



BROAD CENTRAL AIR CONDITIONING (ABSORPTION LiBr+H₂O)

BROAD XI NON-ELECTRIC CHILLER

MODEL SELECTION & DESIGN MANUAL



Function

Cooling, heating, hot water (dedicatedly or simultaneously)

Application

- Provide chilled/heating water for central air conditioning system
- Produce chilled water over 5°C and heating water below 95°C

Cooling capacity

233~11,630kW
(66~3,307Rt)

Energy sources

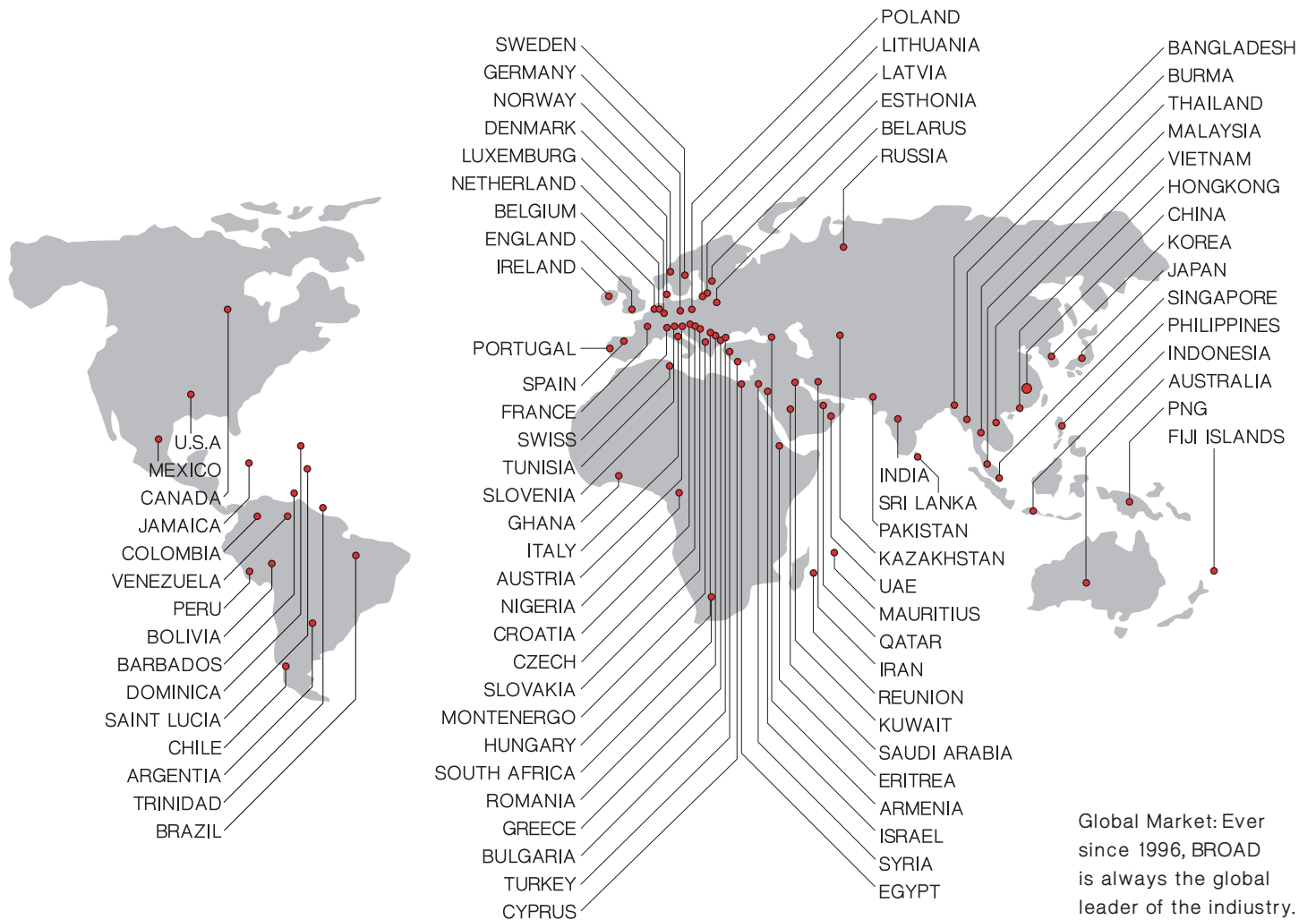
- Natural gas, town gas, biogas
- Gas/oil dual fuel, gas & waste heat hybrid (multiple energy)
- Waste heat from power generation industrial waste streams (steam, hot water, exhaust, etc.)



(BZ200 Direct-fired Absorption Chiller)



Global internet monitoring system for BROAD non-electric chillers.
It has been operating since 1996, known as the originator of "internet +"



Global Market: Ever since 1996, BROAD is always the global leader of the industry.

SIGNIFICANCES OF BROAD NON-ELECTRIC CHILLER

1. GREEN ENERGY

Industrial waste heat, exhaust from power generation are 100% green energies, natural gas with 60% hydrogen is also green energy. BROAD non-electric chillers only use green energy and take nature water instead of CFCs as refrigerant.

2. SAVING ENERGY

BROAD holds dozens of energy-saving patents and the chiller efficiency is 15~30% higher than global industry level. BROAD Packaged Water Distribution System cuts operating electricity consumption by 76%.

3. REDUCING INVESTMENT

Three functions of cooling/heating/hot water integrated in one chiller, reduces equipment investment and machine room footprint. BROAD Packaged Water Distribution System reduces machine room footprint.

4. WORRY-FREE

BROAD Packaged Water Distribution System eliminates troubles including system design, procurement, installation and service for customers.

BROAD Intelligent Control System (ICS) realizes operator free for chiller and water distribution system.

BROAD Internet Monitoring System realizes 24/7 fault prediction, analysis, trouble-shooting and energy-saving management. BROAD offers free monitoring service to customer during chiller's whole lifespan.

5. SAFETY AND DURABLE

Chiller works under vacuum condition which is safe to the customer. 8-level anti-explosion technologies eliminate any explosion risks in any cases (including human destruction) and BROAD over 20 years experiences proved it.

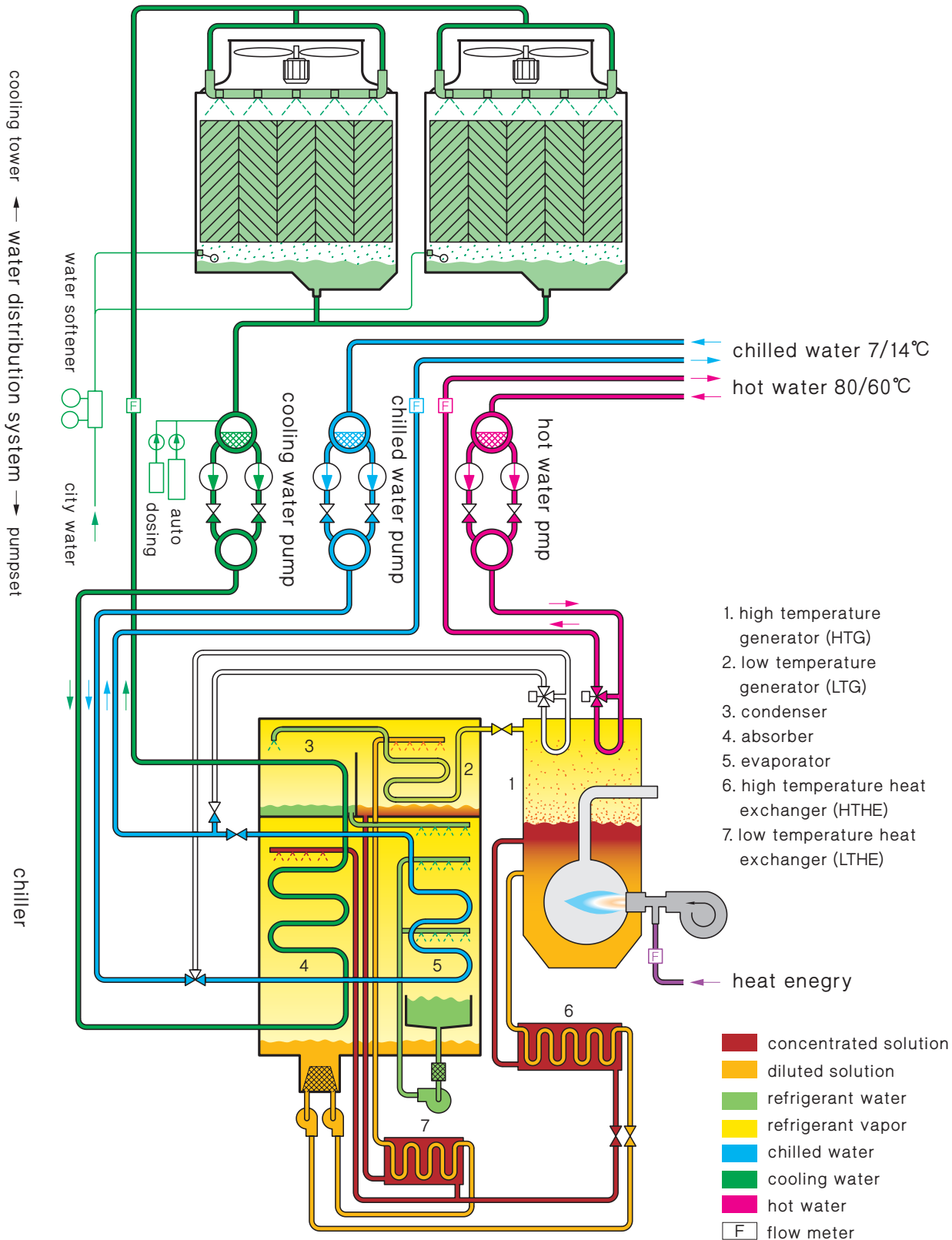
No single explosion case in BROAD 20+ years operation record.

Separate heating technology doubles the chiller lifespan (chillers over 20 years still running well).

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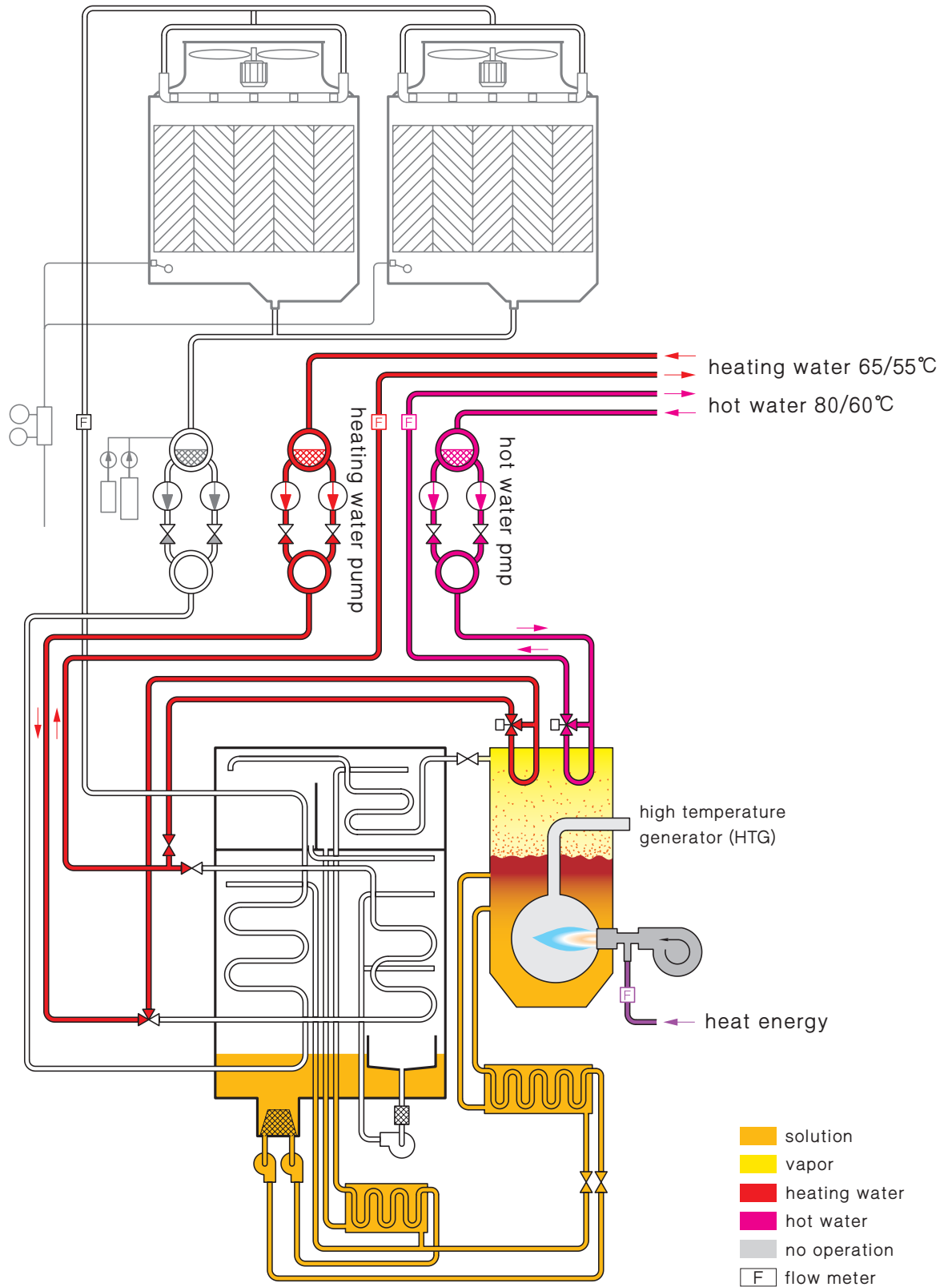
PACKAGED NON-ELECTRIC CHILLER (chiller+water distribution system)



The cooling principle

The input heat energy heats LiBr solution to 140°C and generate vapor, which is then condensed into water by cooling water. When the refrigerant water enters evaporator (in high vacuum condition), its temperature goes down immediately to 5°C. And it is sprayed over the copper tubes, and chilled water from 14°C drop down to 7°C to make cooling. The water absorbs heat from air conditioning system and evaporates, then is absorbed by concentrated LiBr solution from the generators. The cooling water takes away the heat and rejects it into the air. Diluted solution is pumped into HTG and LTG separately to be heated to begin the process all over again.

Notes: Lithium Bromide is a salt of strong hygroscopicity, nontoxic and harmless, with no greenhouse effect and no damage to the ozone layer.



The heating principle

The input heat energy heats the LiBr solution. The vapor produced by the solution heats the heating water or hot water in tubes, while condensate returns to the solution to be heated and the cycle repeats. As "separate heating" is adopted, the heating cycle becomes very simple, just like a vacuum boiler. Therefore, the life span of the chiller can be doubled.

A separate heat exchanger can provide dedicated hot water while cooling or heating operation is stopped. So, only BROAD has the unique technology in the world that can realize "three functions in one unit": cooling, heating and hot water simultaneously or dedicatedly.

Direct-fired Absorption Chiller (DFA) Performance Data

Fuel: natural gas, town gas, biogas, diesel or gas/oil dual fuel

Mode	BZ	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	10 ⁴ kcal/h	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2645	3307
Heating capacity	kW	179	269	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967
Hot water capacity	kW	80	120	200	300	400	500	600	800	1000	1200	1600	/	/	/	/
Chilled water																
Flow rate	m ³ /h	28.6	42.9	71.4	107	143	179	214	286	357	429	571	714	857	1143	1429
Pressure drop	kPa	30	30	30	30	30	40	40	40	50	50	60	60	60	60	60
Cooling water																
Flow rate	m ³ /h	47.5	71.2	119	178	238	297	357	476	595	714	952	1190	1427	1903	2380
Pressure drop	kPa	50	50	50	50	50	50	50	50	80	80	80	90	90	90	90
Heating water																
Flow rate	m ³ /h	15.3	23.1	38.5	57.9	77.1	96.4	116	153	193	231	308	385	463	617	771
Pressure drop	kPa	20	20	20	20	20	20	20	30	30	40	40	50	50	60	60
Hot water																
Flow rate	m ³ /h	3.4	5.2	8.6	12.9	17.2	21.5	25.8	34.4	43.0	51.6	68.8	/	/	/	/
Pressure drop	kPa	20	20	20	20	20	20	20	30	30	40	40	/	/	/	/
NG consumption																
Cooling	Nm ³ /h	16.2	24.3	40.7	61.1	81.4	102	122	163	204	244	326	407	489	652	815
Heating	Nm ³ /h	19	28.7	47.9	72	95.9	120	144	190	240	287	383	479	576	767	959
Hot water	Nm ³ /h	8.5	12.8	21.4	32.0	42.7	53.5	64	85	107	128	171	/	/	/	/
Power demand	kW	2.3	3.8	3.9	5.1	6.8	8.8	9.9	16.3	16.6	22.4	26.6	29.3	39.3	49.7	53.3
Solution wt.	t	1.0	1.6	2.3	2.8	3.8	4.3	5.6	6.8	8.5	10.3	12.6	16.0	21.0	25.0	32.0
Unit ship wt.	t	5.2	7.9	9.5	12.6	15.6	17.7	21	27.5	32	/	/	/	/	/	/
Main shell ship. wt.	t	2.5	4.2	5	5.6	6.5	7.6	8.9	12.7	14.8	17.8	19.8	25	27.5	30.0	32.0
Operation wt.	t	5.8	8.5	10.3	14.1	17.9	20.2	24.2	31.1	36.3	44.3	53.3	64.1	78.5	95.8	116.2

Packaged Direct-fired Absorption Chiller (P-DFA)

Rated chilled water 7°C/14°C, cooling water 37°C/30°C

Mode	BZY	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000	
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630	
Pumpset	Chilled water pump																
	External head	mH ₂ O	22	22	22	24	24	27	27	27	28	28	28	32	32	32	32
	Power demand	kW	4	7.5	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	Cooling water pump																
	External head	mH ₂ O	10	10	10	15	15	15	15	16	16	16	17	17	17	17	17
	Power demand	kW	3	7.5	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	Hot water pump																
	External head	mH ₂ O	7	7	7	15	15	15	15	15	15	15	15	/	/	/	/
	Power demand	kW	0.4	0.58	0.58	2.2	3.0	3.0	4.4	4.4	4.4	6.0	6.0	/	/	/	/
Total power demand	kW	7.4	15.6	15.6	32.2	33	47	56.4	78.4	92.4	110	126	200	220	300	360	
Operation wt.	t	0.6	0.8	0.9	3.8	3.8	4.2	4.3	7.1	7.4	8.1	9.8	5.9/8.6	6.1/8.8	6.1/9.8	9.6/9.8	
Cooling tower	Power demand	kW	5.5	11	11	/	/	/	/	/	/	/	/	/	/	/	
	Operation wt.	t	2.5	4.5	5.1	/	/	/	/	/	/	/	/	/	/	/	
Electricity & water Consumption	Total power demand	kW	15.2	30.4	30.5	37.3	39.8	55.8	66.3	94.7	109	132.4	152.6	229.3	259.3	349.7	413.3
	Water demand for cooling	t/h	0.6	0.9	1.5	2.0	3.0	3.8	4.5	6.0	7.5	9.0	12.0	15.0	18.0	24.0	30.0

General Conditions:

- Rated chilled W. outlet/inlet temp. : 7°C/14°C
(7°C/12°C)
- Rated cooling W. outlet/inlet temp. : 37°C/30°C
(37.5°C/32°C)
- Rated heating W. outlet/inlet temp. : 65°C/55°C
- Rated hot W. outlet/inlet temp. : 80°C/60°C
- Lowest permitted outlet temp. for chilled water: 5°C
- Highest permitted outlet temp. for heating/ hot water: 95°C
- Lowest permitted inlet temp. for cooling water: 10°C
- Adjustable chilled water flowrate: 50%~120%
Adjustable heating/ hot water flowrate: 65%~120%
- Pressure limit for chilled W. , cooling W. , heating W. , hot W. : 0.8MPa (except special order)
- Adjustable load: 5%~115%
- Fouling factor for chilled W. , cooling W. , heating W. , hot W. : $0.086\text{m}^2 \cdot \text{K}/\text{kW}$
- Natural gas consumption is calculated: $10\text{kWh}/\text{m}^3$
($8600\text{kcal}/\text{m}^3$)
- Standard natural gas dynamic pressure is 16~35kPa, static pressure is $< 50\text{kPa}$, lower or higher pressure can be accommodated to special orders
- LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
- Rated exhaust temp. for cooling: 160°C
Rated exhaust temp. for heating: 145°C
- Machine room ambient temperature: 5~43°C, humidity $\leq 85\%$
- Standard climate conditions for cooling operation: temp. 36°C, relative humidity 50% (wet bulb 27°C)
- Heating capacity and hot water capacity refer to the capacity in separate operation, which is adjustable within this range
- Power demand of cooling, heating, hot W. is under rated working condition.
- Rated cooling COP: 1.42
(including chiller power consumption)
Rated heating COP: 0.93
(including chiller power consumption)
- Life design: 30 years

Notes:

technical specification is based upon:

- Standard GB 18361 "Safety Requirement of LiBr Absorption Water Chilling And Water Heating Packages"
- Standard GB/T 18362 "Direct-fired LiBr Absorption Water Chilling And Water Heating Packages"
- Standard GB 29540 "Minimum allowable values of the energy efficiency and energy efficiency grades for LiBr Absorption Water Chilling And Water Heating Packages"
- Standard JIS B 8622 "Absorption Chiller"
- Standard ARI 560 "Absorption Water Chilling And Water Heating Packages"

HTG (high temp. generator)

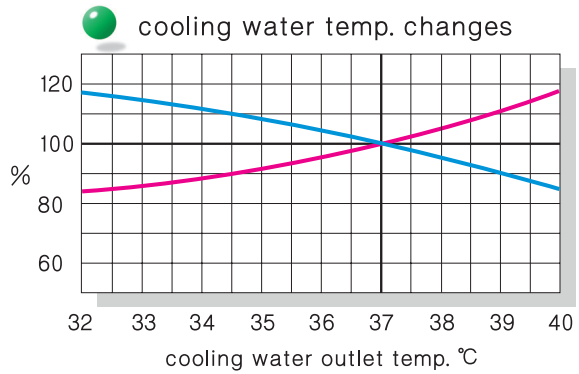
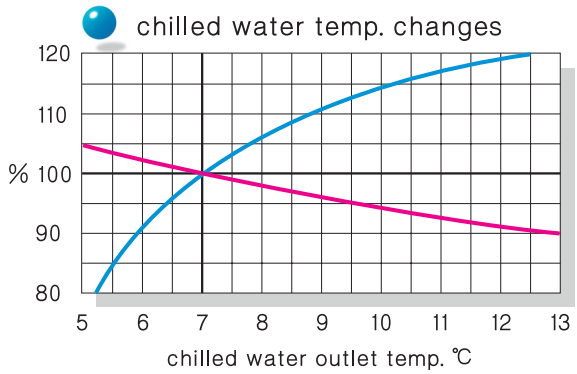
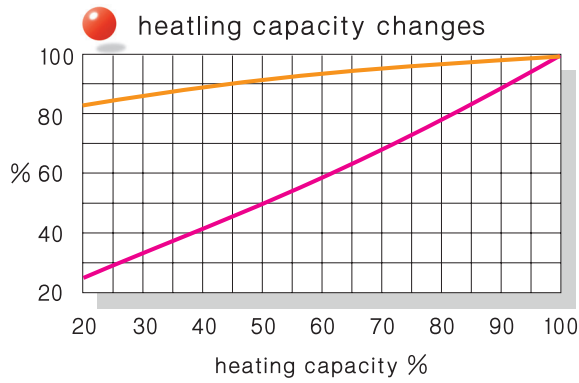
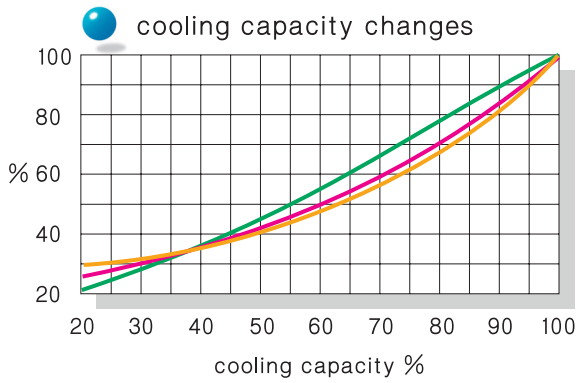
Enlarged Model Performance Data

Mode	Enlarged Models	Heating capacity kW	Gas Consumption m^3/h
20	H ₁	215	23.0
	H ₂	251	26.9
	H ₃	287	30.7
	H ₄	323	34.6
30	H ₁	323	34.6
	H ₂	377	40.3
	H ₃	430	46.1
	H ₄	484	51.8
50	H ₁	538	57.7
	H ₂	628	67.3
	H ₃	717	77.0
	H ₄	807	86.0
75	H ₁	807	86.0
	H ₂	942	101
	H ₃	1076	115
	H ₄	1211	129
100	H ₁	1076	115
	H ₂	1255	135
	H ₃	1435	154
	H ₄	1614	173
125	H ₁	1345	144
	H ₂	1569	168
	H ₃	1793	192
	H ₄	2018	216
150	H ₁	1614	173
	H ₂	1883	202
	H ₃	2152	230
	H ₄	2421	259
200	H ₁	2152	230
	H ₂	2511	269
	H ₃	2869	307
	H ₄	3228	346
250	H ₁	2690	289
	H ₂	3138	337
	H ₃	3587	386
	H ₄	4035	434
300	H ₁	3228	346
	H ₂	3766	403
	H ₃	4304	461
	H ₄	4842	518
400	H ₁	4304	461
	H ₂	5021	538
	H ₃	5739	614
500	H ₁	5380	577
	H ₂	6277	673

Notes:

- Heating capacity increases by 20% for each stage of HTG enlargement. No change with pumpset (excluding hot W. pump) and enclosure specs.
- Special design is available if heating capacity is higher than above list.

Packaged DFA Performance Curves



cooling capacity — water consumption — Note: electricity consumption means the
 fuel consumption — electricity consumption — consumption of the chiller and pumpset.

