

# WFC- SC Chiller

## 2

*Installation*  
*WFC-SC5*  
*Version 8-1*



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## General Information.

### 1.1 Precautions

The chiller should be installed by trained and qualified personnel who are familiar with absorption machinery. All precautions in these instructions, on tags and on labels attached to the chiller must be strictly observed to ensure safety of personnel and continuance of the warranty validation.

Each absorption chiller has been evacuated, charged with lithium bromide and water, and tested prior to leaving the factory. After the equipment has been installed, a Yazaki authorized service agent will check the installation and supervise the initial commissioning of the machine.

It is important to note that the warranty applying to the Yazaki chiller will become void if the following restrictions are not fully observed.

1. Do not open any service valves because such action will result in loss of vacuum.
2. Always handle the equipment with care and in an upright position, do not drop or subject the machine to side impact.
3. Do not attempt to start the system without supervision from a Yazaki authorized service agent.

### 1.2 Receiving

When the absorption chiller is delivered to site, inspect it for transit damage. Should any damage have occurred, do not proceed with the installation until the Yazaki distributor has been notified and instruction to continue has been obtained.

### 1.3 Unit Data Plate

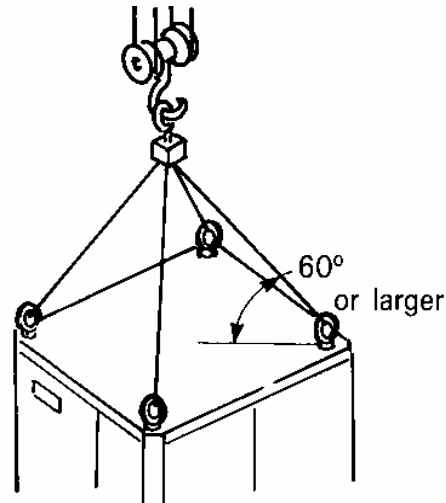
Check that the model number, electric voltage of the chiller are consistent with the system design and services available at site before proceeding with installation. All this information is displayed on the Unit Data Plate located on the CB panel inside the machinery.

Aroace Water Fired Chiller			
Model	WFC-SC5		
Capacity	Cooling	(kW)	17.6
Chilled Water	Outlet Temperature	(°C)	7.0
	Flow Rate	(L/s)	0.77
	Evaporator Pressure Loss	(kPa)	Refer actual pressure loss label
Cooling Water	Inlet Temperature	(°C)	31.0
	Flow Rate	(L/s)	2.55
	Condenser/Absorber Pressure Loss	(kPa)	Refer actual pressure loss label
Heat Medium	Inlet Temperature	(°C)	88.0
	Outlet Temperature	(°C)	83.0
	Flow Rate	(L/s)	1.20
	Generator Pressure Loss	(kPa)	77.0
Electrical	Supply	Voltage	(AC V) 100-240V
		Phase	(ph) 1
		Frequency	(Hz) 50/60
	Consumption	(W)	48
IP	IPX4		
Serial No			
Manufacturing Date			
Manufacturer: YAZAKI RESOURCES CO.,LTD. HAMAMATSU, JAPAN			
Distributor:			

## 2. Handling

### 2.1 Rigging

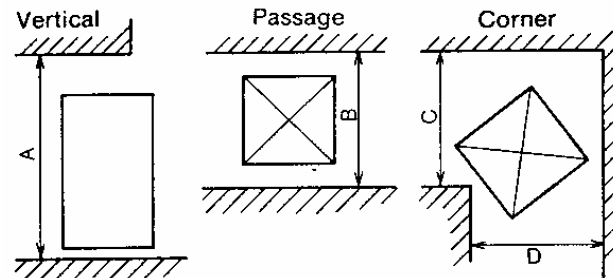
Remove the crate and wooden base from the absorption chiller are detailed in section 1 Specifications of this manual. Care should be taken throughout to avoid damage to panels and piping connections – always lift in a vertical manner.



**Figure 1**

### 2.2 Access Clearances

Properly plan to ensure an accessible route to the place of installation before moving the chiller. If it is not possible to use a crane for lifting, a fork lift truck may be utilized. In the event a crane or forklift cannot be used and the machine must be manhandled into position, minimum dimensions for maneuver are shown in figure 2.



**Figure 2**

**Access Clearance Table (mm)**

Dimension	WFC-SC5
A	2,250
B	800
C	800
D	800

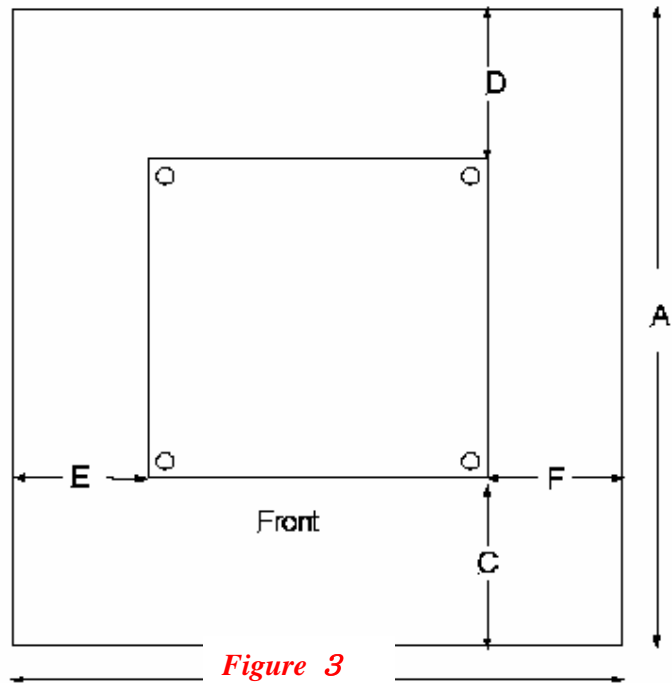
## 3. Place of Installation

### 3.1 Location

The Yazaki absorption chiller units have a weatherproof cabinet suitable for indoor or outdoor installation. Select the location for the chiller with due consideration to the position and proximity of the cooling tower, and air handling equipment. Particular attention must be paid to accessing the absorption machine for service, the Yazaki chiller will not perform correctly on a continuous basis without proper maintenance. Furthermore, always avoid placing the cooling tower at a lower level than the chiller. Such designs invariably lead to problems with maintaining pumping stability.

