Hope Deepblue

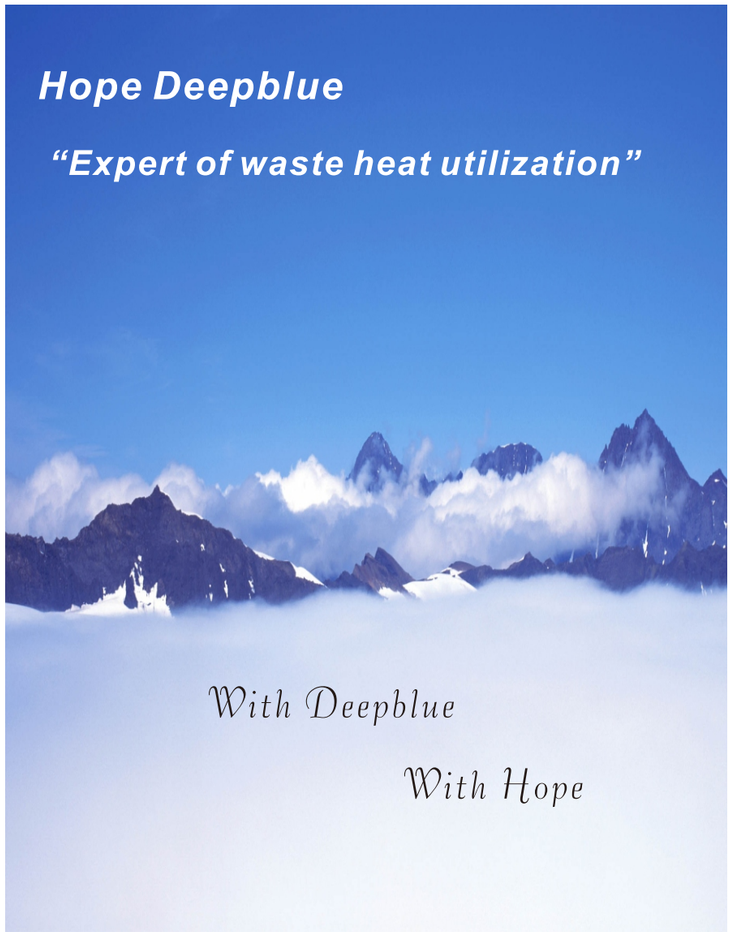


FLUE GAS-FIRED LiBr ABSORPTION WATER CHILLER & HEATER

Hope Deepblue
Continental Hope Group
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CONTINENTAL HOPE GROUP

BE CHINESE TOP BRAND

CREAT EXCELLENT EXTRAORDINARY QUALITY



Mr.Liu Yongyan,
Founder of CHG

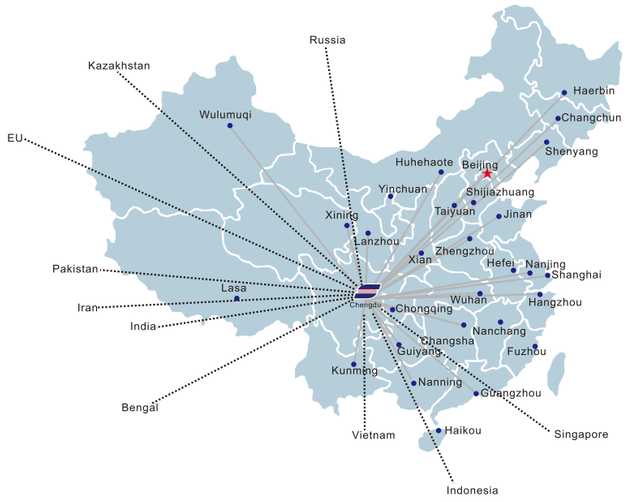


Dr.Chen Bin,
President of CHG

Group Instruction



Continental Hope Group(CHG) was foundedby Mr.Liu Yongyan, chairmanof the Board of HopeGroup in 1995. At that time,Hope Group has reachedits zenith—ranking first among “Top 500 Largest Chinese Private Enterprises ”, “ Top 100 Largest Chinese Private Sci-tech Enterprises by Total Income of Technology, Indaustry and Trade”, serving as the biggest shareho--Ider of China Minsheng Bank and China Mingsheng Life Insurance, and gaining the right of self-support import and export.In order to realize Hope Group’s new great leap forward, Mr. Liu and his three younger brothers clarified the property rights and set up the continental Hope Group,East Hope Group, Huaxi Hope Group and South (New) Hope Group respectively. After over ten years of rapid growth,CHG has developed into a large-scale diversified group with about one hundred subsidiaries and established four core businesses,namely, mechatronics, energy &chemical,construction general contracting,and hotel /tourism/real estate,each industry enjoying high reputation and forging ahead steadily and dynamically.



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Company Profile



Hope Deepblue Air Conditioning Manufacture Corp., Ltd (Deepblue) was established in 1997. It is affiliated to Hope Group, which has been following its corporate philosophy of "Contributing to the Motherland and Striving for the Best" since its founding and has developed into an ultra-large conglomerate after over twenty years of hard work, with its annual sales revenue approaching RMB 100 billion and its business involving energy development, energy and chemicals, HVAC&R, power electronics, information network, drive control, building, real estate, hotel, food, feedstuff, finance and international trade industries.

Deepblue was founded with an investment of RMB 160 million. It is located in the Western High-tech Park in Chengdu, a national key high-tech development zone, and occupies an area of about 170 mu(1 hectare equals 15 mu). As a national key high-tech enterprise and the largest central Air-conditioning manufacturer in West China, Deepblue is engaged in R&D, production and sale of products in HVAC&R, and offer all kinds of Air-conditioning and systematic solutions according to users' different demands.

Deepblue has a strong technology R&D team consisting of renowned experts, scholars and engineers in Air-conditioning industry. So far it has obtained tens of patents and prorpietary technologies and on this basis has developed the Deepblue Green Energy Center, the truly first heat-electricity-cooling tri-generation system with independent intellectual property rights in China, which has been operating successfully for more than ten years. Besides, Deepblue developed various advanced air conditioning products including water(ground)-source central Air-conditioning LiBr(lithium bromide) absorption chiller and vacuum boiler, bringing comfort and energy saving and environmental protection benefits to its customers.

