HOPE DEEPBLUE

LiBr ABSORPTION HEAT PUMP

DEEPBLUE

GREENER WORLD, BLUER SKY

Hope Deepblue

Continental Hope Group

Hope Deepblue Air Conditioning Manufacture Corp.,Ltd

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HOPE DEEPBLUE

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CONTINENTAL HOPE GROUP

Dream Achieves Wonderfulness , Hope Creates Excellence!

Continental CHG (CHG) was founded in 1982. After years of steady development, CHG has now developed into a diversified comprehensive group focusing on four major industrial sections: Mechanical&Electronic, Energy&Chemical, Tourism&Real Estate, and Construction& Contract. The industry involves transmission control, HVAC&R, construction engineering, network engineering, sodium chlorate, hydroelectric development, sapphire, tourism, hotel, real estate, feed, food, financial investment and other fields.

The Mechanical&Electronic section takes energy conservation and environmental protection as its own responsibility. The Senlan Inverter and Deepblue HVAC&R equipment developed by our own intellectual property rights are widely used in the fields of transmission control, energy conservation, HVAC&R ,waste heat utilization in China and abroad, which shows the Road of Chinese Brand. The Energy&Chemical sector builds a green circular economy industrial chain integrating "power generation, transmission, power distribution, salt chemicals, and new materials", transforming water conservancy and power resources into sodium chlorate chemical products, as well as gems. Hope Cultural and Tourism sector devotes to creating an ideal life of living, travel and business, created China's Eight Luxury Real Estate. The Construction&Contract section has several special professional qualifications, using strength to build assured projects and build city dreams.

Hope Group takes high technology as the core, comprehensive utilization of resources as the link, and carries out industrial layout around "energy saving, environmental protection, circular economy, quality life, city music", and initially forms a close and three-dimensional upstream and downstream industries.

Business philosophy---- Excellence Beyond Boarder

Vision----Greener World Bluer Sky Better Life

Mission----Create higher value for customers with excellent products and services.

Values------Sincere and trustworthy, achieving customers, contributing to the human.

Based on China

Service all over the world

HOPE DEEPBLUE AIR CONDITIONING MANUFACTURE CORP., LTD

Hope Deepblue Air Conditioning Manufacture Corp.,Ltd (Deepblue) was founded with an investment of 20 million USD by Continental Hope Group (CHG) in 1997 . It is located in national high-tech zone Chengdu, China, covering an area of 170 acres, which is the largest LiBr absorption equipment manufacture base in West China. Deepblue is engaged in the fields of refrigeration, heat pump, and industrial waste heat utilization product R&D, manufacture, sales, service, and providing one-stop energy system solutions to customers. Deepblue product includes LiBr absorption chiller, absorption heat pump, central vacuum hot water unit, which have been exported to many countries and regions. Deepblue has developed Deepblue Green Energy Center project (DGEC), which is the first CCHP project (Tri-generation) with independent intellectual property right in China. DGEC has been operating stably since 2003, which is known as the longest running time distributed energy project in China.

Thanks to strong technology and manufacture ability, Deepblue has established marketing and service network in China, involving in thousands projects and well known as expert of heat recovery in coking, textile, pharmaceutical, chemical, food, metallurgy, solar energy, rubber tires, power plants, petroleum, urban central heating and other industrial fields. Now Deepbule is paying more and more attention on developing oversea market and is open to cooperate with partners all over the world.

Deepblue products have obtained the National Industrial Product Production License, and have passed the ISO9001, ISO14001, OHSAS18001, CE , CRAA , CSC certification, etc. Deepblue won the Gold Award of China Science and Technology Expo, Gold Award of China Patent Technology Expo. Listed in the National Torch Plan Project, National Key New Product Project, Key Recommendation Unit for China Energy Conservation Project Construction, Top Ten Brands in China's HVAC and Refrigeration Industry, Top Ten Most Trusted Brands by Chinese Designers, China Model Enterprise for Building Energy Conservation and Emission Reduction, China Waste Heat leading company in the recycling field, Special Contribution Award for China's Building Environment and Equipment Industry, and the China Distributed Energy Outstanding Project Award etc.

Certificates


Business License


National Industry Products Production License


High-tech Enterprise Certificate


Disinfection Product Hygienic License


Chinese Top 10 Trusted Brands


Chinese Construction Energy Conservation and Emission Reduction Enterprise


CE Certificate


ISO9001 Certificate


ISO14001 Certificate


18001 Certificate


Chinese Energy Conservation Product Certificate


National Torch Program Project Certificate


Chinese Best Patent Program Certificate


CRAA Certificate

Manufacturing Equipment


CNC Processing Center


CNC Drilling Machine


Submerge-Arc Auto Welding Machine


CNC Cutting Machine


Auto Welding Robot


Sheet Metal Processing Center


Hydraulic Plate Shear


Painting Room


Hydraulic Cutting Machine

Testing Equipment


Helium Leakage Detector


X-Ray Detector


Welding Seam Inspector


Flue Gas Analyzer


Electric Testing Device


Whole Unit Performance Testing Center


Ultrasonic Pipe Flaw Detector

General Description

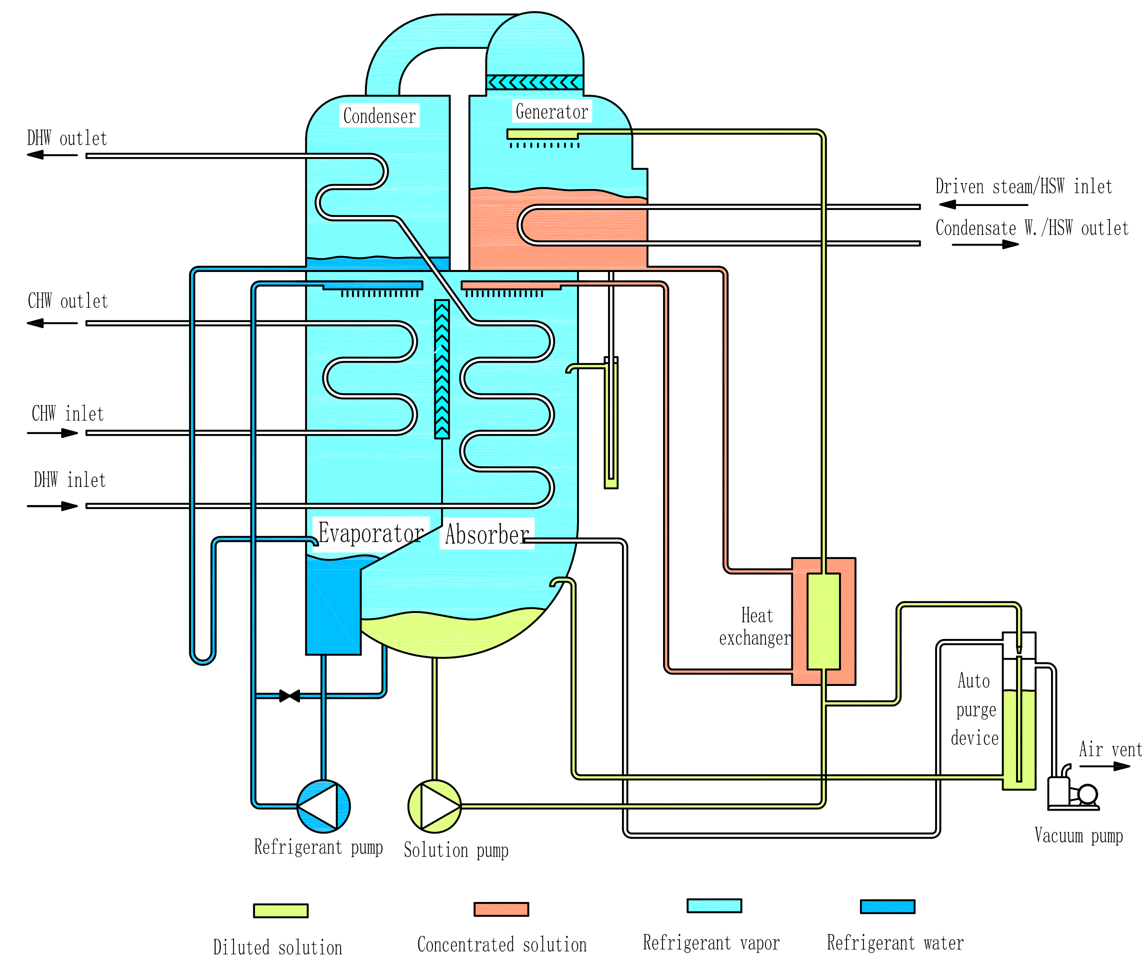
LiBr Absorption Heat Pump is a heat-powered device, which recycles and transfers LT (Low Temperature) waste heat to HT (High Temperature) heat sources for the purpose of process heating or district heating. It can be classified into Class I and Class II, depending on circulation method and operation status.