### 3.2 Minimum Maintenance Clearances

The minimum space and clearance requirements shown in figure 3 must be provided around each chiller unit to facilitate installation, commissioning and procedures in maintenance. The clearances shown in the table below. If the system is a multi-module configuration where chiller will be placed side-by-side, the clearances recommended must still apply. If the recommended service clearances cannot be provided as indicated, the chiller should not be installed.



**Figure 3**

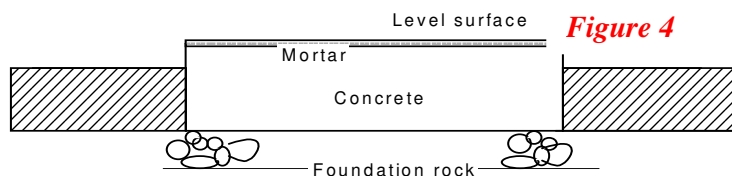
**Table of Clearances**

Model WFC-SC	Installation Area		Maintenance Clearances			
	A	B	Front C	Back D	Left side E	Right side F
5	1944	2744	1,000	1,000	700	700

### 3.3 Foundation

Mount the absorption chiller on a level foundation constructed of non-combustible materials, capable of supporting the operating weight of the machinery. This particularly applies to roofs, if that is where installation is contemplated.

Be sure the roof is able to support the chiller, cooling tower, pumps and associated piping (refer Section 1. **Specifications** for details). It is additionally important that, if the equipment is to be placed on the roof of a building, it should be located in a well drained area and at least two metres from the edge. A suitable platform or walkway should be built such that the chiller, cooling tower and electrical apparatus can be safely and conveniently serviced.



**Figure 4**

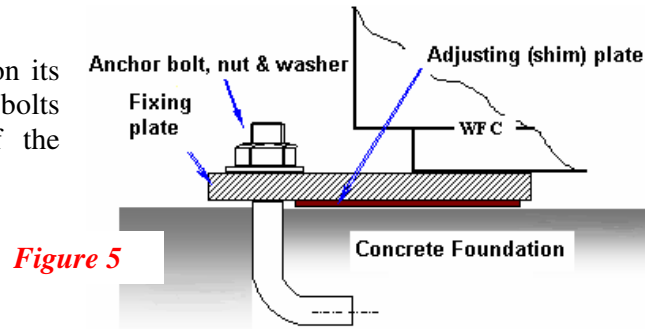
If the chiller is to be placed outdoors at soil level, a proper concrete base, with dimensions indicated in figure 3 and

constructed following the example of figure 4, is necessary. All aspects of foundation and support computations must be in accordance with local codes. Should the foundation prove inadequate, the chiller, over time, will tilt causing the proper

distribution of working fluids internal to the machine to be impaired; poor cooling performance will result.

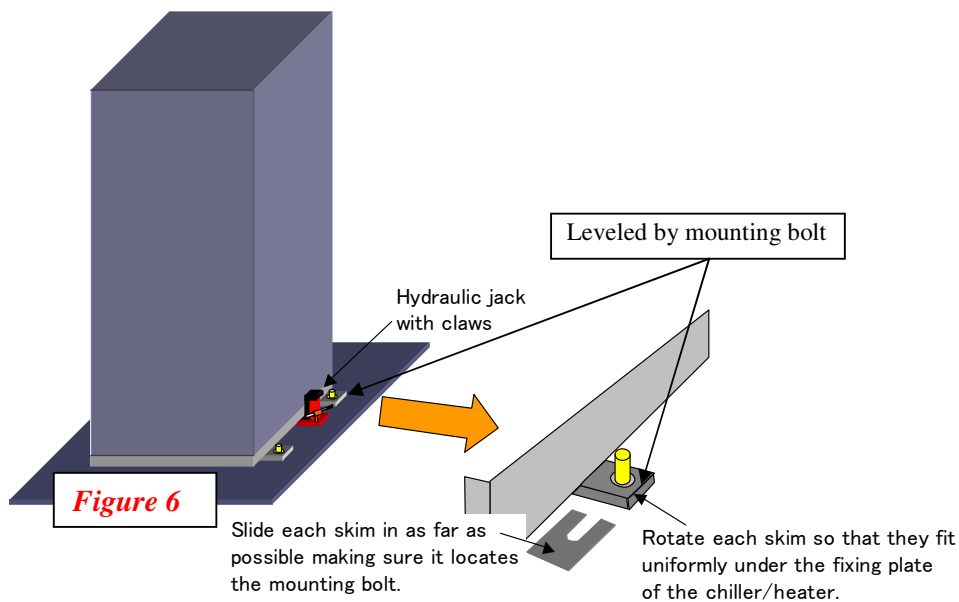
### 3.4 Placement

When the chiller is finally positioned on its foundation, be sure that the mounting bolts are properly located in the slots of the supporting plates (figure 5).



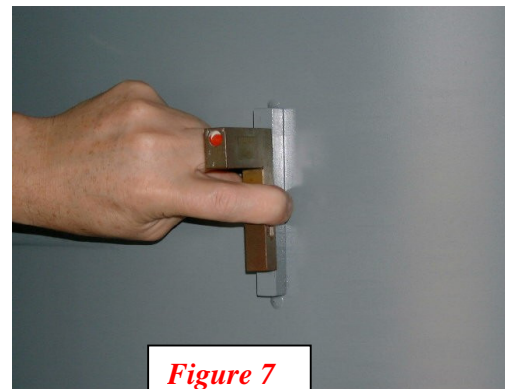
**Figure 5**

A hydraulic jack must be used to lift the machine sufficient to fix the mounting bolt.



**Figure 6**

A spirit level must be used to monitor level as leveling bolt are fixed. Level reference bars are provided on the upper vessel portion of the chiller. The spirit level must be placed on these as indicated in figure 7 to obtain longitudinal and transverse level. Should the installation comprise more than one chiller located side-by side, it is important that all machines be individually level and level with respect to each other. It is of further importance that all machines are leveled before any piping connections are attempted.



