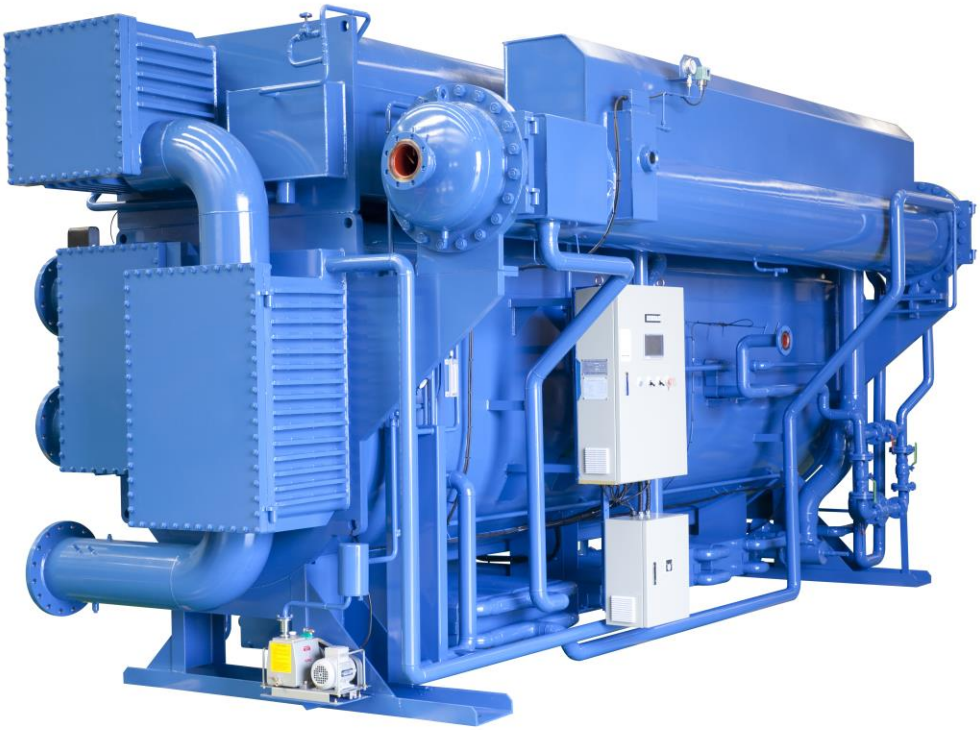
World Energy

Product Data

Double Effect
Steam Fired
Absorption chiller

SWHH Series
50 ~ 1,500 usRT (176 ~ 5,274 kW)



World Energy

SWHH-Series, High Efficiency Double Effect Steam Fired Absorption chiller using high-pressure steam, provides the best solution for most efficient cooling and heating.

- No CFC's and environmentally safe
- High Efficiency Design
- Low Noise & Low vibration operation
- Cost-Effective Cooling
- Low Maintenance Cost
- Simple Chiller System Configuration
- High Reliability

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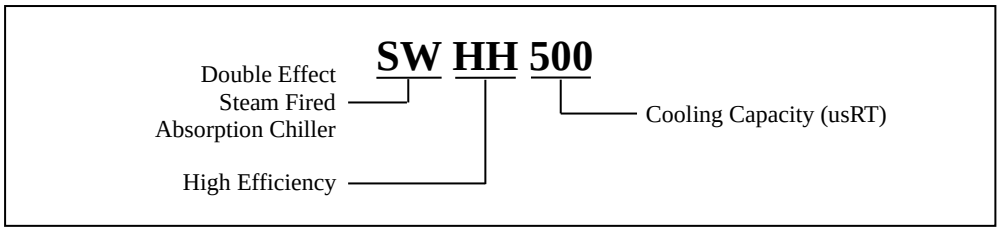
Model Name Nomenclature



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Features/Benefits

SWHH Series Double Effect Steam Fired Absorption Chiller

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 steam is available as the heat source, the SWHH is sure to be the right choice for either new construction or retrofit applications.

Excellent Part Load Performance - Unit controller allows stable, part load operation at cooling water temperatures as low as 20°C (68°F) without a cooling water bypass. For maximum efficiency, a variable frequency drive pump automatically maintains optimum solution flow to Low-Temp Generator and also High-Temp Generator during whole operation. This will result in improved part-load efficiency. The SWHH has a continuous operating range from 100% to 10% of rated machine capacity.

Location and installation savings

Ease of installation-SWHH Absorption chillers are completely fabricated, assembled and wired in the factory as single-piece units.

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 SWHH control.

Low noise and vibration allow 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 SWHH 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.

Easy maintenance

Standard features allow simple maintenance procedures - Every SWHH machine 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 - SWHH 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 SWHH machines to make field service easy, if required.

Reliable operation

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

Features automatic microprocessor control center continuously monitors machine operation, ensuring precise control – Each SWHH 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. The SWHH 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 SWHH'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 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.

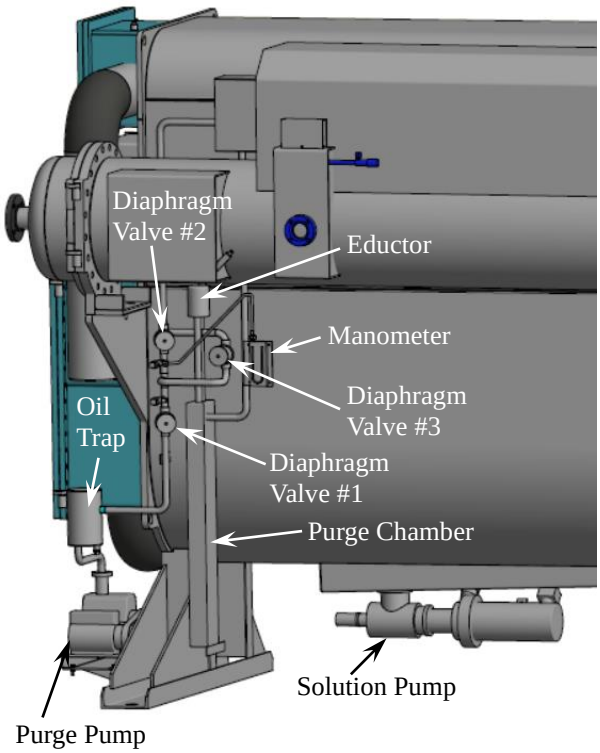
Rugged machine construction – Every SWHH absorption chiller offers numerous standard features designed to provide reliable, trouble-free operation. The machine is fabricated to meet stringent manufacturing and design requirements and is UL-listed to ensure product safety and machine integrity.

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. SWHH 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.



Purge System

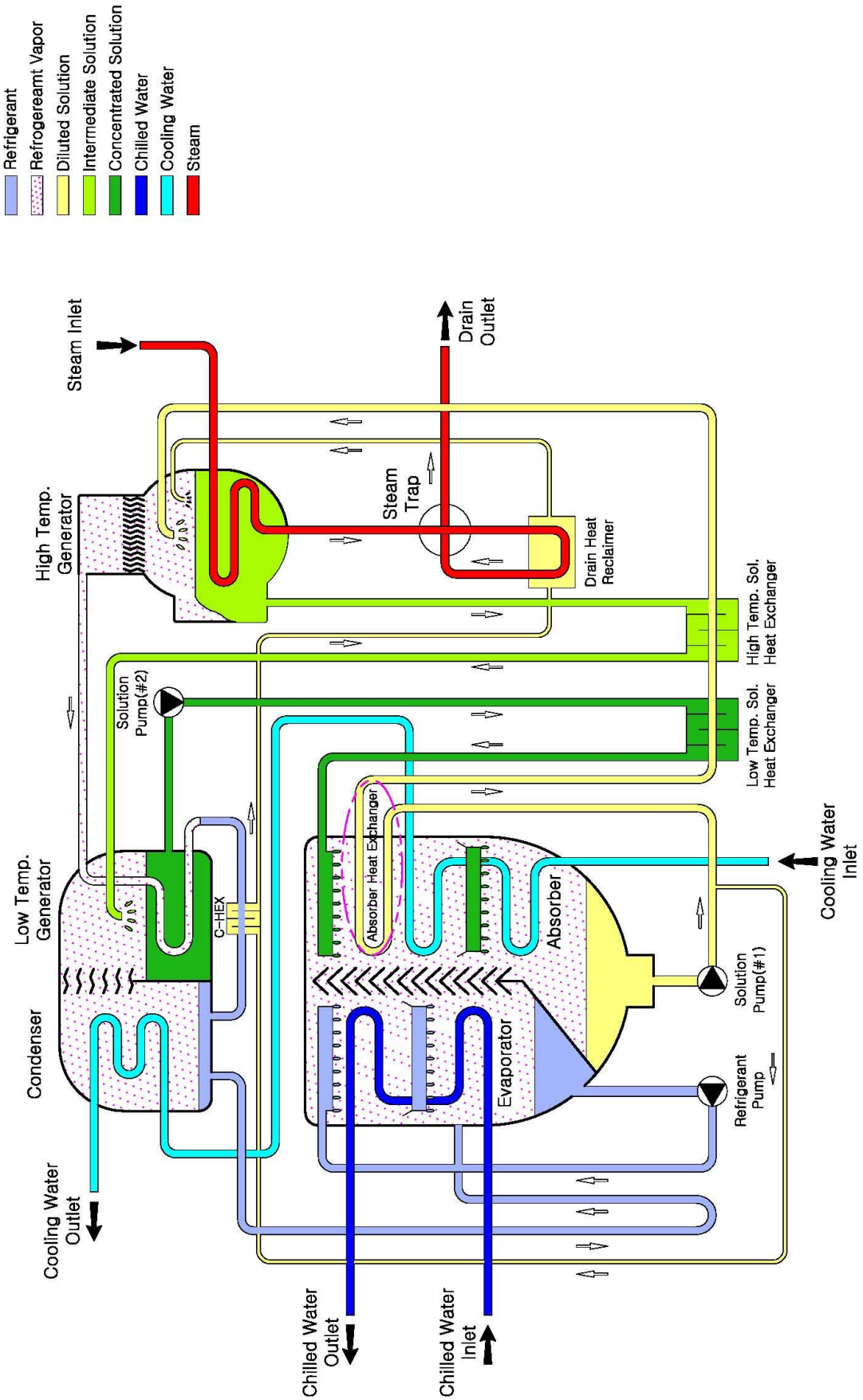
High Efficiency Double Effect Steam Fired Absorption Cycle

The high efficiency double–effect, steam fired absorption chiller(SWHH) consists of an evaporator , absorber, condenser, high-temperature and low-temperature generator, solution heat exchangers, drain heat exchanger, condensation refrigerant heat exchanger, absorber heat exchanger, refrigerant and solution pumps(#1,#2), purge and controls. The machine operates at the conditions that under vacuum, water boils at a low temperature. Under typical operating conditions, this occurs at approximately 4.4℃(40℉), thereby cooling the chilled water that circulates through the evaporator tubes. A refrigerant pump is used to transfer the refrigerant (water) over the evaporator tubes to improve heat transfer.

