World Energy

Product Data

Steam Fired Absorption Chiller

SHH Series

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

World Energy

SHH – Single Effect Steam Fired Absorption Chiller, provides economical water cooling by recovered heat from low pressure steam and mid-temperature hot water.

● Natural Refrigerant: using water as refrigerant, which is environmentally safe and harmless to humans
● Quiet, vibration-free operation
● High reliability due to few moving parts

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Model Number Nomenclature

S- 180 HH
- HH: Super High Efficiency
- 180: Cooling Capacity
- S-: Steam Fired Absorption chiller

Heat recovery cooling and Excellent part load performance

Energy Saving Economical Cooling Solution
SHH produces chilled water from heat of waste steam or hot water, which reduces the electricity usage for cooling.

Application versatility - From comfort cooling to process cooling, SHH offers versatility for almost any job where steam or hot water is available as the heat source. SHH is sure to be the right choice for either new construction or retrofit applications.

Excellent part load performance - SHH 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. SHH has a continuous operating range from 100% to 10% of rated machine capacity.

Easy and Low Cost Installation

Easy Installation – SHH series 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 SHH control.

Location flexibility - Low noise and vibration level of SHH allows its location flexibility. Due to the fact the only rotating parts are the refrigerant and solution pumps. The overall sound level of SHH is 75dbA. This allows the machines to be installed near occupied 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. Also, World Energy design team can provide a special design of application to help a customer who has strict space constraints.

Easy maintenance

Simple maintenance procedures - SHH 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 - SHH solution and refrigerant pumps 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 SHH machines to make field service easy, if required.

Reliable operation

Automatic control system ensuring precise control and safe operation – SHH 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 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 and CE where appropriate and include a microprocessor CPU 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 SHH 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 SHH'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 construction –SHH offers features designed to provide reliable, trouble-free operation. The machine is fabricated to meet manufacturing and design requirements and is UL & CE certified to ensure product safety and machine integrity.

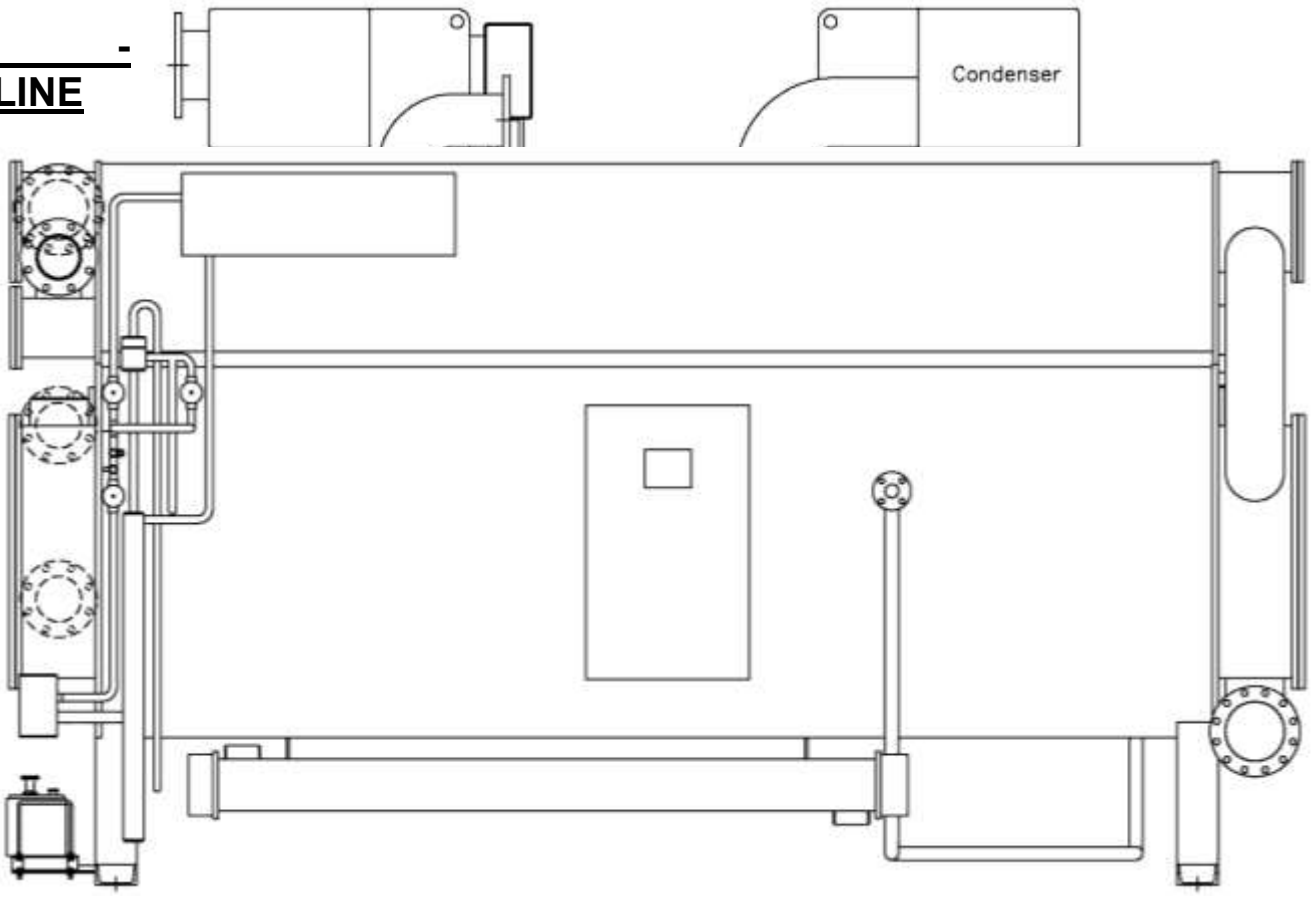
Automatic purge system extends machine life and ensures optimum efficiency and performance – The purge system of an absorption chiller is critical to ensuring efficient operation and long machine life. Even when machines are vacuum tight or properly inhibited, all absorption chillers generate hydrogen 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. SHH 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.

SHH - OUTLINE


Condenser
Cooling Water Outlet
Drain Outlet
Chilled Water Outlet
Chilled Water Inlet
Cooling Water Inlet