Coefficient of Performance (COP)

Rated COP: 1.42, IPLV COP: 1.63

Load	COP	Factor	Result
100%	1.420	0.01	0.014
75%	1.638	0.42	0.688
50%	1.692	0.45	0.761
25%	1.372	0.12	0.165

Note:
 · The integrated part load value (IPLV) reflects chiller's actual COP in operation.
 · Calculated per ARI560

Emissions:

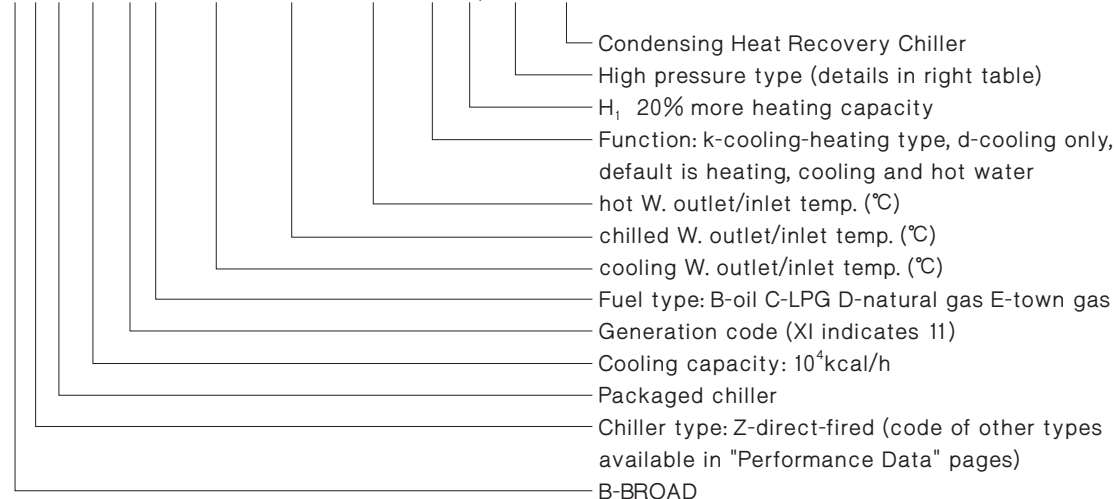
- Standard GB13271-2014
- $NO_x \leq 46ppm(O_2=3.5\%)$
- Special order equipped with low NO_x burner and electrostatic cleaner on exhaust port, and emission is almost zero.
- Exhaust heat recovery technology can realize the "elimination of white smoke" in cold areas.

Operating Noise dB(A)

Model BZY	20~50	75~200	≥250
DFA	≤57	≤58	≤60
pumpset	≤57	≤57	≤59
cooling tower	≤62	≤64	≤66
outside encloure	≤42	≤43	≤44

Nomenclature

B Z Y 200 XI D - 37/30 - 7/14 - 80/60 - k - H₁ - Fa - LN



Codes for high pressure type:

Pressure limit MPa	Chilled W. Code	Cooling W. Code
0.81~1.2	Fa	Ma
1.21~1.6	Fb	Mb
1.61~2.0	Fc	Mc
2.01~2.4	Fd	Md

Model Selection & Ordering

Function selection

- standard type (cooling-heating-hot water)
- A/C type (cooling-heating)
- cooling only type
- Condensing Heat Recovery type

Fuel selection

- Fuels applicable to a DFA can be: natural gas, town gas, LPG, bio-gas, light oil or recycled oil.
- Natural gas and recycled oil are priority.
- Applicable to gas/oil (for special orders)
- Different burner matches different fuel .

Load selection

- Building cooling/heating load cannot be estimated, as it is more closely related to building insulation and room function than to building area.
- Model selection is mainly determined by cooling load. If the heating load is not enough, a HTG enlarged model should be selected.

Quantity

- The fewer units, the lower initial investment and operation cost (as the chiller's COP will be higher and water system's electric consumption will be lower at part load).
- 2 units are recommended for one system (the total capability equals to required load). No need to set standby unit. One unit can be considered for buildings that allow chiller stop once a year.
- Model 1200,1600, 2000 could be supplied by modular combination.

Flowrate selection

- BROAD pumpset adopts a large temperature difference and low flowrate design so as to save power consumption dramatically.
- BROAD designs the pump head according to its profound experience.
- BROAD is open for special head design.

Pressure selection

- The standard pressure limit for chilled/heating/cooling water is 0.8MPa. Information about high pressure type is available on page 5.
- 0.81~1.2MPa system: select high pressure type.
- 1.21~1.6MPa system: either extra pressure type or secondary heat exchanger, to be comprehensively evaluated.
- >1.6MPa system: secondary heat exchange.

Split shipment

- If limited by access of customers' machine room (or limited by container transportation), split shipment can be chosen.
- Split shipment includes two pieces as main shell and HTG. 3 pipes must be connected at jobsite. Customers need to prepare welding facilities, nitrogen and provide necessary help.

Control

- BROAD chiller and its pumpset are equipped with complete control function, including internet monitoring.
- If users have a building management system (BMS), the BMS control interface can be selected as an optional supply. If the BMS interface is not ordered along with the chiller, it can be purchased later.
- BROAD BMS is recommended to customers.

Machine room location

- On the floor or on building rooftop.
- If limited by facilities, the chiller and the pumpset can be installed in basement while cooling tower on the floor, on stilt or on building rooftop.
- Enclosure does not apply to basement installation.
- Chiller and pumpset should be setup in the same machine room to minimize piping and pressure drop.

Lead time

- ≤ BYZ200: 2-4 months
- BZY250~BZY400: 3~5 months
- ≥BZY500: 4~6 months

Warranty

Free warranty is to cover 12 months from commissioning or 18 months from shipment, whichever comes earlier.

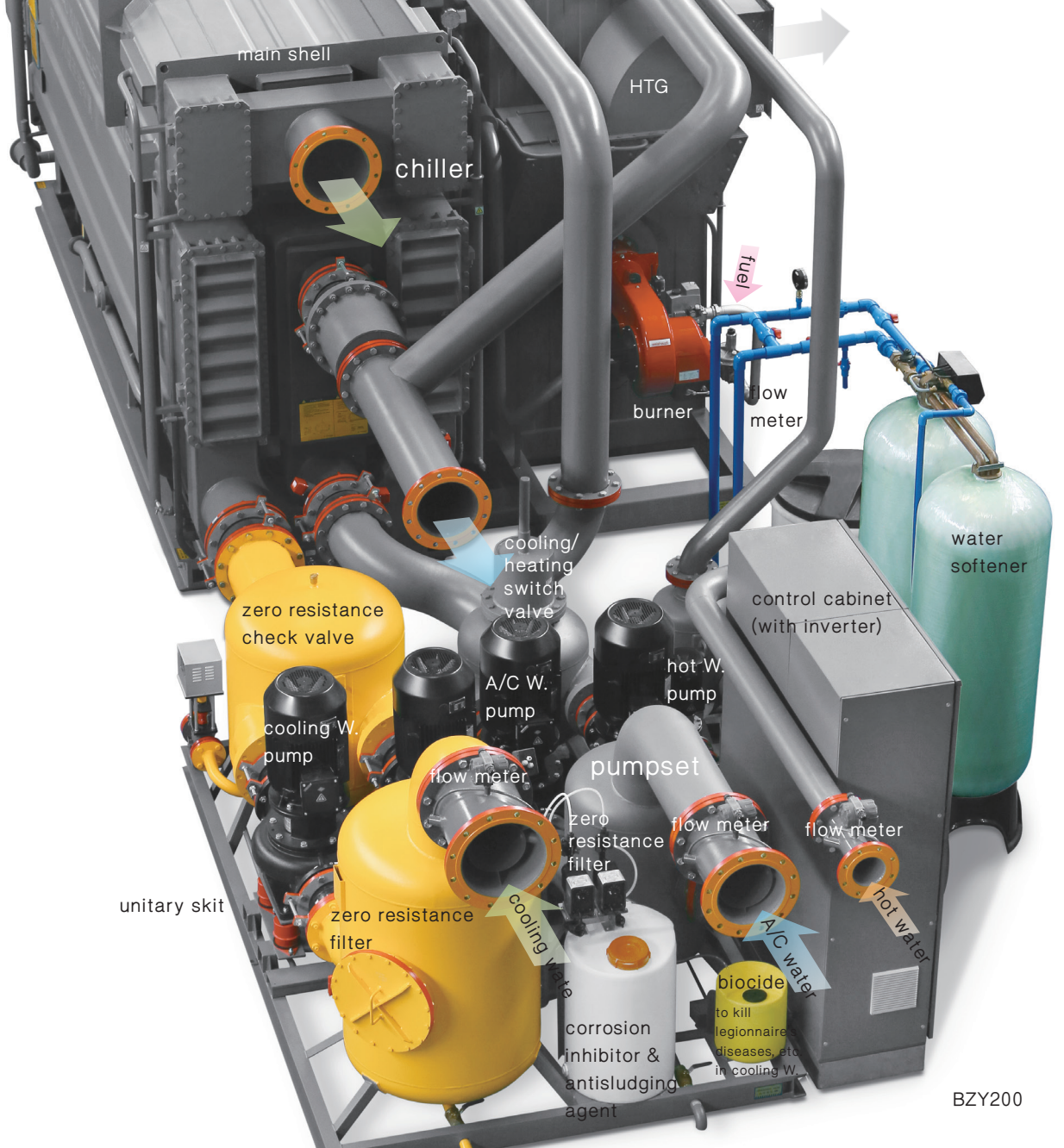
BROAD provides paid service in the whole life span. Service price list is available upon request.

Packaged DFA Supply List

Products	Category	Item	Remarks
Chiller	Main shell	Main shell body	Includes LTG, condenser, evaporator, absorber, cold/heat insulation
		Auto purge/vent system	Includes falling head auto purge device, auto air vent device
		Solution pump, refrigerant pump	Welded canned type
		Low temp heat exchanger	Plate type
		Motor valve	Refrigerant motor valve, etc
	HTG	HTG shell	Includes HTG body, front/rear flue chamber, frame base, etc.
		High temp heat exchanger	Plate type
		Water heater	For heating & hot water, N.A. for cooling only type
		3-way motor valve	2 pieces for heating water & hot water constant temp. control. Available to standard type only.
		Enclosure	Encloses HTG shell, high temperature heat exchanger and water heater. (Removable)
		Burner	Includes gas valve trains, filter, safety devices, muffler, etc.
		Gas flow meter	For accurate measuring of the gas consumption. Available for packaged gas-fired chiller type only.
	Control system	Chiller control cabinet	Includes low voltage components, special circuit board, PLC, etc.
		Touch screen	For operation
		External control elements	Includes temperature & pressure sensors, flow switches, solution level probes and actuators
		Inverters	Solution pump inverter and refrigerant pump inverter
		Network gateway	For internet monitoring
		BMS interface (optional)	Connects to BMS system through dry contact or serial communication
	Solution	LiBr solution	Includes corrosion inhibitor and energy intensifier
	Pumpset system	Pumpset	A/C water pump
Cooling water pump			Two pumps (BZY20, BZY30, BZY50 only one pump)
Hot water pump			Two pumps (BZY20, BZY30, BZY50 only one pump) N.A. for cooling only and cooling-heating types
Pumpset piping			Includes zero resistance filter, zero resistance check valve, soft connectors, valves and vibration isolator
Enclosure piping*			Includes all piping within the system to the external connections
Piping accessories in enclosure			Includes flow switches, vent valves and their sockets, and soft connectors
Motor drain valve			When water quality becomes poor, this valve automatically drains the cooling water. It also drains cooling water automatically in winter to avoid freeze
Cooling/heating switch valve			N.A. for cooling only type
A/C water check valve			N.A. for cooling only type
Flowmeter			Includes chilled/heating W., cooling W., hot W. flow meters. For accurate measuring of the load.(N.A. for cooling W. of BY20/BY30/BY50)
Water softener			Improve water quality, provide soften water for A/C water and cooling water
Auto dosing device			Automatically charge biocide corrosion inhibitor and antisludge to the cooling water
Pumpset control cabinet			Includes cooling W. pump inverter, soft starter, low voltage electric parts, etc.
Electric wiring*			Includes wires, cables, cable conduit, cable supporters, etc.
Optional	/	Enclosure	glass exposy shell (only for BY20/BY30/BY50)
		ATC system	Including injecting and collecting system, control system
		Exhaust economizer	Special stainless steel, asymmetric heat exchanger

Notes :

- "*" means only standard size is available. For any size change, please specify it in purchase orders.
- Supply list of waste heat chillers is available upon request.



BZY200

BZY200 XI D
BROAD PACKAGED DFA

May 15th, 2015
Friday
10: 15: 18

COOLING & HOT WATER

MONITOR

SETTING

CHECK-UP

EXPENSE

INFORMATION

PROFESSION

LANGUAGE

Heating water 0.0m³/h

Cooling water 37.3°C
488.6m³/h

Chilled water 7.1°C
286.3m³/h

Chilled water 14.2°C

Cooling water 30.1°C

Hot water 34.4m³/h
58.1°C

51.2°C

HTG 152.9°C

142.8°C

HTHE

95.0%

193.2Nm³/h

44.2Hz

37.6Hz

39.5Hz

Temp. setting °C

Chilled W. outlet

Heating W. outlet

Hot W. outlet

Cooling W. inlet

HTG

Timing on

Timing off

Mon Tue Wed Thu Fri Sat Sun

Energy saving: OK

Heating W. pump
1# 2#

Cooling W. pump
1# 42.0 Hz
2#

Hot W. pump
1# 2#

Cooling tower fan
1# 45.0 Hz
2# 50.0 Hz

Instant COP

Hour COP

Daily COP

ON Start

OFF Dilution

Steam Chiller Performance Data

BSY: steam from power generation or industrial waste streams

Mode	BS	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	10 ⁴ kcal/h	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2645	3307
Chilled water																
Flowrate	m ³ /h	28.6	42.9	71.4	107	143	179	214	286	357	429	571	714	857	1143	1429
Pressure drop	kPa	30	30	30	30	30	40	40	40	50	50	50	60	60	60	60
Cooling water																
Flowrate	m ³ /h	47.5	71.2	119	178	238	297	357	476	595	714	952	1189	1427	1903	2379
Pressure drop	kPa	50	50	50	50	50	50	50	50	80	80	80	90	90	90	90
Steam consumption	kg/h	234	350	586	879	1172	1465	1759	2345	2932	3518	4693	5864	7036	9386	11732
Power demand	kW	2.1	3.2	3.2	3.6	5.3	5.3	6.4	8.6	8.9	12.4	12.4	15.8	18.8	20.8	26.3
Solution weight	t	0.7	1.2	1.9	2.2	2.6	3.3	3.5	5.0	6.4	7.3	9.4	11.0	13.7	17.0	20.0
Unit ship. wt.	t	4.2	6.0	7.5	9.4	10.6	12.8	14.7	21.0	25.8	/	/	/	/	/	/
Main shell ship. wt.	t	2.5	4.2	5.0	5.6	6.5	7.6	8.9	12.7	14.8	17.8	19.8	25.0	27.5	30.0	32.0
Operation weight	t	4.7	6.7	8.3	10.7	12.7	15.0	17.5	24.3	30.2	35.8	42.2	50.5	57.5	74.5	91.0

Packaged Steam Chiller Performance Data

Rated chilled water 7°C/14°C, Cooling water 37°C/30°C

Mode	BSY	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000	
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630	
Pumpset	A/C water pump																
	External head	mH ₂ O	22	22	22	24	24	27	27	27	28	28	28	32	32	32	32
	Power demand	kW	4	7.5	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	Cooling W. pump																
	External head	mH ₂ O	10	10	10	15	15	15	15	16	16	16	17	17	17	17	17
	Power demand	kW	3	7.5	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	Total power demand	kW	7	15	15	30	30	44	52	74	88	104	120	200	220	300	360
Operation Wt.	t	0.5	0.7	0.8	3.3	3.3	3.6	3.7	6.3	6.6	7.2	8.8	5.9/8.6	6.1/8.8	6.1/9.8	9.6/9.8	
Cooling tower	Power demand	kW	5.5	11	11	/	/	/	/	/	/	/	/	/	/	/	
	Operation Wt.	t	2.5	4.5	5.1	/	/	/	/	/	/	/	/	/	/	/	
Electricity & Water consumption	Total power demand	kW	14.6	29.2	29.2	33.6	35.3	49.3	58.4	82.6	96.9	116.4	132.4	215.8	238.8	320.8	386.3
	Water demand for cooling	t/h	0.6	0.9	1.5	2.0	3.0	3.8	4.5	6.0	7.5	9.0	12.0	15.0	18.0	24.0	30.0

General Conditions:

1. Rated saturated steam pressure: 0.8MPa (0.6MPa for optional), condensate temp. : 95°C
2. Rated chilled W. outlet/inlet temp. : 7°C/14°C (7°C/12°C)
3. Rated cooling W. outlet/inlet temp. : 37°C/30°C (37.5°C/32°C)
4. Lowest permitted outlet temp. for chilled water: 5°C
5. Lowest permitted inlet temp. for cooling water: 10°C
6. Steam pressure upper limit 110%
7. Adjustable chilled water flowrate: 50%~120%
8. Pressure limit for chilled W., cooling W.: 0.8MPa (except special order)
9. Adjustable load: 5%~115%
10. Fouling factor for chilled W., cooling W.: 0.086m² · K/kW
11. LiBr Solution concentration: 52%. Solution is included in unit shipment Wt.
12. Machine room ambient temperature: 5~43°C, humidity ≤ 85%
13. Standard climate conditions for cooling operation: 36°C, relative humidity 50% (wet bulb 27°C)
14. Rated cooling COP: 1.50 (including chiller power consumption)
15. Life design: 30 years

Performance Curves

The same as packaged direct-fired chiller. Please refer to P5 for details.

Coefficient of Performance (COP)

Rated COP: 1.50			
IPLV COP: 1.72			
Load	COP	Factor	Result
100%	1.50	0.01	0.015
75%	1.731	0.42	0.727
50%	1.793	0.45	0.807
25%	1.432	0.12	0.172

Notes:

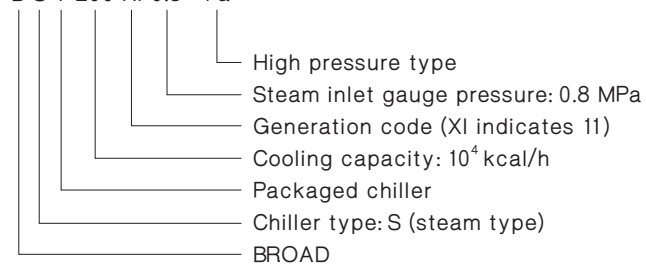
- The integrated part load value (IPLV) reflects chiller's actual COP in operation
- Calculated per ARI560

Operating Noise dB(A)

Mode BSY	20~50	75~200	≥250
Steam chiller	≤52	≤53	≤53
Pumpset	≤57	≤57	≤59
Cooling tower	≤62	≤64	≤66
Outside enclosure	≤40	≤41	≤42

Nomenclature

B S Y 200 XI 0.8 - Fa



Note:

high pressure type (see P5)

Model Selection & Ordering

Steam selection

- Please specify saturated steam pressure and temperature
- The temperature of overheated steam should be $\leq 180^{\circ}\text{C}$ (except special order)

Other factors

Load, quantity, flow, pressure, split shipment, control, machine room, location, ordering and warranty are the same as those of packaged direct-fired chillers. Please refer to P6 for details

Supply list

Refer to packaged DFA supply list on P7



BS500

Packaged Hot W./ Exhaust Chiller Performance Data

BHY/BEY: hot water/exhaust from power generation or industrial waste streams

(pumpset, enclosure data are the same as steam chiller)

Code	Mode	Cooling capacity kW	Heating capacity kW	Chilled W.		Cooling W.		Heating W.		Hot W. Consump m ³ /h	Exhaust consumption		Power demand kW	Solution Wt. t	Unit ship. Wt. t	Main shell ship. Wt. t	Chiller opera-tion Wt. t
				flow rate m ³ /h	Pressure drop kPa	flow rate m ³ /h	Pressure drop kPa	flow rate m ³ /h	Pressure drop kPa		Cooling kg/h	Heating kg/h					
Two-stage hot water chiller BH hot water 180°C	20	233	/	28.6	30	475	50	/	/	9.4	/	/	2.1	0.7	4.3	2.5	5.0
	30	349	/	42.9	30	712	50	/	/	14.0	/	/	3.2	1.1	6.0	4.2	6.9
	50	582	/	71.4	30	119	50	/	/	23.5	/	/	3.2	1.4	7.8	5.0	9.0
	75	872	/	107	30	178	50	/	/	35.2	/	/	3.6	2.0	11.8	5.6	13.6
	100	1163	/	143	30	238	50	/	/	46.9	/	/	5.3	2.8	13.4	6.5	15.7
	125	1454	/	179	40	297	50	/	/	58.7	/	/	5.3	3.6	15.9	7.6	18.5
	150	1745	/	214	40	357	50	/	/	70.5	/	/	6.4	4.8	18.9	8.9	21.9
	200	2326	/	286	40	476	50	/	/	93.9	/	/	8.6	5.6	23.5	12.7	27.0
	250	2908	/	357	50	595	80	/	/	117.4	/	/	8.9	7.3	28.2	14.8	32.8
	300	3489	/	429	50	714	80	/	/	140.9	/	/	12.4	8.5	/	17.8	40.3
	400	4652	/	571	60	952	80	/	/	188	/	/	12.4	10.9	/	19.8	49.0
	500	5815	/	714	60	1189	90	/	/	234.9	/	/	15.8	14.0	/	25.0	62.0
	600	6978	/	857	60	1427	90	/	/	281.8	/	/	18.8	16.9	/	27.5	68.4
	800	9304	/	1143	60	1903	90	/	/	375.9	/	/	20.8	21.0	/	30.0	87.2
1000	11630	/	1429	60	2379	90	/	/	469.9	/	/	26.3	25.5	/	32.0	105	
Two-stage exhaust chiller BE exhaust 500°C	20	233	153	28.6	30	475	50	13.1	20	/	1440	1530	2.1	1.1	6.0	2.5	6.5
	30	349	230	42.9	30	712	50	19.6	20	/	2158	2289	3.2	1.7	8.3	4.2	9.0
	50	582	384	71.4	30	119	50	32.7	20	/	3606	3819	3.2	2.4	10.5	5.0	11.5
	75	872	575	107	30	178	50	49.0	20	/	5414	5722	3.6	3.5	13.5	5.6	15.0
	100	1163	767	143	30	238	50	65.4	20	/	7215	7638	5.3	4.0	17.2	6.5	19.2
	125	1454	959	179	40	297	50	81.8	20	/	9025	9553	5.3	5.0	18.6	7.6	20.6
	150	1745	1151	214	40	357	50	98	20	/	10832	11445	6.4	6.5	23.2	8.9	25.2
	200	2326	1534	286	40	476	50	131	30	/	14439	15299	8.6	8.0	31.0	12.7	34.1
	250	2908	1918	357	50	595	80	163	30	/	18057	19036	8.9	9.2	/	14.8	38.9
	300	3489	2301	429	50	714	80	196	40	/	21663	22890	12.4	11.5	/	17.8	49.5
	400	4652	3068	571	60	952	80	262	40	/	28902	30598	12.4	15.0	/	19.8	61.2
	500	5815	3835	714	60	1189	90	327	50	/	36115	38189	15.8	19.6	/	25.0	77.5
	600	6978	4602	857	60	1427	90	394	50	/	43332	46014	18.8	23.0	/	27.5	90.0
	800	9304	6137	1143	60	1903	90	523	60	/	57800	61079	20.8	27.0	/	30.0	109.5
1000	11630	7671	1429	60	2379	90	654	60	/	72246	76378	26.3	31.0	/	32.0	120.0	

General Conditions:

1. Rated hot W. inlet/outlet temp. for hot W. chiller: 180°C/165°C
2. Rated exhaust inlet/outlet temp. for exhaust chiller: 500°C/160°C
3. Rated chilled W. outlet/inlet temp.: 7°C/14°C (7°C/12°C)
4. Rated cooling W. outlet/inlet temp.: 37°C/30°C (37.5°C/32°C)
5. Rated heating W. outlet/inlet temp. for two-stage exhaust chiller: 65°C/55°C
6. Lowest permitted outlet temp. for chilled water: 5°C
7. Lowest permitted inlet temp. for cooling water: 10°C
8. Adjustable chilled water flowrate: 50%~120%
9. Pressure limit for chilled/cooling water: 0.8MPa (except special order)
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W., cooling W., heating W.: 0.086m² · K/kW
12. LiBr Solution concentration: 54%, solution is included in unit shipment Wt.
13. Machine room ambient temperature: 5~43°C, humidity ≤ 85%
14. Rated cooling COP: 1.50 (including chiller power consumption)
Rated heating COP for exhaust chiller: 0.93 (including chiller power consumption)
16. Life design: 30 years
17. Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list information

Packaged Single-stage Steam/ Hot W. Chiller Performance Data

BDSY/BDHY: steam/hot water from power generation, solar panels or industrial waste streams

(pumpset, enclosure data are the same as steam chiller)

Code	Mode	Cooling capacity	Chilled W.		Cooling W.		Steam consumption	Hot W. consumption	Power demand	Solution Wt.	Unit ship. Wt.	Main shell ship. Wt.	Chiller operation Wt.
			flow rate	Pressure drop	flow rate	Pressure drop							
		kW	m ³ /h	kPa	m ³ /h	kPa	kg/h	m ³ /h	kW	t	t	t	t
Single-stage steam chiller BDS steam 0.1MPa	20	233	28.6	30	64.6	85	457	/	2.5	0.6	3.2	/	3.6
	30	349	42.9	30	96.9	85	687	/	2.5	0.7	5.4	/	6.2
	50	582	71.4	30	162	85	1146	/	2.8	1.1	6.7	/	7.9
	75	872	107	30	242	85	1718	/	4.7	1.4	8.0	/	10.1
	100	1163	143	30	323	85	2292	/	4.9	1.8	9.3	/	11.5
	125	1454	179	40	404	85	2866	/	4.9	2.3	11.4	/	13.6
	150	1745	214	40	485	85	3440	/	5.6	2.8	13.0	/	15.3
	200	2326	286	40	647	85	4586	/	7.5	4.0	18.0	/	21.2
	250	2908	357	50	808	100	5733	/	9.3	5.0	21.4	/	25.6
	300	3489	429	50	970	100	6881	/	10.1	5.6	26.3	/	31.4
400	4652	571	60	1294	100	9173	/	13.9	6.5	29.3	/	36.4	
500	5815	714	60	1617	100	11466	/	15.7	10.0	/	27.5	46.7	
600	6978	857	60	1940	100	13758	/	19.4	11.0	/	30.5	53.5	
800	9304	1143	60	2587	120	18342	/	25.2	13.0	/	32.0	68.3	
1000	11630	1429	60	3234	120	22935	/	26.2	15.3	/	33.0	83.0	
Single-stage hot water chiller BDH hot water 98°C	20	209	25.2	25	58.6	75	/	23.9	2.5	0.6	3.3	/	3.9
	30	302	37.6	25	86.5	75	/	35.8	2.5	0.7	5.4	/	6.4
	50	512	62.9	25	145	75	/	59.8	2.8	1.1	6.9	/	8.4
	75	767	94.2	25	218	75	/	89.7	4.7	1.4	8.1	/	10.4
	100	1023	125	25	291	75	/	119.6	4.9	1.8	9.6	/	12.0
	125	1279	157	30	363	75	/	149.6	4.9	2.3	11.8	/	14.3
	150	1535	188	30	436	75	/	179.6	5.6	2.8	13.3	/	15.8
	200	2046	251	30	582	75	/	239.4	7.5	4.0	18.4	/	22.2
	250	2558	313	40	727	90	/	299.2	9.3	5.0	21.7	/	26.7
	300	3069	376	40	872	90	/	359.2	10.1	5.6	26.8	/	33.4
400	4092	503	50	1163	90	/	478.8	13.9	6.5	30.2	/	38.8	
500	5115	628	50	1454	90	/	598.5	15.7	10.0	/	28.5	50.0	
600	6138	754	50	1745	90	/	718.1	19.4	11.0	/	32.0	57.6	
800	8184	1006	60	2326	100	/	957.3	25.2	13.0	/	32.0	72.5	
1000	10230	1256	60	2908	100	/	1197.1	26.2	15.3	/	33.0	89.0	