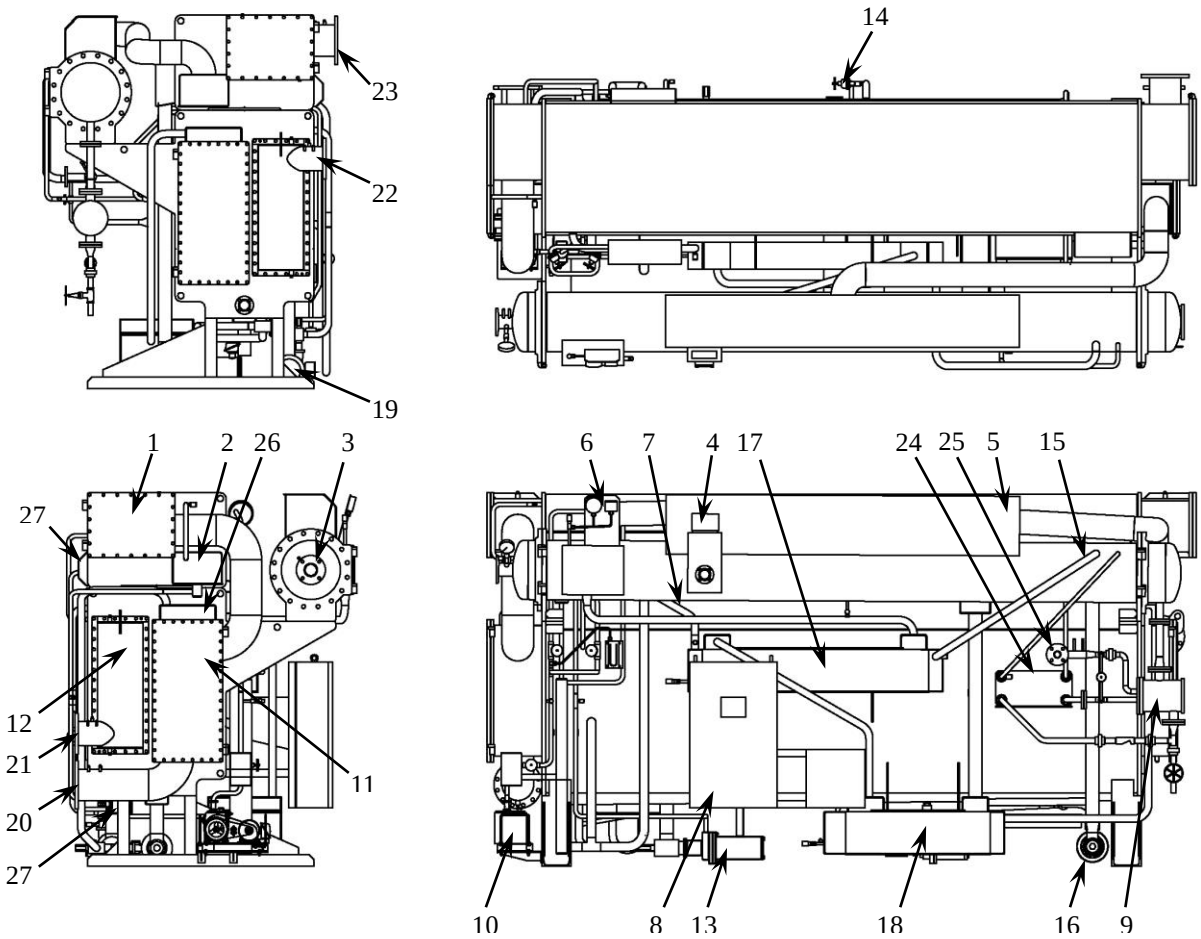
To make the cooling process continuous, the refrigerant (water) vapor must be removed as it is produced. To accomplish this, a lithium bromide solution (which has a high affinity for water) is used to absorb the water vapor. As this process continues, the lithium bromide becomes diluted, reducing its absorption capacity. Before flow to low temp. generator, diluted solution pass through the absorber heat exchanger located top of absorber tube. A solution pump(#1) then transfers this diluted solution to the generators where it is re-concentrated in two stages (double-effect) to boil off the previously absorbed water and A solution pump(#1) transfers this diluted solution to the pipe connected to low temp. and high temp. sol. heat exchanger. A variable frequency drive on the solution pump automatically maintains optimum solution flow to the high temp. generators at all operating conditions for maximum efficiency. The diluted solution is pumped to the high-temperature generator where it is heated and re-concentrated to a medium concentration solution by the steam. Medium concentration solution from the high-temperature generator and diluted solution through condensation refrigerant heat exchanger flow to the low-temperature generator where it is heated and re-concentrated to a strong solution by the high temperature water vapor released from the solution in the high-temperature generator. Since the low temp. generator acts as the condenser for the high temp. generator, the heat energy first applied in the high temp. generator is used again in the low temp. generator, thus reducing the heat input by approximately 45% as compared to an absorption chiller with a single-stage of re-concentration. The water vapor released in the shell side of the low temp. generator, in addition to the condensed water vapor from the tube side of the low temp. generator, enters the condenser to be cooled and returned to a liquid state. The condensed water vapor from the tube side of the low temp. generator flows to the condensation refrigerant heat exchanger. Then it raise temperature diluted solution which flow through the condensation refrigerant heat exchanger. The refrigerant water then returns to the evaporator to begin a new cycle.

To remove heat from the machine, cooling water is first circulated through the tubes of the absorber to remove the heat of vaporization. The water is then circulated through the tubes of the condenser. The re-concentrated (strong) solution from the low temp. generator flows back to the absorber to begin a new cycle.

For efficiency purposes, the medium concentration solution from the high temp. generator is passed through the high-temperature solution heat exchanger to pre-heat the diluted (weak) solution, while pre-cooling the medium concentration solution. The re-concentrated (strong) solution from the low temp. generator is passed through the low-temperature solution heat exchanger to pre-heat/pre-cool the solution before being returned to the absorber.


Refrigerant
Refrogereamt Vapor
Diluted Solution
Intermediate Solution
Concentrated Solution
Chilled Water
Cooling Water
Steam
Steam Inlet
Drain Outlet
High Temp. Generator
Steam Trap
Drain Heat Reclaimer
High Temp. Sol. Heat Exchanger
Low Temp. Sol. Heat Exchanger
Solution Pump(#2)
Absorber Heat Exchanger
Absorber
Cooling Water Inlet
Low Temp. Generator
C-HEX
Condenser
Solution Pump(#1)
Refrigerant Pump
Evaporator
Cooling Water Outlet
Chilled Water Outlet
Chilled Water Inlet

Components Arrangement



1 – Condenser
2 – Low temp. Generator (G2)
3 – Steam inlet
4 – G1 Level Control Box
5 – High temp. Generator (G1)
6 – Pressure gage & switch
7 – Absorbent Flow Pipe(G1 to G2)
8 – Control panel
9 – Steam Trap
10 – Purge (Vacuum) Pump
11 – Absorber
12 – Evaporator
13 – Solution pump(#1)
14 – Blow Down Valve
15 – Absorbent Flow Pipe (A to G1)
16 – Solution pump(#2)
17 – High Temperature Heat Exchanger (H1)
18 – Low Temperature Heat Exchanger (H2)
19 – Refrigerant Pump
20 – Cooling Water Inlet
21 – Chilled Water Inlet
22 – Chilled Water Outlet
23 – Cooling Water Outlet
24 – Drain Heat Reclaimer
25 – Drain Outlet
26 – Absorber Heat Exchanger
27 – Condensation Refrigerant Heat Exchanger

Product Specification

SWHH Double Effect Steam Fired Absorption Chiller

Capacity Range: 50~1,500 usRT(176 ~ 5,274kW)

1. SYSTEM DESCRIPTION

Electronically controlled, SWHH series absorption chiller utilizing hermetic refrigerant and solution pumps, lithium bromide solution as the absorbent, and water as the refrigerant. Steam 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, CE or ATEX 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.

* 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 SUS316L 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 SWHH series absorber, so efficiency of SWHH series is much greater than the previous series.

5) Condensation Refrigerant Heat Exchanger
is located between 2nd generator and condenser, and consists of brazed type high efficiency plate heat-exchangers to recover more heat from concentrated refrigerant 2nd Generator

to week solution of absorber.

6) 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 World energy SWHH series has double tray and dripper system, chiller capacity is greatly increased By this system.

7) 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, Notched floral

Absorber……copper or stainless steel, Floral

Condenser…copper or stainless steel, Prime

Generator….copper or stainless steel Low Fin

* Special tube material like Cupronickel, Titanium, 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.

1) SOLUTION PUMPS
equipped with VVVF inverter driven solution pump to control the diluted solution flow. And HIGH COP chiller is equipped with 1(one) more solution pump for the control of concentrated solution flow from 2nd generator to the LT heat exchanger. All pumps are low-power consumed, self-contained, leak-proof, hermetic motor driven canned type pumps cooled by the same pumped fluid. The pumps are factory fitted with isolating valves on both suction and discharge sides to avoid the drainage of the solution in case of pump repair or maintenance. 20,000 hours of normal operation is guaranteed.