**Figure 7**

## 4.Piping

### 4.1 General

After leveling the chiller and cooling tower, the chilled water piping, cooling water piping and heat medium piping can be installed. All pipes must be installed and connected to the machine ensuring that complete access for service is provided and that all panels, including the top panel, of the chiller can be easily removed. Failure to observe this vital requirement will lead to severe compromise in commissioning the machine and in future attempts to service the machine.

Adequately support and brace the piping independently of the chiller to avoid strain on the piping connections. Do not secure electrical conduit to any part of the machine. Provide thermometer wells at each inlet and outlet relatively close to the machine for measurement of water temperatures during commissioning and maintenance procedures. All piping should be properly aligned and graded to a drain valve to permit complete drainage of the system. Properly located air vents should be provided so that the system can be conveniently filled with water.

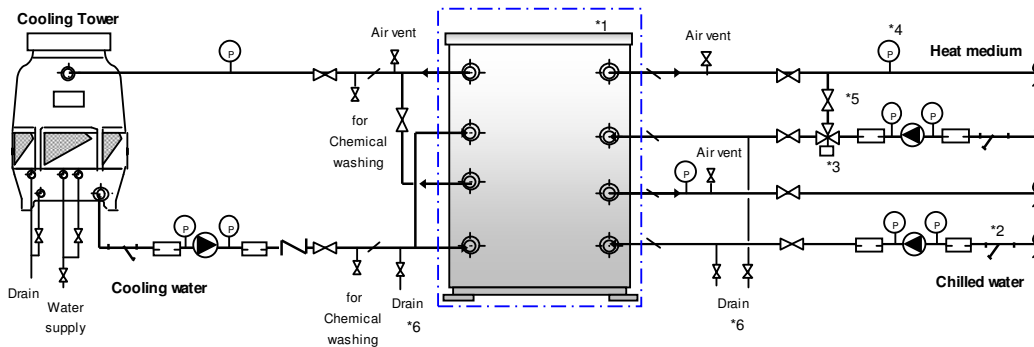
It is particularly emphasized that access with large pieces of service equipment to the rear of the machine will be required during the life of the chiller. Accordingly, it is recommended that the cooling water and chilled water piping to each machine should be by means of droppers or risers from overhead manifold pipe runs.

Insulation providing a proper vapor barrier is recommended on all pipe work, valves and pumps transporting the chilled water. If the chiller is installed outdoors, cladding of the insulation must be provided to combat weathering and the effects of UV.

Before making final connections to the chiller, the piping must be flushed with clean water to remove debris. Figure 8. illustrates a typical system design.

**Figure 8** Typical piping system diagram

**WFC-SC5**



Symbol	Part name	Symbol	Part name
	Thermometer Well		Pressure Gauge ( 0-1.5 MPa )
	Circulation Pump		3 way valve
	Flexible Joint		Strainer
	Manual Valve		Check Valve

- \*1.Except absorption machine ( chain line ) must be supplied externally by others.
- \*2.The strainer should install upstream of the pump to protect pumps from contamination.
- \*3.The 3 way valve should be install where the heat medium pump is under separate control.
- \*4 ,5. Pressure drop adjust by manual valve and pressure gauge ,the pressure drop will not to change by 3 way valve opening.
- \*6.Use in case of repairing the components ( pumps etc. ) ,drain the water in winter time etc.
- \*7.Do not exceed 588 kPa in the water & heat medium circuit !



## 4.2 Chilled Water Piping

Water supply and accommodation of expansion of the chilled water circuit is afforded by either an open cistern or closed expansion tank with check/pressure reducing valves as shown in figure 9.

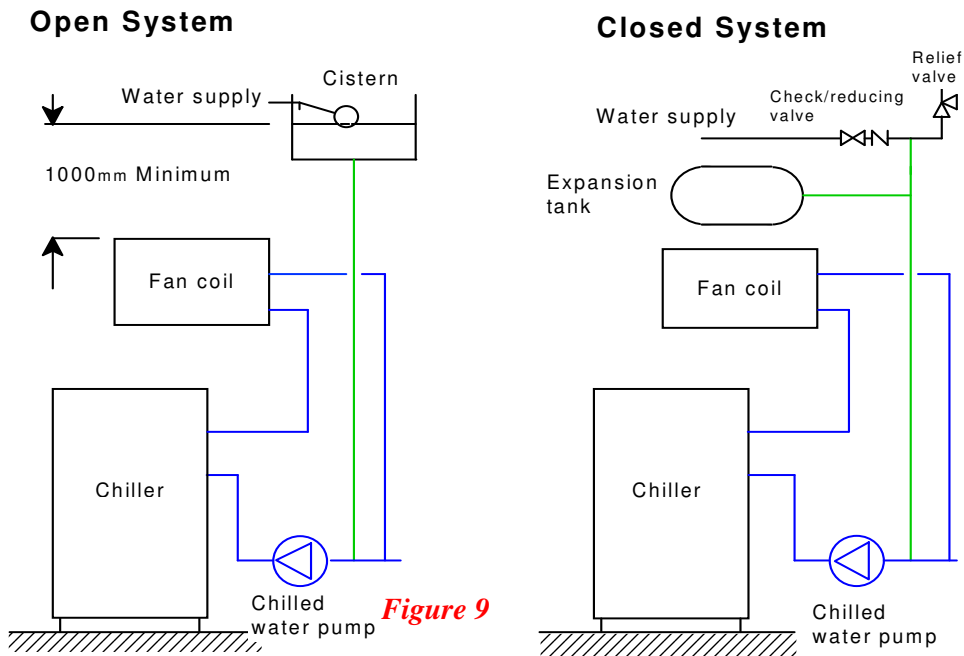


Figure 9

### Caution.

Do not install any valves in the expansion pipeline

## Valve & Thermometer Wells

Plan piping with a rising grade of 1/200. And where high points exist in the piping circuit, install purge valves to expel trapped air.

