooling Water Flow Cutout (Option)
- Generator High Temperature Cutout
- Hot Water High Temperature Cutout

Protective Limits
- Generator Solution Outlet Temperature High
- Hot Water Inlet Temperature High
- Refrigerant Pump Abnormal
- Solution Pump Abnormal
- Refrigerant Outlet Temperature Low
- Chilled Water Outlet Temperature Low
- Cooling Water Inlet Temperature Low
- Chilled Water Flow Abnormal
- Cooling Water Flow Abnormal

Overrides
- Chilled Water Outlet Temperature
- Cooling Water Inlet Temperature
- Generator Solution Outlet Temperature
- Hot Water Inlet Temperature
- High Concentration

Temperature Sensor Faults
- Chilled Water Outlet Temperature
- Cooling Water Inlet Temperature
- Condenser Refrigerant Outlet Temperature
- Evaporator Refrigerant Outlet Temperature
- Generator Solution Outlet Temperature
- Hot Water Inlet Temperature

Capacity Control
- Leaving Chilled Water Control
- Running Travel Limit (Control Valve Opening Limit)

Indications
- Chiller Operating Status Message
- Absorption Cycle State Points
- Dilution Cycle
- Power-On
- Alarm
- Safety Shutdown Message
- Run Hours
- Control Valve Position