Canned type pump & Isolating Valves (Angle valves)

2) REFRIGERANT PUMPS
Low-power consumed, self-contained, leak-proof, hermetic motor driven canned type pumps cooled by the same pumped fluid. The pumps are factory fitted with isolating valves on both suction and discharge sides to avoid the drainage of the solution in case of pump repair or maintenance. 20,000 hours of normal operation is guaranteed

3) VACUUM PUMP (PURGE PUMP)
is equipped with belt-driven electrical motor. The pump is oil-lubricated and inclusive of oil level sight glass. First oil charge is included. The pump is also composed of air-intake valve for oil moisture removal and liquid trap on the suction line. The vacuum circuit is also composed of non-condensable gases storage tank, Ejector Device, pump liquid trap, diaphragm valves, vacuum Hg manometer, piping and service valve.

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:
4) General
The steam driven 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 steam 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 steam 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.

5) differential pressure switch
Chilled water differential pressure switch(or flow switch) shall be factory installed in the evaporator water nozzle chilled water flow detection. 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. And final adjustment must be done during the commissioning.

6) Steam Control Valve
2-port control valve including motorized actuator are supplied loose with the chiller and is used to control the ingress of the steam into the Generator of the chiller based on the cooling demand of the user with a PID logic.

The valve could modulate from 10 to 100% thanks to the signal received by the electrical actuator (supplied with the valve) from the chiller's microprocessor. The valve has also a safety function with a spring return in the actuator that shuts the valve in case of a power failure, chiller's alarm or normal stop

7) Steam trap
is a device used to discharge condensate and non-condensable gases with a negligible consumption or loss of live steam. This steam tram is automatic valve. It open, close or modulate automatically.

8) 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.

9) 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.

10) 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 contro
ller display.

11) 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℃.

12) 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. Others

2) Temperature sensors
2(three) types of temperatures are used depending on the temperature levels: RTD_Low, RTD_Medium.
Chilled water inlet & outlet temperature (RTD_Low)
Cooling water inlet & outlet temperature (RTD_Low)
Evaporator refrigerant outlet temperature (RTD_Low)
Condenser refrigerant outlet temperature (RTD_Low)
Drain outlet temperature (RTD_Low)
LT generator solution temperature (RTD_Low)
HT generator solution temperature (RTD_Medium)

3) refrigerant & absorbent solution
The chiller is delivered together with lithium bromide solution (55wt% concentration) added with 300 ppm lithium molybdate as a corrosion inhibitor, demineralized water as a refrigerant and N-Octyl Alcohol (CH3(CH2)7OH) which will reduce surface tension and increase heat transfer. The refrigerant and absorbent solution is factory charged or supplied in 200liters plastic drums.

4) Sight Glasses
Total 2(two) sight glasses are installed. One is installed on Evaporator to monitor refrigerant level and the other is installed on Absorber and to monitor solution levels.

5) Dampers
Total 4(four) dampers are provided for refrigerant and solution flow tuning at site. Different from STNADARD COP model, HIGH COP model 1(one) more damper is provided between

concentrated heat exchanger and diluted discharge of diluted solution pump.

6) Check Valves & Service Valves
are installed for service purpose such as solution sampling and etc.

7) PRE-SHIPMENT FACTORY TEST
Leakage test with He(Helium) & N2(Nitrogen) Hydraulic test, Electrical function test, Nitrogen gas charging

H. 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.

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

J. Piping Requirements:
1) Piping and instrumentation for the chilled water, cooling water and steam 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.

K. 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.

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

M. 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 Instruction
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:
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

5) Special Application Design
Anti-freeze media on water circuits
Low temp. chilled water design (min. 4℃)
Explosion-proof design
Chemical plant heat recovery
Marine application design

6) Internet monitoring & Control S/W

7) Outdoor installation and Anti-freeze design
Enclosure Case
IP55 Control Cabinet
Trace Heater

8) Safety Device
Solenoid valve on purge pump (Preventing Purge Line Back-flow)
Rupture Disc

9) Others
Eactory Thermal insulation
Foundation anchoring packages
Vibration isolation package
Sectional shipment (2~3 pieces)
Warranty extension (Up to 3 yrs.)
Installation supervision
Commissioning & start-up

Performance Data

SWHH50~SWHH180

Model		Unit	SWHH 50	SWHH 60	SWHH 70	SWHH 80	SWHH 100	SWHH 120	SWHH 150	SWHH 180
Cooling Capacity		usRT	50	60	70	80	100	120	150	180
		kW	176	211	246	281	352	422	527	633
Chilled (Hot) Water	Temp.	°F	53.6 / 44.6							
	Flow rate	GPM	133.0	159.8	186.2	213.1	266.4	319.7	399.4	479.5
	P. Drop	ftH_2O	13.1	12.1	20.3	22.6	19.4	20	26.2	26.9
	Connection	Inch	3				4			
Cooling Water	Temp.	°F	89.6 / 98.6							
	Flow rate	GPM	223.2	268.1	312.6	357.5	446.9	536.3	670.6	804.9
	P. Drop	ftH_2O	24.0	20.0	26.2	24.9	24	25.3	32.5	34.1
	Connection	Inch	4				5		6	
Steam	Inlet Pressure	psi	116.03							
	Flow rate	lb/h	394.6	474.0	553.4	632.7	791.5	950.2	1,188.3	1,426.4
	Inlet Connection	Inch	1 1/2				2			
	Drain Connection	Inch	1				1			
	Control Valve	Inch	1 1/4				1 1/2			
Electric.	Power Source	-	3Ø, 460V, 60Hz							
	Abs. Pumps	kW(A)	1.2(2.9)				1.5(3.9)			
	Ref. Pump	kW(A)	0.2 (0.9)							
	Purge Pump	kW(A)	0.4 (1.2)							
	Control Panel	kW(A)	0.2 (0.4)							
	Total kW	kW	2.0				2.3			
	Total Amp.	A	5.4				6.4			
Size	Length (L)	Inch	83.1		102.8		104.6		144.4	
	Width (W)	Inch	54.9				60.8			
	Height (H)	Inch	75.4	79.2			86.7			
Weight	Rigging	lb	6,852	7,142	7,916	8,120	9,596	9,811	11,962	12,766
	Operation	lb	7,293	7,582	8,577	8,781	10,478	10,913	13,285	14,089
Tube replacement space		Inch	74.8		94.5				134	

Note

1. Working pressure of each water side is based on 1.0Mpa (150pisg)
2. Fouling factor 0.0001 m^2.hr.°C/Kcal for Absorber, Condenser and Evaporator.
3. Min. outlet temp. of chilled water: 41 °F
4. Min. allowable inlet temp. of cooling water: 68 °F
5. Controllable range shall be 10~100%.
6. Available power sources (options): 220V, 380V, 440V and 460V with 50HZ or 60HZ.
7. Custom designed is available with modifications from the standard or redesign
   - Cooling capacity
   - Hating capacity & heating temperature
   - Dual fuel burner
   - Chilled and Cooling water circuit with anti-freezing additives
   - Higher working pressure
   - Special tubes and thicker shell material
   - Various operational temp. conditions
   - Higher delta t operation
   - Outdoor installation
8. The specifications above are subject to change without prior notice for an improvement of the chiller.

Performance Data (Cont)

SWHH210~SWHH400

Model		Unit	SWHH 210	SWHH 240	SWHH 280	SWHH 320	SWHH 360	SWHH 400
Cooling Capacity		usRT	360	400	450	500	560	630
		kW	1,266	1,407	1,582	1,758	1,969	2,215
Chilled (Hot) Water	Temp.	ºF	53.6 / 44.6					
	Flow rate	GPM	559.2	639.3	745.4	852	958.5	1,065.1
	P. Drop	ftH_2O	24.9	24.6	17.7	17.4	18.7	19
	Connection	Inch	5		6			
Cooling Water	Temp.	ºF	89.6 / 98.6					
	Flow rate	GPM	938.7	1073	1251.8	1430.5	1,609.3	1,788.5
	P. Drop	ftH_2O	37.7	33.5	27.2	25.9	26.6	26.9
	Connection	Inch	6		8			
Steam	Inlet Pressure	psi	116.03					
	Flow rate	lb/h	1,662.3	1,900.4	2,217.9	2,533.1	2,850.6	3,168
	Inlet Connection	Inch	2 1/2				3	
	Drain Connection	Inch	1				1 1/2	
	Control Valve	Inch	1 1/2		2			
Electric.	Power Source	-	3Ø, 460V, 60Hz					
	Abs. Pumps	kW(A)	2.0 (5.0)				3.4 (8.9)	
	Ref. Pump	kW(A)	0.3 (1.3)					
	Purge Pump	kW(A)	0.4 (1.2)					
	Control Panel	kW(A)	0.2 (0.4)					
	Total kW	kW	2.9				4.3	
	Total Amp.	A	7.9				11.8	
Size	Length (L)	Inch	146.5		186.6		191.8	
	Width (W)	Inch	74.5				80.6	
	Height (H)	Inch	96.9				100.7	
Weight	Rigging	lb	15,419	16,000	18,076	19,228	22,533	23,445
	Operation	lb	17,183	17,984	20,281	21,654	25,399	26,531
Tube replacement space		Inch	134				190	

Note

1. Working pressure of each water sides are based on 1.0Mpa (150pisg)
2. Fouling factor 0.0001 m^2.hr.ºC/Kcal for Absorber, Condenser and Evaporator.
3. Min. outlet temp. of chilled water: 41 ºF
4. Min. allowable inlet temp. of cooling water: 68 ºF
5. Controllable range shall be 10~100%.
6. Available power sources (options): 220V, 380V, 440V and 460V with 50HZ or 60HZ.
7. Custom designed is available with modifications from the standard or redesign
   - Cooling capacity
   - Chilled and Cooling water circuit with anti-freezing additives
   - Higher working pressure
   - Special tubes and thicker shell material
   - Various operational temp. conditions
   - Higher delta t operation
   - Outdoor installation
8. The specifications above are subject to change without prior notice for an improvement of the chiller.