General Conditions:

- Rated saturated steam pressure for BDS chiller 0.1 MPa
Rated condensate temperature for BDS chiller: 95°C
- Rated hot W. inlet/outlet temp. for single-stage hot W. chiller: 98°C/88°C
- Rated chilled W. outlet/inlet temp.: 7°C/14°C (7°C/12°C)
- Rated cooling W. outlet/inlet temp.: 37°C/30°C (37.5°C/32°C)
- Lowest permitted outlet temp. for chilled water: 5°C
- Lowest permitted inlet temp. for cooling water: 10°C
- Adjustable chilled water flowrate: 50%~120%
- Pressure limit for chilled/cooling water: 0.8MPa (except special order)
- Adjustable load: 5%~115%
- Fouling factor for chilled W., cooling W.: 0.086m² · K/kW
- LiBr Solution concentration: 43%, solution is included in unit shipment Wt.
- Machine room ambient temperature: 5~43°C, humidity ≤ 85%
- Rated cooling COP for single-stage steam chiller: 0.79 (including chiller power consumption)
Rated cooling COP for single-stage hot W. chiller: 0.76 (including chiller power consumption)
- Life design: 30 years
- Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list information

Packaged Multi-energy Chiller Performance Data

BZEY/BHEY/BZHEY: gas (oil) and waste heat hybrid (multi-energy chiller)

(pumpset, enclosure data are the same as DFA)

Code	Mode	Cooling capacity	Heating capacity	Hot water capacity	Chilled W.		Heating W.		Hot W.		Cooling W.		Power demand	Solution wt.
					flow rate	Pressure drop	flow rate	Pressure drop	flow rate	Pressure drop	flow rate	Pressure drop		
		kW	kW	kW	m ³ /h	kPa	m ³ /h	kPa	m ³ /h	kPa	m ³ /h	kPa	kW	t
Exhaust & direct-fired chiller BZE exhaust 500°C gas/oil	20	233	179	80	28.6	30	15.3	20	3.4	20	47.5	50	2.3	1.4
	30	349	269	120	42.9	30	23.1	20	5.2	20	71.2	50	3.8	2.1
	50	582	449	200	71.4	30	38.5	20	8.6	20	119	50	3.9	2.7
	75	872	672	300	107	30	57.9	20	12.9	20	178	50	5.1	3.7
	100	1163	897	400	143	30	77.1	20	17.2	20	238	50	6.8	4.8
	125	1454	1121	500	179	40	96.4	20	21.5	20	297	50	8.8	5.5
	150	1745	1349	600	214	40	116	20	25.8	20	357	50	9.9	7.4
	200	2326	1791	800	286	40	153	30	34.4	30	476	50	16.3	9.0
	250	2908	2245	1000	357	50	193	30	43.0	30	595	80	16.6	10.5
	300	3489	2687	1200	429	50	231	40	51.6	40	714	80	22.4	13.0
400	4652	3582	1600	571	60	308	40	68.8	40	952	80	26.6	16.0	
500	5815	4489	/	714	60	385	50	/	/	1189	90	29.3	20.3	
600	6978	5385	/	857	60	463	50	/	/	1427	90	39.3	26	
800	9304	7176	/	1143	60	617	60	/	/	1903	90	49.7	29.5	
1000	11630	8967	/	1429	60	771	60	/	/	2379	90	53.3	34.0	
Hot W. & exhaust chiller BHE exhaust 500°C hot W. 98°C	20	233	153	/	28.6	30	11.6	15	/	/	52.5	60	2.1	1.2
	30	349	230	/	42.9	30	19.6	20	/	/	73.3	60	3.2	2.0
	50	582	384	/	71.4	30	29.3	15	/	/	131	60	3.2	2.6
	75	872	575	/	107	30	43.8	15	/	/	196	60	3.6	3.7
	100	1163	767	/	143	30	58.4	15	/	/	262	60	5.3	4.3
	125	1454	959	/	179	40	73.0	15	/	/	327	60	5.3	5.3
	150	1745	1151	/	214	40	88.2	15	/	/	393	60	6.4	6.9
	200	2326	1534	/	286	40	117	25	/	/	525	60	8.6	8.4
	250	2908	1918	/	357	50	146	25	/	/	655	80	8.9	9.8
	300	3489	2301	/	429	50	175	35	/	/	787	80	12.4	12.4
400	4652	3068	/	571	60	233	35	/	/	1049	80	12.4	16.0	
500	5815	3835	/	714	60	293	45	/	/	1311	90	15.8	20.1	
600	6978	4602	/	857	60	351	45	/	/	1573	90	18.8	25.6	
800	9304	6137	/	1143	60	467	55	/	/	2097	90	20.8	29.0	
1000	11630	7671	/	1429	60	584	55	/	/	2622	90	26.3	33.0	
Hot W. & exhaust & direct-fired chiller BZHE exhaust 500°C hot W. 98°C gas/oil	20	233	179	80	28.6	30	15.3	20	3.4	20	52.5	60	2.3	1.8
	30	349	269	120	42.9	30	23.1	20	5.2	20	78.7	60	3.8	2.6
	50	582	449	200	71.4	30	38.5	20	8.6	20	131	60	3.9	3.0
	75	872	672	300	107	30	57.9	20	12.9	20	196	60	5.1	4.0
	100	1163	897	400	143	30	77.1	20	17.2	20	262	60	6.8	5.5
	125	1454	1121	500	179	40	96.4	20	21.5	20	327	60	8.8	6.5
	150	1745	1349	600	214	40	116	20	25.8	20	393	60	9.9	7.8
	200	2326	1791	800	286	40	153	30	34.4	30	525	60	16.3	10.5
	250	2908	2245	1000	357	50	193	30	43.0	30	655	80	16.6	12.0
	300	3489	2687	1200	429	50	231	40	51.6	40	787	80	22.4	14.2
400	4652	3582	1600	571	60	308	40	68.8	40	1049	80	26.6	16.8	
500	5815	4489	/	714	60	385	50	/	/	1311	90	29.3	22.0	
600	6978	5385	/	857	60	463	50	/	/	1573	90	39.3	28.0	
800	9304	7176	/	1143	60	617	60	/	/	2097	90	49.7	31.5	
1000	11630	8967	/	1429	60	771	60	/	/	2622	90	53.3	37.0	

Energy consumption						Unit wt.	Main shell wt.	Oper- ation wt.	
Cooling			Heating		Hot water				
NG	Exhaust	Hot W.	NG	Exhaust	NG	Exhaust			
Nm ³ /h	kg/h	m ³ /h	Nm ³ /h	kg/h	Nm ³ /h	kg/h	t	t	t
16.2	432	/	19.2	459	8.5	459	5.7	2.5	6.1
24.3	647	/	28.8	687	12.8	687	8.5	4.2	9.1
40.7	1082	/	48.1	1146	21.4	1146	10.8	5.0	11.2
61.1	1624	/	71.9	1717	32.0	1717	14	5.6	15.1
81.4	2164	/	96.1	2291	42.7	2291	17.5	6.5	19.4
102	2707	/	120	2866	53.5	2866	20.3	7.6	21.4
122	3250	/	144	3434	64.0	3434	24	8.9	26.2
163	4332	/	192	4590	85.0	4590	31	12.7	33.7
204	5417	/	241	5711	107	5711	/	14.8	39.8
244	6499	/	288	6867	128	6867	/	17.8	48.1
326	8671	/	384	9179	171	9179	/	19.8	58.4
407	10834	/	481	11457	/	/	/	25.0	70.2
489	13000	/	577	13804	/	/	/	27.5	84.7
652	17340	/	769	18324	/	/	/	32.0	108.5
815	21674	/	961	22913	/	/	/	34.0	122.2
/	1440	6.6	/	1530	/	/	6.9	2.7	7.7
/	2158	9.9	/	2289	/	/	9.5	4.4	10.5
/	3606	16.4	/	3819	/	/	11.7	5.4	13.3
/	5414	24.7	/	5722	/	/	14.8	6.3	17.1
/	7215	32.9	/	7638	/	/	18.2	7.4	20.5
/	9025	41.1	/	9553	/	/	20.1	8.8	22.6
/	10832	49.3	/	11445	/	/	24.3	10.0	26.8
/	14439	65.8	/	15299	/	/	33	14.0	37.2
/	18057	82.2	/	19036	/	/	/	16.4	42.7
/	21663	98.7	/	22890	/	/	/	20.3	53.5
/	28902	132	/	30598	/	/	/	22.7	67
/	36115	164	/	38189	/	/	/	28.5	83.5
/	43332	197	/	46014	/	/	/	32.0	98.3
/	57800	263	/	61079	/	/	/	32.0	117.4
/	72246	329	/	76378	/	/	/	34.0	139
16.2	432	6.6	19.2	459	8.5	459	6.2	2.7	6.9
24.3	647	9.9	28.8	687	12.8	687	9.2	4.4	10.0
40.7	1082	16.4	48.1	1146	21.4	1146	11.5	5.4	12.5
61.1	1624	24.7	71.9	1717	32	1717	14.8	6.3	17.1
81.4	2164	32.9	96.1	2291	42.7	2291	18.3	7.4	20.9
102	2707	41.1	120	2866	53.5	2866	22	8.8	24.8
122	3250	49.3	144	3434	64.0	3434	25.6	10.0	28.5
163	4332	65.8	192	4590	85.0	4590	33	14.0	37.0
204	5417	82.2	241	5711	107	5711	/	16.4	44.1
244	6499	98.7	288	6867	128	6867	/	20.3	53.8
326	8671	132	384	9179	171	9179	/	22.7	65.8
407	10834	164	481	11457	/	/	/	28.5	79.6
489	13000	197	577	13804	/	/	/	32.0	98.2
652	17340	263	769	18324	/	/	/	32.0	122.8
815	21674	329	961	22913	/	/	/	34.0	146.4

General Conditions:

- Rated chilled W. outlet/inlet temp. : 7°C/14°C (7°C/12°C)
 - Rated cooling W. outlet/inlet temp. : 37°C/30°C (37.5°C/32°C)
 - Rated heating W. outlet/inlet temp. : 65°C/55°C
 - Rated hot W. outlet/inlet temp. : 80°C/60°C
 - Lowest permitted outlet temp. for chilled water: 5°C
 - Highest permitted outlet temp. for heating/ hot water: 95°C
 - Lowest permitted inlet temp. for cooling water: 10°C
 - Adjustable chilled water flowrate: 50%~120%
 - Adjustable heating/hot water flowrate: 65%~120%
 - Pressure limit for chilled W., cooling W., heating W., hot W. 0.8MPa (except special order)
 - Adjustable load: 5%~115%
 - Fouling factor for chilled W., cooling W., heating W.: 0.086m² · K/kW
 - LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
 - Natural gas consumption is calculated: 10kWh/Nm³ (8600kcal/Nm³)
 - Standard natural gas dynamic pressure is 16~35kPa. Static pressure is <50kPa, lower or higher pressure can be accommodated to special orders
 - Machine room ambient temperature: 5~43°C, humidity ≤ 85%
 - Standard climate conditions for cooling operation: 36°C, relative humidity 50% (wet bulb 27°C)
 - Exhaust provides 30% of the total capacity per standard design of BZE/ BZHE. Over 30% can be accommodated into special orders
 - Energy consumption is for separate operation of heat source and fuel
 - Life design: 30 years
 - Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list
- Note:
exhaust, hot water, steam, natural gas can be combined in special order

Condensing Heat Recovery Chiller Performance Data

Mode		BZ	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000	
Condensing Heat Recovery Condition	Cooling capacity kW		233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630	
	10 ⁴ kcal/h		20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000	
	Hot W. capacity kW		80	120	200	300	400	500	600	800	1000	1200	1600	2000	2400	3200	4000	
	Chilled water																	
	Flowrate	m ³ /h		28.6	43	71.4	107	143	179	214	286	357	429	571	714	857	1143	1429
	Pressure drop	kPa		30	30	30	30	30	40	40	40	50	50	60	60	60	60	60
	Hot water																	
	Flowrate	m ³ /h		3.4	5.2	8.6	12.9	17.2	21.5	25.8	34.4	43	51.5	69	86	103	138	172
	Pressure drop	kPa		20	20	20	20	20	20	20	30	30	40	40	40	50	50	50
	Chilled water																	
	Flowrate	m ³ /h		44.2	66.2	110	165	220	275	330	440	550	660	880	1100	1320	1760	2199
	Pressure drop	kPa		50	50	50	50	50	50	50	50	60	60	60	60	60	60	60
	NG consumption																	
Cooling	Nm ³ /h		12.6	18.9	31.4	47	62.6	78.3	94	125	156	188	250	313	376	501	625	
Hot water	Nm ³ /h		8.5	12.8	21.4	32	42.7	53.5	64	85	107	128	171	214	256	342	428	
Heating Condition	Heating capacity kW		179	269	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967	
	10 ⁴ kcal/h		15.3	23	38.5	57.9	77.1	96.4	116	154	193	231	308	386	463	617	771	
	Heating water																	
	Flowrate	m ³ /h		15.3	23.1	38.5	57.9	77.1	96.4	116	153	193	231	308	385	463	617	771
	Pressure drop	kPa		20	20	20	20	20	20	20	30	30	40	40	50	50	60	60
NG consumption Nm ³ /h			19	28.7	47.9	72	95.9	120	144	190	240	287	383	479	576	767	959	
Power demand	kW		2.3	3.8	3.9	5.1	6.8	8.8	9.9	16.3	16.6	22.4	26.6	29.3	39.3	49.7	53.3	
Solution Wt.	t		1.0	1.6	2.3	2.8	3.8	4.3	5.6	6.8	8.5	10.3	12.6	16.0	21.0	25.0	32.0	
Unit ship. Wt.	t		5.2	7.9	9.5	12.6	15.6	17.7	21	27.5	32	/	/	/	/	/	/	
Main shell ship. Wt.	t		2.5	4.2	5	5.6	6.5	7.6	8.9	12.7	14.8	17.8	19.8	25	27.5	30.0	32.0	
Operation Wt.	t		5.8	8.5	10.3	14.1	17.9	20.2	24.2	31.1	36.3	44.3	53.3	64.1	78.5	95.8	116.2	

General Conditions:

- Rated chilled W. outlet/inlet temp.: 7°C/14°C (7°C/12°C)
- Rated cooling W. outlet/inlet temp.: 37°C/30°C (37.5°C/32°C)
- Rated hot W. outlet/inlet temp.: 80°C/60°C
- Rated heating W. outlet/inlet temp.: 65°C/55°C
- Lowest permitted outlet temp. for chilled water: 5°C
- Highest permitted outlet temp. for heating/ hot water: 95°C
- Lowest permitted inlet temp. for cooling water: 10°C
- Adjustable chilled water flowrate: 50%~120%
Adjustable heating/ hot water flowrate: 65%~120%
- Pressure limit for chilled W., cooling W., heating W., hot W.: 0.8MPa (except special order)
- Adjustable load: 5%~115%
- Fouling factor for chilled W., cooling W., hot W., heating W.: 0.086m² · K/kW
- The NG consumption data under condensing heat recovery condition when chilled W. and hot W. working simultaneously
- Natural gas consumption is calculated: 10kWh/Nm³ (8600kcal/Nm³)
- Standard natural gas dynamic pressure is 16~35kPa, static pressure is < 50kPa, lower or higher pressure can be accommodated to special orders
- LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
- Machine room ambient temperature: 5~43°C, humidity ≤ 85%
- Rated cooling COP: 1.85 Rated heating COP: 0.93 (including chiller power consumption)
- Life design: 30 years

Note:

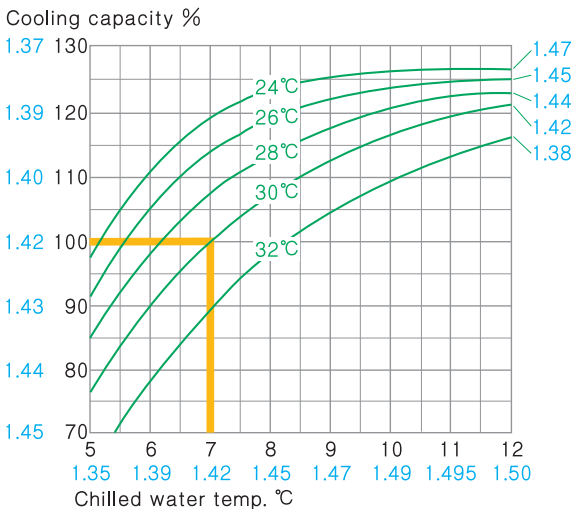
the dimension is the same as DFA chiller

Model Selection Curves

chilled/cooling water temp., cooling capacity, COP

(orange means the rated value)

BZ

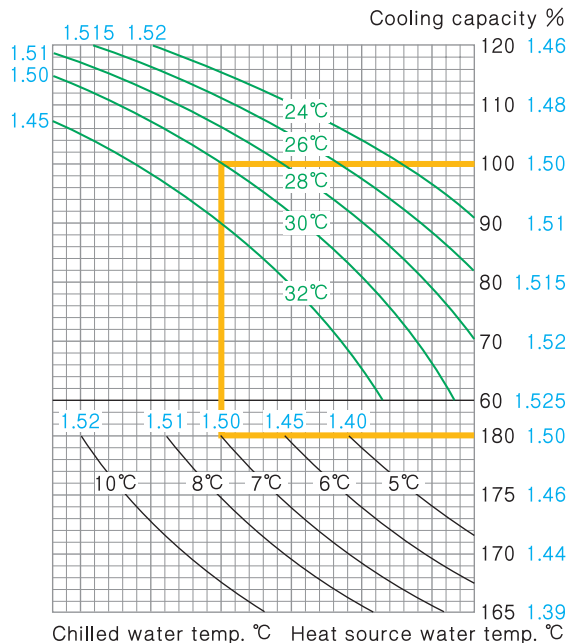


Notes:

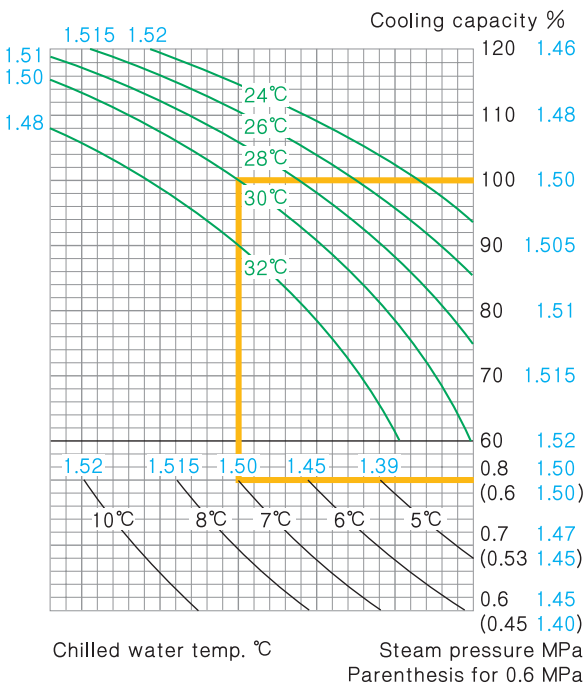
the figure in blue is COP. In calculation, 3 COP values are added and then divided by 3. e.g.

- Cooling capacity is 100%, cooling water temp. is 28°C, then chilled water temp. is 6.2°C, COP is 1.419; i.e. $(1.42 + 1.44 + 1.419) / 3 = 1.419$
- Chilled water temp. is 10°C, cooling water temp. is 30°C, then cooling capacity is 116%, COP=1.435
- Cooling capacity is 90%, chilled water is 6°C, then cooling water temp. is 30°C, COP=1.413

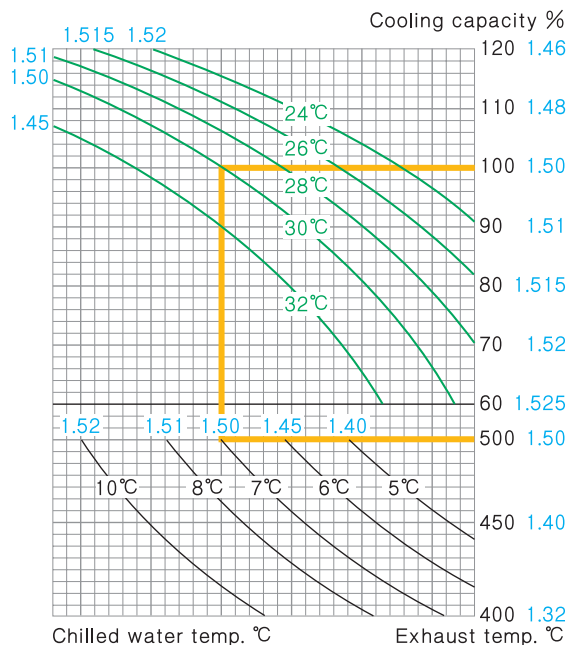
BH



BS



BE



Notes:

the figure in blue is COP. In calculation, 4 COP values are added and then divided by 3. e.g.

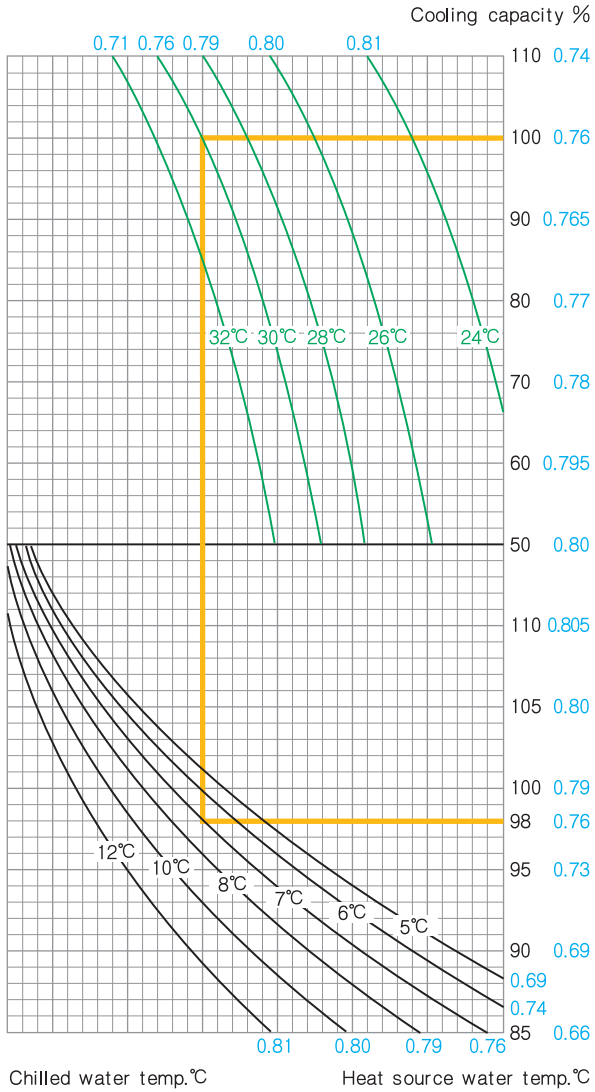
- Cooling capacity is 100%, steam pressure 0.6 MPa, cooling water temp. is 28°C, then chilled water temp. is 8.2°C, COP is 1.494; i.e. $(1.50 + 1.43 + 1.51 + 1.516) / 4 = 1.494$
- Steam pressure 0.7 MPa, chilled water temp. is 8°C, cooling water temp. is 28°C, then cooling capacity is 106%, COP=1.496
- Cooling capacity is 90%, steam pressure 0.8 MPa, chilled water temp. is 6°C, then cooling water temp. is 30.5°C, COP=1.488

Model Selection Curves

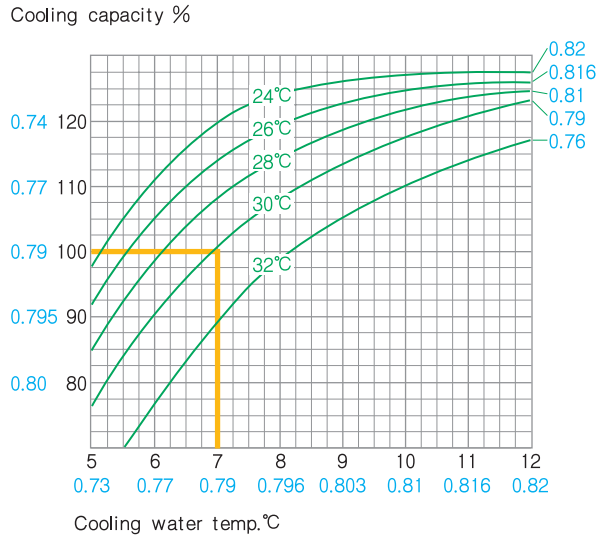
chilled/cooling water temp., cooling capacity, COP

(orange line means the rated value)

