

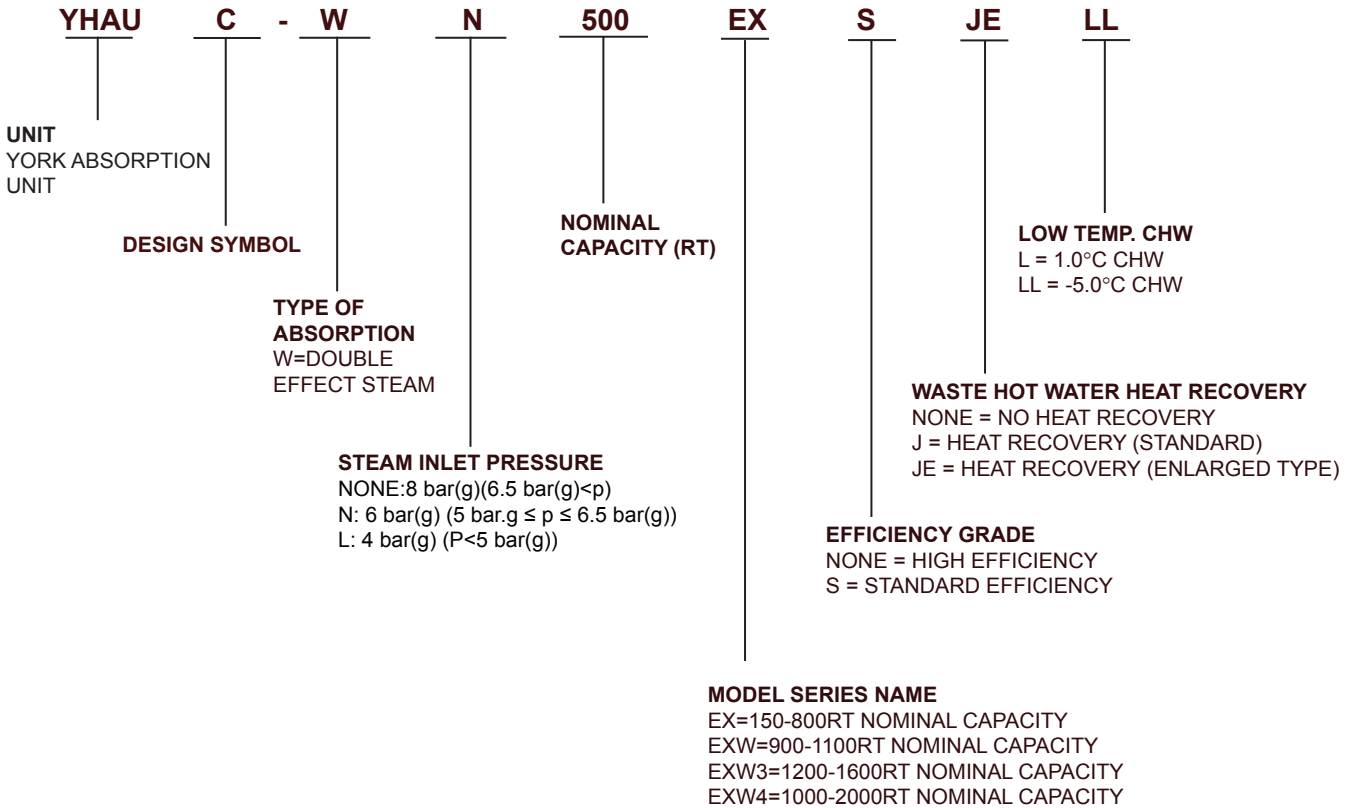
MODEL YHAU-CW DOUBLE EFFECT STEAM-FIRED ABSORPTION CHILLER

150 - 2000 TON

527 - 7033 KW



Nomenclature



Approvals

- GB/T 18431-2014

For Europe:

- CE
- EN ISO 12100:2010
- EN 60204-1: 2006+A1: 2009
- EMC Directive 201 4/30 EC
- EN 55011: 2009+A1: 2010 (Group 1, Class A)
- EN 61000-6-2: 2005
- Pressure Equipment Directive 201 4/68/EC

For Other Countries:

- Pressure Vessel Code GB 150-2011

Images contained in this document may represent the standard product with available options.

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Introduction

The YHAU-CW double effect steam-fired Absorption chiller represents the world's most efficient commercially available absorption technology. The unique two step design requires a remarkably low steam input rate of 3.5 kg per ton-hour (1.00 kg per kW-hour). With today's energy and environmental considerations, the YHAU-CW absorption chiller is the ideal choice for a wide range of applications.

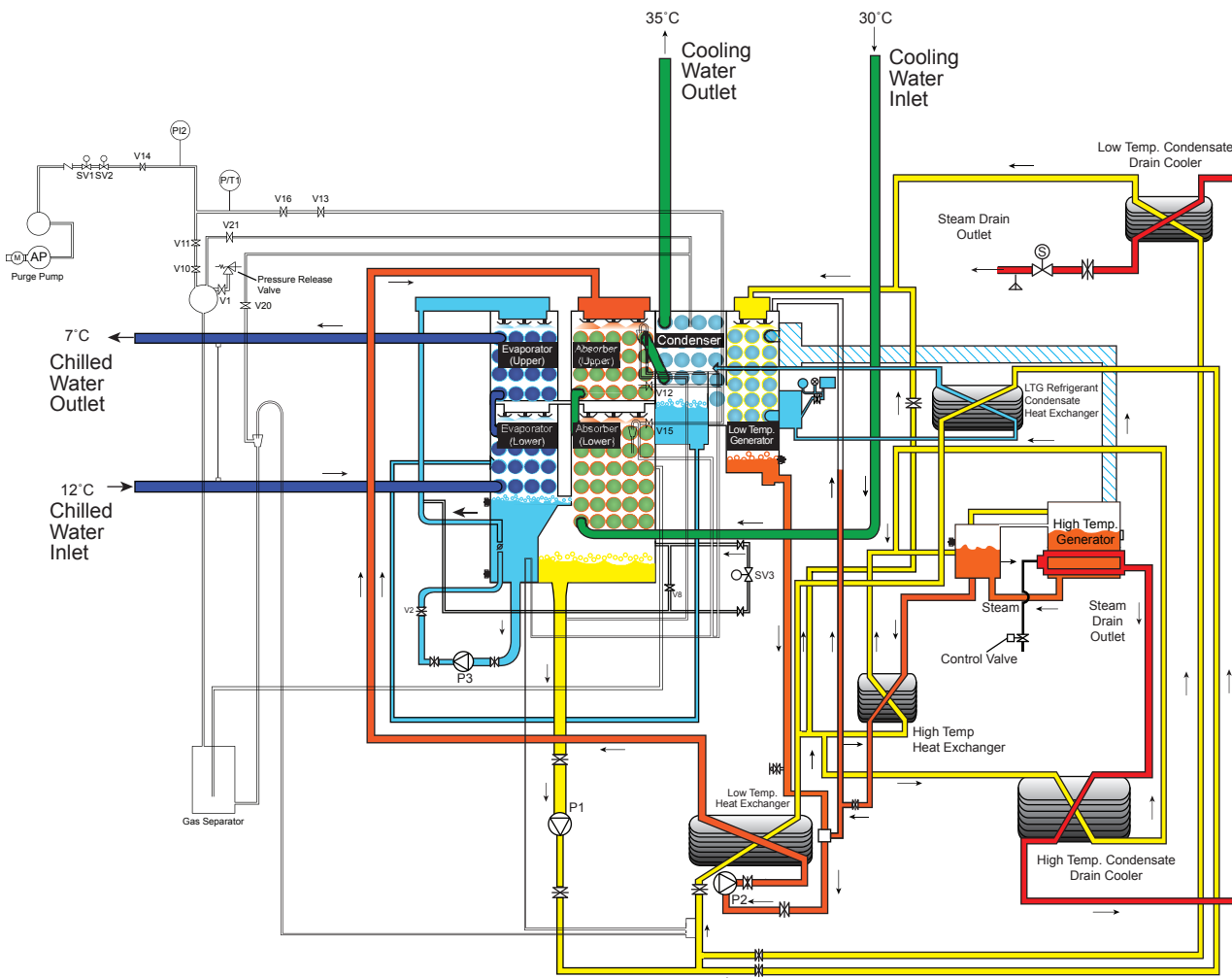
YHAU-CW double effect steam-fired chillers are completely leak tested at the factory before shipping.

YHAU-CW absorption chillers are equipped with sophisticated PLC based controls, making the chiller the smartest and most efficient absorption chiller on the market today.

For these and similar cost saving designs, consider the field proven YHAU-CW design. In many years of operation, the double-effect design has proven itself in applications ranging from schools to refineries. Now, with state of the art controls and continual product improvement, the YHAU-CW absorption chiller is truly without peer. When it comes to absorption technology, there's only one leader - Johnson Controls.

How It Works

The double effect (steam-fired) absorption chiller uses water as the refrigerant and lithium bromide (LiBr) as the absorbent. It is the strong affinity that these two substances have for one another that makes the chiller cycle work. The vapor pressure of the lithium bromide solution is lower than the vapor pressure of the refrigerant. The vapor pressure of the LiBr solution is directly related to the amount of refrigerant (water) present in the solution with the LiBr and the solution temperature. The entire absorption process occurs in almost a complete vacuum.



- Chilled Water
- Cooling Water
- Refrigerant
- Diluted Solution
- Concentrated Solution
- Steam

How It Works (Cont'd)

EVAPORATOR

Liquid refrigerant enters the evaporator and is distributed over the top of the tube bundle. As the refrigerant droplets cover the outside surface of the tubes, the heat from the returning chilled water passing through the tubes causes the refrigerant to flash from a liquid to a vapor. The temperature at which this happens depends on the evaporator shell pressure which is dictated by the absorber section of the chiller. The refrigerant vapor passes through the mist eliminators and into the absorber section of the chiller. As the liquid refrigerant passes down through the bundle of evaporator tubes, more and more of refrigerant vaporizes. The refrigerant remaining in a liquid state at the bottom drains into the refrigerant tank and is pumped back up to the top of the tube bundle where the process is repeated.

ABSORBER

Concentrated LiBr solution enters the Absorber section of the chiller and is sprayed over the absorber tube bundle. Because the vapor pressure of the concentrated solution is very low, the refrigerant (water) vapor from the evaporator flows into the absorber and is absorbed into the LiBr solution. This mass transfer process lowers the concentration of LiBr solution as the refrigerant (water) is absorbed into the solution. This dilution process generates heat and if not cooled would eventually stop as the solution temperature would rise with a corresponding rise in vapor pressure. This would be similar to closing the vanes or slowing down a centrifugal compressor on a chiller where the load was constant. The water flowing inside the absorber tube bundle comes from the cooling tower and serves to cool the LiBr solution as it flows down over the tube bundle. This allows the absorption process to continue and the solution becomes more diluted as it absorbs more refrigerant vapors. When the LiBr solution reaches the bottom of the absorber section, it has become too diluted (weak solution) and drains into the suction of the solution pump where it is re-concentrated.

The following section describes the highly unique 2-step evaporator-absorber design of the YHAU-CW Steam chiller.

TWO-STEP EVAPORATOR-ABSORBER

The evaporator as well as the absorber is split into two sections. This design, similar to a series-counter-flow chiller arrangement along with the parallel flow cycle, enables lower lithium bromide solution concentrations. This reduces crystallization risk, reduces pressure and the potential for corrosion, as well as improves efficiency in conjunction with other advanced components described later in this section.

The two evaporators are in series with respect to the chilled water flow through the tubes. In other words, the chilled water flows through the lower evaporator tubes first and then to the upper evaporator tubes. Each evaporator operates at a slightly different temperature and pressure. The refrigerant in the lower evaporator boils at a slightly higher temperature than in the upper evaporator, consequently cooling the chilled water in 2 steps.

The two absorber sections are split as well, with the strong solution first entering the top of the uppermost absorber and flowing down through the top absorber bundle. It then flows into the top of the lower Absorber section. The strong solution entering the upper Absorber takes advantage of its lower vapor pressure allowing the upper Evaporator to operate at a lower pressure and temperature.

How It Works (Cont'd)

When the LiBr solution enters the lower Absorber section it is somewhat diluted from the refrigerant vapor that boiled off in the upper evaporator. At this lower concentration the solution vapor pressure would normally not be sufficient to provide an evaporator pressure low enough to satisfy the leaving chilled water design. However, the lower evaporator is the first step of the chilled water cooling cycle, and the dilute solution's vapor pressure is adequate to maintain the lower evaporator at the required temperature and pressure in the lower evaporator.

The cooling water enters the lower absorber section first, keeping the vapor pressure of the weaker solution as low as possible. Both the refrigerant (water) and LiBr dispersion system are gravity fed and made of stainless steel.

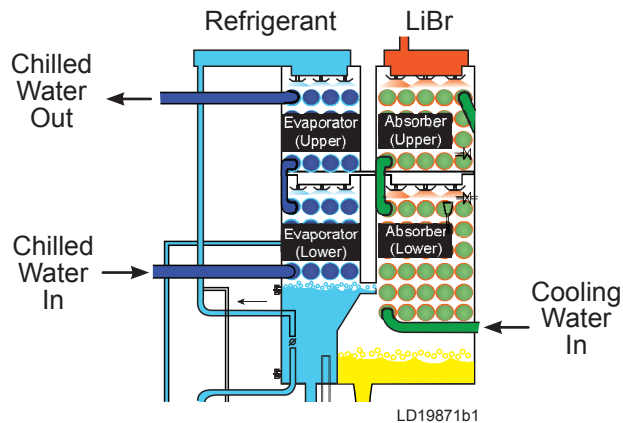
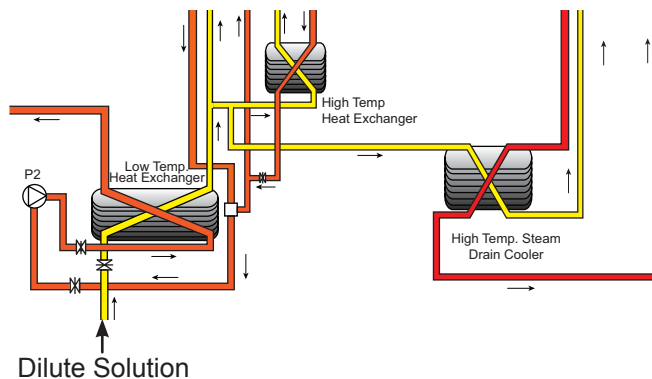


PLATE TYPE HEAT EXCHANGERS

The diluted (weak) lithium bromide solution leaving the absorber section is pumped through various plate type heat exchangers (such as the low temperature heat exchanger, low temperature steam drain cooler, high temperature heat exchanger, high temperature steam drain cooler and LTG refrigerant condensate heat exchanger) before it enters the high temperature generator and low temperature generator sections. These plate type heat exchangers improve cycle efficiency by pre-heating the dilute solution. Pre-heating the dilute solution reduces the load of the driving heat source in the high temperature generator section. The concentrated solution flows out of the generators and back through the various heat exchangers.

The relatively high temperature solution streams from the two generators and the heat of the steam condensate is used to pre-heat the weak solution stream leaving the absorber.

The variable frequency drive on the solution pump, as well as the absorber spray pump, helps achieve superior performance at part loads through savings in steam consumption.



How It Works (Cont'd)

PARALLEL FLOW

The unique parallel flow divides the solution between the low temperature generator and the high temperature generator sections into two parallel, balanced paths. The result is a safer and more efficient operation at a much lower pressure than conventional series-flow designs. The various solution to solution plate type heat exchangers optimize efficiency by enabling effective heat transfer between the diluted (weak) and the concentrated lithium bromide solutions.

HIGH TEMPERATURE GENERATOR (HTG)

The high temperature generator section is a flooded design. The steam passes through the stainless steel tubes and further heats up the pre-heated dilute solution from the high temperature heat exchanger and high temperature drain cooler.

The hot refrigerant vapor boiled off from the dilute solution is sent to the low temperature generator. This leaves behind strong solution which is returned to the high temperature heat exchanger.

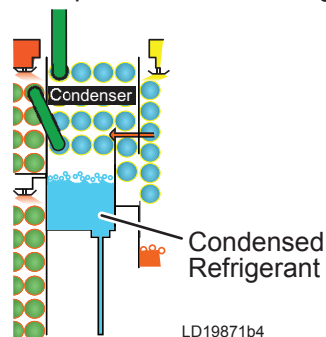
LOW TEMPERATURE GENERATOR (LTG)

The hot refrigerant vapor from the high temperature generator heats up the dilute solution coming from the low temperature heat exchanger and low temperature drain cooler. The additional refrigerant vapor produced migrates to the condenser. The refrigerant vapor from the high temperature generator condenses into liquid and flows to the condenser.

The low temperature generator is a falling film design, ensuring superior heat transfer and enhanced life by eliminating wear and tear at the tube supports.

CONDENSER

The refrigerant vapor from the low temperature generator as well as the condensed refrigerant from the high temperature generator enter the condenser where they condense into a liquid state (by the cooling (condenser) water from the absorber section). The cooled refrigerant is sent to the bottom evaporator section through a U-pipe (liquid seal).



Equipment Overview

GENERAL

The YHAU-CW Double Effect Steam-Fired Absorption Chillers are factory-packaged including the evaporator, condenser, low temperature generator, high temperature generator, absorber, pumps, automatic purging system, control center, interconnecting unit piping, and wiring.

The initial charge of refrigerant is supplied for each chiller. Actual shipping procedures will depend on a number of project-specific details.

Johnson Controls factory-trained, field service representatives will supervise or perform the initial start-up, and provide concurrent operator instructions.

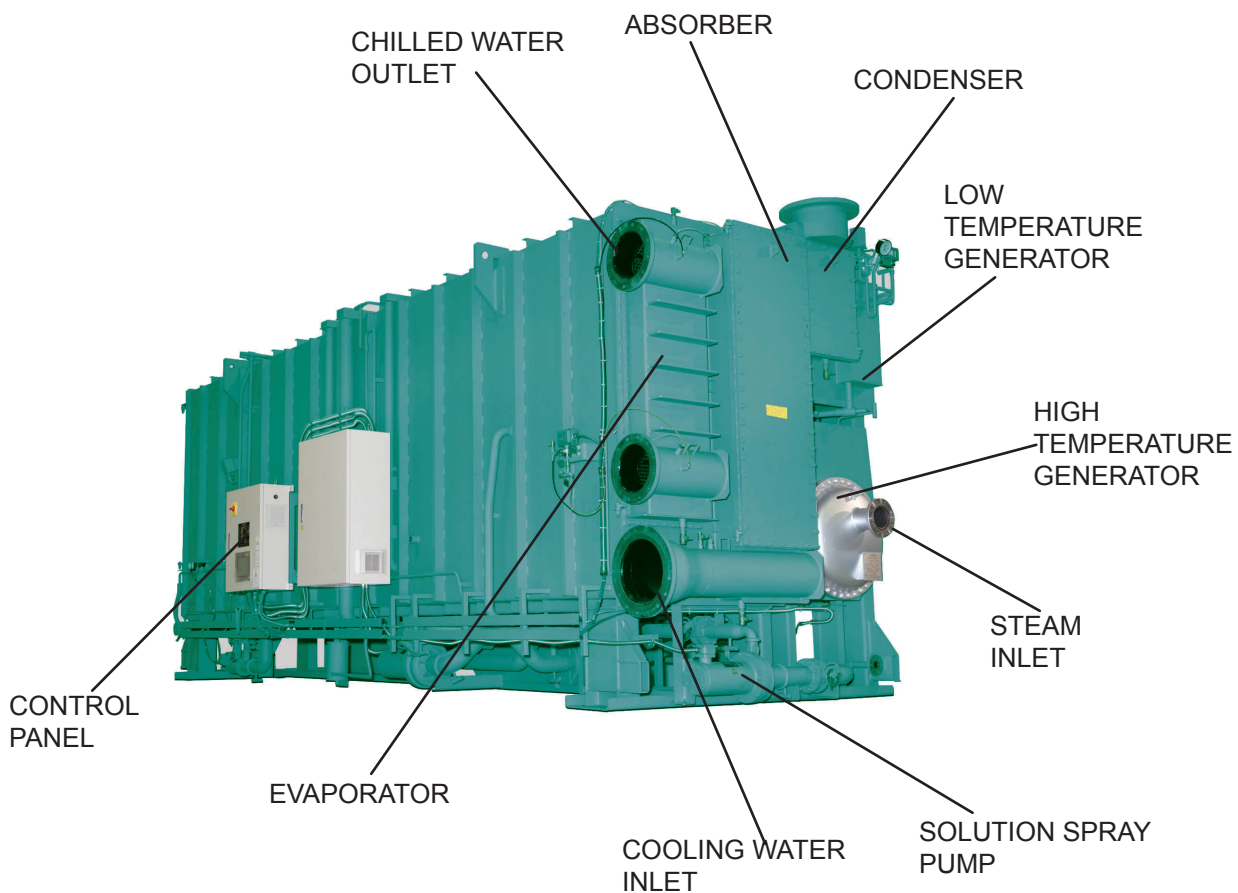


FIGURE 1 - YHAU-CW COMPONENTS

Equipment Overview (Cont'd)

CONSTRUCTION

The chiller consist of a low temperature generator, high temperature generator, solution heat exchangers, absorber, condenser and an evaporator. To minimize the risk of corrosion, the evaporator dispersion tray and the absorber dispersion tray are stainless steel. Each dispersion tray has two step construction and any foreign material is removed from the lithium bromide solution or the refrigerant at the first stage tray. This will avoid any degradation of dispersion performance due to clogging.