Performance Data (Cont)

SWHH450~SWHH840

Model		Unit	SWHH 450	SWHH 500	SWHH 560	SWHH 630	SWH 700	SWHH 770	SWH 840
Cooling Capacity		usRT	450	500	560	630	700	770	840
		kW	1,582	1,758	1,969	2,215	2,461	2,708	2,954
Chilled (Hot) Water	Temp.	°F	53.6 / 44.6						
	Flow rate	GPM	1,198.5	1,331.5	1,491.3	1,677.5	1,864.2	2,050.5	2,236.7
	P. Drop	ftH_2O	16.4	17.4	24	32.5	30.8	39.4	49.5
	Connection	Inch	8					10	
Cooling Water	Temp.	°F	89.6 / 98.6						
	Flow rate	GPM	2,011.7	2,235.4	2,503.5	2,816.6	3,129.4	3,442.7	3,755.3
	P. Drop	ftH_2O	26.9	27.2	37.1	50.2	39	44	45.9
	Connection	Inch	10				12		
Steam	Inlet Pressure	psi	116.03						
	Flow rate	lb/h	3,562.7	3,959.5	4,435.7	4,989.1	5,542.4	6,098	6,651.3
	Inlet Connection	Inch	3		4			5	
	Drain Connection	Inch	1 1/2		2			2 1/2	
	Control Valve	Inch	2 1/2				3		
Electric.	Power Source	-	3Ø, 460V, 60Hz						
	Abs. Pumps	kW(A)	4.9 (11.8)				7.7 (18.3)		
	Ref. Pump	kW(A)	0.4 (1.3)						
	Purge Pump	kW(A)	0.4 (1.2)						
	Control Panel	kW(A)	0.2 (0.4)						
	Total kW	kW	5.9				8.7		
	Total Amp.	A	14.7				21.2		
Size	Length (L)	Inch	191.8		213.1	232.8	239.1	259.8	284.6
	Width (W)	Inch	87.0				93.3		
	Height (H)	Inch	107.0				116.8		
Weight	Rigging	lb	26,854	27,903	30,568	33,017	42,917	46,521	49,599
	Operation	lb	30,602	31,651	34,537	38,750	49,090	52,915	56,433
Tube replacement space		Inch	190		205	224		248	264

Note

1. Working pressure of each water sides are based on 1.0Mpa (150pisg)
2. Fouling factor 0.0001 m^2.hr.°C/Kcal for Absorber, Condenser and Evaporator.
3. Min. outlet temp. of chilled water: 41 °F
4. Min. allowable inlet temp. of cooling water: 68 °F
5. Controllable range shall be 10~100%.
6. Available power sources (options): 220V, 380V, 440V and 460V with 50HZ or 60HZ.
7. Custom designed is available with modifications from the standard or redesign
   - Cooling capacity
   - Chilled and Cooling water circuit with anti-freezing additives
   - Higher working pressure
   - Special tubes and thicker shell material
   - Various operational temp. conditions
   - Higher delta t operation
   - Outdoor installation
8. The specifications above are subject to change without prior notice for an improvement of the chiller.

Performance Data (Cont)

SWHH900~SWHH1500

Model		Unit	SWHH 900	SWHH 1000	SWHH 1100	SWHH 1200	SWHH 1300	SWH 1400	SWHH 1500
Cooling Capacity		usRT	900	1,000	1,100	1,200	1,300	1,400	1,500
		kW	3,165	3,516	3,868	4,220	4,571	4,923	5,274
Chilled (Hot) Water	Temp.	°F	53.6 / 44.6						
	Flow rate	GPM	2,396.6	2,662.9	2,929.3	3,195.7	3,461.6	3,728	3,994.4
	P. Drop	ftH_2O	29.5	39	49.5	37.4	46.9	28.2	34.8
	Connection	Inch	10		12			14	
Cooling Water	Temp.	°F	89.6 / 98.6						
	Flow rate	GPM	4,023.9	4,470.8	4,917.7	5,365.1	5,812	6,258.9	6,706.2
	P. Drop	ftH_2O	28.9	48.6	51.8	46.3	44	44.6	46.3
	Connection	Inch	12	14		16		18	
Steam	Inlet Pressure	psi	116.03						
	Flow rate	lb/h	7,127.5	7,919	8,710	9,501.9	10,295.6	11,087	11,878.5
	Inlet Connection	Inch	5		6				
	Drain Connection	Inch	2 1/2		3				
	Control Valve	Inch	3		4				
Electric.	Power Source	-	3Ø, 460V, 60Hz						
	Abs. Pumps	kW(A)	8.8 (20.3)			7.7(20.3)		10.5(26.6)	
	Ref. Pump	kW(A)	1.5 (3.3)					2.2 (5.8)	
	Purge Pump	kW(A)	0.4 (1.2)			0.75 (1.9)			
	Control Panel	kW(A)	0.2 (0.4)						
	Total kW	kW	10.9			10.2		13.7	
	Total Amp.	A	25.2			25.9		34.7	
Size	Length (L)	Inch	240.7	261.4	281.1	274.3	294.0	273.3	293.0
	Width (W)	Inch	113.4			130.3		154.4	
	Height (H)	Inch	124.8			143.3		148.2	
Weight	Rigging	lb	54,693	59,084	63,436	73,818	78,365	90,902	96,263
	Operation	lb	62,850	67,462	73,797	85,062	90,711	103,910	110,373
Tube replacement space		Inch	224	248	264	248	264	248	264

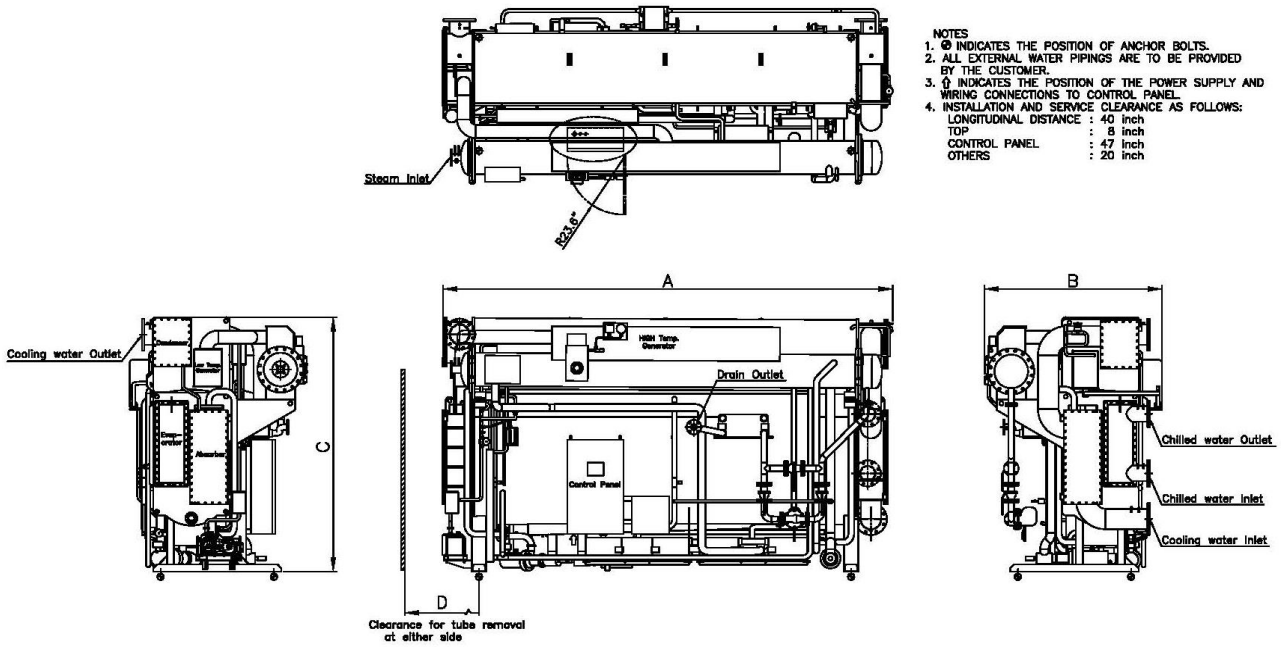
Note

1. Working pressure of each water sides are based on 1.0Mpa (150pisg)
2. Fouling factor 0.0001 m^2.hr.°C/Kcal for Absorber, Condenser and Evaporator.
3. Min. outlet temp. of chilled water: 41 °F
4. Min. allowable inlet temp. of cooling water: 68 °F
5. Controllable range shall be 10~100%.
6. Available power sources (options): 220V, 380V, 440V and 460V with 50HZ or 60HZ.
7. Custom designed is available with modifications from the standard or redesign
   - Cooling capacity
   - Chilled and Cooling water circuit with anti-freezing additives
   - Higher working pressure
   - Special tubes and thicker shell material
   - Various operational temp. conditions
   - Higher delta t operation
   - Outdoor installation
8. The specifications above are subject to change without prior notice for an improvement of the chiller.

Dimensions

SWHH Series

Unit : Inch



	SWHH 50	SWHH 60	SWHH 70	SWHH 80	SWHH 100	SWHH 120	SWHH 150	SWHH 180
A	83.1		102.8		104.6		144.4	
B	54.9				60.8			
C	75.4		79.2		86.7			
D	74.8		94.5					

	SWHH 210	SWHH 240	SWHH 280	SWHH 320	SWHH 360	SWHH 400	SWHH 450	SWHH 500	SWHH 560	SWHH 630
A	152.3		194.5		199.6		199.8		225.1	244.7
B	65.0				78.9		78.3		85.8	
C	96.9				100.7		107.2		110	
D	134		190						205	224

	SWHH 700	SWHH 770	SWHH 840	SWHH 900	SWHH 1000	SWHH 1100	SWHH 1200	SWHH 1300	SWHH 1400	SWHH 1500
A	245.3	269	284.6	245.3	269.6	293.3	274.3	294	283.1	302.2
B	94.6	97.4		108.3		124.4			138	
C	118.9			124.8		155.1			157.5	
D	224	248	264	224	248	264	248	264	248	264

Control System

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
» Menu-driven touch keypad interface for status Status display, set-point control and system configuration
» Primary and secondary status messages
» Password protected
» Recall of up to 200 alarm and warning messages
» Extensive diagnostic and service capabilities
» Advanced crystallization preventive algorithm
» Improved solution flow control

Hardware
- Programmable Logic controller
  - » SIEMENS PLC Controller
- Built-in Touch Screen LCD (7" Color)
- IP52 Protection Grade Cabinet

User Interface Protocol
- MODBUS (Option)
- Internet (Option)
- BACnet (Option)
- PROFIBUS(Option)

Safety Cutouts
- Solution pump(s) motor OVERLOAD/ temp. HIGH
- Refrigerant pump motor OVERLOAD/ temp. HIGH
- Low Chilled water Outlet Temperature Cutout
- Low Refrigerant Temperature Cutout
- Low Cooling Water Inlet Temperature Cutout
- Low Chilled Water Flow Cutout
- Low Cooling Water Flow Cutout (Option)
- High 1st generator solution outlet Temperature Cutout
- 1st generator pressure High
- High 2nd generator solution outlet Temperature Cutout
- Emergency Stop

Protective Limits
- Max. Allowable Cooling Water Inlet Temperature
- Max. Allowable 1st generator Absorbent Temperature
- Max. Allowable Absorbent Concentration
- Low Chilled Water Temperature

Capacity Control
- Chilled Water Outlet Temperature Control
- Control Valve Opening Limit

Tmperature Sensor Faults
- Chilled water Outlet Temperature.
- Cooling water Inlet Temperature.
- Refrigerant Evaporator Temperature.
- Refrigerant Condenser Temperature.
- 1st generator solution Outlet Temperature
- 2en generator solution Outlet Temperature.