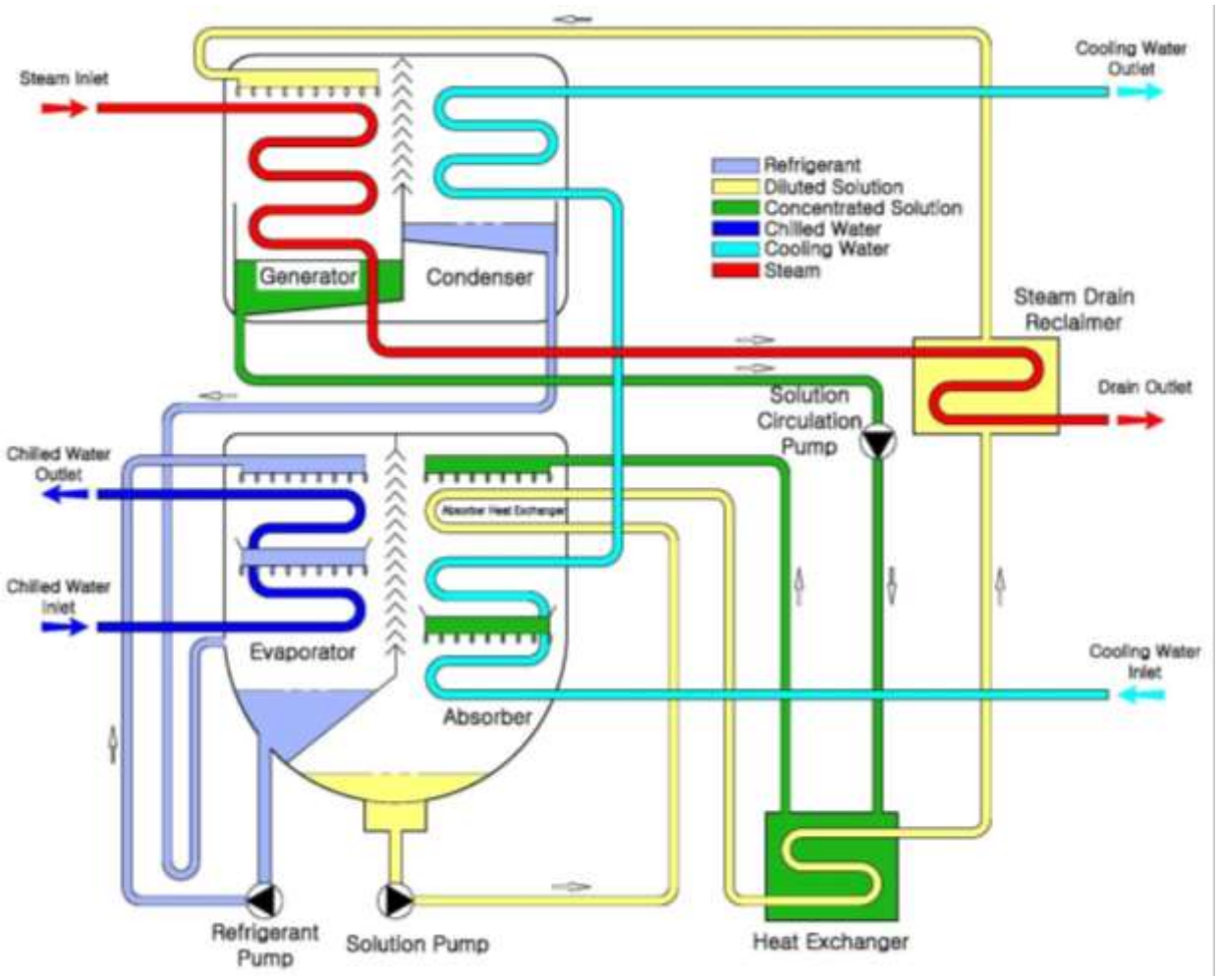
Steam Driven Absorption Cycle

Absorption chiller is composed of evaporator, absorber, condenser, low/high temp. generator, low/ high temp. heat exchanger, solution pump #1 and #2(Solution Circulation pump, which some models don't have), refrigerant pump, and steam drain heat reclaimer. Chilled water temp. goes down in the evaporator and steam from evaporator is absorbed into the concentrated solution in absorber.

Diluted solution in absorber flows into the High Temp. Generator by solution pump through low temp. high temp. heat exchanger and it is heated by steam to become intermediated solution.

Concentrated Intermediate solution in the low temp. generator exchanges it's heat in the low/high heat exchanger, low temp. solution flow back to absorber and repeat the process.

Steam in the high temp. generator exchanges It's heat twice in the chiller, firstly in the high temp. generator and secondly in the steam drain heat reclaimer, therefore high temp. steam drains out at low temp. like 95˚C. This process can increase heat recovery rate and chiller capacity



Specification Data

Model		Unit	S50HH	S60HH	S70HH	S80HH	S100HH	S120HH	S150HH	S180HH	S210HH	S240HH
Cooling Capacity		kW	176	211	246	281	352	422	527	633	738	844
		usRT	50	60	70	80	100	120	150	180	210	240
Chilled Water	Inlet /Outlet Temp.	℃	12 / 7									
	Flow rate	m^3/h	30.2	36.3	42.3	48.4	60.5	72.6	90.7	109	127	145
	P. Drop	mH_2O	6.8	6.4	5.8	6.0	5.9	6.1	8.0	8.2	7.5	7.4
	Connection	mm	80				100				150	
Cooling Water	Inlet /Outlet Temp.	℃	32 / 39									
	Flow rate	m^3/h	48.2	57.8	67.5	77.1	96.4	116	145	174	202	231
	P. Drop	mH_2O	6.0	5.5	7.2	7.2	6.6	7.0	9.3	9.7	9.5	9.0
	Connection	mm	100				150				200	
Steam	Inlet Pressure	MPa	0.15									
	Flow rate	kg/h	336	404	471	538	673	807	1009	1211	1412	1614
	Inlet Connection	mm	105.3	105.3	105.3	105.3	130.8	130.8	130.8	130.8	155.2	155.2
	Drain Connection	mm	25				40					
	Control Valve	mm	40			50			65		80	
Electric	Power source	-	3Φ, 380V, 60Hz									
	Abs. Pump	kW(A)	0.3(1.4)				0.4(1.4)					
	Ref. Pump	kW(A)	0.2(1.2)								0.3(1.4)	
	Purge Pump	kW(A)	0.4(1.4)									
	Control Panel	kW(A)	0.2(0.5)									
	Total Power	kW	1.1				1.2				1.3	
	Total Ampere @400V	A	4.5								4.7	
Size	Length (L)	mm	2110		2610		2658		3678		3728	
	Width (W)	mm	1072				1151				1222	
	Height (H)	mm	2097				2372				2640	
Weight	Rigging	ton	2.3	2.4	2.7	2.7	3.5	3.5	4.2	4.5	5.4	5.7
	Operation	ton	2.6	2.7	3.0	3.1	4.0	4.1	4.9	5.2	6.4	6.8
Clearance, Tube Removal		mm	1,900		2,400				3,400			
Water Volume of Machine	Chilled Water Side	ℓ	60	67	77	80	111	123	142	159	216	237
	Cooling Water Side	ℓ	215	235	265	276	309	336	391	432	569	622
	Hot Water Side	ℓ	51	62	71	79	98	107	127	142	170	189