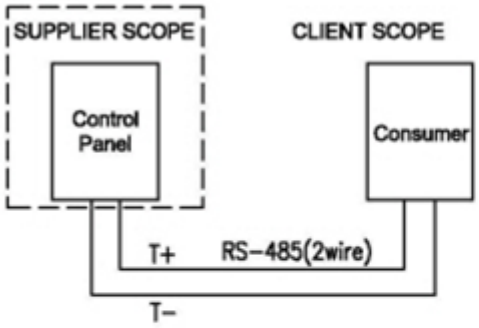
SIEMENS Controller

7″ color
Touch Screen Display

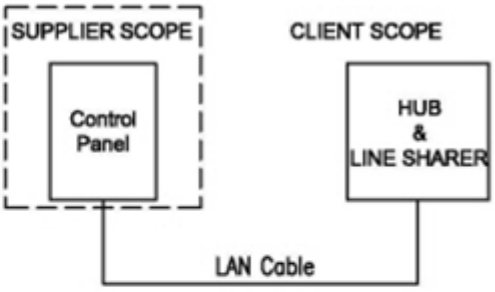
Control Panel

Communication

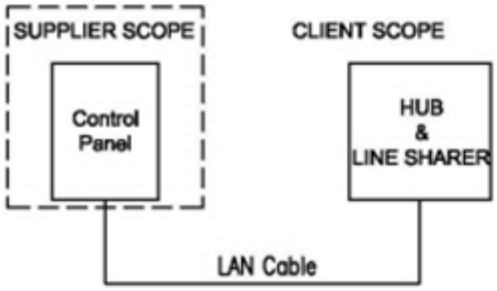
1.MODBUS-RTU



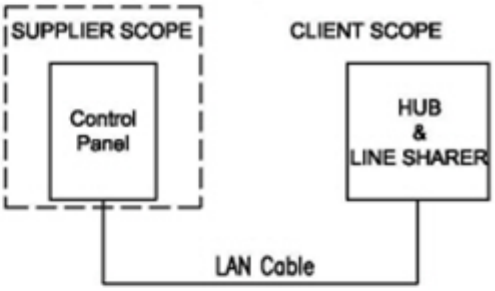
4.BACnet



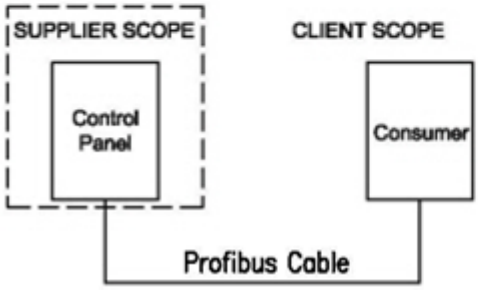
2.MODBUS-TCP