Operation Status Display
- Chilled water inlet & outlet Temperature.
- Cooling water inlet & outlet Temperature.
- 1st Generator Temperature.
- 2nd Generator Temperature.
- Condenser Temperature.
- Evaporator Temperature.
- Temperature setting
- Various status of chiller operation
- Concentration percentage
- Opening percentage of the steam control valve.
- Status of the chiller's auxiliaries
- User's auxiliaries status (if available from the user)
- Date and time
- Absorption chiller's dilution cycle at shutdown
- No. of operating hours
- No. of starts
- Alarms ranges settings
- Alarms data log
- Graphical display of chilled water temp. trend.
- PID logic and other service-related parameters
- Operation Scheduling
- Safety Shutdown Message
- Display language selection
- Diluted solution pump inverter frequency

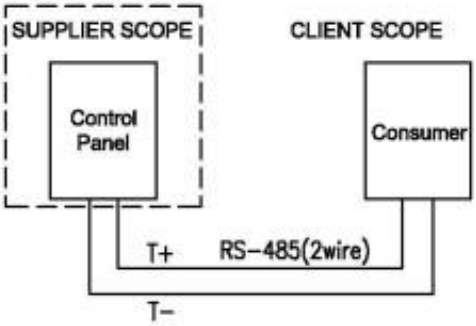
SIEMENS Controller

LCD Touch Screen

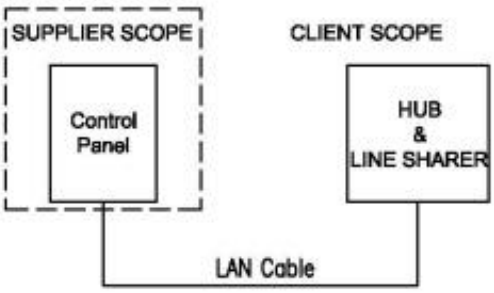
Control Panel

Communication

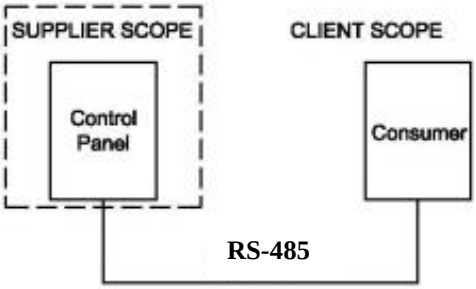
1.MODBUS-RTU



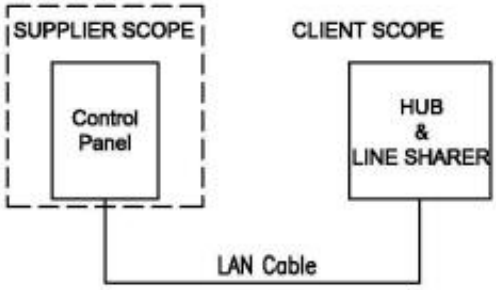
2.MODBUS-TCP



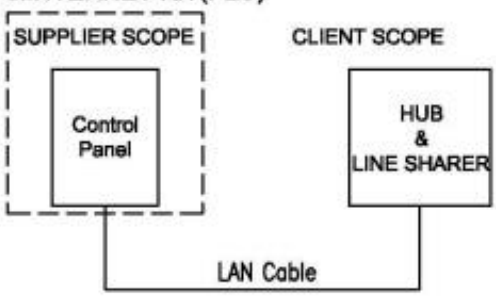
3.PROFIBUS



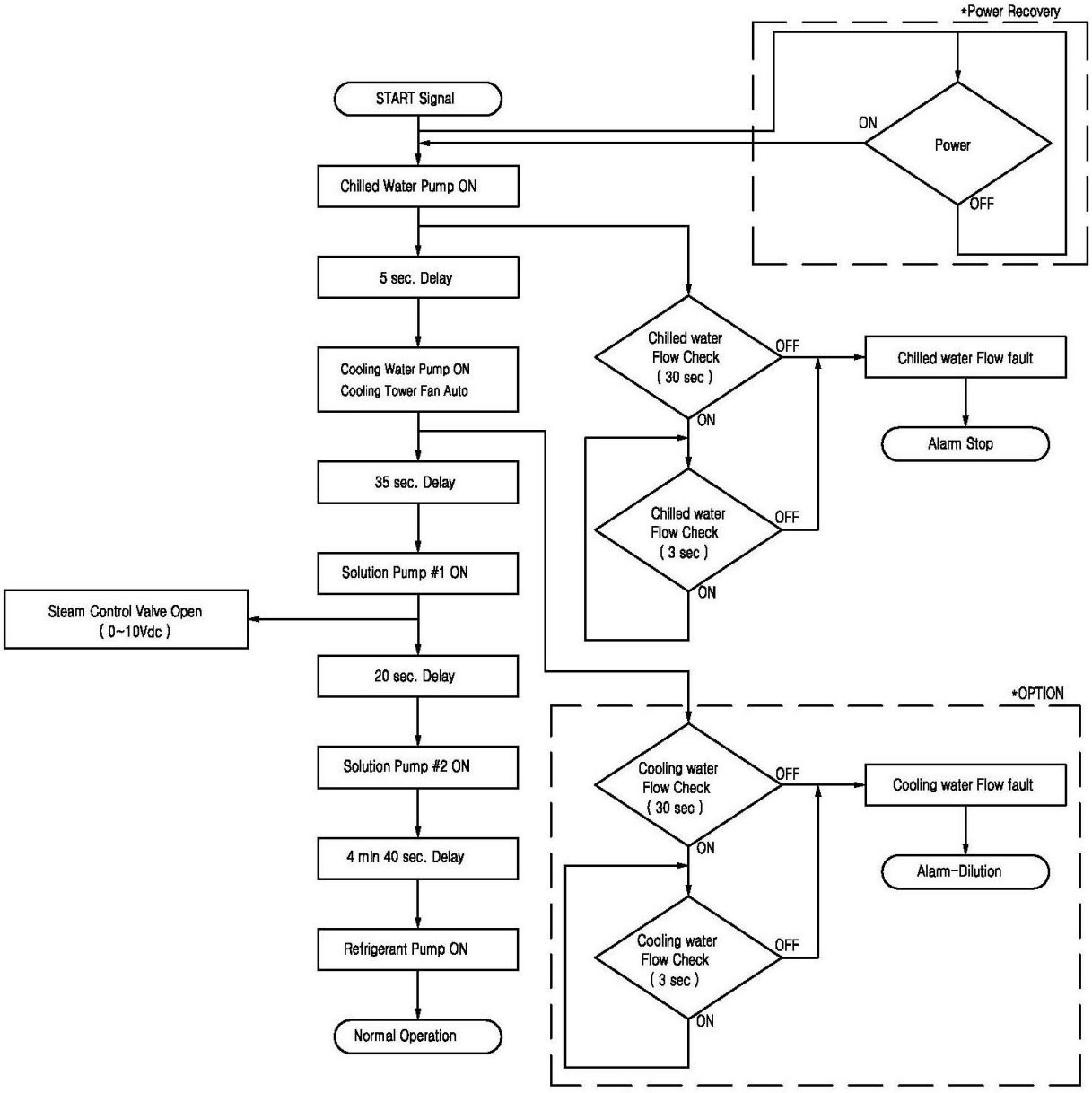
4.BACnet



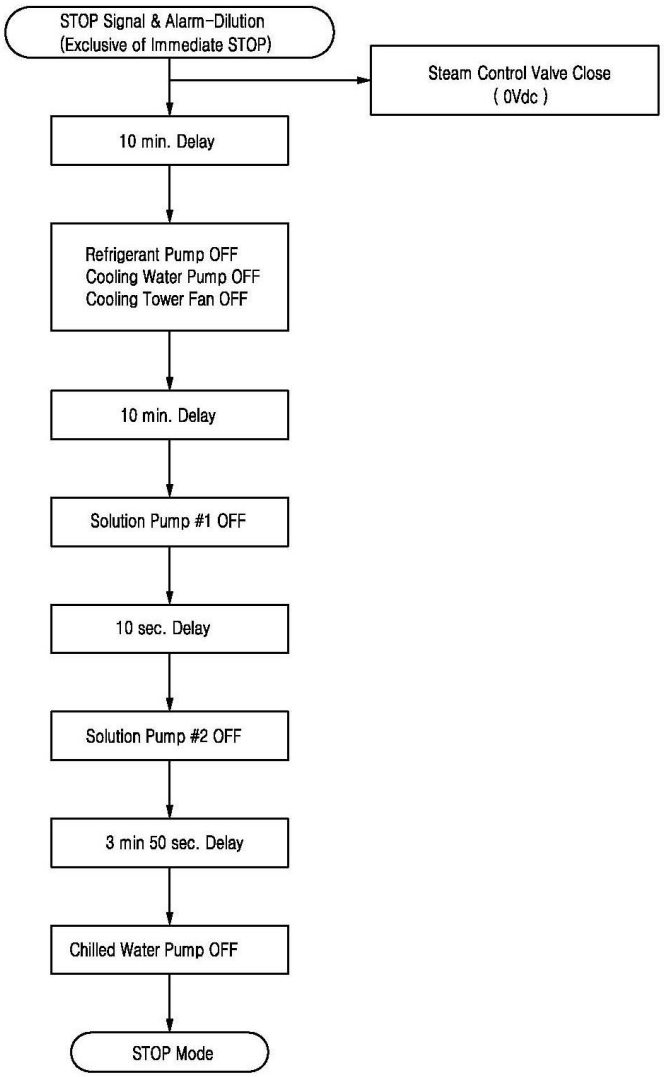
5.INTERNET KIT(PLC)