Working Principle of Class Ⅰ Absorption Heat Pump

Class I absorption heat pump is one kind of device driven by high grade heat sources, such as steam, HT hot water, natural gas, etc. to recover heat from LT heat sources, such as waste hot water, for the purpose of producing hot water for district heating and industrial process.

In the waste heat recovery process, the refrigerant water in evaporator absober heat from the waste hot water and evaporates in refrigerant vapor which enters the absorber. After absorbing the refrigerant vapor, the concentrated solution in absorber becomes diluted solution and releases the absorbed heat, which in turns heats the hot water as a heating medium to a temperature required for heating effect. Meanwhile, the diluted solution is delivered to generator by solution pump, where the diluted solution is heated by driven steam (or HT hot water) turns into concentrated solution and delivered back to absorber. The concentration process generates refrigerant vapor which enters the condenser where it is used to heat the hot water to the required temperature. Meanwhile, the refrigerant vapor condenses into refrigerant water, which enters evaporator and absorbs the heat from waste hot water. Repeating of this cycle constitutes a continuous heating process.

Class I Heat Pump



Working Principle of Class I Dual Effect Absorption Heat Pump

For the HT heat source, dual effect heat pump can be adopted.

The refrigerant water in evaporator absorbs heat from the waste hot water and evaporates in refrigerant vapor which enters the absorber. After absorbing the refrigerant vapor, the concentrated solution in absorber becomes diluted solution and releases the absorbed heat, which in turns heats the hot water as a heating medium to a temperature required for heating effect. Meanwhile, the diluted solution is delivered by solution pump via LT heat exchanger, Ht heat exchanger to HTG, where it's heated by heat source, releases refrigerant vapor and make solution concentrates to intermediate solution.

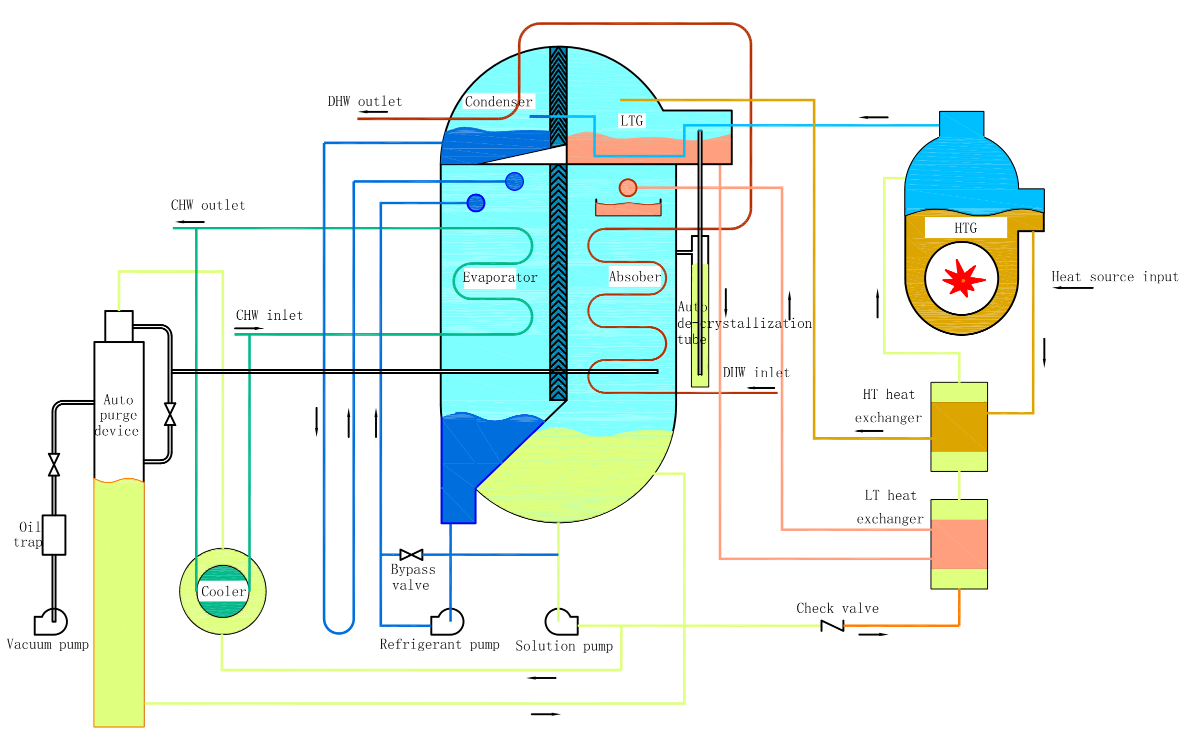
After releasing heat in HT heat exchanger, the intermediate solution enters LTG, where it is heated by HT refrigerant vapor from HTG, releases refrigerant vapor and concentrates in concentrated solution.

After the HT refrigerant vapor generated in HTG heats the intermediate solution in LTG, it becomes condensate water, which enters condenser together with the refrigerant vapor generated in LTG, and heats the hot water to a required temperature. At this point, both HT and LT refrigerant vapor condense into water.

After refrigerant water entering evaporator via throttle to absorb the heat from waste heat from waste hot water, it becomes refrigerant vapor entering absorber. The concentrated solution in LTG returns to absorber via LT heat exchanger to absorb refrigerant vapor and condenses into water.

Repeating of this cycle constitutes a continuous heating process.

Dual Effect Heat Pump



Diluted solution Intermediate solution Concentrated solution HT refrigerant vapor