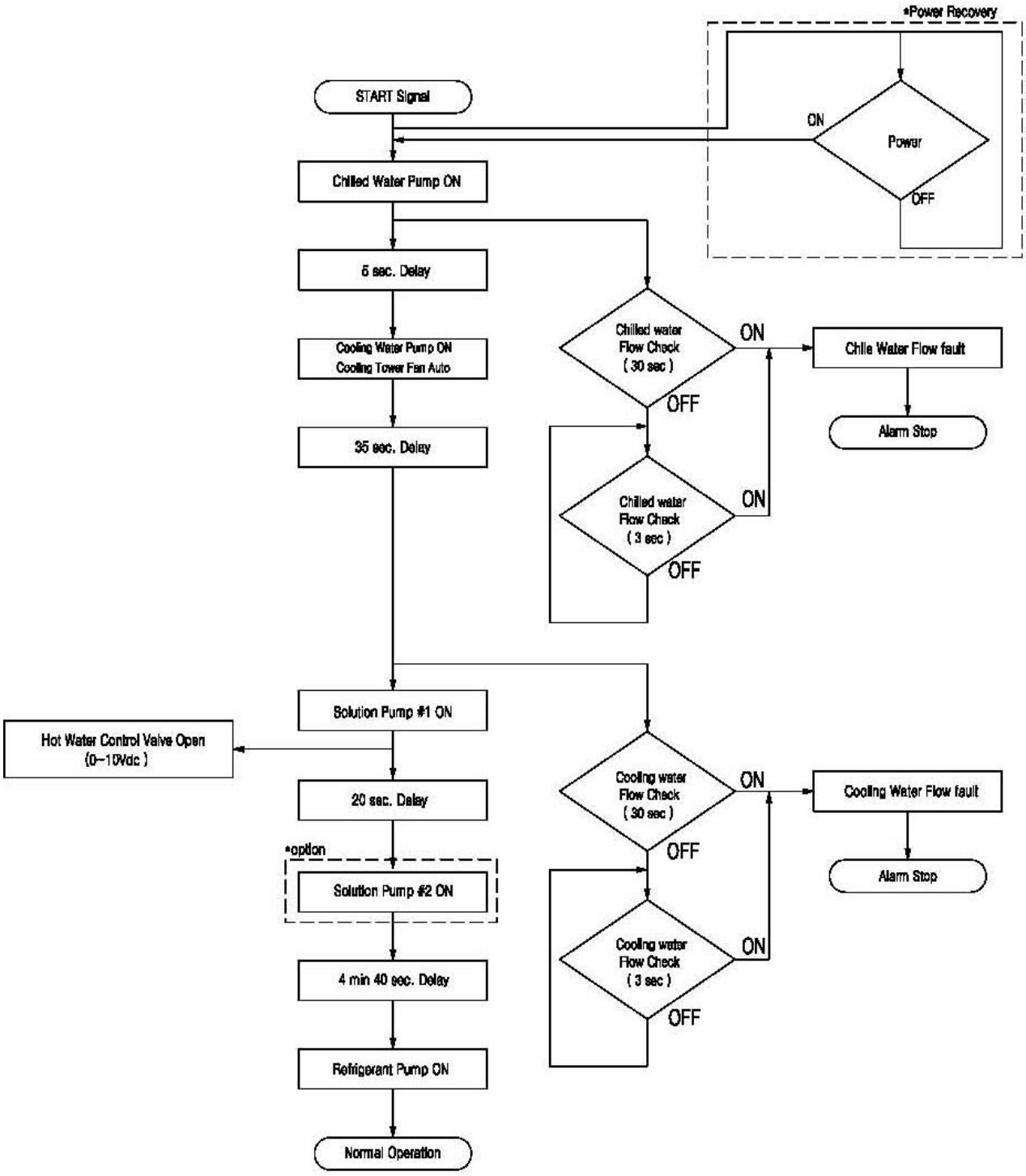
5.INTERNET



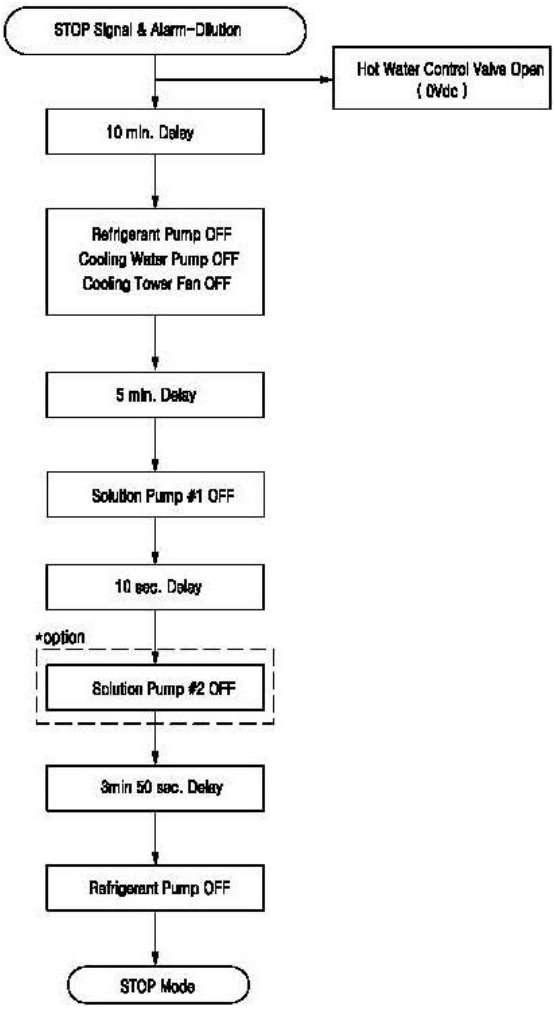
3.PROFIBUS

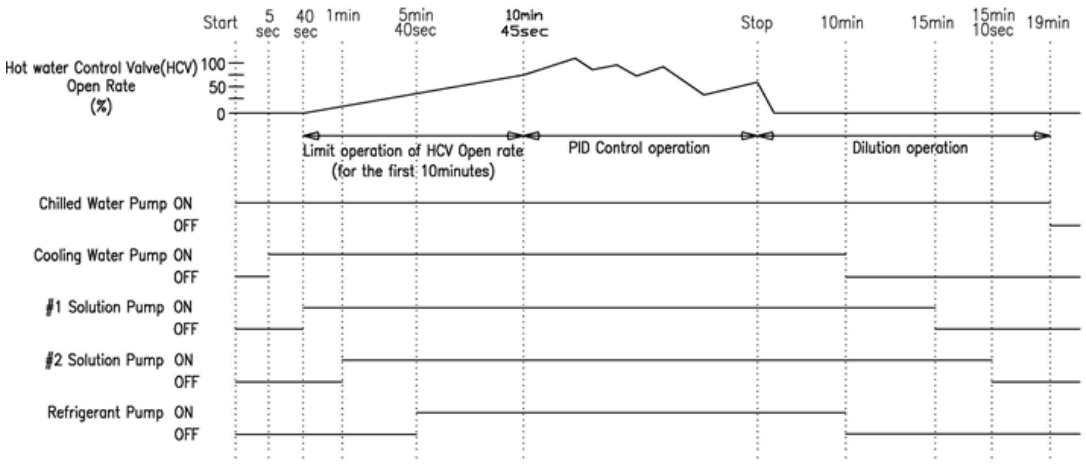


Start-up Sequence



Stop Sequence

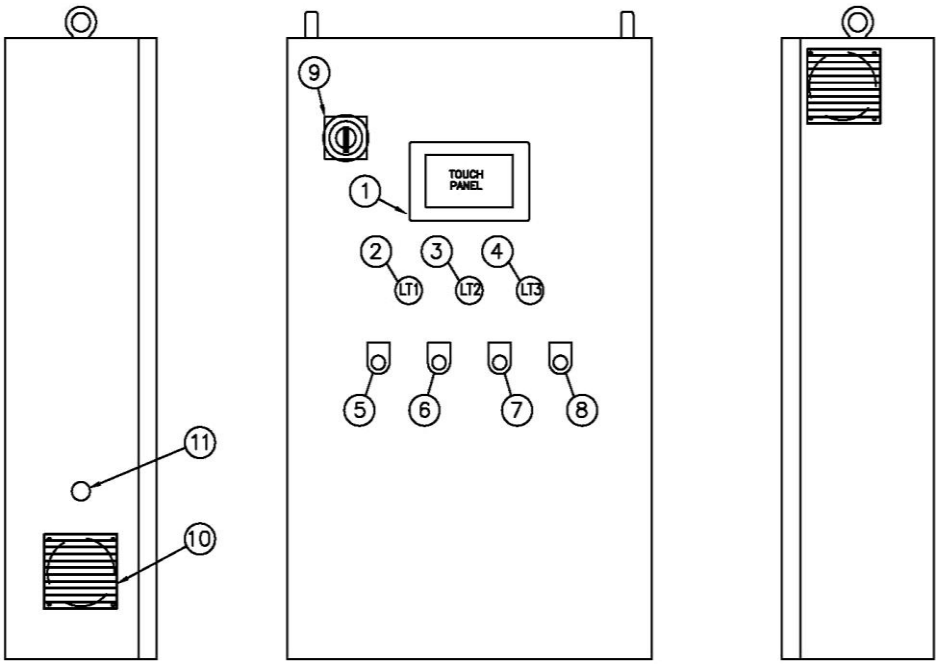


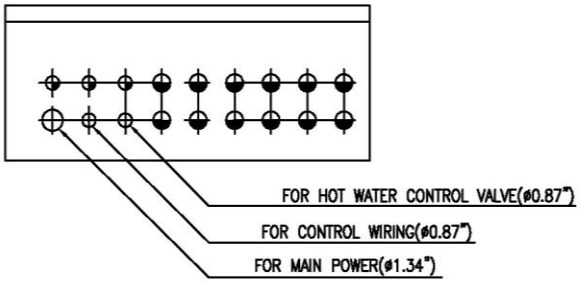


<Operation Graph>

Control Panel – Outside View (CE)