The evaporator, absorber, condenser, low temperature generator, and high temperature generator are a shell and tube construction. The steam-fired high temperature generator is designed for 10 bar(g) and tested to 14.5 bar(g) for Europe according to PED requirement, 13bar(g) for the other countries according to the GB pressure vessel requirement. A shell-side pressure releasing valve is furnished and set to blow at 0.8 bar(g).

The evaporator cycle and the absorber cycle consists of two-steps (upper stage and lower stage). This technology makes absorber solution concentration weak, extending machine life. Furthermore, this technology makes the generator solution temperature lower than the ordinary chiller, which enables it to use lowered steam-fired temperature as the driving heat source.

The plate-type solution heat exchangers are equipped to preheat the diluted solution and achieve higher efficiency.

TUBE MATERIALS

High temperature generator tubes are made of 0.8 mm wall stainless steel (SS22053). Low temperature generator tubes are made of 0.6 mm wall stainless steel (SUS436LTB). Evaporator and absorber tubes of Low Residual Phosphorus Deoxidized Copper (C1201), finned type with a wall thickness before finning of 0.6 mm. Condenser tubes are bare type and made of 0.6 mm wall low residual phosphorus deoxidized copper (C1201).

WATERBOXES

Waterboxes are removable to permit tube cleaning and replacement. Absorber and condenser waterboxes for 360EX(S) models or larger are of marine type. Water circuit tubing are replaceable from either end of the absorption unit. All waterboxes and associated water circuit nozzles and tube bundles are designed for 10 bar(g) working pressure and 12.5 bar(g). Vent and drain connections are provided on each waterbox. The high temperature generator water box is designed for 10 bar(g) and tested to 14.5 bar(g) for Europe according to PED requirement, 13 bar(g) for the other countries according to the GB pressure vessel requirement. All the water connections are equipped with DIN flanges for Europe, GB flanges for other countries. Mating flanges are not included. The inside of the waterboxes and the waterbox covers are coated with epoxy paint.

AUTOMATIC CRYSTALLIZATION PREVENTION SYSTEM

The YHAU-CW Chiller is built with an anti-crystallization system. The absorber and the evaporator are located side by side in the same shell and separated by the eliminator. When the concentration of lithium bromide in the chiller goes up, the water level at the evaporator increases and automatically spills over to the absorber. This causes the concentration rate of the solution at the absorber to go down.

Equipment Overview (Cont'd)

PUMPS

Solution and refrigerant pumps are hermetically sealed, self-lubricating, totally enclosed, factory-mounted, wired, and tested. Motor windings are not exposed to lithium bromide or water. The suction and discharge connections for each pump are fully welded to the unit piping to minimize the opportunity for leaks. Suction and discharge connections are equipped with factory installed isolation valves to permit quick and easy servicing of pumps. Pumps are designed to operate for a total of 60,000 hours. The parts in the pumps such as bearings and sealing gaskets are to be replaced every 20,000 hours.

AUTOMATIC PURGING SYSTEM

The chiller is equipped with a purging system to remove non-condensable gases from the unit during operation. Non-condensables are collected by an eductor and accumulated in the purge tank. The chiller can dictate the pressure increase in the purge tank and automatically remove the non-condensable gas through the operation of an electric vacuum pump.

The purge pump is an oil rotary two stage design, and is furnished complete with a motor, and all required accessories. The purge pump is shipped mounted on the chiller and the connecting hose is factory installed. The purge pump oil is charged at the job site.

LITHIUM BROMIDE AND REFRIGERANT

Lithium bromide shall contain lithium molybdate corrosion inhibitor to minimize the rate of ferrous metal corrosion on both the solution and refrigerant sides of the unit. The solution and deionized refrigerant water are kept in barrels and shipped with the chiller. They are then charged at the field during the commissioning.

DRY SHIPMENT

The solution and refrigerant water are kept in the barrels and shipped with the chiller. They will be charged in the field during the commissioning. The chiller is charged with N₂ to 0.3 bar(g) during the delivery.

CONTROL VALVE

Steam-fired chillers are furnished with a steam control valve for the CW model or a steam drain control valve for the CWN and CWL models, linkage and the actuator motor. The steam or steam drain control valve assembly is capable of modulating steam flow continuously from approximately 20% to 100% of the maximum design chiller capacity into the chiller.

The actuator motor is powered from the chiller control panel with the actuator motor position controlled through a 4-20 mA DC control signal.

Equipment Overview (Cont'd)

CONTROL PANEL

Each unit is furnished complete with a factory mounted and pre-wired control system. The control panel enclosure is equipped with a hinged access door with lock and key. The protection rating of the control panel is equivalent to IP42. All temperature sensors and other control devices necessary to sense unit operating parameters are factory mounted and wired to panel. The control panel shall include a touch panel showing all system parameters in various languages with numeric data in metric units.

The operating program is stored in non-volatile memory (SRAM) to eliminate chiller failure due to AC power failure.

Capacity Control - The control panel automatically controls the input steam flow rate to maintain the programmed leaving chilled water setpoint for cooling loads ranging from approximately 20% to 100% of design. The input steam flow rate can also be manually adjusted from the control panel to any setting between minimum and maximum, when automatic operation is not desired and when steam input is not being inhibited by a specific operating condition.

YHAU CONTROL CENTER

The YHAU-CW Control Center, furnished as standard on each chiller, provides the ultimate in efficiency, monitoring, data recording, chiller protection and operating ease. The control center is a factory-mounted, wired and tested state-of-the-art microprocessor based control system for lithium bromide absorption chillers. The panel is configured with a color display with keys that are integrated into the display, which are redefined with one keystroke based on the screen displayed at that time. This revolutionary development makes chiller operation quicker and easier than ever before. Instead of requiring keystroke after keystroke to hunt for information on a small monochrome LCD screen, a single button reveals a wide array of information on a large, full-color illustration of the appropriate component, which makes information easier to interpret. This is all mounted in the middle of a keypad interface and installed in a locked enclosure.

The LCD allows graphic animated display of the chiller, chiller sub-systems and system parameters; this allows the presentation of several operating parameters at once. In addition, the operator may view a graphical representation of the historical operation of the chiller as well as the present operation. A Status Bar is displayed at all times on all screens.

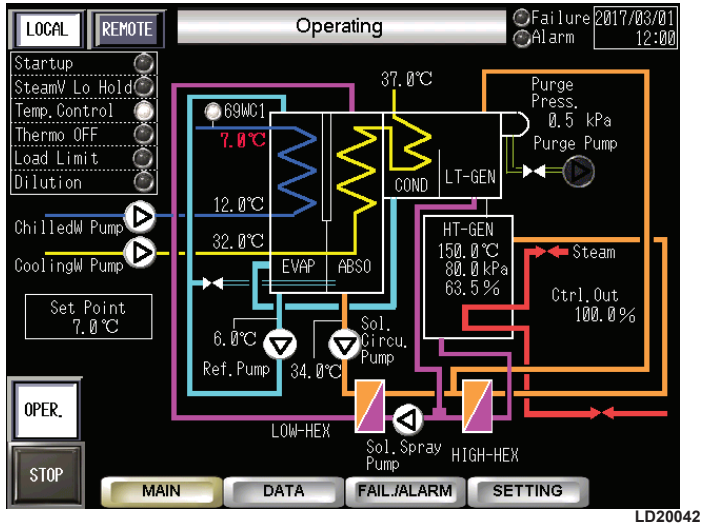
The panel verbiage is available in various languages as standard and can be changed on the fly without having to turn off the chiller. Data can be displayed in Metric units plus keypad entry of setpoints to 0.1 increments.

Security access is provided to prevent unauthorized changes to setpoints. This is accomplished with three different levels of access and passwords for each level. There are certain screens, displayed values, programmable setpoints and manual controls not shown that are for servicing the chiller. The following listing describes the various system screens and subscreens, and what information they provide.

Equipment Overview (Cont'd)

MAIN SCREEN

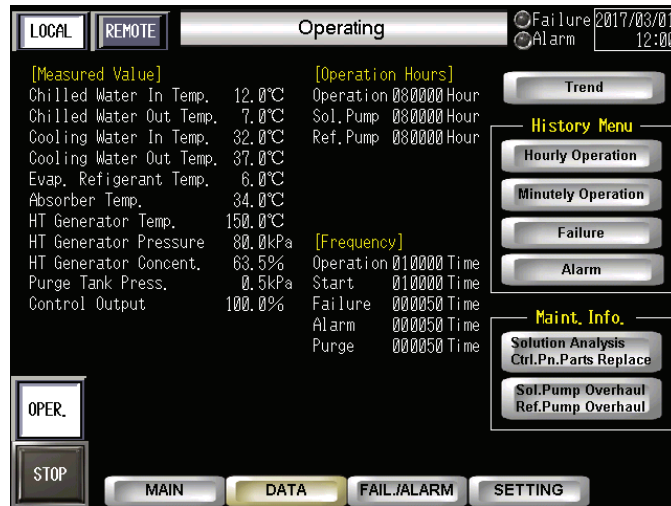
The Main Screen displays equipment status (chiller start/stop, operating, pumps ON/OFF, purge pump ON/OFF, and chilled, and cooling water pumps ON/OFF). Also displayed is the operating status of the various modes of chiller operation.



DATA SCREEN

The Data Screen displays values showing temperatures, operating hours, operating frequency, data trends and a history of failures, alarms, and time based temperature trends.

Equipment Overview (Cont'd)



LD20044

FAILURE/ALARM SCREEN

This screen displays failure indications (time-outs, operation interlock, overcooled refrigerant, over and under temperatures, and problems with the unit's pumps) and system alarms.



LD19932

SETTING SCREEN

This screen displays control parameters (setting method, remote setting base and differential), valve operation (control valve mode auto/manual, pump operation, forced dilution, and purge mode auto/manual), language (Japanese, English, German, or Chinese) and date and time parameters.

Options and Accessories

Optional Tubes – A CuNi(90/10), SUS436L, SUS316L, SUS304 and Titanium options for absorber-condenser tubing, and evaporator is available. However, the chiller rating may change with this option. Certified selection is issued by Johnson Controls' engineering department. Price additions for non-standard tube materials and or wall thickness is provided on a job specific basis.

Wet Shipment - The solution and refrigerant is charged at the factory and used for chiller testing. They are discharged and shipped in barrels with the chiller and charged again during commissioning. The chiller is charged with N2 to 0.3 bar(g) on delivery.

Split Shipment – For tight rigging jobs, it is possible to ship the unit in two pieces – the upper section (evaporator, absorber, condenser, low temperature generator and high temperature generator) and the lower section (solution heat exchangers and base frame). the solution and refrigerant is shipped in barrels together with the chiller and is charged at the job site.

Long Term Storage - The solution and refrigerant water are stored in the barrels and shipped with the chiller. The shell side of the chiller is charged with N2 to 0.3 bar(g) and the pressure gauge is marked. The tube side and waterbox are sealed and the pressure gauge is installed. The tube side of the chiller is charged with N2 to 0.2 bar and the pressure gauge is marked. The drying agent is then placed in the control panel.

Cold Surface Insulation – Elastomeric foam insulation on cold surfaces is applied at the factory as an option.

Isolation Pads – Four (4) pads of 10 mm thick NBR isolation material are provided as an option.

Chilled Water Pressure 20 bar(g) – A chilled water design working pressure 20 bar(g) option is available with marine type waterbox.

Cooling Water Pressure 20 bar(g) – A cooling water design working pressure 20 bar(g) option is available with a marine type waterbox.

Cooling Water Pressure Differential Switch – The chilled water pressure differential switch is included in the base unit. Pressure differential switches for the condenser water are provided as an option when it is required.

Pump Isolation Valves: Isolation valve for solution pump and refrigerant pump as an option

Options and Accessories (Cont'd)

IP54 (Indoor Use) – Protection rating for control panel, electrical component and pumps is equivalent to IP54. Water-resistant flexible conduit is used for chiller wiring. If the plant room will ever get below 10 °C, you must have the cold ambient option.

Outdoor Installation – The protection rating for the control panel, the electrical components and pumps is equivalent to IP54. Water-resistant flexible conduit is used for chiller wiring. The minimum allowable temperature for outdoor installation is 0 °C, provided the chiller includes the cold ambient option. Outdoor installations will be considered on a case-by-case basis.

Hot and cold insulation and metal jacketing is to be done by the customer at the job site.

Band heater and insulation for refrigerant piping is done at the factory.

Factory Testing – Factory testing is only available with single piece equipment.

Factory Performance Test Option Not 3rd Party Witnessed – Provides a full load performance test and a signed report of capacity and performance. (NOTE: Full load single point test. Additional part load points or special testing requirements will be addressed by marketing on a project specific basis).

Customer Witness Factory Test – Permits a customer witnessed factory performance test of a given chiller at design full load conditions. The time of the test will be based on the manufacturing schedule and will be confirmed by the factory.

Remote Interface Option – This option permits the use of 0-10 V remote signals to limit control valve opening.

Junction Box for Separate Installation of Control Panel – A junction box is furnished when the control panel is to be installed at a remote location away from the unit.

Inverter - Inverter is optional, not standard.

Application Data

The following discussion is a guide in the application and installation of YHAU-CW Absorption Steam Chillers to ensure the reliable, trouble-free life for which this equipment was designed. While this guide is directed towards normal water-chilling applications, your local Johnson Controls sales representative can provide complete recommendations on other types of applications.

LOCATION

YHAU-CW units make very little noise or vibration and may be generally located at any level in a building where the construction will support the total system operating weight. The unit site should be a floor, mounting pad or foundation which is level and capable of supporting the operating weight of the YHAU-CW chiller. The YHAU-CW unit will operate properly and produce maximum output only if it is installed level within 1/1000 of the unit length in the lengthwise direction and 1/1000 of unit width in the width-wise direction.

The system location should provide sufficient space around the unit to permit tube removal, if required. If a door or other large opening is conveniently located opposite one end of the system, the tubes may be extracted and replaced through these openings. Allow sufficient clearance on the remaining sides of the unit for necessary access and maintenance.

Standard absorption chillers are not suitable for outdoor installation. The machine room must be enclosed, with adequate lighting, and properly ventilated to keep its temperature no higher than 40 °C and no lower than 10 °C.

WATER CIRCUITS

Flow Rate – For normal fluid chilling duty, the evaporator and absorber/condenser flow rates are permitted at water velocity levels in the heat exchangers tubes of up to 3.3 m/s.

Under variable chilled fluid and cooling fluid flow conditions, special attention needs to be paid to the rate of change of flow rate with time and the minimum/maximum velocities through the tubes. Applications involving chilled and cooling fluid flow rates which vary by more than +10% from design will require special considerations on a case by case basis.

Water Quality – The practical and economical application of liquid chillers requires that the quality of the water supply for the evaporator and the absorber/condenser be analyzed by a water treatment specialist. Water quality may affect the performance of any chiller through corrosion, deposits of heat-resistant scale, sedimentation or organic growth. These will hurt chiller performance and increase operating and maintenance costs. Normally, performance may be maintained by corrective water treatment and periodic cleaning of tubes. If water conditions exist which cannot be corrected by proper water treatment, it may be necessary to provide a larger allowance for fouling, and/or specify special material of construction.

General Water Piping – All chilled water and cooling water piping should be designed and installed in accordance with accepted piping practice. Chilled water and cooling water pumps should be located to discharge through the YHAU-CW unit to assure positive pressure and flow through the unit. Piping should include offsets to provide flexibility and should be arranged to prevent drainage of water from the cooler and condenser when the pumps are shut down. Piping should be adequately supported and braced independent of the chiller to avoid imposing strain on chiller components. Hangers must allow for alignment of the pipe. Isolators in the piping and in the hangers are highly desirable in achieving sound and vibration control.

Application Data (Cont'd)

Convenience Considerations – With consideration given to facilitating the performance of routine maintenance work, some or all of the following steps may be taken by the purchaser.

- Evaporator, absorber and condenser waterboxes are equipped with plugged vent and drain connections.
- If desired, vent and drain valves may be installed with or without piping to an open drain.
- Pressure gauges with stopcocks, and stop valves, may be installed in the inlets and outlet of the cooling and chilled water lines as close as possible to the chiller.
- An overhead monorail or beam may be used to facilitate servicing.

Connections – The standard unit is designed for 10 bar(g) working pressure and water tested to 12.5 bar(g). The connections (water nozzles) to these circuits are furnished in accordance with DIN flanges for Europe, GB flanges for other countries. Piping should be arranged for ease of disassembly at the unit for performance of routine maintenance such as tube cleaning. All water piping should be thoroughly cleaned of all dirt and debris before final connections are made to the YHAU-CW unit.

Chilled Water – The chilled water circuit uses a differential pressure switch as standard. Factory mounted in the water nozzle connection and wired to the chiller control panel. A water strainer with a 10 mesh, should be field installed in the chilled water inlet line as close as possible to the chiller. If located close enough to the chiller, the chilled water pump may be protected by the same strainer. The flow sensor and strainer assure chilled water flow during unit operation. The loss or severe reduction of water flow could seriously impair the YHAU-CW unit performance or even result in tube freeze up.

Cooling Water – Like the chilled water circuit, the cooling water circuit requires a means of proving flow. Low flow protection is provided by an optional differential pressure switch mounted in the water nozzle connection and wired to the chiller control panel.

The YHAU-CW chiller is engineered for maximum efficiency at both design and part load operation by taking advantage of the colder cooling water temperatures which naturally occur in the winter months. In its standard configuration, YHAU-CW absorbers can tolerate entering cooling water temperatures as low as 20 °C. Because the unit flow rates must be maintained, the recommended method of cooling water temperature control is a three way mixing valve.

SOUND AND VIBRATION CONSIDERATIONS

Since the YHAU-CW unit generates very little sound (see *Sound Data on page 58*) or vibration, vibration eliminating mounts are not usually required. However, when the machine is installed where even mild noise is a problem, mounts or pads should be used. The use of anchoring bolts on the machine legs is normally necessary.