Refrigerant vapor Refrigerant water DHW: district hot water CHW: waste hot water

Working Principle of Class II Two Phase Absorption Heat Pump

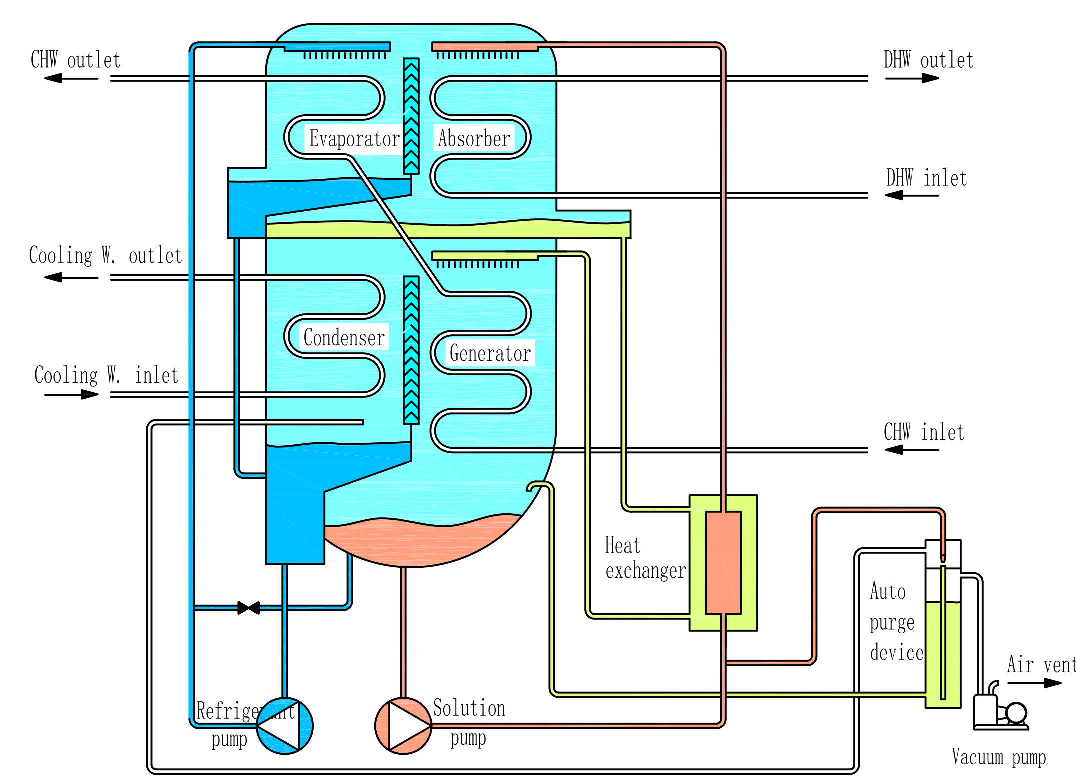
Normally, Class II absorption heat pump is one kind of LT waste heat-driven device, which absorbs heat from waste hot water to generate hot water with a higher temperature than driven waste hot water. The most typical feature for this kind heat pump is that it can generate hot water with a higher temperature than waste hot water without other heat sources. In this condition, waste hot water is also the heat source. This is why Class II absorption heat pump is known as temperature boosting heat pump.

The waste hot water enters generator and evaporator in series or in parallel way. The refrigerant water absorbs the heat from waste hot water in evaporator, then it evaporates into refrigerant vapor and enters absorber. The concentrated solution in absorber becomes diluted solution and releases heat after absorbing the refrigerant vapor. The absorbed heat heats the hot water to the required temperature.

On the other hand, the diluted solution enters generator after heat exchanging with the concentrated solution via heat exchanger and returns to generator, where it is heated by the waste hot water and concentrated into concentrated solution, then delivered to absorber. The refrigerant vapor produced in generator is delivered to condenser, where it is condensed into water by the low temperature cooling water and delivered to evaporator by refrigerant pump.

Repeating of this cycle constitutes a continuous heating process.

Class II Heat Pump



Diluted solution Concentrated solution Refrigerant vapor Refrigerant water

DHW: District Hot Water CHW: Waste Hot Water

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- **Waste Heat Recovery. Energy Conservation&Emission Reduction**

It can be applied to recover LT waste hot water or LP steam in thermal power generation, oil drilling, petrochemical field, steel engineering, chemical processing field, etc. It can utilize river water, groundwater or other natural water source, converting LT hot water into HT hot water for the purpose of district heating or process heating.

- **Dual effect (Used for Cooling/Heating)**

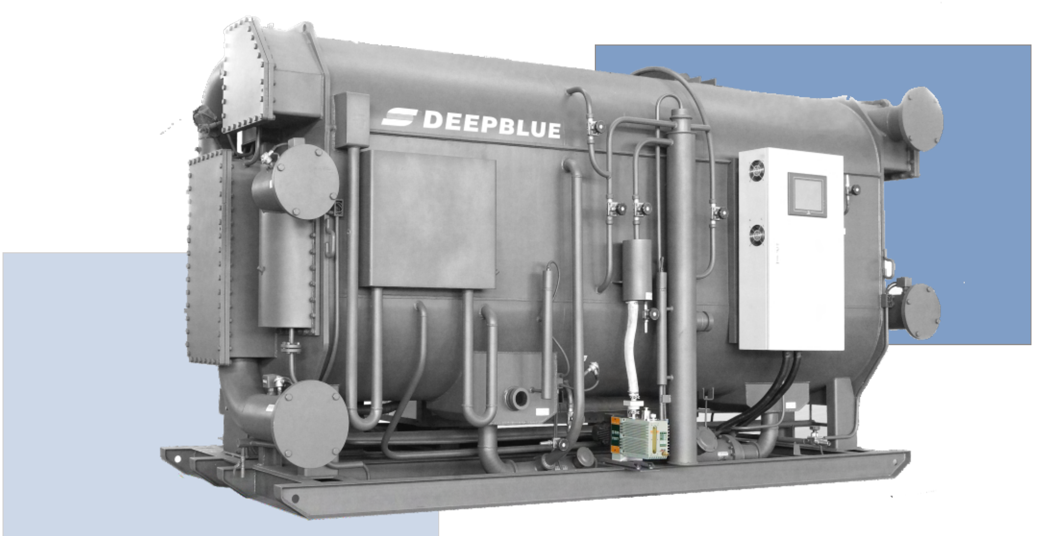
Driven by natural gas or steam, dual effect absorption heat pump can recover waste heat with very high efficiency (COP can reach 2.4). It is equipped with both heating and cooling function, especially applicable to concurrent heating/cooling demand.

- **Two Phase Absorption&Higher Temperature**

Class II two phase absorption heat pump can improve waste hot water temperature to 80°C without other heat source.

- **Intelligent Control&Easy Operation**

Fully automatic control, it can realize one-button On/Off, load regulation, solution concentration limit control and remote monitoring.



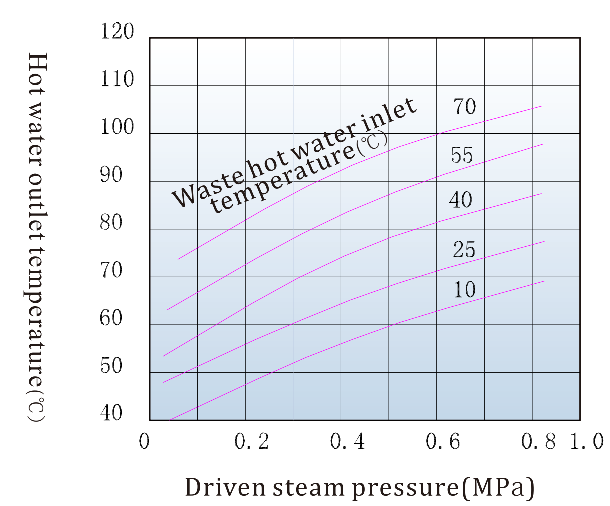
Product Model

RB S Ⅱ (●)-●(●/●)(●/●)(●/●)

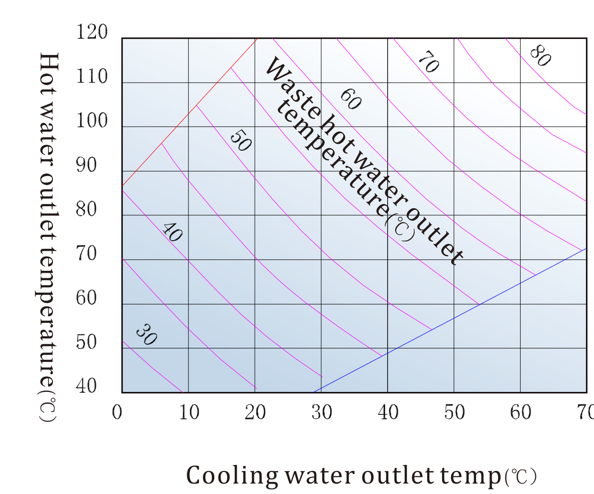
- Waste hot water inlet/outlet temperature
- Cooling water inlet/outlet temperature (Omit it for class I heat pump)
- Hot water inlet/outlet temperature
- Heating capacity: x10kW
- Driven steam: MPa (Omit it for direct fired type and class II heat pump)
- Class II heat pump, omit it for class I heat pump)
- Dual effect heat pump, omit it for other heat pump
- Unit type: LiBr absorption heat pump

Performance Curve

Class I Absorption Heat Pump



Class II Absorption Heat Pump



Fully-automatic control functions

The control system (AI, V5.0) is featured by powerful and complete functions, such as one-key startup/shutdown, timed startup/shutdown, mature safety protection system, multiple automatic adjustment, system interlock, expert system, human machine dialogue(multi languages), building automation interfaces, etc.