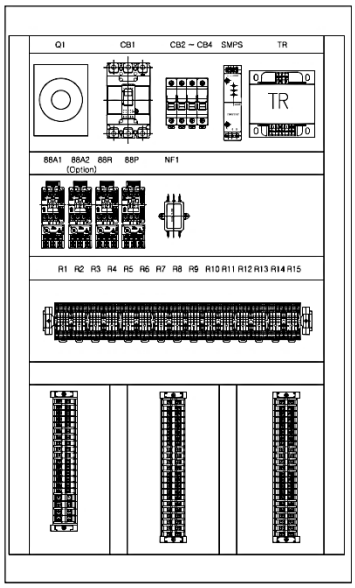
Unit : mm





① Touch Screen Controller
② Solution Pump Run Light
③ Refrigerant Pump Run Light
④ Purge Pump Run Light
⑤ Emergency Stop Push Button Switch
⑥ Buzzer Stop Push Button Switch
⑦ Purge Pump Start Push Button Switch
⑧ Purge Pump Stop Push Button Switch
⑨ Disconnect Switch
⑩ Cooling Fan
⑪ Buzzer

Control Panel - Inside View



No.	SYMBOL	DESCRIPTION	SPECATION	Q'TY
1	Q1	DISCONNECT SWITCH	600V 32A	1
2	CB1	CIRCUIT BREAKER	460V 32A	1
3	CB2	CIRCUIT BREAKER	415V 1A~63A	1
4	CB3	CIRCUIT BREAKER	415V 1A~63A	1
5	CB4	CIRCUIT BREAKER	415V 1A~63A	1
6	S.M.P.S	DC POWER SUPPLY	100~240VAC/24VDC	1
7	TR1	TRANSFORMER	460/115VAC/24VAC	1
8	88A1	SOLUTION PUMP1 CONTACTOR	24VAC 1~22A	1
9	88A2	SOLUTION PUMP1 CONTACTOR(Option)	24VAC 1~22A	1
10	88R	REFRIGERANT PUMP CONTACTOR	24VAC 1~22A	1
11	88P	PURGE PUMP CONTACTOR	24VAC 1~22A	1
12	NF1	NOISE FILTER	250VAC 6A	1
13	R1~15	RELAY	24VDC 3A	15

Electric Data

220V - 3P- 50Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	7.3	2.2	2.0	2.5
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	7.3	2.5	2.0	2.5
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	8.7	2.5	2.5	2.5
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	8.7	2.5	2.5	2.5
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	11.8	2.5	2.5	2.5
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	11.8	2.7	2.5	2.5
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	12.7	2.7	2.5	2.5
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	14.5	7.8	2.5	2.5
HWAR-L750HH	3.0	1.5	1.5	0.4	16.4	7.8	7.3	2.5
HWAR-L820HH	3.0	1.5	1.5	0.75	16.4	7.8	7.3	4.0
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	16.4	11.3	7.3	4.0
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	24.2	12.2	7.8	4.0

380V - 3P- 50Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	4.2	1.3	1.2	1.5
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	4.2	1.5	1.2	1.5
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	5.1	1.5	1.5	1.5
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	5.1	1.5	1.5	1.5
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	6.8	1.5	1.5	1.5
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	6.8	1.6	1.5	1.5
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	7.4	1.6	1.5	1.5
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	8.4	4.5	1.5	1.5
HWAR-L750HH	3.0	1.5	1.5	0.4	9.5	4.5	4.2	1.5
HWAR-L820HH	3.0	1.5	1.5	0.75	9.5	4.5	4.2	2.3
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	9.5	6.5	4.2	2.3
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	14.0	7.1	4.5	2.3

400V - 3P- 50Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	4.0	1.2	1.1	1.4
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	4.0	1.4	1.1	1.4
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.8	1.4	1.4	1.4
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.8	1.4	1.4	1.4
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	6.5	1.4	1.4	1.4
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	6.5	1.5	1.4	1.4
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	7.0	1.5	1.4	1.4
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	8.0	4.3	1.4	1.4
HWAR-L750HH	3.0	1.5	1.5	0.4	9.0	4.3	4.0	1.4
HWAR-L820HH	3.0	1.5	1.5	0.75	9.0	4.3	4.0	2.2
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	9.0	6.2	4.0	2.2
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	13.3	6.7	4.3	2.2

440V - 3P- 50Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	3.6	1.1	1.0	1.3
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	3.6	1.3	1.0	1.3
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.4	1.3	1.3	1.3
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.4	1.3	1.3	1.3
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	5.9	1.3	1.3	1.3
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	5.9	1.4	1.3	1.3
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	6.4	1.4	1.3	1.3
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	7.3	3.9	1.3	1.3
HWAR-L750HH	3.0	1.5	1.5	0.4	8.2	3.9	3.6	1.3
HWAR-L820HH	3.0	1.5	1.5	0.75	8.2	3.9	3.6	2.0
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	8.2	5.6	3.6	2.0
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	12.1	6.1	3.9	2.0