General conditions

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

Specification Data

Model		Unit	S280HH	S320HH	S360HH	S400HH	S450HH	S500HH	S560HH	S630HH	S700HH
Cooling Capacity		kW	985	1,125	1,266	1,407	1,582	1,758	1,969	2,215	2,461
		usRT	280	320	360	400	450	500	560	630	700
Chilled Water	Inlet /Outlet Temp.	℃									
	Flow rate	m^3/h	169	194	218	242	272	302	339	381	423
	P. Drop	mH_2O	5.4	5.3	5.7	5.8	5.0	5.3	7.3	9.9	9.2
	Connection	mm					200				250
Cooling Water	Inlet /Outlet Temp.	℃									
	Flow rate	m^3/h	270	308	347	386	434	482	540	607	675
	P. Drop	mH_2O	7.8	7.4	7.6	7.7	7.7	7.8	6.7	9.0	7.2
	Connection	mm					250				300
Steam	Inlet Pressure	MPa									
	Flow rate	kg/h	1883	2152	2421	2690	3026	3363	3766	4237	4708
	Inlet Connection	mm	204.7	204.7	204.7	204.7	204.7	204.7	254.2	254.2	254.2
	Drain Connection	mm			50		65				
	Control Valve	mm	100			125				150	
Electric	Power source	-									
	Abs. Pump	kW(A)			1.5(4.3)						
	Ref. Pump	kW(A)					0.4(1.4)				
	Purge Pump	kW(A)									
	Control Panel	kW(A)									
	Total Power	kW			2.4		2.5				
	Total Ampere @400V	A			7.6						
Size	Length (L)	mm	4748		4854		4872		5414	5912	6012
	Width (W)	mm			1395		1557				1780
	Height (H)	mm			2677		2880				3140
Weight	Rigging	ton	6.5	6.8	8.2	8.5	9.9	11.5	13.1	14.9	15.9
	Operation	ton	7.7	8.1	9.7	10.2	12.1	13.8	15.5	17.5	19.2
Clearance, Tube Removal		mm	4,600						5,200	5,700	
Water Volume of Machine	Chilled Water Side	ℓ	258	286	324	348	465	485	526	563	656
	Cooling Water Side	ℓ	694	765	927	993	1,252	1,325	1,425	1,517	1,959
	Hot Water Side	ℓ	214	239	278	303	334	365	407	448	485

General conditions

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

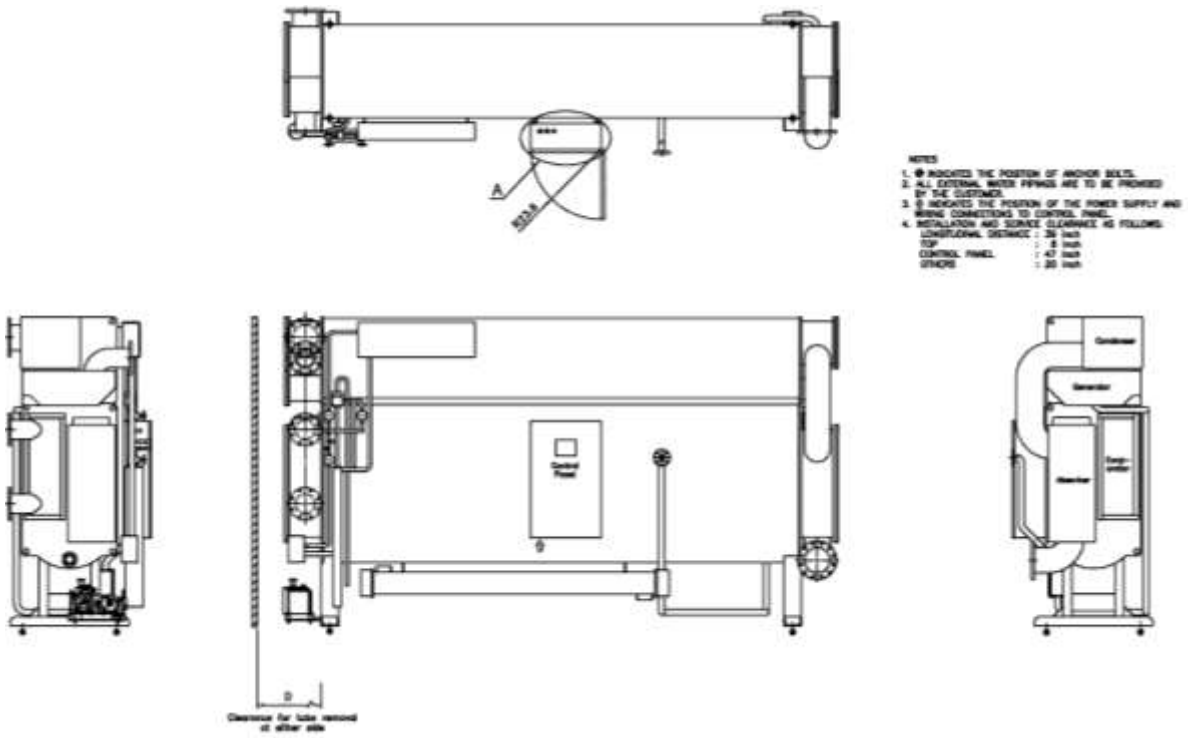
Specification Data

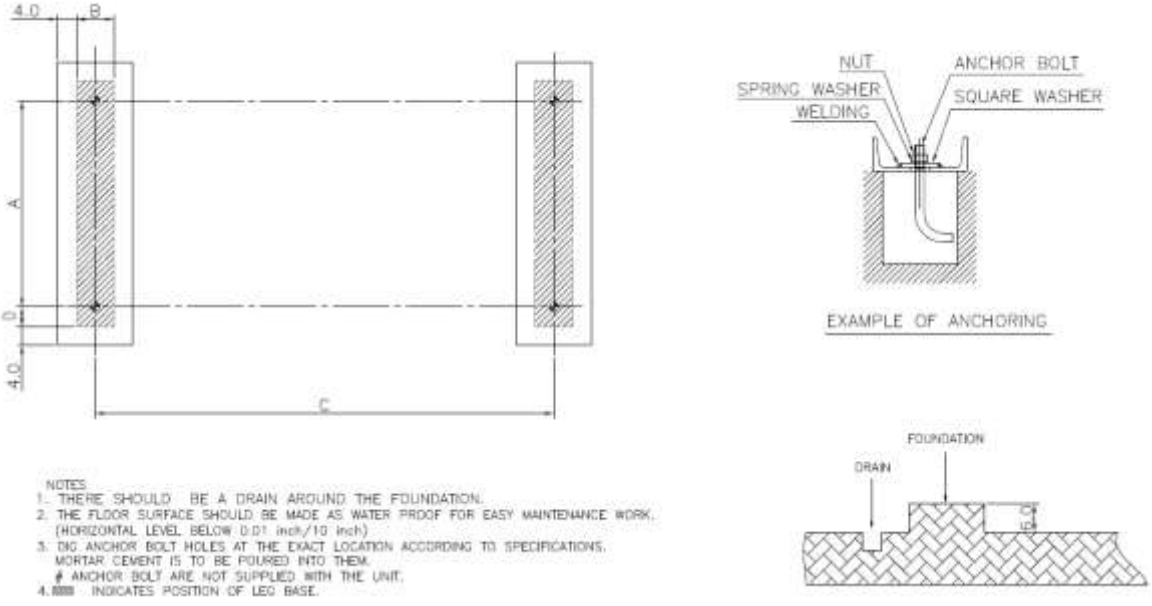
Model		Unit	S770HH	S840HH	S900HH	S1000HH	S1100HH	S1200HH	S1300HH	S1400HH	S1500HH
Cooling Capacity		kW	2,708	2,954	3,165	3,516	3,868	4,220	4,571	4,923	5,274
		usRT	770	840	900	1000	1100	1200	1300	1400	1500
Chilled Water	Inlet /Outlet Temp.	℃									
	Flow rate	m^3/h	466	508	544	605	665	726	786	847	907
	P. Drop	mH_2O	12.0	15.1	9.0	11.9	15.2	11.4	14.3	8.6	10.6
	Connection	mm						300		350	
Cooling Water	Inlet /Outlet Temp.	℃									
	Flow rate	m^3/h	742	810	868	964	1,060	1,157	1,253	1,350	1,446
	P. Drop	mH_2O	9.3	9.4	7.2	9.9	9.7	9.0	9.0	7.7	9.4
	Connection	mm			350			400			
Steam	Inlet Pressure	MPa									
	Flow rate	kg/h	5179	5649	6053	6725	7398	8070	8743	9416	10088
	Inlet Connection	mm	304.7	304.7	304.7	304.7	304.7	339.8	339.8	390.6	390.6
	Drain Connection	mm	80				100				
	Control Valve	mm			200						
Electric	Power source	-									
	Abs. Pump	kW(A)			1.8(6.0)					2.2(6.7)	
	Ref. Pump	kW(A)			1.5(4.0)					1.8(6)	
	Purge Pump	kW(A)						0.75(2.2)			
	Control Panel	kW(A)									
	Total Power	kW			3.9			4.3		5.0	
	Total Ampere @400V	A			11.9			12.7		15.4	
Size	Length (L)	mm	6537	7037	6114	6639	7139	6749	7249	7522	8022
	Width (W)	mm			2177			2467		3000	
	Height (H)	mm			3461			3750		3800	
Weight	Rigging	ton	17.1	18.1	22.4	22.7	25.6	27.2	28.7	35.2	37.1
	Operation	ton	20.6	21.8	26.8	27.3	30.5	33.3	35.1	44.0	46.3
Clearance, Tube Removal		mm	6,200	6,700	5,700	6,200	6,700	6,200	6,700	6,300	6,800
Water Volume of Machine	Chilled Water Side	ℓ	701	744	944	1,004	1,060	1,355	1,423	1,795	1,890
	Cooling Water Side	ℓ	2,082	2,199	3,127	2,738	2,890	3,563	3,746	4,691	4,919
	Hot Water Side	ℓ	523	553	578	784	837	870	932	1,067	1,138

