BROAD CENTRAL AIR CONDITIONING (ABSORPTION LiBr+H_2O)

BROAD X NON-ELECTRIC CHILLER

MODEL SELECTION & DESIGN MANUAL

ENERGY CONSERVATION IS PRIORITY OF A/C

Function

Cooling, heating, hot water (dedicatedly or simultaneously)

Application

- Provide chilled/heating water for large-scale buildings
- Produce chilled water over 41°F and heating water below 203°F

Cooling capacity

6.6-3,307Rt(23-11,630kW)

Energy sources

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

Super energy-saving

- Compared with conventional electric air conditioning, the energy efficiency of BROAD non-electric air conditioning is 2 times higher, while their CO_2 emissions are 4 times lower.
- Compared with conventional water distribution systems, BROAD pakaged pumpset system reduces the rated power demand by 40-60%, and the operating electricity consumption by 60-75%.

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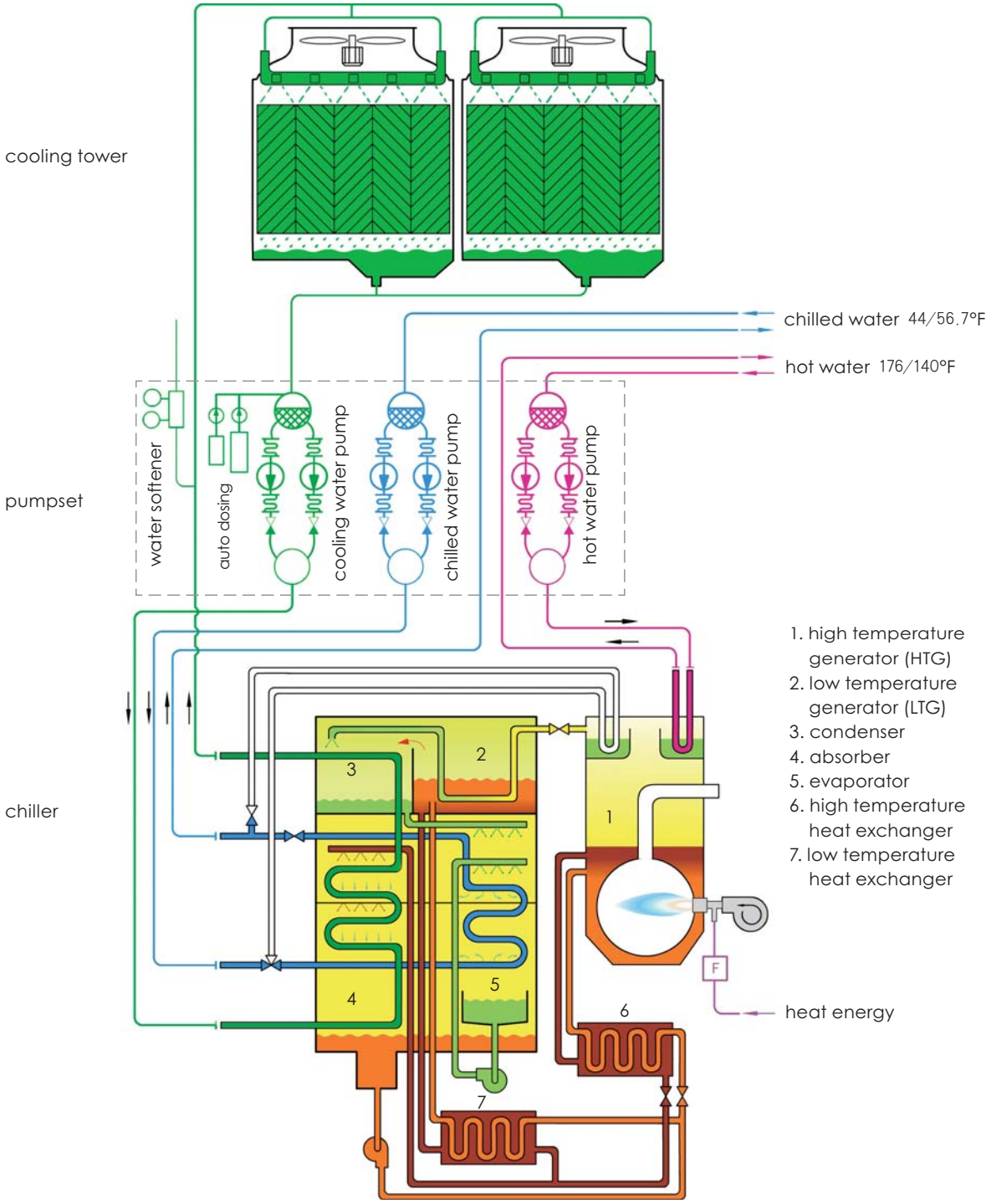
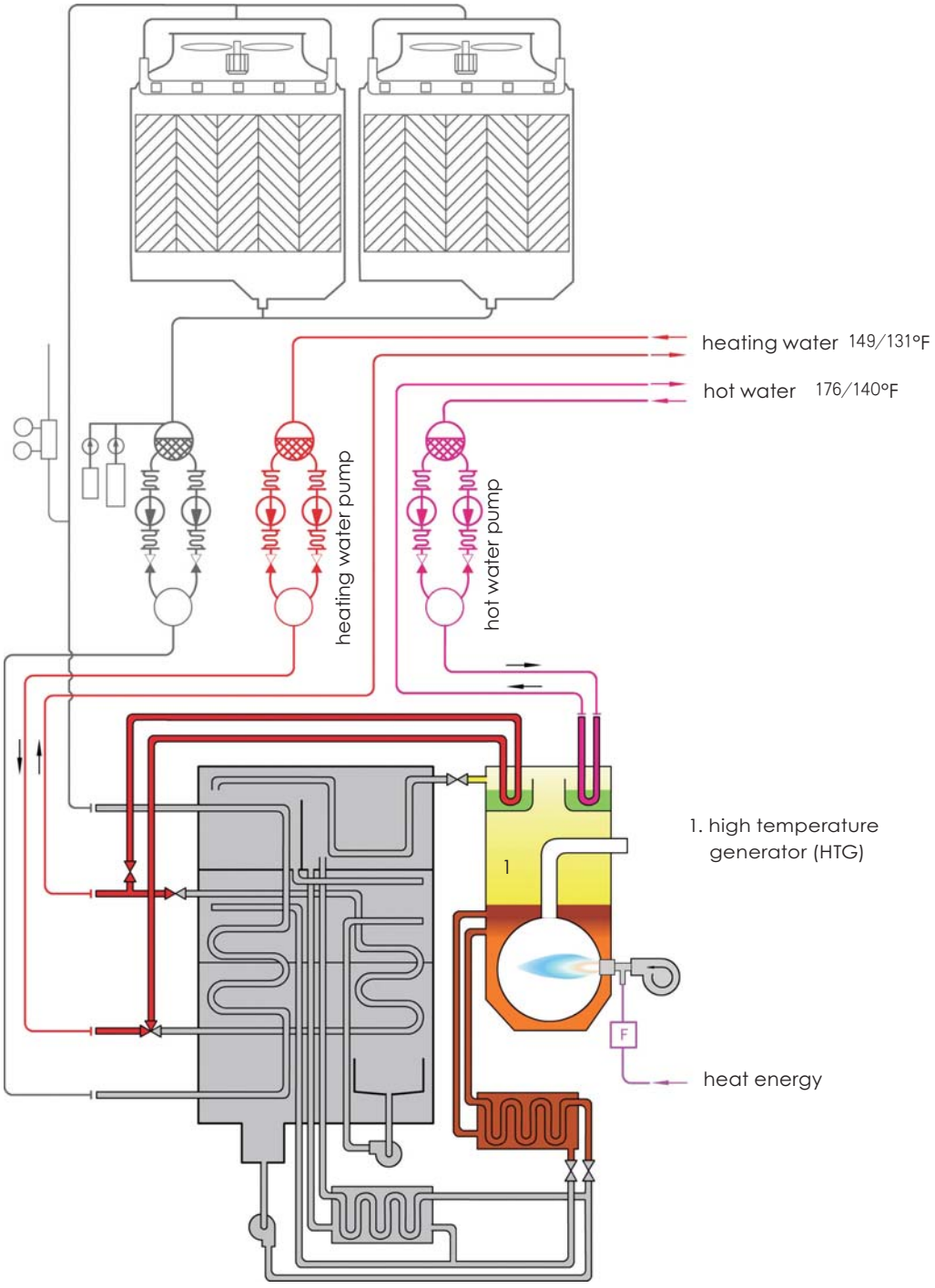
Non-electric Chiller (chiller+pumpset)

The Absorption Principle



The cooling principle

The input heat energy heats LiBr solution to 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. And it is sprayed over the copper tubes 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.



