

Product Data

2AA 2-Lift Hot Water Driven Absorption Chiller (Waste Heat Recovery Absorption Chiller)

105 ~ 4571 kW (30 ~ 1300 usRT)



2AA, Waste Heat Recovery Absorption Chiller, Provides Water Chilling by Exploiting Low Temperature Waste Heat from Production Process or CHP System.

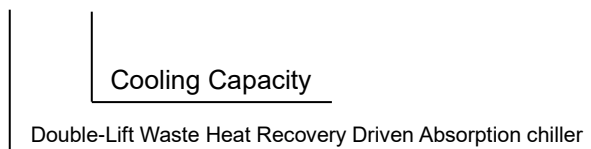
- No CFC's ; environmentally safe
- Quiet, vibration-free operation
- High reliability due to few moving parts

Table of contents

	Page
Model Number Nomenclature.....	2
Features/Benefits.....	2~4
Single-effect Absorption Cycle.....	6
Specification Data.....	7~9
Product Specification.....	12~15
Controls.....	16
Communication.....	17
Start-up & Stop Sequence.....	18~19
Control Panel & Electrical Data.....	20~21
Hot Water Control Valve & Insulation.....	22~23
Typical Piping & Wiring.....	24

Model Number Nomenclature

2AA - 180



Heat Recovery Cooling and Excellent part load performance

Economical Heat Recovery Cooling – 2AA Waste Heat Recovery Absorption Chiller produces cooling from low temperature waste heat, such as water at 70 °C (158°F). This allows customers to eliminate demand charges and high cost electrical usage and high cost electrical usage.

Application versatility designed to suit a variety of applications - From comfort cooling to providing chilled water for process applications, the 2AA offers versatility for almost any job where hot water is available as the heat source. 2AA is sure to be the right choice for either new construction or retrofit applications.

Excellent part load performance – 2AA control system allows stable, part load operation at cooling water temperatures as low as 20 °C 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. 2AA has a continuous operating range from 100% to 0% of rated machine capacity.

Location and installation savings

Easy installation – 2AA is 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 2AA 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 2AA is typically 75dbA. This allows the machines to be installed near occupancies or in areas with strict sound requirements. Low vibration levels also make it possible to install the chiller on upper floors without special consideration for vibration dampening systems.

Low maintenance

Standard features allow simple maintenance procedures - Every 2AA 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 2AA 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 2AA to make field service easy, if required.

Reliable operation

2AA control system features automatic microprocessor control center continuously monitors machine operation, ensuring precise control - Each 2AA 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), or CE (European Conformity) 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 2AA 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 2AA'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 2AA 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. 2AA 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

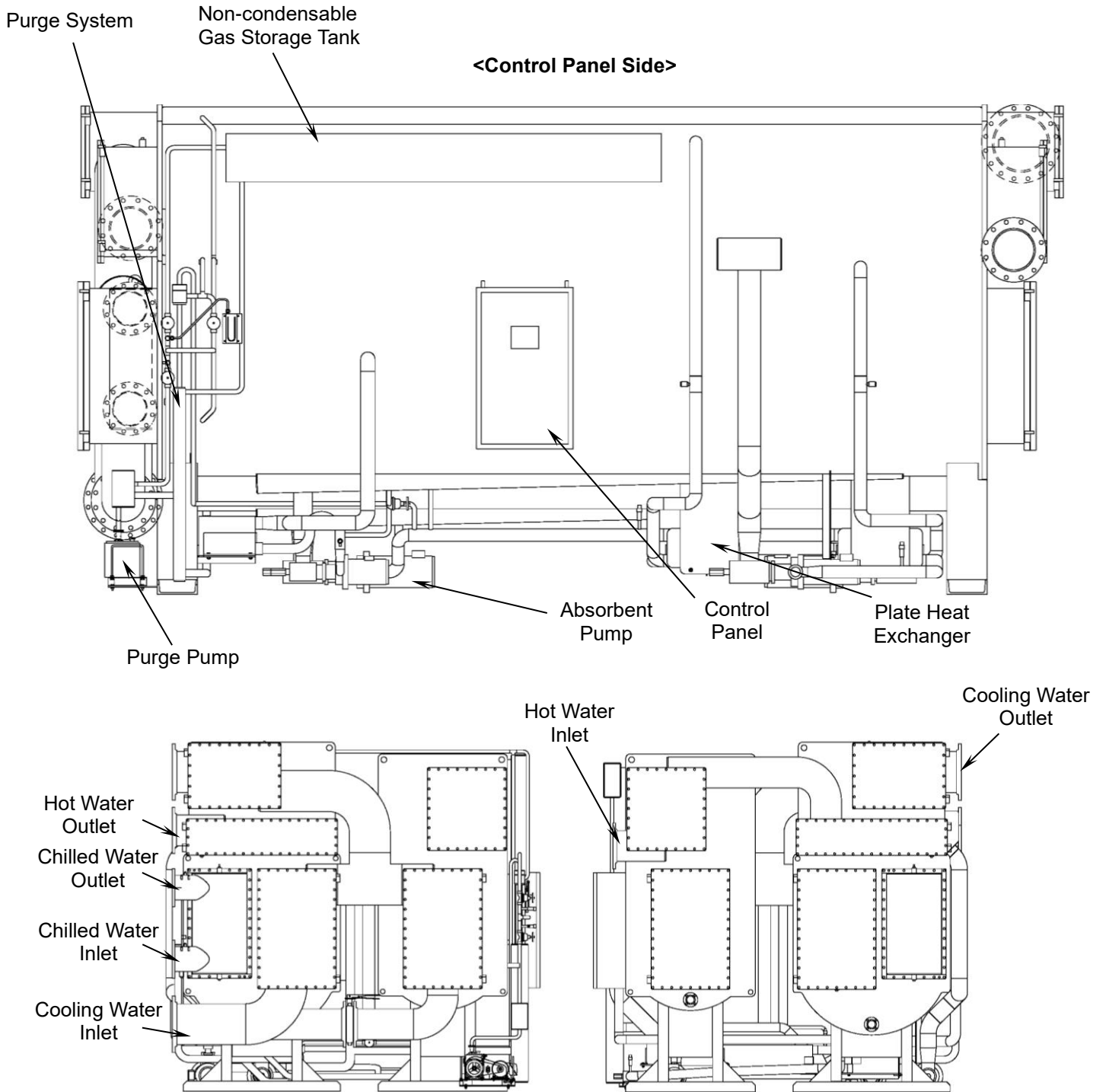
non-condensable gas from the absorber. The non-condensable gas is then entrained by the solution flowing through the eductor. The eductor discharges the solution and non-condensable gas into a separator in a purge chamber, where the non-condensable gas are separated from the solution. The non-condensable 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.