Application Data (Cont'd)

THERMAL INSULATION

YHAU-CW units require thermal insulation (by others) on both hot and cold surfaces in order to achieve maximum efficiency and prevent sweating.

STEAM

General – The YHAU-CW unit is nominally rated for and saturated steam with minimal superheat, and a pressure of 8 bar(g). The inlet steam must not have a temperature higher than 190 °C and cannot have a saturation pressure higher than 10 bar(g).

Pressure – Since a lower steam saturation pressure corresponds to a lower temperature in the generator, a YHAU-CW chiller's available capacity varies with the steam pressures at the steam valve.

Piping – Beginning at the steam supply, a steam separator should be installed to ensure the unit receives only dry steam. A steam trap below the separator will allow draining of only condensate. Beyond the separator, a 60 mesh strainer removes foreign matter from the steam. A regulator is only necessary if the steam supply pressure to the unit will exceed 10 bar(g). The pressure relief valve should be set to open at 10 bar(g). The Johnson Controls' supplied steam, with steam pressure of 8 bar and higher, must be no further than 5 m from the high temperature generator steam inlet flange in order to minimize the pressure drop from the valve exit to the generator inlet. Alternatively, the steam drain control valve is mounted on the chiller before delivery.

The drain cooler installed on the unit effectively eliminates the need for an additional condensate cooler or a steam trap. The drain solenoid valve is a factory installed device to insure zero steam flow through unit during shutdown.

All steam piping should be adequately supported and braced independently of the chiller. The support system must account for the expansion and contraction of steam piping, avoiding the imposition of strain on the chiller components.

Control Valve Sizing – Control valves are sized for each job based upon chiller cooling capacity. During start-up, Johnson Controls technicians establish the minimum load steam or steam drain control valve position (approximately 20%) and set the limit switch accordingly, eliminating possible problems at start up.

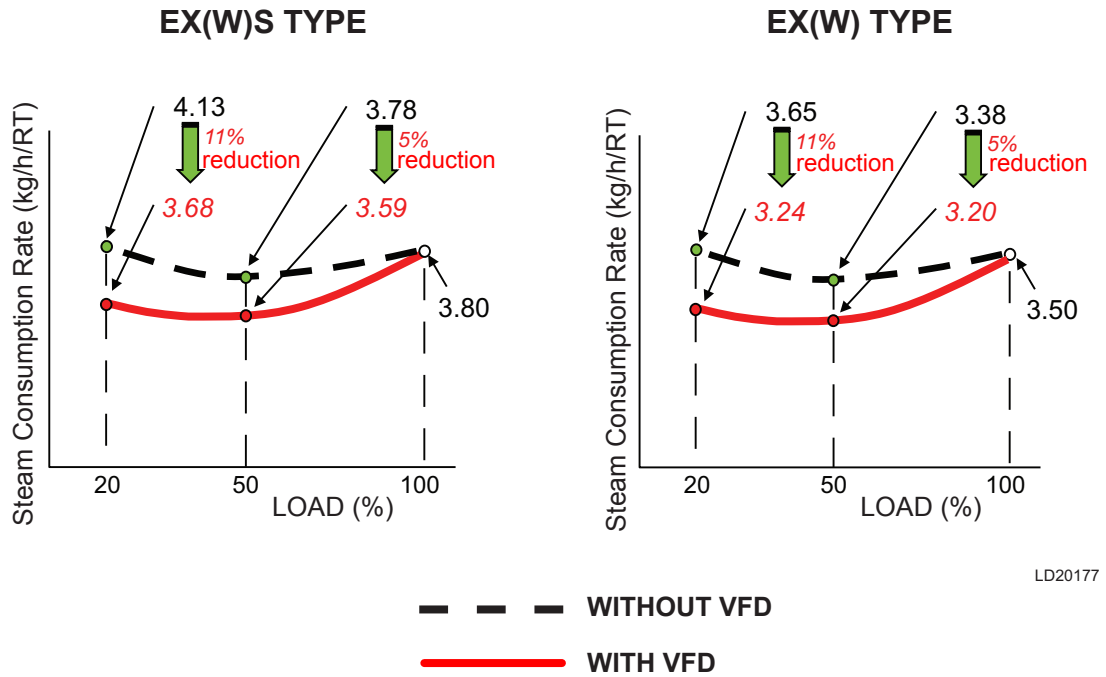
ELECTRICAL DATA

Unit electrical data begins on page 40. Total kW includes power requirements for the system solution and refrigerant pumps. All models have one solution pump, one solution spray pump and one refrigerant pump.

TYPICAL OPERATIONAL RANGE

PARAMETER	ALLOWABLE RANGES
Chilled Water In	7 - 25°C
Chilled Water Out	4 - 16°C
Cooling Water In	20 - 37°C
Cooling Water Out	25 - 42°C
Steam Inlet Pressure	2 - 10 bar(g)
Condensate Outlet	~ 60 °C

Part Load Performance (with VFD for Solution Pump)



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Nozzle Arrangements

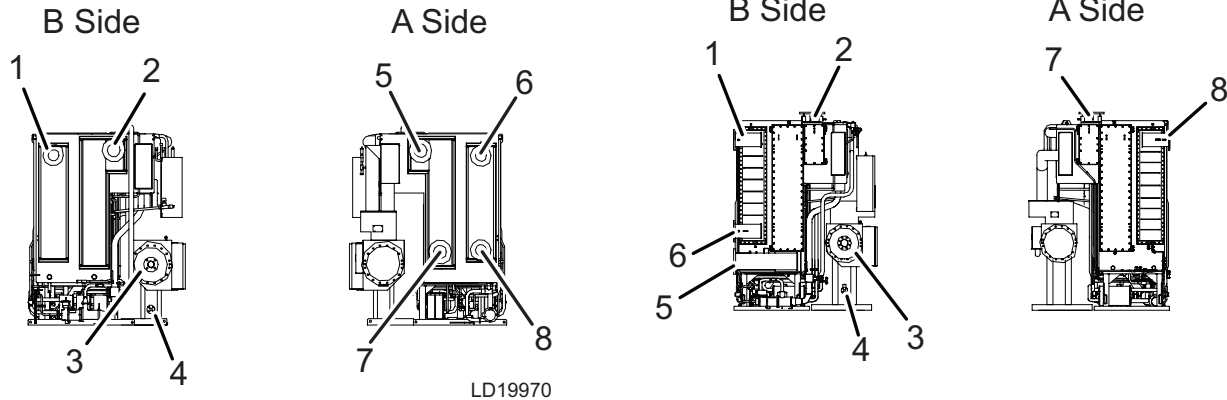
YHAU-CW	NOZZLE LOCATION						
	CHILLED WATER (CHW)		COOLING WATER (COW)		STEAM (STM)	STEAM DRAIN (DRN)	
	INLET	OUTLET	INLET	OUTLET	INLET	OUTLET	
150-300EX(S)	A	ODD PASS	B	A	ODD PASS	B	B
		EVEN PASS	A		EVEN PASS	A	
360-800EX(S) 900~1100EXW(S) 1200~1600EXW3(S) 1000~2000EXW4(S)	B	ODD PASS	A	B	ODD PASS	A	B
		EVEN PASS	B		EVEN PASS	B	

NOTE:

These images are representations of nozzle arrangements. Reference general arrangement drawings for detailed nozzle locations for each specific unit.

360-800 EX(S)
900~1100EXW(S)
1200~1600EXW3(S)
1000~2000EXW4(S)

Steam (150-300EX(S))



LD19970

ITEM	DESCRIPTION
1	Chilled Water Outlet (Odd Pass)
2	Cooling Water Outlet (Odd Pass)
3	Steam Inlet
4	Drain Outlet
5	Cooling Water Outlet (Even Pass)
6	Chilled Water Outlet (Even Pass)
7	Cooling Water Inlet
8	Chilled Water Inlet

ITEM	DESCRIPTION
1	Chilled Water Outlet (Even Pass)
2	Cooling Water Outlet (Even Pass)
3	Steam Inlet
4	Drain Outlet
5	Cooling Water Inlet
6	Chilled Water Inlet
7	Cooling Water Outlet (Odd Pass)
8	Chilled Water Outlet (Odd Pass)

FIGURE 2 - YHAU-CW-150-300EX(S), 360-800EX(S), 900~1100EXW(S), 1200~1600EXW3(S), 1000~2000EXW4(S) NOZZLE LOCATIONS

Weights and Dimensions

TABLE 1 - HIGH EFFICIENCY WEIGHTS AND DIMENSIONS

MODEL YHAU-CW	DIMENSION (METERS)				WEIGHT (TONS)		
	LENGTH	WIDTH	HEIGHT	TUBE EXTRACTING SPACE (M)	MAXIMUM SHIPPING	OPERATION	EMERGENCY (FILLED WITH WATER)
150EX	3.0	2.3	2.6	2.0	5.7	7.2	10.5
180EX	3.6	2.4	2.5	2.6	6.7	8.5	12.7
240EX	4.3	2.4	2.5	3.2	7.8	9.9	15.2
300EX	4.8	2.4	2.5	4.0	8.9	11.6	18.1
360EX	5.8	2.4	2.5	5.0	12.1	15.8	26.1
400EX	6.3	2.4	2.5	5.5	12.9	17.6	29.9
450EX	4.8	2.6	3.1	4.0	13.7	17.1	27.0
500EX	5.3	2.6	3.1	4.5	15.5	20.2	30.6
560EX	5.8	2.6	3.1	5.0	16.7	21.8	34.2
600EX	6.4	2.6	3.1	5.5	18.8	24.3	37.8
700EX	7.2	2.6	3.1	6.3	20.6	26.9	42.4
800EX	8.1	2.6	3.1	7.0	23.0	30.1	47.3
900EXW	6.8	3.1	3.2	5.7	24.9	33.5	50.4
1000EXW	7.4	3.1	3.2	6.3	27.1	36.5	55.1
1100EXW	8.1	3.1	3.2	7.0	29.3	39.4	59.1
1200EXW3	8.1	3.1	3.2	7.0	32.2	44.1	70.6
1300EXW3	8.6	3.1	3.3	7.5	34.5	47.1	75.4
1400EXW3	9.1	3.1	3.3	8.0	37.0	50.1	80.1
1500EXW3	9.6	3.1	3.3	8.5	39.5	53.2	85.1
1600EXW3	10.1	3.1	3.3	9.0	42.1	56.2	89.9
1000EXW4	6.2	3.1	3.9	5.0	29.3	40.3	60.1
1120EXW4	6.9	3.1	3.9	5.7	34.0	45.2	67.7
1250EXW4	7.5	3.1	3.9	6.3	35.6	48.9	73.7
1400EXW4	8.2	3.1	3.9	7.0	38.9	53.3	81.0
1500EXW4	8.7	3.1	3.9	7.5	41.3	56.5	86.2
1600EXW4	9.2	3.1	3.9	8.0	43.7	59.8	91.4
1680EXW4	9.7	3.1	3.9	8.5	44.6	61.5	95.1
1800EXW4	10.2	3.1	3.9	9.0	47.0	64.7	100.3
1900EXW4	10.7	3.1	3.9	9.5	49.5	68.1	105.6
2000EXW4	11.2	3.1	3.9	10.0	52.0	71.4	110.9

NOTE:

Refer to the general arrangement drawings for specific center of gravity locations and data.

Weights and Dimensions (Cont'd)

TABLE 2 - STANDARD EFFICIENCY WEIGHTS AND DIMENSIONS

MODEL YHAU-CW	DIMENSION (METERS)				WEIGHT (TONS)		
	LENGTH	WIDTH	HEIGHT	TUBE EXTRACTING SPACE (M)	MAXIMUM SHIPPING	OPERATION	EMERGENCY (FILLED WITH WATER)
150EXS	3.0	2.3	2.6	2.0	5.1	6.7	9.5
180EXS	3.6	2.3	2.6	2.6	6	7.9	11.5
240EXS	4.3	2.3	2.6	3.2	6.9	9.2	13.9
300EXS	4.8	2.3	2.6	4.0	7.6	10.7	16.4
360EXS	5.8	2.4	2.5	5.0	11.6	15.1	24.7
400EXS	6.3	2.6	3.1	4.0	11.6	16.9	24.6
450EXS	4.87	2.55	3.1	4.0	12.3	16.4	26.3
500EXS	5.3	2.6	3.1	5.0	14.9	18.6	30.9
560EXS	5.87	2.55	3.1	5.0	15.7	20.8	33.2
600EXS	6.4	2.55	3.1	5.5	17.8	23.1	36.6
700EXS	7.2	2.6	3.1	7.0	20.3	25.6	42.4
800EXS	8.1	2.6	3.1	8.0	22.9	28.5	47.9
900EXWS	6.8	2.9	3.2	6.3	24.7	31.9	51.7
1000EXWS	7.4	2.9	3.2	7.0	26.7	34.5	56.6
1100EXWS	8.1	3.1	3.15	7.0	27.7	37.4	56.1
1200EXW3S	8.1	3.1	3.3	7.0	30.5	41.9	67.0
1300EXW3S	8.6	3.1	3.3	7.5	32.8	44.8	71.7
1400EXW3S	9.1	3.1	3.3	8.0	35.1	47.7	76.3
1500EXW3S	9.6	3.1	3.3	8.5	37.5	50.5	80.8
1600EXW3S	10.1	3.1	3.3	9	39.9	53.4	85.4
1000EXW4S	6.2	3.1	3.9	5.0	28.1	38.7	58.5
1100EXW4S	6.9	3.1	3.9	5.7	31.5	43.2	65.8
1250EXW4S	7.5	3.1	3.9	6.3	34.1	46.9	71.7
1400EXW4S	8.2	3.1	3.9	7.0	37.2	51.1	78.8
1500EXW4S	8.7	3.1	3.9	7.5	39.6	54.2	83.9
1600EXW4S	9.2	3.1	3.9	8.0	41.8	57.3	88.9
1680EXW4S	9.7	3.1	3.9	8.5	42.5	58.7	92.3
1800EXW4S	10.2	3.1	3.9	9.0	44.8	61.8	97.4
1900EXW4S	10.7	3.1	3.9	9.5	47.0	64.9	102.4
2000EXW4S	11.2	3.1	3.9	10.0	49.3	67.9	107.4

NOTE:

Refer to the general arrangement drawings for specific center of gravity locations and data.

Physical Data

TABLE 3 - HIGH EFFICIENCY PHYSICAL DATA

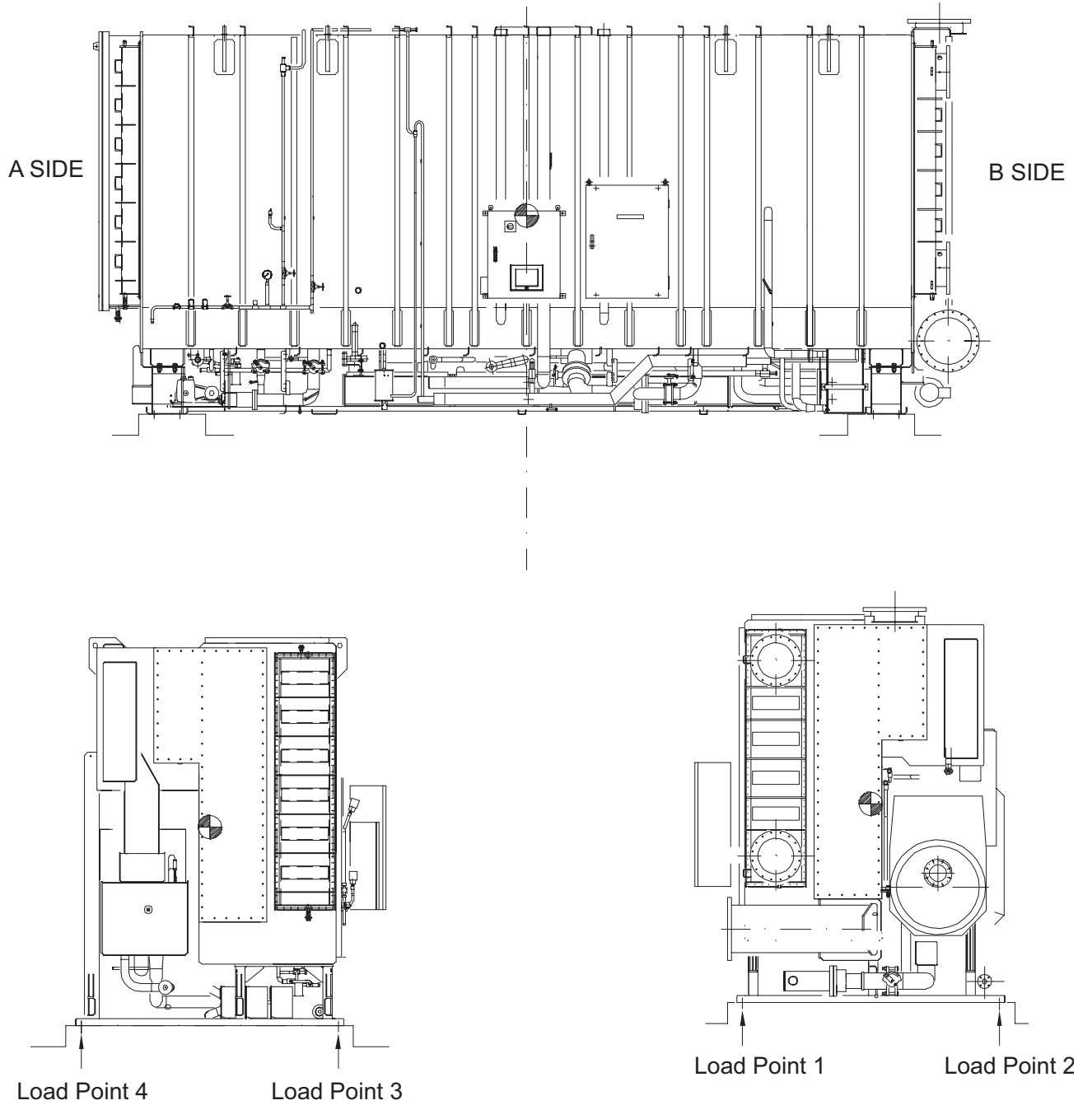
YHAU-CW	COLD INSULATION AREA (M ²)	HOT INSULATION AREA (M ²)	RADIATION HEAT LOSS (WITH INSULATION, AMBIENT TEMP. 10°C) (KW)	RADIATION HEAT LOSS (WITHOUT INSULATION, AMBIENT TEMP. 10°C) (KW)	WATER VOLUME		
					CHILLED WATER (EVAP) (M ³)	COOLING WATER (ABS AND COND) (M ³)	STEAM (GEN) (M ³)
150EX	8	19	1	9	0.21	0.33	0.04
180EX	10	21	1	11	0.25	0.39	0.04
240EX	12	24	1	15	0.3	0.46	0.04
300EX	14	28	2	19	0.36	0.56	0.06
360EX	14	33	2	22	0.46	0.83	0.07
400EX	15	36	2	25	0.5	0.89	0.08
450EX	14	33	3	28	0.55	1.17	0.08
500EX	16	36	3	31	0.60	1.25	0.09
560EX	17	39	3	35	0.65	1.39	0.10
600EX	19	40	4	37	0.71	1.48	0.11
700EX	20	41	4	43	0.79	1.61	0.13
800EX	23	46	5	50	0.88	1.88	0.15
900EXW	32	50	5	56	1.24	2.36	0.17
1000EXW	35	53	6	62	1.34	2.52	0.19
1100EXW	38	58	7	68	1.46	2.71	0.21
1200EXW3	43	64	7	74	1.68	3.28	0.24
1300EXW3	46	70	8	80	1.80	3.40	0.26
1400EXW3	48	76	8	87	1.89	3.55	0.28
1500EXW3	51	82	9	93	1.99	3.70	0.29
1600EXW3	53	88	10	99	2.08	3.85	0.31
1000EXW4	34	40	6	62	2.09	3.53	0.19
1120EXW4	37	45	7	69	2.25	3.80	0.21
1250EXW4	40	49	7	77	2.40	4.03	0.23
1400EXW4	44	53	8	87	2.56	4.29	0.26
1500EXW4	47	56	9	93	2.68	4.48	0.28
1600EXW4	49	59	10	99	2.79	4.68	0.30
1680EXW4	52	63	10	104	2.91	4.87	0.31
1800EXW4	54	66	11	111	3.03	5.06	0.33
1900EXW4	57	69	11	118	3.15	5.25	0.35
2000EXW4	59	72	12	124	3.26	5.44	0.37