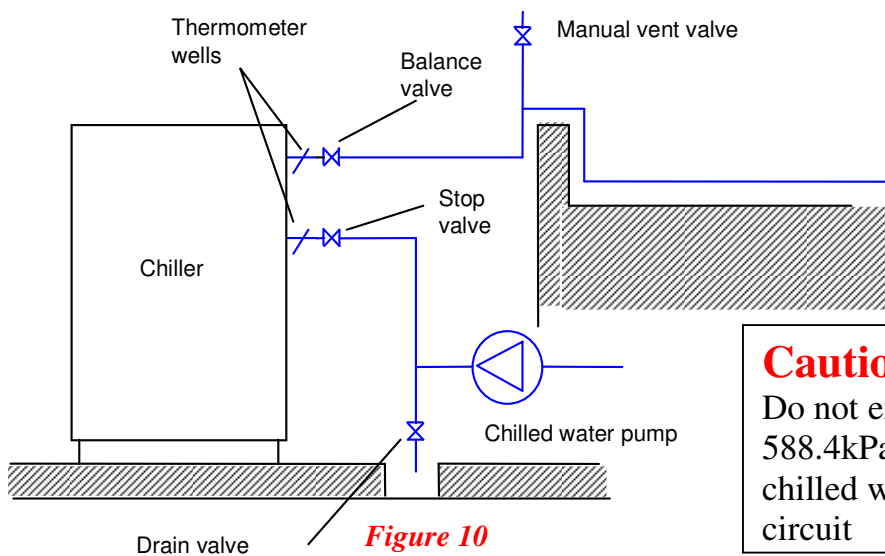


Figure 10

### Caution.

Do not exceed 588.4kPa in the chilled water circuit

A balance valve should be installed in the chilled water outlet and a stop valve should be installed in the chilled water inlet. Both valves along with thermometer wells should be placed in close proximity to the chiller, refer figure 10.

After thoroughly testing for leaks, insulate the piping circuit ensuring an adequate vapor barrier is obtained. Be sure the insulation allows proper access to all thermometer wells and hand valves. Be also sure that the chiller panels are not restricted by the insulation.

If the equipment is installed outdoors and subject to freezing ambient conditions, trace heating of the pipes under the insulation may be considered. If glycol solutions are contemplated, it is important that inhibitors are in solution to protect copper tubes internal to the machine. It is further most important to understand that cooling capacity of the chiller will be degraded as concentrations of the glycol solutions increase – it must be noted that there is limited flow rate increase allowance for the chilled water circuit.

**Caution:**

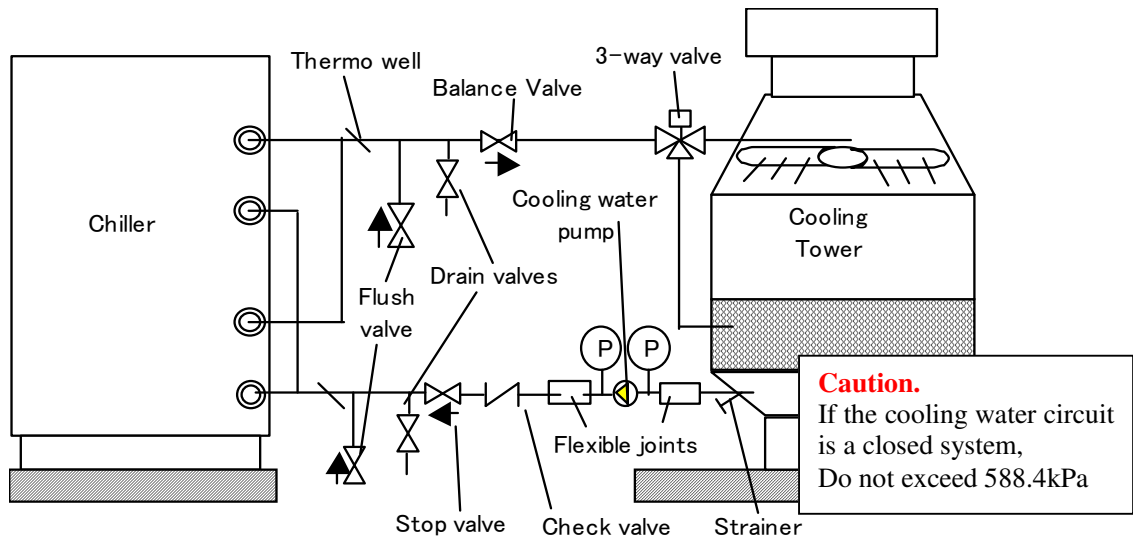
When using the WFC-S series in the cooling – heating system, do not let the hot water over 60°C flow inside the chilled water coil. High temperature water will damage the coil and worst case it will cause leakage.

### 4.3 Cooling Water Piping

Cooling water to the absorption chiller is required at a temperature of 31°C or less during cooling operation. If such contingency is likely to occur, a mixing valve facility must be installed as illustrated in figure 11.

It is also of particular importance to observe that the cooling flows in a parallel fashion through the WFC-SC5 machines. Attention must be paid to the instruction label on the machine with respect to the sizing of the transfer pipe on the cooling water inlet.

Wherever possible, install the cooling tower at the same level or higher than the chiller. If it is not possible, give careful consideration to the prevention of drain-back and loss of cooling water due to overflow at the tower. Such matters should have been given prior consideration by the design engineer along with proper facility to prevent damage to the cooling tower fill media as a result of daily.



A balance valve should be installed in the cooling water inlet and a stop valve installed in the cooling water outlet. Both valves should be placed in close proximity to the chiller along with thermometer wells for temperature measurement. Additionally, drain (flush) valves should be installed between the balance/stop valves and the machine to allow chemical washing of the absorber-condenser coils (see figure 11)

If it is indicated that none of the aforementioned matters have been adequately catered for, the authorized Yazaki distributor should be contacted for advice. Do not ignore these contingencies; operating the machine without proper safeguards for both the cooling tower and the chiller will void the chiller warranty.

