SHUANGLIANG
ABSORPTION CHILLER PRODUCT CATALOGUE

SHUANGLIANG ECO-ENERGY
At least till today we still only have one earth for living, but obvious climate change in recent years linked to greenhouse gas emission reminds human being that immediate measures should be taken to protect our planet well. From Kyoto Protocol, Copenhagen Agreement to Cancun Climate Conference the world has been working hard to promote applications of energy saving solutions and green energy so that reduce emission of greenhouse gas.

There’s only one earth, so there’s a responsibility, for a cleaner and greener earth we need to work together, expect our solutions can win your trust too.

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Features of Product

Pioneering technology have been used to ensure the advanced features of chiller

1. Pioneering a chiller with two pumps and without spray nozzles solves the degradation of cooling capacity forever.

Shuanglang constructed the first in China absorption chiller with two pumps and without spray nozzles, which eliminates the rapid degassing of cooling capacity in order to attain the aim, a chiller with two pumps and without nozzles is manufactured with the knowhow, such as Left-Middle-Right arrangement of absorber-evaporator-absorber, absorber with dripping plates instead of spray nozzles, which don’t need solution spray pump. With this technology, the chiller can be operated for much longer time.

2. Solution heat exchanger with new construction and flow pattern improves chiller energy efficiency and reduces fuel consumption.

Heat exchangers are designed with new tubes and their supports, furthermore, with new flow pattern, that leads to improve heat transfer and reduce flow pressure drop. These measures improved chiller energy efficiency and reduced fuel consumption.

3. Distribution of refrigerant by dripping plates improves chiller energy efficiency and reduces fuel consumption.

The special form of distribution of refrigerant by dripping plates improves the wetting of tubes by refrigerant, fully uses the heat transfer area, reduces the refrigerant film thickness, increases the heat transfer effects, and results in improvement of chiller energy efficiency and reduction of fuel consumption.

4. New tubes and their arrangement in evaporator improves chiller energy efficiency and reduces fuel consumption.

Application of new tubes and their arrangement in evaporator makes more even distribution of heat transfer effect, and thus to improve chiller energy efficiency and reduce fuel consumption.

5. Special construction of high pressure generator improves chiller reliability and energy efficiency, and reduces fuel consumption.

High pressure generator with solution inside tubes and wet back of combustion chamber improves chiller operation safety, and reduces fuel consumption.

6. Heating by evaporator improves heating efficiency and safety of operation

Heating by evaporator improves heating efficiency to 92.5% and improve the operation life.

7. Evaporator tubes are protected from freezing to improve the chiller reliability.

Evaporator tubes are protected from freezing with such measure, as chiller can stop cooling very quickly. It is realized by interrupting the operation of refrigerant pump, if value of power or chilled water occurs, because refrigerant water from condenser is collected in the sump of evaporator, and pumped to the dripping plate for distributing over tubes.

8. Serial flow of solution to improve chiller reliability.

Serial flow of solution in chiller makes solution far from crystallization line to improve chiller reliability and simplify the control of chiller.

9. Pioneering non-condensable gas purging during heating improves the chiller reliability.

The direct fired absorption chiller can be purged during heating mode by pioneering technology to improve the chiller reliability and improves chiller operation life.

All these patented technologies and other pioneering knowhow are implemented aiming at making the chiller operation more efficient, reliable and easier.
The DFM technology guarantees the world advanced production quality. DFM technology is one of the advanced technology to cover the needs of customer. Shuangliang meets the requirements of customer by zero defect and shortest delivery period by DFM technology and quality management system. Quality of Shuangliang products are guaranteed by several hundreds of imported equipments, such as plasma cutting machines, horizontal and vertical machine centers, numerical control drilling and mill centers, welding robots and helium leak detectors, and all performance test stands.
High Air-Tightness

The Decisive Factor to Guarantee the Quality of Lithium Bromide Absorption Chiller
Lithium bromide absorption chiller is operating under high vacuum, which would be impaired by leaking of air into the chiller and non-condensable gases generated inside of the chiller due to corrosion. Poor vacuum will reduce chiller cooling capacity and even increase the corrosion of metal parts in chiller. So high air-tightness is the decisive factor to guarantee the quality of lithium bromide absorption chiller, and the key parameter for evaluation of chiller characteristics.

Two special measures are adopted to improve the air tightness of Shuangliang absorption chillers:
1. The chiller and its parts have been inspected by helium mass spectro leak tester with leakage rate of 1×10⁻¹⁰ Pa·m³/s, which is 4 orders lower than 2.03×10⁻⁶ Pa·m³/s specified by Japanese Industrial Standard JISB8662-1994. The rigid leak tester applied by Shuangliang is the only equipment used in absorption chiller industry in the world. During visiting Shuangliang, a famous atomic expert said, "Shuangliang has the same leak testing facility as used in atomic industry".
2. A patented automatic purging unit is installed on the chiller to purge out non-condensable gases during operation ensuring the vacuum in the chiller.

With High Air Tightness Brings Valued Pay Back
1. The degradation of cooling capacity is solved in the possible way;
2. High reliable operation with less maintenance and repair cost is guaranteed.

Intelligent Control System

Quick Man-Machine Dialogue Interface

Data-setting
Data, such as chilled (hot) water outlet temperature, can be set in accordance with the requirements to ensure the operation of unit in the predetermined or optimized operation conditions.

Control mode selection
Auto Manual control mode can be selected by pressing the touch screen with the aid of instruction indicated on the screen.

Protection from mis-operation or ill-intention
Operator without password is refused to re-set the operation data, and unit is protected from mis-operation or ill-intention.

Operation record searching
The memory of control system stores the operation data for last five failures of unit and normal operation for one week, which can be accessed at every moment.

Guidance to operation and maintenance
Display all special working principles and guidance to operation and maintenance enables operators to understand the operation method and maintenance information, facilitating the unit management by users and prolonging the service life of the unit.

Timer for Automatic Switch on/off
By pre-setting, without limitation, the switch on/off timer on the touch screen or centralized monitoring computer, the unit can be automatically started or stopped at the preset time.