2AA OUT LINE



WASTE HEAT RECOVERY ABSORPTION CHILLER

The absorbent circulation cycle of the main circuit and the auxiliary circuit. In the main circuit, the diluted solution, moves from the absorber to the generator. In the generator, it discharges refrigerant vapor and then becomes concentrated solution. The concentrated solution goes through the absorbent heat exchanger and comes back to the absorber.

In the auxiliary circuit, the diluted solution moves from the auxiliary absorber to the auxiliary generator. In the auxiliary generator, it discharges refrigerant vapor and then becomes concentrated solution. The concentrated solution goes through the auxiliary absorbent heat exchanger and comes back to the auxiliary absorber.

In the condenser, the refrigerant vapor from the auxiliary generator condenses. The refrigerant liquid goes to the evaporator. The refrigerant pump pushes the refrigerant liquid to the top of the evaporator, and makes it sprays. Some of the evaporated refrigerant vapor passes through the eliminator and goes to the absorber. The refrigerant liquid collected at the bottom of the evaporator pushed back to the top of the evaporator again.

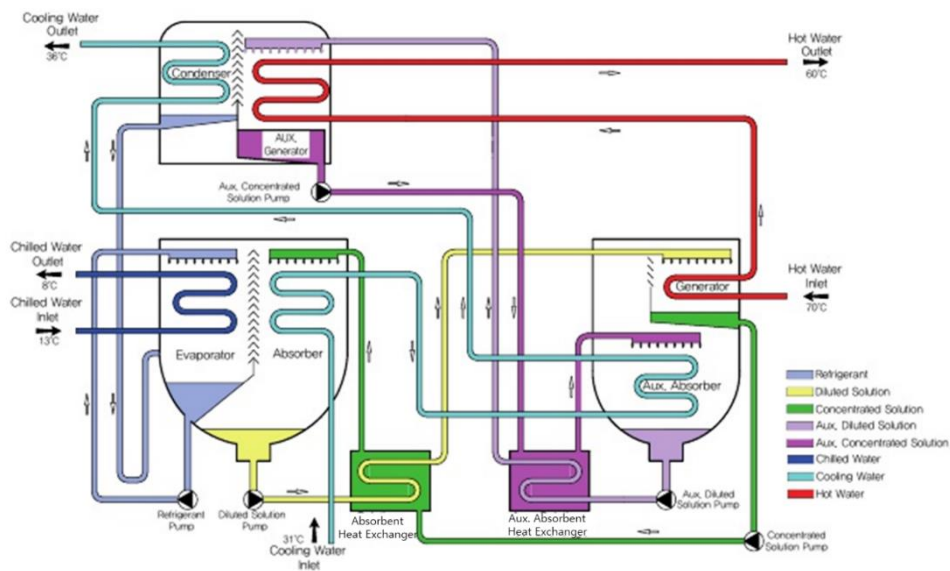
In the evaporator, there are heat transfer tubes in which chilled water flows. The chilled water gets cooled by the evaporation of the refrigerant on the tube surface.

In the absorber, there are heat transfer tubes in which cooling water flows. The concentrated solution is sprayed from the top of the absorber, absorbs the refrigerant vapor and then becomes the diluted solution. On the tube surface, the cooling water takes away the heat created by the absorption from the diluted solution. In the absorbent heat exchanger, the diluted solution and the concentrated solution have the heat exchange which improves the cycle efficiency.

In the generator, there are heat transfer tubes in which hot water flows. It applies heat to the diluted solution and makes the refrigerant evaporates and the solution concentrates. The concentrated solution goes through the absorbent heat exchanger and moves to the auxiliary absorber.

In the auxiliary absorber, there are tubes in which cooling water flows. The concentrated solution is sprayed from the top of the auxiliary absorber, absorbs the refrigerant vapor and then becomes the diluted solution. On the tube surface, the cooling water takes away the heat created by the absorption from the diluted solution. In the auxiliary absorbent heat exchanger, the diluted solution and the concentrated solution have the heat exchange which improves the cycle efficiency.

In the condenser, there are tubes in which cooling flows. It condenses the refrigerant vapor to the refrigerant liquid.



Specification Data (SI unit)

Model		unit	2AA30	2AA40	2AA50	2AA60	2AA75	2AA90	2AA110	2AA135	2AA155	2AA180	
Cooling Capacity		kW	105	141	176	211	264	316	387	475	545	633	
		usRT	30	40	50	60	75	90	110	135	155	180	
Chilled Water	Inlet Temp./Outlet Temp.	°C	13/8										
	Flow rate	m ³ /h	18.1	24.2	30.2	36.3	45.4	54.4	66.5	81.6	93.7	109	
	P. Drop	mH ₂ O	4.5	5.1	5.9	6.5	6.6	6.7	4.6	4.9	4.5	4.5	
	Connection	mm	80				100				125		
Cooling Water	Inlet Temp./Outlet Temp.	°C	31/36										
	Flow rate	m ³ /h	62.2	82.9	104	124	155	187	228	280	321	373	
	P. Drop	mH ₂ O	4.6	5.1	5.3	5.9	4.9	5.2	3.5	3.8	7.3	7.2	
	Connection	mm	125				200				250		
Hot Water	Inlet Temp./Outlet Temp.	°C	70/60										
	Flow rate	ton/h	22.0	29.4	36.7	44.0	55.1	66.1	80.7	99.1	114	132	
		m ³ /h	22.5	30.0	37.6	45.1	56.3	67.6	82.6	101	116	135	
	Pressure Drop	Shell	mH ₂ O	4.0	4.3	3.4	4.0	2.5	2.5	3.3	3.6	3.5	3.8
		Control Valve	mH ₂ O	2.0	3.6	3.6	3.2	3.2	4.6	2.7	4.0	3.4	4.6
	Connection	mm	80				125				150		
Control Valve	mm	65	80	100	125								
Electric	Power source	-	3Φ, 400V, 50Hz										
	Abs. Pump	kW(A)	0.6(2.8)				0.8(2.8)						
	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	1.4				1.6				1.7		
	Total Ampere @400V	A	5.9										
Size	Length (L)	mm	2340		2840		2972		3992		4129		
	Width (W)	mm	1729				1801		1887		2080		
	Height (H)	mm	2282				2545				2777		
Weight	Rigging	ton	3.9	4.0	4.4	4.5	5.4	5.6	6.9	7.1	8.7	9.0	
	Operation	ton	4.5	4.7	5.1	5.1	6.2	6.5	7.9	8.3	10.2	10.6	
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	320	345	383	391	408	438	515	561	753	820	
	Hot Water Side	ℓ	121	137	158	165	216	237	277	308	368	404	