Complete unit abnormality self-diagnosis and protection function

The control system (AI, V5.0) features 34 abnormality self-diagnosis & protection functions. Automatic steps will be taken by system according to level of an abnormality. This is intended to prevent accidents, minimize human labor and ensures a sustained, safe and stable operation of unit.

Unique load adjustment function

The control system (AI, V5.0) has a unique load adjustment function, which enables automatic adjustment of unit output according to actual load. This function not only helps to reduce startup/shutdown time and dilution time, but also contributes to less idle work and energy consumption.

Unique solution circulation volume control technology

The control system (AI, V5.0) employs an innovative ternary control technology to adjust solution circulation volume. Traditionally, only parameters of generator liquid level are used to control of solution circulation volume. This new technology combines merits of concentration&temperature of concentrated solution and liquid level in generator. Meanwhile, an advanced frequency-variable control technology is applied to solution pump to enable unit to achieve an optimal circulated solution volume. This technology improves operating efficiency and reduces startup time and energy consumption.

Solution concentration control technology

The control system (AI, V5.0) uses a unique concentration control technology to enable real-time monitoring/control of concentration and volume of concentrated solution as well as heat source input. This system can maintain unit under safe and stable at high concentration condition, improve unit operating efficiency and prevent crystallization.

Intelligent automatic air purge function

The control system (AI, V5.0) can realize real-time monitoring of vacuum condition and purge out the non-condensable air automatically.

Unique shutdown dilution control

This control system (AI, V5.0) can control operation time of different pumps required for dilution operation, according to the concentration of concentrated solution, ambient temperature and remaining refrigerant water volume. Therefore, an optimal concentration can be maintained for the unit after shutdown. Crystallization is precluded and unit re-start time is shortened.

Working parameter management system

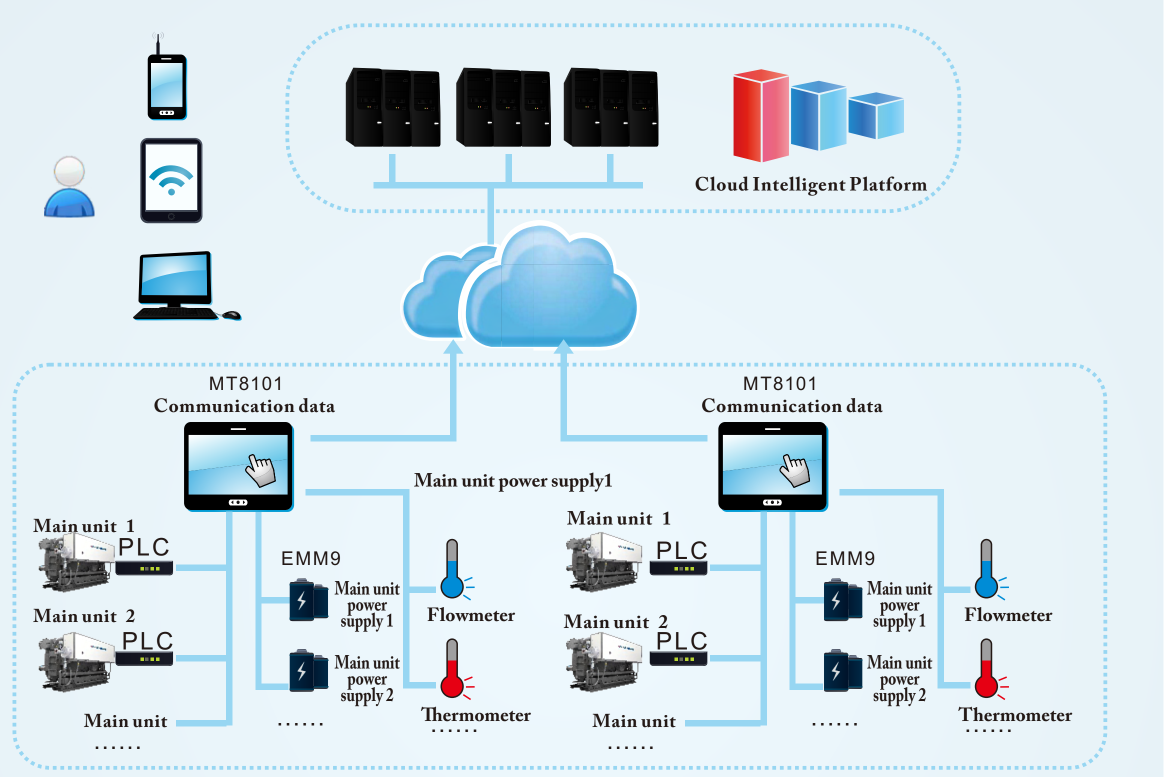
Through interface of this control system (AI, V5.0), operator can perform any of following operations for 12 critical parameters relating to unit performance: real-time display, correction, setting. Records can be kept for historical operation events.

Unit fault management system

If any prompt of occasional fault is displayed on operation interface, this control system (AI, V5.0) can locate and detail fault, propose a solution or trouble shooting guidance. Classification and statistical analyses of historical faults can be conducted to facilitate maintenance service provided by operators.

Remote Operation&Maintenance System

Deepblue Remote Monitoring Center collects the data of the units distributed around the world. Through the classification, statistics, and analysis of real-time data, it displays in the form of reports, curves, and histograms to achieve an overall overview of equipment operating status and fault information control. Through a series of collection, calculation , control, alarm, early warning, equipment ledger, equipment operation and maintenance information and other functions, as well as customized special analysis and display functions, the remote operation, maintenance, and management needs of the unit are finally realized. The authorized client can browse the WEB or APP, which is convenient and fast.