General conditions

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

Outline & Foundation Drawing





Outline & Foundation drawing will be provided according to the site requirement.

Product Specification

SHH - Single Effect Steam Absorption Chiller

Capacity Range: **50 ~ 1500 usRT (176 ~ 5274kW)**

1. SYSTEM DESCRIPTION

Electronically controlled, SHH 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 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. ANSI 150 psig RF flanges shall be furnished on all water box nozzle 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 SHH series absorber, so efficiency of SHH 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 World energy SHH 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…….stainless steel
Generator……. stainless steel

* Special tube material like Cupronickel, Titanium 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 ~ 30℃(60.8 ~ 86℉).

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 380, 400, 440, 460 / 3-ph, 50Hz with 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:
   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.

Controls

Programmable Logic 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 Outlet Temperature Cutout
- Low Refrigerant Temperature Cutout
- Low Cooling Inlet Temperature Cutout
- Low Chilled Water Flow Cutout
- Low Cooling Water Flow Cutout (Option)
- High G1 Absorbent Temperature Cutout
- Emergency Stop

Protective Limits
- Max. Allowable Cooling Water Inlet Temperature
- Max. Allowable G1 Absorbent Temperature
- Max. Allowable Absorbent Concentration
- Low Chilled Water Temperature
-

Temperature Sensor Faults
- Chilled Water Outlet Temperature
- Cooling Water Inlet Temperature
- Refrigerant Condensate Temperature
- Refrigerant Evaporating Temperature
- Generator Absorbent Temperature

Capacity Control
- Chilled Water Outlet Temperature 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