General conditions

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

Specification Data (SI unit)

Model		unit	2AA210	2AA240	2AA270	2AA300	2AA340	2AA375	2AA420	2AA470	2AA525	
Cooling Capacity		kW	738	844	949	1,055	1,196	1,319	1,477	1,653	1,846	
		usRT	210	240	270	300	340	375	420	470	525	
Chilled Water	Inlet Temp./Outlet Temp.	°C	13/8									
	Flow rate	m ³ /h	127	145	163	181	206	227	254	284	318	
	P. Drop	mH ₂ O	9.9	9.7	10.2	10.2	9.2	9.7	4.4	5.9	5.6	
	Connection	mm	125		150			200				
Cooling Water	Inlet Temp./Outlet Temp.	°C	31/36									
	Flow rate	m ³ /h	435	497	560	622	705	777	871	974	1088	
	P. Drop	mH ₂ O	7.5	7.2	7.5	7.4	7.5	7.4	5.2	6.9	3.6	
	Connection	mm	250				350				400	
Hot Water	Inlet Temp./Outlet Temp.	°C	70/60									
	Flow rate	ton/h	154	176	198	220	250	275	308	345	385	
		m ³ /h	158	180	203	225	255	282	315	353	394	
	Pressure Drop	Shell	mH ₂ O	2.8	3.1	2.5	2.5	2.8	2.9	3.9	5.2	4.7
		Control Valve	mH ₂ O	2.5	3.3	4.1	3.2	4.1	5.0	2.5	3.1	2.4
	Connection	mm	150		200						250	
Control Valve	mm	150				200						
Electric	Power source	-	3Φ, 400V, 50Hz									
	Abs. Pump	kW(A)	0.8(2.8)			3.0(8.6)						
	Ref. Pump	kW(A)	0.3(1.4)				0.4(1.4)					
	Purge Pump	kW(A)	0.4(1.4)									
	Control Panel	kW(A)	0.2(0.5)									
	Total Power	kW	1.7		3.9		4.0					
	Total Ampere @400V	A	6.1		11.9							
Size	Length (L)	mm	5149		5266		5368		5910	6408	6633	
	Width (W)	mm	2168		2360		2718		2815		2995	
	Height (H)	mm	2777		2853		3019				3240	
Weight	Rigging	ton	10.3	10.8	12.6	13.0	15.4	15.9	17.4	18.6	24.0	
	Operation	ton	12.2	12.8	15.2	15.7	18.7	19.3	21.2	22.7	28.9	
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	924	1,013	1,201	1,269	1,696	1,780	1,909	2,027	2,405	
	Hot Water Side	ℓ	448	495	623	664	762	812	889	959	1,127	

General conditions

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

Specification Data (SI unit)

Model		unit	2AA580	2AA630	2AA680	2AA750	2AA820	2AA900	2AA975	2AA1050	2AA1125	2AA1300		
Cooling Capacity		kW	2,039	2,215	2,391	2,637	2,883	3,165	3,428	3,692	3,956	4,571		
		usRT	580	630	680	750	820	900	975	1,050	1,125	1,300		
Chilled Water	Inlet Temp./Outlet Temp.	°C	13/8											
	Flow rate	m ³ /h	351	381	411	454	496	544	590	635	680	786		
	P. Drop	mH ₂ O	7.4	9.2	5.5	7.1	9.1	6.9	8.6	5.2	6.4	9.5		
	Connection	mm	200			250			300					
Cooling Water	Inlet Temp./Outlet Temp.	°C	31/36											
	Flow rate	m ³ /h	1202	1306	1409	1555	1700	1865	2021	2176	2332	2695		
	P. Drop	mH ₂ O	4.7	5.8	3.6	4.8	5.9	4.6	5.7	4.5	5.5	8.0		
	Connection	mm	400			450			500					
Hot Water	Inlet Temp./Outlet Temp.	°C	70/60											
	Flow rate	ton/h	426	462	499	551	602	661	716	771	826	954		
		m ³ /h	436	473	511	563	616	676	732	789	845	976		
	Pressure Drop	Shell	mH ₂ O	6.2	7.7	4.4	5.7	7.2	5.6	6.9	5.2	6.3	9.4	
		Control Valve	mH ₂ O	3.0	3.5	2.6	3.2	3.8	2.9	3.4	2.4	2.8	3.7	
	Connection	mm	250			300			350					
Control Valve	mm	250					300							
Electric	Power source	-	3Φ, 400V, 50Hz											
	Abs. Pump	kW(A)	3.0(8.6)			3.6(12.0)			4.4(13.4)					
	Ref. Pump	kW(A)	0.4(1.4)			1.5(4.0)			1.8(6)					
	Purge Pump	kW(A)	0.4(1.4)					0.75(2.2)						
	Control Panel	kW(A)	0.2(0.5)											
	Total Power	kW	4.0			5.7			6.1			7.2		
	Total Ampere @400V	A	11.9			17.9			18.7			22.1		
Size	Length (L)	mm	7158	7658	6841	7366	7866	7378	7878	7866	8166	9166		
	Width (W)	mm	3072			3657		3746	4150			5052		
	Height (H)	mm	3240		3546			3929			4000			
Weight	Rigging	ton	26.1	27.6	33.5	35.9	38.5	44.3	47.0	55.4	58.5	64.5		
	Operation	ton	31.4	33.1	40.3	43.1	46.1	53.8	57.0	68.1	71.9	79.1		
Clearance, Tube Removal		mm	6,200	6,700	5,700	6,200	6,700	6,200	6,700	6,300	6,800	7,800		
Water Volume of Machine	Chilled Water Side	ℓ	701	744	944	1,004	1,060	1,355	1,423	1,795	1,890	2,079		
	Cooling Water Side	ℓ	2,545	2,678	3,127	3,308	3,481	4,376	4,586	6,112	6,390	6,946		
	Hot Water Side	ℓ	1,207	1,284	1,562	1,674	1,781	2,073	2,205	2,708	2,868	3,188		