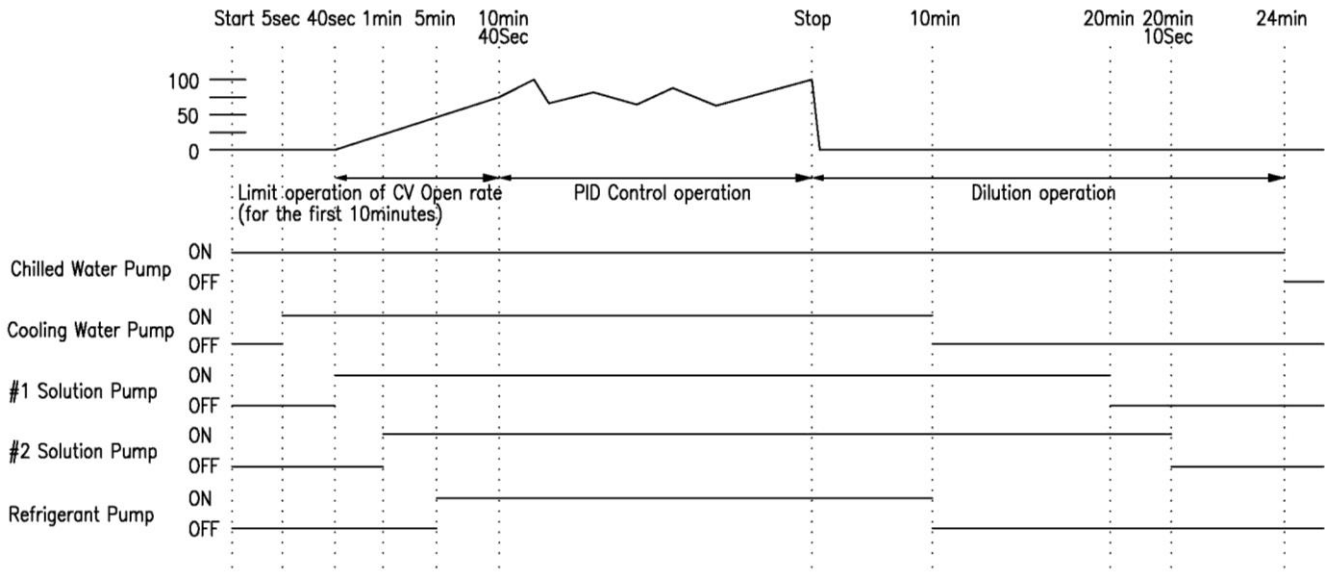


Start-up Sequence



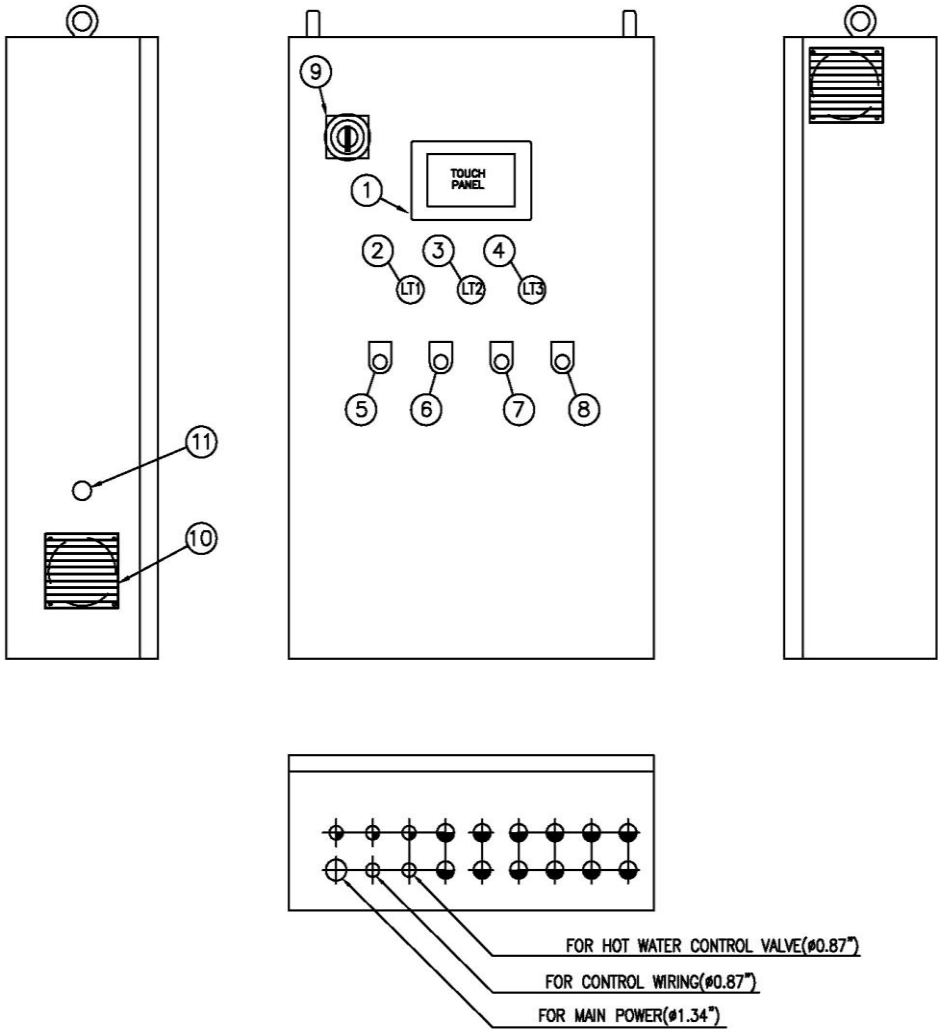
Stop Sequence





<Operation Graph>

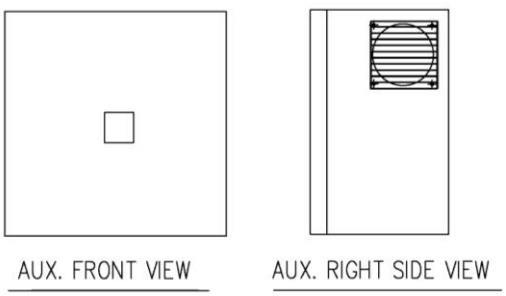
Control Panel



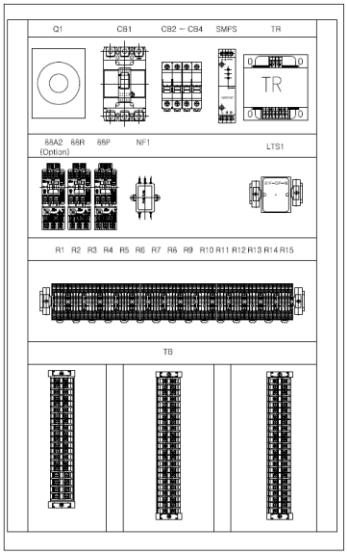
>> Main Control Panel Cabinet

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

>> Inverter Panel Cabinet



Control Panel – Inside View



No.	SYMBOL	DESCRIPTION	Q'TY
1	Q1	DISCONNECT SWITCH	1
2	CB1	CIRCUIT BREAKER	1
3	CB2	CIRCUIT BREAKER	1
4	CB3	CIRCUIT BREAKER	1
5	CB4	CIRCUIT BREAKER	1
6	S.M.P.S	DC POWER SUPPLY	1
7	TR1	TRANSFORMER	1
8	88A2	SOLUTION PUMP2 CONTACTOR(Option)	1
9	88R	REFRIGERANT PUMP CONTACTOR	1
10	88P	PURGE PUMP CONTACTOR	1
11	NF1	NOISE FILTER	1
12	R1~15	RELAY	15
13	TB	TERMINAL BLOCK	1
14	LTS1	RELAY	1

※ Solution Pump#2 is provided as an option for SWHH50~SWHH320

Electric Data

460V - 3P- 60Hz								
Models	Pump motor size (kW)				Rated Current (A)			
	SP1	SP2	RP	VP	SP1	SP2	RP	VP
SWHH50 ~ SWHH80	1.2		0.2	0.4	2.9		0.9	1.2
SWHH100 ~ SWHH180	1.5		0.2	0.4	3.9		0.9	1.2
SWHH210 ~ SWHH320	2.0		0.3	0.4	5.0		1.3	1.2
SWHH360 ~ SWHH400	3.0	0.4	0.3	0.4	7.5	1.4	1.3	1.2
SWHH450 ~ SWHH630	3.4	1.5	0.4	0.4	7.9	3.9	1.3	1.2
SWHH700 ~ SWHH840	5.5	2.2	0.4	0.4	12.5	5.8	1.3	1.2
SWHH900 ~ SWHH1100	6.6	2.2	1.5	0.4	14.5	5.8	3.3	1.2
SWHH1200 ~ SWHH1300	5.5	2.2	1.5	0.75	14.5	5.8	3.3	1.9
SWHH1400 ~ SWHH1750	7.5	3.0	2.2	0.75	18.3	8.3	5.8	1.9

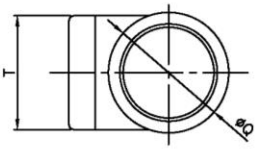
LEGEND : SP1 – Solution Pump1, SP2 – Solution Pump2, RP – Refrigerant Pump, VP – Vacuum Pump