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".

Packaged Direct-fired Absorption Chiller (P-DFA) Performance Data

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

Model		BYZ	20	50	75	100	125	150	200	250	300	400	500	600	800	1000
chiller	cooling capacity	Rt	66	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
		kW	233	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	heating cap	MBH	612	1530	2295	3060	3824	4589	6119	7649	9179	12238	15298	18357	24476	30595
		kW	179	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967
	hot water cap	MBH	273	683	1024	1365	1707	2048	2730	3412	4096	5460	/	/	/	/
		kW	80	200	300	400	500	600	800	1000	1200	1600	/	/	/	/
	chilled water															
	flow rate	GPM	126	314	471	629	786	943	1257	1571	1886	2514	3143	3771	5029	6286
	pressure drop	ftH_2O	10	10	10	10	10	13.4	13.4	16.7	16.7	16.7	20	20	20	20
	cooling water															
	flow rate	GPM	208	520	779	1039	1299	1559	2078	2598	3118	4157	5196	6235	8314	10392
	pressure drop	ftH_2O	16.7	16.7	16.7	16.7	16.7	16.7	16.7	20	20	20	23.4	23.4	23.4	23.4
	heating water															
	flow rate	GPM	67	169	255	339	424	510	678	849	1016	1355	1698	2037	2715	3392
	pressure drop	ftH_2O	6.7	6.7	6.7	6.7	6.7	6.7	10	10	13.4	13.4	16.7	16.7	20	20
	hot water															
	flow rate	GPM	15	38	57	76	95	114	151	189	227	303	/	/	/	/
	pressure drop	ftH_2O	6.7	6.7	6.7	6.7	6.7	6.7	10	10	13.4	13.4	/	/	/	/
	natural gas consumption															
	cooling	MBH	583	1459	2188	2918	3647	4376	5835	7294	8753	11670	14589	17507	23342	29178
	heating	MBH	658	1645	2468	3290	4112	4934	6580	8225	9870	13159	16449	19739	26318	32898
	hot water	MBH	293	734	1101	1468	1835	2202	2935	3669	4404	5871	/	/	/	/
	power demand	kW	2.5	5.8	6.1	9.8	9.8	11.6	16.7	16.7	21.7	25.2	31.9	40.7	49.9	63.3
	solution wt.	klbs	2.4	5.7	7	8.6	10.8	12.3	17.6	19.8	25.8	29.7	37.4	47.6	63.2	76.4
	unit ship. wt.	klbs	11	22	26	31	31	42	57	68	/	/	/	/	/	/
	main shell ship. wt.	klbs	5.5	10	11	14	16	19	24	28	33	44	53	62	64	66
	operation wt.	klbs	11.7	23	28	35	42	48	64	77	92	110	139	167	196	235
pumpset	Chilled water pump															
	external head	ftH_2O	62	62	66	66	72	72	72	72	72	72	85	85	85	85
	power demand	kW	4	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	cooling water pump															
	external head	ftH_2o	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	power demand	kW	3	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	hot water pump															
	external head	ftH_2O	23	23	39	39	39	39	39	39	39	39	/	/	/	/
	power demand	kW	0.4	0.6	2.2	3	3	4.4	4.4	4.4	6	6	/	/	/	/
	total power demand	kW	7.4	15.6	32.2	33	47	56.4	78.4	92.4	110	126	200	220	300	360
	operation wt.	klbs	1.3	2.0	8.4	8.4	9.2	9.5	15.6	16.3	17.8	21.4	13/18.9	13.4/18.9	13.4/21.6	21.1/21.6
cooling tower	power demand	kW	5.5	11	/	/	/	/	/	/	/	/	/	/	/	/
	operation wt.	klbs	5.5	11.2	/	/	/	/	/	/	/	/	/	/	/	/
Enclosure	ventilation power demand	kW	0.3	0.3	1.0	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	3.0	3.0	3.0
	weight	klbs	1.1	1.8	7.5	7.5	8.6	8.6	11	12	14	15	24	25	32	34
Electricity and water consumption	total power demand	kW	15.7	32.7	39.3	44.3	58.3	69.5	96.6	111.1	133.7	153.2	233.9	263.7	352.9	426.3
	cooling water consumption	klbs/h	1.3	3.3	4.4	6.6	8.4	10	13.2	16.5	19.8	26.4	33	39.6	52.8	66

HTG(high temp generator)Enlarged Model Performance Data

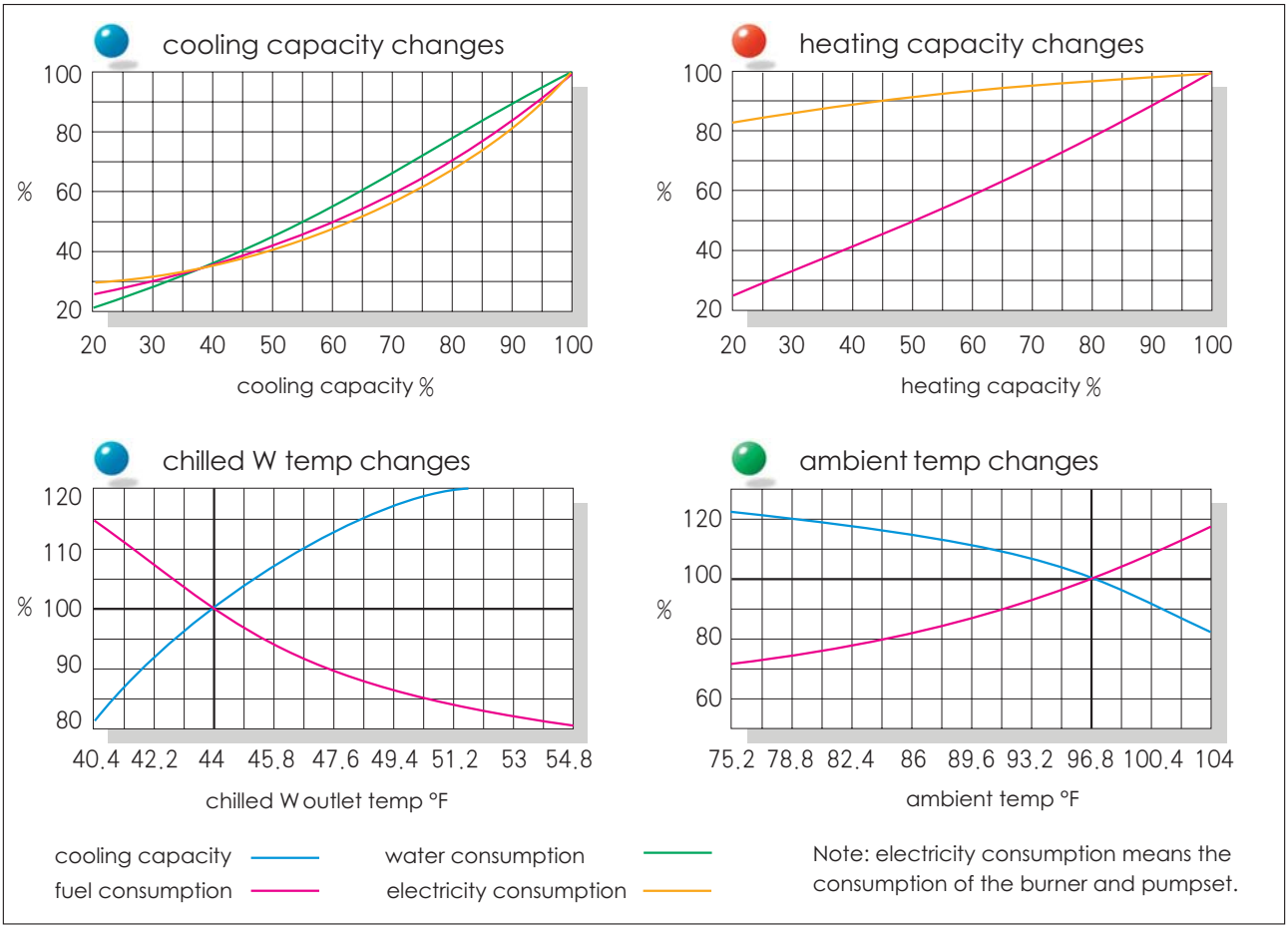
Model BZ	Enlarged Models	Heating capacity MBH	NG Consumption MBH
20	H_1	736	791
	H_2	859	923
	H_3	982	1056
	H_4	1105	1188
50	H_1	1841	1980
	H_2	2149	2311
	H_3	2454	2639
	H_4	2762	2970
75	H_1	2762	2970
	H_2	3224	3467
	H_3	3682	3959
	H_4	4144	4456
100	H_1	3682	3959
	H_2	4295	4618
	H_3	4911	5281
	H_4	5523	5939
125	H_1	4603	4949
	H_2	5369	5773
	H_3	6136	6598
	H_4	6906	7426
150	H_1	5523	5939
	H_2	6444	6929
	H_3	7364	7918
	H_4	8285	8909
200	H_1	7364	7918
	H_2	8593	9240
	H_3	9818	10557
	H_4	11046	12265
250	H_1	9205	9898
	H_2	10738	11546
	H_3	12275	13199
	H_4	13808	14847
300	H_1	11046	11877
	H_2	12887	13857
	H_3	14728	15837
	H_4	16569	17816
400	H_1	14728	15837
	H_2	17182	18475
	H_3	19639	21117
500	H_1	18410	19796
	H_2	21446	23060