General conditions

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

Product Specification

2AA Hot water driven Absorption Chiller Capacity Range: 30 ~ 1300 usRT (105 ~ 4571kW)

1. SYSTEM DESCRIPTION

Electronically controlled, 2AA 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 of UL or CE (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 of stainless steel to prevent corrosion. Plate heat exchanger is built-up by a plate package of corrugated channel plates surrounded by front and rear cover plate packages. The heat plate makes channel passing two kinds of fluid. The corrugated shape formed on heat plate makes fluid turbulence and supports plates against pressure difference between two fluids.

- 4) Absorber heat exchanger.
Absorber heat exchanger is increasing the efficiency of 2AA 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 2AA series has double tray and dripper system, chiller capacity is greatly increased By this system.
- 6) Material.
Heat exchanger material and minimum wall thickness shall be contingent on the type of corrosion inhibitor used in the machine. For lithium molybdate systems, the following tube specifications shall apply to ensure long machine life and continuous operation:

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

* Special tube material like Cupronickel, Titanium 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 °C (60.8 ~ 86 °F).
- 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

M. 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
- High Hot Water Inlet Temperature Cutout
- Emergency Stop

Protective Limits

- Max. Allowable Cooling Water Inlet Temperature
- Max. Allowable G1 Absorbent Temperature
- Max. Allowable Hot Water Inlet 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
- Hot Water Inlet 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

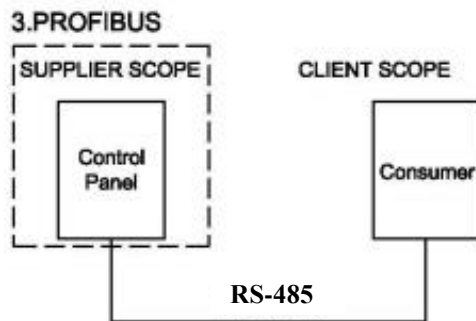
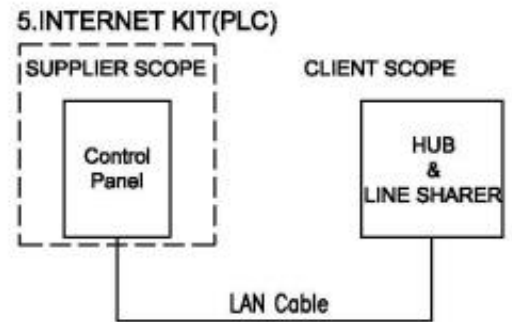
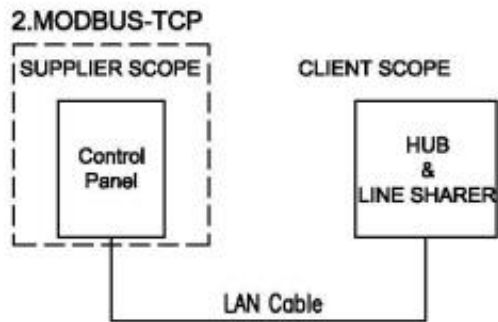
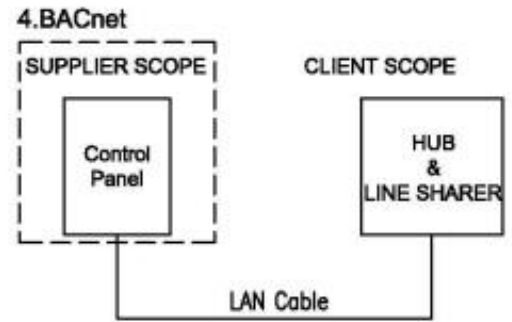
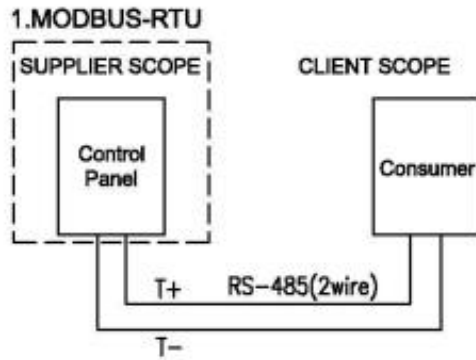