#### 4.4 Heat Medium Piping

The heat medium pipe work will most likely be a closed system. Accordingly, since temperature of the heat medium may operate as high as 95°C, with a standard inlet 88°C, care should be taken with the expansion device. All considerations with respect to hand valves in the other water circuits also apply to the heat medium circuit.

Depending on the type of system used to source the hot water to operate the chiller, a diverting valve in the heat medium circuit may be required. Should the decision be made to use a three way valve, the approach to control outlined in the following electrical circuit should be adopted.

**Caution.**

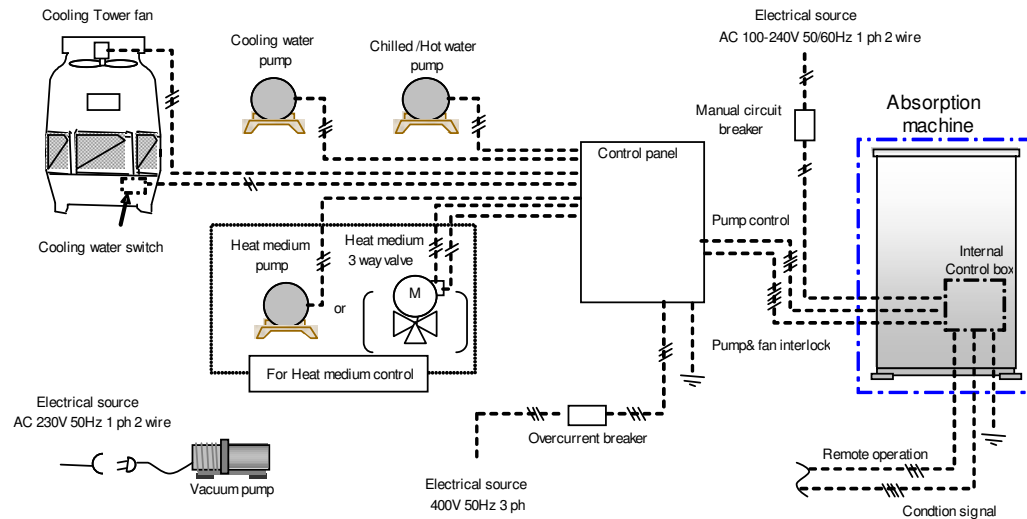
Do not exceed 588.4kPa in the heat medium circuit of the absorption chiller

## 5 Electrical.

### 5.1 Electrical system diagram

Figure 5-1-1. illustrate a typical electrical system diagram.Refer following section for wiring details.

Figure 5-1-1. Typical electrical system diagram



- \*1.Except absorption machine (chain line ) must be supplied externally by others
- \*2.The 3 way valve control can be used in situations where the heat medium pump (P3) is under separate control.
- \*3.AC 230V 50Hz 1ph.(2 wire) power consent is requirement for maintenance (vacuum pump operation ) .

### 5.2 Electrical connection of auxiliary equipment

All connection according to figure 5-2-1 must be supplied externally by others.

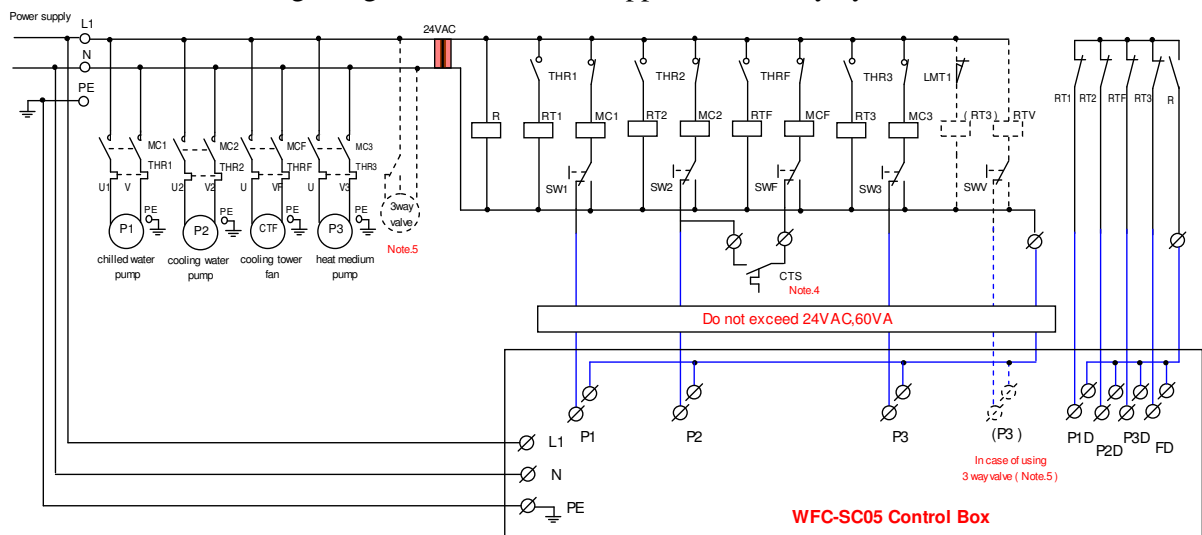
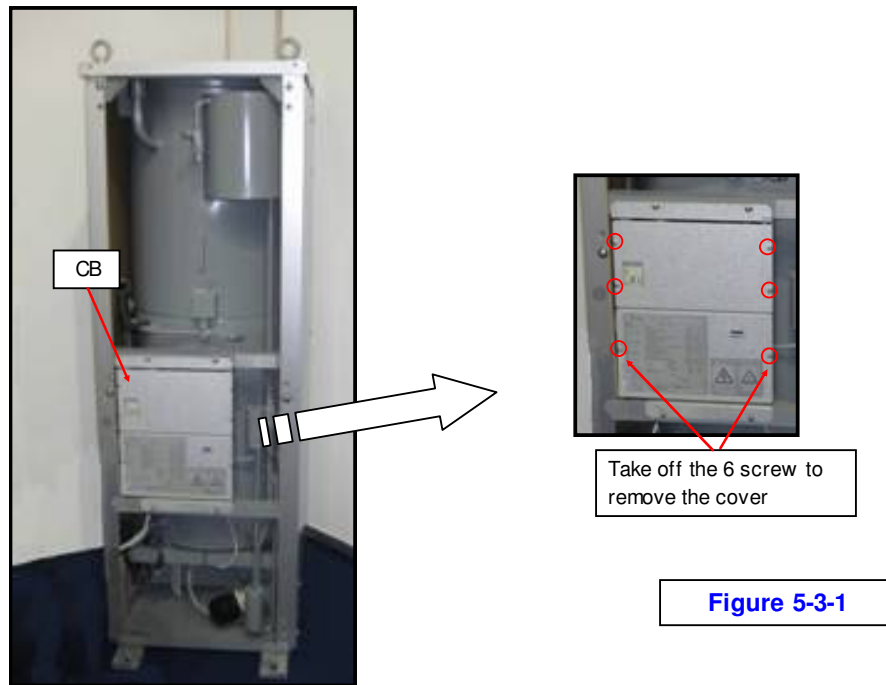