General Conditions:

1. Rated chilled W outlet/inlet temp: 44°F/56.7°F
2. Rated cooling W outlet/inlet temp: 97.5°F/85°F
3. Rated heating W outlet/inlet temp: 149°F/131°F
4. Rated hot W outlet/inlet temp: 176°F/140°F
5. Lowest permitted outlet temperature for chilled water: 41°F
6. Highest permitted outlet temperature for heating/ hot water: 203°F
7. Lowest permitted inlet temperature for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120% Adjustable heating/hot water flowrate: 65%~120%
9. Pressure limit for chilled W, cooling W, heating W, hot W: 116psig (except special order)
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W, heating W, hot W: 0.0001hr ft^2·°F/Btu,for cooling W:0.00025hr ft^2·°F/Btu
12. Natural gas consumption is calculated by low heating: 900Btu/ft^3 (8051kcal/m^3)
13. Standard natural gas pressure is 5.2~16.4ftH_2O (16~50kPa), lower or higher pressure can be accommodated to special orders
14. LiBr Solution concentration: 52%. Solution weight is included in unit shipment weight.
15. Rated exhaust temp for cooling: 320°F Rated exhaust temp for heating: 293°F
16. Machine room ambient temperature: 41~109°F, humidity ≤ 85%
17. Standard climate conditions for cooling operation: temp 96.8°F, relative humidity 50% (wet bulb 80.6°F)
18. Heating capacity and hot water capacity refer to the capacity in separate operation, which is adjustable within this range
19. Power demand of cooling, heating, hot W is under rated working condition.
20. Rated cooling COP: 1.36 Rated heating COP: 0.93
21. Heating capacity increases by 20% for each stage of HTG enlargement. No change with pumpset and metal enclosure specs.
22. Life design: 25 years

Notes: Technical specification is based upon Japanese Industry Standard JIS B 8622 "Absorption Chiller" or based upon ARI 560 standard "Absorption Water Chilling And Water Heating Packages"

Packaged DFA Performance Curves



COP

Rated COP:1.36 IPLV COP:1.56			
Load	COP	Factor	Result
A 100%	1.360	0.01	0.014
B 75%	1.569	0.42	0.659
C 50%	1.619	0.45	0.729
D 25%	1.308	0.12	0.157

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

Environmental Protection Features

Operating Noise dB(A)

Model BYZ	20～50	75～200	⩾250
DFA	⩽57	⩽58	⩽60
pumpset	⩽57	⩽57	⩽59
cooling tower	⩽62	/	/
outside enclosure	⩽40	⩽41	⩽42

Emissions:
CO/CO_2⩽0.02% NOx⩽46ppm (O_2=5%)

Nomenclature

BY Z 100 X D－k－H_1－Fa

- Fa: High pressure type (details in below table)
- H_1: 20% more heating capacity
- k: Function: k-cooling-heating type, d-cooling only, default is heating, cooling and hot water
- D: Fuel type: B-oil C-LPG D-natural gas E-town gas
- X: BROAD non-electric chiller design code (X indicates 10)
- 100: Cooling capacity: 10^4kcal/h
- Z: Chiller type: Z-direct-fired(code of other types available in "Performance Data" pages)
- BY: Product: B-BROAD, Y-packaged chiller

Codes for high pressure type:

pressure limit	chilled water code	cooling water code
117~174psig	Fa	Ma
175~232psig	Fb	Mb
233~290psig	Fc	Mc
291~348psig	Fd	Md

Model Selection & Ordering

Function selection

- BROAD chillers are classified into standard type (cooling-heating-hot water),A/C type (cooling-heating) and cooling only type.
- An extra boiler is recommended to meet the excessive heating requirement when heating load exceeds 1.3 times of cooling load.

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 of priority.
- Applicable to gas/oil (for special orders)
- Different fuel matches different burner.

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 have standby unit. One unit can be considered for buildings that allow chiller stop once a year.

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.
- If the head is proved to be insufficient, BROAD will enlarge the pump free of charge.

Pressure selection

- The standard pressure limit for chilled/heating/cooling water is 116psig. Information about high pressure type is available on page 5.
- 117~174psig system: select high pressure type. 175~232psig system: either extra pressure type, or secondary heat exchanger, to be comprehensively evaluated.>232psig system: secondary heat exchange.

Split shipment

- If limited by access of customers' machine room (or limited by container transportation), split shipment can be chosen.
- The chiller normally will be split into 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.

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 top.
- Metal enclosure does not apply to basement installation. The chiller and pumpset are installed in the same metal enclosure so as to minimize piping length.

Lead time

- ⩽ BYZ150: 3-6 months
- BYZ200-BYZ400: 4-8 months
- ⩾ BYZ500: 8-12 months

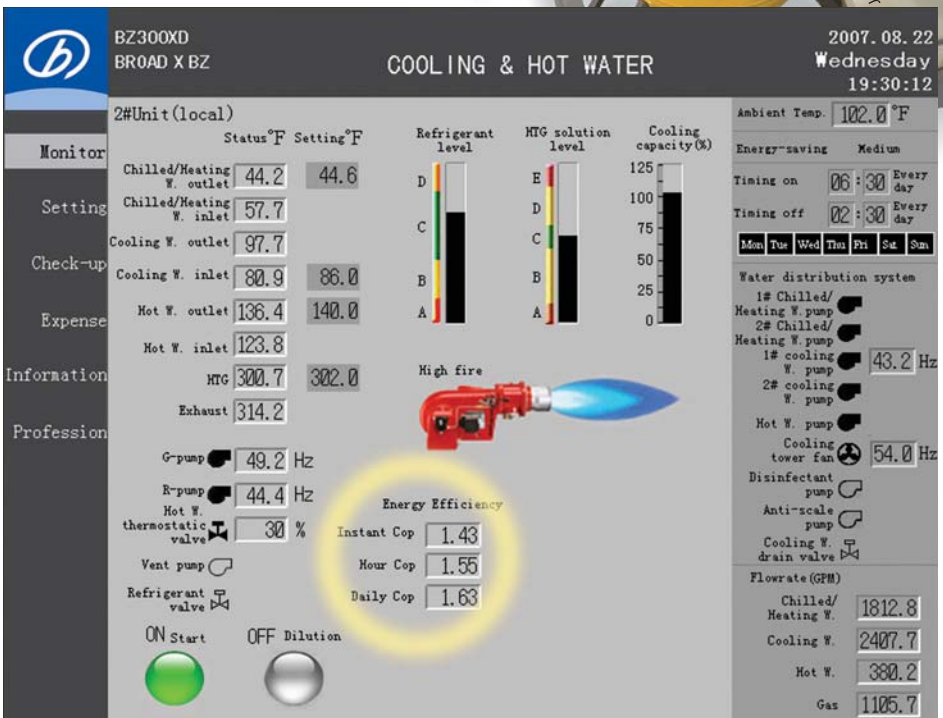
Warranty

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 pricelist 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 type
		Low temp. heat exchanger	Plate type including heat insulation
		Motor valve	Refrigerant motor valve, auto purge 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
		Thermostatic valve	1 piece each for heating water & hot water constant temp. control. N.A. for cooling only type
		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. N.A. for non gas-fired type
	Control system	Chiller control cabinet	Includes low voltage components, special circuit board, microprocessor or PLC, etc.
		Touch screen	For operation ("central control" for BY20 & BY50)
		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	Connects to BMS system through dry contact or serial communication
	Solution	LiBr solution	Includes corrosion inhibitor and energy intensifier.
Pumpset system	Pumpset	Chilled/heating water pump	Two pumps (BY20, BY 50 only one pump)
		Cooling water pump	Two pumps (BY20, BY 50 only one pump)
		Hot water pump	Two pumps (BY20, BY50 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	N.A. for cooling only type
		Chilled/heating water check valve	N.A. for cooling only type
		Flow meter	Includes gas, chilled/heating W, cooling W, hot W flow meters. For accurate measuring of the load.
		Water softener	For hard water softening (optional for BY20 & BY50)
		Auto dosing device	Automatically charge biocide corroision inhibitor and antisludge to the cooling water
		Pumpset control cabinet	Includes cooling W pump and cooling tower fan inverters (no inverter for⩾3 cooling fans), soft starter, low voltage electric parts, etc.
		Electric wiring*	Includes wires, cables, cable conduit, cable supporters, etc.
Enclosure	/	Metal enclosure	Aluminum-galvanized zinc shell with insulation
		Accessories	Includes ventilation and gas leakage detector (for gas type only)