460V - 3P- 50Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	3.5	1.0	1.0	1.2
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	3.5	1.2	1.0	1.2
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.2	1.2	1.2	1.2
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.2	1.2	1.2	1.2
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	5.7	1.2	1.2	1.2
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	5.7	1.3	1.2	1.2
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	6.1	1.3	1.2	1.2
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	7.0	3.7	1.2	1.2
HWAR-L750HH	3.0	1.5	1.5	0.4	7.8	3.7	3.5	1.2
HWAR-L820HH	3.0	1.5	1.5	0.75	7.8	3.7	3.5	1.9
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	7.8	5.4	3.5	1.9
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	11.6	5.8	3.7	1.9

220V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	6.9	2.8	1.9	2.5
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	6.9	2.8	1.9	2.5
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	8.6	2.8	2.6	2.5
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	8.6	2.8	2.6	2.5
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	10.4	2.8	2.6	2.5
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	10.4	2.8	2.6	2.5
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	12.1	2.8	2.6	2.5
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	15.5	8.6	2.6	2.5
HWAR-L750HH	3.0	1.5	1.5	0.4	19.0	8.6	6.9	2.5
HWAR-L820HH	3.0	1.5	1.5	0.75	19.0	8.6	6.9	4.0
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	19.0	11.2	6.9	4.0
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	27.6	12.1	6.9	4.0

380V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	4.0	1.6	1.1	1.45
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	4.0	1.6	1.1	1.45
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	5.0	1.6	1.5	1.45
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	5.0	1.6	1.5	1.45
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	6.0	1.6	1.5	1.45
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	6.0	1.6	1.5	1.45
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	7.0	1.6	1.5	1.45
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	9.0	5.0	1.5	1.45
HWAR-L750HH	3.0	1.5	1.5	0.4	11.0	5.0	4.0	1.45
HWAR-L820HH	3.0	1.5	1.5	0.75	11.0	5.0	4.0	2.3
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	11.0	6.5	4.0	2.3
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	16.0	7.0	4.0	2.3

400V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	3.8	1.5	1.0	1.4
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	3.8	1.5	1.0	1.4
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.8	1.5	1.4	1.4
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.8	1.5	1.4	1.4
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	5.7	1.5	1.4	1.4
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	5.7	1.5	1.4	1.4
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	6.7	1.5	1.4	1.4
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	8.6	4.8	1.4	1.4
HWAR-L750HH	3.0	1.5	1.5	0.4	10.5	4.8	3.8	1.4
HWAR-L820HH	3.0	1.5	1.5	0.75	10.5	4.8	3.8	2.2
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	10.5	6.2	3.8	2.2
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	15.2	6.7	3.8	2.2

440V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	3.5	1.4	1.0	1.3
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	3.5	1.4	1.0	1.3
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.3	1.4	1.3	1.3
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.3	1.4	1.3	1.3
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	5.2	1.4	1.3	1.3
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	5.2	1.4	1.3	1.3
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	6.0	1.4	1.3	1.3
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	7.8	4.3	1.3	1.3
HWAR-L750HH	3.0	1.5	1.5	0.4	9.5	4.3	3.5	1.3
HWAR-L820HH	3.0	1.5	1.5	0.75	9.5	4.3	3.5	2.0
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	9.5	5.6	3.5	2.0
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	13.8	6.0	3.5	2.0