Automatic Interlocked Connection of External Units
Chilled (hot) and cooling water pumps and fans for cooling tower can be operated automatically only by connection of control wires with the control panel of unit. In such conditions, full automatic start and stop of chilled (hot) and cooling water pumps and fans for cooling tower will be set.

Limit Control
More considerate way of control:
Running control—limit control—safety protection control.
When chiller’s normal running endangered, the self-diagnosis and self-adjustment function will carry out to ensure stable and safe operation.
The solution concentration control, specific to the company, allows the unit to operate under high concentration safely and stably by monitoring the spray crystallization of the strong solution and controlling the heating capacity, thus not only to prevent crystallization but also to improve the operation efficiency of the unit.

Central control of units, such as automatic change-over, central control, storage and print-out of operation data of parallel operated units, and etc. can be realized by means of a computer with the software MMI2 for centralized control developed by the company. In such a way, the computer automatically displays the operation data and conditions, troubles and alarm signal or stops the units, when the load increases or decreases, and the energy consumption can be saved. The control functions are optional for order.

Flexible Connection with Centralized Control of Buildings

The central control of a building is supported by the control system. The unit control panel is provided with interfaces RS232, RS422 or RS485 and data communication protocol for acquisition and displaying of the operation data and control of the unit realized by the control system of a building. The control functions are optional for order.

Remote Monitoring System for Real Time Supervision of the Operation System

The start and shutdown of unit can be realized by pressing the Start/Stop buttons in the control room remotely and the operation status can be displayed through indicator lights to operate and know the unit data without the need to be on the site. Under special requirement, the touch screen can be installed in the control room to know the operation status of the unit and operation data and information of each part of the unit anytime, thus to monitor the unit on a real time basis as well as to store and print the operation data. The company’s monitoring and control center is able to carry out patrol inspection on the units located in the users’ machine room to know and analyze the operation status of the units anytime. Should there be any abnormality during the operation, the control system will automatically deal and connect to the company’s monitoring and control center and the service engineer responsible for the unit by sending out failure information. The control functions are optional for order.

Inverter Control of Cooling Water Pump for Stable Operation and Saving of Energy

The cooling water flow can be adjusted in accordance with the operation mode of unit by means of the Inverter, which control the operation of water pump. In such a way the consumption of energy by the pump can be saved, and unit can be operated under lower temperature of cooling water. Then the unit can be operated under full load even at lower temperature of cooling water. The control functions are optional for order.

Shuangliang Company uses the most advanced in the world color touch screen as the man-machine interface. The operator can start or stop the unit or learn the basic operation, maintenance and acquisition of operation mode and data merely by touching the screen in accordance with the instruction displayed. Man-machine dialogue by touch screen will make the operation of Shuangliang made units easier and more accessible.

Advanced Analog Adjustment of Cooling (Heating) Capacity

Chilled (Hot) water outlet temperature, controlled by analog system, which is specific for the company, can stabilize at high precision, improving the operation efficiency of the unit and more suitable for places that are highly temperature-sensitive.

The Limit Control for Cooling Water Temperature

The control system provides with cooling water inlet temperature limit control makes the unit safe operation in the limits of cooling water temperature in the range of 18C-34C.

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The control system monitors the concentration of sprayed strong solution to calculate the optimized dilution cycle to far away from the preferred solution concentration during shutdown, thus not only to prevent crystallization but also to decrease the re-start time. The control functions are optional for order.

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The control system adopts the advanced PID control technology and touch screen LCD to display the operation conditions and data of the unit in a real-time manner with both texts and pictures, featuring direct expression of contents and easiness for understanding, enabling the operator to know the operation conditions anytime and to take timely measures in emergency.

Display of Parameters

- Chilled (hot) water inlet temperature
- Chilled (hot) water outlet temperature
- Evaporating temperature
- Flue gas temperature
- Cooling water inlet temperature
- HPG pressure
- Cooling water outlet temperature
- Concentrated solution temperature
- LPG pressure
- Cooling water inlet temperature
- Concentrated solution temperature

Specific Working Principle and Operation and Maintenance Instructions Displaying

This function ensures that the operator can understand the unit easily and rapidly thus to well manage the unit and greatly improve the life of the unit and guarantee the increase of efficiency for users as well.

Control System Diagram

- Temperature sensor
- Pressure sensor
- Filter for refrigerant
- Control signal for boiler
- Emergency signal for burner
- Emergency shutdown signal
- Inlet and outlet of chilled water
- Activated carbon filter for chilled water
- Refrigerated solution
- Evaporator cooling water pump

Certificates
Trigeneration (CCHP) system, which applies the heat of the flue gas from industrial processes to produce high-quality renewable power and cooling, is an effective measure to improve the efficiency of energy use and protect the environment. This system is widely used in places where electric power and air conditioning requirements exist simultaneously, such as hospitals, large department stores, and industrial parks.
In order to meet the requirements to comfort and technological needs of air conditioning systems, lithium bromide absorption chillers/heaters are mainly applicable to the refrigeration installations with turbo generators (including micro turbines) and other places where high temperature flue gas is available and air conditioning is necessary (such as industrial fields). For flue gas-hot water fired types, main heat sources can find the flue gas and jacket water from internal combustion engine. These types can also be used in other places where high temperature flue gas is available and air conditioning is necessary.

**Typical Modes for Application of Trigeneration System with Flue Gas Type Lithium Bromide Absorption Chiller/Heater**

- **Mode 1: Gas Turbine + Flue Gas Type Lithium Bromide Absorption Chiller/Heater**

  **Working Principle**
  Fuel is burned in the gas turbine combustion chamber to produce high pressure and temperature gas to drive gas turbine generator. Flue gas of which is directed to lithium bromide absorption chillers/heaters to produce chilled (hot) water for air conditioning.

  **Application Features**
  - Gas turbine generator is working based on simple cycle, which is beneficial to improve rate of utilizing waste heat.
  - Flue gas from gas turbine is used in flue gas type lithium bromide absorption chillers/heaters, simplify the installation configuration, save equipment investment, and improve the energy integrated utilization in system.
  - This mode is applicable to the trigeneration system with gas turbine generator.