Notes : 1. "*" means only standard size is available. For any size change, please specify it in purchase orders.
2. Supply list of waste heat chillers is almost the same as DFA supply list. The main difference of waste heat chillers lies in HTG. Supply list will be provided separately when the order is placed.



main shell
HTG
exhaust
chiller
burner
flowmeter
water softener
flowmeter
control cabinet (with inverter)
cooling/ heating switch valve
zero resistance check valve
air conditioning water pump
hot water pump
hot water
Pumpset system
cooling water pump
zero resisdence filter
unitary skid
zero resistance filter
A/C water
cooling water
biocide (to kill legionnaire's diseases, etc. in cooling water)
corrosion inhibitor & antisludging agent

Packaged Steam Chiller Performance Data

BYS: Steam from power generation or industrial waste streams

model		BYS	20	50	75	100	125	150	200	250	300	400	500	600	800	1000
chiller	cooling capacity	Rt	66	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
		kW	233	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	chilled W															
	flowrate	GPM	126	314	471	629	786	943	1257	1571	1886	2514	3143	3771	5029	6286
	pressure drop	ftH_2O	10	10	10	10	10	13.4	13.4	16.7	16.7	16.7	20	20	20	20
	cooling W															
	flowrate	GPM	208	520	779	1039	1299	1559	2078	2598	3118	4157	5196	6235	8314	10392
	pressure drop	ftH_2O	16.7	16.7	16.7	16.7	16.7	16.7	16.7	20	20	20	23.4	23.4	23.4	23.4
	steam consumption	lb/h	553	1383	2073	2764	3456	4037	5531	6912	8295	11059	13828	16590	22119	27643
	power demand	kW	1.7	4.3	4.6	6.8	6.8	6.8	10.2	10.2	11.7	13.2	17.7	20.7	25.9	34.9
	solution weight	klbs/h	1.7	4.2	5.7	6.6	9.0	10.1	14.7	16.5	21.8	24.6	32.1	38.5	50.0	62.1
	unit ship. wt	klbs/h	8.8	16	20	25	31	35	46	57	/	/	/	/	/	/
	main shell ship. wt	klbs/h	5.5	10	11	14	16	19	24	28	33	44	53	62	64	66
	operation weight	klbs/h	10	19	22	28	35	40	53	66	77	95	119	139	165	187
pumpset	chilled/heating W pump															
	external head	ftH_2O	62	62	66	66	72	72	72	72	72	72	85	85	85	85
	power demand	kW	4	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	cooling W pump															
	external head	ftH_2O	33	33	33	33	33	33	33	33	33	33	33	33	33	33
	power demand	kW	3	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	total power demand	kW	7	15	30	30	44	52	74	88	104	120	200	220	300	360
	operation weight	klbs/h	1.1	1.8	7.3	7.3	7.9	8.1	13.9	14.5	15.8	19.4	13/18.9	13.4/19.4	13.4/21.6	21.1/21.6
cooling tower	power demand	kW	5.5	11	/	/	/	/	/	/	/	/	/	/	/	/
	operation weight	klbs/h	5.5	11.2	/	/	/	/	/	/	/	/	/	/	/	/
enclosure	ventilation power demand	kW	0.3	0.3	1.0	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	3.0	3.0	3.0
	weight	klbs/h	1.1	1.8	7.5	7.5	8.6	8.6	11	12	14	15	24	25	32	34
Electricity and water consumption	total power demand	kW	14.5	30.6	35.6	38.3	52.3	60.3	85.7	100.2	117.7	135.2	219.7	243.7	328.9	397.9
	cooling water demand	klbs/h	1.3	3.3	4.4	6.6	8.4	10	13.2	16.5	19.8	26.4	33	39.6	52.8	66

General Conditions:

1. Rated saturated steam pressure: 116psig, rated condensate temp: 203°F
2. Rated chilled W outlet/inlet temp: 44°F/56.7°F
3. Rated cooling W outlet/inlet temp: 97.5°F/85°F
4. Lowest permitted outlet temperature for chilled water: 41°F
5. Lowest permitted inlet temperature for cooling water: 50°F
6. steam pressure upper limit 110%
7. Adjustable chilled water flowrate: 50%~120%
8. Pressure limit for chilled W, cooling W: 116psig (except special order)
9. Adjustable load: 5%~115%
10. Fouling factor for chilled W: 0.0001hr $ft^2 \cdot °F/Btu$, for cooling W:0.00025hr $ft^2 \cdot °F/Btu$
11. LiBr Solution concentration: 52%. Solution weight is included in unit ship, wt.
12. Machine room ambient temperature: 41~109°F,humidity ⩽ 85%
13. Standard climate conditions for cooling operation: 96.8°F, relative humidity 50% (wet bulb 80.6°F)
14. Rated cooling COP: 1.41
15. Life design: 25 years

Performance Curves

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

COP

Rated COP:1.41 IPLV COP:1.62			
Load	COP	Factor	Result
A 100%	1.410	0.01	0.014
B 75%	1.627	0.42	0.683
C 50%	1.679	0.45	0.756
D 25%	1.356	0.12	0.163

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

Operating Noise dB(A)

Model BYS	20~50	75~200	⩾250
Steam chiller	⩽52	⩽53	⩽53
Pumpset	⩽57	⩽57	⩽59
Cooling tower	⩽62	/	/
outside enclosure	⩽40	⩽41	⩽42

Nomenclature

BY S 100 X 0.8—Fa

- Fa: High pressure type
- 0.8: steam inlet pressure: 0.8 MPa(116psig)
- X: BROAD non-electric chiller design code (X indicates 10)
- 100: Cooling capacity: 10^4 kcal/h
- S: Chiller type: S (steam type)
- BY: Product: B-BROAD, Y-packaged chiller

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 ⩽180°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.

Packaged Hot W/Exhaust chiller Performance Data

BYH/BYE: hot water/exhaust from power generation or industrial waste streams
(pumpset, enclosure data are the same as steam chiller)

code	model	cooling capacity		heating capacity		chilled W		cooling W		heating W		hot water consump.	exhaust consump.		power demand	solution wt.	unit ship. wt.	main shell ship. wt.	main shell operation weight
						flowrate	pressure drop	flowrate	pressure drop	flowrate	pressure drop		cooling	heating					
		Rt	kW	MBH	kW	GPM	ftH_2O	GPM	ftH_2O	GPM	ftH_2O	GPM	lb/h	lb/h	kW	klbs	klbs	klbs	klbs
two-stage hot water chiller BH hot water 365°F	20	66	233	/	/	126	10	208	16.7	/	/	45	/	/	1.7	2.2	10	5.5	11
	50	165	582	/	/	314	10	520	16.7	/	/	112	/	/	4.3	4.8	18	10	20
	75	248	872	/	/	471	10	779	16.7	/	/	168	/	/	4.6	6.2	21	11	24
	100	331	1163	/	/	629	10	1039	16.7	/	/	224	/	/	6.8	7.5	26	14	29
	125	413	1454	/	/	786	10	1299	16.7	/	/	280	/	/	6.8	9.7	31	16	33
	150	496	1745	/	/	943	13.4	1559	16.7	/	/	336	/	/	6.8	10.8	35	19	40
	200	661	2326	/	/	1257	13.4	2078	16.7	/	/	449	/	/	10.2	15.6	46	24	53
	250	827	2908	/	/	1571	16.7	2598	20	/	/	559	/	/	10.2	17.2	57	28	66
	300	992	3489	/	/	1886	16.7	3118	20	/	/	673	/	/	11.7	23.3	/	33	77
	400	1323	4652	/	/	2514	16.7	4157	20	/	/	898	/	/	13.2	26.6	/	44	99
	500	1653	5815	/	/	3143	20	5196	23	/	/	1122	/	/	17.7	32.6	/	53	112
	600	1984	6978	/	/	3771	20	6235	23	/	/	1346	/	/	20.7	39.9	/	62	139
	800	2646	9304	/	/	5029	20	8314	23	/	/	1795	/	/	25.9	53.3	/	64	158
	1000	3307	11630	/	/	6286	20	10392	23	/	/	2244	/	/	34.9	67.2	/	66	203
two-stage exhaust chiller BE exhaust 932°F	20	66	233	522	153	126	10	208	16.7	58	6.7	/	3392	3392	1.7	3.3	14	5.5	15
	50	165	582	1310	384	314	10	520	16.7	144	6.7	/	8482	8482	4.3	7.7	26	10	27
	75	248	872	1962	575	471	10	779	16.7	215	6.7	/	12725	12725	4.6	9.7	31	11	35
	100	331	1163	2617	767	629	10	1039	16.7	288	6.7	/	16960	16960	6.8	12.5	40	14	44
	125	413	1454	3272	959	786	10	1299	16.7	360	6.7	/	21207	21207	6.8	14.5	48	16	53
	150	496	1745	3927	1151	943	13.4	1559	16.7	431	6.7	/	25449	25449	6.8	16.7	55	19	59
	200	661	2326	5234	1534	1257	13.4	2078	16.7	576	10	/	33920	33920	10.2	23.8	73	24	79
	250	827	2908	6544	1918	1571	16.7	2598	20	717	10	/	42414	42414	10.2	26.6	/	28	92
	300	992	3489	7851	2301	1886	16.7	3118	20	862	13.4	/	50881	50881	11.7	34.8	/	33	123
	400	1323	4652	10468	3068	2514	16.7	4157	20	1153	13.4	/	67841	67841	13.2	40.0	/	44	145
	500	1653	5815	13085	3835	3143	20	5196	23	1439	16.7	/	84802	84802	17.7	50.7	/	53	183
	600	1984	6978	15702	4602	3771	20	6235	23	1734	16.7	/	101762	101762	20.7	64.1	/	62	236
	800	2646	9304	20940	6137	5029	20	8314	23	2301	20	/	135683	135683	25.9	80	/	64	260
	1000	3307	11630	26174	7671	6286	20	10392	23	2878	20	/	169603	169603	34.9	90	/	66	288