BDH



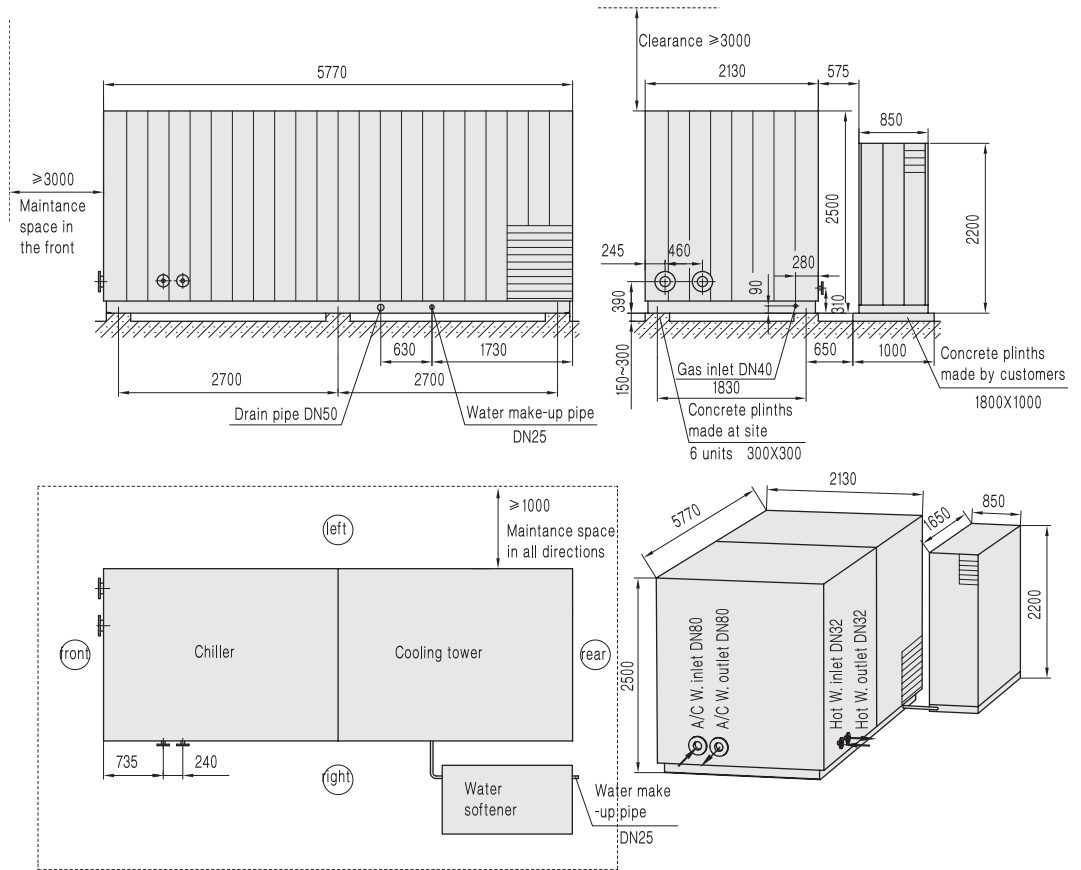
BDS



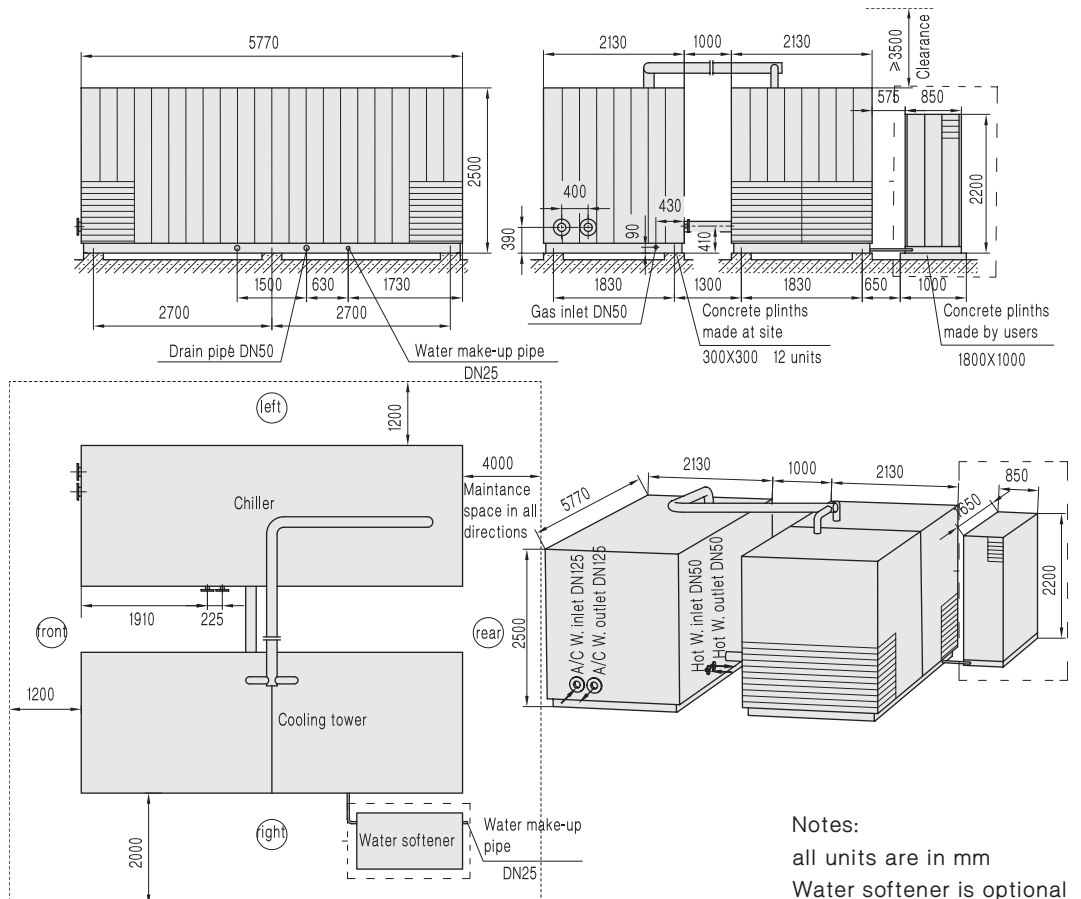
Note:
the figure in blue is COP (BH, BE, BDH, BDE, BDS).
Calculation is the same with BZ & BS models.

Packaged DFA

BZY20



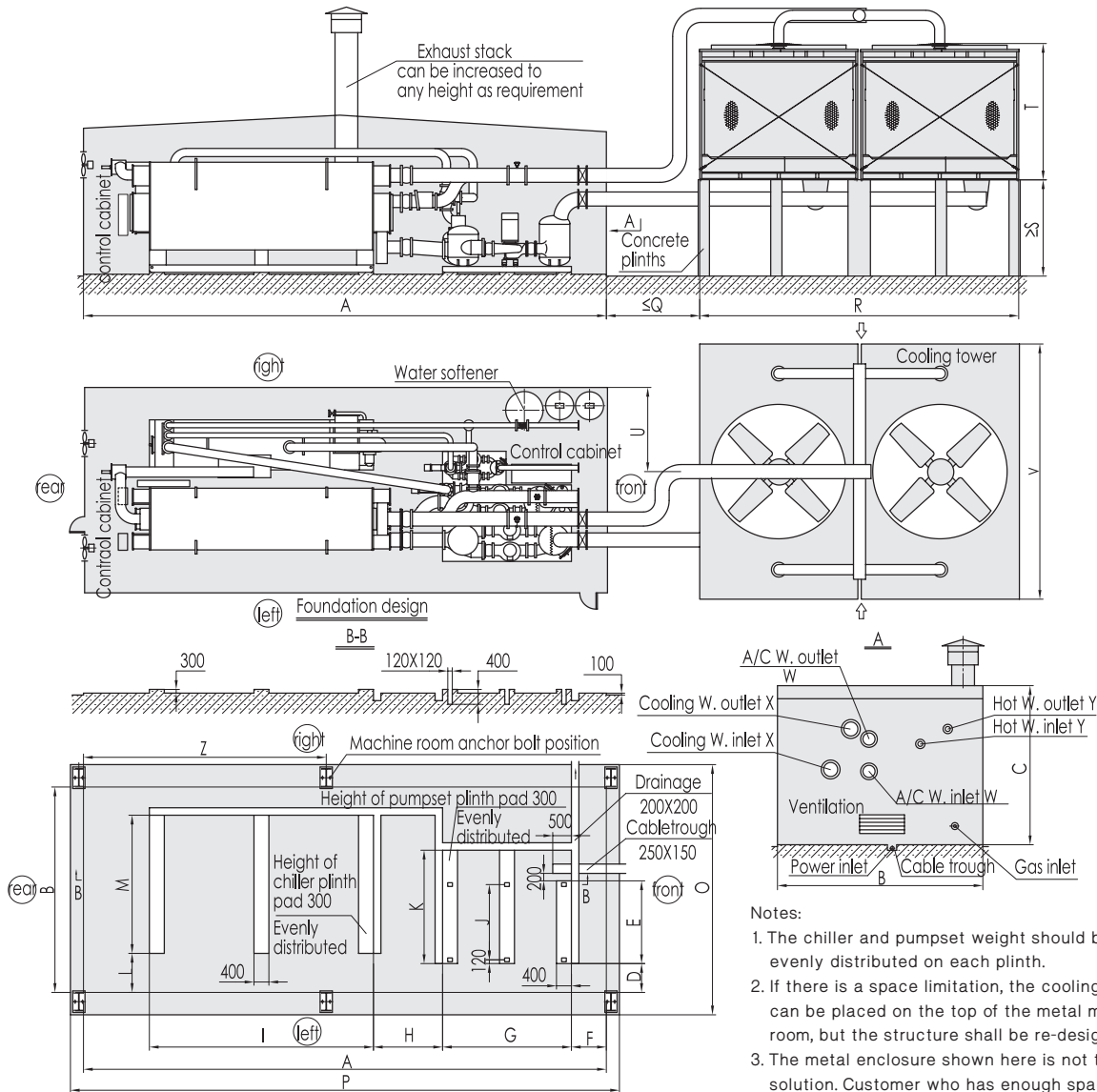
BZY30/BZY50



Notes:
 all units are in mm
 Water softener is optional

Packaged DFA Dimensions (with enclosure)

BZY75/BZY100/BZY125/BZY150/BZY200/BZY250/BZY300/BZY400

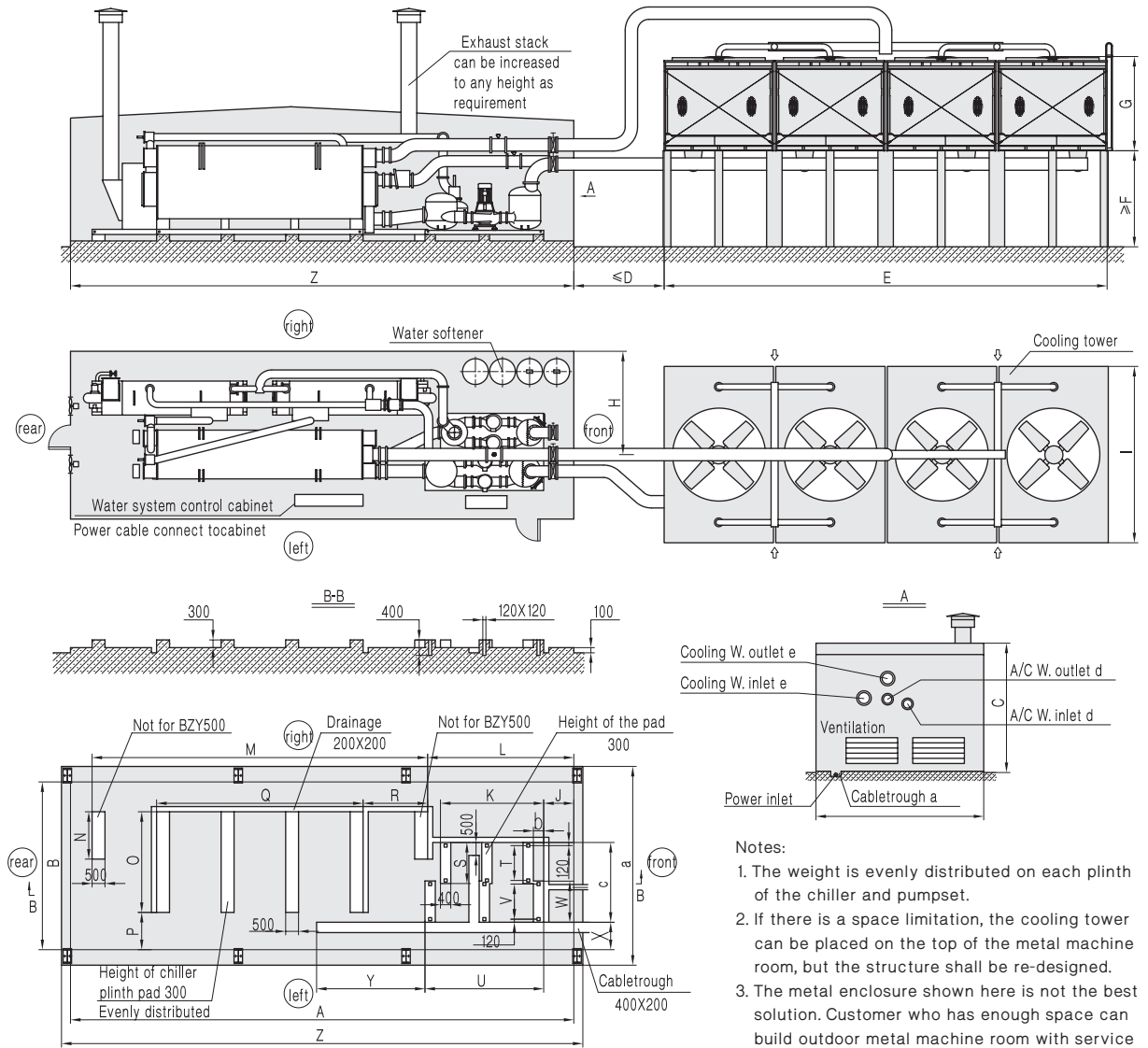


Notes:

1. The chiller and pumpset weight should be evenly distributed on each plinth.
2. If there is a space limitation, the cooling tower can be placed on the top of the metal machine room, but the structure shall be re-designed.
3. The metal enclosure shown here is not the best solution. Customer who has enough space can build outdoor metal machine room with service access inside. BROAD can provide design drawing upon request.

Mode	A	B	C	D	E	F	G	H	I	J	K	L	M
BZY75	10000	4500	3235	645	1995	530	2700	1300	4000	1755	2615	860	2300
BZY100	10000	4500	3235	740	1945	530	2900	1300	4000	1705	2545	900	2600
BZY125	11500	4500	3675	590	2085	650	2900	1500	5000	1845	2795	785	2600
BZY150	11500	4500	3675	605	2085	795	2900	1500	5000	1845	2725	775	2800
BZY200	12500	5000	4150	655	2255	880	3200	1670	5000	2015	2895	965	3400
BZY250	13500	5000	4240	485	2255	965	3200	1670	6000	2015	2895	795	3400
BZY300	14000	5500	4260	740	2255	935	3450	1850	6000	2015	3055	1045	3700
BZY400	14500	6000	4880	605	2485	1100	3700	1850	6000	2245	3285	905	4000
Mode	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
BZY75	2	5400	10700	1500	4154	2055	3113	3235	3912	DN150	DN200	DN65	4600
BZY100	2	5400	10700	1500	5207	2040	3124	2340	4318	DN150	DN200	DN65	4600
BZY125	3	5400	12200	2000	6125	2115	3656	2250	6070	DN200	DN250	DN80	5250
BZY150	3	5400	12200	2000	6125	2115	3656	2230	6070	DN200	DN250	DN80	5250
BZY200	3	6000	13200	2000	7343	2505	3656	2500	6401	DN250	DN300	DN125	5750
BZY250	3	6000	14200	2000	8560	2560	3651	1995	6833	DN250	DN350	DN125	6250
BZY300	3	6500	14700	2500	8560	2580	3651	2255	6833	DN300	DN350	DN125	6500
BZY400	3	7000	15200	3000	7373	2588	5739	3000	6833	DN300	DN400	DN150	6500

BZY500/BZY600/BZY800/BZY1000

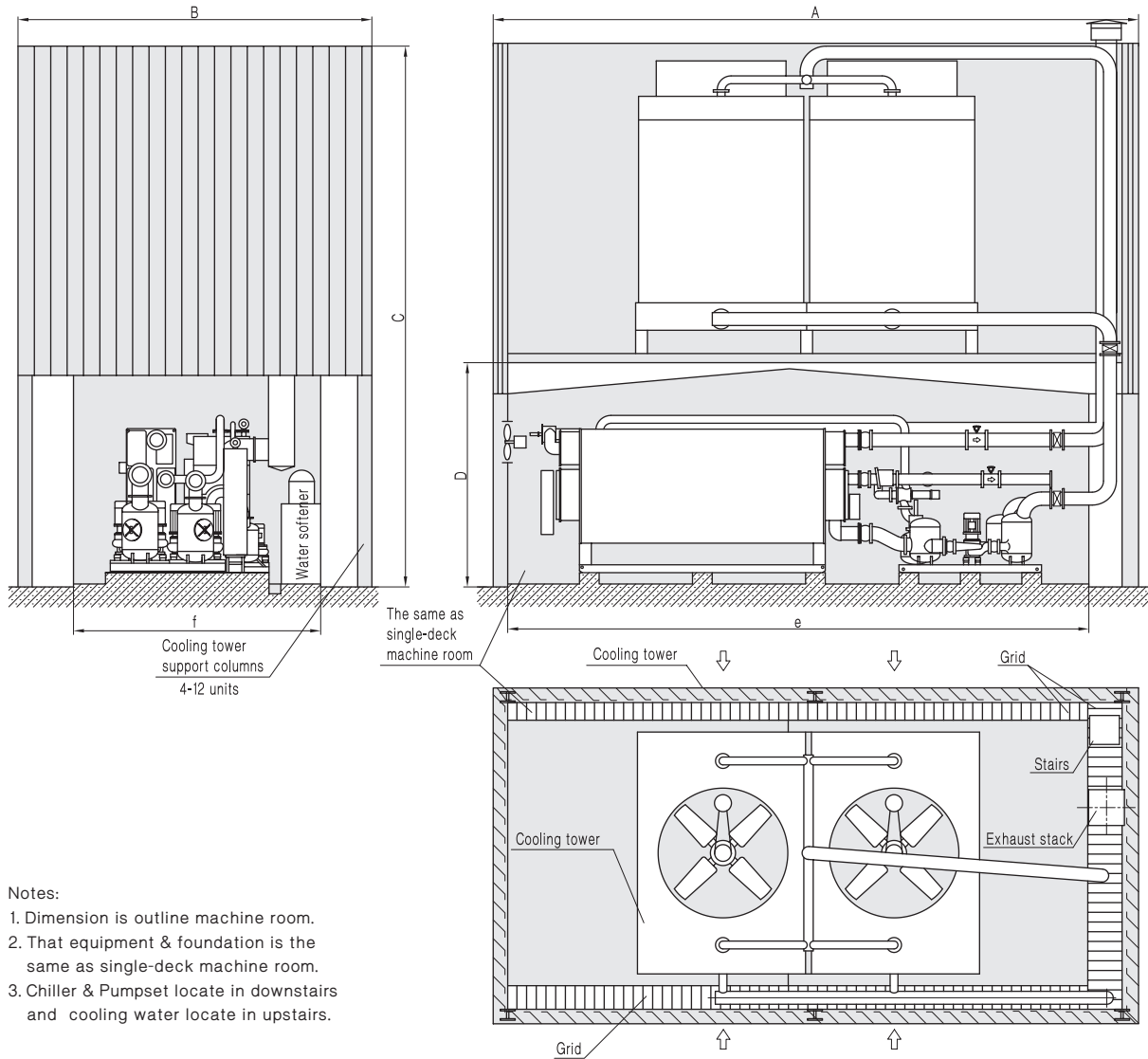


- Notes:
1. The weight is evenly distributed on each plinth of the chiller and pumpset.
 2. If there is a space limitation, the cooling tower can be placed on the top of the metal machine room, but the structure shall be re-designed.
 3. The metal enclosure shown here is not the best solution. Customer who has enough space can build outdoor metal machine room with service access inside. BROAD can provide design drawing upon request.

Mode	A	B	C	D	E	F	G	H	I	J	K
BZY500	17000	6500	4500	3000	12885	3290	3652	3325	6833	960	3260
BZY600	19500	6500	5000	3500	17210	3375	3652	4110	6833	1165	4000
BZY800	19500	7200	5500	3500	14840	3485	5739	3415	6833	1065	4000
BZY1000	21200	7200	5500	4000	18485	3560	5739	3670	6833	1405	4400
Mode	L	M	N	O	P	Q	R	S	T	U	V
BZY500	7560	/	/	4200	1310	8000	/	1450	1210	4600	1360
BZY600	5665	13000	1530	4000	1445	8000	2500	1590	1350	4600	1360
BZY800	5565	13000	1700	4400	1715	8000	2500	1540	1300	5000	1410
BZY1000	6905	13000	1700	4500	1715	10000	1500	1630	1390	5000	1410
Mode	W	X	Y	Z	a	b	c	d	e		
BZY500	1600	890	3800	17900	7600	345	2950	DN350	DN400		
BZY600	1600	1055	4200	20400	7600	0	3090	DN400	DN450		
BZY800	1650	1295	4600	20400	8300	225	3090	DN450	DN500		
BZY1000	1650	1295	4600	22150	8300	0	3180	DN450	DN500		

Packaged DFA Dimensions (with enclosure)

BZY75/BZY100/BZY125/BZY150/BZY200/BZY250/BZY300/BZY400/BZY500/BZY600/BZY800/BZY1000



Notes:

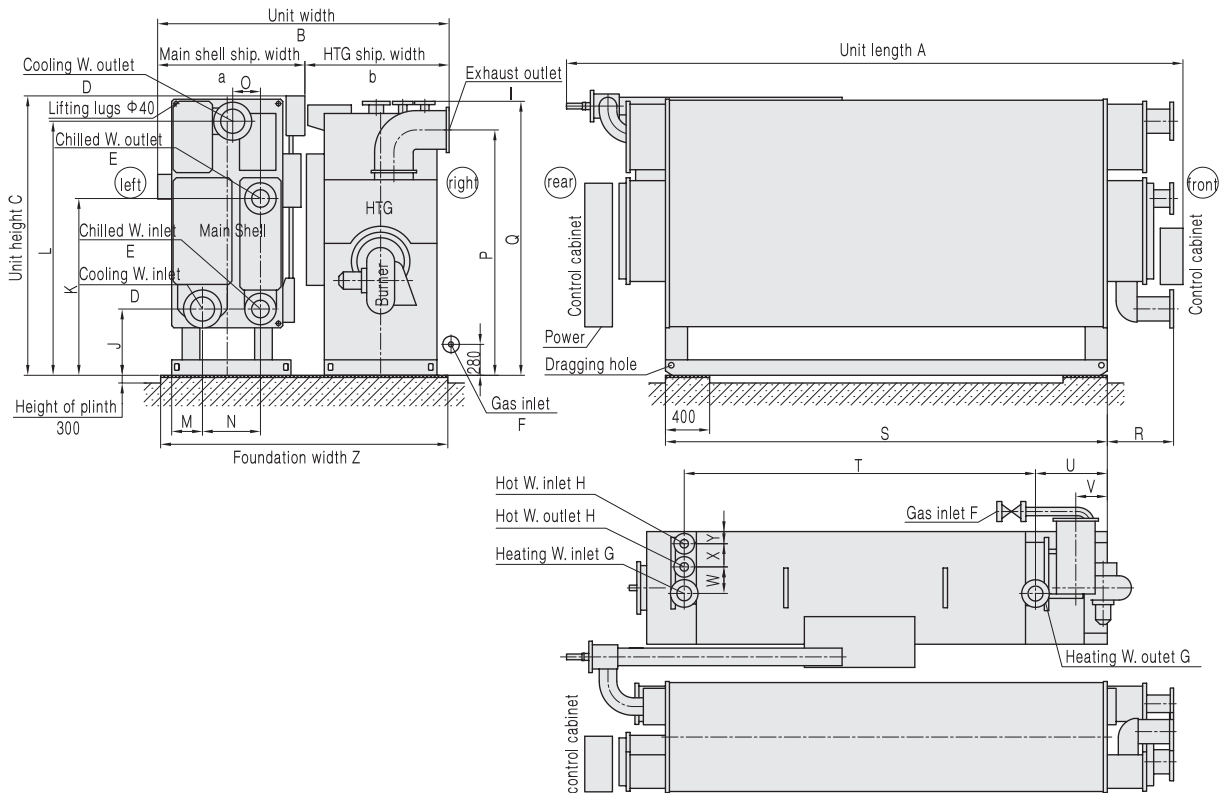
1. Dimension is outline machine room.
2. That equipment & foundation is the same as single-deck machine room.
3. Chiller & Pumpset locate in downstairs and cooling water locate in upstairs.