Physical Data (Cont'd)

TABLE 4 - STANDARD EFFICIENCY PHYSICAL DATA

YHAU-CW	COLD INSULATION AREA (M ²)	HOT INSULATION AREA (M ²)	RADIATION HEAT LOSS (WITH INSULATION, AMBIENT TEMP. 10°C) (KW)	RADIATION HEAT LOSS (WITHOUT INSULATION, AMBIENT TEMP. 10°C) (KW)	WATER VOLUME		
					CHILLED WATER (EVAP) (M ³)	COOLING WATER (ABS AND COND) (M ³)	STEAM (GEN) (M ³)
150EXS	8	19	1	10	0.21	0.33	0.04
180EXS	10	21	1	12	0.25	0.39	0.04
240EXS	12	24	2	16	0.30	0.46	0.04
300EXS	14	28	2	20	0.36	0.56	0.06
360EXS	14	33	2	24	0.46	0.83	0.07
400EXS	15	36	3	27	0.50	0.89	0.08
450EXS	14	33	3	30	0.55	1.17	0.08
500EXS	16	36	3	33	0.60	1.25	0.09
560EXS	17	39	4	37	0.65	1.39	0.10
600EXS	19	40	4	40	0.71	1.48	0.11
700EXS	20	41	4	47	0.79	1.61	0.13
800EXS	23	46	5	53	0.88	1.88	0.15
900EXWS	32	50	6	60	1.24	2.36	0.17
1000EXWS	35	53	6	67	1.34	2.52	0.19
1100EXWS	38	58	7	73	1.46	2.71	0.21
1200EXW3S	43	64	8	80	1.68	3.28	0.24
1300EXW3S	46	70	8	87	1.80	3.40	0.26
1400EXW3S	48	76	9	93	1.89	3.55	0.28
1500EXW3S	51	82	10	100	1.99	3.70	0.29
1600EXW3S	53	88	10	107	2.08	3.85	0.31
1000EXW4S	34	40	6	67	2.09	3.53	0.19
1120EXW4S	37	45	7	75	2.25	3.80	0.21
1250EXW4S	40	49	8	83	2.40	4.03	0.23
1400EXW4S	44	53	9	93	2.56	4.29	0.26
1500EXW4S	47	56	10	100	2.68	4.48	0.28
1600EXW4S	49	59	10	107	2.79	4.68	0.30
1680EXW4S	52	63	11	112	2.91	4.87	0.31
1800EXW4S	54	66	12	120	3.03	5.06	0.33
1900EXW4S	57	69	12	127	3.15	5.25	0.35
2000EXW4S	59	72	13	133	3.26	5.44	0.37

Load Points for EX(S) and EXW(S) Units



LD

FIGURE 3 - LOAD POINTS FOR EX(S) AND EXW(S) UNITS

Load Points for EX and EXW Units - High Efficiency

TABLE 5 - LOAD POINTS FOR HIGH EFFICIENCY

	LOAD POINT 1	LOAD POINT 2	LOAD POINT 3	LOAD POINT 4
150EX	1.84	1.99	1.62	1.75
180EX	2.04	2.36	1.90	2.20
240EX	2.34	2.70	2.25	2.61
300EX	2.70	3.12	2.68	3.10
360EX	3.95	3.95	3.95	3.95
400EX	4.40	4.40	4.40	4.40
450EX	4.42	4.13	4.42	4.13
500EX	5.22	4.88	5.22	4.88
560EX	5.63	5.27	5.63	5.27
600EX	6.28	5.87	6.28	5.87
700EX	6.95	6.50	6.95	6.50
800EX	7.78	7.27	7.78	7.27
900EXW	8.38	8.38	8.38	8.38
1000EXW	9.13	9.13	9.13	9.13
1100EXW	9.85	9.85	9.85	9.85
1200EXW3	11.0	11.1	11.0	11.1
1300EXW3	11.7	11.8	11.7	11.8
1400EXW3	12.5	12.6	12.5	12.6
1500EXW3	13.2	13.4	13.2	13.4
1600EXW3	14.0	14.1	14.0	14.1
1000EXW4	10.0	10.1	10.0	10.1
1120EXW4	11.3	11.3	11.3	11.3
1250EXW4	12.2	12.3	12.2	12.3
1400EXW4	13.3	13.4	13.3	13.4
1500EXW4	14.1	14.2	14.1	14.2
1600EXW4	14.9	15.0	14.9	15.0
1680EXW4	15.3	15.4	15.3	15.4
1800EXW4	16.1	16.2	16.1	16.2
1900EXW4	17.0	17.1	17.0	17.1
2000EXW4	17.8	17.9	17.8	17.9

Load Points for EXS and EXWS Units - Standard

TABLE 6 - LOAD POINTS FOR STANDARD EFFICIENCY

	LOAD POINT 1	LOAD POINT 2	LOAD POINT 3	LOAD POINT 4
150EXS	1.71	1.85	1.51	1.63
180EXS	1.90	2.19	1.77	2.04
240EXS	2.17	2.51	2.10	2.42
300EXS	2.49	2.88	2.47	2.86
360EXS	3.78	3.78	3.78	3.78
400EXS	4.23	4.23	4.23	4.23
450EXS	4.24	3.96	4.24	3.96
500EXS	4.81	4.50	4.81	4.50
560EXS	5.37	5.03	5.37	5.03
600EXS	5.97	5.58	5.97	5.58
700EXS	6.61	6.19	6.61	6.19
800EXS	7.36	6.89	7.36	6.89
900EXWS	7.98	7.98	7.98	7.98
1000EXWS	8.63	8.63	8.63	8.63
1100EXWS	9.35	9.35	9.35	9.35
1200EXW3S	10.4	10.5	10.4	10.5
1300EXW3S	11.2	11.2	11.2	11.2
1400EXW3S	11.9	12.0	11.9	12.0
1500EXW3S	12.6	12.7	12.6	12.7
1600EXW3S	13.3	13.4	13.3	13.4
1000EXW4S	9.64	9.71	9.64	9.71
1120EXW4S	10.8	10.8	10.8	10.8
1250EXW4S	11.7	11.8	11.7	11.8
1400EXW4S	12.7	12.8	12.7	12.8
1500EXW4S	13.5	13.6	13.5	13.6
1600EXW4S	14.3	14.4	14.3	14.4
1680EXW4S	14.6	14.7	14.6	14.7
1800EXW4S	15.4	15.5	15.4	15.5
1900EXW4S	16.2	16.3	16.2	16.3
2000EXW4S	16.9	17.0	16.9	17.0

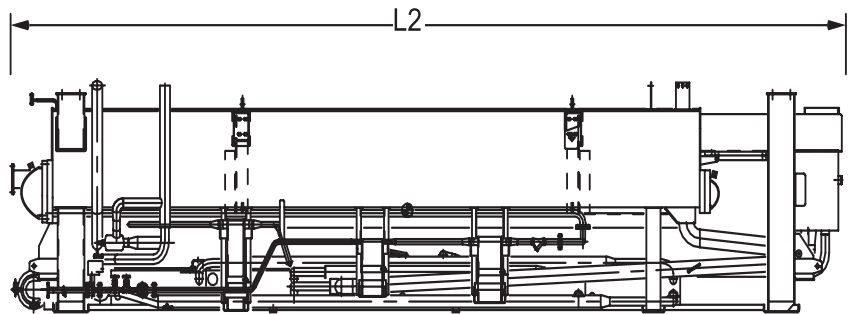
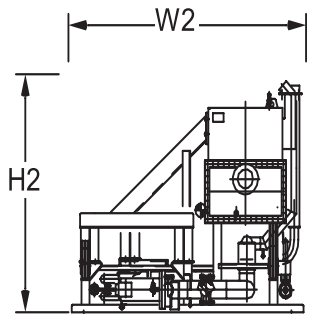
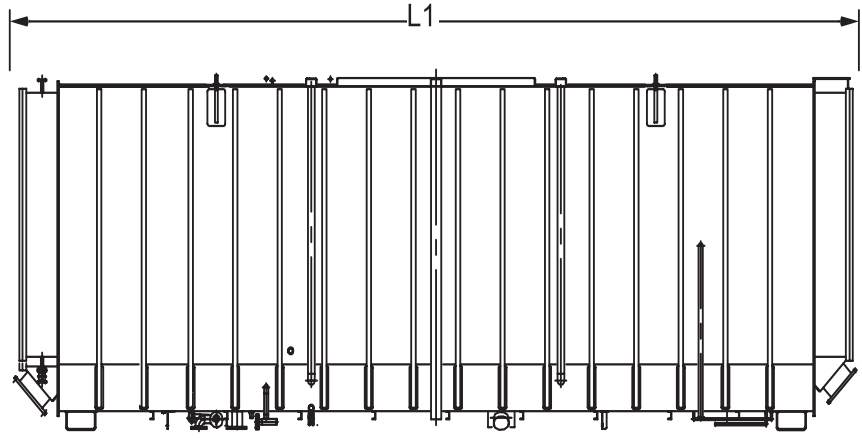
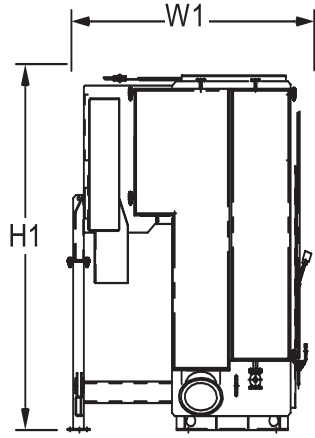
Split Shipment

TABLE 7 - SPLIT SHIPMENT

YHAU-CW	DOUBLE EFFECT STEAM FIRED ABSORPTION CHILLER								
	MAIN SHELL UNIT				SOLUTION HEAT EXCHANGER UNIT				
	LENGTH (M)	WIDTH (M)	HEIGHT (M)	WEIGHT (TON)	LENGTH (M)	WIDTH (M)	HEIGHT (M)	WEIGHT (TON) STANDARD	WEIGHT (TON) HIGH EFF.
150EX(S)	3	2	2.3	4.3	3.0	2	1.5	2.0	2.1
180EX(S)	3.6	2	2.3	4.6	3.6	2	1.5	3.1	3.2
240EX(S)	4.3	2	2.3	5	4.3	2	1.5	3.6	3.8
300EX(S)	4.8	2	2.3	6	4.8	2	1.5	4.0	4.2
360EX(S)	5.8	2	2.3	7.2	5.7	2	1.7	6.2	6.5
400EX(S)	6.3	2	2.3	8	6.2	2	1.7	6.9	7.2
450EX(S)	4.87	2.3	2.6	8.6	4.77	2.3	1.9	5.0	5.2
500EX(S)	5.37	2.3	2.6	9.6	5.27	2.3	1.9	5.6	5.8
560EX(S)	5.87	2.3	2.6	10.7	5.77	2.3	1.9	6.2	6.5
600EX(S)	6.4	2.3	2.6	11.5	6.3	2.3	1.9	6.7	7
700EX(S)	7.2	2.3	2.6	13.7	7.1	2.3	1.9	7.7	8
800EX(S)	8.1	2.3	2.6	15.5	8.0	2.3	1.9	8.8	9.2
900EXW(S)	6.8	2.7	2.7	20.2	6.7	2.8	2.0	8.0	8.3
1000EXW(S)	7.4	2.7	2.7	21.6	7.3	2.8	2.0	8.5	8.9
1100EXW(S)	8.1	2.7	2.7	23.4	8.0	2.8	2.0	9.1	9.5
1200EXW3(S)	8.1	2.7	2.9	25.5	8.0	2.8	2.1	10.4	10.8
1300EXW3(S)	8.6	2.7	2.9	27	8.5	2.8	2.1	11.2	11.7
1400EXW3(S)	9.1	2.7	2.9	28.5	9.0	2.8	2.1	12.2	12.7
1500EXW3(S)	9.6	2.7	2.9	29.6	9.5	2.8	2.1	131.	13.7
1600EXW3(S)	10.1	2.7	2.9	30.8	10	2.8	2.1	41.4	15
1000EXW4(S)	6.2	2.7	3.4	21.3	6.1	2.8	2.2	8.6	9
1120EXW4(S)	6.9	2.7	3.4	23.4	6.8	2.8	2.2	9.3	9.7
1250EXW4(S)	7.5	2.7	3.4	25	7.4	2.8	2.2	10.1	10.5
1400EXW4(S)	8.2	2.7	3.4	26.8	8.1	2.8	2.2	10.9	11.4
1500EXW4(S)	8.7	2.7	3.4	28.1	8.6	2.8	2.2	11.8	12.3
1600EXW4(S)	9.2	2.7	3.4	29.5	9.1	2.8	2.2	12.8	13.3
1680EXW4(S)	9.7	2.7	3.4	30.8	9.6	2.8	2.2	13.7	14.3
1800EXW4(S)	10.2	2.7	3.4	32.1	10.1	2.8	2.2	14.9	15.5
1900EXW4(S)	10.7	2.7	3.4	33.4	10.6	2.8	2.2	16.0	16.7
2000EXW4(S)	11.2	2.7	3.4	34.7	11.1	2.8	2.2	17.2	17.9

FIGURE 4 - SPLIT

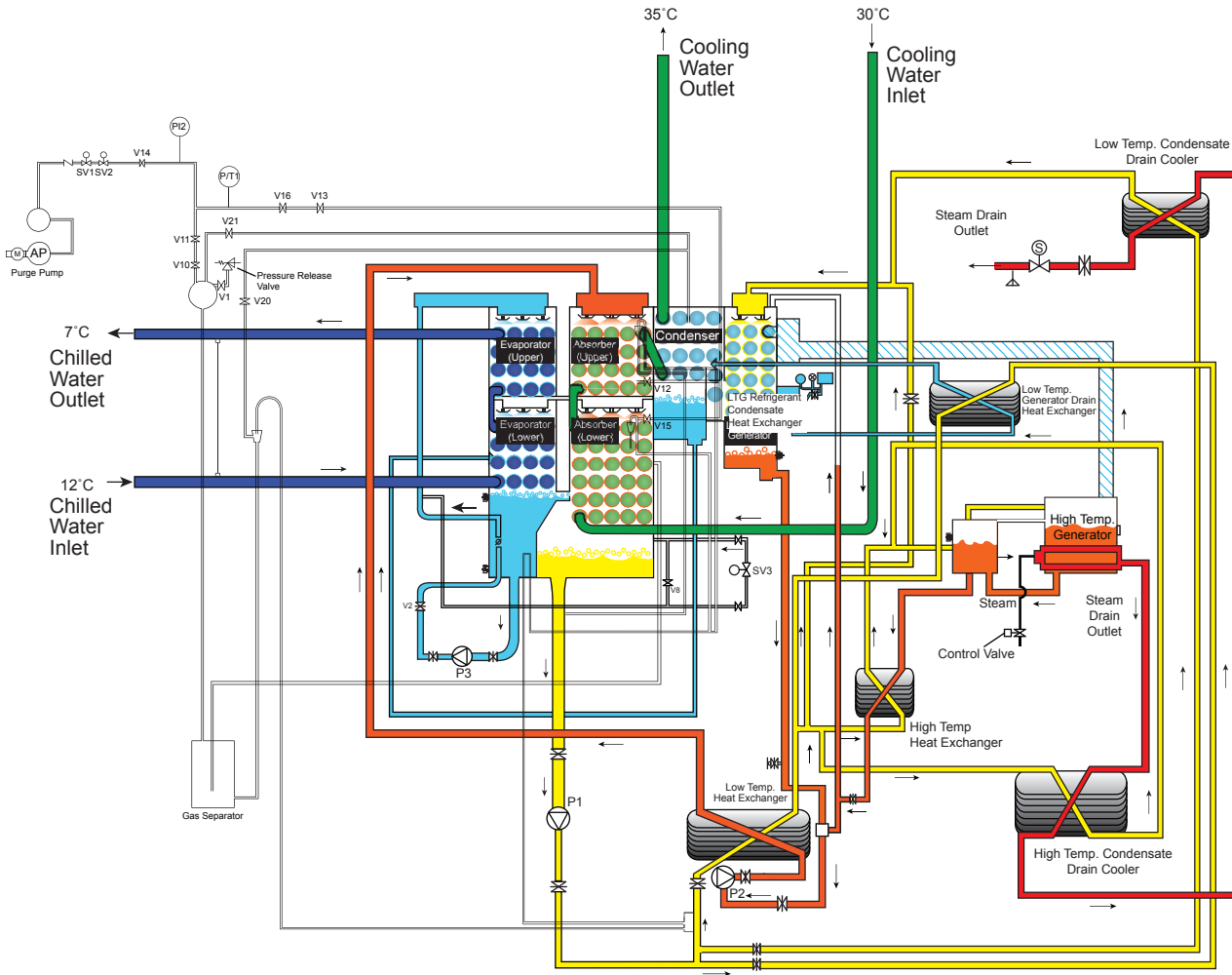
Split Shipment (Cont'd)



LD19925

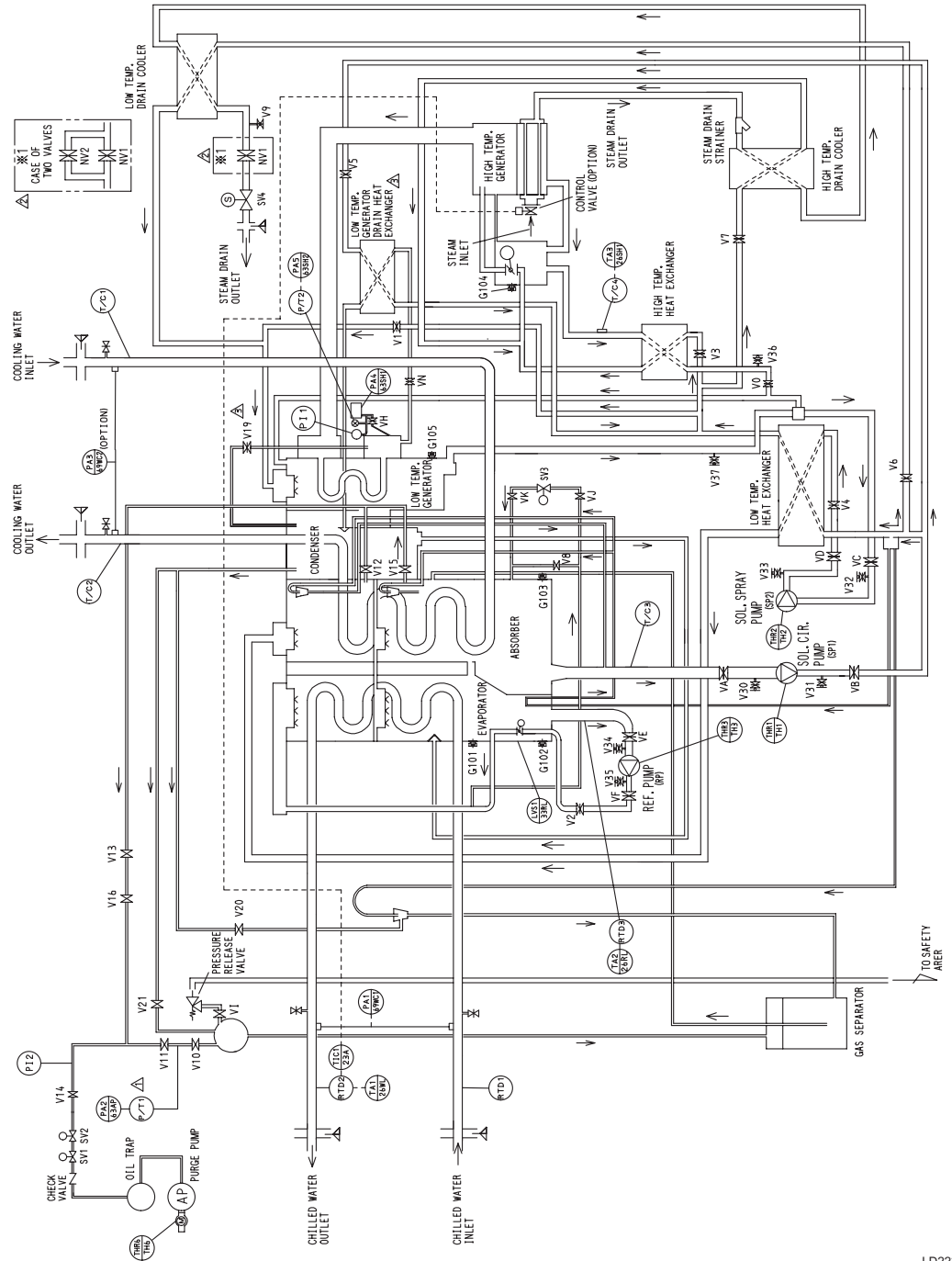
Process and Instrumentation

The following system flow and process and instrumentation diagrams are used for quoting and bidding. Temperatures and pressures on these graphics are representative; actual values may differ.