- **Mode 2: Gas Turbine + Flue gas type Lithium Bromide Chiller/Heater with after burning**

  **Working Principle**
  Fuel is burned in the gas turbine combustion chamber to produce high pressure and temperature gas to drive gas turbine generator. Flue gas of which is directed to lithium bromide absorption chillers/heaters with after-burning to offer chilled (hot) water for air conditioning. When the flue gas cannot meet the cooling capacity required by air-conditioning, the after burning system is started to supply additional portion of fuel into the combustion chamber of absorption chiller/heaters.

  **Application Features**
  - Gas turbine generator is working based on simple cycle, which is beneficial to improve rate of utilizing waste heat.
  - Flue gas from gas turbine is used in flue gas type lithium bromide absorption chillers/heaters with after-burning to offer chilled (hot) water for air conditioning.
  - Installation of flue gas type lithium bromide absorption with after-burning allows rational configuration of generator and chiller/heat capacity based on the air conditioning system cooling and heating load, save equipment investment, and improve the energy integrated utilization in system.
  - This mode is applicable to the trigeneration system with gas turbine generator.

- **Mode 3: Internal Combustion Engine + Flue Gas/Hot Water Type Lithium Bromide Absorption Chiller/Heater**

  **Working Principle**
  Fuel is burned in the engine combustion chamber to produce mechanical power for driving generator. Engine high temperature flue gas and jacket hot water is directed to lithium bromide absorption chillers/heaters to offer chilled (hot) water for air conditioning. Engine circulating jacket water is directed to water-water heat exchanger to supply heating when the system is running.

  **Application Features**
  - Internal combustion engine-fuel gas and jacket water can be used directly to operate flue gas/hot water type absorption chiller to simplify equipment configuration, reduce equipment investment and improve the system integrated energy utilization.
  - This mode is applicable to the trigeneration system with internal combustion engine driven generators.
Fuel is burned in the engine combustion chamber to produce mechanical power for driving generator. Engine high temperature flue gas and jacket water is directed to lithium bromide absorption chiller/heaters with after burning to the chilled hot water for air conditioning. Engine cooling jacket water is directed to water-water heat exchanger to supply heating when the system is running.

Application Features
- Internal combustion engine flue gas and jacket water can be used directly to operate flue gas hot water type absorption chiller with after burning to simplify equipment configuration, reduce equipment investment and improve the system integrated energy utilization.
- Installation of flue gas and hot water operated lithium bromide absorption chiller with after burning allows rational configuration of generator and chiller capacity based on the air conditioning system cooling and heating load, save equipment investment and improve the system operation economy.
- This mode is applicable to the trigeneration system with internal combustion engine driven generators.

Description of Different Types of Flue Gas Type Lithium Bromide Absorption Chiller / Heaters and Their Applications

<table>
<thead>
<tr>
<th>Type</th>
<th>Flue Gas Type</th>
<th>Flue Gas Type with after Burning</th>
<th>Chilled Water Temperature</th>
<th>Heating Water Temperature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Function</td>
<td>Cooling Heating</td>
<td>Cooling Heating</td>
<td>Cooling Heating</td>
<td>Heating Heating</td>
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<tr>
<td>Cooling capacity</td>
<td>90-1000 kWh</td>
<td>90-1000 kWh</td>
<td>90-2500 kWh</td>
<td>90-2500 kWh</td>
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<tr>
<td>Heat source characteristics</td>
<td>Flue gas temp &lt;= 350°C</td>
<td>Flue gas temp &lt;= 350°C</td>
<td>Flue gas temp &lt;= 350°C</td>
<td>Flue gas temp &lt;= 350°C</td>
<td></td>
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<tr>
<td>Heat source</td>
<td>Natural gas, LPG, light and heavy fuel oil</td>
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<td>Applications</td>
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</table>

Flue gas type absorption chiller/heater

Max. design capacity: 3500kW/UrL. Inlet temp. of flue gas >250°C, flue gas is required to be clean and corrosion-free while having qualified back pressure for its circulation (induct fan shall be introduced into the system if such back pressure is not sufficient). Our standardized series of chillers have 400~520°C and 170°C for flue gas inlet/outlet temp. respectively, chilled water inlet/outlet temp. 12/7°C, hot water inlet/outlet temp. 58/50°C, cooling water inlet/outlet temp. 32/38°C. Please consult with our technical dept. for details and other applications.

Working Principle

Cooling cycle and its Features

Flue gas type lithium bromide absorption chiller/heater is a equipment, which uses high temperature flue gas discharged by gas turbine installation, as fuel, water as refrigerant, lithium bromide as absorbent solution, produces chilled and/or hot water for the purpose of air conditioning and technology processes. It consists of flue gas high pressure generator (HP generator), low pressure generator (LP generator), condenser, evaporator, absorber, high temperature heat exchanger (HP heat exchanger), low temperature heat exchanger (LT heat exchanger), and some auxiliary parts, as hermetically-sealed pumps and vacuum pump, and keeps itself under vacuum conditions by vacuum pump and automatic purge unit.
Chilled water from customer about 12°C heats the strong lithium bromide solution and turns into vapor, which flows into condenser. Refrigerant vapor, which flows from HP generator, is condensed by heating the solution, and condenses the vapor outside the tubes into refrigerant water. Cooling water from cooling tower enters the heat transfer system to cool the strong solution distributed outside tubes, and heating Capacity 10-7 kcal/h 30 40 50 60 70 80 90 100 125 150 kJ/h 24 32 40 48 56 64 72 80 100 120 kW 350 470 580 700 810 930 1050 1160 1450 1740. Strong lithium bromide solution possesses tremendous water vapor absorbing capacity drips over tubes, absorbs refrigerant vapor, produced in the evaporator, and becomes weak solution. Cooling water flows through tubes in the condenser and condenses the vapor outside the tubes into refrigerant water. Refrigerant water absorbs heat from external system, becomes water vapor, and flows into absorber.