General Conditions:

1. Rated hot W inlet/outlet temp for hot W chiller:356°F/329°F
2. Rated exhaust inlet/outlet temp for exhaust chiller: 932°F/320°F
3. Rated chilled W outlet/inlet temp: 44°F/56.7°F
4. Rated cooling W outlet/inlet temp: 97.5°F/85°F
5. Rated heating W outlet/inlet temp for two-stage exhaust chiller: 149°F/131°F
6. Lowest permitted outlet temperature for chilled water: 41°F
7. Lowest permitted inlet temperature for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120%
9. Pressure limit for chilled/cooling W: 116psig
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W: 0.0001hr ft^2·°F/Btu, for cooling W:0.00025hr ft^2·°F/Btu
12. LiBr Solution concentration: 52%, solution weight is included in unit ship, wt.
13. Machine room ambient temperature: 41~109°F, humidity ≤ 85%
14. Rated cooling COP: 1.41
15. Rated heating COP for exhaust chiller: 0.93
16. Life design: 25 years
17. Please refer to P5, P6 & P7 for performance curve, model selection & ordering and supply list information.

Packaged Single-stage Steam/Hot W/Exhaust Chiller Performance Data BYDS/BYDH/BYDE: steam/hot water/exhaust

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

code	model	cooling capacity		chilled W		cooling W		steam consump.	hot water consu-mp.	exhaust consu-mp.	power demand	solution wt.	unit ship. wt.	main shell ship. wt.	chiller operation weight
				flowrate	pressure drop	flowrate	pressure drop								
		Rt	kW	GPM	ftH_2O	GPM	ftH_2O	lb/h	GPM	lb/h	kW	klbs	klbs	klbs	klbs
single-stage steam chiller BDS steam 14.5psig	20	66	233	126	10	285	16.7	1011	/	/	2.5	1.5	7.7	/	8.8
	50	165	582	314	10	713	16.7	2528	/	/	2.5	3.7	14	/	15
	75	248	872	471	10	1069	20	3793	/	/	5.3	4.8	19	/	21
	100	331	1163	629	10	1425	20	5057	/	/	5.7	5.3	23	/	25
	125	413	1454	786	10	1782	20	6321	/	/	5.7	7.0	27	/	31
	150	496	1745	943	13.4	2138	20	7584	/	/	5.7	7.7	31	/	35
	200	661	2326	1257	13.4	2847	20	10112	/	/	8.6	12.1	44	/	48
	250	827	2908	1571	16.7	3560	23	12640	/	/	10.1	13.2	52	/	57
	300	992	3489	1886	16.7	4272	23	15170	/	/	10.1	18.1	62	/	68
	400	1323	4652	2514	16.7	5698	23	20227	/	/	13.9	19.6	70	/	81
	500	1653	5815	3143	20	7119	30	25282	/	/	13.8	25.8	/	59	97
	600	1984	6978	3771	20	8545	30	30339	/	/	17.5	31.9	/	64	108
single-stage hot water chiller BDH hot water 208°F	20	60	209	113	8.4	262	16.7	/	108	/	2.5	1.5	7.7	/	8.8
	50	146	512	277	8.4	642	16.7	/	264	/	2.5	3.7	14	/	15
	75	220	767	415	8.4	959	20	/	382	/	5.3	4.8	19	/	21
	100	292	1023	553	8.4	1280	20	/	510	/	5.7	5.3	23	/	25
	125	365	1279	691	8.4	1602	20	/	638	/	5.7	7.0	27	/	31
	150	439	1535	830	10	1923	20	/	765	/	5.7	7.7	31	/	35
	200	585	2046	1106	10	2561	20	/	1020	/	8.6	12.1	44	/	48
	250	730	2558	1383	13.4	3203	23	/	1272	/	10.1	13.2	52	/	57
	300	877	3069	1659	13.4	3841	23	/	1527	/	10.1	18.1	62	/	68
	400	1169	4092	2231	13.4	5122	23	/	2037	/	13.9	19.6	73	/	81
	500	1461	5115	2766	16.7	6402	30	/	2547	/	13.8	25.8	/	62	97
	600	1754	6138	3319	16.7	7682	30	/	3058	/	17.5	31.9	/	66	110
single-stage exhaust chiller BDE exhaust 572°F	20	66	233	126	10	285	16.7	/	/	12533	2.5	1.7	8.8	/	9.7
	50	165	582	314	10	713	16.7	/	/	31332	2.5	4.6	15	/	17
	75	248	872	471	10	1069	20	/	/	47000	5.3	5.5	20	/	20
	100	331	1163	629	10	1425	20	/	/	62665	5.7	6.2	24	/	24

General Conditions:

1. Rated saturated steam pressure for BDS chiller 14.5psig.Rated condensate temperature for BDS chiller: 203°F
2. Rated hot W inlet/outlet temp for single-stage hot W chiller: 208°F/190°F
3. Rated exhaust inlet/outlet temp for single-stage exhaust chiller: 572°F/266°F
4. Rated chilled W outlet/inlet temp: 44°F/56.7°F
5. Rated cooling W outlet/inlet temp: 97.5°F/85°F
6. Lowest permitted outlet temperature for chilled water: 41°F
7. Lowest permitted inlet temperature for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120%
9. Pressure limit for chilled/cooling W: 116psig
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W: 0.0001hr ft^2·°F/Btu, for cooling W: 0.00025hr ft^2·°F/Btu
12. LiBr Solution concentration: 50%. Solution weight is included in unit ship, wt.
13. Machine room ambient temperature: 41~109°F,humidity ⩽ 85%
14. Rated COP: single-stage steam chiller and exhaust chiller: 0.79,single-stage hot W chiller: 0.76
15. Life design: 25 years
16. Please refer to P5, P6 & P7 for performance curve, model selection & ordering and supply list information.