Figure 5-2-1 (Typical connection )

- Note1. All conductors must be from copper material.
- Note2. All circuits except power supply are low voltage.
- Note3. All wiring must comply with local and national electrical code and regulation.
- Note4. Cooling water switch (CTS) in sump of cooling tower use switch with minimum contact rating of 24VAC ,1.2VA.
- Note5.The 3 way valve control can be used in situations where the heat medium pump (P3) is under separate control.  
LTM1 is limit switch of 3 way valve.

### 5.3 Location of Control Box ( CB )

The CB is located behind the front panel as figure 5-3-1 .

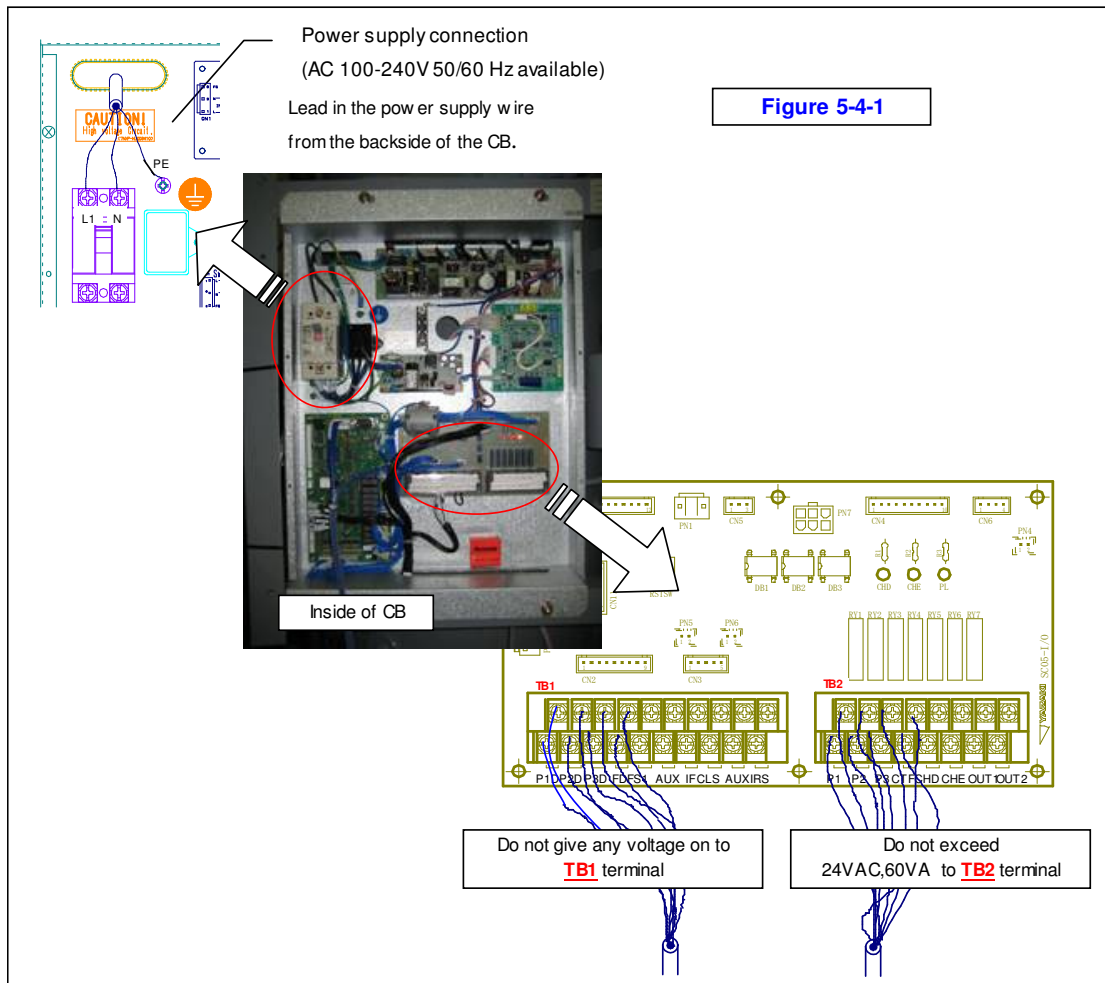


**Figure 5-3-1**

## 5.4 Connection with CB terminal

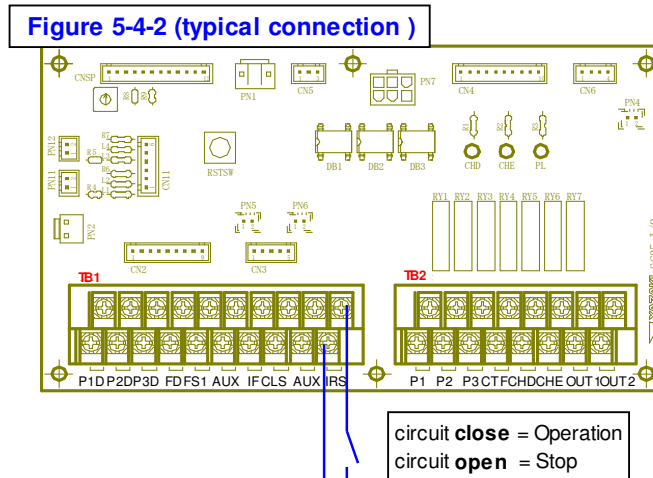
### 5.4.1 Power supply & auxiliary equipment