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Steam Fired Dual Effect LiBr Absorption Heat Pump Parameter

Model			RBS(0.8)-	35	47	58	70	81	93	116	145	174	204	233	262	291	349	407	465	582	698	814
Capacity	Cooling		kW	291	384	488	582	675	768	965	1210	1454	1686	1931	2175	2419	2896	3384	3861	4826	5792	6757
			$\times10^4$Kcal/h	25	33	42	50	58	66	83	104	125	145	166	187	208	249	291	332	415	498	581
	Heating		kW	350	470	580	700	810	930	1160	1450	1740	2040	2330	2620	2910	3490	4070	4650	5820	6980	8140
			$\times10^4$Kcal/h	30	40	50	60	70	80	100	125	150	175	200	225	250	300	350	400	500	600	700
Cooling	Chilled water	Inlet/outlet temp.	℃	12→7																		
		Flow rate	m³/h	50	66	84	100	116	132	166	208	250	290	332	374	416	498	582	664	830	996	1162
		Pressure drop	kPa	44.7	44.6	44.5	68.4	68.7	42.1	42	42.2	42.1	58.8	59	58.7	79.4	79.3	39.6	39.6	39.6	75.4	75.4
		Joint connection	DN(mm)	80	100	100	125	125	150	150	150	200	200	200	200	250	250	250	300	300	350	400
	Cooling water	Inlet/outlet temp.	℃	32→37.5																		
		Flow rate	m³/h	80	106	134	160	186	211	266	333	400	464	531	598	666	797	931	1062	1328	1594	1859
		Pressure drop	kPa	42. 3	42. 5	43. 8	48	48	70	70	70	70	89	89	89	47	47	53	56.4	55.8	61.2	63.1
		Joint connection	DN(mm)	100	125	125	125	150	150	150	200	200	200	250	250	300	350	350	350	400	400	450
	Steam	Consumption	Kg/h	332	442	553	663	774	884	1105	1381	1658	1934	2210	2486	2763	3315	3868	4420	5525	6630	7735
		Inlet connection	DN(mm)	40	50	50	65	65	65	65	80	80	100	100	100	100	125	125	125	150	150	150
		Condensate connection	DN(mm)	25	25	25	25	25	25	40	40	40	40	40	40	40	50	50	50	50	65	65
Heating	CHW	Inlet/outlet temp.	℃	35→28																		
		Flow rate	m³/h	43	57	71	85	100	114	142	178	213	249	284	320	356	427	498	569	711	853	995
		Pressure drop	kPa	32. 8	32. 7	32. 7	50. 2	50. 5	73. 3	73. 2	73. 4	73. 3	82. 1	74. 6	81. 3	79. 4	82. 1	43. 2	43. 6	45. 1	80. 6	81. 3
		Joint connection	DN(mm)	80	100	100	125	125	150	150	150	200	200	200	250	250	250	300	300	350	400
	DHW	Inlet/outlet temp.	℃	50→55																		
		Flow rate	m³/h	60	80	100	120	140	160	200	250	300	350	400	450	500	600	700	800	1000	1200	1400
		Pressure drop	kPa	33.8	34.0	35.0	38.4	38.4	56.0	56.0	56.0	56.0	71.2	69.4	71.2	37.6	37.6	42.4	45.1	44.6	49.0	50.5
		Joint connection	DN(mm)	100	125	125	125	150	150	150	200	200	200	250	250	300	350	350	350	400	400	450
	Steam	Consumption	Kg/h	217. 8	290. 4	363. 0	435. 6	508. 2	580. 8	726. 0	907. 5	1089. 0	1270. 5	1452. 0	1633. 5	1815. 0	2178. 0	2541.0	2904. 0	3630. 0	4356. 0	5082. 0
		Inlet connection	DN(mm)	40	50	50	65	65	65	65	80	80	100	100	100	100	125	125	125	150	150	150
		Condensate connection	DN(mm)	25	25	25	25	25	25	40	40	40	40	40	40	40	50	50	50	50	65	65
Power	Power supply		kW	2.8	2.8	2.8	2.8	3.2	3.2	3.2	3.5	3.8	4.2	5.2	5.2	6.6	7.1	7.6	7.9	8.4	12.2	13.2
	Power			3ph\380V\50Hz																		
Dimension	Length		mm	2980	2980	2980	2980	4030	4030	4220	4640	4680	5740	5760	5820	5840	5925	6780	6780	6800	7800	9155
	Width		mm	1525	1650	1795	1895	1680	1810	1930	2120	2190	2100	2215	2480	2510	2630	2640	2860	3140	3450	3530
	Height		mm	1920	2030	2185	2210	2160	2210	2320	2410	2540	2640	2710	2820	3155	3230	3380	3500	3545	3640	3520
Operation weight			t	4.1	5.2	6.4	7.4	7.8	10	11.4	13.8	16.1	17.4	21.2	22.8	25.3	28.2	33.2	37.1	44.9	52.4	59.8

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Direct Fired Dual Effect
LiBr Absorption Heat Pump Parameter

Item			Unit	35	47	58	70	81	93	116
Model			RBS-	35	47	58	70	81	93	116
Capacity	Cooling		kW	290	386	483	579	676	772	965
Capacity	Cooling		$\times10^4$Kcal/h	25	33	42	50	58	66	83
Capacity	Heating		kW	350	470	580	700	810	930	1160
Capacity	Heating		$\times10^4$Kcal/h	30	40	50	60	70	80	100
Cooling	Chilled water	Inlet/outlet temp.	℃	12→7						
Cooling	Chilled water	Flow rate	m³/h	50	66	84	100	116	132	166
Cooling	Chilled water	Pressure drop	kPa	44.7	44.6	44.5	68.4	68.7	42.1	42
Cooling	Chilled water	Joint connection	DN(mm)	80	100	100	125	125	150	150
Cooling	Cooling water	Inlet/outlet temp.	℃	32→37.5						
Cooling	Cooling water	Flow rate	m³/h	80	106	134	160	186	211	266
Cooling	Cooling water	Pressure drop	kPa	42. 3	42. 5	43. 8	48	48	70	70
Cooling	Cooling water	Joint connection	DN(mm)	100	125	125	125	150	150	150
Cooling	Natural gas	Consumption	Nm³/h	18.9	25.0	31.8	37.9	43.9	50.0	62.9
Cooling	Natural gas	Inlet connection	DN(mm)	32	40	40	40	40	50	50
Cooling	Natural gas	Exhaust outlet	mm	250×180	250×180	250×180	300×200	300×200	300×200	370×250
Heating	CHW	Inlet/outlet temp.	℃	35→28						
Heating	CHW	Flow rate	m³/h	43	57	71	85	100	114	142
Heating	CHW	Pressure drop	kPa	32. 8	32. 7	32. 7	50. 2	50. 5	73. 3	73. 2
Heating	CHW	Joint connection	DN(mm)	80	100	100	125	125	150	150
Heating	DHW	Inlet/outlet temp.	℃	50→55						
Heating	DHW	Flow rate	m³/h	60	80	100	120	140	160	200
Heating	DHW	Pressure drop	kPa	33.8	34.0	35.0	38.4	38.4	56.0	56.0
Heating	DHW	Joint connection	DN(mm)	100	125	125	125	150	150	150
Heating	Natural gas	Consumption	Nm³/h	12.5	16.6	20.8	24.9	29.1	33.2	41.5
Heating	Natural gas	Inlet connection	DN(mm)	32	40	40	40	40	50	50
Heating	Natural gas	Exhaust outlet	mm	250×180	250×180	250×180	300×200	300×200	300×200	370×250
Power	Power supply		kW	3.4	3.4	3.6	4.6	4.9	4.9	5.3
Power	Power			3ph\380V\50Hz						
Dimension	Length		mm	2980	2980	2980	2980	4030	4030	4220
Dimension	Width		mm	1820	1940	1995	2065	1980	2035	2069
Dimension	Height		mm	1920	2030	2185	2210	2160	2210	2320
Operation weight			t	4.9	6.2	7.7	8.9	10.1	12	13.7