Packaged Multi-energy Chiller Performance Data

BYZE/BYHE/BYZHE: gas (oil) and waste heat hybrid (multi-energy chiller)
(pumpset, enclosure data are the same as DFA)

code	model	cooling capacity		heating capacity		hot water capacity		chilled W		heating water		hot water		cooling W	
								flowrate	pressure drop	flowrate	pressure drop	flowrate	pressure drop	flowrate	pressure drop
		Rt	kW	MBH	kW	MBH	kW	GPM	ftH$_2$O	GPM	ftH$_2$O	GPM	ftH$_2$O	GPM	ftH$_2$O
exhaust & direct-fired chiller BZE exhaust 932°F gas/oil	20	66	233	612	179	273	80	126	10	67	6.7	15	6.7	208	16.7
	50	165	582	1530	449	683	200	314	10	169	6.7	38	6.7	520	16.7
	75	248	872	2295	672	1024	300	471	10	255	6.7	57	6.7	779	16.7
	100	331	1163	3060	897	1365	400	629	10	339	6.7	76	6.7	1039	16.7
	125	413	1454	3824	1121	1707	500	786	10	424	6.7	95	6.7	1299	16.7
	150	496	1745	4589	1349	2048	600	943	13.4	510	6.7	114	6.7	1559	16.7
	200	661	2326	6119	1791	2730	800	1257	13.4	678	10	151	10	2078	16.7
	250	827	2908	7649	2245	3412	1000	1571	16.7	849	10	189	10	2598	20
	300	992	3489	9179	2687	4096	1200	1886	16.7	1016	13.4	227	13.4	3118	20
	400	1323	4652	12238	3582	5460	1600	2514	16.7	1355	13.4	303	13.4	4157	20
	500	1653	5815	15298	4489	/	/	3143	20	1698	16.7	/	/	5196	23
	600	1984	6978	18357	5385	/	/	3771	20	2037	16.7	/	/	6235	23
	800	2646	9304	24476	7176	/	/	5029	20	2715	20	/	/	8314	23
	1000	3307	11630	30595	8967	/	/	6286	20	3392	20	/	/	10392	23
hot W & exhaust chiller BHE exhaust 932°F hot W 208°F	20	66	233	522	153	/	/	126	10	58	6.7	/	/	231	16.7
	50	165	582	1310	384	/	/	314	10	144	6.7	/	/	576	16.7
	75	248	872	1962	575	/	/	471	10	215	6.7	/	/	862	16.7
	100	331	1163	2617	767	/	/	629	10	288	6.7	/	/	1153	16.7
	125	413	1454	3272	959	/	/	786	10	360	6.7	/	/	1439	16.7
	150	496	1745	3927	1151	/	/	943	13.4	431	6.7	/	/	1729	16.7
	200	661	2326	5324	1534	/	/	1257	13.4	576	10	/	/	2310	16.7
	250	827	2908	6544	1918	/	/	1571	16.7	717	10	/	/	2882	20
	300	992	3489	7851	2301	/	/	1886	16.7	862	13.4	/	/	3463	20
	400	1323	4652	10468	3068	/	/	2514	16.7	1153	13.4	/	/	4615	20
	500	1653	5815	13085	3835	/	/	3143	20	1439	16.7	/	/	5768	23
	600	1984	6978	15702	4602	/	/	3771	20	1734	16.7	/	/	6921	23
	800	2646	9304	20940	6137	/	/	5029	20	2301	20	/	/	9227	23
	1000	3307	11630	26174	7671	/	/	6286	20	2878	20	/	/	11537	23
hot W & exhaust & direct-fired chiller BZHE exhaust 932°F hot W 208°F	20	66	233	612	179	273	80	126	10	67	6.7	15	6.7	231	16.7
	50	165	582	1530	449	683	200	314	10	169	6.7	38	6.7	576	16.7
	75	248	872	2295	672	1024	300	471	10	255	6.7	57	6.7	862	16.7
	100	331	1163	3060	897	1365	400	629	10	339	6.7	76	6.7	1153	16.7
	125	413	1454	3824	1121	1707	500	786	10	424	6.7	95	6.7	1439	16.7
	150	496	1745	4589	1349	2048	600	943	13.4	510	6.7	114	6.7	1729	16.7
	200	661	2326	6119	1791	2730	800	1257	13.4	678	10	151	10	2310	16.7
	250	827	2908	7649	2245	3412	1000	1571	16.7	849	10	189	10	2882	20
	300	992	3489	9179	2687	4096	1200	1886	16.7	1016	13.4	227	13.4	3463	20
	400	1323	4652	12238	3582	5460	1600	2514	16.7	1355	13.4	303	13.4	4615	20
	500	1653	5815	15298	4489	/	/	3143	20	1698	16.7	/	/	5768	23
	600	1984	6978	18357	5385	/	/	3771	20	2037	16.7	/	/	6921	23
	800	2646	9304	24476	7176	/	/	5029	20	2715	20	/	/	9227	23
	1000	3307	11630	30595	8967	/	/	6286	20	3392	20	/	/	11537	23

code	model	energy consumption							power demand	solution wt.	unit ship. wt.	main shell ship. wt.	chiller operation weight
		cooling			heating		hot water						
		NG MBH	exhaust lb/h	hot W GPM	NG MBH	exhaust lb/h	NG MBH	exhaust lb/h	kW	klbs	klbs	klbs	klbs
exhaust & direct-fired chiller BZE exhaust 932°F gas/oil	20	583	1018	/	658	1018	293	1018	2.5	2.9	13	5.5	14
	50	1459	2544	/	1645	2544	734	2544	5.8	6.2	24	10	25
	75	2188	3817	/	2468	3817	1101	3817	6.1	7.7	31	11	33
	100	2918	5088	/	3290	5088	1468	5088	9.8	9.7	40	14	42
	125	3647	6361	/	4112	6361	1835	6361	9.8	11.9	46	16	49
	150	4376	7634	/	4934	7634	2202	7634	11.6	13.4	50	19	55
	200	5835	10176	/	6580	10176	2935	10176	16.7	18.7	68	24	75
	250	7294	12614	/	8225	12614	3669	12614	16.7	22.0	/	28	90
	300	8753	15264	/	9870	15264	4404	15264	21.7	28.0	/	33	103
	400	11670	20352	/	13159	20352	5871	20352	25.2	32.8	/	44	125
	500	14589	27643	/	16449	27643	/	/	31.9	41.8	/	53	158
	600	17507	30529	/	19739	30529	/	/	40.7	50.9	/	62	189
	800	23342	40705	/	26318	40705	/	/	49.9	66.5	/	64	209
	1000	29178	50881	/	32898	50881	/	/	63.3	79.7	/	66	251
hot W & exhaust chiller BHE exhaust 932°F hot W 208°F	20	/	3392	29	/	3392	/	/	1.7	3.5	14	5.5	15
	50	/	8482	72	/	8482	/	/	4.3	7.9	26	10	28
	75	/	12725	108	/	12725	/	/	4.6	10.0	33	11	35
	100	/	16960	145	/	16960	/	/	6.8	12.8	42	14	45
	125	/	21207	180	/	21207	/	/	6.8	15.0	49	16	55
	150	/	25449	217	/	25449	/	/	6.8	17.2	56	19	62
	200	/	33920	290	/	33920	/	/	10.2	24.2	75	24	81
	250	/	42414	362	/	42414	/	/	10.2	27.8	/	28	95
	300	/	50881	217	/	50881	/	/	11.7	35.7	/	33	125
	400	/	67841	580	/	67841	/	/	13.2	41.2	/	44	147
	500	/	84802	722	/	84802	/	/	17.7	52.2	/	53	187
	600	/	101762	867	/	101762	/	/	20.7	65.6	/	62	240
	800	/	135683	1157	/	135683	/	/	25.9	81.9	/	64	264
	1000	/	169603	1448	/	169603	/	/	34.9	92.5	/	66	293
hot W & exhaust & direct-fired chiller BZHE exhaust 932°F hot W 208°F	20	583	1018	29	658	1018	293	1018	2.5	3.1	14	5.5	15
	50	1459	2544	72	1645	2544	734	2544	5.8	6.4	25	10	28
	75	2188	3817	108	2468	3817	1101	3817	6.1	7.9	33	11	35
	100	2918	5088	145	3290	5088	1468	5088	9.8	10.0	42	14	44
	125	3647	6361	180	4112	6361	1835	6361	9.8	12.3	48	16	53
	150	4376	7634	217	4934	7634	2202	7634	11.6	13.9	54	19	58
	200	5835	10176	290	6580	10176	2935	10176	16.7	19.2	73	24	79
	250	7294	12614	362	8225	12614	3669	12614	16.7	23.1	/	28	95
	300	8753	15264	217	9870	15264	4404	15264	21.7	28.8	/	33	108
	400	11670	20352	580	13159	20352	5871	20352	25.2	33.9	/	44	132
	500	14589	27643	722	16449	27643	/	/	31.9	43.4	/	53	167
	600	17507	30529	867	19739	30529	/	/	40.7	52.4	/	62	200
	800	23342	40705	1157	26318	40705	/	/	49.9	68	/	64	240
	1000	29178	50881	1448	32898	50881	/	/	63.3	82	/	66	288