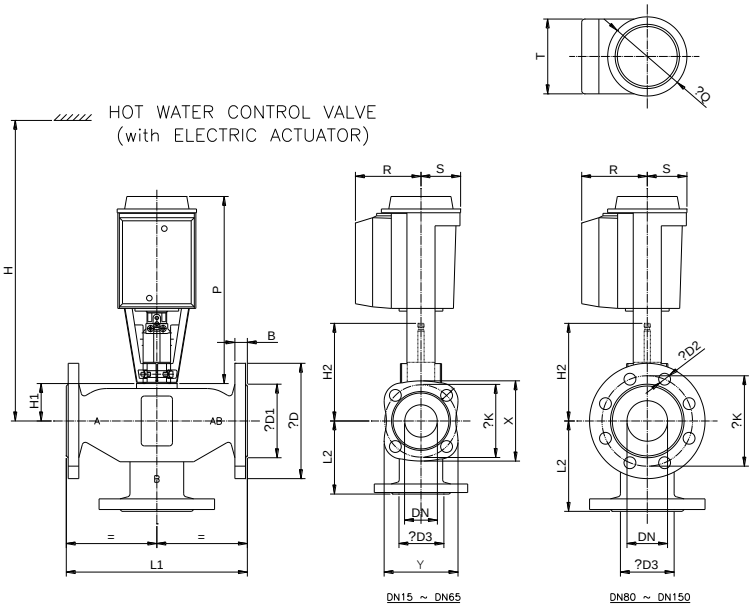
460V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
HWAR-L30HH ~ HWAR-L60HH	1.2	0.2	0.2	0.4	3.3	1.3	0.9	1.2
HWAR-L75HH ~ HWAR-L135HH	1.2	0.3	0.2	0.4	3.3	1.3	0.9	1.2
HWAR-L155HH ~ HWAR-L180HH	1.5	0.3	0.3	0.4	4.1	1.3	1.2	1.2
HWAR-L210HH ~ HWAR-L240HH	1.5	0.4	0.3	0.4	4.1	1.3	1.2	1.2
HWAR-L270HH ~ HWAR-L300HH	2.0	0.4	0.3	0.4	5.0	1.3	1.2	1.2.
HWAR-L340HH ~ HWAR-L375HH	2.0	0.4	0.4	0.4	5.0	1.3	1.2	1.2
HWAR-L420HH ~ HWAR-L470HH	2.4	0.4	0.4	0.4	5.8	1.3	1.2	1.2
HWAR-L525HH ~ HWAR-L630HH	3.0	1.5	0.4	0.4	7.4	4.1	1.2	1.2
HWAR-L750HH	3.0	1.5	1.5	0.4	9.1	4.1	3.3	1.2
HWAR-L820HH	3.0	1.5	1.5	0.75	9.1	4.1	3.3	1.9
HWAR-L900HH ~ HWAR-L975HH	3.0	2.0	1.5	0.75	9.1	5.4	3.3	1.9
HWAR-L1050HH ~ HWAR-L1300HH	4.5	2.2	1.5	0.75	13.2	5.8	3.3	1.9

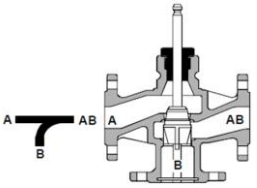
LEGEND : SP1 - Solution Pump1, SP2 – Solution Pump2, RP - Refrigerant Pump, VP - Vacuum Pump

Hot Water Control Valve

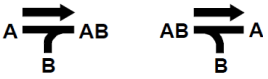
The three-way hot water control valve is supplied from factory. But, this hot water control valve is installed in the outlet(or inlet) line of hot water at jobsite. The valve has a gray cast iron body with DIN type flanged end connections. The valve size is changed 1 to 6 in., depending on the machine model or the specific job requirements. The electric actuator of valve is operated with 24Vac and controlled with 0 to 10Vdc signal. The electric power and the control signal are supplied from the chiller control panel. The hot water pipes have to be correctly connected according to the flow direction marked at the side of valve body, whether it is used as mixing type or diverting type.

* Use the 3-port valve primarily as a mixing valve.





VALVE CROSS SECTION



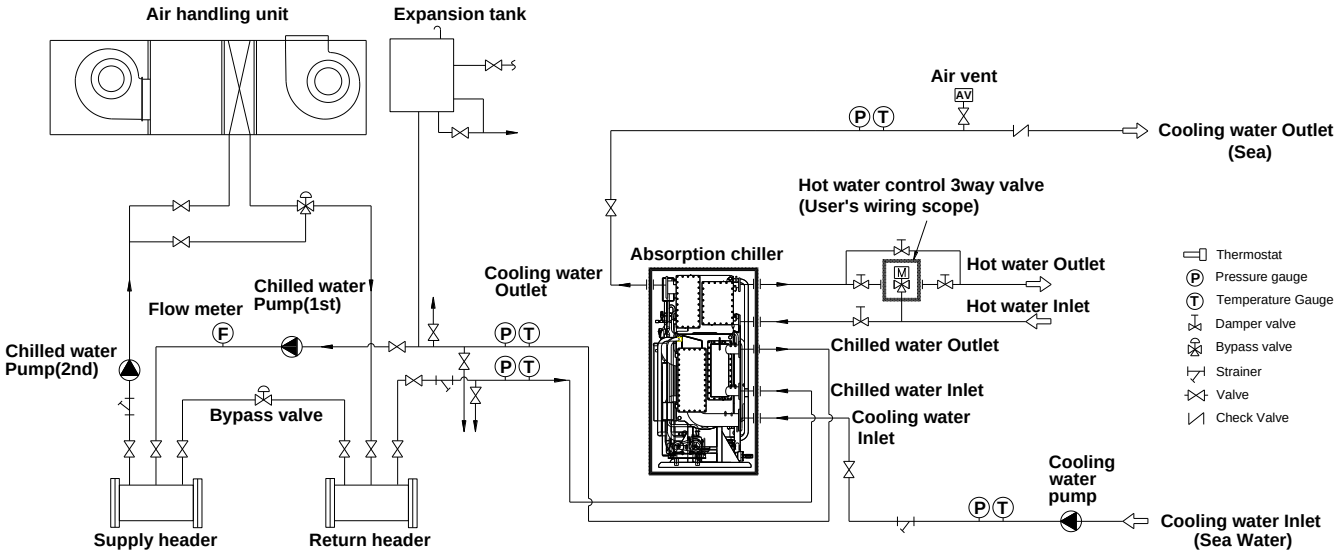
Mixing
from A/B to AB

Diverting
from AB to A/B

Hot Water Control Valve Dimensions (unit : mm)