Dimensions of double-deck machine room

Code	Mode	A	B	C	D	e	f
1	BZY75, BZY100	11500	5500	9000	3300	10000	4500
2	BZY125, BZY150	13000	6800	10000	3800	11500	4500
3	BZY200	14000	6800	11000	4200	12500	5000
4	BZY250, BZY300, BZY400 BZY75×2, BZY100×2, BZY125×2, BZY150×2	16000	8000	11500	4900	14500	7500
5	BZY500, BZY600 BZY200×2, BZY250×2	21000	9500	12500	5100	19500	9000
6	BZY800 BZY300×2, BZY200×3	21000	10500	12500	5600	19500	10000
7	BZY1000 BZY400×2	25000	11500	13500	5600	21200	11000
8	BZY600×2, BZY400×3	21000	20000	12500	5100	21000	20000
9	BZY800×2, BZY500×3	21000	21000	12500	5600	21000	21000
10	BZY1000×2	25000	22000	13500	5600	25000	22000

DFA Dimensions

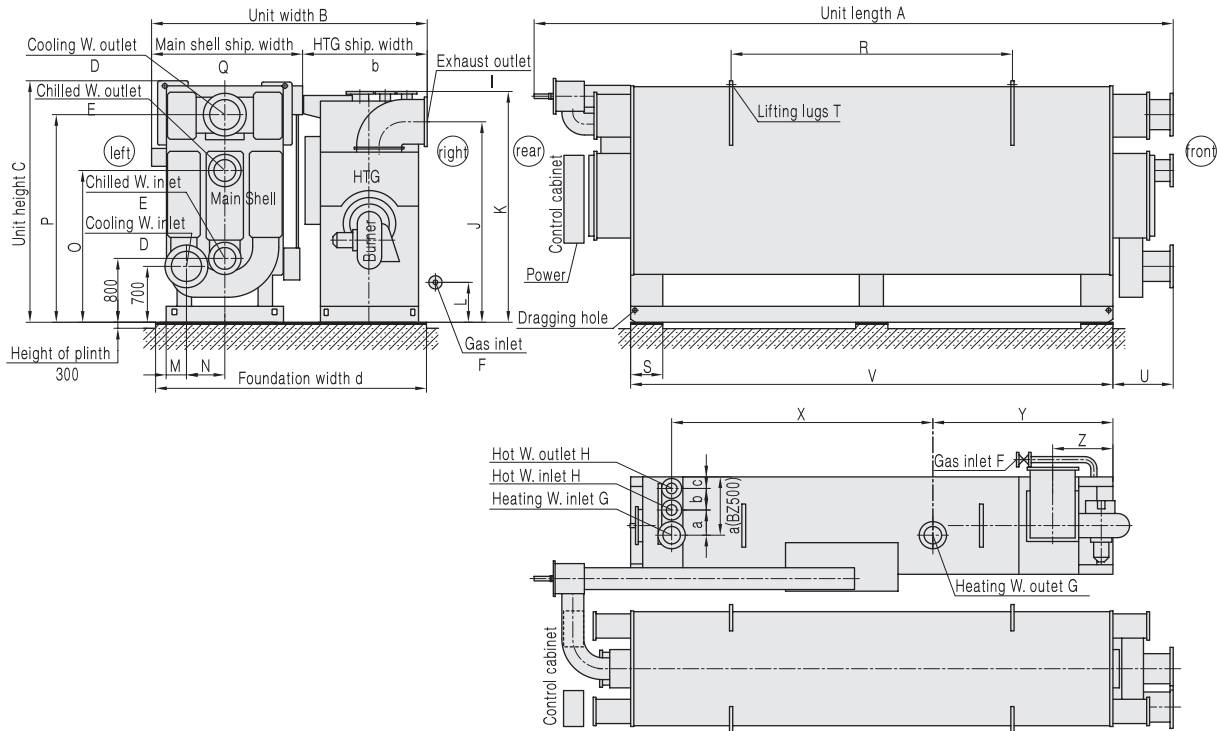
BZ75/BZ100/BZ125/BZ150



Mode	A	B	C	D	E	F	G	H	I	J
BZ75	5600	2310	2580	DN200	DN150	DN25	DN100	DN65	320×320	600
BZ100	5580	2650	2580	DN200	DN150	DN40	DN125	DN65	350×350	600
BZ125	6740	2620	2630	DN250	DN200	DN40	DN150	DN80	400×400	600
BZ150	6700	2770	3015	DN250	DN200	DN40	DN150	DN80	440×440	800
Mode	K	L	M	N	O	P	Q	R	S	T
BZ75	1600	2300	230	430	170	2210	2480	600	4000	3180
BZ100	1600	2300	280	525	250	2200	2480	600	4000	3180
BZ125	1600	2300	305	525	225	2050	2500	700	5000	3220
BZ150	1900	2700	340	525	190	2490	2880	700	5000	3220
Mode	U	V	W	X	Y	Z	a	b		
BZ75	650	300	220	200	100	2300	1190	1250		
BZ100	650	285	240	210	100	2600	1400	1400		
BZ125	1370	640	260	220	110	2600	1400	1400		
BZ150	1370	620	260	220	110	2800	1400	1550		

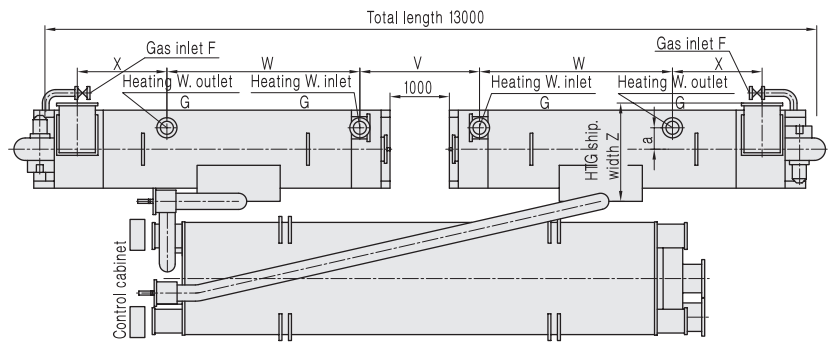
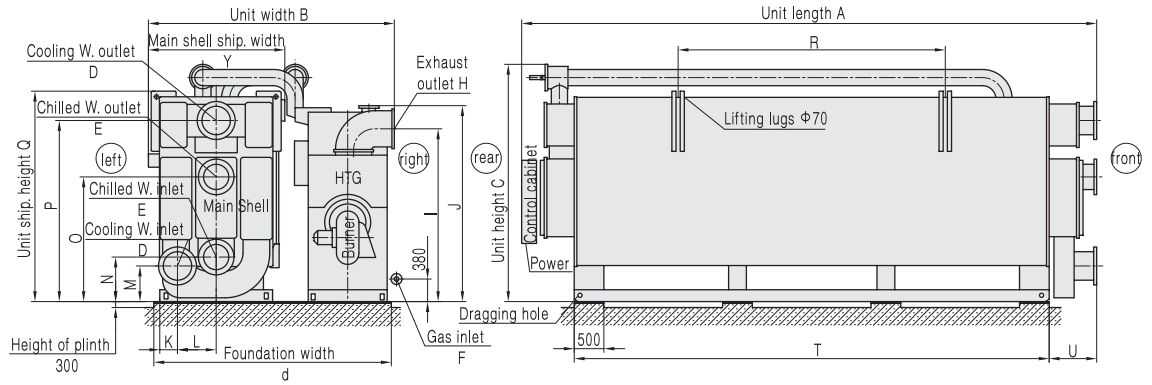
DFA Dimensions

BZ200/BZ250/BZ300/BZ400/BZ500



Mode	A	B	C	D	E	F	G	H	I	J
BZ200	6760	3380	3025	DN300	DN250	DN50	DN200	DN125	560×560	2510
BZ250	7950	3380	3050	DN350	DN250	DN50	DN200	DN125	560×560	2510
BZ300	8020	3750	3050	DN350	DN300	DN65	DN200	DN125	610×610	2490
BZ400	8080	4060	3545	DN400	DN300	DN65	DN250	DN150	710×710	2900
BZ500	10130	4260	3545	DN400	DN350	DN80	DN250	/	790×790	2945
Mode	K	L	M	N	O	P	Q	R	S	T
BZ200	2890	320	255	475	1900	2600	1880	2900	400	Φ50
BZ250	2890	320	255	475	1900	2600	1880	3500	400	Φ50
BZ300	2890	380	270	570	1900	2600	2120	3500	400	Φ50
BZ400	3290	380	280	620	2100	3050	2235	3500	400	Φ70
BZ500	3290	380	280	620	2100	3050	2300	4500	500	Φ70
Mode	U	V	W	X	Y	Z	a	b	c	d
BZ200	700	5000	1700	3250	1350	560	315	270	125	3400
BZ250	750	6000	1700	3250	2240	750	315	270	145	3400
BZ300	750	6000	1840	3250	2240	725	315	270	145	3700
BZ400	750	6000	2080	3285	2230	675	365	305	170	4000
BZ500	750	8000	2300	3300	3565	1985	400	/	/	4200

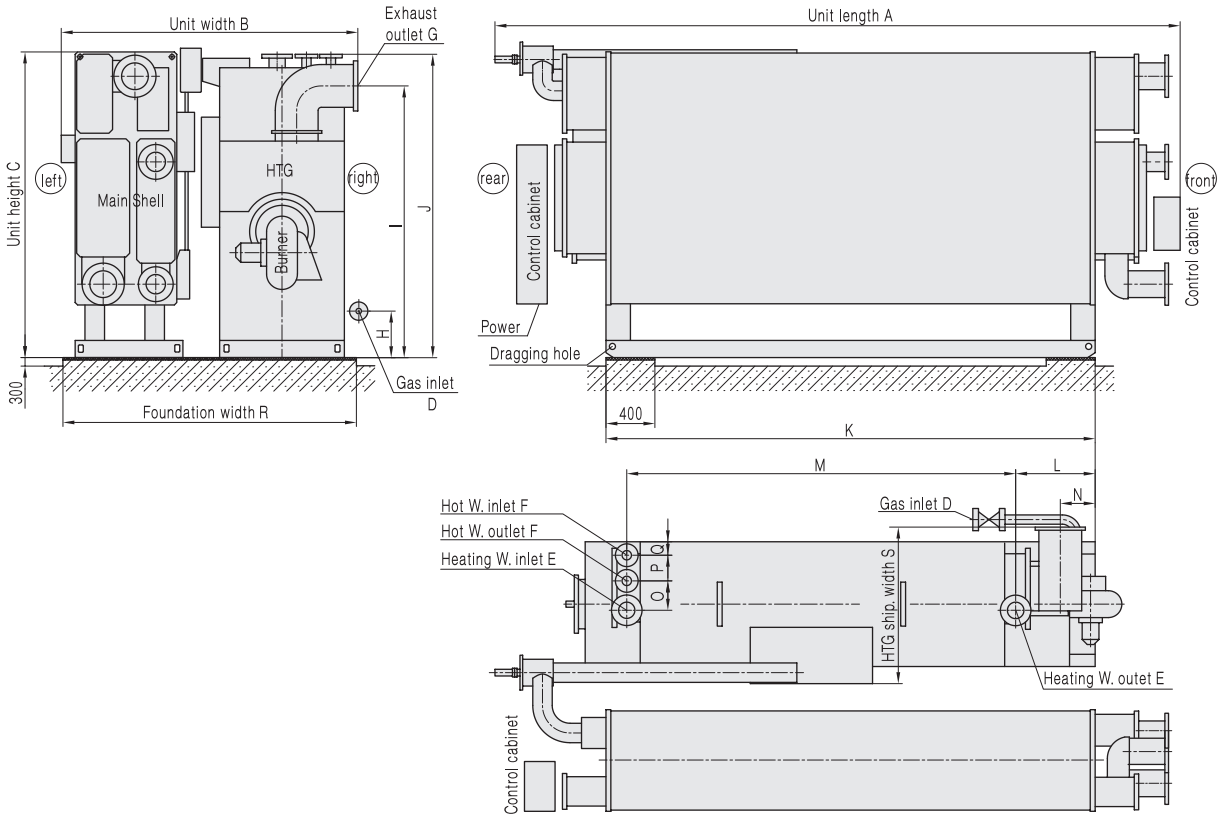
BZ600/BZ800/BZ1000



Mode	A	B	C	D	E	F	G	H	I
BZ600	9680	4100	4000	DN450	DN400	DN65	DN200	610 × 610	2900
BZ800	9780	4450	4455	DN500	DN450	DN65	DN250	710 × 710	3310
BZ1000	11780	4580	4525	DN500	DN450	DN80	DN250	790 × 790	3350
Mode	J	K	L	M	N	O	P	Q	R
BZ600	3300	300	650	600	750	2100	3050	3545	4500
BZ800	3710	325	670	500	725	2400	3450	3995	4500
BZ1000	3700	325	670	500	725	2400	3450	3995	4700
Mode	S	T	U	V	W	X	Y	Z	a
BZ600	4000	8000	800	2015	3250	1510	2350	1850	360
BZ800	4400	8000	850	1965	3300	1540	2600	1980	395
BZ1000	4500	10000	850	1960	3300	1580	2600	1980	400

DFA Enlarged Model Dimensions

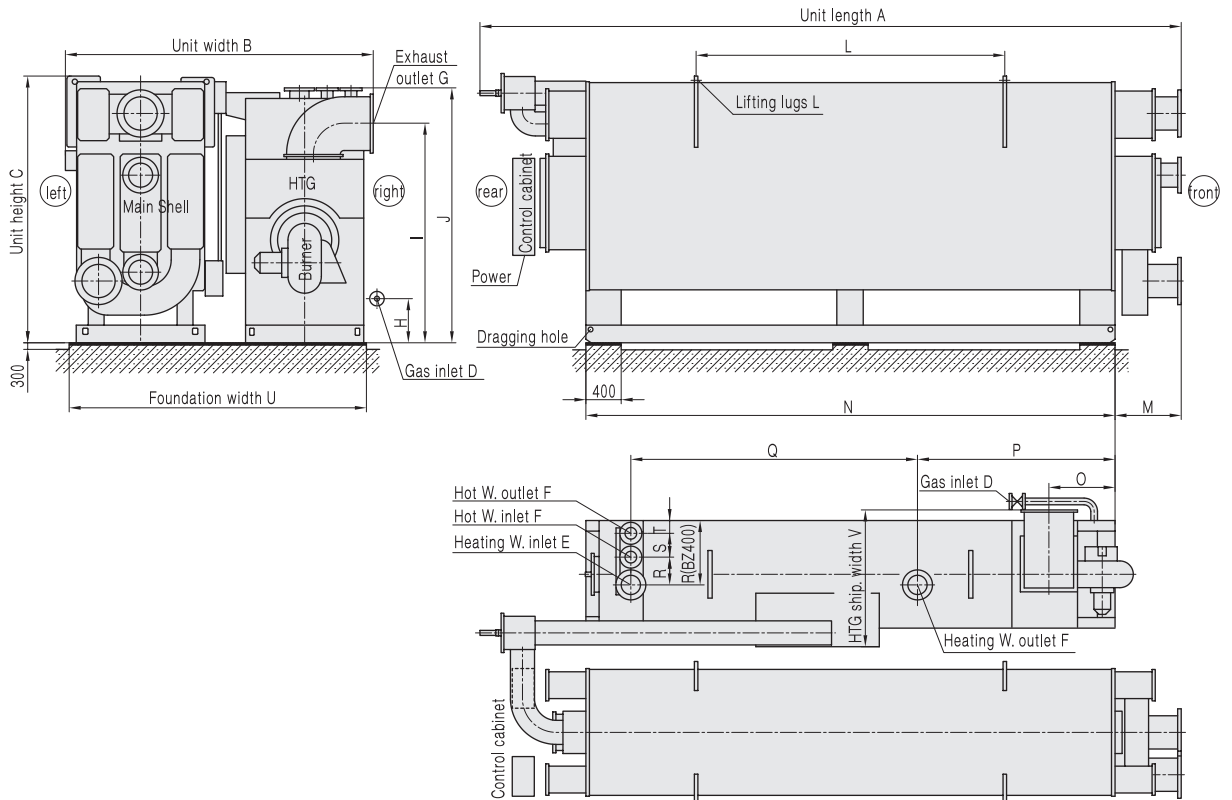
BZ75/BZ100/BZ125/BZ150



HTG Enlarged H₃, H₄ dimensions (HTG Enlarged H₁, H₂ is the same size with standard models)
 (Refer to P22 of the DFA standard model for dimensions not shown in the drawing)

Mode	A	B	C	D	E	F	G	H	I	J
BZ75	5600	2425	2580	DN40	DN125	DN65	350×350	280	2200	2480
BZ100	5580	2650	2580	DN40	DN150	DN80	400×400	280	2030	2480
BZ125	6740	2750	2630	DN40	DN150	DN80	440×440	280	2110	2500
BZ150	6700	2845	3020	DN50	DN200	DN125	560×560	320	2510	2890
Mode	K	L	M	N	O	P	Q	R	S	
BZ75	4000	650	3180	285	240	210	100	2400	1400	
BZ100	4000	750	3220	20	260	220	110	2600	1400	
BZ125	5000	1370	3220	620	260	220	110	2800	1550	
BZ150	5000	1350	3250	560	315	270	125	2900	1700	

BZ200/BZ250/BZ300/BZ400

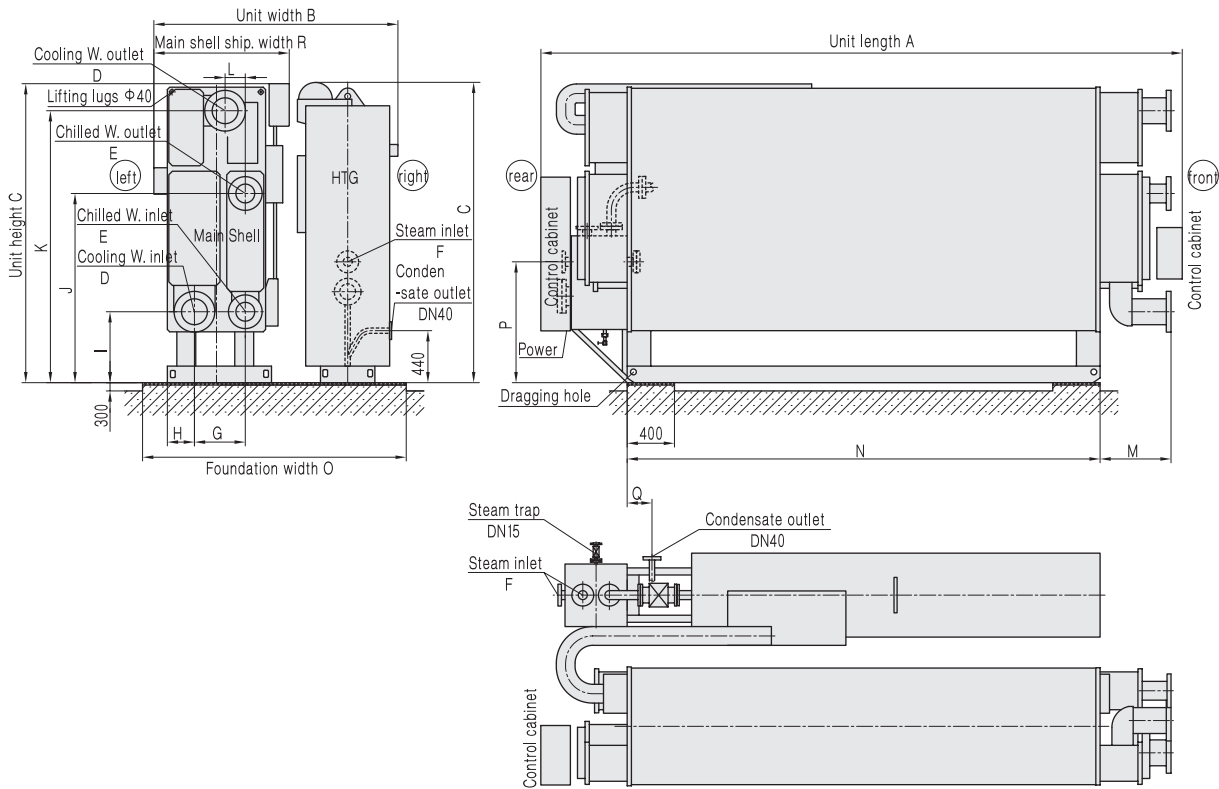


HTG Enlarged H₃, H₄ dimensions (HTG Enlarged H₁, H₂ is the same size with standard models)
 (Refer to P23 of the DFA standard model for dimensions not shown in the drawing)

Mode	A	B	C	D	E	F	G	H	I	J	K
BZ200	6760	3375	3035	DN50	DN200	DN125	560×560	320	2510	2890	2900
BZ250	7950	3490	3050	DN65	DN200	DN125	610×610	380	2490	2890	3500
BZ300	8020	3885	3050	DN65	DN250	DN150	710×710	380	2720	3100	3500
BZ400	8080	4180	3500	DN80	DN250	/	790×790	380	2940	3290	3500
Mode	L	M	N	O	P	Q	R	S	T	U	V
BZ200	Φ50	700	5000	160	1650	3250	315	270	145	3400	1700
BZ250	Φ50	750	6000	725	2240	3250	315	270	145	3400	1840
BZ300	Φ50	750	6000	675	2215	3330	365	305	170	3800	2080
BZ400	Φ70	750	6000	625	2205	3330	400	/	/	4200	2300

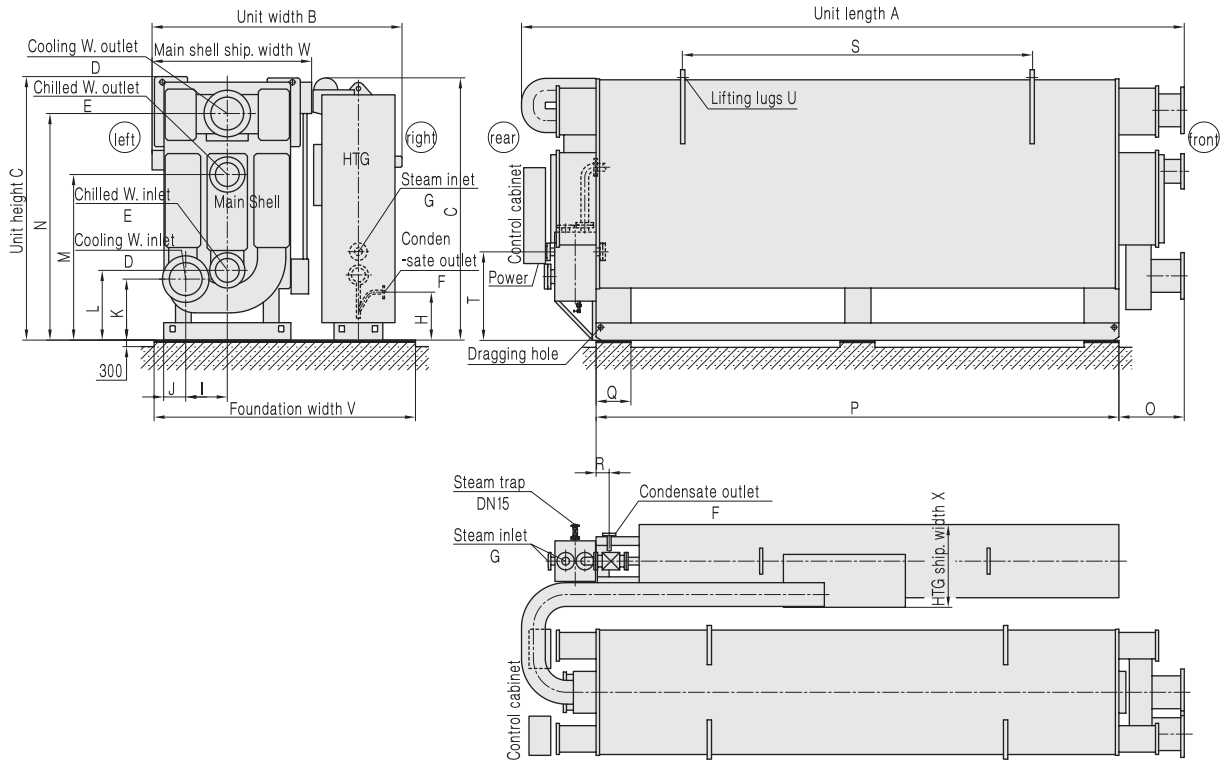
Steam Chiller Dimensions

BS75/BS100/BS125/BS150



Mode	A	B	C	D	E	F	G	H	I
BS75	5600	2000	2530	DN200	DN150	DN50	430	230	600
BS100	5580	2220	2530	DN200	DN150	DN65	525	280	600
BS125	6740	2220	2570	DN250	DN200	DN65	525	305	600
BS150	6700	2350	2985	DN250	DN200	DN65	525	340	800
Mode	J	K	L	M	N	O	P	Q	R
BS75	1600	2300	170	600	4000	2000	1030	320	1190
BS100	1600	2300	250	600	4000	2300	1020	210	1400
BS125	1600	2300	225	700	5000	2300	1020	230	1400
BS150	1900	2700	190	700	5000	2400	1020	220	1400

BS200/BS250/BS300/BS400/BS500/BS600/BS800/BS1000

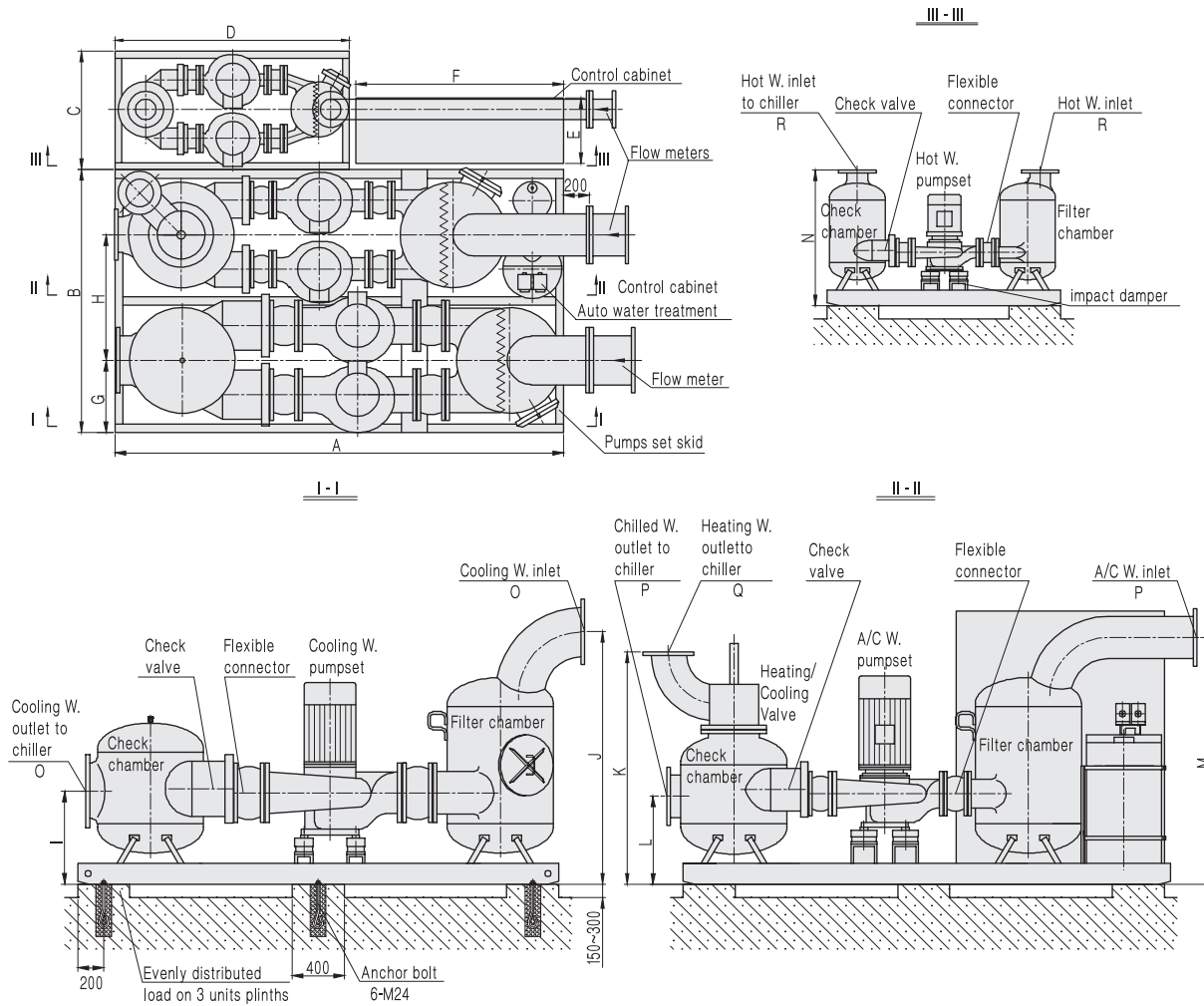


Mode	A	B	C	D	E	F	G	H	I	J	K	L
BS200	6500	2860	3025	DN300	DN250	DN40	DN80	550	475	255	700	800
BS250	7600	2930	3025	DN350	DN250	DN40	DN80	550	480	255	700	800
BS300	7660	3260	3025	DN350	DN300	DN50	DN100	550	570	270	700	800
BS400	7760	3470	3545	DN400	DN300	DN50	DN100	600	620	280	700	800
BS500	9810	3570	3545	DN400	DN350	DN50	DN125	600	620	280	700	800
BS600	9680	3660	3910	DN450	DN400	DN65	DN125	600	650	300	600	750
BS800	9780	4100	4370	DN500	DN450	DN65	DN150	600	670	325	500	725
BS1000	11800	4100	4435	DN500	DN450	DN65	DN150	600	670	325	500	725
Mode	M	N	O	P	Q	R	S	T	U	V	W	X
BS200	1900	2600	700	5000	400	180	2900	1015	Φ50	3000	1880	1200
BS250	1900	2600	750	6000	400	150	3500	1015	Φ50	3000	1880	1200
BS300	1900	2600	750	6000	400	135	3500	1005	Φ50	3400	2120	1350
BS400	2100	3050	750	6000	400	70	3500	1005	Φ70	3500	2235	1400
BS500	2100	3050	750	8000	500	1220	4500	1345	Φ70	3500	2300	1400
BS600	2100	3050	800	8000	500	1250	4500	1345	Φ70	3700	2350	1500
BS800	2400	3450	850	8000	500	1230	4500	1330	Φ70	4100	2600	1900
BS1000	2400	3450	850	10000	500	1200	4700	1330	Φ70	4100	2600	2000

Note:
Some dimension drawings are not included in this manual. Please request from BROAD.