Thanks to the advanced technologies, state-of-the-art production and test equipment, and scientific management, Deepblue's products has passed ISO9001, ISO14001, CCC, CRAA, CSC and CE certifications, won the "Gold Medal of the Fourth Shanghai Science and Technology Exposition" and "Gold Medal of China Fair of Inventions and Technologies", and included in the National Torch Program and National Key & New Product list, and Deepblue has won a number of awards such as Key Recommended Unit for National Energy Saving Project Construction, Top Ten Most Influential HVAC&R Brand, Top Ten Most Designer-trusted HVAC&R Brand, Model Enterprise for Building's Energy Conservation and Emission Reduction, Special Contribution Prize in Building Environment and Facilities Industry, and Leading Enterprise in Waste Heat Recovery. Particularly, Deepblue's water(ground)-source central Air-conditioning has become the first choice in the industry due to its prominent energy efficiency and high quality.

After more than ten years of rapid development, Deepblue has formulated a nationwide marketing and service network and established powerful and professional marketing and installation teams, which provide pre-sale technical consultancy, production installation and consultancy, lifelong product maintenance, energy saving management consultancy, energy saving project retrofit, and Air-conditioning and energy operation management services, making customers enjoy satisfactory services during the whole process from R&D, manufacture, inspection to commissioning and after-sale maintenance.

"One Project, One Masterpiece". Deepblue has built an array of important and representative projects across China such as the Beijing Newton Office, Zhejiang World Trade Center, Hefei New City International, Lingbo Xinfeng Resort(five-star), Chengdu Homeland Hotel(five-star), and Hongpailou Commercial Plaza. "Deepblue Fits Top Building" has been a fashion, trend and acknowledgement. Deepblue will continue to work hard and take public praise as its best encourage and endeavour to grow into an industrial leading company.

Certificates



CE Certificate



ISO14001 Certificate



ISO9001 Certificate



CRAA Certificate



Chiller(Heater) performance test-room certificate



National Torch Program Project Certificate



Chinese Energy Conservation Product Certificate

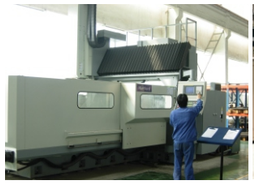


High-tech Enterprise Certificate



National Industrial Product Production License

Manufacture Facility



NC Production Center



NC Drilling Machine



Submerged Arc welding machine



NC Cutting Machine



Welding robot



plate Production Center

Test Facility



Helium Leak Detectors



X-Ray Detectors



Welding Seam Detectors



Electrical test device





Chiller Testing Center With International Standard(FAT)

Working Principle

The flue gas-fired LiBr absorption chiller & heater is used to supply cold in summer and heat in winter utilizing flue gas emissions from gas turbines, industrial furnaces and kilns as a source of heat. This system involves no expenses in terms of thermal energy. When the flue gas emissions are insufficient to supply the required quantities of cold or heat, direct-fired supplementation system can be adopted as a substitute.

The flue gas-fired LiBr absorption chiller & heater is a system which uses the thermal energy of HT flue gas (300-600℃) to generate cold or heat quantities. The cycling working medium is the lithium bromide solution (LiBr). LiBr works as an absorbent and water works as a refrigerant.

The system comprises primarily the HP generator, LP generator, condenser, evaporator, absorber, HT heat exchanger, LT heat exchanger, automatic air extractor, burner (for direct fired supplementation), vacuum pump and canned pump.

Refrigeration Principle: The refrigerant water in the evaporator evaporates away from the surface of the heat conducting tube. As heat in the chilled water is taken away from the tube, the water temperature drops and quantities of cold are generated. The refrigerant steam evaporated from the evaporator is absorbed by the mixed solution in the absorber and therefore dilutes the solution. The diluted solution in the absorber is then delivered by the solution pump to the LT heat exchanger, where the solution flow branches into two ways. One part of the solution is delivered via the HT heat exchanger to the HP generator, where it is heated by HT flue gas to produce refrigerant steam. Then the solution becomes an HT concentrated solution. The other part of the solution is delivered to the LP generator, where it is heated by the refrigerant steam from the HP generator. After refrigerant steam is produced, the solution becomes a LT concentrated solution. The HT concentrated solution in the HT heat exchanger releases heat before converging with the LT concentrated solution to form a mixed solution. After the mixed solution releases heat in the LT heat exchanger and enters the absorber, it absorbs the refrigerant steam from the evaporator, becomes diluted solution and enters the next cycle. The refrigerant steam/water generated by the HP/LP generators is cooled in the condenser to form refri--gerant water, which is further depressurized by a throttle valve. The depressurized refrig--erant water is then delivered into the evaporator, where it is evaporated and used for refr igeration purposes. Then the next cycle begins.

Heating Principle: The circulated cooling water flow is therefore stopped. The diluted solution in the absorber is then delivered by the solution pump to the HP generator by way of the LT heat exchanger and HT heat exchanger, where it is heated by HT flue gas to produce refrigerant steam. The refrigerant steam is directly delivered to the evaporator and absorber, where it is used to heat water in the evaporator (the water works as a heat= ing medium) into hot water. After the heating process is completed, the refrigerant steam will condense into refrigerant water. The diluted solution in the HP generator, which releases refrigerant steam, is condensed into a concentrated solution, enters the absorber and mixes with the refrigerant water to produce diluted solution. Then the dilutedsolution is delivered by the solution pump to the next cycle.

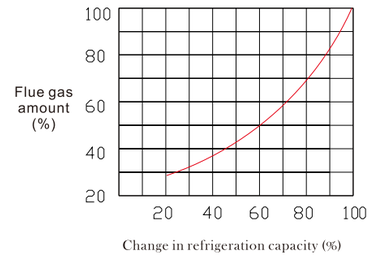
The aforesaid cycle occurs repeatedly to form a continuous heating process.