Connect the conductor to CB as figure 5-4-1 by adjusting the symbol with figure 5-2-1



### 5.4.2 Operation signal

Connect the dry contact to terminal "IRS" for Operation signal (switch). Figure 5-4-2



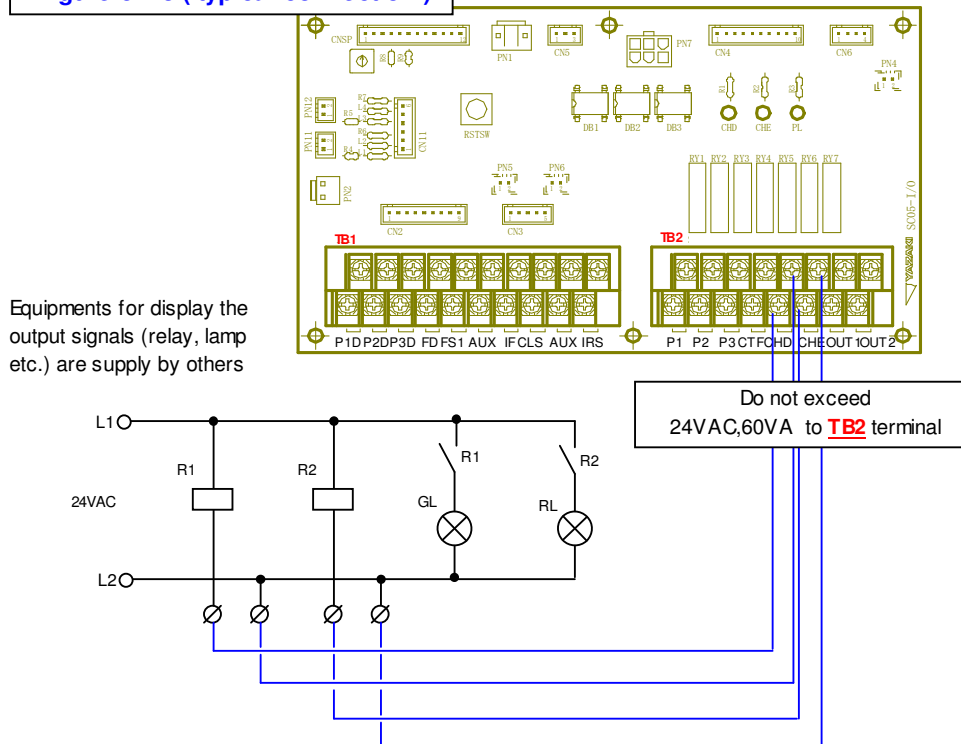
Attention!

You must not give any voltage on to **TB1** terminals

### 5.4.3 Condition output signal

If absorption machine operation signal and absorption machine alarm signal is required, connect the conductor to terminal "CHD" & "CHE" as figure 5-4-3.

Figure 5-4-3 ( typical connection )



Equipments for display the output signals (relay, lamp etc.) are supply by others

#### Power supply terminal

Terminal marking	Description
L1,N	100-240VAC 1phase 50/60Hz primary power supply
PE	ground line

Terminal marking	Description of the symbol
P1D	Error signal from chilling/heating water pump
P2D	Error signal from cooling water pump
P3D	Error signal from heat medium pump ( or 3 way valve )
FD	Error signal from cooling tower fan
FS1	Chilled water flow switch ( pre-connected in factory)
AUX1	Not used
IF	Not used
CLS	Not used ( pre-shorted in factory)
AUX2	Not used
IRS	Input signal for absorption machine operate

symbol	Description of the symbol
P1	P1 Operation signal
P2	P2 Operation signal
P3	P3 Operation signal
CTF	CTF Operation signal
CHD	Output signal of absorption machine operate
CHE	Output signal of absorption machine alarm stop
OUT1	Not used
OUT2	Not used

## 6 Water Quality.

### 6.1 General.

Water used in the chilled water circuit and cooling water circuit may cause corrosion if not properly analysed and treated to maintain a passive condition. The cooling water circuit is particularly vulnerable since in most cases, this is an open circuit thus lending itself to scaling from precipitation of dissolved solids, and to growth of algae and micro-organisms in the water. All have a detrimental effect on the function of rejecting heat. If left unchecked, moreover, performance of the chiller will be affected and a significant reduction in life expectancy could result. It is equally important to consider that extreme health hazards may attend badly maintained cooling towers.

Correct and continuous water treatment is thus essential to the correct operation of the chiller. Failure to provide and maintain in operation the necessary apparatus for water treatment will immediately void the warranty applying to the absorption machine.

### 6.2 Water Quality Limits

The following table describes the maximum limits of water contaminants within the circuits of the chiller. Make-up water, exhibiting total dissolved solids no greater than 50ppm, with substantial “bleed-off”, would be necessary to achieve this result in the cooling water circuit.

If such water quality in supply is not available under all circumstances, chemical treatment is required to combat scaling. Chemicals to combat algae and micro-organisms are in any event necessary. It is highly recommended that water treatment specialists be retained prior to the initial commissioning of the plant and to provide an ongoing program of chemicals and periodic inspections to ensure that the cooling water circuit remains safe and compatible throughout.