DN	B	D	D1	D2	D3	L1	L2	X	Y	K	H1	H2	H	P	Q	R	S	T
15	14	95	46	14(4x)	23	130	65	79	76	65	37	133.5	>537	300	127	105	64	120
20	16	105	56		29	150	75	86.6	83	75								
25	15	115	65		36	160	80	94.4	90.1	85								
32	17	140	76	19(4x)	46	180	90	115.6	110.7	100								
40	16	150	84		56	200	100	123.2	117.8	110								
50		165	99		69	230	115	135.2	128.4	125	50	146.5	>550					
65	17	185	118		85	290	145	150	142.5	145	75	171.5	>575					
80		200	132	19(8x)	102	310	155	-	-	160								
100		220	156		124	350	175	-	-	180	110	226.5	>685	375	178	137	89	127
125		250	184		149	400	200	-	-	210	123	239.5	>698					
150		284	211	23(8x)	174	480	240	-	-	240	150.5	267	>726					

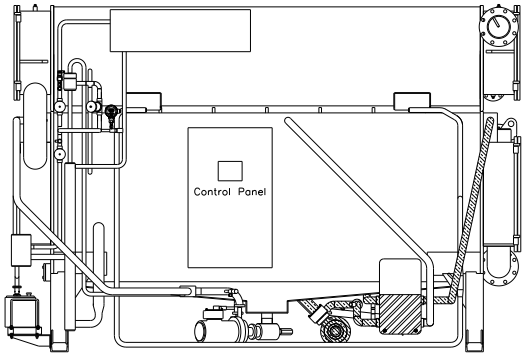
Typical Piping & Wiring

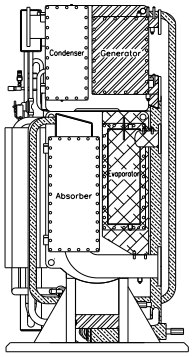


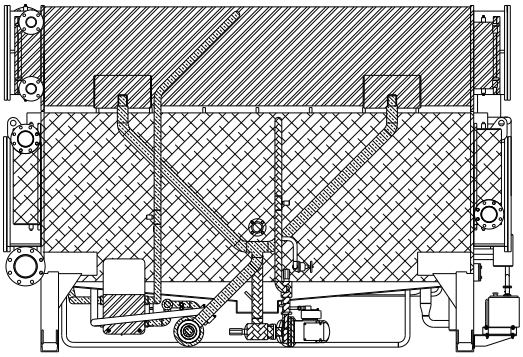
1) All external equipment out of dotted line(- - -) shall not be prepared and provided by Absorption Machine Manufacturer.
2) For pipe connections and diameters, please refer to the outline and specification data sheet
3) Driving hot water must be maintained as design temperature.
4) The stop valves at hot water inlet and outlet pipe shall be installed.
5) The locations of the chilled water pumps, cooling water pumps and expansion tanks shall be determined in consideration of the hydrostatic head of pumps and the height of building. And the Machine shall not be subject to a pressure larger than the designed pressure at any water headers.
6) For cooling water quality control, it is recommended to install cooling water bleed-off device on the inlet pipe line of cooling tower and higher than the water sump level of cooling tower.
7) About 10 meshes of strainers shall be installed in the cooling water line.
8) For the maintenance and the inspection of the Machine, the following equipment shall be installed on each chilled water and cooling water inlet/outlet lines as well as stop valve.
   - Thermometers and pressure gauges at chilled and cooling water inlet/outlet.
   - Air relief valves shall be installed on each chilled and cooling water lines and at the highest points of each piping.
   - Drain valves at the lowest position between the stop valves of chilled, cooling water and the Machine water box and the drain valve shall be piped to the drain ditch.
9) It should be better that a sufficient clearance for access to water box of the absorber, evaporator, condenser, and generator to facilitate inspection and cleaning work.