Product Nomenclature

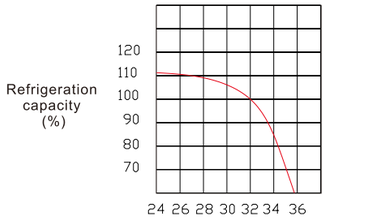
YX —116 D

- D: Chilled Water Outlet Temperature: D (7℃), Z (10℃), H (13℃) and T (16℃)
- 116: Nominal Refrigeration Capacity: 116×10kW
- YX: YX (flue gas-fired LiBr absorption chiller & heater); YZX (flue gas-supplementation LiBr absorption chiller & heater)

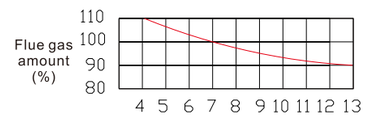
Performance curve



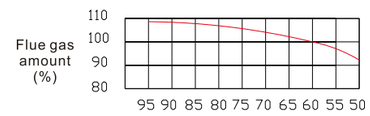
Change in refrigeration capacity (%)



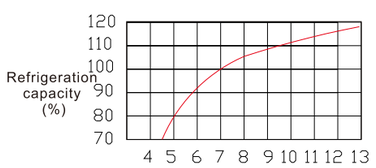
Cooling water inlet temperature (℃)



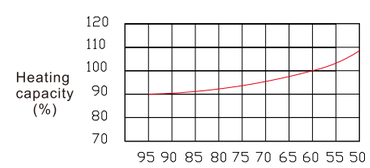
Chilled water inlet temperature (℃)



Hot water outlet temperature(℃)

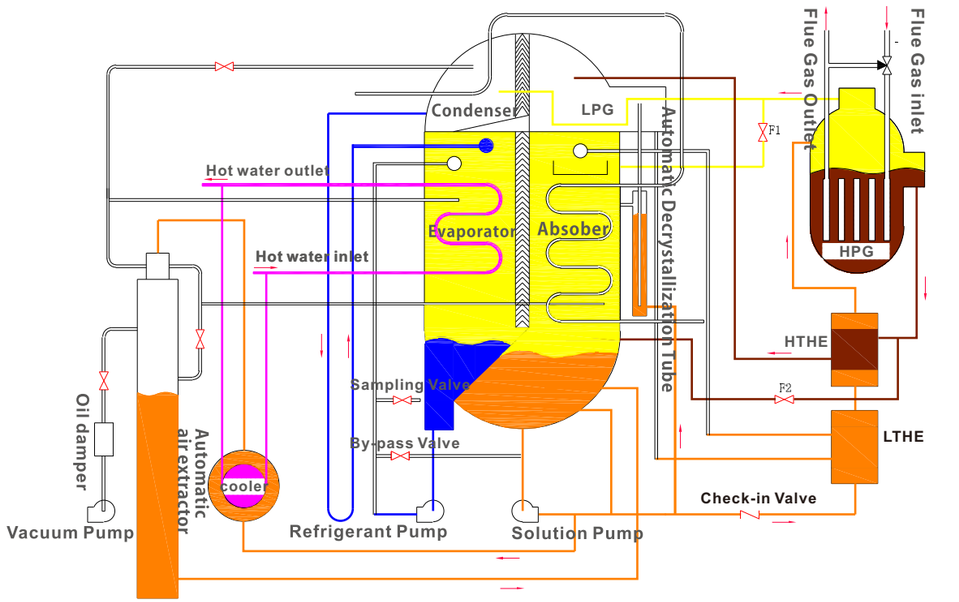


Chilled water outlet temperature (℃)



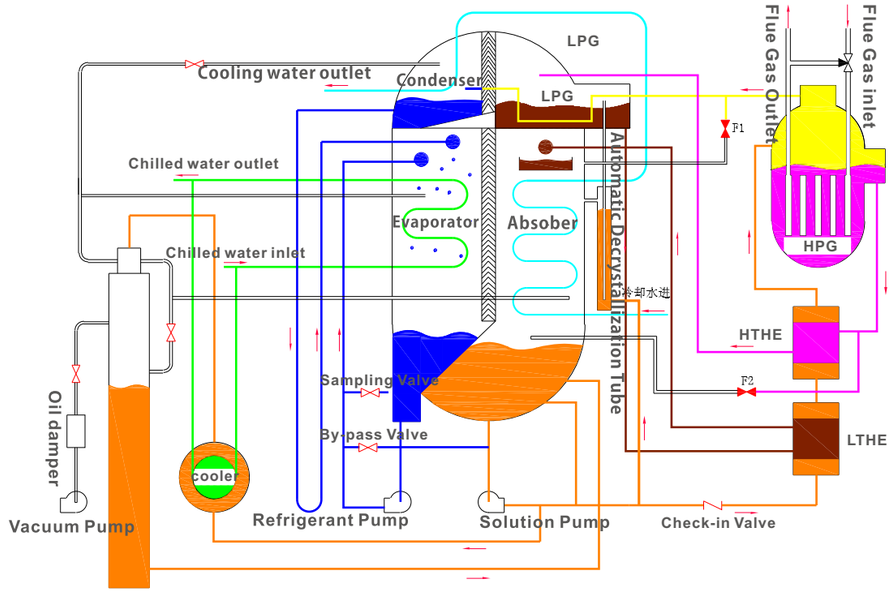
Hot water inlet temperature(℃)

Heating Flow Chart



Hot water | Concentrated Solution | Diluted Solution | Refrigerant Water | High pressure refrigerant vapor

Cooling Flow Chart



Cooling water | Chilled water | Concentrated Solution | Diluted Solution
Intermediate Solution | Refrigerant Water | Refrigerant Steam | High pressure refrigerant vapor

Chiller Features

1. Automatic air extraction system combining multi-ejector & water head technology: Speedy vacuum pumping and high vacuum degree maintenance



This is a new, high-efficiency automatic air extraction system. The ejector functions as a small air extraction pump. Deepblue automatic air extraction system adopts multiple ejectors to increase the air extraction & exhaust rate of the chiller. The water head design can help to elevate the vacuum limits and maintain a high vacuum degree. The design, which features “rapidity” and “highness”, can provide a high vacuum degree for every part of the chiller at any time. Therefore, oxygen corrosion is precluded, service life is prolonged and an optimal operating status is maintained for the chiller.

2. Fine separation device: Stemming contamination

The concentration process for the LiBr solution in the generator is composed of two stages: flash evap oration and generation. Flash evaporation is the root cause for contamination. The fine separation unit conducts fine separation for the refrigerant water (containing parts of the solution) in the flash evaporation stage, and purifies and delivers the refrigerant water to the next refrigeration cycle. By eliminating the source of contamination, the fine separation unit radically addresses refrigeration water contamination.