LCD Touch Screen

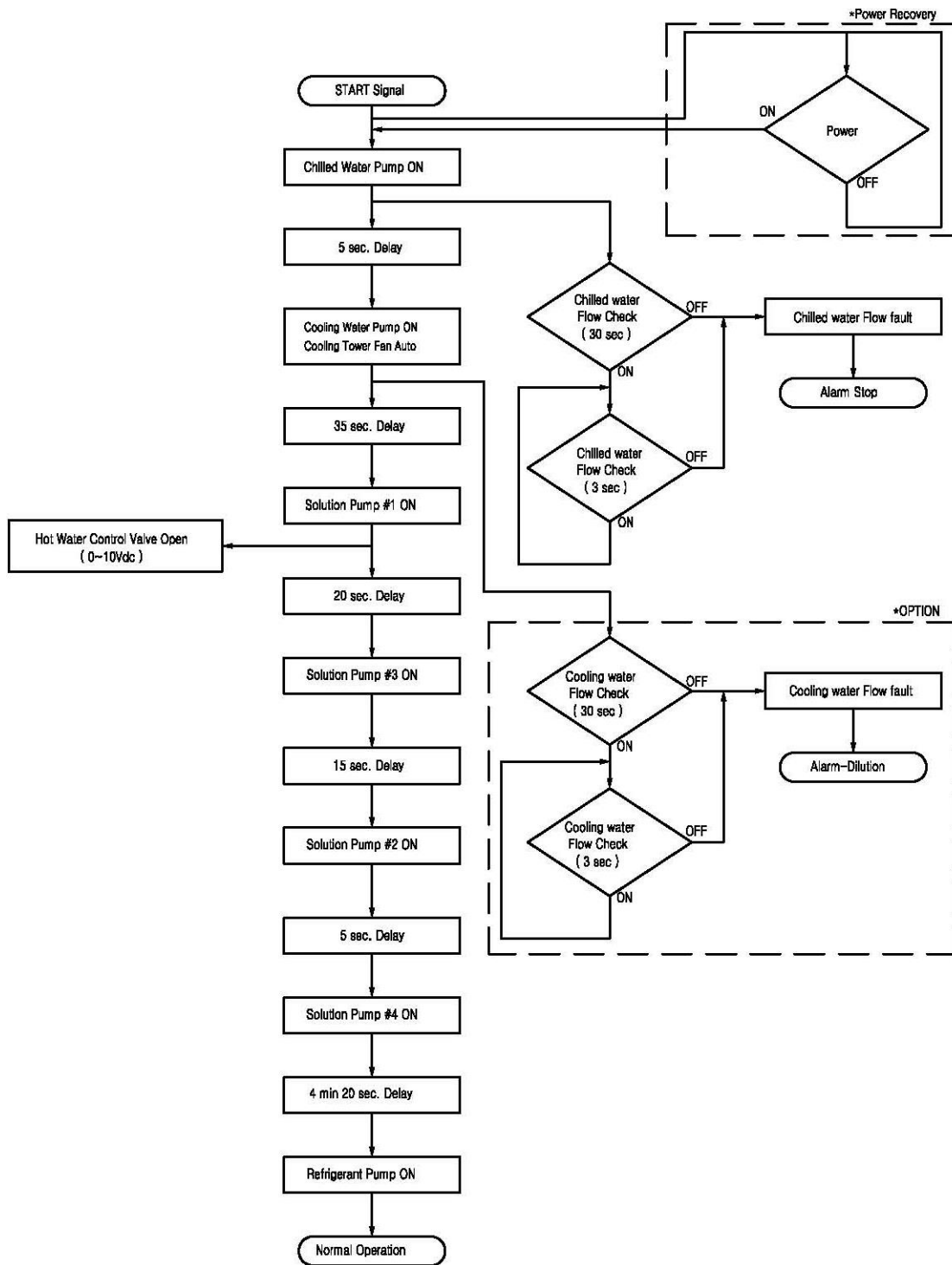


Control Panel

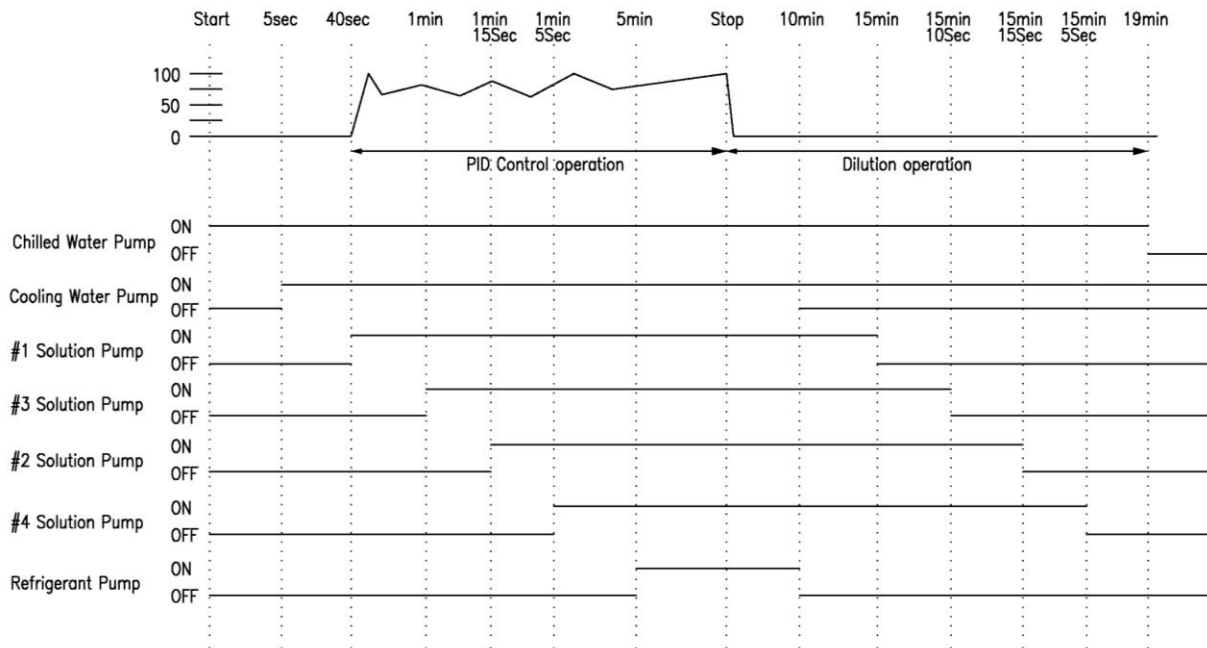
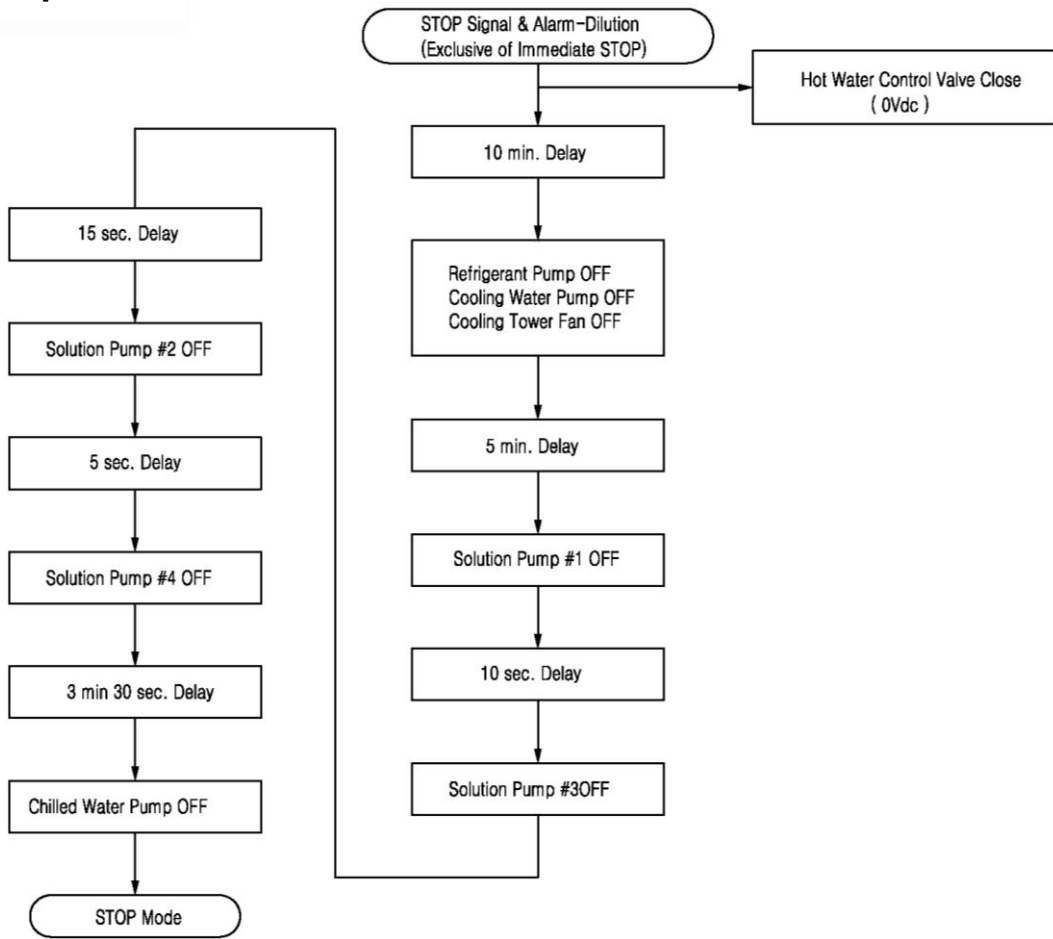
Communication