Item			Unit	145	174	204	233	262	291	349	407	465	582	698	814
Model			RBS-	145	174	204	233	262	291	349	407	465	582	698	814
Capacity	Cooling		kW	1207	1448	1689	1931	2172	2413	2896	3379	3861	4826	5792	6757
Capacity	Cooling		$\times10^4$Kcal/h	104	125	145	166	187	208	249	291	332	415	498	581
Capacity	Heating		kW	1450	1740	2040	2330	2620	2910	3490	4070	4650	5820	6980	8140
Capacity	Heating		$\times10^4$Kcal/h	125	150	175	200	225	250	300	350	400	500	600	700
Cooling	Chilled water	Inlet/outlet temp.	℃	12→7											
Cooling	Chilled water	Flow rate	m³/h	208	250	290	332	374	416	498	582	664	830	996	1162
Cooling	Chilled water	Pressure drop	kPa	42.2	42.1	58.8	59	58.7	79.4	79.3	39.6	39.6	39.6	75.4	75.4
Cooling	Chilled water	Joint connection	DN(mm)	150	200	200	200	200	250	250	250	300	300	350	400
Cooling	Cooling water	Inlet/outlet temp.	℃	32→37.5											
Cooling	Cooling water	Flow rate	m³/h	333	400	464	531	598	666	797	931	1062	1328	1594	1859
Cooling	Cooling water	Pressure drop	kPa	70	70	89	89	89	47	47	53	56.4	55.8	61.2	63.1
Cooling	Cooling water	Joint connection	DN(mm)	200	200	200	250	250	300	350	350	350	400	400	450
Cooling	Natural gas	Consumption	Nm³/h	78.8	94.7	109.8	125.8	141.7	157.6	188.6	220.5	251.5	314.4	377.3	440.2
Cooling	Natural gas	Inlet connection	DN(mm)	50	50	65	65	80	80	80	100	100	125	125	150
Cooling	Natural gas	Exhaust outlet	mm	370×250	450×250	500×300	550×320	580×360	580×360	600×400	700×450	700×450	750×550	750×550	750×550
Heating	CHW	Inlet/outlet temp.	℃	35→28											
Heating	CHW	Flow rate	m³/h	178	213	249	285	320	356	427	498	569	712	854	996
Heating	CHW	Pressure drop	kPa	73. 4	73. 3	82. 1	74. 6	81. 3	79. 4	82. 1	43. 2	43. 6	45. 1	80. 6	81. 3
Heating	CHW	Joint connection	DN(mm)	150	200	200	200	200	250	250	250	300	300	350	400
Heating	DHW	Inlet/outlet temp.	℃	50→55											
Heating	DHW	Flow rate	m³/h	250	300	350	400	450	500	600	700	800	1000	1200	1400
Heating	DHW	Pressure drop	kPa	56.0	56.0	71.2	69.4	71.2	37.6	37.6	42.4	45.1	44.6	49.0	50.5
Heating	DHW	Joint connection	DN(mm)	200	200	200	250	250	300	350	350	350	400	400	450
Heating	Natural gas	Consumption	Nm³/h	51.9	62.3	72.6	83.0	93.4	103.8	124.5	145.3	166.0	207.5	249.0	290.5
Heating	Natural gas	Inlet connection	DN(mm)	50	50	65	65	80	80	80	100	100	125	125	150
Heating	Natural gas	Exhaust outlet	mm	370×250	450×250	500×300	550×320	580×360	580×360	600×400	700×450	700×450	750×550	750×550	750×550
Power	Power supply		kW	5.7	6.6	10	10	10	10.7	16.1	16.6	21.5	22.4	32.9	34.9
Power	Power			3ph\380V\50Hz											
Dimension	Length		mm	4640	4680	5740	5760	5820	5840	5925	6780	6780	6800	7800	9155
Dimension	Width		mm	2520	2590	2305	2515	2860	2910	3065	2940	3185	3740	4050	4110
Dimension	Height		mm	2410	2540	2640	2710	2820	3155	3230	3380	3500	3545	3640	3520
Operation weight			t	16.6	19.4	22.1	24.7	27.3	29.8	34.9	39.8	44.5	53.9	61.4	69.1

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Steam Fired Class I LiBr Absorption Heat Pump Parameter

Model		RB(0.6)-	116	174	233	291	349	407	465	582	698	814	930	1047	1164
Heating capacity		kW	1163	1740	2330	2910	3490	4070	4650	5820	6980	8140	9300	10470	11640
Heating capacity		$\times 10^4$Kcal/h	100	150	200	250	300	350	400	500	600	700	800	900	1000
CHW	Inlet/outlet temp.	℃	40→35												
CHW	Flow rate	m³/h	88	132	176	220	264	308	352	440	528	616	704	792	880
CHW	Pressure drop	kPa	35.50	35.50	51.70	51.60	51.70	41. 00	41. 10	69. 20	69.20	69.20	39.10	39.10	39.00
CHW	Joint connection	DN(mm)	125	125	150	200	200	150	250	250	250	300	300	350	350
DHW	Inlet/outlet temp.	℃	62→80												
DHW	Flow rate	m³/h	56	84	112	140	168	196	224	280	336	392	448	504	560
DHW	Pressure drop	kPa	101.0	102.0	111.0	111.0	111.0	130.0	130.0	133.0	137.0	137.0	147.0	147.0	147.0
DHW	Joint connection	DN(mm)	100	100	125	150	150	200	200	200	200	250	250	250	300
Steam	Pressure	MPa	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Steam	Consumption	Kg/h	1134	1701	2268	2835	3402	3969	4536	5670	6804	7938	9072	10207	11341
Steam	Inlet connection	DN(mm)	65	80	100	100	125	125	125	150	150	200	200	200	200
Steam	Condensate connection	DN(mm)	40	40	50	50	65	65	65	80	80	80	100	100	100
Power	Power supply	kW	2.8	3.8	4.2	4.4	5.4	5.8	6.4	6.4	7.7	8.2	8.7	9.7	12.2
Power	Power		3ph\380V\50Hz												
Dimension	Length	mm	4020	4658	5750	5750	5850	5935	6700	6765	6800	7800	7800	9160	9160
Dimension	Width	mm	1580	1910	2074	2185	2460	2520	2510	2815	2975	3120	3360	3470	3640
Dimension	Height	mm	2250	2652	2740	2890	3315	3410	3570	3615	3675	3720	3810	3785	4065
Operation weight		t	8.5	11.9	16.5	18.7	23.2	24.7	28.4	34.0	38.1	42.3	46.2	58.7	61.4

Class II LiBr Absorption Heat Pump Parameter

Model		RBII-	58	70	81	93	105	116	145	174	204	233	291	349	407	465
Heating capacity		kW	580	700	810	930	1050	1160	1450	1740	2040	2330	2910	3490	4070	4650
Heating capacity		$\times 10^4$Kcal/h	50	60	70	80	90	100	125	150	175	200	250	300	350	400
DHW	Inlet/outlet temp.	℃	60→80													
DHW	Flow rate	m³/h	25.0	30.0	35.0	40.0	45.0	50.0	62.5	75.0	87.5	100.0	125.0	150.0	175.0	200.0
DHW	Pressure drop	kPa	75.0	75.0	82.0	84.0	96.0	96.0	102.0	107. 0	113. 0	113. 0	120.0	131.0	131.0	114.0
DHW	Joint connection	DN(mm)	65	80	80	80	80	80	100	100	100	125	125	150	150	150
CHW	Inlet/outlet temp.	℃	60→50													
CHW	Flow rate	m³/h	111	133	156	178	200	222	278	333	389	444	556	667	778	889
CHW	Pressure drop	kPa	62	67	71	71	78	78	81	81	92	95	95	93	96	97
CHW	Joint connection	DN(mm)	100	125	150	150	150	200	200	200	200	250	250	300	350	350
Cooling water	Inlet/outlet temp.	℃	15→20													
Cooling water	Flow rate	m³/h	122	146	171	195	220	244	305	366	427	488	610	732	854	976
Cooling water	Pressure drop	kPa	54	54	61	66	72	75	79	83	87	91	95	107	112	98
Cooling water	Joint connection	DN(mm)	125	150	150	150	200	200	200	250	250	250	300	300	350	300
Dimension	Length	mm	4120	4870	4870	4870	5870	5870	5895	5920	5940	6920	6920	7980	7980	8980
Dimension	Width	mm	1495	1420	1635	1960	1895	2080	2240	2670	2885	2380	2640	2760	2885	3040
Dimension	Height	mm	2765	2830	3180	3225	3240	3645	3750	3780	3910	3825	3865	3825	3870	3820
Operation weight		t	9.4	12.3	13.8	16	17.6	19.1	23.4	28.7	33.2	37.4	47.2	55.7	65.7	74.3