3. Automatic anti-crystallization system combining potential difference-based dilution and crystal dissolution: Stemming crystallization

A self-contained temperature & potential difference detection system enables the chiller to monitor excessively high concentration of the thick solution. On the one hand, upon detecting an overly high concentration, the chiller automatically feeds refrigerant water to the thick solution for dilution; on the other hand, the chiller utilizes the HT LiBr solution in the generator to heat the thick solution to a higher temperature. The two-pronged solution helps to prevent crystallization-induced failure by keeping the thick solution concentration well below the critical point of crystallization.

In the event of a sudden power failure or abnormal system shutdown, the potential difference-based dilution system will start rapidly to dilute the LiBr solution and to ensure rapid dilution after power supply is restored.

4. Mixed-process refrigeration cycling: An innovative refrigeration process

By combining the merits of the serial process and the parallel process, mixed -process refrigeration cycling can effectively reduce the circulated solution volume and heat loss. Meanwhile, the mixed solution helps to improve chiller operation, minimize crystallization and ensure more stable and energy-efficient chiller operation.

5. Economizer: Energy output boosting

Isooctanol with a conventional chemical structure, as an energy-boosting agent added to the LiBr solution, is normally an insoluble chemical that has only a limited energy boosting effect. The economizer can prepare the mixture of isooctanol and the LiBr solution in a special way to guide isooctanol into the generation & absorption process, therefore enhancing the energy boosting effect of isooctanol, effectively reducing energy consumption and realizing energy efficiency.



TIGER electric control valve

6. Interlocked mechanical & electrical anti-freezing system: Multiple anti-freezing protection

The coordinated anti-freezing system features the following merits: a lowered primary sprayer design for the evaporator; an interlock mechanism which links the secondary sprayer of the evaporator with the supply of refrigerant water/cold water; a pipe blockage prevention device; a two-hierarchy old water flow regulating valve; and an interlock mechanism designed for the cold water circulating pump and the cooling water circulating pump. A sextuple anti-freezing design ensures timely detection of cutoff, underflow and under-temperature of cold water supply. Meanwhile, automatic steps will be taken to prevent pipe freezing.

7. Self-adaptive refrigerant storage unit: Improving part of the load characteristics and shortening startup/shutdown time

The refrigerant water storage capacity can be automatically adjusted according to external load changes, particularly when the chiller works under only partial load. The refrigerant storage unit has an evident energy-saving effect in that it can automatically control the solution concentration and maintain optimal performance parameters. The adoption of the refrigerant storage unit can shorten the start/ shutdown time substantially and reduce idle work.



canned pump

9. Special surface treatment for heat-conducting tubes: High performance in heat exchanging & less energy consumption

The evaporator and absorber have been hydrophilically treated to ensure even liquid film distribution on the tube surface. This design can improve the heat exchange effect and lower energy consumption.

10. Li_2MoO_4 corrosion inhibitor: An environment-friendly corrosion inhibitor

Lithium molybdate (Li_2MoO_4), an environment-friendly corrosion inhibitor, is used to replace Li_2CrO_4 (containing heavy metals) during the preparation of the LiBr solution.

11. Wholly welded structure: Secure sealing performance

All the sealed places are treated by submerged arc-welding, CO_2 gas-shielded welding or argon arc-welding to prevent chiller leaks that are caused by bolt connection or flat sealing.

12. Frequency-variable operation: An energy-saving technology

The chiller can adjust its operation condition automatically and maintain optimal working according to changes in refrigeration capacity. This technology ensures the least energy consumption for prolonged chiller operation.

Artificial Intelligence(AI) Control System(V3.0)

1. Fully-Automatic Control Functions

The AI control system (V3.0) is featured by powerful and complete functions, such as one-key startup /shutdown, timed startup/shutdown, a mature safety protection system, multiple automatic adjustment options, system interlock, an expert system, human-machine dialogue, building automation interfaces, etc. These functions help to enable simple operation, stable performance and high working efficiency.

2. Unique Load Adjustment Function

The AI control system (V3.0) has a unique load adjustment function, which enables automatic adjustment of chiller output load according to the actual load of the user. The function not only helps to reduce startup /shutdown time and dilution time, but also contributes to less idle work and energy consumption.

3. Unique Circulated Solution Volume Control Technology

The AI control system (V3.0) employs an innovative ternary control technology to adjust the circulated solution volume. Traditionally, only parameters of the generator liquid level are used for control of the circulated solution volume. By contrast, the new technology combines the merits of the concentration & temperature of a thick solution and the liquid level in the generator. Meanwhile, an advanced frequency-variable control technology is applied to the solution pump to enable the chiller to achieve an optimal circulated solution volume. The technology improves operating efficiency and reduces startup time & energy consumption.

4. Cooling Water Temperature Limits Control Technology

The AI control system (V3.0) can control and adapt the hot water volume to the temperature changes of the inlet cooling water. By maintaining the cooling water inlet temperature within 18-34℃, the chiller can operate safely and efficiently.

5. Solution Concentration Limits Control Technology

The AI control system (V3.0) uses a unique concentration control technology to enable real-time monitoring/control of the concentration and circulated volume of a thick solution as well as the hot water volume. The system can maintain the chiller under safe and stable high-concentration condition, improve chiller operating efficiency and prevent crystallization.

6. Complete Chiller Abnormality Self-Diagnosis & Protection Function

The AI control system (V3.0) features 34 abnormality self-diagnosis & protection functions. Automatic steps will be taken by the system according to the level of an abnormality. This is intended to prevent accidents, minimize human labor and ensures a sustained, safe and stable operation of the chiller.

7. Intelligent Automatic Air Extraction Function

The AI control system (V3.0) can realize real-time monitoring of non-condensable gas volumes inside the chiller. The system can automatically start up or shut down the air extractor, or give prompts of manual operation.

8. Unique Shutdown Dilution Control Technology

The AI control system (V3.0) can control the operation time of different pumps requiring dilution, according to the thick solution concentration, ambient temperature and remaining refrigerant water volume (in the case of refrigeration). Therefore, an optimal concentration can be maintained for the chiller after shutdown. Crystallization is precluded and chiller re-start time is shortened.

9. Unit Working Parameter Management System

Through the interface of the AI control system (V3.0), the operator can perform any of the following operations for 12 critical parameters relating to chiller performance: real-time display, correction and configuration. Also, records can be kept of historical operation events.