- Chilled Water
- Cooling Water
- Refrigerant
- Diluted Solution
- Concentrated Solution
- Steam

Process and Instrumentation (Cont'd)



LD22375

Insulation

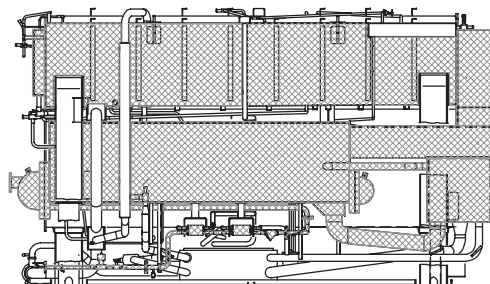
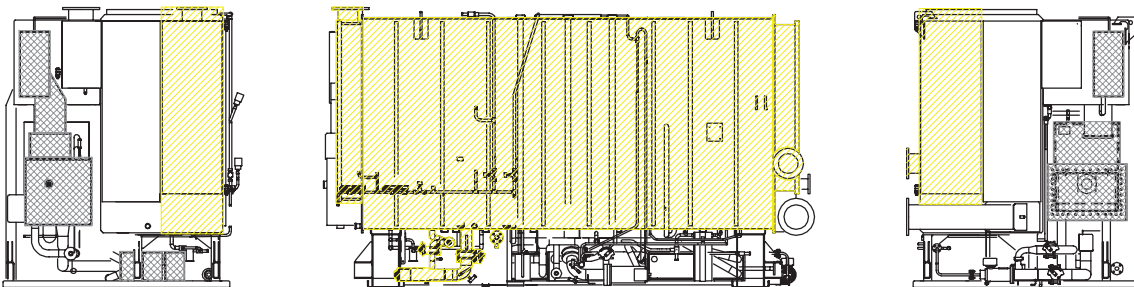
1. The recommended materials and their thickness for hot insulation or cold insulation are shown in *Table 8 on page 34*
2. Use a bonding agent, iron wire, iron band, and so on, to fix the hot insulation/cold insulation material. Never rivet them. The use of welding pins is not permitted.
3. Make the outer covering, flanged parts, and evaporator water chamber casing easily removable to facilitate servicing.
4. The points that require hot insulation or cold insulation are shown in *Table 9 on page 34*
5. The casing of the absorber and the condenser water chamber does not require hot insulation or cold insulation. If insulation is used, make it easy to remove.

TABLE 8 - INSULATING MATERIAL AND THICKNESS

	HOT INSULATION	COLD INSULATION
MATERIAL	Rock wool or glass wool	Polyurethane foam, polystyrene foam, or glass wool
THICKNESS	50 mm	50 mm

TABLE 9 - POINTS REQUIRING HOT OR COLD INSULATION

REQUIRES HOT INSULATION	REQUIRES COLD INSULATION	MUST NOT BE HEAT-INSULATED
High Temperature Generator	Evaporator Shell	Sight Glass
Heat Exchanger for Drain	Evaporator Water Chamber Case	Valve Manipulator
Drain Piping	Refrigerant Spray Piping	
Heat Exchanger	Refrigerant Blow Piping	Pressure Gauge
Low Temperature	Point Carrying Cold Insulation Label	Thermometer Insertion Hole
Point Carrying Hot Insulation Label	Valve for vacuuming (factory use only)	Relay Insertion Hole



LD19977

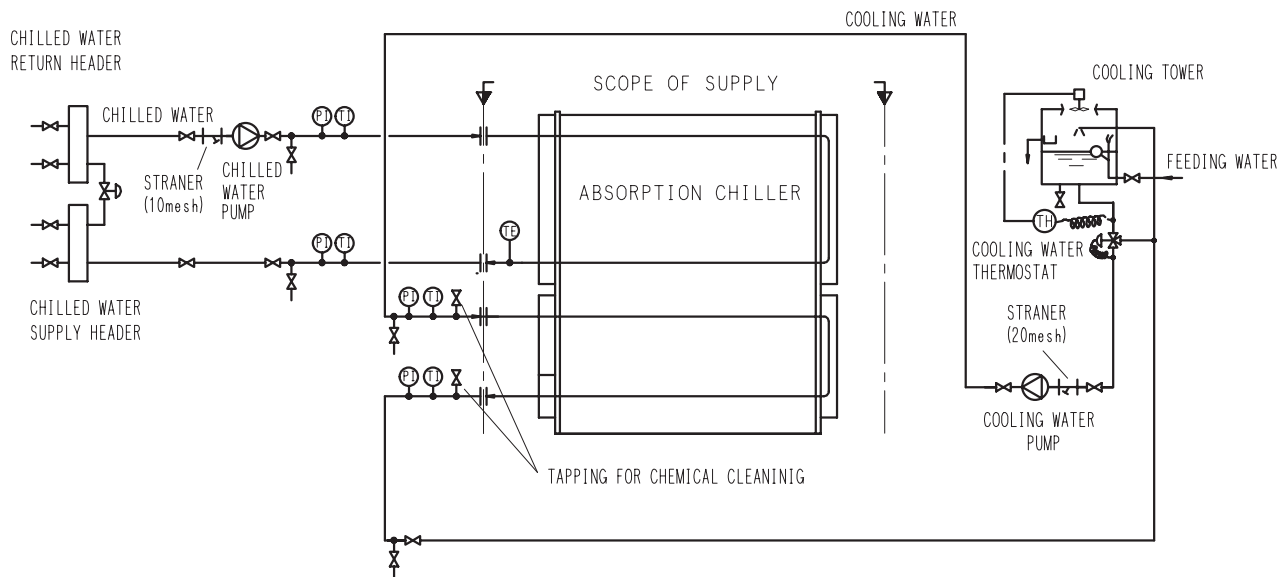
Water Quality

ELEMENT ⁽¹⁾ ⁽⁶⁾		COOLING WATER SYSTEM ⁽⁴⁾			CHILLED WATER SYSTEM		TENDENCY ⁽²⁾	
		CIRCULATING TYPE		NON-CIRCULATING WATER				
		CIRCULATING WATER	REPLENISH WATER	PASSING WATER	CIRCULATING WATER (20 °C OR LOWER)	REPLENISH WATER	CORROSION	SCALE FORMING
STANDARD ITEMS	pH (25 °C)	6.5~8.2	6.0~8.0	6.8~8.0	6.8~8.0	6.8~8.0	○	○
	Electric Conductivity (mS/m) (25 °C) (μS/cm) (25 °C) ⁽¹⁾	Max. 80 (Max. 800)	Max. 30 (Max. 300)	Max. 40 (Max. 400)	Max. 40 (Max. 400)	Max. 30 (Max. 300)	○	○
	Chloride Ion (MGCL ⁻ /L)	Max. 200	Max. 50	Max. 50	Max. 50	Max. 50	○	
	Sulfuric Acid Ion (mgSO ₄ ²⁻ /l)	Max. 200	Max. 50	Max. 50	Max. 50	Max. 50	○	
	Acid Consumption (PH4.8) (mgCaCO ₃ /l)	Max. 100	Max. 50	Max. 50	Max. 50	Max. 50		○
	Total Hardness (mgCaCO ₃ /l)	Max. 200	Max. 70	Max. 70	Max. 70	Max. 70		○
	Calcium Hardness (mgCaCO ₃ /l)	Max. 150	Max. 50	Max. 50	Max. 50	Max. 50		○
	Ionized Silica (mgSiO ₃ /l)	Max. 50	Max. 30	Max. 30	Max. 30	Max. 30		○
REFERENCE ITEMS	Iron (mgFe/l)	Max. 1.0	Max. 0.3	Max. 1.0	Max. 1.0	Max. 0.3	○	○
	Copper (mgCu/l)	Max. 0.3	Max. 0.1	Max. 0.1	Max. 0.1	Max. 0.1	○	
	Sulfurization Ion (mgS ²⁻ /l)	NO IONS ALLOWED					○	
	Ammonium Ion (mgNH ₄ ⁺ /l)	Max. 1.0	Max. 0.1	Max. 1.0	Max. 1.0	Max. 0.1	○	
	Residual Chlorine (mgCl/l)	Max. 0.3	Max. 0.3	Max. 0.3	Max. 0.3	Max. 0.3	○	
	Free Carbonate Acid (mgCO ₂ /l)	Max. 4.0	Max. 4.0	Max. 4.0	Max. 4.0	Max. 4.0	○	
	Stability Index	6.0~7.0	–	–	–	–	○	○

NOTES:

- The item names, their definitions, and units are based on JIS K 0101. Units and figures in braces are those which were used formerly. They are shown here for reference purposes.
- In the "Tendency" column, a white circle (○) indicates that a particular item is a factor in corrosion/scale formation.
- Generally speaking, when the water temperature is high (40 °C or higher), corrosion develops noticeably. Especially when steel material which makes direct contact with water has no protective covering, it is desirable to provide a suitable corrosion-preventive measure, such as adding a corrosion-preventive agent or applying deaeration treatment.
- In a cooling water system using a closed cooling tower, the closed-circuit circulating water and its replenishment water shall meet the quality standards for a hot water system, and the sprinkling water and its replenishment water shall meet the quality standards for a circulation-type cooling water system.
- The supply water and replenishment water shall be tap water, industrial water, or ground water. Demineralized water, neutral water, and softened water are excluded.
- The 15 items shown above are representative factors in corrosion and scale formation.

Chilled and Cooling Water System

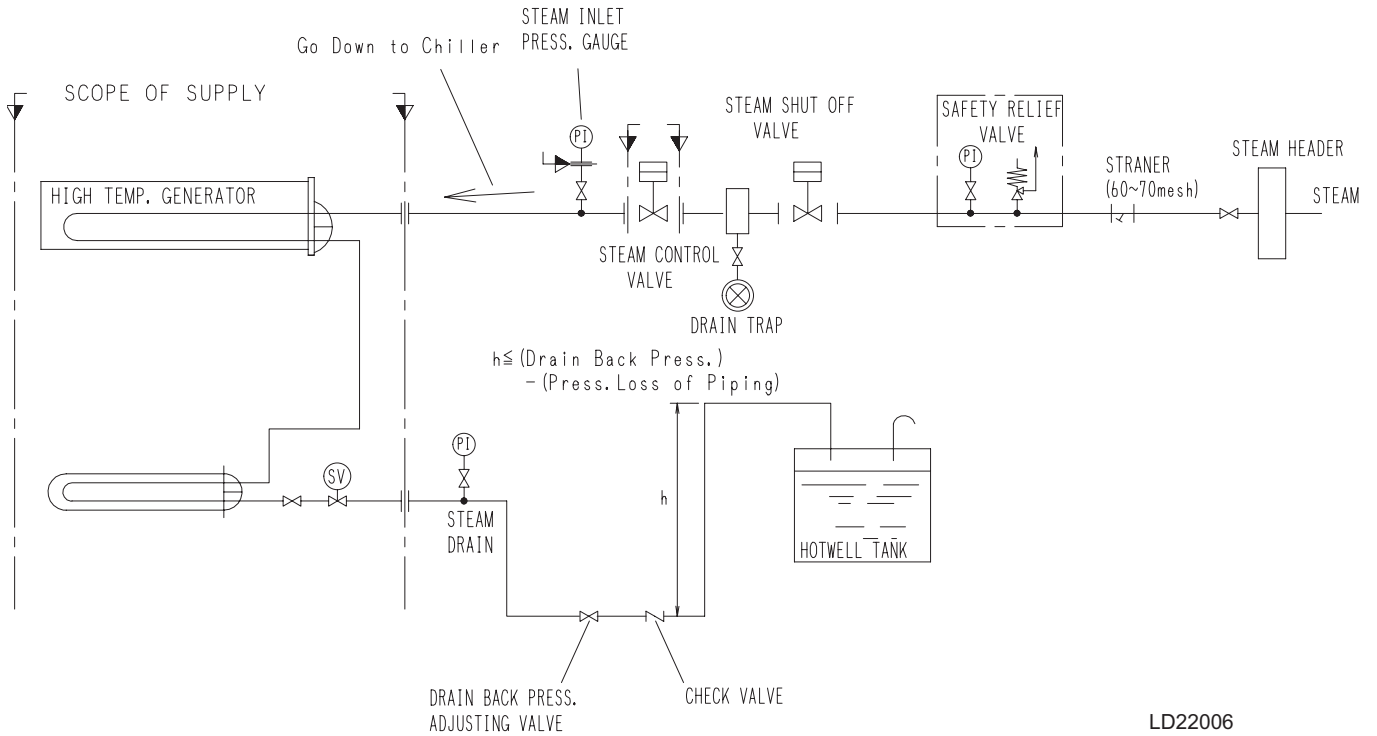


LD22369

FIGURE 5 - CHILLED AND COOLING WATER SYSTEM

Steam and Drain System

OPEN SYSTEM



(EXAMPLE OF CLOSED SYSTEM)

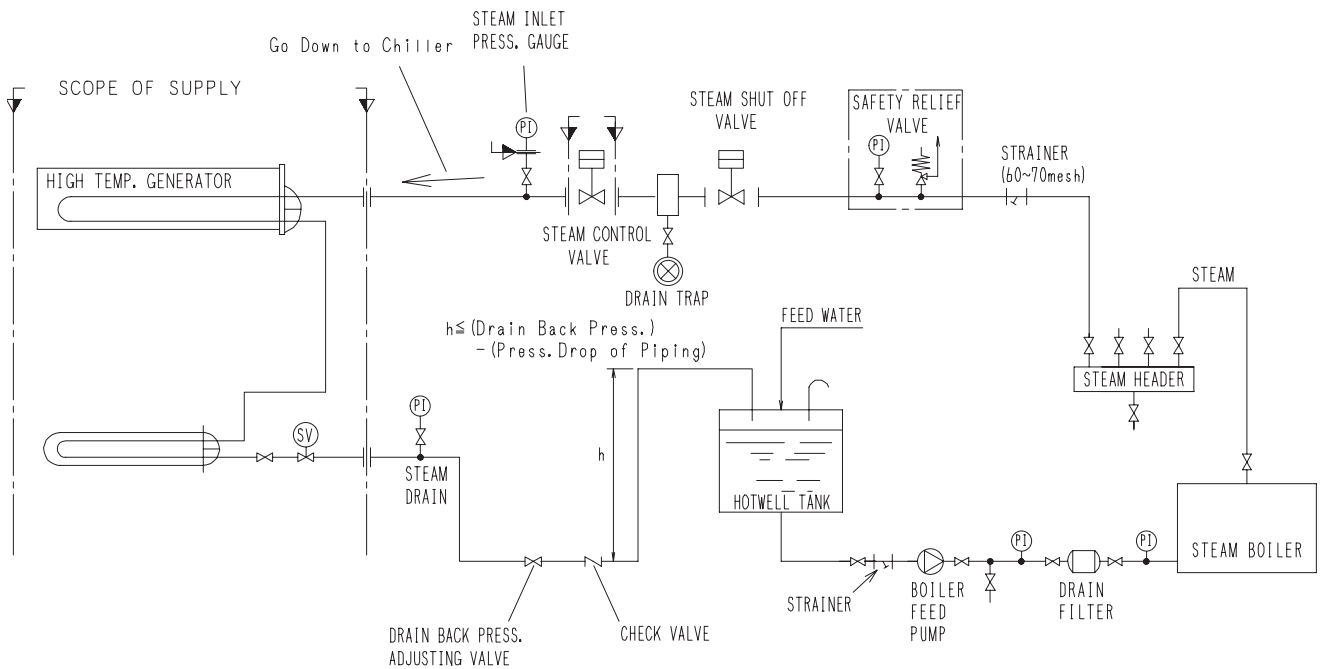
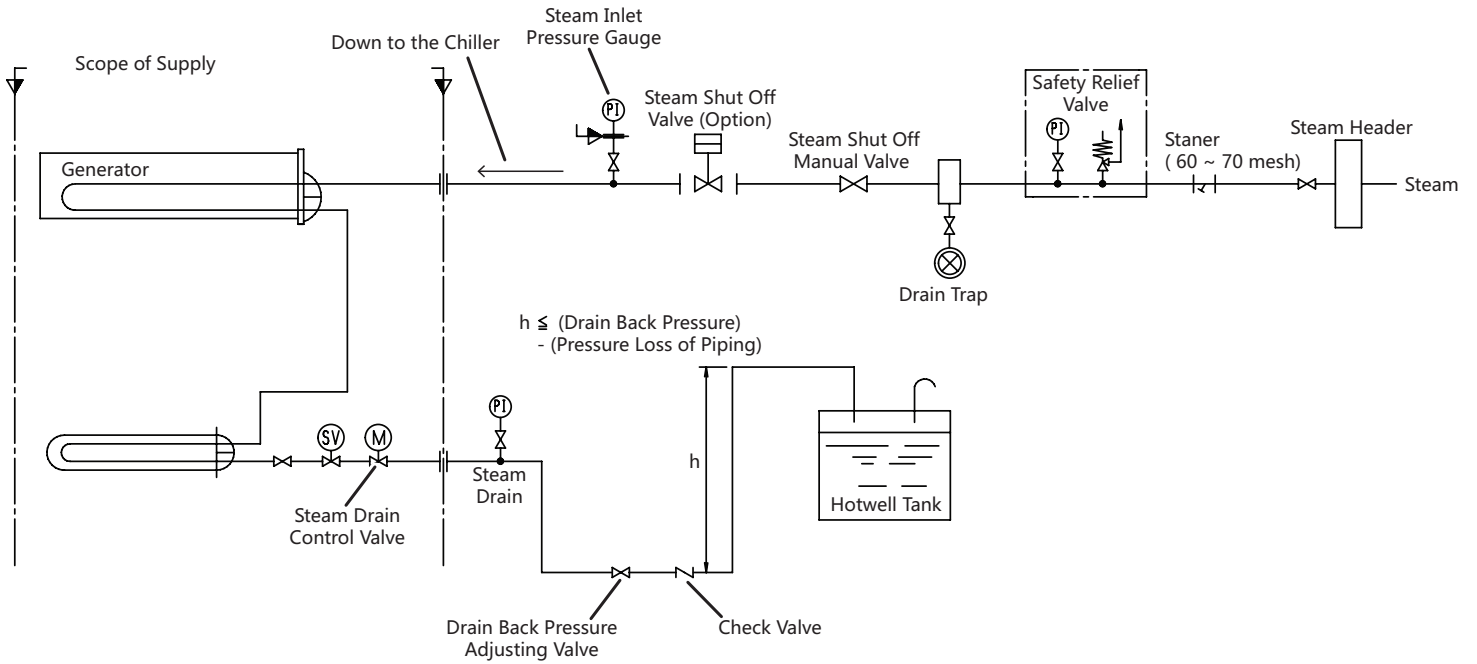