Pumpset Dimensions

BYP75/BYP100/BYP125/BYP150/BYP200/BYP250/BYP300/BYP400

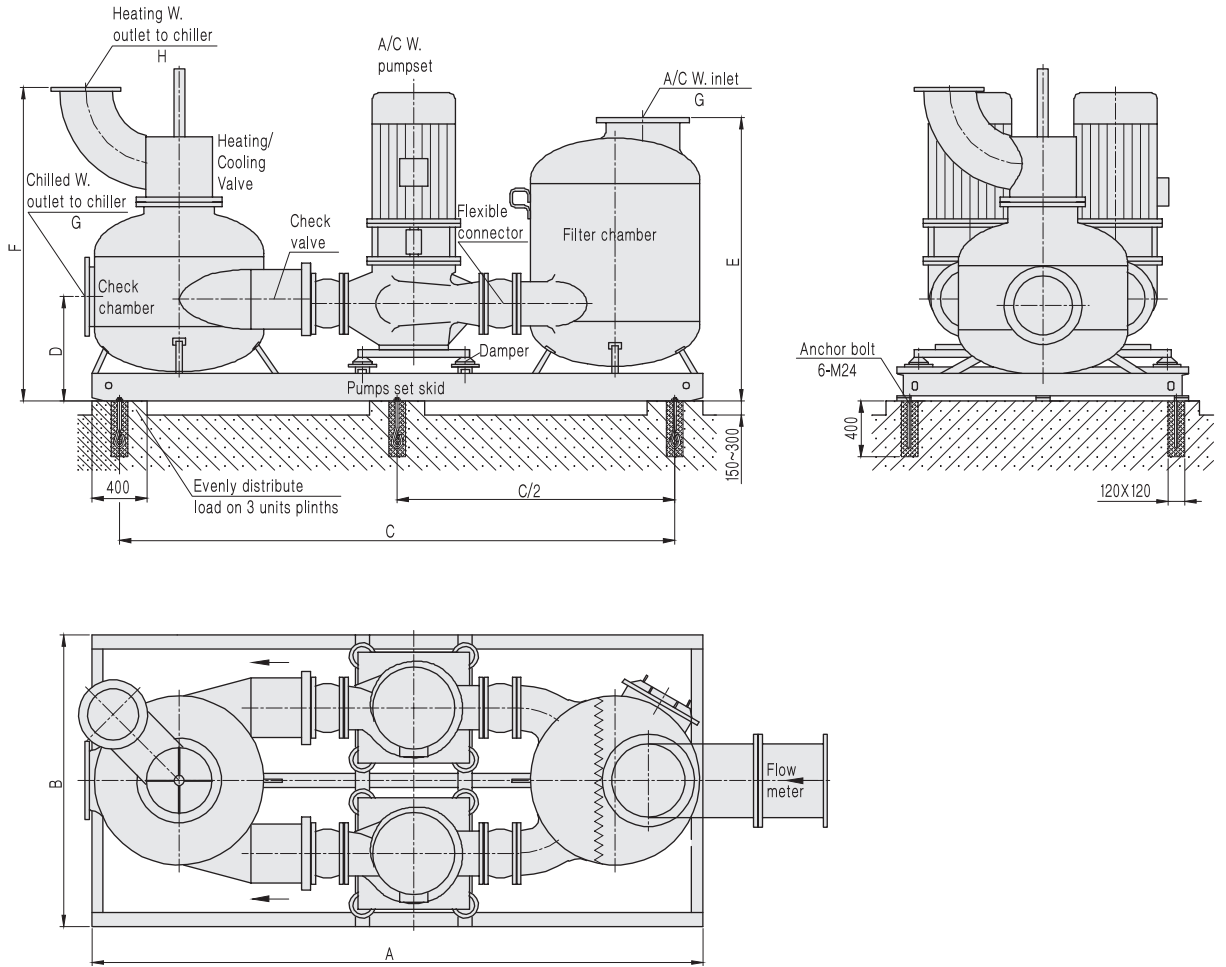


Mode	Dimension						Pipe Postion			
	A	B	C	D	E	F	G	H		
BYP75	2700	1790	700	1350	400	800	445	845		
BYP100	2900	1740	700	1350	400	800	440	835		
BYP125	2900	1880	700	1350	400	800	500	915		
BYP150	2900	1880	740	1570	400	800	505	905		
BYP200	3200	2050	740	1700	500	1400	565	1000		
BYP250	3200	2050	740	1700	500	1400	565	995		
BYP300	3450	2050	900	1700	500	1600	575	1025		
BYP400	3700	2080	900	1700	500	1600	580	1120		
Mode	Pipe Postion						Pipe Diameter (DN)			
	I	J	K	L	M	N	O	P	Q	R
BYP75	555	1435	1270	480	1365	720	200	150	100	65
BYP100	540	1420	1295	480	1365	720	200	150	125	65
BYP125	560	1495	1320	480	1420	720	250	200	150	80
BYP150	570	1505	1320	480	1420	920	250	200	150	80
BYP200	615	1885	1420	535	1530	920	300	250	200	125
BYP250	615	1945	1420	535	1530	920	350	250	200	125
BYP300	635	1965	1695	635	1915	940	350	300	200	125
BYP400	675	1970	1750	635	1910	940	400	300	250	150

Notes:

1. Flow meters are set up on the outlet pipes of chiller water system, when pumpset is packed with BROAD XI chiller.
2. Refer to Packaged Direct-fired Absorption Chiller and Pumpset Performance Data on P3.

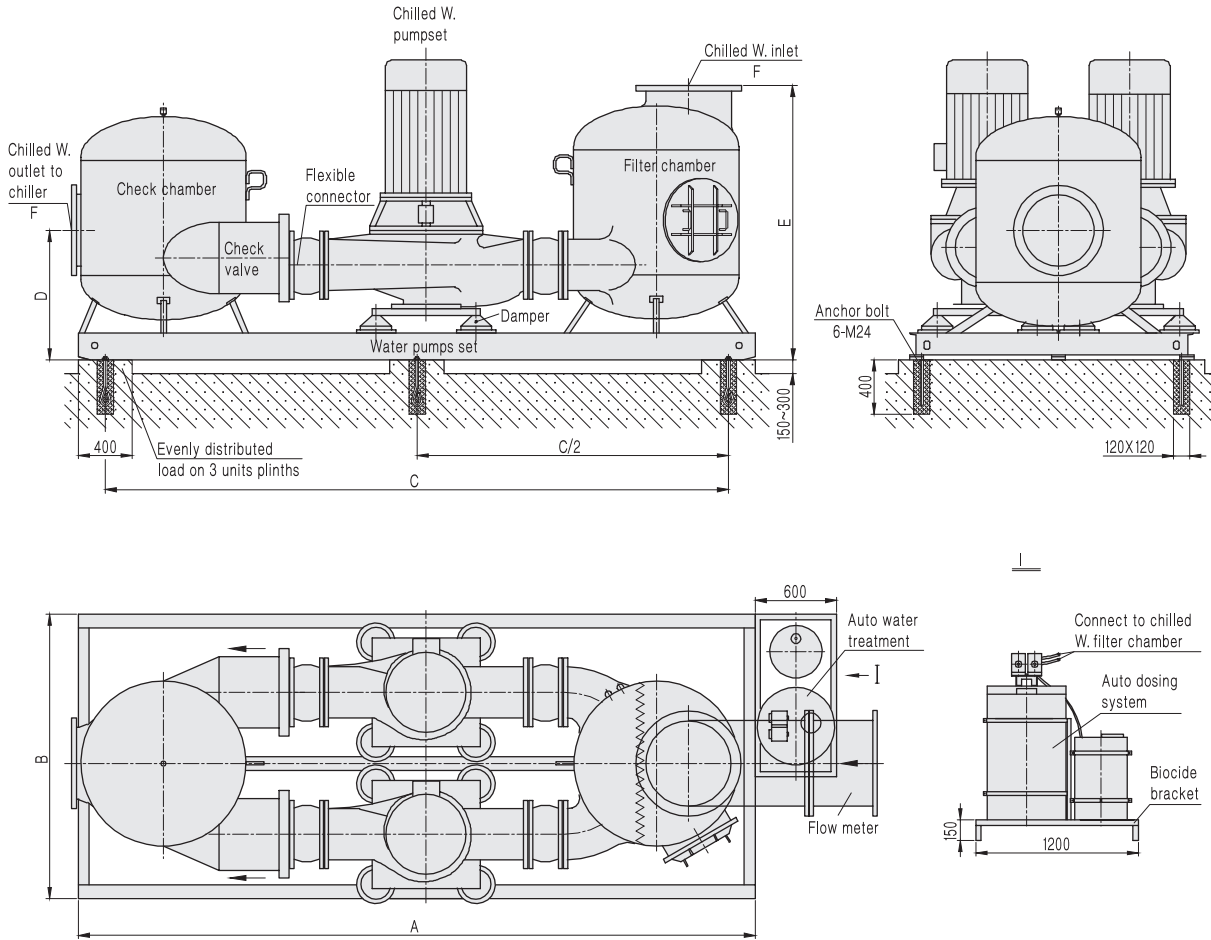
A/C water pumpset: BYP500AC/BYP600AC/BYP800AC/BYP1000AC



Mode	Dimension			Pipe Position			Pipe diameter (DN)	
	A	B	C	D	E	F	G	H
BYP500AC	3260	1350	2860	625	1690	1760	350	250
BYP600AC	4000	1490	3600	740	2020	2210	400	300
BYP800AC	4000	1440	3600	725	2010	2195	450	350
BYP1000AC	4400	1530	4000	590	2075	2225	450	350

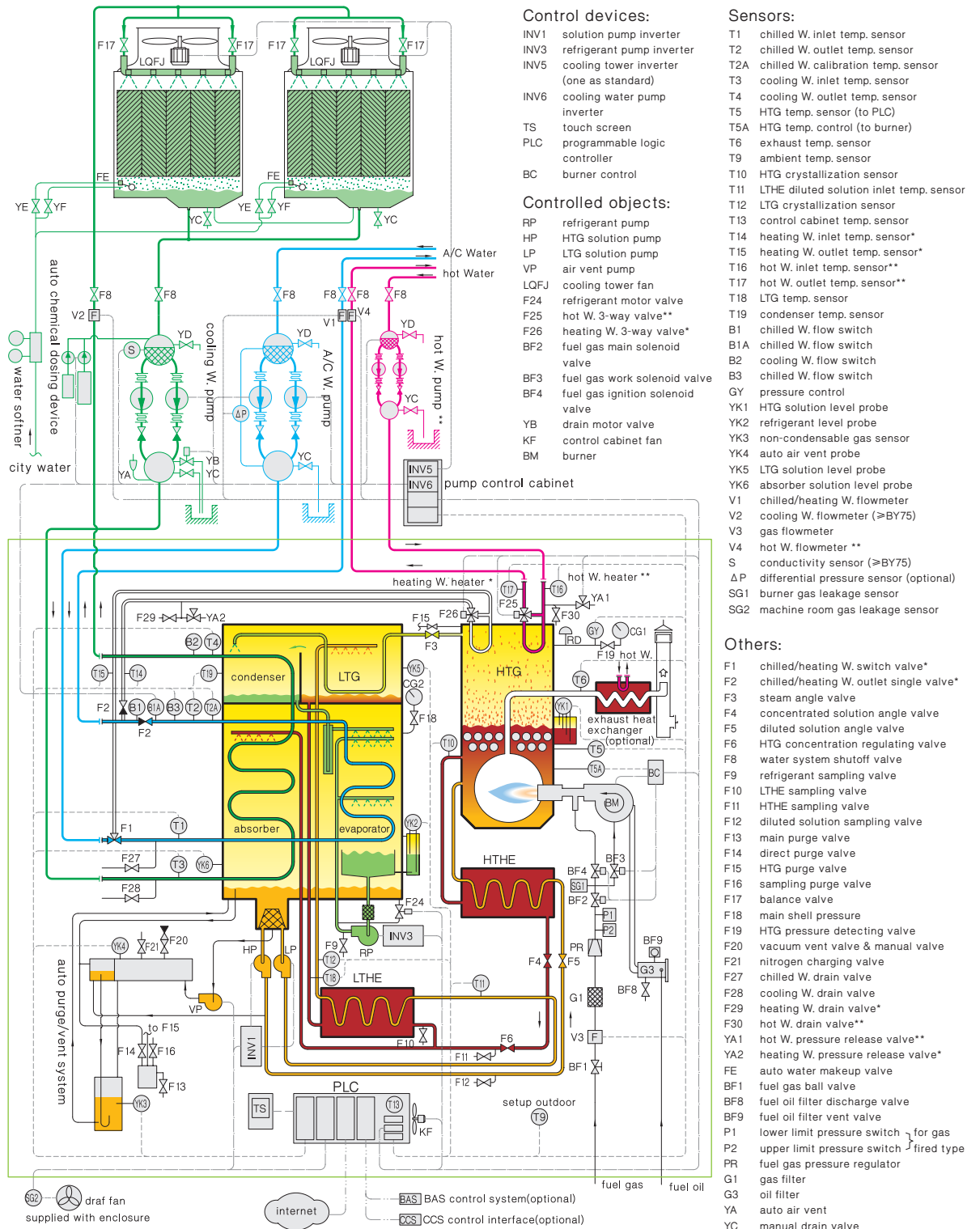
Pumpset Dimensions

Cooling water pumpset: BYP500CL/BYP600CL/BYP800CL/BYP1000CL



Mode	Dimension			Pipe Position		Pipe diameter (DN)
	A	B	C	D	E	
BYP500CL	4600	1500	4200	750	2000	400
BYP600CL	4600	1500	4200	750	2000	450
BYP800CL	5000	1550	4600	780	2030	500
BYP1000CL	5000	1550	4600	780	2030	500

Packaged DFA P&I Diagram



Control devices:

- INV1 solution pump inverter
- INV3 refrigerant pump inverter
- INV5 cooling tower inverter (one as standard)
- INV6 cooling water pump inverter
- TS touch screen
- PLC programmable logic controller
- BC burner control

Controlled objects:

- RP refrigerant pump
- HP HTG solution pump
- LP LTG solution pump
- VP air vent pump
- LQFJ cooling tower fan
- F24 refrigerant motor valve
- F25 hot W. 3-way valve**
- F26 heating W. 3-way valve*
- BF2 fuel gas main solenoid valve
- BF3 fuel gas work solenoid valve
- BF4 fuel gas ignition solenoid valve
- YB drain motor valve
- KF control cabinet fan
- BM burner

Sensors:

- T1 chilled W. inlet temp. sensor
- T2 chilled W. outlet temp. sensor
- T2A chilled W. calibration temp. sensor
- T3 cooling W. inlet temp. sensor
- T4 cooling W. outlet temp. sensor
- T5 HTG temp. sensor (to PLC)
- T5A HTG temp. control (to burner)
- T6 exhaust temp. sensor
- T9 ambient temp. sensor
- T10 HTG crystallization sensor
- T11 LTHE diluted solution inlet temp. sensor
- T12 LTG crystallization sensor
- T13 control cabinet temp. sensor
- T14 heating W. inlet temp. sensor*
- T15 heating W. outlet temp. sensor*
- T16 hot W. inlet temp. sensor**
- T17 hot W. outlet temp. sensor**
- T18 LTG temp. sensor
- T19 condenser temp. sensor
- B1 chilled W. flow switch
- B1A chilled W. flow switch
- B2 cooling W. flow switch
- B3 chilled W. flow switch
- GY pressure control
- YK1 HTG solution level probe
- YK2 refrigerant level probe
- YK3 non-condensable gas sensor
- YK4 auto air vent probe
- YK5 LTG solution level probe
- YK6 absorber solution level probe
- V1 chilled/heating W. flowmeter
- V2 cooling W. flowmeter (≥BY75)
- V3 gas flowmeter
- V4 hot W. flowmeter **
- S conductivity sensor (≥BY75)
- ΔP differential pressure sensor (optional)
- SG1 burner gas leakage sensor
- SG2 machine room gas leakage sensor

Others:

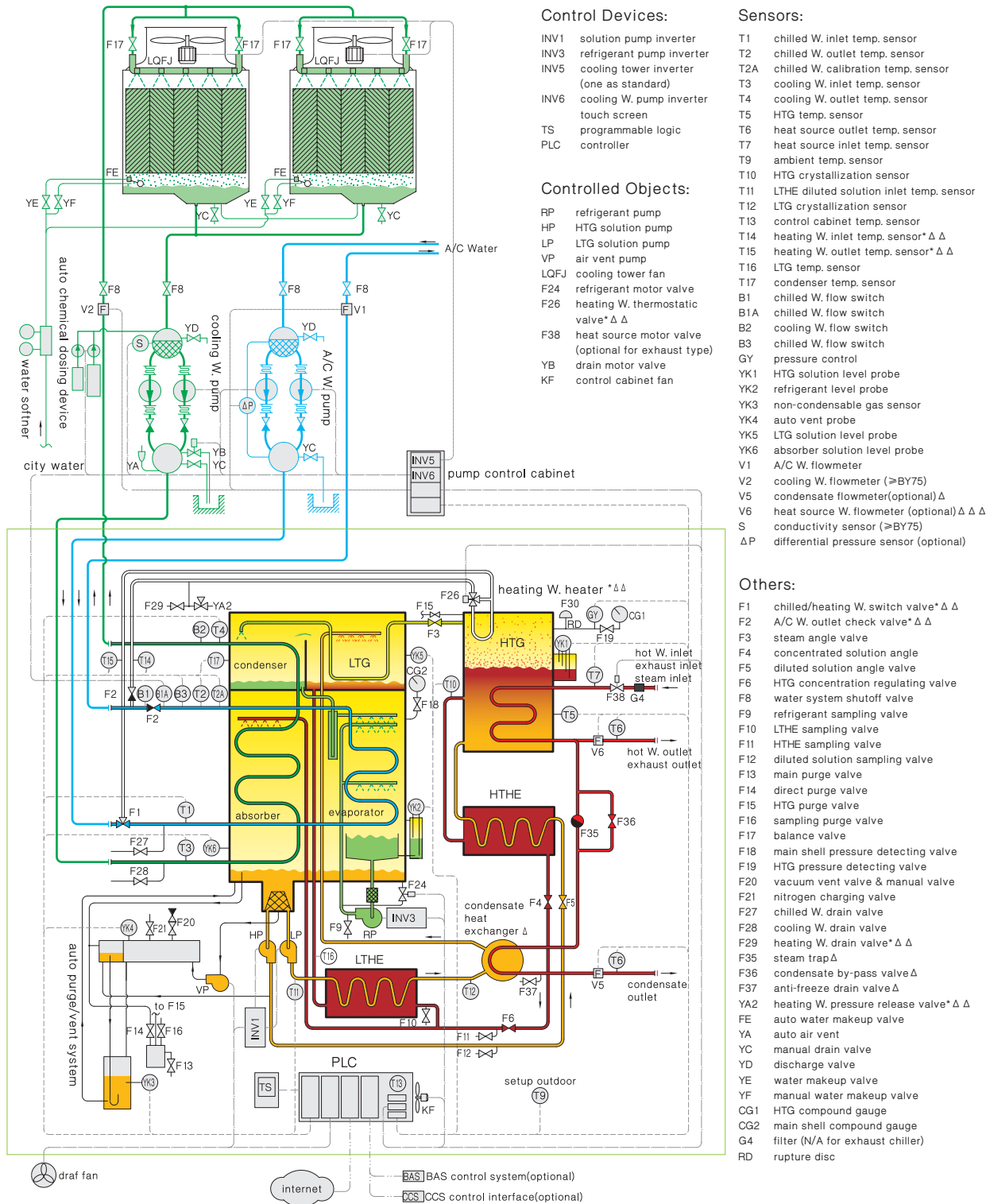
- F1 chilled/heating W. switch valve*
- F2 chilled/heating W. outlet single valve*
- F3 steam angle valve
- F4 concentrated solution angle valve
- F5 diluted solution angle valve
- F6 HTG concentration regulating valve
- F8 water system shutoff valve
- F9 refrigerant sampling valve
- F10 LTHE sampling valve
- F11 HTHE sampling valve
- F12 diluted solution sampling valve
- F13 main purge valve
- F14 direct purge valve
- F15 HTG purge valve
- F16 sampling purge valve
- F17 balance valve
- F18 main shell pressure
- F19 HTG pressure detecting valve
- F20 vacuum vent valve & manual valve
- F21 nitrogen charging valve
- F27 chilled W. drain valve
- F28 cooling W. drain valve
- F29 heating W. drain valve*
- F30 hot W. drain valve**
- YA1 hot W. pressure release valve**
- YA2 heating W. pressure release valve*
- FE auto water makeup valve
- BF1 fuel gas ball valve
- BF8 fuel oil filter discharge valve
- BF9 fuel oil filter vent valve
- P1 lower limit pressure switch } for gas
- P2 upper limit pressure switch } fired type
- PR fuel gas pressure regulator
- G1 gas filter
- G3 oil filter
- YA auto air vent
- YC manual drain valve
- YD discharge valve
- YE water makeup valve
- YF manual water makeup valve
- CG1 HTG compound gauge
- CG2 main shell compound gauge
- RD rupture disc

Notes:

1. Chiller scope
2. Parts marked with**** are not applicable to cooling/heating type, and those marked with ** & *** are not applicable to cooling only type.
3. Line type:
 - actuator output -----
 - sensor input -----
 - communication -----

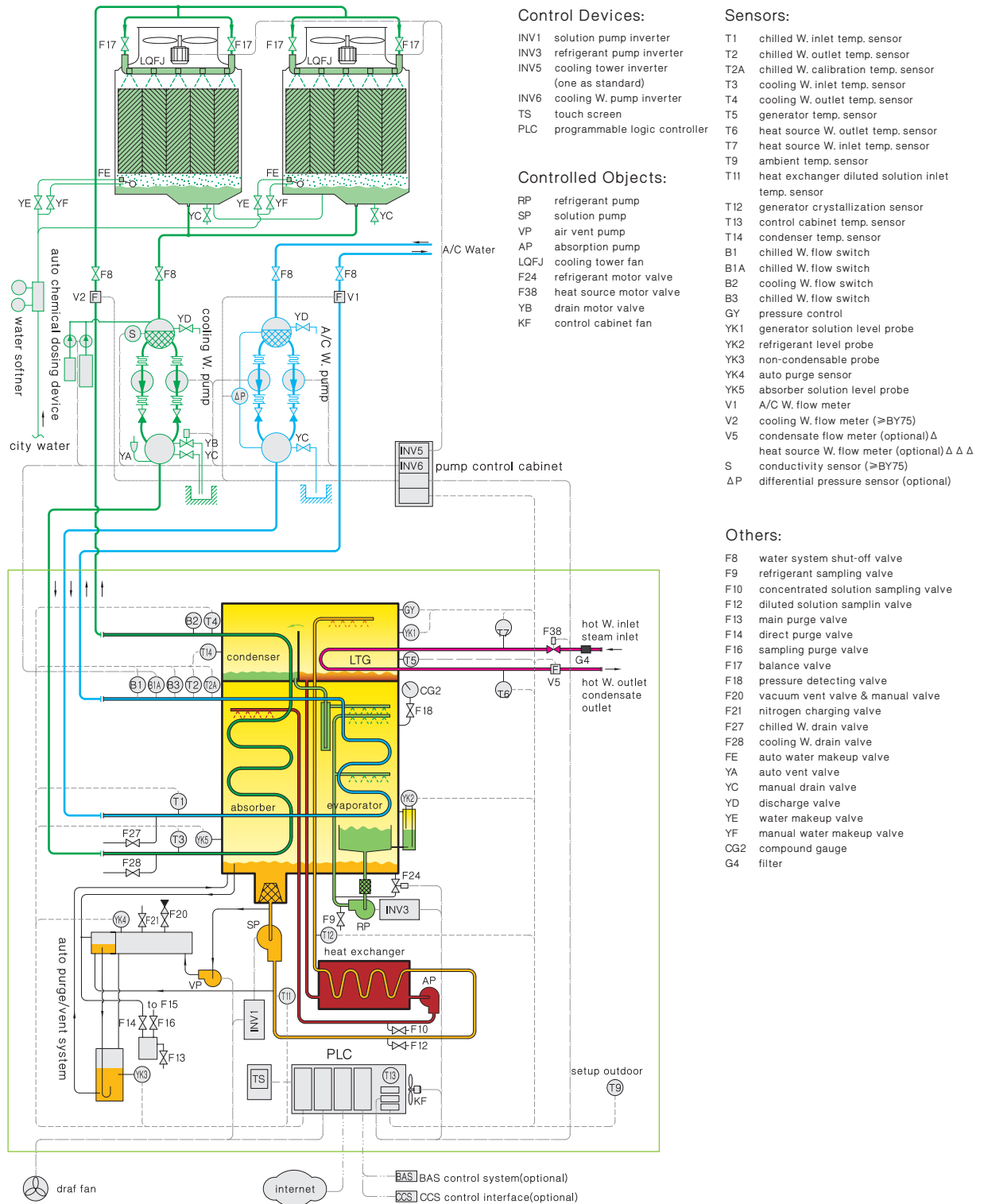
Packaged Steam Chiller

(similar for BSY: steam chiller, BHY: hot W. chiller, BEY: exhaust chiller)