10. Chiller Fault Management System

If any accurate prompt of any occasional fault is displayed on the operation interface, the AI control system (V3.0) can locate and detail the fault, and propose a solution or cautionary tips. Classification and statistical analyses of historical faults can be conducted to facilitate maintenance service provided by operators.

Nominal Parameters of a Flue Gas-Fired LiBr Absorption Water Chiller&Heater

Model Number		YX-	58	70	81	93	105	116	145	174	204	233	262	291	349	407	465	523	582	698
Refrigeration Capacity		KW	580	700	810	930	1050	1163	11450	1740	2040	2330	2620	2910	3490	4070	4650	5230	5820	6980
		$\times 10^4$Kcal/h	50	60	70	80	90	100	125	150	175	200	225	250	300	350	400	450	500	600
		USRt	165	198	231	265	299	331	413	496	579	661	744	827	992	1157	1323	1488	1653	1984
Heating Capacity		KW	465	558	651	744	837	930	1163	1395	1628	1860	2093	2325	2790	3255	3720	4185	4650	5580
		$\times 10^4$Kcal/h	40	48	56	64	72	80	100	120	140	160	180	200	240	280	320	360	400	480
Chilled/Heat Water	Inlet/Outlet Temperature	℃	Cooling12→7 /Heating55→60						Cooling12→7 /Heating55→60											
	Refrigeration Flow	m^3/h	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	900	1000	1200
	Heating Flow	m^3/h	70	84	98	112	126	140	175	210	245	280	315	350	420	490	560	630	700	840
	Pressure Loss	kPa	33	36	36	52	52.0	52	52	29	29.0	29	29	29	48	48	48	44	44	65
	Adaptor Diameter	DN(mm)	125	125	150	150	150	150	200	200	200	250	250	250	250	300	300	350	350	400
Cooling Water	Inlet/Outlet Temperature	℃	30→36						30→36											
	Flow Rate	m^3/h	143	171	200	228	257	285	356	428	499	570	581	713	855	998	1140	1283	1425	1710
	Pressure Loss	kPa	85	62	62	62	91	91	91	91	58	58	58	58	58	51	51	63	63	76
	Adaptor Diameter	DN(mm)	150	150	200	200	200	200	250	250	250	300	300	350	350	350	400	400	400	450
Flue Gas	Inlet/Outlet Temperature	℃	500→170						500→170											
	Consumption	Nm^3/h	3188	3825	4463	5100	5738	6375	7969	9563	11156	12750	14344	15938	19125	22313	25500	28688	31875	38250
	Adaptor Diameter	DN(mm)	450	500	500	550	600	600	700	800	850	900	950	1000	1100	1200	1200	1400	1400	1500
Electricity	Total Power	KW	2.8	3.8	3.8	3.8	4.2	4.2	4.4	5.4	5.8	6.4	6.4	7.4	7.7	8.2	8.7	9.7	12.2	13.2
	Power Supply		3相/380V/50Hz						3相/380V/50Hz											
Unit Size	Length (L)		2980	4030	4030	4030	4640	4640	4658	5740	5740	5770	5870	5920	6720	6720	6800	8900	9300	11230
	Width (W)	mm	2050	2055	2170	2280	2340	2520	2515	2580	2655	2810	2890	2975	3120	3530	4175	4240	4350	4580
	Height (H)	mm	2100	2160	2180	2320	2350	2438	2640	2640	2740	2890	3200	3360	3380	3600	3712	3740	3720	3745
Total Shipment Weight		t	7.7	9.1	10.4	10.6	12.8	14.1	16.3	17.9	20.3	24.6	26.1	29.1	34.0	38.4	42.6	49.7	54.3	63.8
Operation Weight		t	9.2	10.5	10.6	12.1	14	16.2	19.4	20.7	24	27.8	29.3	32.2	37.9	42.3	48.5	53.4	58.8	70.6

Nominal Parameters of a Flue Gas-Supplementation Water Chiller&Heater

Model Number			YZX-	58	70	81	93	105	116	145	174	204	233	262	291	349	407	465	523	582	698
Refrigeration Capacity			KW	580	700	810	930	1050	1163	1450	1740	2040	2330	2620	2910	3490	4070	4650	5230	5820	6980
			$\times 10^4$Kcal/h	50	60	70	80	90	100	125	150	175	200	225	250	300	350	400	450	500	600
			USRt	165	198	231	265	299	331	413	496	579	661	744	827	992	1157	1323	1488	1653	1984
Heating Capacity			KW	488	582	686	779	884	977	1221	1465	1710	1954	2198	2442	2931	3419	3908	4396	4885	5862
			$\times 10^4$Kcal/h	42	50	59	67	76	84	105	126	147	168	189	210	252	294	336	378	420	504
Chilled /Heat Water	Inlet/Outlet Temperature		℃	Cooling12→7 /Heating55.8→60					Cooling12→7 /Heating55.8→60												
	Flow Rate		m^3/h	100	120	140	160	180	200	250	300	350	400	450	500	600	700	800	90.0	1000	1200
	Pressure Loss		kPa	33	36	36	52	52.0	52	52	29	29.0	29	29	29	48	48	48	44	44	65
	Adaptor Diameter		DN(mm)	125	125	150	150	150	150	200	200	200	250	250	250	250	300	300	350	350	400
Cooling Water	Inlet/Outlet Temperature		℃	cooling water 32→38					cooling water 32→38												
	Flow Rate		m^3/h	142.5	171	199.5	228	256.5	285	356.3	427.5	498.8	570	641.3	712.5	855	997.5	1140	1282.5	1425	1710
	Pressure Loss		kPa	85	62	62	62	91	91	91	91	58	58	58	58	58	51	51	63	63	76
	Adaptor Diameter		DN(mm)	150	150	200	200	200	200	250	250	250	300	300	350	350	350	400	400	400	450
Flue	Rated thermal energy consumption	Flue Gas	Inlet/Outlet Temperature	℃	500→170					500→170											
			Refrigeration consumption	Nm^3/h	1594	1913	2232	2550	2869	3188	3985	4782	5579	6376	7173	7970	9564	11158	12752	14346	15940	19128
			Heating consumption	Nm^3/h	1875	2250	2625	3000	3375	3750	4688	5625	6563	7500	8438	9375	11250	13125	15000	16875	18750	22500
			Adaptor Diameter	DN(mm)	350	350	400	450	450	500	550	600	650	700	700	750	850	900	950	1000	1000	1200
		Max.supplementation for refrigeration		$\times 10^4$Kcal/h	19.3	23.1	27.0	30.9	34.7	38.6	48.2	57.9	67.5	77.2	86.8	96.5	115.7	135.0	154.3	173.6	192.9	231.5
		Max.supplementation for heating		$\times 10^4$Kcal/h	23.9	28.7	33.5	38.2	43.0	47.8	59.8	71.7	83.7	95.6	107.6	119.5	143.4	167.3	191.2	215.1	239.0	286.8
		Fuel gas adaptor diameter		DN(mm)	32	32	32	32	32	32.0	40.0	40	50	50.0	50	50	50.0	50	50.0	65	65.0	80.0
		Fuel oil adaptor diameter		DN(mm)	25					25											
Electricity		Total Power		KW	3.6	4.2	4.2	4.2	4.6	5.0	5.0	6.5	7.3	7.9	7.9	8.9	10.0	10.4	13.2	14.2	16.7	20.7
		Power Supply			3相/380V/50Hz					3相/380V/50Hz											
Unit Size		Length (L)		mm	2980	4030	4030	4030	4640	4640	4658	5740	5740	5770	5870	5920	6720	6720	6800	9400	10300	12230
		Width (W)		mm	2050	2105	2105	2310	2360	2420	2570	2625	2760	2910	2985	3070	3240	3685	4070	4275	4360	4670
		Height (H)		mm	2100	2160	2180	2320	2350	2438	2640	2640	2740	2890	3200	3360	3380	3600	3712	3740	3720	3745
Transportation					Transportation in whole					Transportation in whole											
Total Shipment Weight				t	7.1	8.3	9.5	10.6	11.7	12.8	15.5	18.1	20.6	23.1	25.5	27.9	32.6	37.2	41.7	46.0	50.4	58.8
Operation Weight				t	8.0	9.3	10.6	11.9	13.2	14.4	17.4	20.3	23.2	25.9	28.7	31.4	36.6	41.7	46.8	51.7	56.5	66.0