Flue gas exhaust:

Flue gas inlet:

Vacuum pump

Cooler inlet valve

Check valve

Refrigerant pump

Solution pump

HT heat exchanger

Absorber

Evaporator

Bypass

Auto de-crystallization pipe

Oil trap

Sampling valve

1. Flue gas temperature: 82°C~90°C, Flue gas pressure: 1500~2000Pa

2. Refrigerant element for refrigeration.

3. Flow of hot water can be adjusted within range of 380-413°C.

4. Flow of chilled water can be adjusted within range of 19°C~4°C.

5. Cooling water from cooling tower enters the heat transfer system.

6. Performance of heat exchangers determines the operation conditions of chiller/heaters.

7. The lowest outlet temp. for chilled water is 5°C.

8. Inlet temp. of cooling water can be adjusted in the range of 18~34°C.

9. Inlet temp. of chilled water is about 7°C.

10. Gas is used to heat and boil the lithium bromide weak solution in the HP generator. The weak solution is concentrated into intermediate solution, which flows into the low pressure generator through HT heat exchanger. The produced refrigerant water enters the evaporator through U-llation pipe and enters condenser also.

11. Cooling capacity can be adjusted in the range of 20~100%.

12. Heating capacity 10-7 kcal/h 30 40 50 60 70 80 90 100 125 150. Cooling capacity 10-7 kcal/h 30 40 50 60 70 80 90 100 125 150.
### Flue Gas with Direct-fired After Burning Type Lithium Bromide Absorption Chiller/Heater

Inlet temp. of flue gas ≥ 250°C, flue gas is required to be clean and corrosion-free while having qualified back pressure for it's a clearance (induct fan shall be introduced into the system if such back pressure is not sufficient). After burning fuel can be oil (light diesel oil) or gas (NG, city gas etc.). Our standardization series of chillers have 430~520°C and 170°C for flue gas inlet/outlet temp. respectively, after burning capacity can compensate up to 100% of nominal load capacity by using split structure, chilled water inlet/outlet temp. 12°C/7°C, hot water inlet/outlet temp. 56/60°C, cooling water inlet/outlet temp. 32/38°C. Cooling capacity: 350-5820 kw.

Please consult with our technical dept. for details and other applications.

### Cooling Cycle

<table>
<thead>
<tr>
<th>Type</th>
<th>kW</th>
<th>2040</th>
<th>2330</th>
<th>2620</th>
<th>2910</th>
<th>3490</th>
<th>4070</th>
<th>4650</th>
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<td>4070</td>
<td>4650</td>
<td>5230</td>
<td>5820</td>
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<tr>
<td>Heating Capacity</td>
<td>kW</td>
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<td>1830</td>
<td>2050</td>
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<td>2380</td>
<td>2580</td>
<td>2780</td>
<td>2980</td>
<td>3180</td>
</tr>
</tbody>
</table>

| Chilled Water In/Out Temp | °C | 12~7 |
| Hot Water In/Out Temp | °C | 50~60 |

### Heating Cycle

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### Note

1. Values for chilled water, hot water, cooling water in the above table are for nominal operation conditions and can be properly adjusted in actual operation.
2. Coefficient of performance can be adjusted in the range of 18~4°C.
3. Flow of flue gas can be adjusted in the range of 50~120%.
4. Cooling capacity can be adjusted in the range of 20~100%.
5. Cooling water, hot water, cooling water in the above table are for nominal operation conditions and can be properly adjusted in actual operation.
6. Coefficient of performance can be adjusted in the range of 18~4°C.
7. Flow of flue gas can be adjusted in the range of 50~120%.
8. Cooling capacity can be adjusted in the range of 20~100%.
## Flue Gas/Steam Type Lithium Bromide Absorption Chiller

Inlet temp. of flue gas ≥ 250°C, flue gas is required to be clean and corrosion-free while having qualified back pressure for its clearance (induct fan shall be introduced into the system if such back pressure is not sufficient). Our standardized series of chillers have 170°C for flue gas outlet temp., steam pressure 0.4–0.8MPa, chilled water inlet/outlet temp. 12°C/7°C, cooling water inlet/outlet temp. 32°C/38°C. Cooling Capacity for single unit: 350–550kW.

Please consult with our technical dept. for details and other applications.

## Flue Gas/Hot Water Type Lithium Bromide Absorption Chiller/Heater

Inlet temp. of flue gas ≥ 250°C, flue gas is required to be clean and corrosion-free while having qualified back pressure for its clearance (induct fan shall be introduced into the system if such back pressure is not sufficient). Hot water returning temp. ≤ 92°C, hot water inlet temp. ≥ 88°C, chilled water outlet temp. ≤ 7°C, cooling water inlet/outlet temp. 28°C/34°C. Cooling capacity for single unit: 350–540kW.

Please consult with our technical dept. for details and other applications.

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**Cooling Cycle**

**Heating Cycle**
Flue Gas/Hot Water with Direct-fired After Burning Type Lithium Bromide Absorption Chiller/Heater

Inlet temp. of flue gas = 250°C. Flue gas is required to be clean and corrosion-free while having qualified back pressure for it’s clearance (induct fan shall be introduced into the system if such back pressure is not sufficient). After burning fuel can be oil (light diesel oil) or gas (NG, city gas etc). Hot water returning temp. = 92°C (hot water inlet temp. = 58°C), chilled water outlet temp. = 7°C, cooling water inlet/outlet temp. = 29/33°C. Cooling capacity for single unit: 350-3400 kw.

Please consult with our technical dept. for details and other applications.

H₂ Type Direct Fired Lithium Bromide Absorption Chiller/Heater

H₂-type direct fired lithium bromide absorption chiller/heater is a kind of large-size industrial facility to supply cool or heat with gas (natural gas, city gas, or LPG) or oil (light oil) as the driving energy and lithium bromide solution as the absorbent and water as refrigerant.

H₂-type direct fired chiller/heater, using fuel as the energy source (with only limited electricity as auxiliary power), not only reduces greatly the cost for electricity and operates in regions where there are cheap natural gas resources, but also compensates the peak-valley load difference. When the hot summer rolls in, shortage of electric power will pose a great worry for various cities. Concentrated consumption of power by air-conditioners is the sticking point for such a seasonal problem, for which H₂-type direct fired chiller/heater offers an attractive solution.