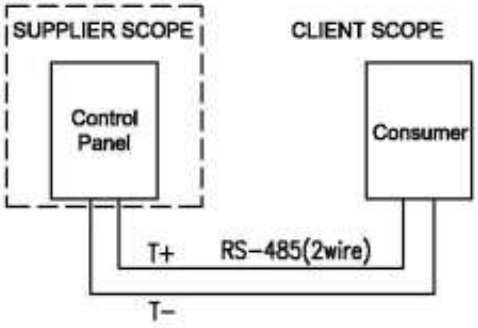
SIEMENS POL635 Controller

LCD Touch Screen

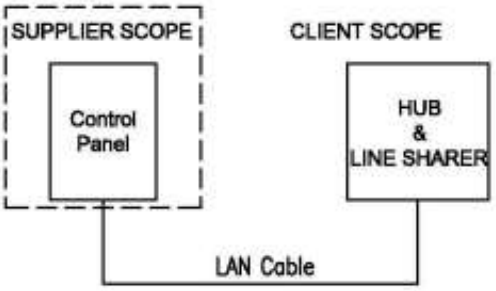
Control Panel

Communication

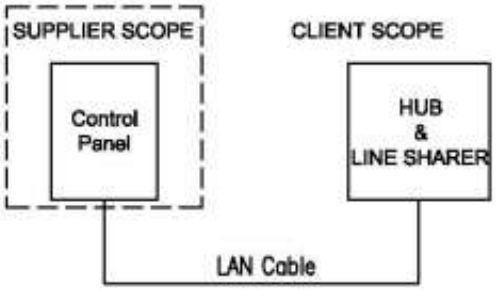
1.MODBUS-RTU



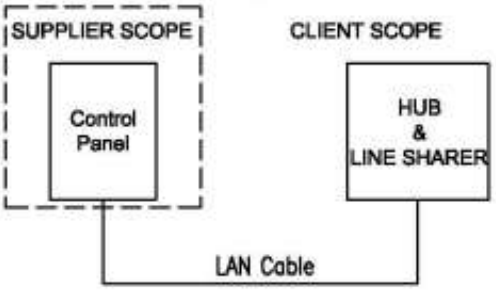
4.BACnet



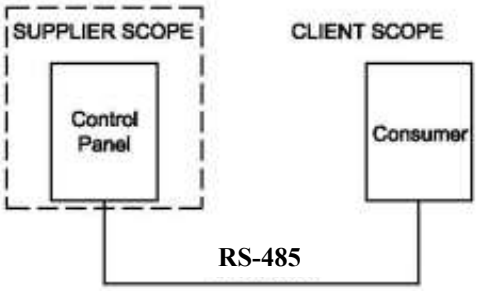
2.MODBUS-TCP



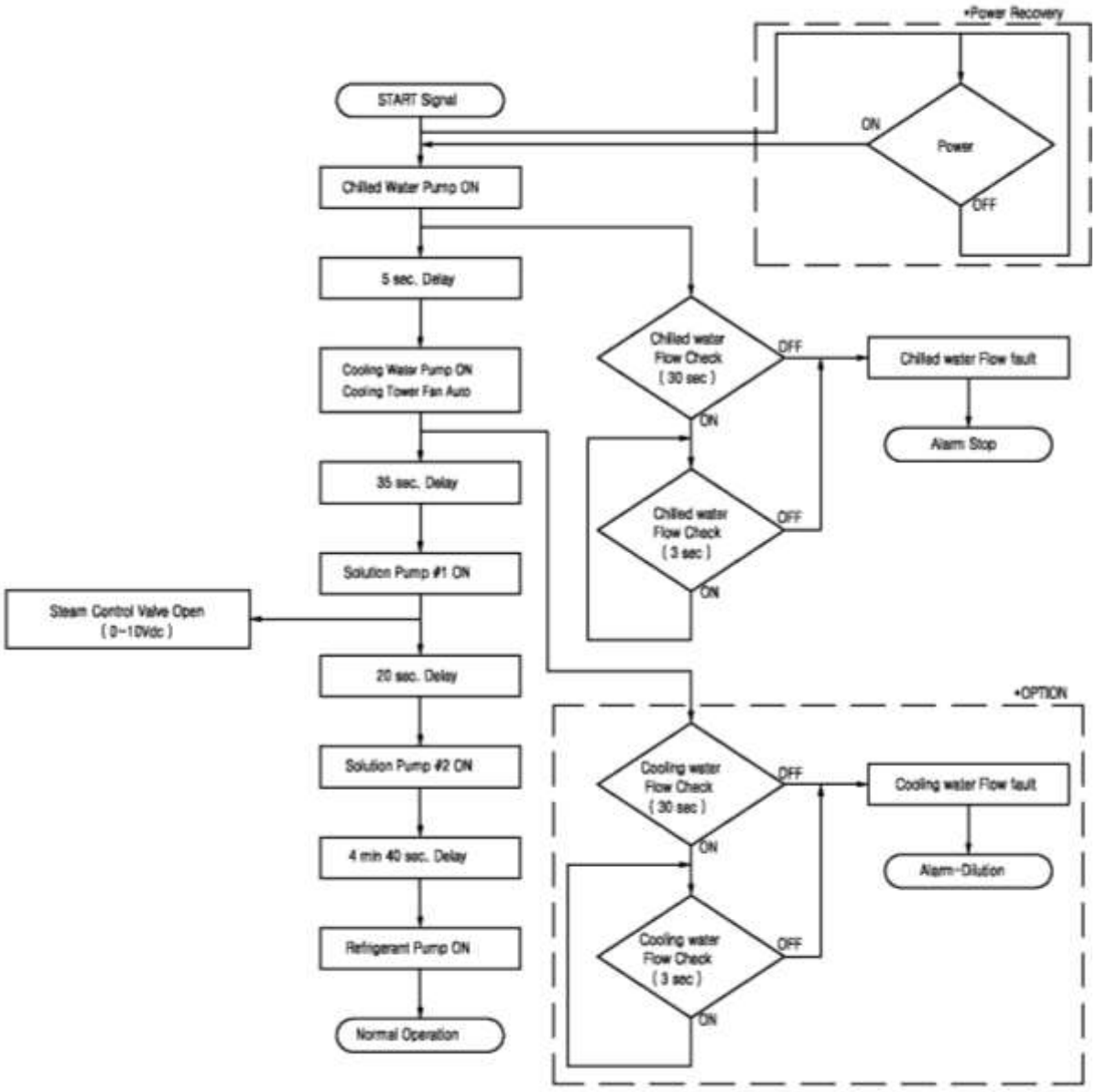
5.INTERNET KIT(PLC)