Packaged Multi-energy Chiller Performance Data

gas (oil) and waste heat hybrid (multi-energy chiller)
(pumpset, enclosure data are the same as DFA)

code	model	cooling capacity		heating capacity		hot water capacity		chilled W		heating water		hot water		cooling W	
								flowrate	pressure drop	flowrate	pressure drop	flowrate	pressure drop	flowrate	pressure drop
		Rt	kW	MBH	kW	MBH	kW	GPM	ftH_2O	GPM	ftH_2O	GPM	ftH_2O	GPM	ftH_2O
steam & direct-fired chiller BZS steam 116psig gas/oil	20	66	233	612	179	273	80	126	10	67	6.7	15	6.7	208	16.7
	50	165	582	1530	449	683	200	314	10	169	6.7	38	6.7	520	16.7
	75	248	872	2295	672	1024	300	471	10	255	6.7	57	6.7	779	16.7
	100	331	1163	3060	897	1365	400	629	10	339	6.7	76	6.7	1039	16.7
	125	413	1454	3824	1121	1707	500	786	10	424	6.7	95	6.7	1299	16.7
	150	496	1745	4589	1349	2048	600	943	13.4	510	6.7	114	6.7	1559	16.7
	200	661	2326	6119	1791	2730	800	1257	13.4	678	10	151	10	2078	16.7
	250	827	2908	7649	2245	3412	1000	1571	16.7	849	10	189	10	2598	20
	300	992	3489	9179	2687	4096	1200	1886	16.7	1016	13.4	227	13.4	3118	20
	400	1323	4652	12238	3582	5460	1600	2514	16.7	1355	13.4	303	13.4	4157	20
	500	1653	5815	15298	4489	/	/	3143	20	1698	16.7	/	/	5196	23
	600	1984	6978	18357	5385	/	/	3771	20	2037	16.7	/	/	6235	23
	800	2646	9304	24476	7176	/	/	5029	20	2715	20	/	/	8314	23
	1000	3307	11630	30595	8967	/	/	6286	20	3392	20	/	/	10392	23
hot W & direct-fired chiller BZH hot W 356°F gas/oil	20	66	233	612	179	273	80	126	10	67	6.7	15	6.7	208	16.7
	50	165	582	1530	449	683	200	314	10	169	6.7	38	6.7	520	16.7
	75	248	872	2295	672	1024	300	471	10	255	6.7	57	6.7	779	16.7
	100	331	1163	3060	897	1365	400	629	10	339	6.7	76	6.7	1039	16.7
	125	413	1454	3824	1121	1707	500	786	10	424	6.7	95	6.7	1299	16.7
	150	496	1745	4589	1349	2048	600	943	13.4	510	6.7	114	6.7	1559	16.7
	200	661	2326	6119	1791	2730	800	1257	13.4	678	10	151	10	2078	16.7
	250	827	2908	7649	2245	3412	1000	1571	16.7	849	10	189	10	2598	20
	300	992	3489	9179	2687	4096	1200	1886	16.7	1016	13.4	227	13.4	3118	20
	400	1323	4652	12238	3582	5460	1600	2514	16.7	1355	13.4	303	13.4	4157	20
	500	1653	5815	15298	4489	/	/	3143	20	1698	16.7	/	/	5196	23
	600	1984	6978	18357	5385	/	/	3771	20	2037	16.7	/	/	6235	23
	800	2646	9304	24476	7176	/	/	5029	20	2715	20	/	/	8314	23
	1000	3307	11630	30595	8967	/	/	6286	20	3392	20	/	/	10392	23

General Conditions:

1. Rated chilled W outlet/inlet temp: 44°F/56.7°F
2. Rated cooling W outlet/inlet temp: 97.5°F/85°F
3. Rated heating W outlet/inlet temp: 149°F/131°F
4. Rated hot W outlet/inlet temp: 176°F/140°F
5. Lowest permitted outlet temperature for chilled water: 41°F
6. Highest permitted outlet temperature for heating/ hot water: 203°F
7. Lowest permitted inlet temperature for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120%
   Adjustable heating/hot water flowrate: 65%~120%
9. Pressure limit for chilled W, cooling W, heating W, hot W 116psig (except special order)
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W, heating W, hot W: 0.0001hr ft^2·°F/Btu,for cooling W:0.00025hr ft^2·°F/Btu
12. LiBr Solution concentration: 52%. Solution weight is included in unit ship. wt.
13. Natural gas consumption is calculated by low heating: 900Btu/ft^3 (8051kcal/m^3)

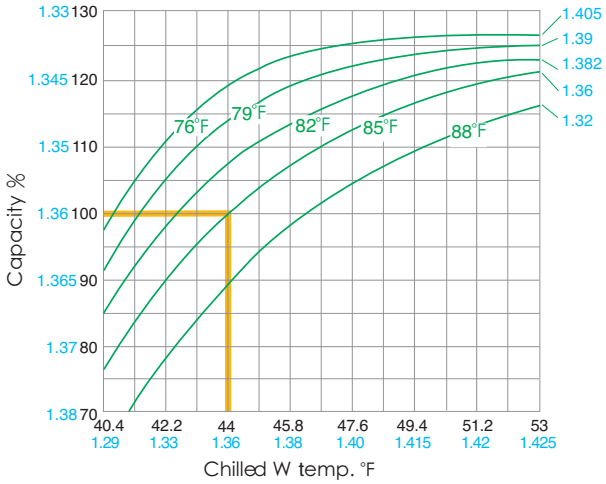
code	model	energy consump.					power demand	solution wt.	unit ship. wt.	main shell ship. wt.	operation weight
		cooling			heating	hot W					
		NG	steam	hot W	NG	NG					
		MBH	lb/h	GPM	MBH	MBH	kW	klbs	klbs	klbs	klbs
steam & direct-fired chiller BZS steam 116psig gas/oil	20	583	553	/	658	293	2.5	2.9	13	5.5	14
	50	1459	1383	/	1645	734	5.8	6.2	24	10	26
	75	2188	2073	/	2468	1101	6.1	7.7	30	11	32
	100	2918	2764	/	3290	1468	9.8	9.7	37	14	41
	125	3647	3456	/	4112	1835	9.8	11.9	45	16	48
	150	4376	4037	/	4934	2202	11.6	13.4	51	19	55
	200	5835	5531	/	6580	2935	16.7	18.7	66	24	73
	250	7294	6912	/	8225	3669	16.7	22.0	81	28	88
	300	8753	8295	/	9870	4404	21.7	28.0	/	33	99
	400	11670	11059	/	13159	5871	25.2	32.8	/	44	123
	500	14589	13828	/	16449	/	31.9	41.8	/	53	156
	600	17507	16590	/	19739	/	40.7	50.9	/	62	187
	800	23342	22119	/	26318	/	49.9	66.5	/	64	222
	1000	29178	27643	/	32898	/	63.3	79.7	/	66	269
hot W & direct-fired chiller BZH hot W 356°F gas/oil	20	583	/	45	658	293	2.5	2.9	13	5.5	14
	50	1459	/	112	1645	734	5.8	6.2	24	10	26
	75	2188	/	168	2468	1101	6.1	7.7	31	11	33
	100	2918	/	224	3290	1468	9.8	9.7	38	14	42
	125	3647	/	280	4112	1835	9.8	11.9	44	16	49
	150	4376	/	336	4934	2202	11.6	13.4	51	19	55
	200	5835	/	449	6580	2935	16.7	18.7	68	24	75
	250	7294	/	559	8225	3669	16.7	22.0	81	28	88
	300	8753	/	673	9870	4404	21.7	28.0	/	33	101
	400	11670	/	898	13159	5871	25.2	32.8	/	44	123
	500	14589	/	1122	16449	/	31.9	41.8	/	53	156
	600	17507	/	1346	19739	/	40.7	50.9	/	62	187
	800	23342	/	1795	26318	/	49.9	66.5	/	64	222
	1000	29178	/	2244	32898	/	63.3	79.7	/	66	269

14. Standard natural gas pressure is5.2~16.4ftH_2O (16~50kPa), lower or higher pressure can be accommodated to special orders
15. Machine room ambient temperature: 41~109°F, humidity ⩽ 85%
16. Standard climate conditions for cooling operation: 96.8°F, relative humidity 50% (wet bulb 80.6°F).
17. Exhaust provides 30% of the total capacity per standard design of BZE/BZHE. Over 30% can be accommondated into special orders.
18. Energy consumption is for seperate operation of heat source and fuel.
19. Rated direct-fired cooling COP: 1.36
    Rated waste heat cooling COP: 1.41
20. Rated heating COP: 0.93
21. Life design: 25 years
22. Please refer to P5, P6 & P7 for performance curve, model selection & ordering and supply list information.