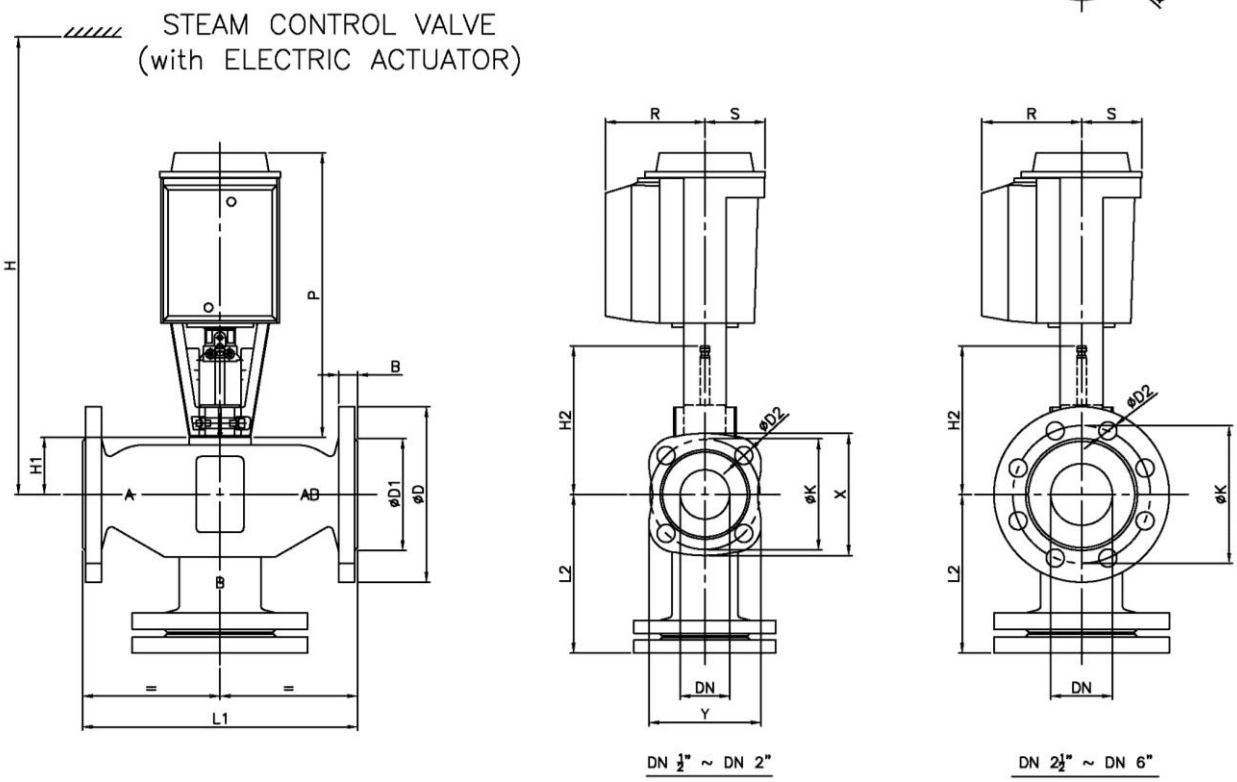
※ Solution Pump#2 is provided as an option for SWHH50~SWHH320

Steam Control Valve

Unit : Inch

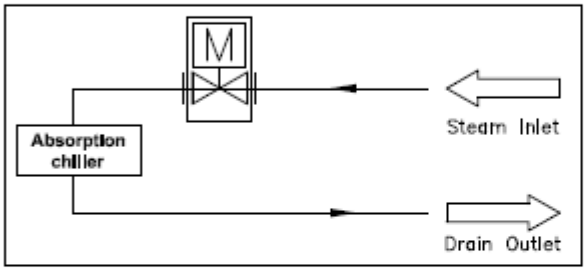
VALVE															ACTUATOR							
Valve Model	DN [inch]	DN [mm]	B	D	D1	D2	L1	L2	X	Y	K	H1	H2	VALVE Weight [Kg]	H	P	Q	R	S	T	ACTUATOR Weight [Kg]	ACTUATOR Model
WF53	1/2	15	14	95	46	14(4x)	130	87.5	79	76	65	63	159.5	4.2	>638	375	178	137	89	127	9.20	SKB62
	3/4	20	16	105	56		150	99.5	86.6	83	75	63	144.4	5.3								
	1	25	15	115	65		160	104.5	94.4	90.1	85	63	159.5	6.1								
	1 1/4	32	17	140	76	19(4x)	180	119	115.6	110.7	100	60	156.5	8.7	>635							
	1 1/2	40	16	150	84		200	129	123.2	117.8	110	60	156.5	10.1								
	2	50	16	165	99		230	146	135.2	128.4	125	100	196.5	13.6	>675							
WF43	2 1/2	65	17	185	118	19(4x)	290	178	–	–	145	115	231.5	21.5	>690						9.85	SKC62
	3	80	17	200	132		310	190	–	–	160	115	231.5	27.5								
	4	100	17	220	156	19(8x)	350	206	–	–	180	146	262.5	33.8	>721							
	5	125	17	250	184		400	233	–	–	210	159	275.5	45.8	>734							
	6	150	17	284	211	23(8x)	480	275.5	–	–	240	186.5	303	67.9	>762							



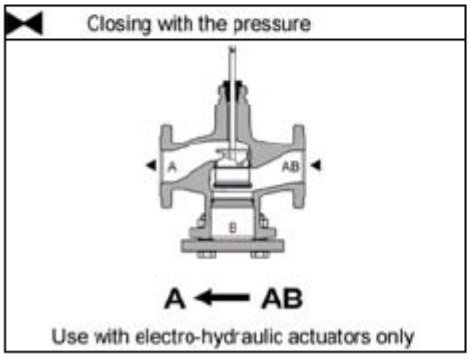


NOTE :
1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. VALVE OPERATING TEMPERATURE : 100 ~ 200 °C(SATURATED STEAM).
3. VALVE BODY MATERIAL : NODULAR CAST IRON.
4. DN : NOMINAL DIAMETER(VALVE SIZE).
5. H : TOTAL ACTUATOR HEIGHT PLUS MINIMUM DISTANCE TO THE WALL OR THE CEILING FOR MOUNTING, CONNECTION, OPERATION, MAINTENANCE etc.
6. H1 : DIMENSION FROM THE PIPE CENTER TO INSTALL THE ACTUATOR(UPPER EDGE).
7. H2 : VALVE IN THE "CLOSED" POSITION MEANS THAT THE STEM IS FULLY EXTENDED.

8. VALVE'S FLOW DIRECTION

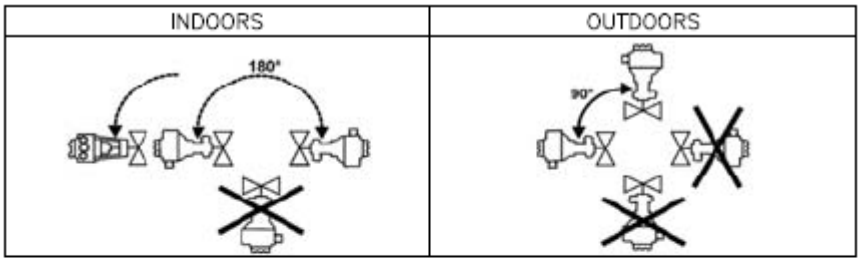


9. VALVE'S CROSS SECTION

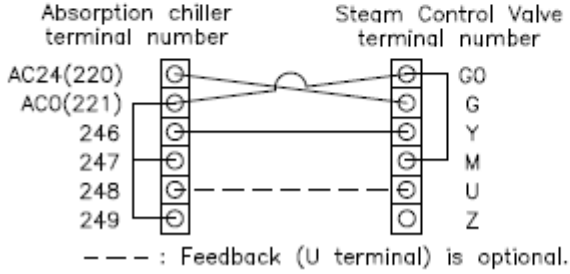


– THE TWO–PORT VALVE DOES NOT BECOME A THREE–PORT VALVE BY REMOVING THE BLANK FLANGE.