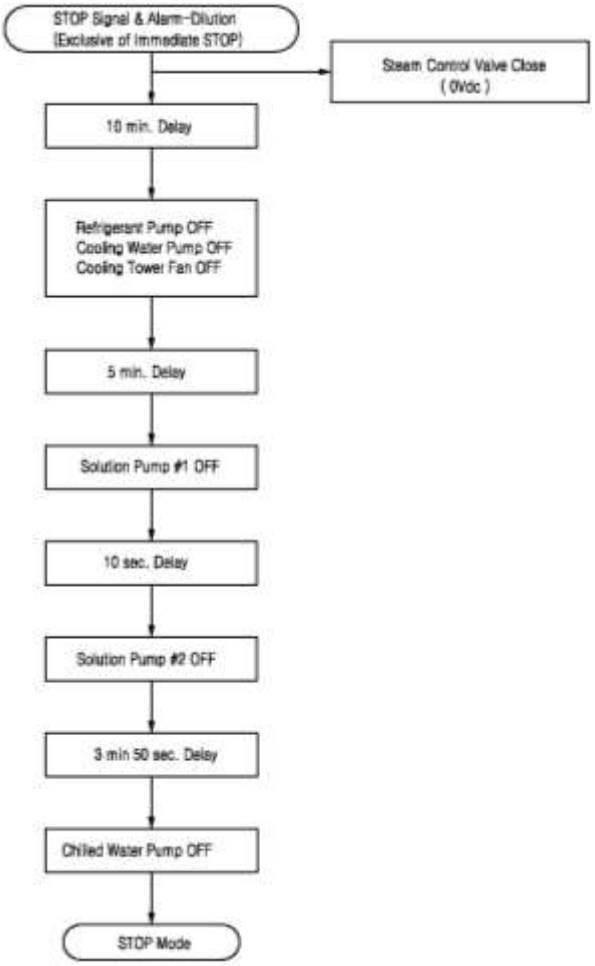
3.PROFIBUS

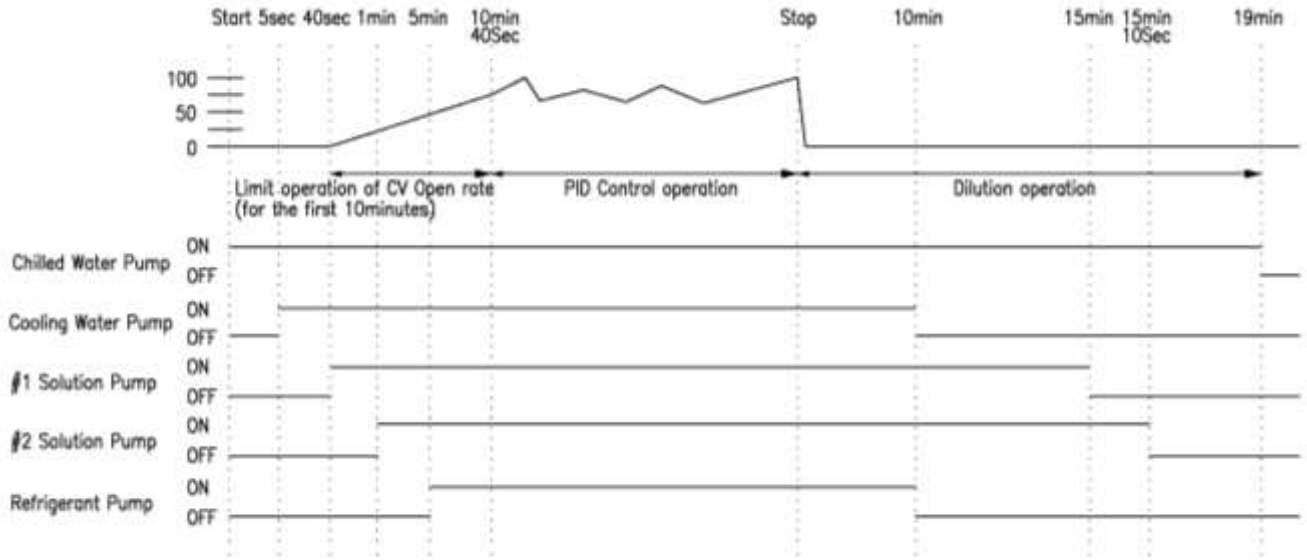


Start-up Sequence



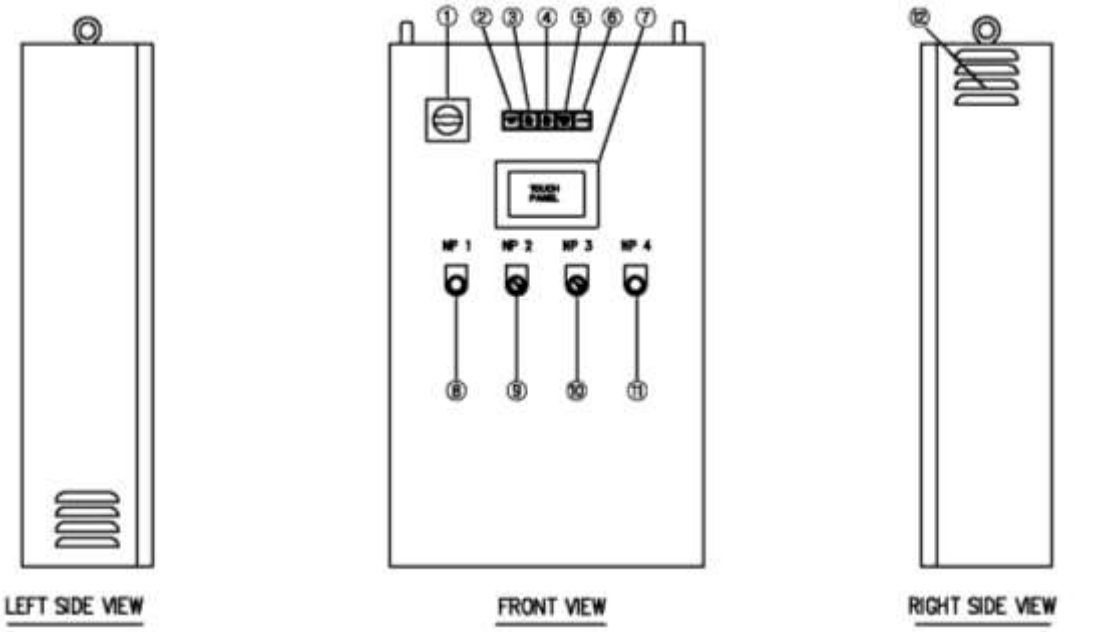
Stop Sequence

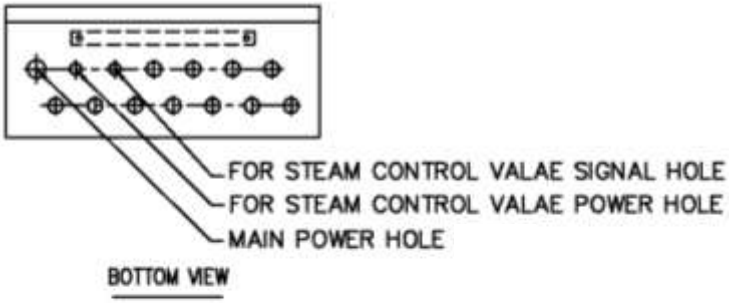




<Operation Graph>

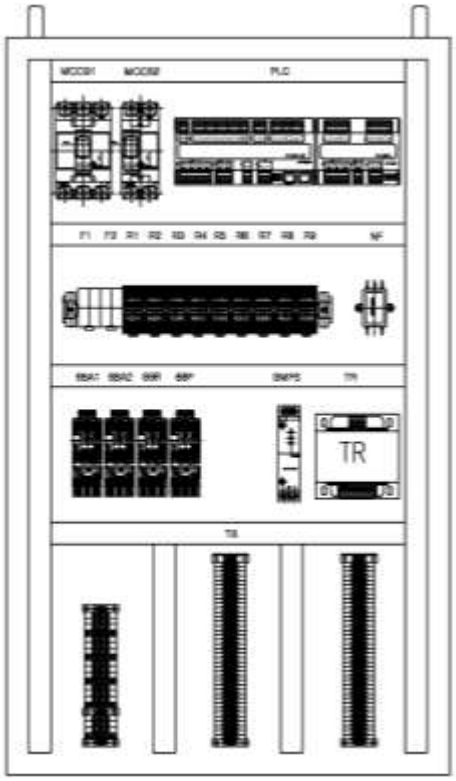
Control Panel – Outside View





NO.	SYMBOL NAME	DESCRIPTION
1	Q1	DISCONNECT SWITCH
2	LT1	SYSTEM RUN LIGHT
3	LT4	SOLUTION PUMP LIGHT
4	LT3	REFRIGERANT PUMP LIGHT
5	LT5	PURGE PUMP LIGHT
6	LT2	TOTAL ALARM LIGHT
7	TOP	TOUCH OPERATION PANEL
8	BZ	BUZZER
9	S1	BUZZER ON/OFF SELECTOR SWITCH
10	S2	PURGE PUMP START/STOP SELECTOR SWITCH
11	S3	EMERGENCY STOP
11	CF	COOLING FAN

Control Panel - Inside View



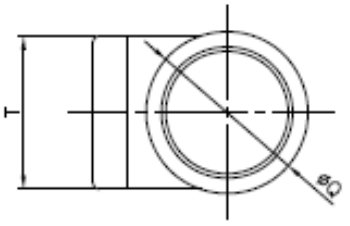
NO.	SYMBOL NAME	NAME OF INSTRUMENT	Q'TY
1	PLC	CONTROLLER	1
2	MCCB1	MAIN POWER CIRCUIT BREAKER	1
3	MCCB2	CONTROL CIRCUIT BREAKER	1
4	TR	TRANSFORMER	1
5	88A1	SOLUTION PUMP1 CONTACTOR	1
6	88A2	SOLUTION PUMP2 CONTACTOR	1
7	88R	REFRIGERANT PUMP CONTACTOR	1
8	88P	PURGE PUMP CONTACTOR	1
9	51A1	SOLUTION PUMP1 OVERLOAD RELAY	1
10	51A2	SOLUTION PUMP2 OVERLOAD RELAY	1
11	51R	REFRIGERANT PUMP OVERLOAD RELAY	1
12	51P	PURGE PUMP OVERLOAD RELAY	1
13	F1~F2	POWER FUSE	2
14	R1~R8	RELAY	8
15	NF	NOISE FILTER	1
16	SMPS	DC POWER SUPPLY	1
17	TB	TERMINAL BLOCK	