The most attractive feature of Shuangliang H₂-type direct fired chiller/heater is its stunning performance in energy saving. High COP of 1.325 and provenly high efficiency rank Shuangliang H₂-type direct fired chiller/heater in the leading position worldwide.

Shuangliang H₂-type direct fired chiller/heater are widely applied in industries, such as precision machinery manufacturing, instruments & meters, aviation & aerospace, textiles, electronics, electric power, metallurgy, pharmaceuticals, chemicals, hospitals, food, etc. By utilizing dozens of patented technologies with features of extremely high energy efficiency and outstanding environmental effects, in addition to its customer service experience of over 25 years, Shuangliang guarantees to reward her users with optimal returns.
This direct-fired absorption chiller/heater is operated by heat from fuel and gas burner and with LiBr solution as the absorbent. It consists of high pressure generator, low pressure generator, condenser, evaporator, absorber, high and low temperature heat exchangers, and canned motor and vacuum pumps, is a combination of shell and tube heat exchangers. It is operated under vacuum conditions by vacuum pump and auto-purging unit.

### Cooling Cycle

1. **Evaporator**: Water to be chilled at 12°C is supplied into the tubes of evaporator, and cooled to 7°C by the sprayed refrigerant, and returns to the external system. Refrigerant gains the heat from the external system, and becomes vapor, which enters the absorber.
2. **Absorber**: LiBr solution, as an absorbent, possesses strong absorbing capacity to water vapor and is sprayed on the heat-exchanging tubes of the absorber to absorb the vapor generated in the evaporator and is then diluted. Heat of solution i.e. heat from the external system is carried away by the cooling water from the cooling tower through heat exchange tubes in the absorber, and diluted solution collects under the bottom of the absorber, after being purged by solution pump and heated in the heat exchanger, it enters the HPG.

### Special Features of Cooling Cycle

- **High Pressure Generator (hereinafter HPG)**: Large quantity of vapor is generated by heating the solution with high-temperature flame and meanwhile the solution is concentrated into intermediate solution, which enters with vapor the low pressure generator after being cooled down through high-temperature heat exchanger.
- **Low Pressure Generator (hereinafter LPG)**: The intermediate solution, which is cooled down and enters the LPG, is once again heated by vapor from HPG and vapor generated. The solution is further concentrated. The strong solution flows back to the absorber after being cooled down through heat-exchanging in the low-temperature heat exchanger. The vapor thus generated enters the condenser. The vapor from HPG is condensed to water after heating the solution and enters the condenser after being regulated.

### Heating Cycle

1. **Condenser**: Cooling water flows through tubes in the condenser and condenses the vapor outside the tubes into refrigerant water. The produced refrigerant water enters the evaporator through U pipe as refrigerant element for refrigeration.
2. **LT Heat Exchanger**: Low temperature heat exchanger is used to exchange heat between the solution from LPG and weak solution from absorber to increase the temperature of weak solution and thus to recover the heat of strong solution.
3. **HT Heat Exchanger**: High temperature heat exchanger is used to exchange heat between the intermediate solution from HPG and the weak solution after being heated in the low temperature heat exchanger, to further increase the temperature of weak solution. Heat exchangers are used to decrease the heat consumption in the HPS and reduce the cooling water load required for lowering the temperature of strong solution, which is vital to the energy-saving efficiency of the unit.

### Special Features of Heating Cycle

In HPG generator solution is heated to produce vapor, which is led to the evaporator to heat the hot water in the tubes. Strong solution mixes with refrigerant water to form weak solution. Then solution is pumped to HPG generator to repeat the circulation and heating. During changing chiller-heater from cooling mode to heating mode, two changeover valves are to be opened simultaneously, and cooling water pump and refrigerant pump should be shut down.
### Table of Technical Parameters (SI)

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**Note:**
- Values for chilled/heated/cooling water in above table are for nominal conditions and can be properly adjusted in actual operation.
- The lowest inlet temperature of chilled water is 5°C.
- Cooling/heated water can be adjusted in range of 60-120°C.
- On the chilled/heated water side, scale factor is 0.001 m³/s/MW (0.001 m³/s/MW).
- Coating/heated capacity can be adjusted in range of 1.5-10% for Oil-fired types, 2.5-10% for Gas-fired types.
- Nominal temperature of fuel gas 170°C for heating mode.
- The maximum chilled/heated/cooling water pressure bearing capacity of normal pressure chiller is 0.8 MPa (G).
- Heat values indicated in the table are low heat values.
- Electric Data
  - Power Supply: 3φ, 380/415V, 50Hz
  - Total Current: 7.4 A / 9.4 A / 11.4 A / 13.4 A
  - Electric Power: 47.5 kW / 56 kW / 65 kW / 73.5 kW
  - Overall Dimensions: Height 2332 mm / 2351 mm / 2349 mm / 2411 mm
  - Operating Weight: 23.4 t / 25.1 t / 28.9 t / 31.1 t
  - Shipping Weight: 8.2 t / 9.6 t / 11.1 t / 12.2 t

- Oil Consumption: 2% of heating oil consumption indicated in the table.
- Gas Pressure indicated in the table is the pressure at the outlet of bulk valve then the chiller is under operation.
- Overall dimensions indicated in the table include rack dimensions.
- The shipping weight includes the oil weight, excluding solution weight.
- When referring to Chilled/Heated Water sub-sections, data are used on 100% chilled water temperature difference of 7°C.
**Steam-Operated Double Effect Lithium Bromide Absorption Chiller**

H₂-type steam operated double effect lithium bromide absorption chiller is a kind of large-size industrial facility with steam as the driving energy and lithium bromide solution as the absorbent and water as refrigerant.

H₂-type steam operated double effect units, using steam as the energy source, not only reduces greatly the cost for electricity and operation fees in regions where there are rich steam resources, but also compensates the peak-valley load difference. When the hot summer in, shortage of electric power will pose a great worry for various cities. Concentrated consumption of power by air conditioners is the sticking point for such a seasonal problem, for which, H₂-type steam operated double effect chillers offer an attractive solution.