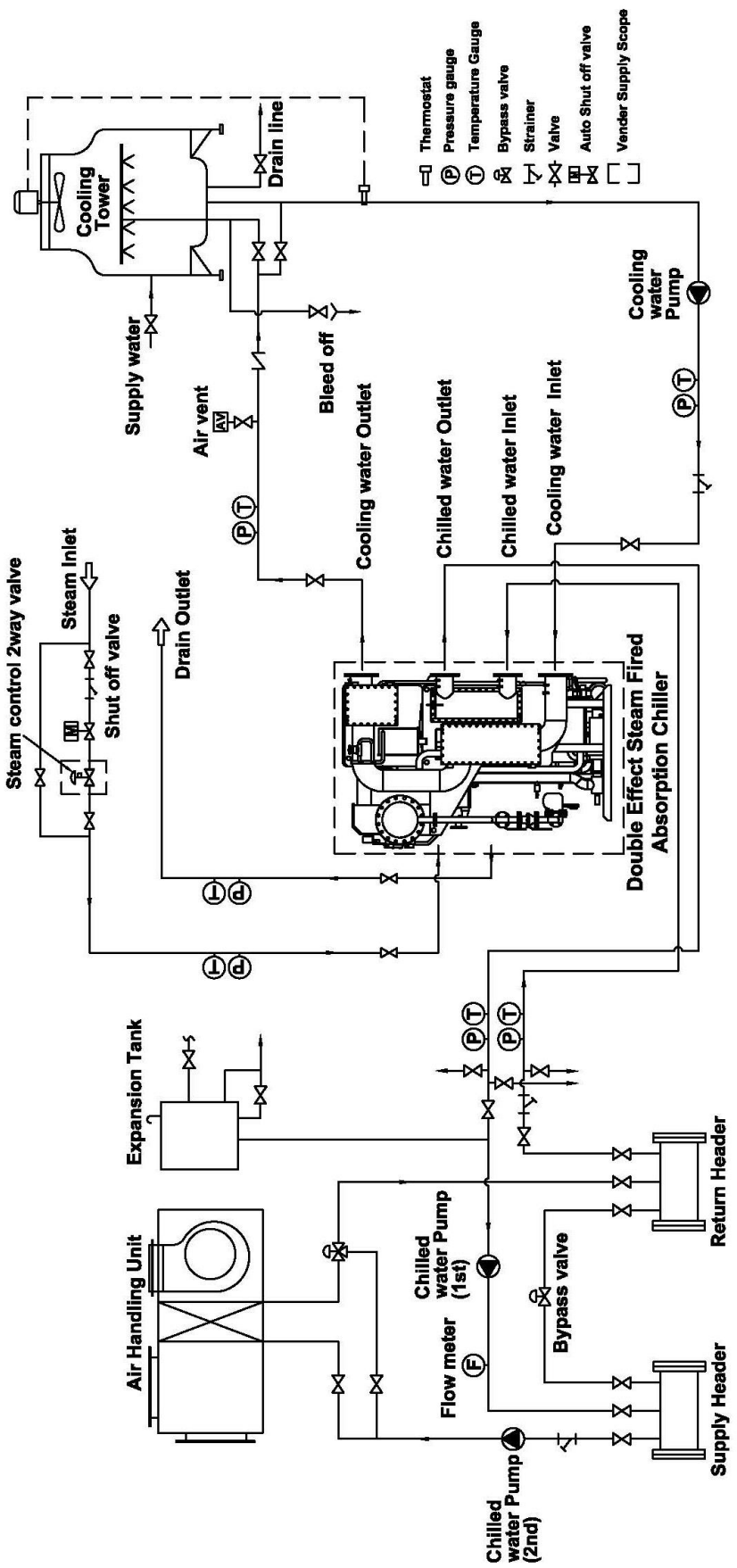
10. MOUNTING POSITION



11. VALVE WIRING DIAGRAM

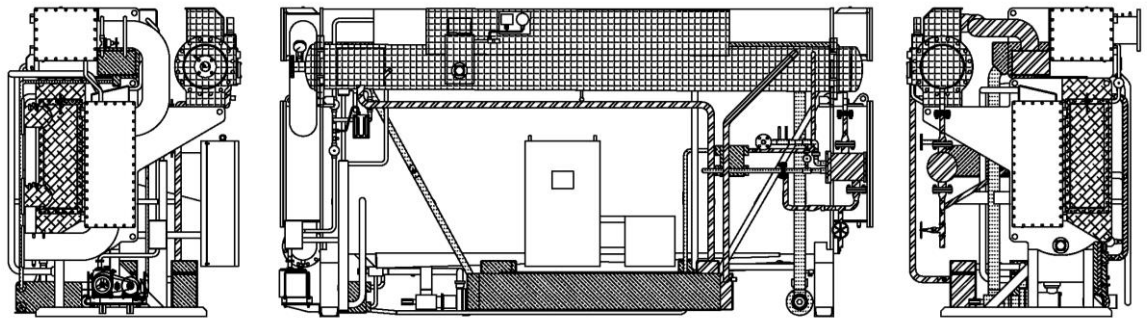


System Piping Diagram



1) All external equipment out of dotted line shall not be prepared and provided by Absorption chiller Manufacturer.
2) For pipe connections and diameters, please refer to the external dimensional diagrams and specification tables provided separately.
3) Supply Steam inlet Pressure is as specification data sheet.
4) The shut off valves at Steam inlet 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 towers.
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 shut off valve.
   -Thermometers and pressure gauges shall be installed at chilled and cooling water inlet/outlet
   -Air relief valves shall be installed on each chilled and cooling water lines at higher points than each water headers.
   -Drain valves shall be installed at the lowest position between the stop valves of chilled and cooling water and the Machine and the drain valve shall be piped to the drain ditch.
9) There shall be a sufficient clearance for access to the absorber, evaporator, condenser and generator to facilitate inspection and cleaning work.

Thermal Insulations



INSULATION FOR HOT SURFACES

- 75mm(3inch) : High Temperature Generator
- 50mm(2inch) : Steam Pipings, Boxes of Low Temp. Generator, Inlet and Outlet pipings of High Temp. Generator, Box of High Temp. Heat Exchanger.
- 19mm(3/4inch) : Low Temp. Generator Body and it's Outlet Box(ABSO), High & Low Temp. Heat Exchanger Body it's and Boxes(Inlet, Outlet) Drain Heat Exchanger
- 10mm(3/8inch) : Inlet & Outlet Pipings of Low Temp. Generator. Low Temp. Pipings of Drain Heat Exchanger

INSULATION FOR COLD SURFACES

- 19mm(3/4inch) : Evaporator Body and it's Water Box
- 10mm(3/8inch) : Inlet and Outlet Piping of Refrigerant Pump

Notes

1. Use only non-inflammable or incombustible insulation materials.
2. Do not insulate motor of refrigerant pump and fusible plug
3. Total insulation is includes piping.
4. Do not cover all valves, dampers, sight glasses, temperature sensors and its wells.

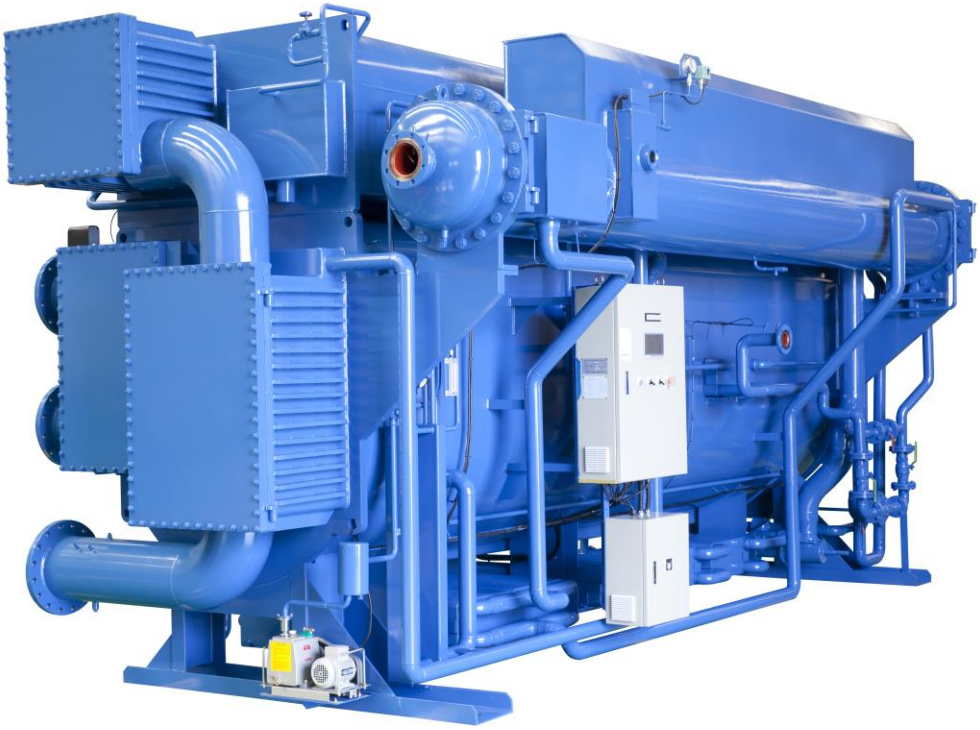
Model	Hot Surface (ft^2)				Cold Surface (ft^2)	
	3inch	2inch	3/4inch	3/8inch	3/4inch	3/8inch
SWHH50	26.9	12.9	47.4	20.5	35.5	6.5
SWHH60	26.9	12.9	47.4	20.5	35.5	6.5
SWHH70	37.7	16.1	59.2	20.5	38.8	6.5
SWHH80	37.7	16.1	59.2	20.5	38.8	6.5
SWHH100	43.1	16.1	62.4	25.8	50.6	7.5
SWHH120	43.1	16.1	63.5	25.8	50.6	7.5
SWHH150	59.2	21.5	75.3	25.8	68.9	7.5
SWHH180	59.2	21.5	76.4	25.8	68.9	7.5
SWHH210	59.2	21.5	85.0	32.3	81.8	10.8
SWHH240	66.7	21.5	86.1	32.3	81.8	10.8
SWHH280	76.4	24.8	99.0	39.8	103.3	10.8
SWHH320	85.0	24.8	101.2	39.8	103.3	10.8
SWHH360	86.1	28.0	109.8	44.1	106.6	10.8
SWHH400	99.0	28.0	109.8	44.1	106.6	10.8
SWHH450	99.0	29.1	121.6	44.1	123.8	14.0
SWHH500	120.6	29.1	121.6	44.1	123.8	14.0
SWHH560	138.9	72.1	137.8	50.6	136.7	14.0
SWHH630	157.2	78.6	146.4	50.6	147.5	14.0
SWHH700	158.2	88.3	157.2	54.9	166.8	14.0
SWHH770	176.5	98.0	172.2	56.0	179.8	15.1
SWHH840	194.8	106.6	188.4	57.0	193.8	15.1
SWHH900	170.1	109.8	173.3	58.1	195.9	20.5
SWHH1000	188.4	124.9	179.8	61.4	211.0	20.5
SWHH1100	206.7	147.5	164.7	61.4	226.0	20.5
SWHH1200	205.6	161.5	167.9	61.4	245.4	26.9
SWHH1300	225.0	174.4	172.2	65.7	262.6	26.9
SWHH1400	231.4	172.2	175.5	65.7	398.3	23.7
SWHH1500	253.0	187.3	181.9	65.7	425.2	23.7

Water Quality

The cooling water which is recycled by cooling tower is exposed into atmosphere and polluted as it is vaporized. If the cooling water gets polluted, it develops corrosion and also scale inside the tubes and Absorption chiller performance drops.

Therefore, it is recommended to control the water quality; the following table shows guideline for cooling water and make-up water. The tube cleaning method and interval depends on each water quality.

Items		Cooling Water	Make-up Water	Tendency	
				Corrosion	Scale
Standard	PH(77 °F)	6.5 ~ 8.0	6.5 ~ 8.0	O	O
	Conductivity (77 °F, s/cm)	Max. 800	Max. 200	O	O
	Chloride ion Cl (mg / cl /liter)	Max. 200	Max. 50	O	
	Sulfuric acid ion $SO_4$2-(mg $CaCo_3$ /liter)	Max. 200	Max. 50	O	
	Alkalinity pH4.8 (mg $CaCo_3$ /liter)	Max. 100	Max. 50		O
	Total hardness (mg $CaCo_3$ /liter)	Max. 200	Max. 50		O
Reference	Iron Fe (77 °F)	Max. 1.0	Max. 0.3	O	
	Sulfides S^{2-} ion(ms S^{2-}/liter)	No trace	No trace	O	
	Ammonium ion NH_4+(mg NH_4+/liter)	Max. 1.0	Max. 0.2	O	
	Silica SiO (mg SiO_2 /liter)	Max. 50	Max. 30		O



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