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Machine Room Design and Construction

Scope of Delivery and Construction

Items	Description	Scope of Delivery and Construction: Deepblue	Scope of Delivery and Construction: User	Remarks
Unit	Chiller and accessories	●		Please refer to Scope of Supply.
Performance test	Ex-factory performance test	●		
	Site commissioning	●		Depends on Sales Contract
Transportation to the site	From the factory to the worksite		●	Depends on Sales Contract
	From the worksite to the mounting		●	Depends on Sales Contract
	Installation in place		●	Depends on Sales Contract
	Chiller assembly (separate delivery)	●		The user must provide welding equipment, nitrogen and other necessary tools.
Electrical engineering	Sensors and meters	●		The user must be responsible for laying remote control cables.
	External electrical wiring engineering		●	The wires extend till the outlet of the wiring terminal of the control cabinet.
Other engineering	Foundation construction		●	
	External tubing engineering		●	
	Air extraction system		●	
	Tubing system anti-freezing measures		●	During winter shutdowns, please adopt anti-freezing measures for the water tubing.
	Cooling water quality management		●	Please set the cooling water discharge valve or other unit to enable proper water quality.
	Insulation engineering		●	Optional, depends on Sales Contract
Other	LiBr solution	●		
	Operation training & instructions	●		

Civil Works for the Machine Room

Site Selection of the Machine Room
The unit can operate stably, safely and reliably with very little noise, so it may be installed in the basement or on the first floor, middle floors or rooftop or in independent machine rooms.

Machine Room Ventilation
The machine room should have a good ventilation environment.

Ambient Temperature in the Machine Room
The temperature should be controlled within the range of 5-40°C.

Drainage
The machine room should be equipped with good drainage facilities: ① Drains covered by cast iron grates should be available around the unit. Water in the drains can flow out of the machine room without difficulty. ② All the discharge pipes and signal pipes in the machine room should be installed at a visible place above the drains. They should not be installed in the drains. ③ Sump pits and submerged pumps should be available in a machine room located in the basement. Automatic control devices should be provided to enable automatic drainage.

Machine Room Arrangement
The installation location of the machine room should ensure handy operation and adequate maintenance space. A 1 -meter-wide operation space (minimum) should be left at the front of the electrical control cabinet, a 0.3m distance (minimum) should be reserved between the top of the unit and the bottom of the beam of the machine room, a 1,2-meter-wide space (minimum) should be left for the other sides of the Unit. A space for drawing heat conducting tubes (length: no less than the tube length) should be reserved at any end of the lengthwise direction of the unit. If this space can not be reserved, a window or door may be designed for tube drawing.

Unit Foundation
The unit's foundation may be designed on the basis of the dead load of the
unit. The design should ensure stable, firm and unsinkable, otherwise the unit
may suffer damage or a shortened service life.

Tubing System
The tubing system should be designed and planned as a whole in compliance with the requirements of the applicable standards and regulations. The tubes should be arranged in an orderly and neat way. Try to adopt overhead installation. The tubes should be firmly supported. The gravity of external tubing must not be applied to the unit.

Water Supply System
Flexible joints must be fitted for CHW/DHW and cooling water supply to the unit. A filter must be fitted for the inlet end at a place easy for disassembly. If the hydrostatic pressure of the water is more than 30mH2O, it is recommended to install the water pump at the outlet side so as to relieve unnecessary pressure load. Tubes at both inlet and outlet ends should be easy to uninstall. This is intended to facilitate the cleaning of heat conducting tubes by opening the water chamber.

Gas System (Only for Gas Direct Fired Heat Pump)
Normally the inlet pressure of natural gas and artificial coal gas need to meet the requirements within the range listed in the nominal parameter sheet, the pressure reduction devices should be installed if the pressure exceeds this range. A drain valve should be installed at the lowest point of the gas pipeline. A reliable gas leak alarm device must be installed in the machine room, and its action value should alarm when the gas leak content reaches 1/4 of the lower explosive limit. The machine room should be well ventilated. When natural ventilation cannot meet the requirements, mechanical ventilation devices should be installed and can be operated for 24 hours continuously. The user should provide the type, heating value, pressure of the gas to Hope Deepblue when ordering, to choose corresponding burner.

Fuel System (Only for Fuel Direct Fired Heat Pump)
The fuel system generally consists of oil storage tanks, daily fuel tanks, fuel pumps, filters and other equipment. The capacity of the oil storage tank should meet the fuel consumption using for at least seven days for the unit .
Oil storage tanks should be equipped with inspection holes, oil level detection devices, fire-stop breathing valves, lightning protection and anti-static devices, etc. The total capacity of the daily fuel tank should generally not be greater than the unit's daily needs. The indoor daily fuel tank should use a closed fuel tank with a vent pipe that directly leads to the outside. The vent pipe should be equipped with a flame damper and rainproof device, the fuel tank should not be equipped with a glass tube level gauge. The minimum oil level of the daily fuel tank should be 0.5m higher than the burner. The oil pipeline should be welded by seamless steel pipes, and an emergency shut-off valve should be installed on the oil supply pipeline. The heavy oil pipeline system needs to be equipped with a heating device. A fuel filter (60 mesh/inch) with enough passage area to reduce the pipeline resistance should be installed near the inlet of the fuel pump and the burner.

Exhaust System (only for Direct Fired unit)
The flue should have good air tightness and low resistance. The horizontal pipe should keep a slope more than 1%, and the cross-sectional area of the flue duct should not be less than exhaust outlet i of the unit. When several unit share one flue duct, the exhaust extraction of each unit should be even and the total cross-section area should be no less than the sum area of each flue duct.
The flue design should ensure sufficient strength and rigidity. The gravity of the flue should not be borne by the unit. The insulation of the flue duct should be selected according to 400°C, and the surrounding fire isolation zone should be designed according to 400°C as well. The bottom of the horizontal flue closest to the unit should be equipped with a water collection trough and a drainage pipe to prevent condensate from flowing into the unit and causing serious corrosion.

Electric System
The design of the electrical system in the machine room must match the control system of the unit to achieve full automation.

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Handling and Installation in Place

Delivery Status

Delivery usually takes the form of whole-unit delivery.
Transportation suggestion: During the lifting process of the unit, it should be carried out in accordance with the "Lifting Instruction" provided by Hope Deepblue. Lifting ropes and fastening devices can only be placed at the indicated marks on the unit.

Installation in Place:

A layer of steel plate and rubber sheet should be laid on the foundation of the unit. After the unit is in place, the length direction and width should be corrected with the small holes (φ4) on both sides as the reference point, and the levelness of the unit should be controlled within 1/1000. There should be no gap between the bracket of the unit and the foundation to ensure the uniform pressure.

During the lifting, installation and construction of the unit, protective measures should be taken and strictly forbid to hit the unit with heavy objects and to screw the valve to prevent it from being damaged.