Start-up Sequence

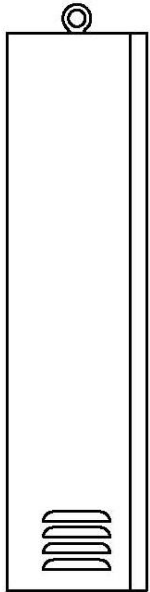


Stop Sequence

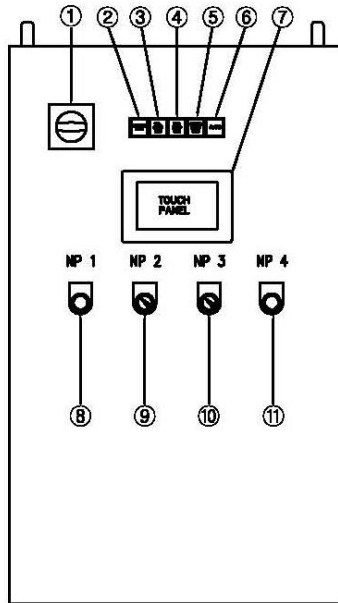


<Operation Graph>

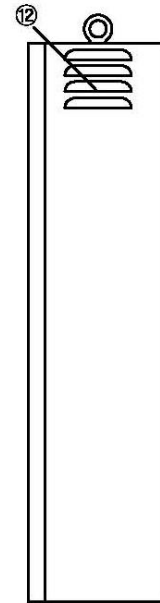
Control Panel – Outside View



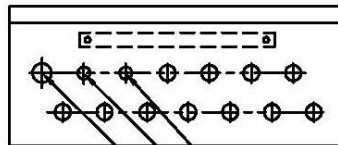
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW

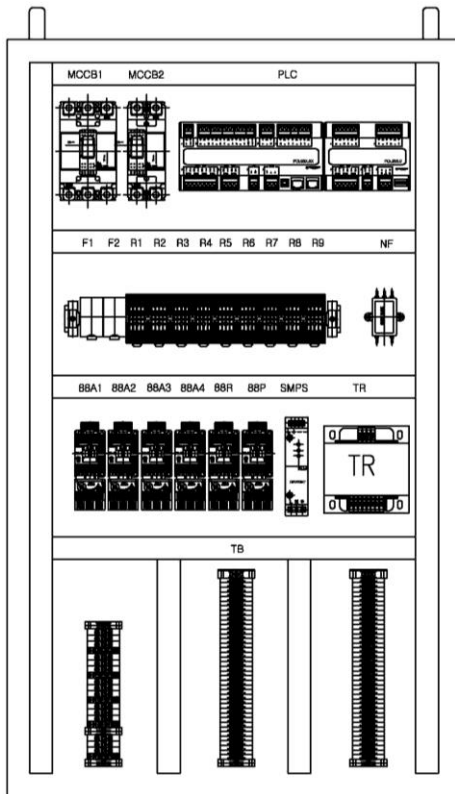


- FOR HOT WATER CONTROL VALAE SIGNAL HOLE
- FOR HOT WATER CONTROL VALAE POWER HOLE
- MAIN POWER HOLE

BOTTOM 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
12	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	88A3	SOLUTION PUMP3 CONTACTOR	1
8	88A4	SOLUTION PUMP4 CONTACTOR	1
9	88R	REFRIGERANT PUMP CONTACTOR	1
10	88P	PURGE PUMP CONTACTOR	1
11	51A1	SOLUTION PUMP1 OVERLOAD RELAY	1
12	51A2	SOLUTION PUMP2 OVERLOAD RELAY	1
13	51A3	SOLUTION PUMP3 OVERLOAD RELAY	1
14	51A4	SOLUTION PUMP4 OVERLOAD RELAY	1
15	51R	REFRIGERANT PUMP OVERLOAD RELAY	1
16	51P	PURGE PUMP OVERLOAD RELAY	1
17	F1~F2	POWER FUSE	2
18	R1~R8	RELAY	8
19	NF	NOISE FILTER	1
20	SMPS	DC POWER SUPPLY	1
21	TB	TERMINAL BLOCK	