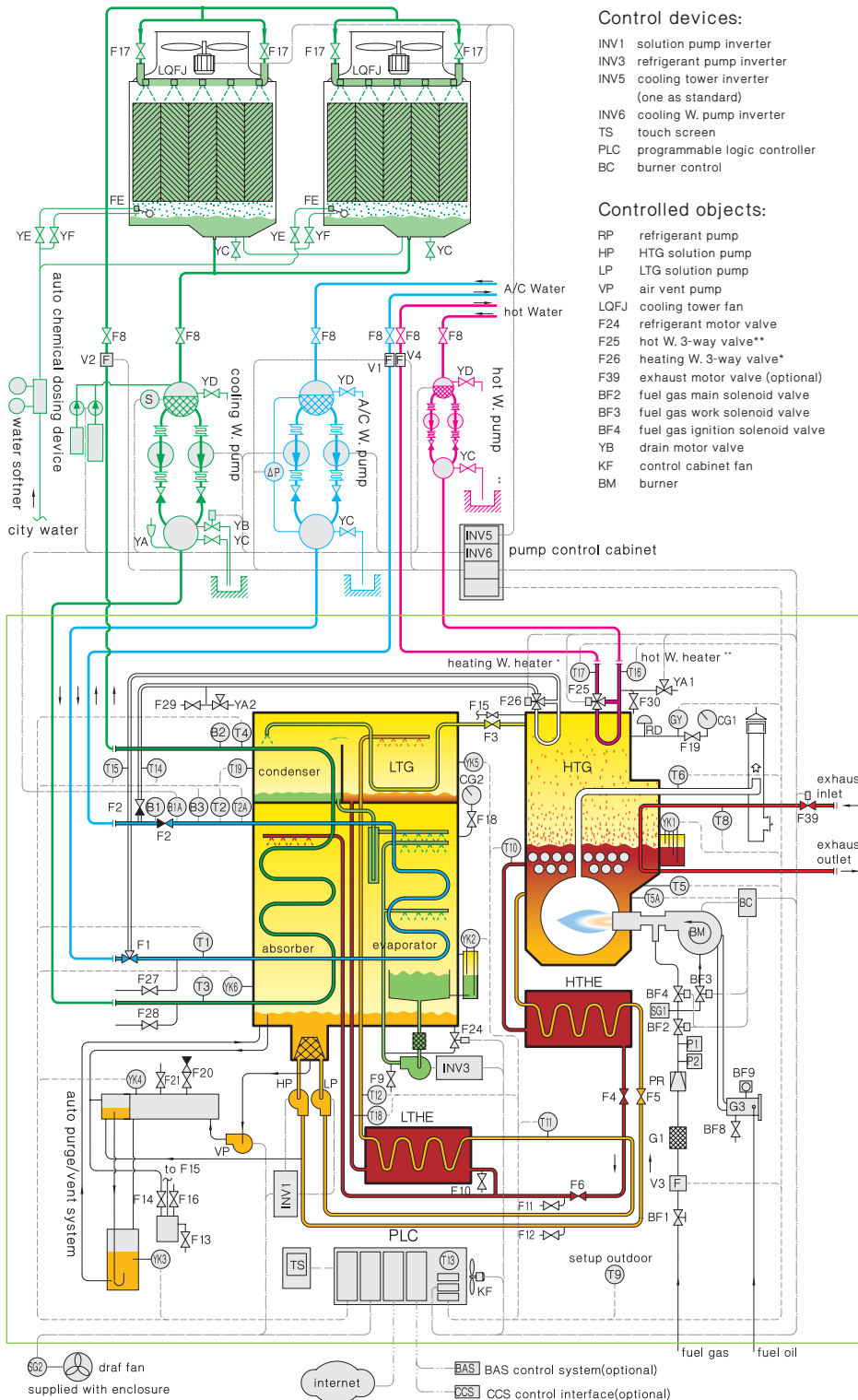


- Notes:
- Chiller scope
 - The components marked with "*" Δ for steam chiller, and marked with "Δ Δ" for exhaust chiller, "Δ Δ Δ" for hot W. chiller
 - The components marked with "*" are N.A with cooling only models.
 - Line type:
 - actuator signal output
 - sensor signal input
 - communication

Packaged Single-stage Steam Chiller (similar for BDSY: Single-stage steam chiller, BDHY: Single-stage hot W chiller, BDEY: Single-stage exhaust chiller)



Packaged Exhaust & Direct-fired Chiller



Notes:

- Chiller scope
- Parts marked with "*" are not applicable to cooling/heating type, and those marked with "**" & "***" are not applicable to cooling only type.
- Line type:
 - actuator output -----
 - sensor input -----
 - communication -----

Control devices:

- INV1 solution pump inverter
- INV3 refrigerant pump inverter
- INV5 cooling tower inverter (one as standard)
- INV6 cooling W. pump inverter
- TS touch screen
- PLC programmable logic controller
- BC burner control

Controlled objects:

- RP refrigerant pump
- HP HTG solution pump
- LP LTG solution pump
- VP air vent pump
- LQFJ cooling tower fan
- F24 refrigerant motor valve
- F25 hot W. 3-way valve**
- F26 heating W. 3-way valve*
- F39 exhaust motor valve (optional)
- BF2 fuel gas main solenoid valve
- BF3 fuel gas work solenoid valve
- BF4 fuel gas ignition solenoid valve
- YB drain motor valve
- KF control cabinet fan
- BM burner

Sensors:

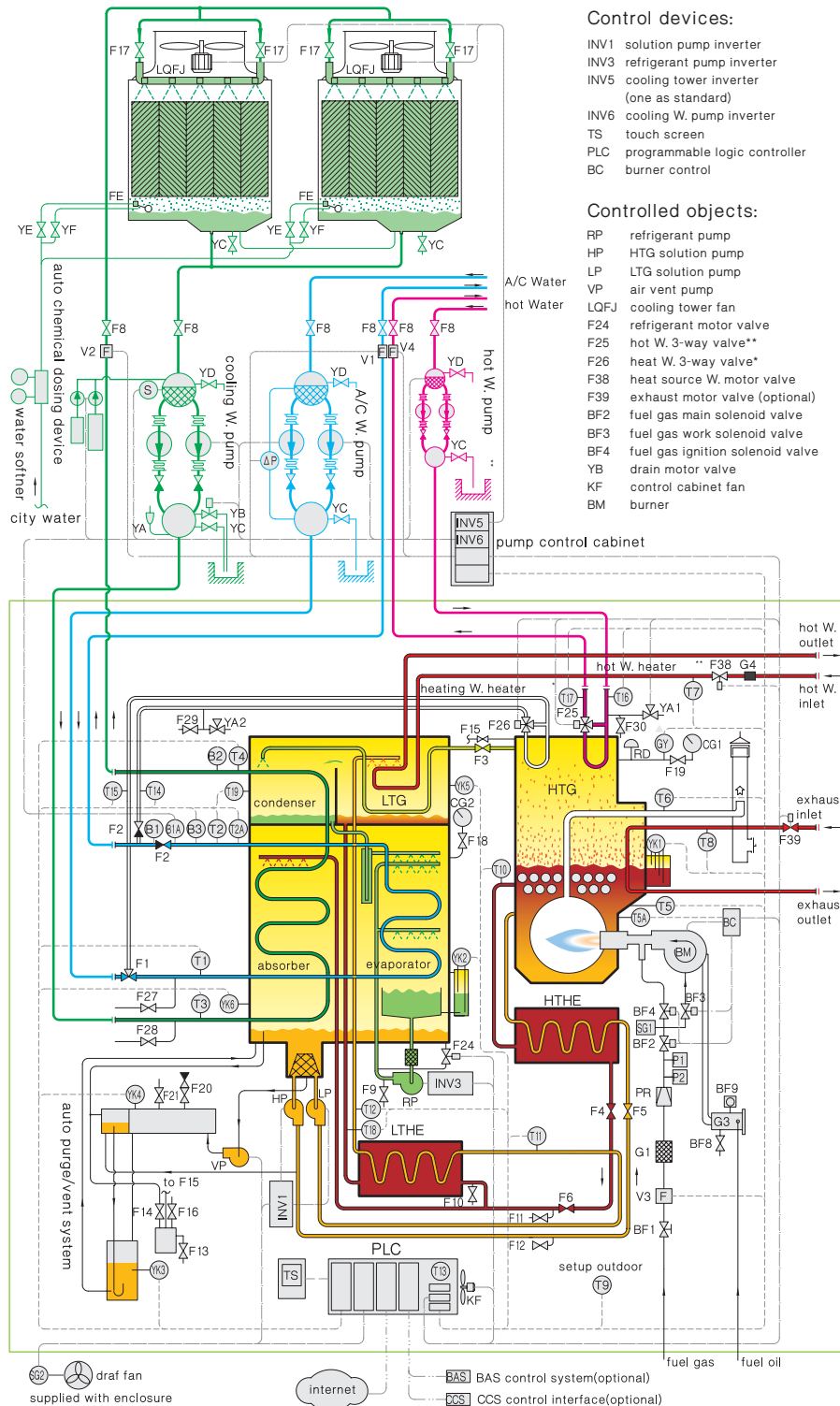
- T1 chilled W. inlet temp. sensor
- T2 chilled W. outlet temp. sensor
- T2A chilled W. calibration temp. sensor
- T3 cooling W. inlet temp. sensor
- T4 cooling W. outlet temp. sensor
- T5 HTG temp. sensor (to PLC)
- T5A HTG temp. control (to burner)
- T6 exhaust temp. sensor
- T6A waste heat outlet temp. sensor
- T8 exhaust inlet temp. sensor
- T9 ambient temp. sensor
- T10 HTG crystallization sensor
- T11 LTHE diluted solution inlet temp. sensor
- T12 LTG crystallization sensor
- T13 control cabinet temp. sensor
- T14 heating W. inlet temp. sensor*
- T15 heating W. outlet temp. sensor*
- T16 hot W. inlet temp. sensor**
- T17 hot W. outlet temp. sensor**
- T18 LTG temp. sensor
- T19 condenser temp. sensor
- B1 chilled W. flow switch
- B1A chilled W. flow switch
- B2 cooling W. flow switch
- B3 chilled W. flow switch
- GY pressure control
- YK1 HTG solution level probe
- YK2 refrigerant level probe
- YK3 non-condensable sensor
- YK4 auto air vent probe
- YK5 LTG solution level probe
- YK6 absorber solution level probe
- V1 chilled/heating W. flowmeter
- V2 cooling W. flowmeter (≥BY75)
- V3 gas flowmeter
- V4 hot W. flowmeter
- S conductivity sensor (≥BY75)
- ΔP differential pressure sensor (optional)
- SG1 burner gas leakage sensor
- SG2 machine room gas leakage sensor

Others:

- F1 chilled/heating W. switch valve*
- F2 chilled/heating W. outlet single valve*
- F3 steam angle valve
- F4 concentrated solution angle valve
- F5 diluted solution angle valve
- F6 HTG concentration regulating valve
- F8 water system shutoff valve
- F9 refrigerant sampling valve
- F10 LTHE sampling valve
- F11 HTHE sampling valve
- F12 diluted solution sampling valve
- F13 main purge valve
- F14 direct purge valve
- F15 HTG purge valve
- F16 sampling purge valve
- F17 balance valve
- F18 main shell pressure detecting valve
- F19 HTG pressure detecting valve
- F20 vacuum vent valve & manual valve
- F21 nitrogen charging valve
- F27 chilled W. drain valve
- F28 cooling W. drain valve
- F29 heating W. drain valve*
- F30 hot W. drain valve**
- YA1 hot W. pressure release valve**
- YA2 heating W. pressure release valve*
- FE auto water makeup valve
- BF1 fuel gas ball valve
- BF8 fuel oil filter discharge valve
- BF9 fuel oil filter vent valve
- P1 lower limit pressure switch
- P2 upper limit pressure switch
- PR fuel gas pressure regulator } for gas fired type
- G1 gas filter
- G3 oil filter
- YA auto air vent
- YC manual vent valve
- YD discharge valve
- YE water makeup valve
- YF manual water makeup valve
- CG1 HTG compound gauge
- CG2 main shell compound gauge
- RD rupture disc

Packaged Multi-energy Chiller

similar for BZHEY: Hot W., exhaust & direct-fired chiller



Control devices:

- INV1 solution pump inverter
- INV3 refrigerant pump inverter
- INV5 cooling tower inverter (one as standard)
- INV6 cooling W. pump inverter
- TS touch screen
- PLC programmable logic controller
- BC burner control

Controlled objects:

- RP refrigerant pump
- HP HTG solution pump
- LP LTG solution pump
- VP air vent pump
- LOFJ cooling tower fan
- F24 refrigerant motor valve
- F25 hot W. 3-way valve**
- F26 heat W. 3-way valve*
- F38 heat source W. motor valve
- F39 exhaust motor valve (optional)
- BF2 fuel gas main solenoid valve
- BF3 fuel gas work solenoid valve
- BF4 fuel gas ignition solenoid valve
- YB drain motor valve
- KF control cabinet fan
- BM burner

Sensors:

- T1 chilled W. inlet temp. sensor
- T2 chilled W. outlet temp. sensor
- T2A chilled W. calibration temp. sensor
- T3 cooling W. inlet temp. sensor
- T4 cooling W. outlet temp. sensor
- T5 HTG temp. sensor (to PLC)
- T5A HTG temp. sensor (to burner)
- T6 exhaust temp. sensor
- T7 heat source W. inlet sensor
- T8 exhaust inlet temp. sensor
- T9 ambient temp. sensor
- T10 HTG crystallization sensor
- T11 LTHE diluted solution inlet temp. sensor
- T12 LTG crystallization sensor
- T13 control cabinet temp. sensor
- T14 heating W. inlet temp. sensor*
- T15 heating W. outlet temp. sensor*
- T16 hot W. inlet temp. sensor**
- T17 hot W. outlet temp. sensor**
- T18 LTG temp. sensor
- T19 condenser temp. sensor
- B1 chilled W. flow switch
- B1A chilled W. flow switch
- B2 cooling W. flow switch
- B3 chilled W. flow switch
- GY pressure control
- YK1 HTG solution level probe
- YK2 refrigerant level probe
- YK3 non-condensable gas sensor
- YK4 auto air vent probe
- YK5 LTG solution level probe
- YK6 absorber solution level probe
- V1 chilled/heating W. flowmeter
- V2 cooling W. flowmeter (≥BY75)
- V3 gas flowmeter
- V4 hot W. flowmeter **
- S conductivity sensor (≥BY75)
- ΔP differential pressure sensor (optional)
- SG1 burner gas leakage sensor
- SG2 machine room gas leakage sensor

Others:

- F1 chilled/heating W. switch valve*
- F2 chilled/heating W. outlet single valve*
- F3 steam angle valve
- F4 concentrated solution angle valve
- F5 diluted solution angle valve
- F6 HTG concentration regulating valve
- F8 water system shutoff valve
- F9 refrigerant sampling valve
- F10 LTHE sampling valve
- F11 HTHE sampling valve
- F12 diluted solution sampling valve
- F13 main purge valve
- F14 direct purge valve
- F15 HTG purge valve
- F16 sampling purge valve
- F17 balance valve
- F18 main shell pressure detecting valve
- F19 HTG pressure detecting valve
- F20 vacuum vent valve & manual valve
- F21 nitrogen charging valve
- F27 chilled W. drain valve
- F28 cooling W. drain valve
- F29 heating W. drain valve*
- F30 hot W. drain valve**
- YA1 hot W. pressure release valve**
- YA2 heating water pressure release valve*
- FE auto water make up valve
- BF1 fuel gas ball valve
- BF8 fuel oil filter discharge valve
- BF9 fuel oil filter vent valve
- P1 lower limit pressure switch } for gas
- P2 upper limit pressure switch } fired type
- PR fuel gas pressure regulator
- G1 gas filter
- G3 oil filter
- G4 waste heat filter
- YA auto air vent
- YC manual vent valve
- YD discharge valve
- YE water makeup valve
- YF manual water makeup valve
- CG1 HTG compound gauge
- CG2 main shell compound gauge
- RD rupture disc

Notes:

1. Chiller scope
2. Parts marked with **** are not applicable to cooling/heating type, and those marked with ** & *** are not applicable to cooling only type.
3. Line type:

- actuator output ————
- sensor input - - - - -
- communication

Scope of Supply/Work

Category	Item	BROAD	Customer	Remarks
Transportation and location	Factory to port		✓	BROAD can arrange transportation upon request.
	Port to jobsite		✓	
	Jobsite handling (main shell, pumpset)		✓	
	Joint (for split shipment)	✓		Welding machine and nitrogen to be provided by customers. Customers need to pay BROAD for joint.
Electric	Power supply to enclosure		✓	3 phase, 4 wires
engineering	Internet connection	✓		Network cable to the enclosure is to be provided by users.
	Grounding		✓	Place special grounding terminal with grounding resistance $\leq 4\Omega$ near water system control cabinet
Construction & installation	Foundation		✓	Enclosure should be installed after foundation is completed.
	Installation of metal enclosure		✓	
	Pipe connection between chiller and pumpset		✓	\geq BY400 model, a crane must be provided by customer.
	Water softener installation		✓	Optional
	Pipe connection between chiller and cooling tower		✓	
	External piping installation		✓	Includes chilled/heating water pipes, hot water pipes, water make-up and drain pipes, energy source pipes.
	Chiller insulation	✓		Factory-mounted
	Piping insulation in enclosure	✓		
	Pipeline insulation		✓	
	Antifreezing		✓	Water anti-freeze treatment is recommended when the ambient temp is below 0°C.
Commissioning	Jobsite chiller commissioning	✓		Customer provides energy and air conditioning load. Customers need to pay BROAD for commissioning.
Operation & maintenance	Operator training on site	✓		BROAD provides professional training for free, the customers pay for the accommodations and transportation of BROAD engineers.
	Regular maintenance	✓		Service contract can be signed after the warranty period.

Machine Room Construction Tips

Machine room

Machine rooms must be well ventilated with temp. humidity control and drain functions. It contains the service space.

Attention should be paid to machine room built by customers:

- Please refer to dimension drawings for plinth dimensions.
- Load capacity:
 - a. The machine room foundation load is recommended as 1.5 times of the operation weight.
 - b. Make sure that the foundation is level without sinking or overload (for rooftop installation).
 - c. The load of a chiller is evenly distributed on the contact surface between the frame base rolling steel and the plinth.
- Anchor bolts:
 - a. Chiller can be placed on the foundation directly without bolts (if there is a strong earthquake source or special anti-vibration requirement, please specify in a purchase order).
 - b. Anchor bolts must be pre-installed for pumpset foundation per dimension drawings.

Foundation

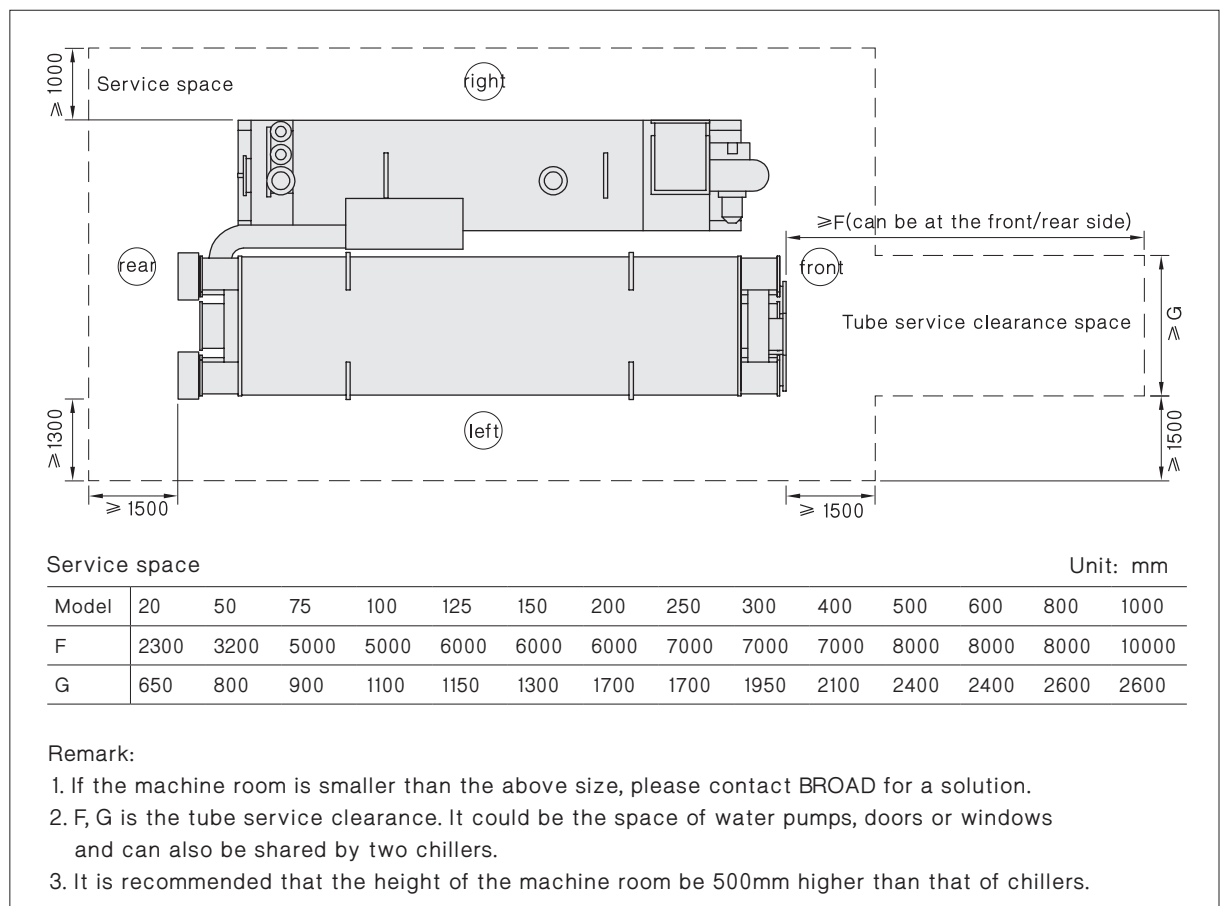
- Ventilation:

poor ventilation leads to high humidity in the machine room, which may erode the unit.

So serious attention should be paid to ventilation in the machine room. Please ventilate 2X machine rooms every hour and make up the combustion air. The volume of combustion air for a DFA is estimated at 1.3 m³ for every kW fuel.
- Drainage:
 - a. Chiller foundation must be on a high level in the machine room.
 - b. All discharge pipes and drain pipes must be visible above the drainage.
 - c. Machine room in basement must be built above a water ditch, which is equipped with an auto level-controlled submerged pump.
- Temperature:

machine room temperature must be controlled within 5-43°C. Lower temperature may crack heat exchange tubes and water box when the chiller is shut off; higher temperature may damage electrical components. Thermometer and over temperature alarm must be installed in machine room.
- Humidity:

machine room humidity must be lower than 85%. Higher humidity may impair insulation of electrical components.
- Chiller service space



Piping System

Gas system

- The gas dynamic pressure is 16~35kPa, and static pressure is <math><50\text{kPa}</math>, the pressure not in this range can be accommodated by special orders.
- Drain valve should be installed at the lowest part of gas pipes. All connecting pipes must be cleaned and tested for air tightness with 0.6MPa air when gas piping system is completed.
- When two or more units are connected in parallel, a buffer pipe (with diameter 3-6 times of the main pipe) must be installed at the main pipe to avoid flameout due to gas low pressure caused by simultaneous startup. Manual drain valve should be equipped at the bottom of the buffer tube.
- Customers are required to inform BROAD of the fuel type, heating value and pressure so that a burner can be properly selected and the gas pipe diameter can be notified to customers. Then customers can design filter, flow meter, ball valve, diffuser tube and pressure meter. BROAD is responsible for installation of gas train valves within supply scope. External gas piping system is to be installed by customers to 1m distance from the burner.
- The ball valve of BROAD gas valve train must be closed if customers need to test piping pressure so that gas train valve will not be damaged by high pressure.
- A gas leakage alarm (acting value must be set 20% lower than danger value lower limit) must be equipped in machine room and be linkage controlled with draft fans. Machine room must be well ventilated all the time.

Oil system

- Oil system includes oil storage tank, oil pump, daily oil tank, oil filter and metering instruments. Oil tank should be equipped with oil check nozzle, air vent(breather valve), oil refill valve, oil level sensor and drain valve. The lowest oil level of daily oil tank must be 0.1m higher than the burner.
- Oil pipe should be copper pipe or seamless steel pipe and leakage test should be taken at 0.8MPa min.
- Medium filters are to be installed at inlet and outlet of oil storage tank. The filters should have enough section area, and should be convenient to install/uninstall and drain.
- Oil tank should be equipped with metering device to make energy saving management.

Steam system

- The supply of the steam should be pressure-stable. The upper limit should not be over 110% of the rated pressure. If the pressure may exceed the upper limit, a regulating valve should be equipped in the pipeline.
- Safety valve should be fixed in the steam inlet pipeline. The protection value is adjusted as 110-130% of its working pressure. The safety valve should be connected to outdoor to avoid the overpressure of the system.
- Condensed water can be stored in an open tank beside the chiller, and then pump back to the boiler by a condensed water pump or steam trap pressurizer.
- Eliminate condensed water from steam thoroughly before steam entering chiller.

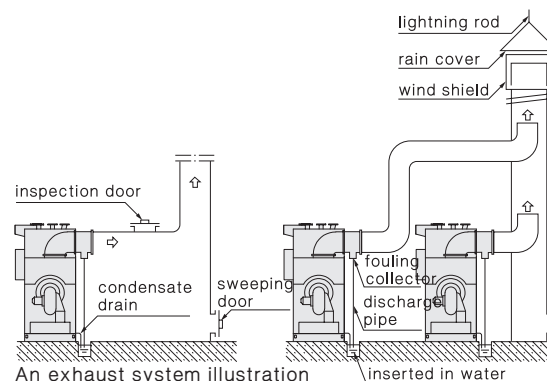
Water system

- The initial filling of the chilled/heating water must be with soft water. The leakage rate should be less than 10% every year, or else large amount of city water makeup will cause water system scaling.
- Minor leakage in chilled/heating water system is made up from the expansion water tank. An open expansion water tank instead of a closed expander is recommended for pressure balance. The water expansion volume is calculated as 4% of total water volume in the system.
- Chiller, pumpset and cooling tower should be in one to one correspondence to achieve better energy efficient.
- Regarding to BROAD non-packaged chiller, the heating water and hot water three-way valve is installed in customer's piping system, and it will be packaged separately and delivery together with chiller.