The most attractive feature of Shuangliang H₂-type steam operated double effect chiller is its stunning performance in energy saving. High COP of 1.33 and proven high energy efficiency rank Shuangliang H₂-type steam operated chiller in the leading position worldwide.

Shuangliang H₂-type steam operated double effect chillers are widely applied in industries, such as precision machinery manufacturing, instruments & meters, aviation & aerospace, textiles, electronics, electric power, metallurgy, pharmacueticals, cigarettes, chemicals, hospitals, food, etc. By utilizing dozens of patented technologies with features of extremely high energy efficiency and outstanding environmental effects, in addition to her customer service experience of over 25 years, Shuangliang guarantees to reward her users with optimal returns.

**Working Principle**

The steam operated double effect LiBr absorption chiller uses steam as the energy, LiBr solution as absorbent, and water as refrigerant. It consists of major parts such as high pressure generator, low pressure generator, condenser, evaporator, absorber, high and low temperature heat exchangers, condensate heat exchanger, etc., as well as auxiliary parts such as canned motor pumps (solution pump and refrigerant pump), vacuum pump and purging unit. It is a combination of shell and tube heat exchangers. It is operated under vacuum conditions by vacuum pump and purging unit.

**Cooling Cycle**

- **Evaporator:** Water to be chilled of 12°C is supplied into the tubes of evaporator, and cooled to 7°C by the sprayed refrigerant, and returns to the external system. Refrigerant vapor is generated in the evaporator and is then condensed. Heat of solution is transferred to the chilled water of external system, and becomes vapor, which flow to the absorber.
- **Absorber:** LiBr solution, as an absorbent, possesses strong absorbing capacity to water vapor and is sprayed in the heat exchanging tubes of the absorber to absorb the vapor generated in the evaporator and is then diluted. Heat of solution is transferred to the chilled water of external system, and is carried away by the cooling water from the cooling tower through heat exchanging tubes in the absorber, and weak solution collects under the bottom of the absorber. After being purged by solution purging and treated in the heat exchanger, it enters the HPG.
- **High Pressure Generator (hereinafter HPG):** Large quantity of vapor is generated in the high temperature steam, and meanwhile, the solution is concentrated into intermediate solution, which enters the low pressure generator after being cooled down through high-temperature heat exchanger. The refrigerant vapor is also fed into the low pressure generator.
- **Low Pressure Generator (hereinafter LPG):** The intermediate solution, which is cooled down and enters the LPG, is once again heated by vapor from HPG. The solution is further concentrated. The strong solution flow back to the absorber after being cooled down through heat-exchanging in the low-temperature heat exchanger. The vapor thus generated enters the condenser. The vapor from HPG is condensed in the generator after being heated in the external system, and enters into the condenser through the condenser pressure heat exchanger. The refrigerant vapor is also fed into the low pressure generator.
- **Condenser:** Cooling water flows through tubes in the condenser and condensate the vapor, which flow into the tube into refrigerant water. The produced refrigerant water enters the evaporator through U pipe as refrigerant element for refrigeration.

**Special Features of Cooling Cycle**

- Evaporator: Water to be chilled of 12°C is supplied into the tubes of evaporator, and cooled to 7°C by the sprayed refrigerant, and returns to the external system. Refrigerant vapor is generated in the evaporator and is then condensed. Heat of solution is transferred to the chilled water of external system, and becomes vapor, which flow to the absorber.
- Absorber: LiBr solution, as an absorbent, possesses strong absorbing capacity to water vapor and is sprayed in the heat exchanging tubes of the absorber to absorb the vapor generated in the evaporator and is then diluted. Heat of solution is transferred to the chilled water of external system, and is carried away by the cooling water from the cooling tower through heat exchanging tubes in the absorber, and weak solution collects under the bottom of the absorber. After being purged by solution purging and treated in the heat exchanger, it enters the HPG.
- High Pressure Generator (hereinafter HPG): Large quantity of vapor is generated in the high temperature steam, and meanwhile, the solution is concentrated into intermediate solution, which enters the low pressure generator after being cooled down through high-temperature heat exchanger. The refrigerant vapor is also fed into the low pressure generator.
- Low Pressure Generator (hereinafter LPG): The intermediate solution, which is cooled down and enters the LPG, is once again heated by vapor from HPG. The solution is further concentrated. The strong solution flow back to the absorber after being cooled down through heat-exchanging in the low-temperature heat exchanger. The vapor thus generated enters the condenser. The vapor from HPG is condensed in the generator after being heated in the external system, and enters into the condenser through the condenser pressure heat exchanger. The refrigerant vapor is also fed into the low pressure generator.

**Heat Exchanger**

- Evaporator: Water to be chilled of 12°C is supplied into the tubes of evaporator, and cooled to 7°C by the sprayed refrigerant, and returns to the external system. Refrigerant vapor is generated in the evaporator and is then condensed. Heat of solution is transferred to the chilled water of external system, and becomes vapor, which flow to the absorber.

**Heat Exchanger: Heat exchanging between working steam condensate and weak solution after being mixed in LT heat exchanger.**
## Technical Specifications

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### Notes

1. Values for steam, chilled water and cooling water in above table are for nominal conditions and can be properly adjusted in actual operation.
2. With the inlet/outlet temperature of cooling water at 30°C, 38°C, the steam condensate is only 12.3kg/(10°C·h), and the COD value is 1.43.
3. Steampressure 0.8MPa/G refers to the inlet pressure without any valve pressure loss. The lowest outlet temperature of chilled water is 5°C.
4. Cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.