Electric Data

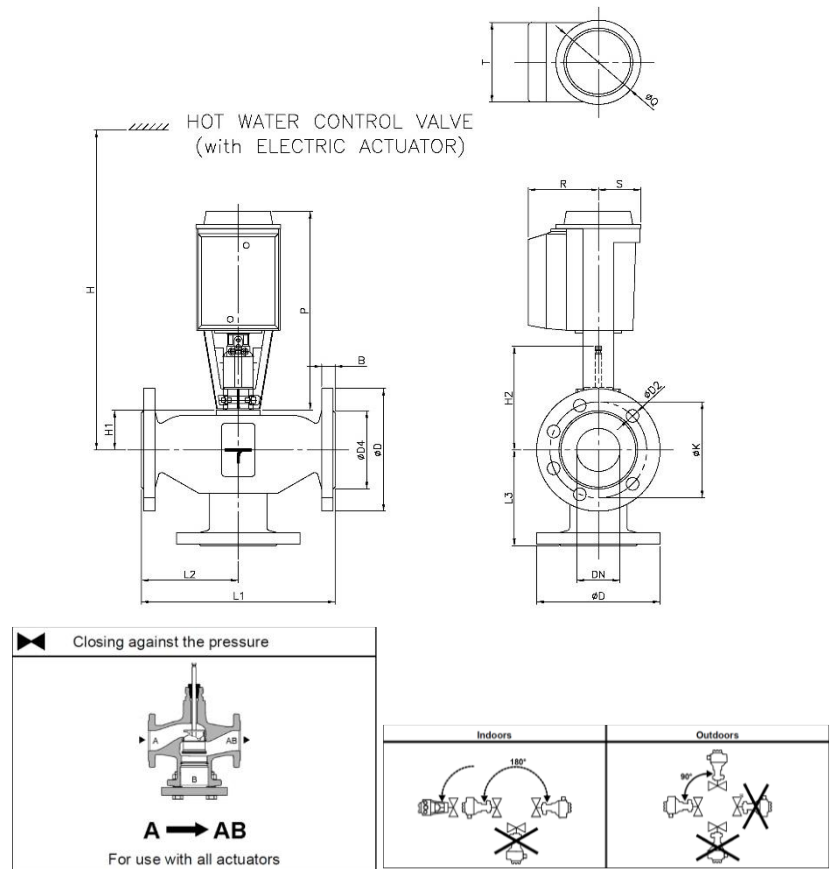
Models	460V - 3P- 60Hz																	
	Pump motor size (kW)						RLA (A)						LRA (A)					
	SP1	SP2	SP3	SP4	RP	VP	SP1	SP2	SP3	SP4	RP	VP	SP1	SP2	SP3	SP4	RP	VP
2AA30 ~ 2AA60	1.2	0.2	1.2	0.2	0.2	0.4	3.3	1.3	3.3	1.3	0.9	1.4	12.0	4.2	12.0	4.2	3.3	4.2
2AA75~2AA135	1.2	0.3	1.2	0.3	0.2	0.4	3.3	1.3	3.3	1.3	0.9	1.4	12.0	4.2	12.0	4.2	3.3	4.2
2AA155~2AA180	1.5	0.3	1.5	0.3	0.3	0.4	4.1	1.3	4.1	1.3	1.2	1.4	16.8	4.2	16.8	4.2	4.2	4.2
2AA210~2AA240	1.5	0.4	1.5	0.4	0.3	0.4	4.1	1.3	4.1	1.3	1.2	1.4	16.8	2.8	16.8	2.8	4.2	4.2
2AA270~2AA300	2.0	0.4	2.0	0.4	0.3	0.4	5.0	1.3	5.0	1.3	1.2	1.4	26.0	2.8	26.0	2.8	4.2	4.2
2AA340~2AA375	2.0	0.4	2.0	0.4	0.4	0.4	5.0	1.3	5.0	1.3	1.2	1.4	26.0	3.0	26.0	3.0	4.2	4.2
2AA420~2AA470	2.4	0.4	2.4	0.4	0.4	0.4	5.8	1.3	5.8	1.3	1.2	1.4	21.0	3.0	21.0	3.0	4.2	4.2
2AA525~2AA680	3.0	1.5	3.0	1.5	0.4	0.4	7.4	4.1	7.4	4.1	1.2	1.4	24.0	17.2	24.0	17.2	4.2	4.2
2AA750	3.0	1.5	3.0	1.5	1.5	0.4	9.1	4.1	9.1	4.1	3.3	1.4	36.0	15.1	36.0	15.1	16.0	4.2
2AA820	3.0	1.5	3.0	1.5	1.5	0.75	9.1	4.1	9.1	4.1	3.3	2.2	36.0	15.1	36.0	15.1	16.0	10.6
2AA900~2AA975	3.0	2.0	3.0	2.0	1.5	0.75	9.1	5.4	9.1	5.4	3.3	2.2	36.0	27.9	36.0	27.9	16.0	10.6
2AA1050~2AA1300	4.5	2.2	4.5	2.2	1.5	0.75	13.2	5.8	13.2	5.8	3.3	2.2	79.8	30.2	79.8	30.2	17.2	10.6

LEGEND : SP1 - Solution Pump1, SP2 – Solution Pump2, SP3 - Solution Pump3, SP4 – Solution Pump4
 RP - Refrigerant Pump, VP - Vacuum Pump, RLA - Rated Load Amps, LRA - Locked Rotor Amps
 Notes : RLA = Listed RLA x (listed voltage/actual voltage), LRA = Listed LRA x (listed voltage/actual voltage)

Hot Water Control Valve

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

* The 2-port valve for use with all actuators.



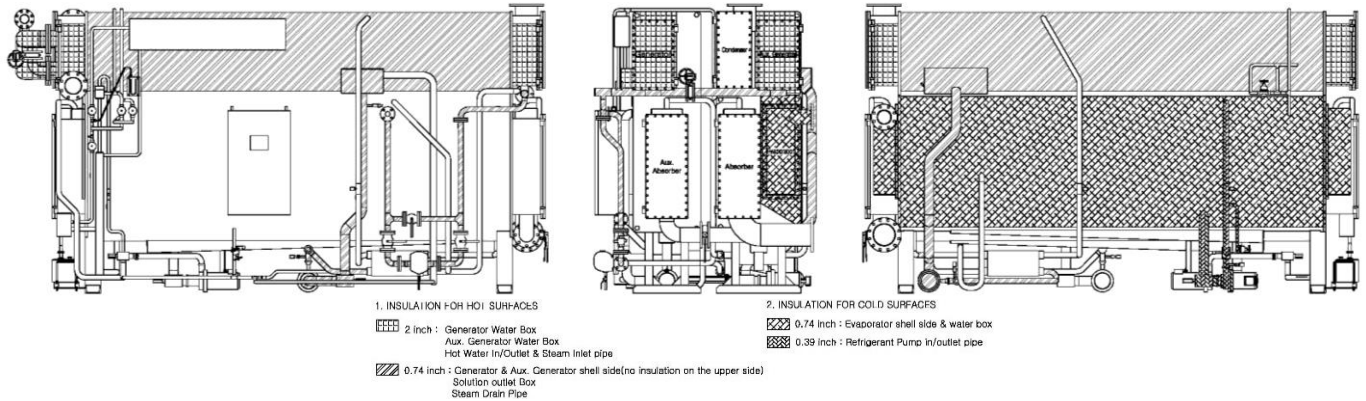
Hot Water Control Valve Dimensions (unit : inch)