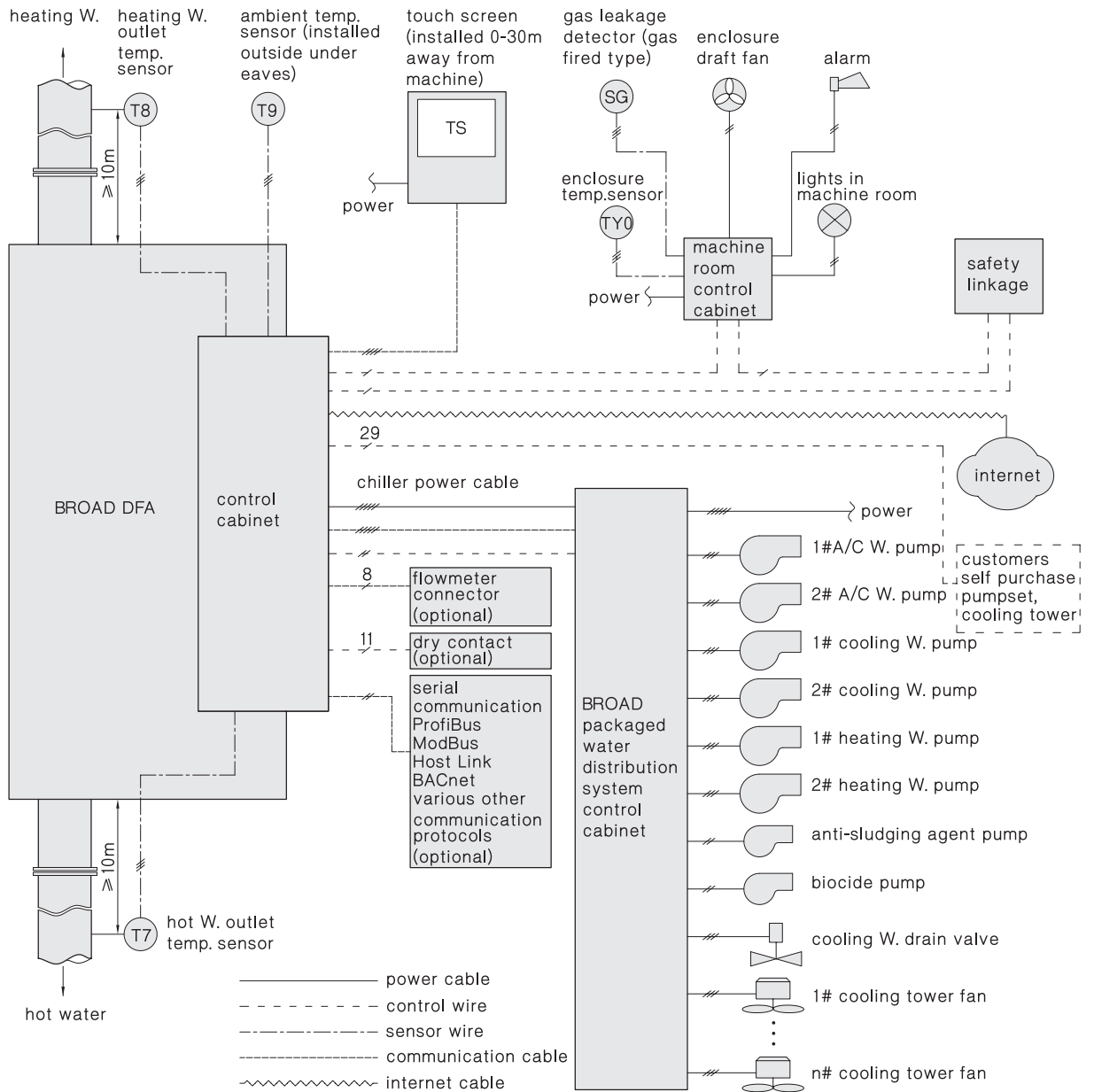
- Auto dosing system should be installed in cooling water pipe or cooling tower. Auto drain valve (motor valve) should be set at the lowest point of cooling water system. (BROAD packaged pumpset included)
- When the distance between cooling tower and machine room is $\leq 30\text{m}$, the cooling water pipe diameter can follow the dimension drawing. If it's 30-90m, the pipe diameter shall be enlarged one size. If it's $>90\text{m}$, the pipe diameter shall be enlarged two size.
- In water system, zero resistance filter with section area 8-15 times larger than pipe section area instead of Y-shape filters shall be used to minimize the water resistance.
- Soft connector must be installed at inlet/outlet of chilled/cooling water system. The weight of the external piping system can never be borne by the chiller.
- The installation site of the cooling tower should be far from heat source and power, especially should be at least 6m far from the chimney, or the chimney should be 2m higher than the top of the cooling tower. Otherwise the exhaust may access the cooling tower and cause corrosion to copper tubes of the chiller.
- The cooling tower and cooling water system should be far from pollution source like acid and alkali. If there is a pollution source, information should be delivered when ordering thus special treatment could be applied.
- Piping requirements: all pipes and valves should not go across the space above the chiller to avoid chiller damage caused by pipe installation, maintenance or leakage.
- Secondary heat exchange hot water system is recommended for areas with very hard water.
- Hot W. system for BY20, BY30, BY50 must adopt secondary heat exchange.

Exhaust system

- It is recommended independent stack be used for each chiller. If chillers have to share a common stack due to space limitation, the shared stack must be inserted type and the main stack must be bigger and higher to avoid any interference from each other. Exhaust motor valve shall be installed for each exhaust duct to avoid condensate corrosion caused by exhaust entering into chillers that are not in operation.
- The exhaust volume is dependent on the fuel heat input. It is estimated at 1.55m³ per KW fuel input. 3-5m/s flue gas flow velocity in the stack is recommended.
- Fouling collector should be installed at flue duct inlet to the chiller to prevent condensate from flowing directly into the chiller. The indoor flue duct must be insulated. For high outdoor steel stack, insulation shall be done to maintain the up force of flue. No insulation is required for low outdoor steel exhaust stack. Try to locate the exhaust outlet as far as possible from the cooling tower, or 2m higher than the cooling tower. Otherwise the flue gas may get into cooling tower and damage the chiller.
- The rated exhaust outlet temperature is 160°C. However, selection of insulation materials and design of fire isolation area should be based on 300°C temperature for safety concern.



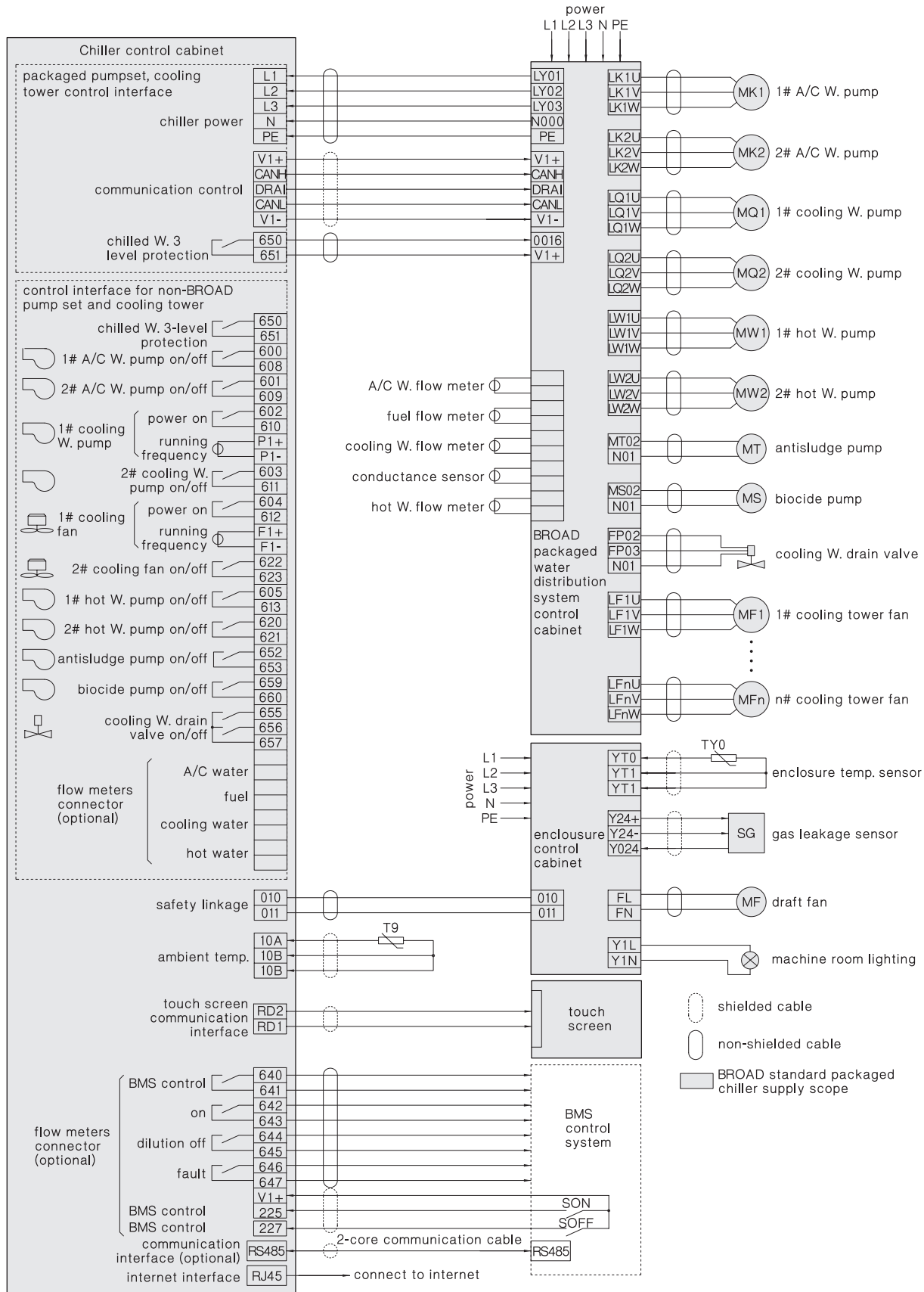
Control System



Notes:

1. BROAD packaged chiller control system includes interfaces for chiller, pumpset, cooling tower, outdoor enclosure, internet remote monitoring, BMS and multi-unit control, etc.
2. Pumpset and cooling tower control interface and water distribution system control cabinet are supplied with pumpset. Enclosure control cabinet and relevant electrical parts are supplied with enclosure.
3. BMS control interface includes "Serial communication" and "Dry-contact" options. Serial Communication interface can be HostLink, ModBus, ProfiBus or BACnet protocol.
4. If the customer does not order pumpset, standard control interface for pumpset and cooling tower will be provided.

Exterior Wiring Diagram



- Notes:
1. Packaged pumpset interface, cooling tower control interface and water system control cabinet will not be supplied if the pumpset and cooling tower are not ordered, but a control interface for user self-purchased pumps and cooling tower is available. The enclosure control cabinet and relevant electrical devices are not supplied if the enclosure is not ordered.
 2. 3-level chilled water protection is used to switch off cooling water pump directly in order to prevent tube freezing. Connect T9 environmental temperature sensor to outside place with well-ventilation but without sunshine.

List of Control System Installation

Item		Installation position and requirement	Material	Source	BROAD scope	Customer scope
Chiller	Chiller and pumpset grounding	Grounding resistance $\leq 4\Omega$	Grounding wire	Customer	/	Grounding setup and wiring
	Chiller power	Control cabinet of chiller and water system	5-core cable (10m standard supply)	BROAD	Wiring inside chiller control cabinet	Cable installation
	Touch screen	Anywhere in office (on the wall or desk) humidity 0-85% (no condensate), temperature 0-30°C	2-core shielded cable (30m standard supply)	BROAD	Wiring inside chiller control cabinet	Cable installation
	Network monitoring	Chiller control cabinet	Network cable	Custome	Wiring inside chiller control cabinet	Cable installation, wiring at building side
	BMS interface(optional)	Chiller control cabinet	Communication cable (for serial communication), 11-core cable (for dry contact)	Custome	Wiring inside chiller control cabinet	Cable installation, wiring at building side
	Ambient temperature sensor	Ventilation and avoid direct sunlight	3-core cable (standard cable is 10m)	BROAD	Chiller control cabinet wiring	Temperature sensor installation wiring*
	Heating W outlet temperature sensor, hot W outlet temperature sensor	At heating W/hot W pipe outlet side 10m away from the chiller	3-core cable (standard cable is 10m)	BROAD	Wiring	Temperature sensor installation
Pumpset	Installation of water distribution system control cabinet and power connection	Water distribution system control cabinet	Installation bolts 5-core cable	Custome	Wiring inside chiller control cabinet	Cable & control cabinet installation
	Wiring between chiller and water distribution system control cabinet	Between chiller and water distribution system control cabinet	Cable supply as per packaged chiller	BROAD	Wiring inside chiller control cabinet	Cable installation
	Wiring between pumpset and water distribution system control cabinet	Between water distribution system control cabinet and pumpset	Cable supply as per standard pumpset	BROAD	Wiring inside chiller control cabinet	Cable installation

Note:

For BROAD packaged chiller, the energy meter is included already for accurate electricity metering; If customers order chiller only, they need to install energy meter separately to calculate the total electricity consumption of chiller and pumpset.

Transportation Tips

Shipping status

- BY20 is to be shipped in one piece, while BY30 BY50 in two pieces.
- BY75-1000 chiller and pumpset are to be shipped separately.
- BY75-400: pumpset and control cabinet are to be shipped in 3 pieces. BY500-1000: pumpset and control cabinet are to be shipped in 3-5 pieces (A/C water pumpset, cooling water pumpset and control cabinet)
- All equipment can be containerized as per "Container Arrangement Reference".
- Chillers ≤ BZ75, BE75, BS100 (Max. width ≤ 2.3m) in single piece.
- Other units will confirm the shipment depends on design drawings, split in 2-4 pieces shipment.
- If limited by site space or machine room access, the unit can also be split (or split with steel frame) 2~6 pieces shipment.
- When the unit reaches the machine room, the split pieces need to be connected by BROAD welders. The customer needs to prepare welding facilities, nitrogen and other necessary assistance.
- Solution is charged into the chiller when a unit is shipped in one piece, and packed separately for split shipment or for single-piece shipment with unit shipping weight over 30 tons.
- BROAD can arrange transportation and insurance on behalf of customers. If customers manage it by themselves, please refer to "BROAD Chiller Packing & Transportation Regulations" for container arrangement in advance, so as to make sure safety transportation.

Container arrangement reference:

Model	BZ	With BY pumpset	BS(BH)	BDH(S)
20	20'GP*	40'HQ*	20'GP*	20'GP*
50	20'GP*	40'HQ+20'GP*	20'GP*	20'GP*
75	40'HQ*	+20'GP	40'HQ*	40'HQ*
100	40'HQ	+20'GP	40'HQ*	40'HQ*
125	40'HQ	+40'GP(BSY:+20'GP)	40'HQ*	40'HQ*
150	40'OT+20'GP	+40'GP	40'OT	40'OT*
200	40'OT×2	+40'GP(BSY:+20'GP)	40'OT×2	40'OT*
250	40'OT×2	+40'GP(BSY:+20'GP)	40'OT×2	40'OT*
300	40'OT×2	+40'GP+20'GP (BSY:+20'GP)	40'OT×2	40'OT+20'GP*
400	40'OT×2	+40'GP+20'GP (BSY:+40'GP)	40'OT×2	40'OT+20'GP*
500	40'FR+40'OT+20'GP	+40'GP×2 (BSY:+40'GP+20'GP)	40'FR+40'OT+20'GP	40'FR+20'GP*
600	40'FR+40'OT×2+20'GP	+40'GP×2+20'GP (BSY:+40'GP x 2)	40'FR+40'OT+20'GP	40'FR+20'GP*
800	40'FR+40'OT×2+40'GP	+40'GP×2+20'GP	40'FR+40'OT+40'GP	40'FR×2+20'GP*
1000	40'FR×2+40'OT×2 +40'GP+20'GP	+40'GP×2+20'GP	40'FR×2+40'OT +40'GP	40'FR×2+20'GP*

Notes:

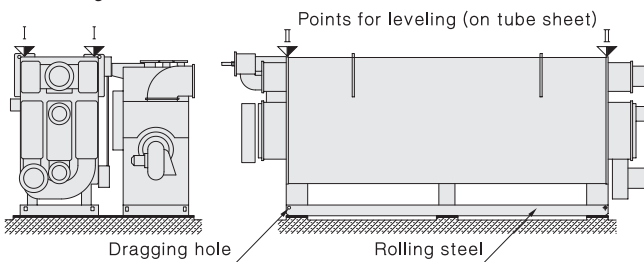
1. Models marked with " * " are in one-piece shipment, and the rest are in split shipment.
2. For chillers over model 500 (main shell weight exceeds requirement), there might be some changes as per actual condition.
3. In case some countries may have limitation on dimension and weight, loading shall be arranged accordingly.
4. For other models not showed in this list will be confirmed based on actual condition before placing orders.

Lifting & Leveling Tips

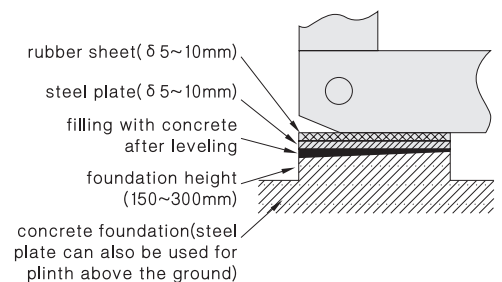
- Before the chiller is positioned, concrete foundation plinths must be molded and leveled. The level degree is $<1.5\%$, height of foundation is 150-300mm. When machine room height allows, the higher, the better for maintenance. Then locate the chiller without bolts. (If there is strong vibration source or a special anti-vibration requirement, it should be stated before placing order). The pumpset shall be fixed by anchor bolts. The foundation must be level and solid to make sure no sink or overload (when the unit is installed on the top of roof).
- Lifting must be done by qualified lifting companies that are properly insured.
- The crane must be supported by cross-ties and firm foundation to prevent it from sinking. Check the crane steel ropes and hooks before lifting to prevent any accident. The lifting intersection angle must be less than 90° . It is strictly prohibited to lift the chiller with a single steel rope. When the chiller is lifted 20mm above the carriage or the ground, it should be kept for a little while. Lift the chiller slowly if everything is OK.
- If limited by loading height, loading angle or machine room access, the professional lifting company must make special plan with BROAD team together to avoid any risks.
- The landing of the chiller must be with care. Crash landing is strictly forbidden! As the unit is a vacuum device, any impact on the chiller is strictly forbidden!
- When moving the chiller, only round steels or thick steel tubes can be used as rollers instead of wooden sticks. Only drag the dragging hole on the rolling steel do not place forces on other part of the chiller. Lift the unit first with jacks under the rolling steel before rigging. Both sides of HTG and main shell must be lifted simultaneously.
- For multiple chillers of split shipment, please make sure the original matching between HTG and the main shell. Please locate the chiller according to chiller joint drawing and make sure the joint gap is less than 1.5mm.
- After chiller positioning, please adjust leveling and lay thin steel plate where it is uneven to guarantee compact contact between the chiller and base. Take tube sheet as the leveling point and make front/rear and left/right leveling (check level height of every part by acrylic tube). It should be leveled within 0.8/1000 both lengthwise and sidewise. Leveling must be done within 2 hours after locating the chiller, otherwise the chiller base will be damaged.
- The chiller must be located levelly and its steel frame bases must match the plinth, the weight of the chiller must be evenly balanced on the plinth. Otherwise, the chiller may be twisted slowly, which will finally result in damage due to leakage.
- The chiller should be protected by full time personnel during transportation & installation. No access for unauthorized persons. Valves of the chiller are forbidden to be screwed. If the machine room is still under construction, precautions are essential to avoid chiller get damaged or dirty. No scraping the paint or insulation layer.

Sketch of leveling and foundation

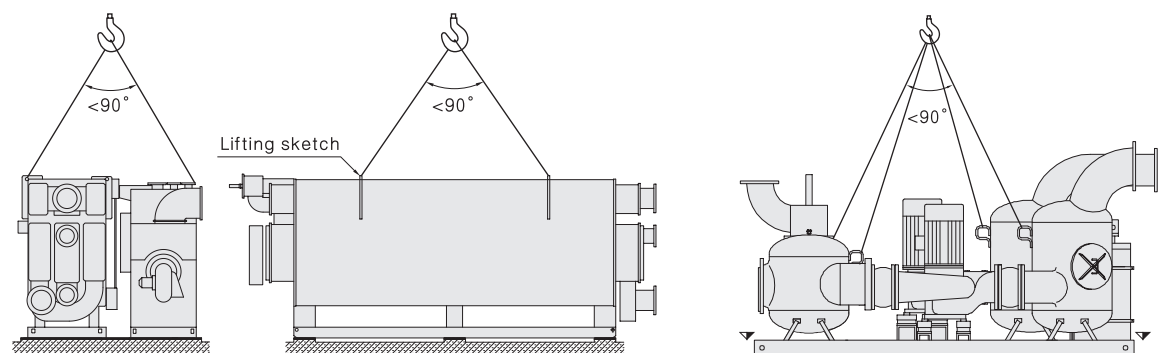
Leveling sketch



Foundation sketch



Lifting sketch



COMPARISON

Energy saving comparison

Compared with conventional machine room arrangements, BROAD packaged pumpset system reduces the rated power demand by 50-70%, and the operating electricity consumption by 70-85% (the electricity for pumpset only amounts to 2-5% of the rated cooling capacity.)

Examples on power consumption comparison

· BY50 type (pumpset for 582kW/165Rt chillers)

Power consuming parts	Conventional machine room type power demand	Packaged pumpset	
		power demand	Operating power consumption
Cooling water pump	30 kW	7.5 kW	2~7.5 KW
Cooling tower fan	11 kW	11 kW	3~11 KW
Chilled/heating W pump	22 kW	7.5 kW	7.5 kW
Total electricity/cooling capacity	63 kW 10.8%	26 kW 4.47%	17 kW (annual) 2.92%
Annual operating consumption	190 MWh	52 MWh (power saving is 79%)	

· BY300 type (pumpset for 3489kW/992Rt chillers)

Power consuming parts	Conventional machine room type power demand	Packaged pumpset	
		power demand	Operating power consumption
Cooling water pump	180 kW	44 kW	11~44 KW
Cooling tower fan	37 kW	37 kW	6~37 KW
Chilled/heating W pump	110 kW	60 kW	30~60 kW
Total electricity/cooling capacity	327 kW 9.4 %	141 kW 4.04 %	100 kW (annual) 2.86%
Annual operating consumption	1000 MWh	300 MWh (power saving is 76 %)	

· BY1000 type (pumpset for 11630kW/3307Rt chillers)

Power consuming parts	Conventional machine room type power demand	Packaged pumpset	
		power demand	Operating power consumption
Cooling water pump	550 kW	180 kW	30~180 KW
Cooling tower fan	110 kW	110 kW	20~110 KW
Chilled/heating W pump	440 kW	180 kW	90~180 kW
Total electricity/cooling capacity	1100 kW 9.5 %	470 kW 4.04 %	250 kW (annual) 2.15%
Annual operating consumption	3300 MWh	750 MWh (power saving is 82 %)	

Notes:

1. Calculation of annual operating power consumption is based upon cooling operation, 5 months per year and 20 hours per day.
2. Operating consumption is the result of using inverters and shifting between two pumps, while the power consumption of conventional pump system equals to the power demand.

Why electricity saving ?

· Saving from design:

1. Many innovations reduce the resistance from filters, valves and piping to almost zero.
2. Specially designed pumps optimize head and flow rate to system design.

· Saving from operation:

1. BROAD leads the world in inverter control system design and operation. Standard designs incorporate inverter-controlled cooling water pump(s) and cooling tower fan(s) which are automatically adjusted according to load and ambient temperature.
2. Two pumps combined or separate operation by software analyzer.
3. Actual power consumption during operation is 30-60% of the rated design.

Comprehensive Comparison

Mode	BROAD Non-electric Chillers	Other Non-electric Chillers	Electric Chillers
Investment	<p>Low</p> <ul style="list-style-type: none"> Chiller price is high but water distribution system invests is low. (design+equipment+in stallation+commissioning+machine room) Small footprint Smaller equipment selection. (Refer to P6) 	<p>High</p> <ul style="list-style-type: none"> Chillers are less expensive but customers' self-purchased water distribution system costs high Need separate hot water system. Prevalently oversized equipment selection 	<p>Higher</p> <ul style="list-style-type: none"> Electricity demand is 8-10 times more than that of non-electric chillers Need boiler (boiler room) for heating High investment on water distribution system. Prevalently oversized equipment selection
Function	<p>Three functions in one unit</p> <p>Provide cooling, heating and hot water simultaneously or dedicatedly, and automatically adjust all temperatures</p>	<p>Two functions in one unit</p>	<p>Only one function heat pump has two functions, but its heating capacity is reduced dramatically or even lost when the ambient temperature is low</p>
Energy Efficiency	<p>Energy saving is visible</p> <ul style="list-style-type: none"> Ultrasonic flow meters are installed on all pipes (fuel, chilled/heating water, cooling water, hot water) to reflect the energy efficiency directly or indirectly The touch screen real time displays (and records) cooling capacity and energy efficiency Dozens of energy saving patents assure initial and long-term energy efficiency, such as auto purge and air vent (without a vacuum pump n the life span), plate heat exchanger, upward spraying, refrigerant anti-overflow, turbulator in fir tubes, etc. Cooling water system is equipped with water softner and biocide & antisludge auto dosing device to eliminate energy waste and cooling capacity decrease caused by fouling Conduct yearly energy consumption investigation and diagnosis to each user BROAD chillers are proven that at least 50% more energy saving per our energy investigation to thousands of users 	<p>Energy consumption is not transparent</p> <ul style="list-style-type: none"> No flow meters. No energy efficiency display No auto air vent device so energy efficiency drops periodically. 	<p>Not energy-saving</p> <ul style="list-style-type: none"> Energy mode not energy-saving. No flow meters No energy efficiency Tear & wear of moving parts causing energy efficiency decrease
Reliability	<p>Pursuing "zero fault"</p> <ul style="list-style-type: none"> The annual "tube freezing" rate in evaporator is as low as 0.05%, as it is equipped with 3-level temperature sensors, 3-level flow switches and ultrasonic flow meters* "Separate heating" reduces number of parts involved in heating by 80%+, and doubles the lifespan of the main shell "Auto purge/ vent" prevents metals from corrosion and makes sure no cooling capacity decrease Water distribution system is factory made so that industrialization of central air conditioning is materialized. All aspects from designing to component quality control, production, testing, site commissioning and maintenance are integrated into a uniform quality control system All materials and components are outsourced from world's top manufacturers (quality comes first at any time) BROAD offer free global network monitoring service to customers during chiller's whole lifespan Design lifespan of BROAD non-electric chiller is 30 years 	<p>Numerous faults</p> <ul style="list-style-type: none"> Annual "tube freezing" rate exceeds 5% Main shell heating brings many faults and short life design No auto air vent device causes periodical cooling capacity and energy efficiency decrease Water distribution system is designed individually, purchased separately and installed by non-professionals with quality risks Since it does not include cooling water auto treatment device, the copper tubes that get scaled must be cleaned by acid, which will easily cause attenuation or even puncture of the copper tubes 	<p>Many faults</p> <ul style="list-style-type: none"> Number of moving parts is several times more than that of non-electric chillers, and they are easy to be damaged Water distribution system is designed individually, purchased separately and installed by non-professionals with great quality risks Since it does not include cooling water auto treatment device, the copper tubes that easily get scaled must be cleaned by acids, which will easily cause attenuation or even puncture of the copper tubes
Safety	<p>Risk free</p> <ul style="list-style-type: none"> The world's only non-electric chiller with complete American and European safety certificates High temperature generator is equipped with 8-level mechanical and electronic anti-explosion devices to ensure explosion free (even in case of sabotage) Cooling water system is with auto biocide device to eliminate legionnaires'disease 	<p>Risky</p> <ul style="list-style-type: none"> Not completely certified No comprehensive anti-explosion measures No biocide dosing 	<p>Risky</p> <ul style="list-style-type: none"> Explosion risks for compressors Working under positive pressure condition
Uncertain	<p>Customers are worry-free & carefree</p> <ul style="list-style-type: none"> A single purchase order to solve all ordering, installation and operation problems Automatic operation of the equipment and system makes full-time operator unnecessary Provide life-long maintenance & repair, or even operation management service (energy management contract). Life-long quality commitment 	<p>Customers are not carefree</p> <ul style="list-style-type: none"> Purchase and installation of water distribution system are troublesome The whole system is a combination of products from many manufacturers, make it impossible to actualize automation Poor after-sale service 	<p>Customers are not carefree</p> <ul style="list-style-type: none"> Purchase and installation of water distribution system are troublesome The whole system is a combination of products from many manufacturers, making it impossible to actualize automation Poor after-sale service

Note: ultrasonic flow meters is optional.



BROAD Non-electric Chillers and packaged water distribution system are ISO, CE, UL, ETL, ASME certified. Certifications are available only upon customer request.



100g

To preserve forest & water sources, pls imitate us to adopt compact layout & thin paper printing

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