Model Selection Guide

Model Selection

Load Determination

The refrigeration/heating capacity of a flue gas-fired LiBr absorption water chiller & heater should be selected in accordance with the refrigeration load of a building (or a process) and the flue gas supply.

Product Type

A flue gas-fired LiBr absorption water chiller & heater may be of any of the following types, depending on the flue gas temperature and the form of thermal energy: flue gas-fired type, flue gas-direct fired sup--plementation type,and flue gas-hot water-direct fired -supplementation type (specifically used for tri-generation system).

Source of Flue Gas

For a flue gas-fired LiBr absorption water chiller&heater, the following exploitable sources of flue gas may be used as thermal energy: waste gas emissions from power generation systems, residue heat emissions from various industrial furnaces & kilns (gas melting furnaces and cement kilns), and residual heat emissions from a garbage incinerator. As a result of the different industrial processes and compositions of flue gas emissions, special heat recovery units should be adopted for flue gas emissions containing corrosive, viscous or dusty substances.

Chilled Water Outlet Temperature

Besides the specified cold water outlet temperature of a standard chiller, other outlet temperature values (min.: 6℃) may also be selected.

Pressure Bearing Requirements

The design pressure bearing standard capacity of the cold water/cooling water system of the chiller is 0.8MPa. If the actual pressure of the water system exceeds this standard value, a HP-type chiller should be selected.

Chiller Qty

The selection of the right type of chiller is based on the calculations of the cooling load of the processes or of the air-conditioner in the building. If more than one chiller is are used, the determination of the single unit refrigeration capacity and of the number of chillers should take into account maximum load operation and partial load operation.

Control Mode

The flue gas fired LiBr absorption chiller is supported by an AI (artificial intelligence) control system that enables automatic operation. Mean while, there are a number of options available for the customers, such as control interfaces for the cold water pump, cooling water pump, cooling tower fan & buildings, centralized control system and dial-up internet access.

List of Selectable Models

Flue Gas-Fired LiBr Absorption Water Chiller & Heater

Item	Type	Feature	Remarks
Function	Standard type	Used for refrigeration or heating	
	Single effect type (refrigeration-only type)	Used for refrigeration only	
Form of Energy	Flue gas-fired type	Flue gas (300-600℃)	
	Flue gas-supplementation type	Flue gas+fuel gas (or fuel oil) (300-600℃)	
	Flue gas and hot water -supplementation type	Flue gas (300-600℃)+fuel gas (or fuel oil)+hot water (90℃)	Used for residual heat recovery from power generation systems
Special	Type on Demand HP-boosted type	The heat supply capacity of the system can be boosted, if Hp generator is enlarged	
	HP type	If the cold water (or cooling water) system pressure is equal to or above 0.8MPa, a HP water chamber may be used. The pressure level can be 0.8-1.6MPa, or1.6- 2.0MPa	
	Separately-handled type	Given the limited dimensions of the access way leading to the user's machine room, the main body and the HP generator can be transported separately	

Machine Room Design and Construction

Scope of Delivery and Construction

Item	Description	Scope of Delivery and Construction		Remarks
		Hope Deepblue	User	
Unit	Chiller and accessories	○		Please refer to Scope of Supply.
Performance	Factory performance test	○		
	Commissioning	○		
Transportation to the site	From the factory to the worksite		○	
	From the worksite to the mounting base		○	
	Installation in place		○	
	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	Mounting base construction		○	
	External tubing engineering		○	
	Ventilation 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 management
	Thermal insulation engineering		○	
Other	LiBr solution	○		
	Operation training & instructions	○		

Civil Works for the Machine Room

Site Selection of the Machine Room:

The hot water-powered LiBr absorption chiller 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.

Ambient Temperature in the Machine Room:

The temperature should be within the range of 5-40℃.

Drainage:

The machine room should be equipped with good drainage facilities: ① drains covered by cast iron grates should be available around the chiller. 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 chiller 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 chiller. 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 chiller. If this space can not be reserved, a window or door may be designed for tube drawing.

Chiller Mounting Base:

The mounting base may be designed on the basis of the dead load of the chiller. The design should ensure a stable, firm and unsinkable base; otherwise the chiller 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 chiller.