FIGURE 6 - STEAM AND DRAIN SYSTEM (OPEN AND CLOSED EXAMPLE) WITH STEAM CONTROL VALVE

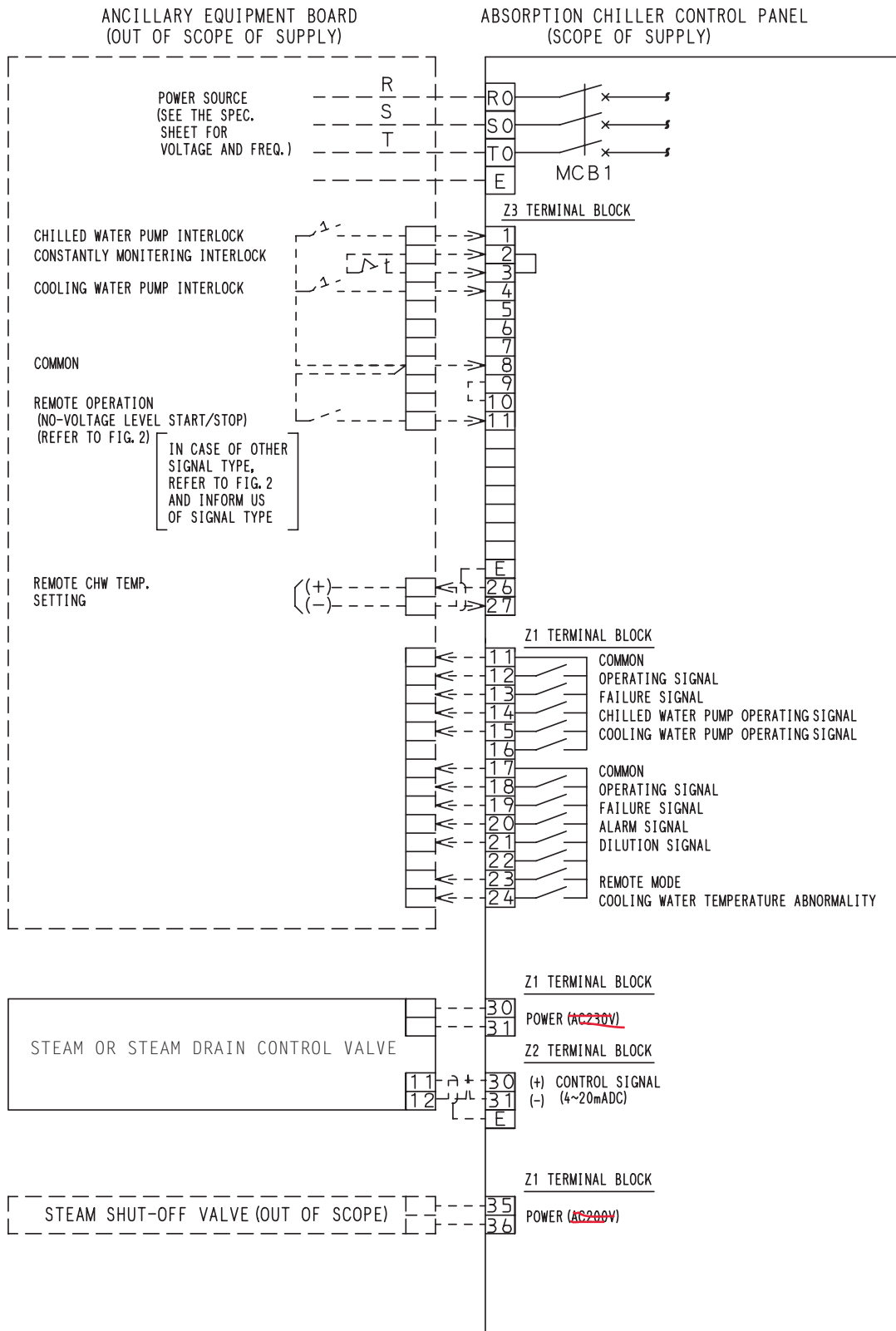
Steam and Drain System



LD27812

FIGURE 7 - STEAM AND DRAIN SYSTEM WITH STEAM DRAIN CONTROL VALVE

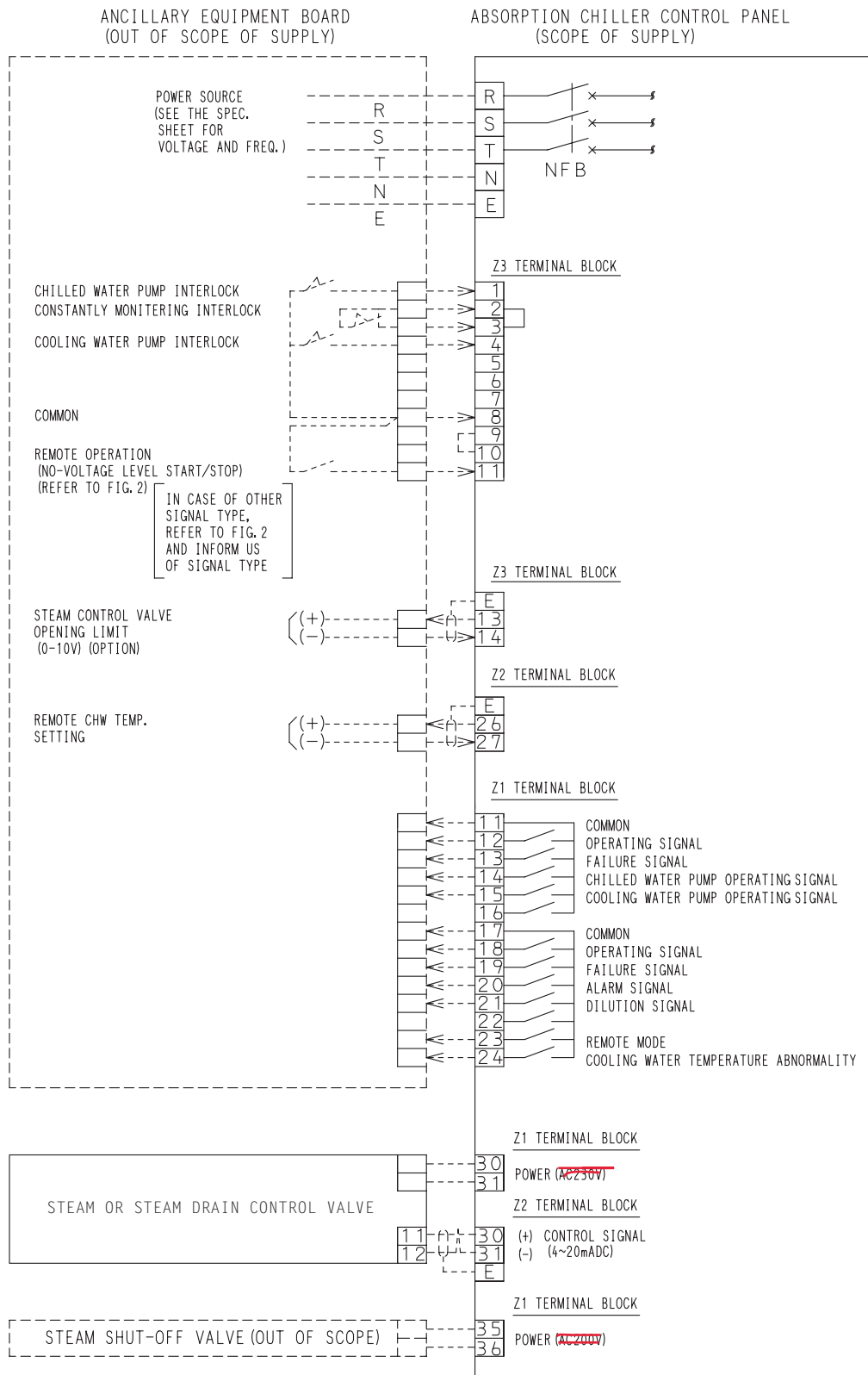
Control Panel for Europe



LD20948

FIGURE 8 - EXTERNAL CONNECTION TERMINAL DETAILS FOR EUROPE

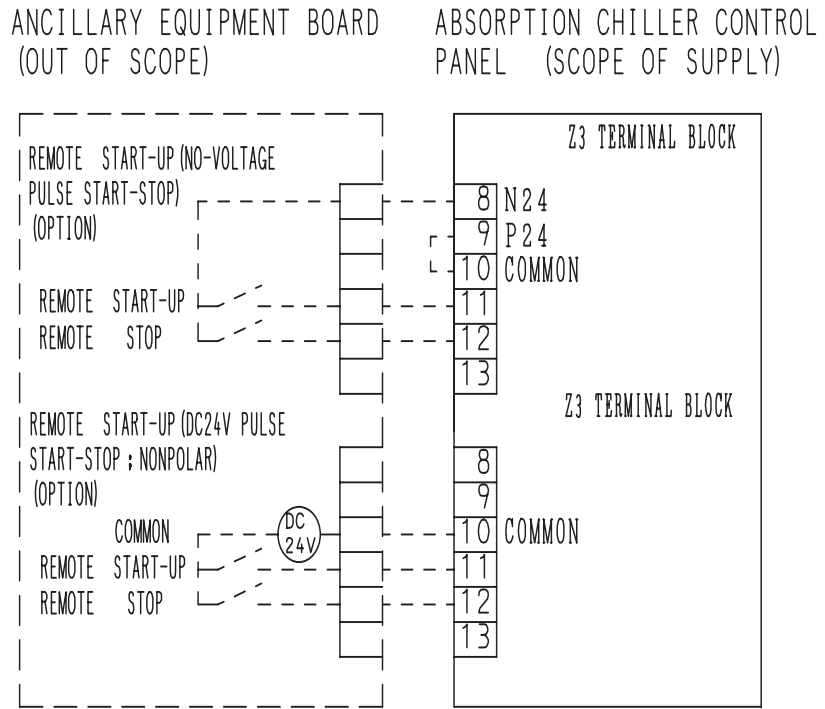
Control Panel for Other Countries



LD22996

FIGURE 9 - EXTERNAL CONNECTION TERMINAL DETAILS FOR OTHER COUNTRIES

Remote Transmission



LD20950

FIGURE 10 - REMOTE TRANSMISSION

Electrical Data

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP				
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA		
150EX(S)	AC200V-3Ph-50Hz	30A	100A	2.2	11.6	48.0	1.1	6.9	25.2		
	AC200V-3Ph-60Hz(JIS)	30A	100A		11.4	40.6		6.2	22.2		
	AC200V-3Ph-60Hz(US)	35A	125A		11.4	40.6		6.2	22.2		
	AC220V-3Ph-60Hz	32A	160A		10.6	44.8		6.1	24.6		
	AC380V-3Ph-50Hz	20A	160A		6.1	23.0		3.4	12.1		
	AC380V-3Ph-60Hz				6.2	19.0		3.2	10.7		
	AC400V-3Ph-50Hz				5.8	24.0		3.45	12.6		
	AC415V-3Ph-50Hz				5.75	24.4		3.6	13.2		
	AC400V-3Ph-60Hz				5.7	20.3		3.1	11.1		
	AC440V-3Ph-60Hz				5.3	22.4		3.05	12.3		
	AC460V-3Ph-60Hz				15A	125A		5.2	24.0	3.0	12.9
AC200V-3Ph-50Hz	40A			100A	11.6	48.0	11.6	48.0			
AC200V-3Ph-60Hz(JIS)	40A			100A	11.4	40.6	11.4	40.6			
AC200V-3Ph-60Hz(US)	45A	125A	11.4	40.6	11.4	40.6					
180EX(S)	AC220V-3Ph-60Hz	40A	100A	2.2	10.6	44.8	2.2	10.6	44.8		
	AC380V-3Ph-50Hz	20A	160A		6.1	23.0		6.1	23.0		
	AC380V-3Ph-60Hz				6.2	19.0		6.2	19.0		
	AC400V-3Ph-50Hz				5.8	24.0		5.8	24.0		
	AC415V-3Ph-50Hz				5.75	24.4		5.75	24.4		
	AC400V-3Ph-60Hz				5.7	20.3		5.7	20.3		
	AC440V-3Ph-60Hz				5.3	22.4		5.3	22.4		
	AC460V-3Ph-60Hz				15A	125A		5.2	24.0	5.2	24.0
	AC200V-3Ph-50Hz				40A	100A		11.6	48.0	11.6	48.0
	AC200V-3Ph-60Hz(JIS)				40A	100A		11.4	40.6	11.4	40.6
AC200V-3Ph-60Hz(US)	45A	125A	11.4	40.6	11.4	40.6					
240EX(S)	AC220V-3Ph-60Hz	40A	100A	2.2	10.6	44.8	2.2	10.6	44.8		
	AC380V-3Ph-50Hz	20A	160A		6.1	23.0		6.1	23.0		
	AC380V-3Ph-60Hz				6.2	19.0		6.2	19.0		
	AC400V-3Ph-50Hz				5.8	24.0		5.8	24.0		
	AC415V-3Ph-50Hz				5.75	24.4		5.75	24.4		
	AC400V-3Ph-60Hz				5.7	20.3		5.7	20.3		
	AC440V-3Ph-60Hz				5.3	22.4		5.3	22.4		
	AC460V-3Ph-60Hz				20A	125A		5.2	24.0	5.2	24.0
	AC200V-3Ph-50Hz				50A	100A		15.6	60.0	11.6	48.0
	AC200V-3Ph-60Hz(JIS)				50A	100A		14.8	53.2	11.4	40.6
AC200V-3Ph-60Hz(US)	50A	125A	14.8	53.2	11.4	40.6					
300EX(S)	AC220V-3Ph-60Hz	50A	100A	3.0	14.4	59.0	2.2	10.6	44.8		
	AC380V-3Ph-50Hz	32A	160A		8.1	29.0		6.1	23.0		
	AC380V-3Ph-60Hz				8.2	23.0		6.2	19.0		
	AC400V-3Ph-50Hz				7.8	30.0		5.8	24.0		
	AC415V-3Ph-50Hz				7.7	31.0		5.75	24.4		
	AC400V-3Ph-60Hz				7.4	26.6		5.7	20.3		
	AC440V-3Ph-60Hz				7.2	29.5		5.3	22.4		
	AC460V-3Ph-60Hz				25A	125A		7.1	31.0	5.2	24.0

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA			
	KW	FLA	LRA	KW	FLA	LRA						
150EX(S)	0.2	2.4	7.0	0.75	3.8	20.6	8.9	7.1	5			
		2.0	6.8		3.4	20.6	8.3	6.6				
		2.0	6.8		3.4	20.6	8.3	6.6				
		2.06	7.6		3.4	20.6	8.7	7.0				
		1.1	3.0		1.8	9.0	8.5	6.8	6			
		1.0	2.5		1.8	9.0	8.3	6.7				
		1.12	3.3		1.8	9.0	8.7	7.0				
		1.14	3.9		1.8	9.0	9.1	7.3				
		1.0	3.4		1.6	9.0	8.2	6.6				
		1.03	3.8		1.6	9.0	8.7	6.9				
		1.05	4.0		1.6	9.0	8.9	7.2	5			
		180EX(S)	0.4		3.3	8.8	0.75	3.8	20.6	10.8	8.6	5
2.8	8.2			3.4	20.6	10.3		8.3				
2.8	8.2			3.4	20.6	10.3		8.3				
2.9	9.0			3.4	20.6	10.8		8.6	6			
1.6	4.2			1.8	9.0	10.6		8.5				
1.4	3.9			1.8	9.0	10.6		8.5				
1.65	4.4			1.8	9.0	10.7		8.6				
1.7	4.7			1.8	9.0	11.1		8.9				
1.4	4.1			1.6	9.0	10.3		8.2				
1.45	4.5			1.6	9.0	10.7		8.6	5			
1.5	4.7			1.6	9.0	11.1		8.8				
3.3	8.8			3.8	20.6	10.8		8.6				
240EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	10.3	8.3	5			
		2.8	8.2		3.4	20.6	10.3	8.3				
		2.9	9.0		3.4	20.6	10.8	8.6				
		1.6	4.2		1.8	9.0	10.6	8.5	6			
		1.4	3.9		1.8	9.0	10.6	8.5				
		1.65	4.4		1.8	9.0	10.7	8.6				
		1.7	4.7		1.8	9.0	11.1	8.9				
		1.4	4.1		1.6	9.0	10.3	8.2				
		1.45	4.5		1.6	9.0	10.7	8.6				
		1.5	4.7		1.6	9.0	11.1	8.8	5			
		300EX(S)	0.4		3.3	8.8	0.75	3.8	20.6	12.2	9.7	5
					2.8	8.2		3.4	20.6	11.5	9.2	
2.8	8.2			3.4	20.6	11.5		9.2				
2.9	9.0			3.4	20.6	12.2		9.8	6			
1.6	4.2			1.8	9.0	11.9		9.5				
1.4	3.9			1.8	9.0	11.9		9.5				
1.65	4.4			1.8	9.0	12.1		9.7				
1.7	4.7			1.8	9.0	12.5		10.0				
1.4	4.1			1.6	9.0	11.5		9.2				
1.45	4.5			1.6	9.0	12.2		9.7	5			
1.5	4.7			1.6	9.0	12.6		10.1				