Water Quality Management

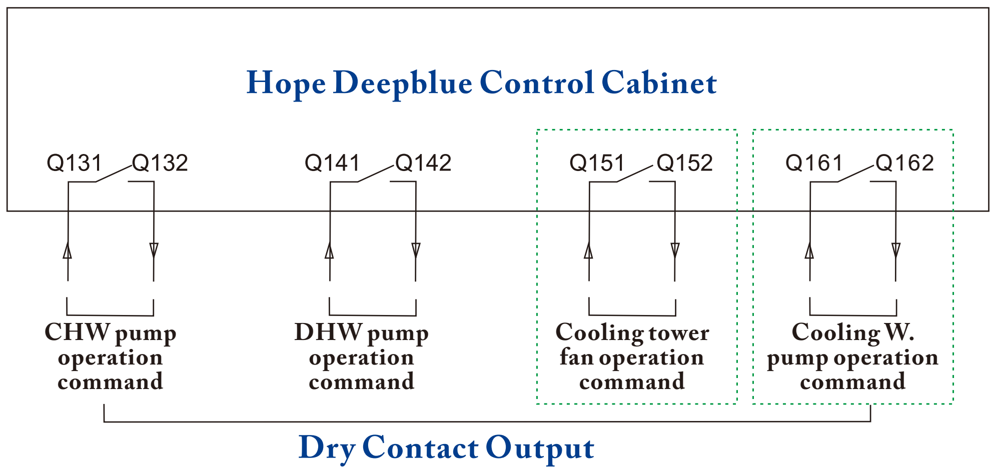
Refer to the following table for the water quality requirements on makeup water

Item	Unit	Makeup Water	Cooling Water Requirements	Tendency	
				Corrosion	Scaling
pH value(25°C)		6.5-8.0	6.5-8.0	△	△
Conductivity (25 °C)	μS/cm	<200	<800	△	
Chloride ion Cl^-	mgCl^-/L	<50	<200	△	
Sulfate ion SO_4^{2-}	mgSO_4^{2-}/L	<50	<200	△	
Acid consumption (pH:4.8)	mg$CaCO_3$/L	<50	<100		△
Total hardness	mg$CaCO_3$/L	<50	<200		△
Ferric ion (Fe)	mgFe/L	<0.3	<1.0	△	△
Sulfide ion S^{2-}	mgS^{2-}/L	Undetectable	Undetectable	△	
Ammonium ion NH_4^+	mgNH_4^+/L	<0.3	<1.0	△	
Silicon dioxide SiO^2	mgSiO_2/L	<30	<50		△

Control System

The electrical system in the machine room must match the control system of the LiBr absorption unit to achieve full automation. Otherwise, the advanced nature, reliability, safety and high efficiency of the Hope Deepblue LiBr absorption unit cannot be realized.

Interlock Control Diagram for User Water System



Note:
1.The capacity of the output relays for the interlock control terminals of above water pumps is AC250V, 5A (resistance load).
2. Q131, Q132, Q141, Q142, Q151, Q152 are numbers of wirings inside the control cabinet. Please connect them accordingly.
3. The CHW pump and DHW pump must be interlocked control during operation of the unit. The interlocked control in the dotted box are only adapt to class II heat pump.

Hope Deepblue LiBr Absorption Unit Control System

Point to point interface----PPI protocol

Multi-point --MPI protocol

PROFIBUS ----PROFIBUS protocol

Free interface-----User defined protocol

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Communication interface pins are assigned as follows

Pin (9 pin female connector)	PROFIBUS Name	System communication interface
1	RS-485 Signal A	RS-485 Signal A
2	RS-485 Signal B	RS-485 Signal B

Control System Site Construction Project

Item		Installation place & Requirement	Material source	Deepblue construction	User construction
Power supply		In control cabinet	User	In-cabinet connection	Lay 5×6mm² cables (wires) under the control cabinet
Ground connection		Ground resistance ≤10Ω	User	Connection	Lay the grounding grid and connect the wire to the bottom of the unit control cabinet
IoT		Interface in control cabinet	Users provide Internet	In-cabinet plug-in line	Lay the network cable under the control cabinet
PC Monitor≤ (1200m)		In user's monitoring room, in control cabinet	Deepblue (Optional accessories)	On-site installation	Lay the seven-core cable from the monitoring room to the bottom of the unit control cabinet
Oil level sensor (Fuel type unit)		Daily fuel tank/ storage tank	Deepblue (Optional)	Instructed installation	Lay the 4 control wires and the oil pump control panel under the control cabinet of the unit
Gas leak detector (Gas fired unit)		Installed at poorly ventilated place and close to gas pipe line	User	In-cabinet connection	Install the detector, and lay the 2 control wires from the detector to the bottom of the unit control cabinet
Fire detector		According to the requirements of Fire Dept	User	In-cabinet connection	Lay the 2 control wires from the detector to the bottom of the unit control cabinet
Building interface		In control cabinet	Deepblue (Optional)	In-cabinet connection	Laying the control wires under the control cabinet of the unit
Chilled/hot water pump	Frequency conversion linkage control	Inside or near the power distribution panel in the machine room	User	In-cabinet connection	Each motor has 2 control wires, and another 2 spare control wires, which are laid by the power distribution panel in the machine room to the lower part of the unit control cabinet
Cooling water pump					
Cooling tower fan	Frequency conversion linkage control	In control cabinet	User	In-cabinet connection	
Domestic hot water circulating pump					

Note: The control wire is 0.75mm² multi-strand soft copper wire

Model Selection Form

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Project Background					
Project Name					
Chiller Application	☐ Comfort A/C	☐ Industrial process cooling/heating			
Chiller Installation Environment	☐ Safe	☐ Combustible ☐ Corrosive air	☐ Dusty		
	NOTE: Safe means the environment is not harmful to human being and chiller operation.				
Chiller					
Chiller Type	☐ Hot water	☐ Steam			
	☐ Direct fired	☐ Multi-energy			
Unit Cooling(Capacity)	---------Kw				
Unit Heating(Capacity)	---------Kw				
QTY					
Heat Source	☐ Steam	Source	☐ Boiler	☐ District heating	
			☐ Others		
		Pressure	☐ 0. 4Mpa	☐ 0.6Mpa	☐ 0.8Mpa
			☐ Others________________________		
	☐ Direct fire	Type	☐ NG	☐ Coal gas	☐ LGP
			☐ Others ______________		
		Species	Heat value	___________ Kcal/Nm³	
			Pressure	Mpa	
	☐ Fuel	Type	☐ Heavy Oil	☐	☐Waste Oil
		Viscosity		______________	
	☐ Hot water	Inlet/Outlet	☐95-85°C	☐ Other___°C	
		Pressure	to Mpa		
	☐ Exhaust	Temperature	___ to °C		
		Pressure	Allowable Pressure	Mpa	
Water Temp.	Chilled water	Inlet/Outlet	☐ 12-7°C	☐23-16°C	
			☐ Other _____ to ________ °C		
		Pressure	☐ 0.8Mpa	☐ 1.0Mpa	
			☐ Other	_______	
	Domestic hot water	Inlet/Outlet	☐ 55.8-60°C	☐ Other__to__°C	
		Pressure	☐ 0. 8Mpa	☐ 1.0Mpa	
			☐ Other	____Mpa	
	Cooling water	Inlet/Outlet	☐ 30-36°C	☐ 32-37°C	
			☐ Other	to °C	
		Pressue	☐ 0. 8Mpa	☐ 1.0Mpa	
			☐ Other	Mpa	
Water Quality	Chilled water	☐ Standard	☐ Special		
	Domestic hot water	☐ Standard	Special		
	Cooling water	☐ Standard	☐ Special		
	Hot water	Standard	☐ Special		
Operation Condition	Operation Time/Day	☐ 24hours	☐ 8-10hours	☐ ___hours	
	Operation Time/Year	☐ All Year	☐ Summer	☐ Winter	
		☐ Other			
	Average Load	☐ >=90%	☐ 75-90%	☐ 60-75%	
		☐ Other			
Lead Time	days				
Other					
NOTE:Please full fill as much as possible.					

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