Water Quality Reference Table

Item			Cooling Water		Chilled Water (20°C or less)		Heat Medium Water		Trend	
			Circulation water	Make-up water	Circulation water	Make-up water	Circulation water	Make-up water	Corrosion	Scale
Standard Items	pH	At 25°C	6.5 ~ 8.2	6.0 ~ 8.0	6.8 ~ 8	6.0 ~ 8.0	7.0 ~ 8.0	7.0 ~ 8.0	○	○
	Conductivity	mS/m at 25°C	80 or less	30 or less	40 or less	30 or less	30 or less	30 or less	○	○
		μS/cm at 25°C	800 or less	300 or less	400 or less	300 or less	300 or less	300 or less	○	
	Chloride ion	mg Cl <sup>-</sup> / l	200 or less	50 or less	50 or less	50 or less	30 or less	50 or less	○	
	Sulfate ion	mg SO <sub>4</sub> <sup>2-</sup> / l	200 or less	50 or less	50 or less	50 or less	30 or less	50 or less		
	Acid consumption (pH4.8)	mg CaCO <sub>3</sub> / l	100 or less	50 or less	50 or less	50 or less	50 or less	50 or less		○
	Total hardness	mg CaCO <sub>3</sub> / l	200 or less	70 or less	70 or less	70 or less	70 or less	70 or less		○
	Calcium hardness	mg CaCO <sub>3</sub> / l	150 or less	50 or less	50 or less	50 or less	50 or less	50 or less		○
Reference Items	Ionic silica	mg SiO <sub>2</sub> / l	50 or less	30 or less	30 or less	30 or less	30 or less	30 or less		○
	Iron	mg Fe / l	1.0 or less	0.3 or less	1.0 or less	0.3 or less	1.0 or less	0.3 or less		○
	Copper	mg Cu / l	0.3 or less	0.1 or less	1.0 or less	0.1 or less	1.0 or less	0.1 or less	○	
	Sulfide ion	mg S <sup>2-</sup> / l	None detectable	None detectable	None detectable	None detectable	None detectable	None detectable	○	
	Ammonium ion	mg NH <sub>4</sub> <sup>+</sup> / l	1.0 or less	1.0 or less	1.0 or less	1.0 or less	0.1 or less	1.0 or less	○	
	Residual chlorine	mg Cl / l	0.3 or less	0.3 or less	0.3 or less	0.3 or less	0.1 or less	0.3 or less	○	
	Free carbon dioxide	mg CO <sub>2</sub> / l	4.0 or less	4.0 or less	4.0 or less	4.0 or less	0.4 or less	4.0 or less	○	
	Ryzner stability index		6.0 ~ 7.0				-	-	○	○

**Caution.**

**Operating the chiller-heater in cooling mode without cooling water treatment equipment installed, applied with chemicals and operating correctly will void the warranty.**

## 7 Commissioning Request.

### 7.1 General

After the absorption chiller has been installed, piped, flushed, leak tested and electrically wired as described in these instructions, and in full compliance with all pertinent safety codes, the Yazaki authorised distributor must be contacted to arrange supervision of the initial test-run and plant commissioning. It is essential that personnel representing all trade disciplines involved in the installation be on site on the day of start-up to cater for any final adjustment and alterations necessary to allow the chiller and the system generally to function correctly.

<b>Installation Check and Request for Commissioning</b>	
Yazaki Distributor: ..... Project Name: ..... Location ..... Date Installation Completed: .....	
<div style="font-size: 24px; font-weight: bold; margin-bottom: 5px;">Aroace</div> Model No. .... Serial No. ....	
<b>Check Items</b>	
<b>Absorption machine &amp; cooling tower</b> 1. Unit & cooling tower correctly mounted <input type="checkbox"/> 2. Levelling bolts properly located <input type="checkbox"/> 3. Mounting plates properly located <input type="checkbox"/> 4. Level longitudinal and transverse correct <input type="checkbox"/> 5. Multiple machines level with each other <input type="checkbox"/> 6. All unit cabinet panels accessible and free for removal <input type="checkbox"/>	<b>Gas Piping</b> 1. Gas pipe correctly sized and installed between the chiller- heater & gas meter. <input type="checkbox"/> 2. Gas cock and sediment trap installed. <input type="checkbox"/> 3. Gas pipe purged and leak tested. <input type="checkbox"/>
<b>Water Piping and Valves</b> 1. Chilled water piping installed, supported and aligned correctly <input type="checkbox"/> 2. Chilled water pump correctly sized and operative. <input type="checkbox"/> 3. Chilled water stop and regulating valves installed. <input type="checkbox"/> 4. Thermometer wells installed in the inlet and outlet chilled water pipes. <input type="checkbox"/> 5. Cooling water pipes installed, supported and aligned correctly. <input type="checkbox"/> 6. Cooling water pump correctly sized and operative. <input type="checkbox"/> 7. Cooling water stop, regulating and flush valves installed. <input type="checkbox"/> 8. Thermometer wells installed in the inlet & outlet cooling water pipes. <input type="checkbox"/> 9. Make-up and fill lines installed to the cooling tower and chilled-hot water circuit. <input type="checkbox"/> 10. Air vent valves correctly installed. <input type="checkbox"/> 11. All water pipes cleaned, flushed, filled and leak tested ready for operation. <input type="checkbox"/> 12. Water treatment apparatus installed, chemically dosed and ready for operation. <input type="checkbox"/>	<b>Electrical</b> 1. Power supply compatible with the chiller- heater data plate. <input type="checkbox"/> 2. Power wiring correctly sized connected to the control box of the chiller. <input type="checkbox"/> 3. Chilled water pump correctly wired with motor contactor and thermal relay. <input type="checkbox"/> 4. Cooling tower pump correctly wired with motor contactor and thermal relay. <input type="checkbox"/> 5. Cooling tower fan correctly wired with motor contactor and thermal relay. <input type="checkbox"/> 6. Correct rotation of each motor confirmed. <input type="checkbox"/> 7. Transient protection apparatus correctly installed. <input type="checkbox"/> 8. Single phase power supply outlet available near the chiller for the vacuum pump. <input type="checkbox"/> 9. Control wiring between the chiller-heater junction box and field enclosure properly installed, voltage does not exceed ac 30V. <input type="checkbox"/> 10. Field wiring to facilitate remote heating, cooling selection (optional) properly installed and functional. <input type="checkbox"/>
On the arranged date of commissioning, it is required that representatives from the organizations involved in the installation be present throughout at site.	

## 7.2 Start-up Check List

The list above should be copied. The copy moreover, should be completed and forwarded to the Yazaki authorised distributor prior to the request for commissioning. It is expected that any irregularities in the status of the plant will be corrected at the time the list is checked. Complete one copy of the Check List for each Yazaki chiller.