Electrical Data

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
360EX(S)	AC200V-3Ph-50Hz	50A	100A	3.0	15.6	60.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	50A	100A		14.8	53.2		11.4	40.6
	AC200V-3Ph-60Hz(US)	50A	125A		14.8	53.2		11.4	40.6
	AC220V-3Ph-60Hz	50A	100A		14.4	59.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		8.1	29.0		6.1	23.0
	AC380V-3Ph-60Hz				8.2	23.0		6.2	19.0
	AC400V-3Ph-50Hz				7.8	30.0		5.8	24.0
	AC415V-3Ph-50Hz				7.7	31.0		5.75	24.4
	AC400V-3Ph-60Hz				7.4	26.6		5.7	20.3
	AC440V-3Ph-60Hz				7.2	29.5		5.3	22.4
AC460V-3Ph-60Hz	25A	125A	7.1	31.0	5.2	24.0			
400EX(S)	AC200V-3Ph-50Hz	50A	100A	3.0	15.6	60.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	50A	100A		14.8	53.2		11.4	40.6
	AC200V-3Ph-60Hz(US)	50A	125A		14.8	53.2		11.4	40.6
	AC220V-3Ph-60Hz	50A	100A		14.4	59.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		8.1	29.0		6.1	23.0
	AC380V-3Ph-60Hz				8.2	23.0		6.2	19.0
	AC400V-3Ph-50Hz				7.8	30.0		5.8	24.0
	AC415V-3Ph-50Hz				7.7	31.0		5.75	24.4
	AC400V-3Ph-60Hz				7.4	26.6		5.7	20.3
	AC440V-3Ph-60Hz				7.2	29.5		5.3	22.4
AC460V-3Ph-60Hz	25A	125A	7.1	31.0	5.2	24.0			
450EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.4	40.6
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.4	40.6
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.1	23.0
	AC380V-3Ph-60Hz				14.0	51.0		6.2	19.0
	AC400V-3Ph-50Hz				13.5	63.0		5.8	24.0
	AC415V-3Ph-50Hz				13.0	66.0		5.75	24.4
	AC400V-3Ph-60Hz				12.5	59.0		5.7	20.3
	AC440V-3Ph-60Hz				11.4	65.0		5.3	22.4
AC460V-3Ph-60Hz	30A	125A	11.0	68.0	5.2	24.0			
500EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.4	40.6
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.4	40.6
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.1	23.0
	AC380V-3Ph-60Hz				14.0	51.0		6.2	19.0
	AC400V-3Ph-50Hz				13.5	63.0		5.8	24.0
	AC415V-3Ph-50Hz				13.0	66.0		5.75	24.4
	AC400V-3Ph-60Hz				12.5	59.0		5.7	20.3
	AC440V-3Ph-60Hz				11.4	65.0		5.3	22.4
	30A	125A	11.0	68.0	5.2	24.0			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA			
	KW	FLA	LRA	KW	FLA	LRA						
360EX(S)	0.4	3.3	8.8	0.75	3.8	20.6	12.2	9.7	5			
		2.8	8.2		3.4	20.6	11.5	9.2				
		2.8	8.2		3.4	20.6	11.5	9.2				
		2.9	9.0		3.4	20.6	12.2	9.8	6			
		1.6	4.2		1.8	9.0	11.9	9.5				
		1.4	3.9		1.8	9.0	11.9	9.5				
		1.65	4.4		1.8	9.0	12.1	9.7				
		1.7	4.7		1.8	9.0	12.5	10.0				
		1.4	4.1		1.6	9.0	11.5	9.2				
		1.45	4.5		1.6	9.0	12.2	9.7	5			
		1.5	4.7		1.6	9.0	12.6	10.1				
		3.3	8.8		3.8	20.6	12.2	9.7				
400EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	11.5	9.2	5			
		2.8	8.2		3.4	20.6	11.5	9.2				
		2.9	9.0		3.4	20.6	12.2	9.8				
		1.6	4.2		1.8	9.0	11.9	9.5	6			
		1.4	3.9		1.8	9.0	11.9	9.5				
		1.65	4.4		1.8	9.0	12.1	9.7				
		1.7	4.7		1.8	9.0	12.5	10.0				
		1.4	4.1		1.6	9.0	11.5	9.2				
		1.45	4.5		1.6	9.0	12.2	9.7				
		1.5	4.7		1.6	9.0	12.6	10.1	5			
		450EX(S)	0.4		3.3	8.8	0.75	3.8	20.6	15.8	12.6	5
					2.8	8.2		3.4	20.6	15.1	12.0	
2.8	8.2			3.4	20.6	15.1		12.0				
2.9	9.0			3.4	20.6	15.4		12.3	6			
1.6	4.2			1.8	9.0	15.9		12.7				
1.4	3.9			1.8	9.0	15.7		12.6				
1.65	4.4			1.8	9.0	16.1		12.8				
1.7	4.7			1.8	9.0	16.3		13.0				
1.4	4.1			1.6	9.0	15.0		12.0				
1.45	4.5			1.6	9.0	15.4		12.3	5			
1.5	4.7			1.6	9.0	15.7		12.5				
3.3	8.8			3.8	20.6	15.8		12.6				
500EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	15.1	12.0	5			
		2.8	8.2		3.4	20.6	15.1	12.0				
		2.9	9.0		3.4	20.6	15.4	12.3				
		1.6	4.2		1.8	9.0	15.9	12.7	6			
		1.4	3.9		1.8	9.0	15.7	12.6				
		1.65	4.4		1.8	9.0	16.1	12.8				
		1.7	4.7		1.8	9.0	16.3	13.0				
		1.4	4.1		1.6	9.0	15.0	12.0				
		1.45	4.5		1.6	9.0	15.4	12.3				
		1.5	4.7		1.6	9.0	15.7	12.5	5			

Electrical Data

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
560EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.4	40.6
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.4	40.6
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.1	23.0
	AC380V-3Ph-60Hz				14.0	51.0		6.2	19.0
	AC400V-3Ph-50Hz				13.5	63.0		5.8	24.0
	AC415V-3Ph-50Hz				13.0	66.0		5.75	24.4
	AC400V-3Ph-60Hz				12.5	59.0		5.7	20.3
	AC440V-3Ph-60Hz				11.4	65.0		5.3	22.4
AC460V-3Ph-60Hz	30A	125A	11.0	68.0	5.2	24.0			
600EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.4	40.6
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.4	40.6
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.1	23.0
	AC380V-3Ph-60Hz				14.0	51.0		6.2	19.0
	AC400V-3Ph-50Hz				13.5	63.0		5.8	24.0
	AC415V-3Ph-50Hz				13.0	66.0		5.75	24.4
	AC400V-3Ph-60Hz				12.5	59.0		5.7	20.3
	AC440V-3Ph-60Hz				11.4	65.0		5.3	22.4
AC460V-3Ph-60Hz	30A	125A	11.0	68.0	5.2	24.0			
700EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	11.6	48.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.4	40.6
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.4	40.6
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		10.6	44.8
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.1	23.0
	AC380V-3Ph-60Hz				14.0	51.0		6.2	19.0
	AC400V-3Ph-50Hz				13.5	63.0		5.8	24.0
	AC415V-3Ph-50Hz				13.0	66.0		5.75	24.4
	AC400V-3Ph-60Hz				12.5	59.0		5.7	20.3
	AC440V-3Ph-60Hz				11.4	65.0		5.3	22.4
AC460V-3Ph-60Hz	30A	125A	11.0	68.0	5.2	24.0			
800EX(S)	AC200V-3Ph-50Hz	75A	100A	5.5	26.0	132.0	2.2	12.4	42.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.6	46.0
	AC200V-3Ph-60Hz(US)	70A	125A		25.0	118.0		11.6	46.0
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		11.0	48.0
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.5	20.3
	AC380V-3Ph-60Hz				14.0	51.0		6.3	18.0
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0
	AC415V-3Ph-50Hz				13.0	66.0		6.0	22.0
	AC400V-3Ph-60Hz				12.5	59.0		5.8	23.0
	AC440V-3Ph-60Hz				11.4	65.0		5.5	24.0
AC460V-3Ph-60Hz	30A	125A	11.0	68.0	5.4	24.5			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA
	KW	FLA	LRA	KW	FLA	LRA			
560EX(S)	0.4	3.3	8.8	0.75	3.8	20.6	15.8	12.6	5
		2.8	8.2		3.4	20.6	15.1	12.0	
		2.8	8.2		3.4	20.6	15.1	12.0	
		2.9	9.0		3.4	20.6	15.4	12.3	6
		1.6	4.2		1.8	9.0	15.9	12.7	
		1.4	3.9		1.8	9.0	15.7	12.6	
		1.65	4.4		1.8	9.0	16.1	12.8	
		1.7	4.7		1.8	9.0	16.3	13.0	
		1.4	4.1		1.6	9.0	15.0	12.0	
		1.45	4.5		1.6	9.0	15.4	12.3	5
		1.5	4.7		1.6	9.0	15.7	12.5	
		3.3	8.8		3.8	20.6	15.8	12.6	
600EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	15.1	12.0	5
		2.8	8.2		3.4	20.6	15.1	12.0	
		2.9	9.0		3.4	20.6	15.4	12.3	
		1.6	4.2		1.8	9.0	15.9	12.7	6
		1.4	3.9		1.8	9.0	15.7	12.6	
		1.65	4.4		1.8	9.0	16.1	12.8	
		1.7	4.7		1.8	9.0	16.3	13.0	
		1.4	4.1		1.6	9.0	15.0	12.0	
		1.45	4.5		1.6	9.0	15.4	12.3	
		1.5	4.7		1.6	9.0	15.7	12.5	5
		3.3	8.8		3.8	20.6	15.8	12.6	
		2.8	8.2		3.4	20.6	15.1	12.0	
700EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	15.1	12.0	5
		2.8	8.2		3.4	20.6	15.1	12.0	
		2.9	9.0		3.4	20.6	15.4	12.3	
		1.6	4.2		1.8	9.0	15.9	12.7	6
		1.4	3.9		1.8	9.0	15.7	12.6	
		1.65	4.4		1.8	9.0	16.1	12.8	
		1.7	4.7		1.8	9.0	16.3	13.0	
		1.4	4.1		1.6	9.0	15.0	12.0	
		1.45	4.5		1.6	9.0	15.4	12.3	
		1.5	4.7		1.6	9.0	15.7	12.5	5
		3.3	8.8		3.8	20.6	16.1	12.8	
		2.8	8.2		3.4	20.6	15.1	12.1	
800EX(S)	0.4	2.8	8.2	0.75	3.4	20.6	15.1	12.1	5
		2.8	8.2		3.4	20.6	15.1	12.1	
		2.9	9.0		3.4	20.6	15.6	12.5	
		1.6	4.2		1.8	9.0	16.2	12.9	6
		1.4	3.9		1.8	9.0	15.8	12.6	
		1.65	4.4		1.8	9.0	16.3	13.1	
		1.7	4.7		1.8	9.0	16.5	13.2	
		1.4	4.1		1.6	9.0	15.1	12.0	
		1.45	4.5		1.6	9.0	15.5	12.4	
		1.5	4.7		1.6	9.0	15.8	12.7	5

Electrical Data

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
900 EXW(S)	AC200V-3Ph-50Hz	75A	100A	5,5	26.0	132.0	2.2	12.4	42.0
	AC200V-3Ph-60Hz(JIS)	75A	100A		25.0	118.0		11.6	46.0
	AC200V-3Ph-60Hz(US)	80A	125A		25.0	118.0		11.6	46.0
	AC220V-3Ph-60Hz	75A	100A		22.8	130.0		11.0	48.0
	AC380V-3Ph-50Hz	32A	160A		14.2	60.0		6.5	20.3
	AC380V-3Ph-60Hz				14.0	51.0		6.3	18.0
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0
	AC415V-3Ph-50Hz				13.0	66.0		6.0	22.0
	AC400V-3Ph-60Hz				12.5	59.0		5.8	23.0
	AC440V-3Ph-60Hz				11.4	65.0		5.5	24.0
AC460V-3Ph-60Hz	35A	125A	11.0	68.0	5.4	24.5			
1000 EXW(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	2.2	12.4	42.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		11.6	46.0
	AC200V-3Ph-60Hz(US)	100A	125A		36.0	134.0		11.6	46.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		11.0	48.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		6.5	20.3
	AC380V-3Ph-60Hz				19.3	60.0		6.3	18.0
	AC400V-3Ph-50Hz				19.2	72.0		6.2	21.0
	AC415V-3Ph-50Hz				18.6	73.5		6.0	22.0
	AC400V-3Ph-60Hz				18.0	67.0		5.8	23.0
	AC440V-3Ph-60Hz				17.0	73.0		5.5	24.0
AC460V-3Ph-60Hz	45A	125A	16.5	76.0	5.4	24.5			
1100 EXW(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1200 EXW3(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA		
	KW	FLA	LRA	KW	FLA	LRA					
900 EXW(S)	1.3	7.6	25.6	0.75	3.8	20.6	17.6	14.0	5		
		7.2	25.0		3.4	20.6	16.7	13.3			
		7.2	25.0		3.4	20.6	16.7	13.3			
		7.0	26.0		3.4	20.6	17.1	13.7	6		
		3.9	11.9		1.8	9.0	17.7	14.1			
		3.7	10.7		1.8	9.0	17.3	13.8			
		3.8	12.8		1.8	9.0	17.8	14.3			
		3.7	13.2		1.8	9.0	17.9	14.3			
		3.6	12.5		1.6	9.0	16.6	13.3			
		3.5	13.0		1.6	9.0	17.1	13.7	5		
		3.4	14.0		1.6	9.0	17.4	13.9			
		7.6	25.6		0.75	3.8	20.6	21.8		17.5	5
		7.2	25.0			3.4	20.6	20.5		16.4	
7.2	25.0	3.4	20.6	20.5		16.4					
7.0	26.0	3.4	20.6	21.4		17.1	6				
3.9	11.9	1.8	9.0	21.4		17.1					
3.7	10.7	1.8	9.0	20.8		16.6					
3.8	12.8	1.8	9.0	21.8		17.4					
3.7	13.2	1.8	9.0	21.9		17.5					
3.6	12.5	1.6	9.0	20.4		16.3					
3.5	13.0	1.6	9.0	21.3		17.1	5				
3.4	14.0	1.6	9.0	21.7		17.4					
9.0	26.0	0.75	3.8	20.6		25.0		20.0	5		
8.4	24.0		3.4	20.6		23.4		18.8			
8.4	24.0		3.4	20.6	23.4	18.8					
8.0	26.4		3.4	20.6	24.5	19.6	6				
4.7	12.5		1.8	9.0	24.6	19.7					
4.9	9.0		1.8	9.0	24.2	19.4					
4.5	13.0		1.8	9.0	25.0	20.0					
4.4	13.5		1.8	9.0	25.2	20.1					
4.2	12.0		1.6	9.0	23.4	18.7					
4.0	13.2		1.6	9.0	24.4	19.5	5				
3.9	13.8		1.6	9.0	24.8	19.9					
9.0	26.0		0.75	3.8	20.6	25.0		20.0	5		
8.4	24.0			3.4	20.6	23.4		18.8			
8.4	24.0	3.4		20.6	23.4	18.8					
8.0	26.4	3.4		20.6	24.5	19.6	6				
4.7	12.5	1.8		9.0	24.6	19.7					
4.9	9.0	1.8		9.0	24.2	19.4					
4.5	13.0	1.8		9.0	25.0	20.0					
4.4	13.5	1.8		9.0	25.2	20.1					
4.2	12.0	1.6		9.0	23.4	18.7					
4.0	13.2	1.6		9.0	24.4	19.5	5				
3.9	13.8	1.6		9.0	24.8	19.9					

Electrical Data

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
1400 EXW3(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1500 EXW3(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1600 EXW3(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1000EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA
	KW	FLA	LRA	KW	FLA	LRA			
1400 EXW3(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
		9.0	26.0		3.8	20.6	25.0	20.0	
1500 EXW3(S)	1.5	8.4	24.0	0.75	3.4	20.6	23.4	18.8	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	
		4.7	12.5		1.8	9.0	24.6	19.7	6
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	
		3.9	13.8		1.6	9.0	24.8	19.9	
		9.0	26.0		3.8	20.6	25.0	20.0	
		1600 EXW3(S)	1.5		8.4	24.0	0.75	3.4	20.6
8.4	24.0			3.4	20.6	23.4		18.8	
8.0	26.4			3.4	20.6	24.5		19.6	
4.7	12.5			1.8	9.0	24.6		19.7	6
4.9	9.0			1.8	9.0	24.2		19.4	
4.5	13.0			1.8	9.0	25.0		20.0	
4.4	13.5			1.8	9.0	25.2		20.1	
4.2	12.0			1.6	9.0	23.4		18.7	
4.0	13.2			1.6	9.0	24.4		19.5	
3.9	13.8			1.6	9.0	24.8		19.9	
9.0	26.0			3.8	20.6	25.0		20.0	
1000EXW4(S)	1.5			8.4	24.0	0.75		3.4	20.6
		8.4	24.0	3.4	20.6		23.4	18.8	
		8.0	26.4	3.4	20.6		24.5	19.6	
		4.7	12.5	1.8	9.0		24.6	19.7	6
		4.9	9.0	1.8	9.0		24.2	19.4	
		4.5	13.0	1.8	9.0		25.0	20.0	
		4.4	13.5	1.8	9.0		25.2	20.1	
		4.2	12.0	1.6	9.0		23.4	18.7	
		4.0	13.2	1.6	9.0		24.4	19.5	
		3.9	13.8	1.6	9.0		24.8	19.9	
		9.0	26.0	3.8	20.6		25.0	20.0	

Electrical Data (Cont'd)

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
1120EXW(S) 1120EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1250EXW(S) 1250EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1400EXW(S) 1400EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1500EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA
	KW	FLA	LRA	KW	FLA	LRA			
1120EXW(S) 1120EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
1250EXW(S) 1250EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
1400EXW(S) 1400EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
1500EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	

Electrical Data (Cont'd)

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
1600EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1680EXW4(S)	AC200V-3Ph-50Hz	100A	100A	7.5	38.4	144.0	3.7	20.2	72.0
	AC200V-3Ph-60Hz(JIS)	100A	100A		36.0	134.0		19.0	70.0
	AC200V-3Ph-60Hz(US)	110A	125A		36.0	134.0		19.0	70.0
	AC220V-3Ph-60Hz	100A	100A		34.0	146.0		18.0	74.0
	AC380V-3Ph-50Hz	50A	160A		19.8	68.6		10.6	34.0
	AC380V-3Ph-60Hz				19.3	60.0		10.3	30.0
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0
	AC415V-3Ph-50Hz				18.6	73.5		9.8	37.0
	AC400V-3Ph-60Hz				18.0	67.0		9.5	35.0
	AC440V-3Ph-60Hz				17.0	73.0		9.0	37.0
AC460V-3Ph-60Hz	50A	125A	16.5	76.0	8.8	38.0			
1800EXW4(S)	AC200V-3Ph-50Hz	150A	225A	11.0	52.6	208.0	7.5	38.4	144.0
	AC200V-3Ph-60Hz(JIS)	150A	225A		52.0	180.0		36.0	134.0
	AC200V-3Ph-60Hz(US)	150A	225A		52.0	180.0		36.0	134.0
	AC220V-3Ph-60Hz	150A	225A		47.6	197.2		34.0	146.0
	AC380V-3Ph-50Hz	80A	160A		27.5	99.1		19.8	68.6
	AC380V-3Ph-60Hz				27.2	89.0		19.3	60.0
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0
	AC415V-3Ph-50Hz				25.5	108.0		18.6	73.5
	AC400V-3Ph-60Hz				26.0	90.0		18.0	67.0
	AC440V-3Ph-60Hz				23.8	98.6		17.0	73.0
AC460V-3Ph-60Hz	70A	125A	23.0	103.0	16.5	76.0			
1900EXW4(S)	AC200V-3Ph-50Hz	150A	225A	11.0	52.6	208.0	7.5	38.4	144.0
	AC200V-3Ph-60Hz(JIS)	150A	225A		52.6	208.0		38.4	144.0
	AC200V-3Ph-60Hz(US)	150A	225A		52.0	180.0		36.0	134.0
	AC220V-3Ph-60Hz	150A	225A		47.6	197.2		34.0	146.0
	AC380V-3Ph-50Hz	80A	160A		27.5	99.1		19.8	68.6
	AC380V-3Ph-60Hz				27.2	89.0		19.3	60.0
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0
	AC415V-3Ph-50Hz				25.5	108.0		18.6	73.5
	AC400V-3Ph-60Hz				26.0	90.0		18.0	67.0
	AC440V-3Ph-60Hz				23.8	98.6		17.0	73.0
AC460V-3Ph-60Hz	70A	125A	23.0	103.0	16.5	76.0			