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(4) On the chilled water/cooling water inlet, the scale factor is 0.98m³/min/kW(100°C·h/°C)³.
(5) The maximum chilled cooling water inlet pressure bearing capacity of normal pressure chiller is 0.8 MPa/G.
(6) The unit is transported with pack of 180mm in height, and for the units ST 192H1 and above, subassembled type rack will be adopted, extra 65mm shall be included.
(7) The shipping weight includes the sole weight, excluding loading weight.
### Table of Technical Parameters (0.6MPa) (SI)

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<th>Model</th>
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<th>Connection Diameter (DN)</th>
<th>Electric Modulating Valve (Dia.)</th>
<th>Steam Condensate Pipe (Dia.)</th>
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### Notes
1. Values for steam, chilled water and cooling water are invariable as for nominal conditions and can be properly adjusted in actual operation.
2. The maximum chilled/cooling water box pressure bearing capacity of normal pressure chiller is 0.8MPa G.
3. With the inlet/outlet temperature of the chilled water as 3°C/36°C, the steam consumption is only 12.36 kg/h/100kcal/h, and the COP values is 1.6.
4. The unit is transported with rack of 180mm in height, and for the units ST-827H2 and above, submerged type rack will be adopted, extra 60mm shall be included.
5. The shipping weight includes the rack weight, excluding solution weight.
6. The cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.
7. On the chilled water/cooling water side, scale factor is 0.086m/KW/1000m^2/°C.
8. Steam pressure 0.6 MPa/G refers to the inlet pressure without any valve pressure loss. The lowest outlet temperature of chilled water is 5°C.
9. Cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.
10. The shipping weight includes the rack weight, excluding solution weight.
### Table of Technical Parameters (0.4MPa) (SI)

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<th>Cooling Water Capacity kW</th>
<th>Cooling Water Inlet/Outlet Temp. °C</th>
<th>Flow Rate m³/h</th>
<th>Steam Consumption kg/h</th>
<th>Steam Condensate Temp. °C</th>
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**Notes:**

1. Values for steam/chilled water and cooling water in above tables are for nominal conditions and can be adjusted in proper actual operation.
2. With the inlet/outlet temperature of cooling water as 30°C/5°C, the steam consumption is only 12.6kg/1071kcal/h, and the COP value is 1.3.
3. Steam condensate 0.4 Mpa refers to the inlet pressure without any pressure loss. The lowest outlet temperature of chilled water is 5°C.
4. Cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.
5. On the chilled water/cooling water side, scale factor is (0.0086m²·h·K/kW)·0.0001m²·h·kcal/°C.
6. The maximum chilled/cooling water box pressure bearing capacity of normal pressure chiller is 0.8 MPa/°G.
Working Principle

Special Feature of Cooling Cycle

Lithium bromide solution is absorbent and water is refrigerant. As we know Water is vaporized at low boiling point in deep vacuum. It is the feature that is used in our chiller to absorb heat and to realize cooling effect.

Chiller is pumped into deep vacuum by vacuum pump, which creates the necessary condition for boiling of water at low temperature. The resulting refrigerant vapor is sucked in by the absorber through pressure differences. As refrigerant vapor is absorbed by the absorber solution, it is diluted, and heat is released to the cooling water. The refrigerant vapor then is absorbed by strong lithium bromide solution and thereby performs continuous boiling of refrigerant water.

In steam operated single effect chiller, weak solution in absorber is pumped into generator via heat exchangers and spray on heat exchanging tubes of absorber through dispersion trays. As refrigerant vapor is absorbed by the solution, strong solution is diluted and heat is generated and ejected to the cooling water flow in the absorber tubes. In this cycle, strong and weak concentration and refrigerant is changed between strong and weak solution, therefore, increasing the heat efficiency of chiller.

Refrigerant vapor enters evaporator and then is pumped to spray through spraying device by refrigerant pump.

Refrigerant water enters evaporator and then is pumped to spray through spraying device by refrigerant pump.

Technical Specifications

- **Model**: SS-99H2, 165H2, 265H2, 331H2, 413H2, 496H2, 579H2, 661H2, 744H2, 827H2, 992H2, 1157H2, 1323H2
- **Cooling Capacity**
  - kW: 350, 580, 930, 1160, 1450, 1740, 2040, 2330, 2620, 2910, 3490, 4070, 4650
- **Motor regulating valve**: kcal/h: 30, 50, 80, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400
- **Generator**
  - USRt: 99, 165, 265, 331, 413, 496, 579, 661, 744, 827, 992, 1157, 1323
- **Condenser**
  - Cooling water inlet/outlet Temp.: °C
- **Chilled Water Inlet/outlet Temp.**: °C
- **Pressure Loss**: mH2O 5.5, 5.4, 5.4, 8.2, 3.5, 3.5, 3.5, 4.6, 5.8, 5.8, 7.9, 8.1, 8.1
- **Connection Diameter**: mm 100, 150, 200, 200, 200, 250, 250, 250, 300, 300, 350, 350, 400
- **Refrigerant pump**
  - Solution spray temperature (I,C): °C
  - De-crystallization temperature (I,A): °C
  - Evaporation temperature (I,A): °C
  - Condensation temperature (I,A): °C
  - Vacuum pressure (I): kPa
- **Check valve**
  - Atmospheric pressure: MPa ≤0.02
- **Refrigerant water**
  - Solution pump
  - Absorber
  - Condenser heat exchanger
  - Absorber
  - Oil trap
  - Steering pump
  - Sampling valve
  - Vacuum pump
  - Electric: 380VAC, 50Hz
- **Dimensions**
  - Length: 3950, 3900, 4020, 4475, 5180, 5218, 5200, 5650, 5960, 6083, 6695, 6715, 6855
  - Width: 1592, 1802, 2048, 2135, 2410, 2418, 2626, 2519, 2521, 2576, 2895, 3203, 3215
  - Height: 2346, 2438, 2753, 2804, 2980, 3226, 3364, 3381, 3425, 3683, 3759, 4100, 4495
- **Consumption**
  - kg/h 690, 1114, 1840, 2300, 2875, 3450, 4025, 4600, 5175, 5750, 6900, 8050, 9200
- **Liquid pump**
  - by-pass valve
- **Steam Condensate Temp.** °C
- **Pressure** G MPa
- **Shipping Weight**
  - kg 6, 6.8, 8.3, 9.9, 11.8, 13.4, 14.9, 17.2, 18, 19.9, 23.2, 26.5, 29.1
- **Dimensions**
  - Overall Length: 3950, 3900, 4020, 4475, 5180, 5218, 5200, 5650, 5960, 6083, 6695, 6715, 6855
  - Overall Width: 1592, 1802, 2048, 2135, 2410, 2418, 2626, 2519, 2521, 2576, 2895, 3203, 3215
  - Overall Height: 2346, 2438, 2753, 2804, 2980, 3226, 3364, 3381, 3425, 3683, 3759, 4100, 4495
- **Operating Weight**
- **Vacuum pump**
  - kg: 2.6, 4.1, 6.6, 8.4, 10.7, 12.1, 14, 17.2, 20, 23.2, 26.4, 29.6
- **Water consumption**
  - mm 25, 25, 40, 40, 40, 90, 50, 65, 65, 65, 65, 80, 80
- **Steel supply**
  - kg: 3.4, 17.9, 40.5, 60.1, 80.5, 101.1, 111.7, 122.3
- **Refrigerant water consumption**
  - kg/h: 690, 1114, 1840, 2300, 2875, 3450, 4025, 4600, 5175, 5750, 6900, 8050, 9200
- **Refrigerant pipe diameter**: mm 25
- **Refrigerant max. diameters**: mm 25, 25, 40, 40, 40, 90, 50, 65, 65, 65, 65, 80, 80