Thermal Insulation – Surface Area

The cold and hot machine surfaces have to be thermally insulated after the initial operation at jobsite. Thermal insulation drawings will be submitted in details. Non-inflammable Polymer sponge usable at 120℃ or incombustible Glass wool should be used for cold and hot surfaces. When glass wool is used, it is wrapped with thin aluminum plate or galvanized steel plate. The motor section of refrigerant pump is not insulated and the insulations on water box sections should be disassembled for the repair. The final finish painting is performed after the insulation work. The insulation work and the final finishing paint could be performed as the optional works after factory testing.







1. INSULATION FOR HOT SURFACES
19mm (3/4 inch) : Generator and It's Water Box
Heat Exchanger Body
10mm (3/8 inch) : Pipings of High Temperature's Parts

2. INSULATION FOR COLD SURFACES
19mm (3/4inch) : Evaporator Body and It's Water Box
10mm (3/8inch) : Inlet and Outlet Piping of Refrigerant Pump

Model	Hot Surface (m²)		Cold Surface (m²)	
	19 mm	10 mm	19 mm	10 mm
HWAR-L30HH	5.3	1.0	3.3	0.7
HWAR-L40HH	5.3	1.0	3.3	0.7
HWAR-L50HH	6.4	1.2	3.6	0.7
HWAR-L60HH	6.4	1.2	3.6	0.7
HWAR-L75HH	7.0	1.5	4.8	0.7
HWAR-L90HH	7.1	1.7	4.8	0.7
HWAR-L110HH	8.3	1.6	6.5	0.8
HWAR-L135HH	8.4	1.6	6.5	0.8
HWAR-L155HH	9.3	1.8	7.7	1.0
HWAR-L180HH	9.5	1.8	7.7	1.0
HWAR-L210HH	10.8	1.9	9.6	1.0
HWAR-L240HH	10.9	1.9	9.6	1.0
HWAR-L270HH	11.9	2.2	9.9	1.0
HWAR-L300HH	12.0	2.4	9.9	1.0
HWAR-L340HH	13.6	2.3	11.5	1.3
HWAR-L375HH	13.6	2.3	11.5	1.3
HWAR-L420HH	14.8	2.8	12.7	1.4
HWAR-L470HH	15.8	2.8	13.8	1.3
HWAR-L525HH	17.2	2.9	15.5	1.4
HWAR-L580HH	18.3	2.9	16.8	1.4
HWAR-L630HH	19.3	2.9	18.0	1.4
HWAR-L680HH	20.7	3.9	18.2	1.9
HWAR-L750HH	21.9	3.9	19.7	1.9
HWAR-L820HH	23.1	3.9	21.1	1.9
HWAR-L900HH	25.7	4.9	22.8	2.5
HWAR-L975HH	27.5	4.9	24.4	2.5
HWAR-L1050HH	26.3	7.2	37.0	2.2
HWAR-L1125HH	28.0	7.2	39.6	2.2
HWAR-L1300HH	30.8	7.2	44.7	2.2

Spare Part List

No	Part Name	Maker Model No.	Maker	Specification	unit	Q'ty	Remark	
1	Controller	POL955/STD	SEIMENS	PLC	EA	1		
2	Controller	POL635/STD	SEIMENS	PLC	EA	1		
3	Touch Screen	TOPRW0700WD	M2I Corp.	DC24V, 12W	EA	1		
4	Temperature Sensor			PT1000 ohm Low shield	EA	9		
5	Absorbent Pump		Chunin (Korea)	90lpm, 8.0m	EA	1		
6	Absorbent Pump-2nd		Chunin (Korea)	60lpm, 3.0m	EA	1		
7	Refrigerant Pump		Chunin (Korea)	64lpm, 2.3m	EA	1		
8	Purge Pump		Sehwa vacuum (Korea)	180ℓ/min 0.4KW	EA	1		
9	Diaphragm	KDV20A02	Kikwang (Korea)	DIA=3/4", Butyl Rubber	EA	4		
10	Diaphragm packing	KDV20A02	Kikwang (Korea)	Butyl Rubber	EA	2		
11	Sight Glass Set			Sight Glass + packing	SET	1		
12	Flow Switch	24-013			EA	1		
13	FUSE	KF-32L		250V 2A,4A / 10ea	SET	1		
14	Octy-Alcohol			1 litter (bottle)	litter	1		
15	Purge Pump Oil			20 litter (can)	litter	20		
16	Inhibitor	10% Lithium Molybdate		20kg (barrel)	kg	20		
17	String type Gasket			100 meter (roll)	meter	100		
18	U type Gasket			20 meter (roll)	meter	20		

< Factory Performance Test >

World Energy Co., Ltd
97, Gaeungongdan-gil, Gaeun-eup, Mungyeong-si,
Gyeongsangbuk-do, 36995 Republic of Korea
Tel. : 82-31-501-2706
Fax. : 82-31-501-2705
Home page : www.worldenergy.co.kr
E-mail : rachelryu@worldenergy.co.kr