Water Supply System

Flexible joints must be fitted for cold water/cooling water supply to the chiller. A filter must be fitted for the inlet end at a place easy for uninstallation. If the hydrostatic pressure of the water supply system is more than 30mH2O, it is recommended that the water pump be installed on 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 watertight cover.

Fuel gas system

The natural gas and town gas inlet pressure shall be within the scope listed in the "Rated parameter table". If the pressure is higher than the scope, a pressure reducing device shall be installed. The fuel gas shall pass a ball valve and a filter before it enters the Unit. There shall be a drain valve at the lowest point of the fuel gas pipe. The machine room must be equipped with a gas leak alarm, which acts when the leakage reaches 25 percent of the lower explosion limit. The machine room shall have excellent ventilation. If natural ventilation cant'meet the requirement, a mechanical ventilation device shall be installed and run around the clock. When placing an order, the customer shall provide the type, heating value and pressure of the fuel, so that Deepblue can select a burner matching the Unit.

Fuel oil system

The fuel oil system is generally composed of an oil storage tank, oil daily tank, oil transfer pump and strainers. The capacity of the oil storage tank shall be able to meet the Unit's combustion need for at least seven days. It shall be equipped with access hole, oil-level probe, fire detention breather valve, lightning-proof and antistatic devices. The capacity of the oil daily tank generally shall not be greater than one day's need of the Unit. An indoor oil daily tank shall be of closed type with an air pipe connecting straight to the outdoor. On the air pipe there shall be a fire arrester and rainproof device. Glass oil-level meter shall not be adopted on the oil daily tank. The lowest oil level in it shall be 0.5 meters higher than the burner. Oil pipes shall be seamless steel pipes and welded. There shall be an emergency shut-off valve on the oil supply pipe. For heavy oil piping, a heating device shall be added. Both the oil transfer pump and burner shall have an oil strainer (60 holes/inch) at their inlets and the strainer's cross section shall be great enough to reduce the resistance of the piping.

Exhaust system

The flue ducts shall be airtight and have low resistance. The horizontal flue duct shall maintain an upward slope of at least 10% and its cross section area not be less than that of the exhaust outlet. Where multiple Units share one chimney each Unit shall have an equal exhaust pumping force, and the cross section area of the general flue duct shall not be less than the sum of the cross section area of all branch flue ducts.

The flue ducts must be designed to have enough strength and rigidness and their weight shall not be born by the Unit. The heat insulating material of the duct shall withstand 400℃ and the fire isolation zone around the Unit shall be designed for the same temperature.

The horizontal flue duct nearest to the Unit shall have a water collecting tank and drainpipe at its bottom to prevent the condensed water flowing into the Unit and causing serious corrosion.

Electrical system

The electrical system of the machine room must be designed to match the control system of the Unit, otherwise the advancement, stability, safety and high efficiency of the Unit cannot be achieved.

Handling and Installation in Place

Delivery Status:

Delivery usually takes the form of whole-unit delivery. If handling is restricted by the user's access way, the chiller may be delivered in two parts: the principal part and the HP generator. After the chiller is installed in place, Deepblue Company will be responsible for internal tubing connection and the user will be responsible for providing welding equipment and assistance. Recommendations on Transportation: The chiller should be hoisted in place and transported as per Corporate Specification for Chiller Hoisting & Transportation provided by Deepblue Company. The slings and fasteners must be fixed to the indicated positions of the chiller. Deepblue is ready to seek transportation service & insurance for the user.

Installation in Place:

A steel plate and a rubber plate should be laid on the surface of the mounting base. After the chiller is installed in place, the small holes (ϕ4) on the two sides should be used as reference points for horizontal adjustment in the length and width direction. The levelness of the chiller should be controlled within 1/1000. To achieve an even pressure load, there should be no gaps between the bracket and the mounting base.

Protective measures must be taken for the chiller during the hoisting, transportation, installation and project construction stage. To prevent a chiller breakdown, never impact the chiller with heavy objects or twist the valves at will.

The control system of Deepblue flue-gas fired LiBr absorption chiller supports multiple communication protocols.

Point-to-point interface: PPI protocol
Multi-point interface: MPI protocol
Process field bus (PROFIBUS): PROFIBUS protocol
Freeport communication: User-defined protocol
Modbus

Water Quality Management Tips

As cooling water in the cooling tower evaporates continuously, its salinity will increase and its quality will deteriorate, thus causing corrosion and scaling in the heat conducting tubes. Also, the summer heat will conduce to algae propagation, impurities accumulation and scaling, therefore raising the thermal resistance of copper tubes and compromising the refrigeration capacity substantially.

Refer to the following table for the water quality requirements on cooling water as a make-up:

Item	Unit	Makeup Water Requirements	Cooling Water Requirements	Scaling	
				Corrosion	Tendency
pH value (25° C)		6.5-8.0	6.5-8.0	△	△
Conductivity (25° C)	US/cm	＜200	＜200	△	△
Chloride ion Cl^-	mgC1⁻/L	＜50	＜200	△	
Sulfate ion $SO4^{2-}$	$mgSO_4^{2-}/L$	＜50	＜200	△	
Acid consumption (pH: 4.8)	$mgCaCo_3/L$	＜50	＜100		△
Total hardness	$mgCaCo_3/L$	＜50	＜200		△
Ferric ion (Fe)	mgFe/L	＜0.3	＜1.0	△	△
Sulfide ion S^{2-}	mgS^{2-}/L	Undetectable	Undetectable	△	
Ammonium ion NH_4^+	$mgNH_4^+/L$	＜0.2	＜1.0	△	
Silicon dioxide SiO_2	$mgSiO_2/L$	＜30	＜50		△

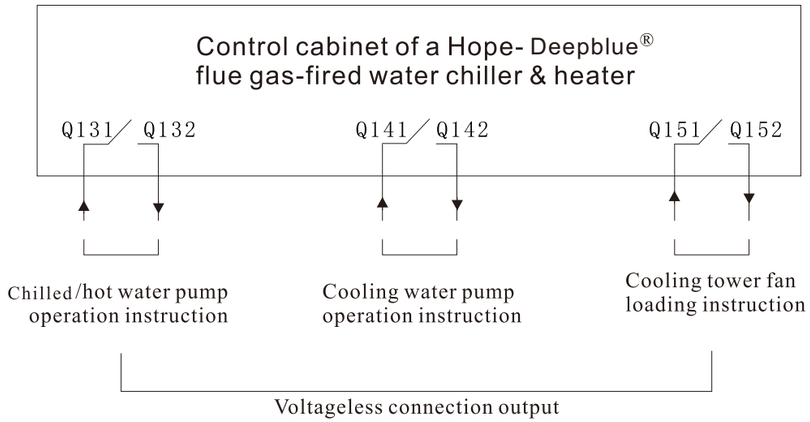
Field construction items for control system