Notes:
1. Values for steam chiller water and cooling water in applicable area are nominal conditions and can be properly adjusted in actual operation.
2. The base outlet temperature of chilled water is 7°C.
3. Cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.
4. On the chilled water/cooling water side, scale factor is 0.0001m/kW (1/100000°F/°C).
5. The maximum chilled/dischilling water box pressure bearing capacity of normal pressure chiller is 0.8 MPa/GPa.
6. The unit is transported with rack of 180mm in height, and for the units SS-661-H2 and above, submerged type rack will be adopted, extra 60mm shall be included.
7. The shipping weight includes the rack weight, excluding solution weight.
Hot water operated two stage lithium bromide absorption chiller is a kind of large-size industrial facility with hot water as the driving energy and lithium bromide solution as the absorbent and water as refrigerant.

Hot water two stage units, using hot water as the energy source, not only reduces greatly the cost for electricity and operation fees in regions where there are rich hot water resources, but also compensates the peak-valley load difference. When the hot summer ends in, shortage of electric power will pose a great worry for various cities. Concentrated consumption of power by air-conditioners is the sticking point for such a seasonal problem, for which, hot water operated two stage chillers offer an attractive solution.

Shuangliang hot water operated two stage chillers are widely applied in industries, such as precision machinery manufacturing, instruments & meters, aviation & aerospace, textiles, electronics, electric power, metalurgy, pharmaceuticals, cigarettes, chemicals, hospitals, food, etc. By utilizing dozens of patented technologies with features of extremely high energy efficiency and outstanding environmental effects, in addition to her custom-service experience of over 25 years, Shuangliang guarantees to reward her users with optimal returns.

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# Hot Water Operated Single Stage Lithium Bromide Absorption Chiller

## Table of Technical Parameters (SI)

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<th>Model</th>
<th>HSC (303×81) - HSB (525×81)</th>
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<td>Pressure Loss</td>
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<td>Connection Diameter (DN)</td>
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<td>Cooling Water Inlet/Outlet Temp.</td>
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### Notes:

1. The lowest outlet temperature of chilled water is 5°C.
2. Cooling capacity can be adjusted in range of 20~100%, and chilled water can be adjusted in range of 60~120%.
3. The chilled water/cooling water/hot water side, scale factor is 0.086m³/K/kW·h·kcal.
4. Chilled/cooling/hot water boxes have the maximum pressure bearing capacity of 0.8 MPa for standard type and 1.6 MPa for High pressure type.
5. The chiller is transported with rack of 180mm in height for chiller less than unit HSB-413H2, and additional height of rack of 60mm for the units HSB-1488H2 and move.
6. The shipping weight includes the rack weight, excluding solution weight balance during handling.

### Technical requirements for lithium bromide solution

Lithium bromide solution is supplied by the Company, and its quality will be higher than that of provision of National standard.
### Working Principle

**Lithium bromide solution is absorbent and water is refrigerant.** As we know Water is vaporized at low boiling point in deep vacuum. It is the feature that is used in our chiller to absorb heat and to realize cooling effect.

Chiller is pumped into deep vacuum by vacuum pump, which creates the necessary condition for evaporation of water at low temperature. The resulting refrigerant vapor is attracted to the absorber by the pressure difference between absorber and evaporator and then absorbed by concentrated lithium bromide solution and therefore performs continuous evaporation of refrigerant.

In hot water operated single effect chiller, weak solution in absorber is pumped into generator via heat exchangers by solution pump and then concentrated into strong solution when heating by hot water. Refrigerant vapor generated at the same time is condensed into strong solution when heating by hot water.

Refrigerant water enters evaporator and then is pumped to spray through spraying device by refrigerant pump. The transfer of heat from the system water to the refrigerant causes the refrigerant water to vaporize again, producing chilled water (cooling source provided by the chiller), concentrated strong solution directly enters absorber via heat exchangers and spray on heat exchanging tubes of absorber through dispersion trays. As refrigerant vapor is absorbed by the solution, strong solution is diluted and heat is generated and rejected to the cooling water flowing in the absorber tubes.

### Technical Specifications

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**Notes**

1. The loss of outlet temperature of chilled water is 6°C.
2. Cooling capacity can be adjusted in range of 20~100% and chilled water can be adjusted in range of 60~120%.
3. On the chilled water/cooling water/refrigerant side, scale factor is 0.06m²/kW.1000(m³/h)·K/kW for standard type and 1.6 MPa for High pressure type.
4. Chilled water/cooling water/refrigerant have the maximum pressure bearing capacity of 0.8 MPa/G for standard type and 1.6 MPa/G for High pressure type.
5. The chiller is transported with rack of 180mm in height for chiller less than unit HSA-496H2, and additional height of rack of 60mm for the unit HSA-496H2 and above.
6. The shipping weight includes the rack weight, excluding solution weight.