DN	B	D	D1	D2	L1	L2	X	Y	K	H1	H2	H	P	Q	R	S
1/2	0.55	3.74	1.81	0.55(4x)	5.12	3.39	3.11	2.99	2.56	1.46	5.26	>21.14	11.8	5.0	4.1	2.5
3/4	0.63	4.13	2.56		5.91	3.82	3.41	3.27	2.95							
1	0.55	4.53	2.56		6.30	4.19	3.72	3.55	3.35							
1 1/4	0.67	5.51	2.99	0.75(4x)	7.09	4.69	4.55	4.36	3.94	1.97	5.77	>21.65	11.8	5.0	4.1	2.5
1 1/2	0.63	5.91	3.31		7.87	4.96	4.85	4.64	4.33							
2		6.50	3.90		9.10	5.67	5.32	5.06	4.92							
2 1/2	0.67	7.28	4.65	0.75(8x)	11.42	6.85	5.91	5.61	5.71	2.95	6.75	>22.64	14.8	7.0	5.4	3.5
3		7.87	5.20		12.20	7.32	-	-	6.30							
4		8.66	6.14		13.78	8.07	-	-	7.09							
5		9.84	7.24	15.75	9.17	-	-	8.27								
6	11.18	8.31	0.91(8x)	18.90	10.85	-	-	9.45	5.93	10.51	>28.58					

Thermal Insulation – Surface Area

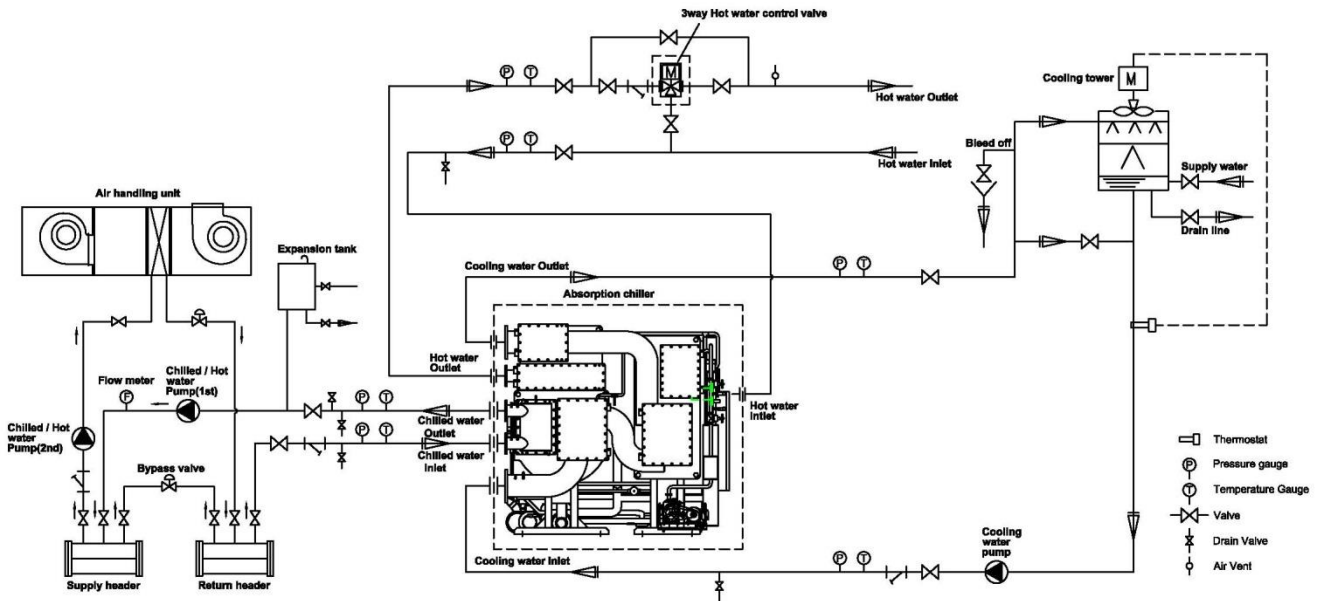
The cold and hot machine surfaces have to be thermally insulated after the initial operation at jobsite. Thermal insulation drawings will be submitted in details. Non-inflammable Polymer sponge usable at 120°C or incombustible Glass wool should be used for cold and hot surfaces. When glass wool is used, 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 (m ²)		Cold Surface (m ²)	
	19mm	10mm	19mm	10mm
2AA30	49	12	11	2
2AA40	49	12	11	2
2AA50	58	12	12	2
2AA60	58	13	12	2
2AA75	60	14	14	2
2AA90	60	14	14	2
2AA110	81	16	19	2
2AA135	81	17	19	2
2AA155	85	21	20	3
2AA180	85	22	20	3
2AA210	109	24	26	3
2AA240	112	25	26	3
2AA270	129	28	28	4
2AA300	129	28	28	4
2AA340	143	28	34	4
2AA375	143	29	34	4
2AA420	160	34	47	4
2AA470	86	35	52	5
2AA525	197	37	55	5
2AA580	266	45	56	8
2AA630	266	45	62	8
2AA680	287	46	62	8
2AA750	311	47	67	8
2AA820	318	50	68	8
2AA900	341	51	73	8
2AA975	362	53	73	8
2AA1050	470	69	94	9
2AA1125	492	71	98	9
2AA1300	533	72	103	9

Typical Piping & Wiring



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

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