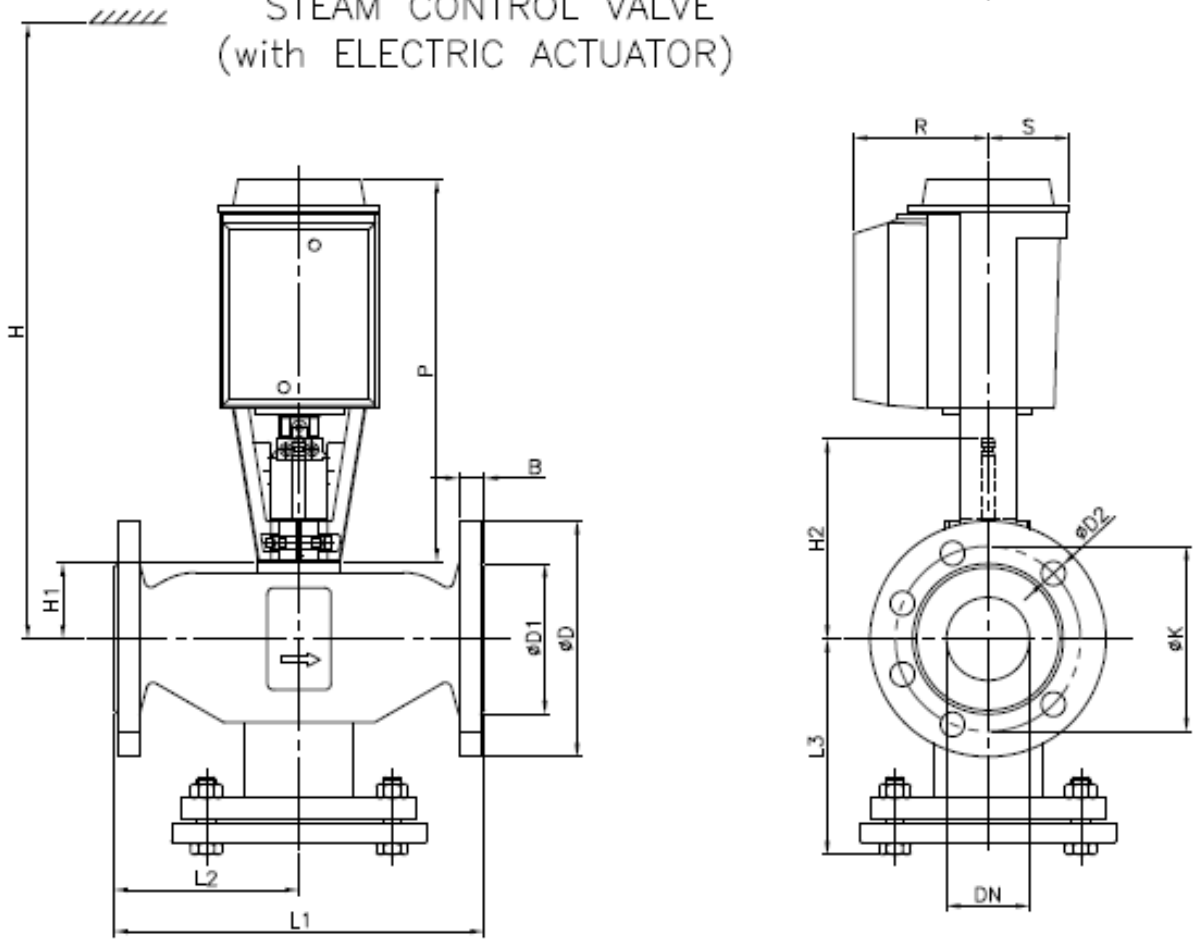
Electric Data

Model		60Hz			50Hz			Ref. Pump	Sol Pump	Purge Pump	Control
		380V	440V	460V	380V	400V	440V				
	KW	A	A	A	A	A	A	KW	KW	KW	KW
S50 ~ S80HH	1.1	4.8	4.1	3.8	4.8	4.5	4.2	0.2	0.3	0.4	0.2
S100HH~S180HH	1.2	4.8	4.1	3.8	4.8	4.5	4.2	0.2	0.4	0.4	0.2
S210HH~S320HH	1.3	5.1	4.4	4.2	5.0	4.7	4.4	0.3	0.4	0.4	0.2
S360HH~S400HH	2.4	8.5	7.3	7.1	8.0	7.6	7.0	0.3	1.5	0.4	0.2
S450HH~S630HH	2.5	8.5	7.3	7.1	8.0	7.6	7.0	0.4	1.5	0.4	0.2
S700HH~S840HH	2.5	8.5	7.3	7.1	8.0	7.6	7.0	0.4	1.5	0.4	0.2
S900HH~S1100HH	3.9	15.0	13.2	12.4	12.7	11.9	11.0	1.5	1.8	0.4	0.2
S1200HH~S1300HH	4.25	16.8	14.9	13.9	13.5	12.7	11.7	1.5	1.8	0.75	0.2
S1400HH~S1700HH	4.95	16.3	14.0	13.5	16.3	15.4	14.1	1.8	2.2	0.75	0.2

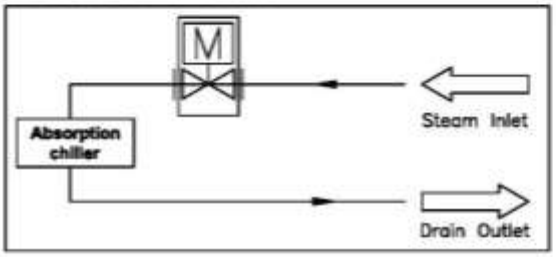
Steam Control Valve

VALVE														ACTUATOR						
DN [inch]	DN [mm]	B	øD	øD1	øD2	L1	L2	X	Y	øK	H1	H2	VALVE Weight [lb]	H	P	Q	R	S	T	ACTUATOR Weight [lb]
1/2	15	0.6	3.7	1.8	0.6(4x)	5.1	3.4	3.1	3.0	2.6	2.5	6.3	9.3	>25.1	14.8	7.0	5.4	3.5	5.0	20.9
3/4	20	0.6	4.1	2.2		5.9	3.9	3.4	3.4	3.0	2.5	5.7	11.7							
1	25	0.6	4.5	2.6		6.3	4.1	3.7	3.7	3.3	2.5	6.3	13.4							
1 1/4	32	0.7	5.5	3.0	0.7(4x)	7.1	4.7	4.6	4.6	3.9	2.4	6.2	19.2	>25.0						
1 1/2	40	0.6	5.9	3.3		7.9	5.1	4.9	4.9	4.3	2.4	6.2	22.3							
2	50	0.6	6.5	3.9		9.1	5.7	5.3	5.1	4.9	3.9	7.7	30.0	>26.6						
2 1/2	65	0.7	7.3	4.6	0.7(8x)	11.4	7.0	–	–	5.7	4.5	9.1	49.2	>27.2						22.4
3	80	0.7	7.9	5.2		12.2	7.5	–	–	6.3	4.5	9.1	61.5							
4	100	0.7	9.3	6.1	0.9(8x)	13.8	8.4	–	–	7.5	5.7	10.3	86.0	>28.4						
5	125	0.7	10.6	7.2		15.7	9.5	–	–	8.7	6.3	10.8	126.8	>28.9						
6	150	0.7	11.7	8.3		18.9	11.2	–	–	9.8	7.3	11.9	167.1	>30.0						

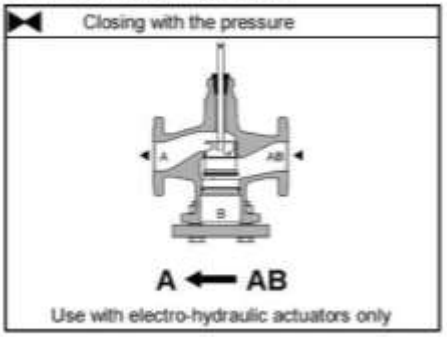




NOTE :
1. ALL DIMENSIONS ARE IN INCHES.
2. VALVE OPERATING TEMPERATURE : 212 °F ~ 392 °F(SATURATED STEAM).
3. VALVE BODY MATERIAL : NODULAR CAST IRON.
4. DN : NOMINAL DIAMETER(VALVE SIZE).
5. H : TOTAL ACTUATOR HEIGHT PLUS MINIMUM DISTANCE TO THE WALL OR THE CEILING FOR MOUNTING, CONNECTION, OPERATION, 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

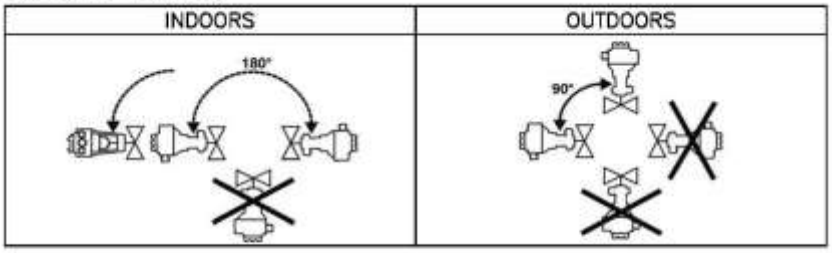


9. VALVE'S CROSS SECTION

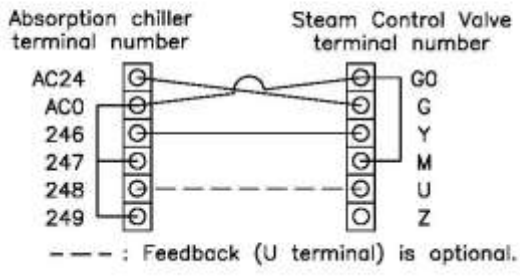


– THE TWO–PORT VALVE DOES NOT BECOME A THREE–PORT VALVE BY REMOVING THE BLANK FLANGE.