Item		Installation position and requirement	Material source	By Deepblue	By coatomer
Power supply		In control cabinet	Customer	Wiring in control cabinet	Lay 5×6mm2 cable(wire)to underside of control cabinet
Grounding		Grounding resistance ≤10Ω	Customer	Wiring	Lay grounding network and run wire to underside of control cabinet
Phone networking		Interface is in control cabinet	Customer provides telephone line(option)	Connecting in control cabinet	Lay telephone line to underside of control cabinet
PC monitoring (≤1200m)		In monitoring room and control cabinet	Deepblue (option)	Field installation	Lay 7-ply cable from monitoring room to underside of control cabinet
Household hot water (HHW)temperature probe and probe seat(triple-use unit)		HHW outlet; in control cabinet	Deepblue	Instruction for installation	Weld probe seat and lay 3control lines from the seat to underside of control cabinet
HHW circulating pump start/stopcontrol (triple-use unit)		HHW circulating pump control panel; in control cabinet	Customer	Instruction for installation	Lay 4control lines from HHW circulating pump control panel to underside of control cabinet
Oil level sensor (oil-fired unit)		Oil daily tank/oil storage tank	Deepblue (option)	Instruction for installation	Lay 4control lines from HHW circulating pump control panel to underside of control cabinet
Gas leak detector (gas-fired unit)		In machine room,near fuel gas pipe,and with POORventilation	Customer	Wiring in control cabinet	Install detector and lay 2control lines from the detector to underside of control cabinet
Fire fighting detector		Per fire department requirement	Customer	Wiring in control cabinet	Lay 2control lines from the detector to underside of control cabinet
Building interface		In control cabinet	Deepblue (option)	Wiring in control cabinet	Lay control cabinet to underside of control cabinet
Chilled/hot water pump	Inverter control	In or near switchboard of machine room(our inverter control system is recommended)	Customer	Wiring in control cabinet	2 control lines for each motor and 2 lines for spare use.Lay the lines from switch board to underside of control cabinet
Cooling water pump	Inverter control	In or near switchboard of machine room(our inverter control system is recommended)	Customer	Wiring in control cabinet	2 control lines for each motor and 2 lines for spare use.Lay the lines from switch board to underside of control cabinet
Cooling water fan	Ordinary control	In control cabinet	Customer	Wiring in control cabinet	2 control lines for each motor and 2 lines for spare use.Lay the lines from switch board to underside of control cabinet
HHW circulating pump	Ordinary control	In control cabinet	Customer	Wiring in control cabinet	2 control lines for each motor and 2 lines for spare use.Lay the lines from switch board to underside of control cabinet

Note:control lines are multi-ply 0.7mm flexible coɒper line.

Wiring Diagram

Power Distribution Diagram of the External Interlock Mechanism of a Flue Gas-Fired Water Chiller & Heater System



NOTE:

1. The capacitance of the output relays of the interlocked water pump terminal is AC250V and the amperage is 5A (resistive load).
2. Q131, Q132, Q141, Q151, are the wiring numbers of the conductors in the control cabinet of a Hope-Deepblue® Flue-gas fired water chiller & heater.
3. The operation of a cold water pump and a cooling water pump must be interlocked.



Model Selection Form

Project Background					
Project Name					
Chiller Application	☐Comfort	☐Industrial Process bulding/factory type			
Chiller Installation Environment	☐Safe	☐Inflammable	☐Corrasive air	☐Dusty	
	NOTE:Safe means the enviroment is not harmful to human being and chiller operation				
Chiller					
Chiller Type	☐ Flue gas fired		☐Flue gas direct fired supplementation		
	☐Hot water+Flue gas direct fired		☐ Steam+flue gas direct fired		
Unit Cooling Capacity	_____ Kw or _____ Kcal				
Unit Heating Capacity	_____ Kw or _____ Kcal				
Quanlity	_____				
Heat Source	☐Steam	Source	☐Boiler	☐Heating net	
			☐Others _____		
		Pressure	☐0.4Mpa	☐0.6Mpa	☐0.8mpa
			☐Others _____		
	☐Direct fire	Type	☐NG	☐Town Gas	☐LGP
			☐Others _____		
		Species	Heat value	_____Kcal/Nm³	
			Pressure	_____Mpa	
	☐Fuel	Type	☐Heavy Oil	☐Light Oil	☐Waste Oil
		Viscosity	_____		
	☐Hot Water	Inlet/Outlet Temp.	☐95-85℃	☐Other ____ → ____℃	
		Pressure	_____ → _____Mpa		
	☐Exhaust	Temperature	_____ → _____℃		
		Pressure	Allowable Pressure Drop	Mpa	
Water Temp.	Cold water	Inlet/Outlet temp.	☐12-7℃	☐23-16℃	
			☐Other _____ → _____℃		
		Pressure	☐0.8mpa	☐1.0mpa	
			☐Other	_____	
	Heating Water	Inlet/Outlet Temp.	☐55.8-60℃	☐Other ____ → ____℃	
		Pressure	☐0.8Mpa	☐1.0Mpa	
			☐Other	_____Mpa	
	Cooling water	Inlet/Outlet Temp.	☐30-36℃	☐32-37℃	
			☐Other ____ → ____℃		
		Pressure	☐0.8Mpa	☐1.0Mpa	
			☐Other	_____Mpa	
	Heat Pump Hot Source Water	Inlet/Outlet Temp.	_____ → _____℃		
	Heat Pump Hot Source Water	Inlet/Outlet Temp.	_____ → _____℃		
Water Quality Request	Cold water	☐Standard		☐Special	
	Heating Water	☐Standard		☐Special	
	Cooling Water	☐Standard		☐Special	
	Heat Source Water	☐Standard		☐Special	
Operation Condition	Operation Time/Day	☐24hours	☐8-10hours	☐Other	_____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 , *is optional					