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA
	KW	FLA	LRA	KW	FLA	LRA			
1600EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
1680EXW4(S)	1.5	9.0	26.0	0.75	3.8	20.6	25.0	20.0	5
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.4	24.0		3.4	20.6	23.4	18.8	
		8.0	26.4		3.4	20.6	24.5	19.6	6
		4.7	12.5		1.8	9.0	24.6	19.7	
		4.9	9.0		1.8	9.0	24.2	19.4	
		4.5	13.0		1.8	9.0	25.0	20.0	
		4.4	13.5		1.8	9.0	25.2	20.1	
		4.2	12.0		1.6	9.0	23.4	18.7	
		4.0	13.2		1.6	9.0	24.4	19.5	5
		3.9	13.8		1.6	9.0	24.8	19.9	
1800EXW4(S)	2.2	12.4	42.0	0.75	3.8	20.6	37.4	29.9	5
		11.6	46.0		3.4	20.6	36.0	28.8	
		11.6	46.0		3.4	20.6	36.0	28.8	
		11.0	48.0		3.4	20.6	36.9	29.5	6
		6.5	20.3		1.8	9.0	36.9	29.5	
		6.3	18.0		1.8	9.0	36.2	29.0	
		6.2	21.0		1.8	9.0	37.4	29.9	
		6.0	22.0		1.8	9.0	37.6	30.1	
		5.8	23.0		1.6	9.0	35.9	28.7	
		5.5	24.0		1.6	9.0	36.8	29.4	5
		5.4	24.5		1.6	9.0	37.3	29.9	
1900EXW4(S)	2.2	12.4	42.0	0.75	3.8	20.6	37.4	29.9	5
		12.4	42.0		3.8	20.6	37.4	29.9	
		11.6	46.0		3.4	20.6	36.0	28.8	
		11.0	48.0		3.4	20.6	36.9	29.5	6
		6.5	20.3		1.8	9.0	36.9	29.5	
		6.3	18.0		1.8	9.0	36.2	29.0	
		6.2	21.0		1.8	9.0	37.4	29.9	
		6.0	22.0		1.8	9.0	37.6	30.1	
		5.8	23.0		1.6	9.0	35.9	28.7	
		5.5	24.0		1.6	9.0	36.8	29.4	5
		5.4	24.5		1.6	9.0	37.3	29.9	

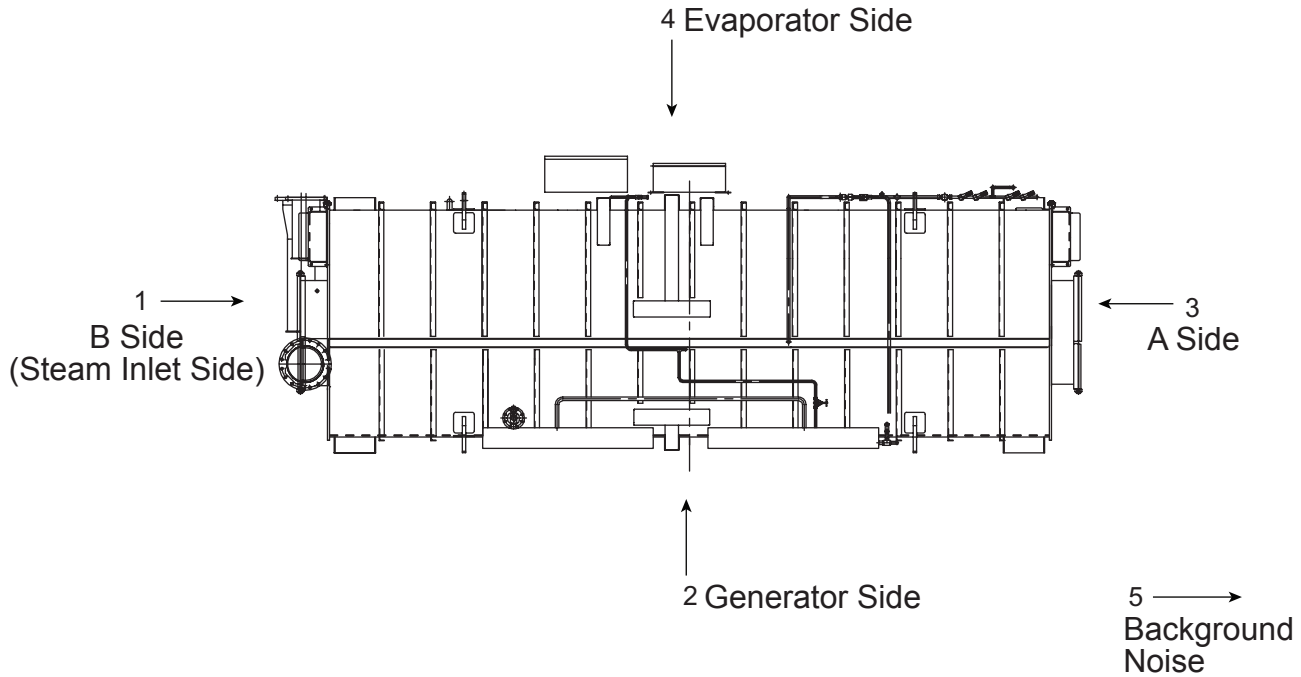
Electrical Data (Cont'd)

YHAU-CW(L)	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP		
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA
2000EXW4(S)	AC200V-3Ph-50Hz	150A	225A	11.0	52.6	208.0	7.5	38.4	144.0
	AC200V-3Ph-60Hz(JIS)	150A	225A		52.0	180.0		36.0	134.0
	AC200V-3Ph-60Hz(US)	150A	225A		52.0	180.0		36.0	134.0
	AC220V-3Ph-60Hz	150A	225A		47.6	197.2		34.0	146.0
	AC380V-3Ph-50Hz	80A	160A		27.5	99.1		19.8	68.6
	AC380V-3Ph-60Hz				27.2	89.0		19.3	60.0
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0
	AC415V-3Ph-50Hz				25.5	108.0		18.6	73.5
	AC400V-3Ph-60Hz				26.0	90.0		18.0	67.0
	AC440V-3Ph-60Hz				23.8	98.6		17.0	73.0
	AC460V-3Ph-60Hz	70A	125A		23.0	103.0		16.5	76.0

Electrical Data (Cont'd)

YHAU-CW(L)	REFRIGERANT PUMP			VACUUM PUMP			CAPACITY KVA	CONSUMPTION KW	SCCR KA
	KW	FLA	LRA	KW	FLA	LRA			
2000EXW4(S)	2.2	12.4	42.0	0.75	3.8	20.6	37.4	29.9	5
		11.6	46.0		3.4	20.6	36.0	28.8	
		11.6	46.0		3.4	20.6	36.0	28.8	
		11.0	48.0		3.4	20.6	36.9	29.5	6
		6.5	20.3		1.8	9.0	36.9	29.5	
		6.3	18.0		1.8	9.0	36.2	29.0	
		6.2	21.0		1.8	9.0	37.4	29.9	
		6.0	22.0		1.8	9.0	37.6	30.1	
		5.8	23.0		1.6	9.0	35.9	28.7	
		5.5	24.0		1.6	9.0	36.8	29.4	
		5.4	24.5		1.6	9.0	37.3	29.9	5

Sound Data



LD19976

LOCATION*	OVERALL	OCTAVE BAND									
		31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	16 kHz
1	80 / 83	37 / 76	48 / 74	57 / 73	64 / 73	69 / 72	73 / 73	75 / 74	75 / 74	70 / 71	56 / 63
2	77 / 83	40 / 79	49 / 75	56 / 72	62 / 71	68 / 71	70 / 70	71 / 70	70 / 69	70 / 71	53 / 60
3	75 / 83	41 / 80	49 / 75	59 / 75	62 / 71	65 / 68	69 / 69	71 / 70	67 / 66	58 / 59	44 / 51
4	78 / 84	40 / 79	50 / 76	61 / 77	64 / 73	71 / 74	71 / 71	74 / 73	71 / 70	65 / 66	50 / 57
5	64 / 80	37 / 76	44 / 70	60 / 76	56 / 65	54 / 57	57 / 57	56 / 55	50 / 49	36 / 37	26 / 33

* Position of Measuring instrument
 Height:1.5 m, Horizon:1.0 m (from chiller surface)

NOTE: These data are reference value, as the chiller unit was not covered with the thermal insulation materials and the water pipes (for chilled water, cooling water, and steam) were temporary during the measurement.

Guide Specifications

GENERAL

Provide double effect steam-fired absorption chiller(s) capable of producing chilled water per the capacities shown on drawings and schedules.

Each chiller are of hermetic design and factory helium leak-tested.

The chiller shall ship as a one-piece assembly charged with nitrogen and without solution and refrigerant water charging. The steam control valve is shipped loose for field installation. Alternatively, the steam drain control valve is mounted on the chiller before delivery. All unit mounted controls and control panels are factory mounted, wired, tested, and shipped pre-installed as integral components of the chiller.

Purchase price shall include start-up service and parts and labor warranty for a period of one year from start-up or eighteen months from delivery, whichever occurs first.

BASE UNIT INCLUDES:

- Absorber, evaporator and condenser
- DIN flanges for Europe, GB flanges for the other countries. (Mating flanges are not included)
- High temperature generator and low temperature generator
- High temperature solution heat exchanger and low temperature solution heat exchanger
- High temperature steam drain cooler and low temperature steam drain cooler
- LTG refrigerant condensate heat exchanger
- Hermetic solution circulation pump, solution spray pump and refrigerant pump
- ~~Pump isolation valves~~
- Compact 10 bar(g) waterboxes for chilled water
- Compact 10 bar(g) for cooling water for models up to CW300EX(S)
- Marine type 10 bar(g) for cooling water for models CW360EX(S) or above
- YORK Caribbean blue paint (Munsell 4.65G 4.50/2.85)
- Epoxy paint inside chilled waterboxes and cooling waterboxes
- Control panel
- Power supply 3 phase/380 V or 400 V/50 Hz 3 wires (Europe), 4 wires for other countries.
- Pressure release valve for over pressure relief 0.8 bar(g)
- Chilled water pressure differential switch
- Compound gauge
- Automatic purge system including purge pump
- 4-20 mA remote temperature reset control for chilled water
- CE marking for Europe
- PED CE European pressure vessel code for Europe, GB pressure vessel code for other countries.

Guide Specifications (Cont'd)

- LiBr (lithium bromide + lithium molybdate inhibitor)
- Deionized water refrigerant
- 2-ethyl hexyl alcohol
- Modbus / RTU / TCP
- Factory end of line function test
- Initial startup
- **Steam control valve** for CW model or steam drain control valve for CWN and CWL models
- Steam drain solenoid valve
- Dry shipment

BASE UNIT DOES NOT INCLUDE:

- Steam shut-off valve (option)
- Cold surface insulation (option)
- Hot surface insulation
- Cooling water pressure differential switch (option)
- Field reassembly of split shipped units
- Factory performance test (option)

CONSTRUCTION

The chiller shall consist of a high temperature generator, a low temperature generator, a high temperature solution heat exchanger, a low temperature solution heat exchanger, a high temperature drain cooler, a low temperature cooler, and an absorber, evaporator and condenser. To minimize the risk of corrosion, the evaporator dispersion tray and the absorber dispersion tray are of stainless steel. Each dispersion tray has two step construction. Any foreign material are removed from lithium bromide solution or the refrigerant at the first stage tray to avoid degradation of dispersion performance by clogging.

The evaporator, absorber, condenser, low temperature generator and high temperature generator are of shell and tube construction. The high temperature generator water box is designed for 10 bar(g) and tested to 14.5 bar(g) for Europe according to PED requirement, 13bar(g) for the other countries according to the GB pressure vessel requirement. A shell-side pressure releasing valve is furnished and set to blow at 0.8 bar(g).

The evaporator cycle and the absorber cycle shall consist of two steps (upper stage and lower stage). This technology makes absorber solution concentration weak and makes the high temperature generator solution temperature lower than the ordinary machine, which enables it to extend the machine life.

The low temperature generator is a falling liquid film design.

Five plate type solution heat exchangers (high temperature solution heat exchanger, low temperature solution heat exchanger and high temperature steam drain cooler and low temperature steam drain coolers, and LTG refrigerant condensate heat exchanger) are equipped to achieve higher efficiency.

Guide Specifications (Cont'd)

Lithium bromide solution flow type are a parallel flow cycle. The flow of weak solution pumped from the absorber shall initially pass through the low temperature solution heat exchanger to improve operating efficiency by preheating and is divided into two paths and one shall lead to the high temperature generator through the high temperature solution heat exchanger and the other shall lead to the low temperature generator in parallel

The unit is hermetically tight and built to very stringent standards. It operates under a better vacuum, which improves performance and reliability ensuring design performance to GB/T 18431-2014. Standard (2.03×10^{-6} Pa·m³/s).

TUBE MATERIALS

The high temperature generator tubes are 0.8 mm wall thickness stainless steel (SS22053). Low temperature generator tubes are made of 0.6 mm wall stainless steel (SUS436LTB). The evaporator and absorber tubes are Low Residual Phosphorus Deoxidized Copper (C1201) finned type and wall thickness before finning is 0.6 mm. Condenser tubes are bare type and made of 0.6 mm wall low residual phosphorus deoxidized copper (C1201).

WATERBOXES

The waterboxes are removable to permit tube cleaning and replacement whereas absorber and condenser waterboxes for CW360EX(S) model or a marine type. Water circuit tubing to be replaceable from either end of the absorption unit. The high temperature generator waterbox is designed for 10 bar(g) and tested to 14.5 bar(g) for Europe according to PED requirement, 13bar(g) for the other countries according to the GB pressure vessel requirement. All waterboxes and associated water circuit nozzles and tube bundles are designed for 10 bar(g) and water tested to 12.5 bar(g). Vent and drain connections are provided on each waterbox. All the water connections are equipped with DIN flanges for Europe, GB flanges for other countries. Mating flanges are not included. Inside of the waterboxes and waterbox covers are coated with epoxy paint.

AUTOMATIC CRYSTALLIZATION PREVENTION SYSTEM

Chiller shall have an automatic anti-crystallization system. The absorber and the evaporator are located side by side in a same shell and separated by the eliminator. When the concentration rate of lithium bromide in the chiller goes up, the water level at the evaporator increases and automatically spills over to the absorber and the concentration rate of the solution at the absorber goes down.

PUMPS

Solution pump, solution spray pump and refrigerant pumps are hermetically sealed, self-lubricating, totally enclosed, factory-mounted, wired and tested. Motor windings shall not be exposed to lithium bromide or water. The suction and discharge connections for each pump are fully welded to the unit piping to minimize the opportunity for leaks. Suction and discharge connections are equipped with factory installed isolation valves to permit quick and easy servicing of pumps. The pumps are designed to operate for a total of 60,000 hours. The pump's bearings and sealing gaskets are inspected every 20,000 hours and are replaced depending on condition.

Guide Specifications (Cont'd)

FULLY AUTOMATIC PURGING SYSTEM

The chillers are equipped with an automatic purging system to remove non-condensable gases from the unit during operation. Non-condensables is collected by an eductor and accumulated in the purge tank. The control panel can sense the pressure increase in the purge tank and automatically remove the non-condensable gas through the operation of an electric vacuum pump.

The purge pumps are of an oil rotary two stage design, and are furnished complete with a motor and all required accessories. The purge pump and connecting hose are factory installed. The purge pump oil is charged at the job site.

LITHIUM BROMIDE AND REFRIGERANT

Lithium bromide shall contain lithium molybdate corrosion inhibitor to minimize the rate of ferrous metal corrosion on both the solution and refrigerant sides of the unit. The solution and deionized refrigerant water are kept in barrels and shipped with the chiller. They are then charged at the field during the commissioning.

DRY SHIPMENT

The solution and refrigerant water are kept in the barrels and shipped with the chiller. They are charged in the field during the commissioning. The chiller is be charged with N₂ to 0.3 bar(g) during the delivery.

CONTROL VALVE

Steam-fired chillers are furnished with a steam control valve for the CW model or a steam drain control valve for the CWN and CWL models, linkage and the actuator motor. The steam control valve is shipped loose for field installation.

The steam or steam drain control valve assembly are capable of modulating steam flow continuously from approximately 20% to 100% of the maximum design chiller capacity. The actuator motor is powered by the chiller's control panel. The actuator motor position is controlled via the control panel through a 4-20 mA DC control signal.

CONTROL PANEL

Each unit is furnished complete with a factory mounted and pre-wired control system. The control panel enclosure are equipped with a hinged access door with lock and key. The protection rating of the control panel is IP42. All temperature sensors and other control devices necessary to sense unit operating parameters to be factory mounted and wired to the panel. The control panel are capable of showing all system parameters in various languages with numeric data in metric units.

A dual inverter control system is used to control the solution pumps.

The operating program are stored in non-volatile memory (SRAM) to eliminate chiller failure due to AC power failure.

Capacity Control - the control panel shall automatically control the input steam flow rate to maintain the programmed leaving chilled water set-point for cooling loads ranging from approximately 20% to 100% of design. The input steam flow rate shall also be manually adjustable from the control panel to any setting between minimum and maximum when automatic operation is not desired and when steam input is not being inhibited by a specific operating condition.

Guide Specifications (Cont'd)

MAIN SCREEN

1. Equipment Status:

- Chiller stop/operating/failure activating
- Solution circulation pump, solution spray pump, refrigerant pump ON/OFF
- Purge pump ON/OFF
- Chilled water pump/cooling water pump ON/OFF

2. Operation Status:

- Startup
- Low combustion
- Temperature control
- Thermo off
- Load limit
- Dilution operation
- Set point of chilled water leaving temperature
- Control valve control output
- Chilled water entering/leaving temperature
- Cooling water entering/leaving temperature
- Refrigerant temperature
- Absorber temperature
- High temperature generator temperature
- High temperature generator concentration
- High temperature generator pressure
- Purge tank pressure

3. Condition Lamps:

- Chiller stop/operation
- Local/remote
- Failure/alarm

4. Operation button:

- Chiller stop/operation
- Local/remote mode select

DATA SCREEN

1. Measured value:

- Chilled water entering temperature (°C)
- Chilled water leaving temperature (°C)
- Cooling water entering temperature (°C)
- Cooling water leaving temperature (°C)
- Evaporator refrigerant temperature (°C)
- Absorber temperature (°C)
- High temperature generator temperature (°C)
- High temperature generator pressure (kPa)
- High temperature generator concentration (%)
- Purge tank pressure (kPa)
- Control valve control output (%)

2. Operation hours:

- Chiller operation hours
- Solution pump operation hours
- Refrigerant pump operation hours

3. Frequency:

- Chiller operation times
- Start times
- Failure times
- Alarm times
- Automatic purge times

4. Trend:

- Chilled water temperature
- Cooling water temperature
- High temperature generator temperature
- High temperature generator pressure

Specifications (Cont'd)

5. History menu:

- Hourly operation history (12 hours)
- Minute operation history (12 minutes)
- Failure history (6 times)
- Alarm history (6 times)

FAILURE/ALARM SCREEN

1. Failure:

- Chilled water time out
- Cooling water time out
- Operation interlock
- Cooling water pump interlock
- Chilled water suspension
- Chilled water overcooled
- Refrigerant overcooled
- Constantly monitoring interlock
- Solution pump inverter trouble
- Low cooling water inlet temperature
- Control sensor abnormal
- CPU abnormal
- High temp generator high temperature
- High temp generator high pressure
- High Cut
- Solution circulation pump abnormal
- Solution spray pump abnormal
- Refrigerant pump abnormal

2. Alarm:

- Abnormal purge frequency
- Purge system abnormal
- Chilled water overcool prevention control
- Refrigerant overcool prevention control
- Cooling water tube fouling

- Refrigerant pump stop
- High temp generator high temperature prevention control
- High temp generator high pressure prevention control
- High temp generator high concentration prevention control
- Low cooling water inlet temperature
- High cooling water inlet temperature
- Recording sensor abnormal
- Low battery
- ELB for arrester trip

SETTING SCREEN

1. Control parameter:
 - Setting method local/remote
 - Setting base temperature
 - Remote setting differential
 - Set point (display)
 - Automatic stop temperature
 - Automatic restart temperature
2. Valve operation:
 - Control valve mode auto/manual
 - Control valve position setting
3. Operation switch:
 - Forced dilution on/off
 - Refrigerant pump Auto or Stop
 - Purge mode auto/manual
 - Manual purge on/off
4. Select language:
 - Japanese, English, Chinese, and German

Specifications (Cont'd)

5. Date & time

Touch panel mechanical specification -

- Screen size : 10.4 inches
- Electrical power supply : DC 24 V
- Electrical power consumption : Less than 17 W
- Display : TFT 65,536 colors
- Graphic mode : 640 x 480 dot (VGA)

Communication – Modbus communication as standard.

- Modbus/RTU
- Modbus/TCP