10. MOUNTING POSITION

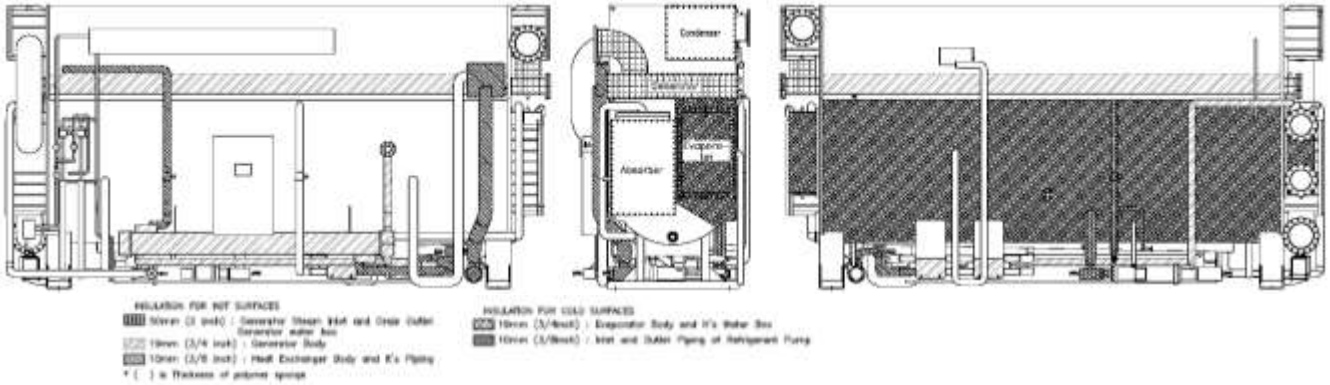


11. VALVE WIRING DIAGRAM



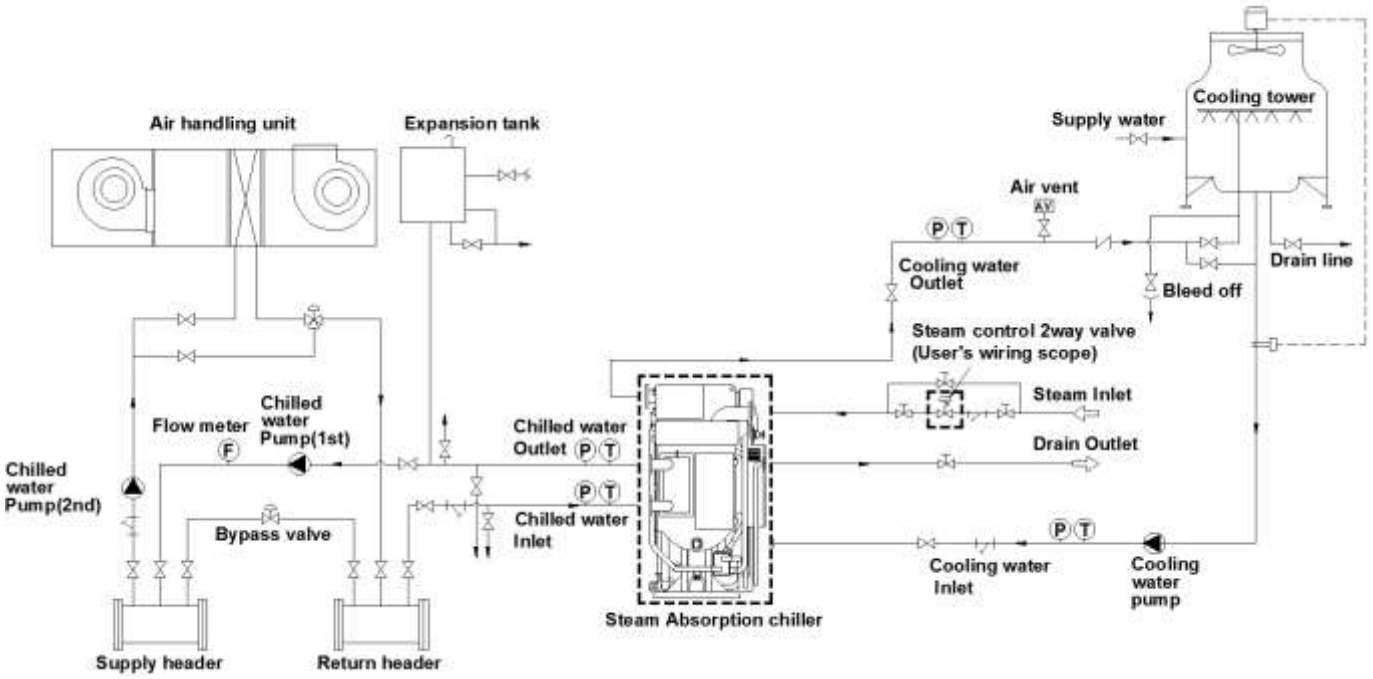
Thermal Insulation – Surface Area

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.



Model	Hot Surface (m²)			Cold Surface (m²)	
	50 mm	19 mm	10 mm	19 mm	10 mm
S50HH	3	24	3	11	2
S60HH	3	24	3	11	2
S70HH	3	27	4	12	2
S80HH	3	27	4	12	2
S100HH	5	33	5	16	2
S120HH	5	33	6	16	2
S150HH	5	42	5	21	3
S180HH	5	42	5	21	3
S210HH	7	40	6	25	3
S240HH	7	40	6	25	3
S280HH	7	48	6	31	3
S320HH	7	48	7	31	3
S360HH	8	59	8	32	3
S400HH	8	60	8	32	3
S450HH	10	66	8	38	4
S500HH	10	66	8	38	4
S560HH	10	72	10	42	4
S630HH	10	78	10	45	4
S700HH	11	84	10	51	5
S770HH	11	88	10	55	5
S840HH	12	94	10	59	5
S900HH	18	111	13	60	6
S1000HH	18	117	13	65	6
S1100HH	18	125	13	69	6
S1200HH	19	130	16	75	8
S1300HH	20	137	16	50	8
S1400HH	23	144	17	121	7
S1500HH	23	152	17	130	7

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) Steam inlet Pressure must be maintained as design pressure.
4) The stop valves at Steam 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.
10) when the chiller in stop condition do close the valves around steam control valve.

< Factory Performance Test >

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