Model Selection Curves

(chilled/cooling water temp, cooling capacity, COP) orange means the rated value

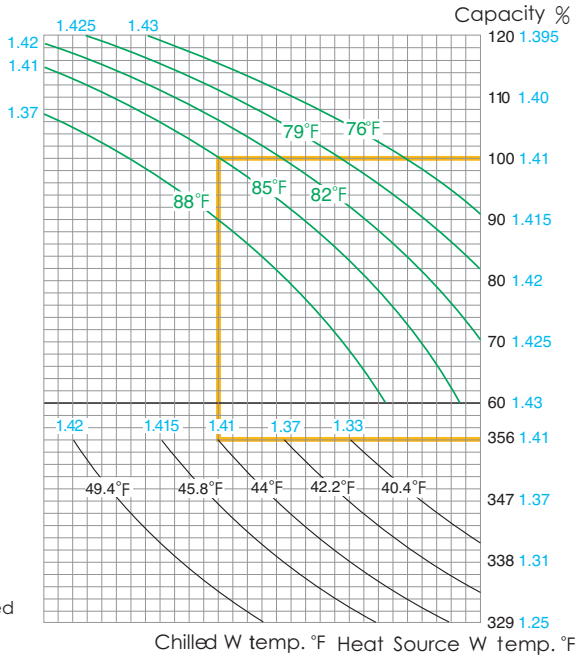
BZ



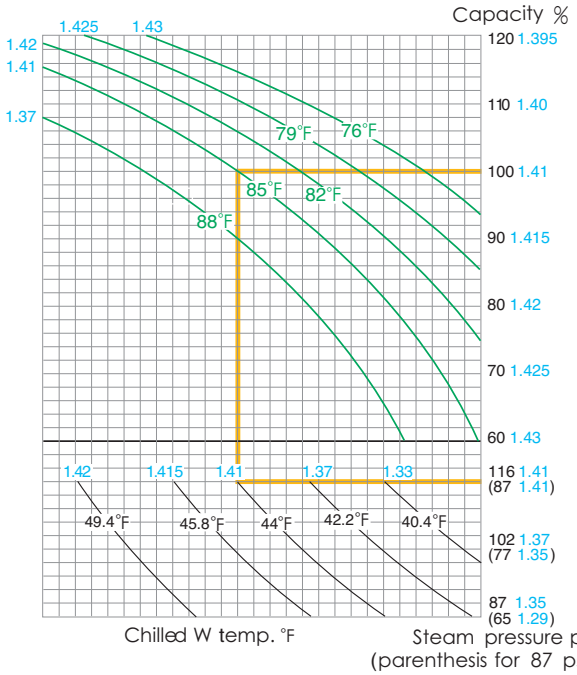
Notes: The figure in blue is COP. In calculation, 3 COP values are added and then divided by 3. e.g.

1. Cooling capacity is 100%, cooling water temp. is 82 °F, then chilled water temp. is 42.6 °F,COP is 1.358,i.e.(1.36+1.382+1.332)/3=1.358
2. Chilled water temp. is 49.4 °F, cooling water temp. is 85 °F, then cooling capacity is 116%, COP=1.374
3. Cooling capacity is 90%, chilled water is 42.2°F, then cooling water temp. is 85°F, COP=1.352

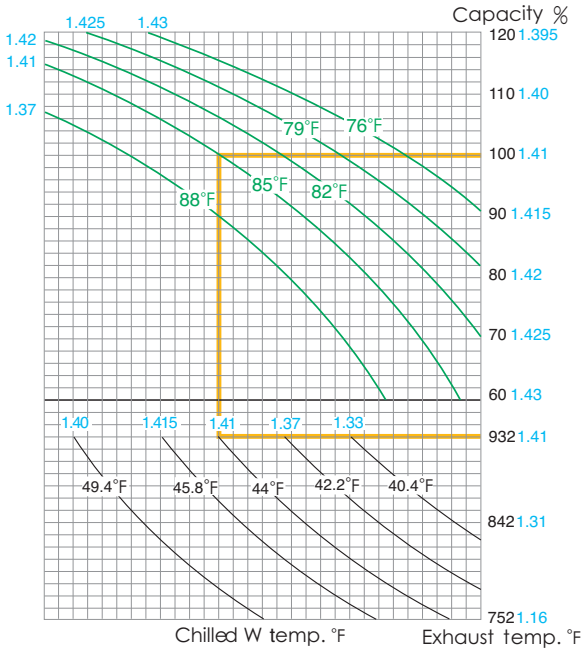
BH



BS



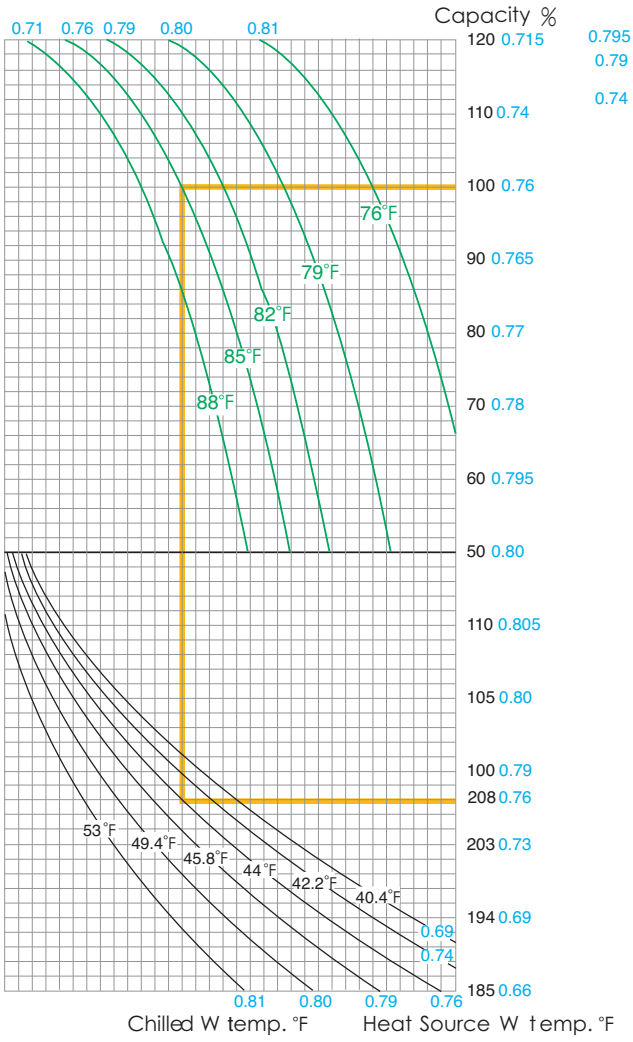
BE



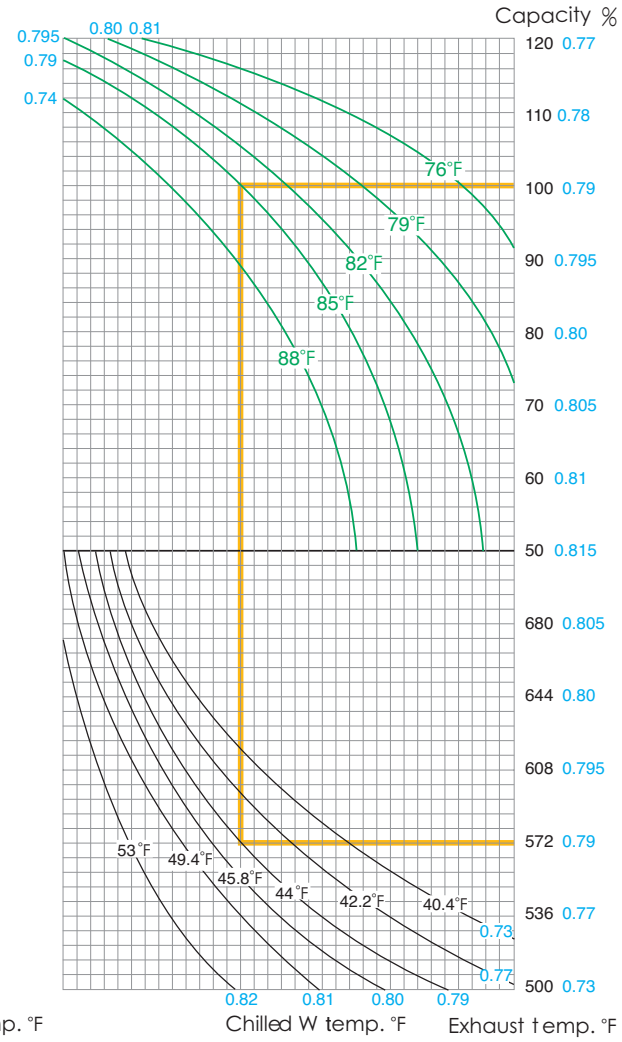
Notes: The figure in blue is COP. In calculation, 4 COP values are added and then divided by 4. e.g.

1. Cooling capacity is 100%, steam pressure 87 psig, cooling water temp. is 82°F, then chilled water temp. is 46.1 °F,COP is 1.399,i.e.(1.41+1.42+1.35+1.416)/4=1.399
2. Steam pressure 102 psig, chilled water temp. is 45.8 °F, cooling water temp. is 82°F, then cooling capacity is 106%, COP=1.402
3. Cooling capacity is 90%, steam pressure 116 psig, chilled water is 42.2°F, then cooling water temp. is 85.7°F, COP=1.396 (steam pressure 116psig)

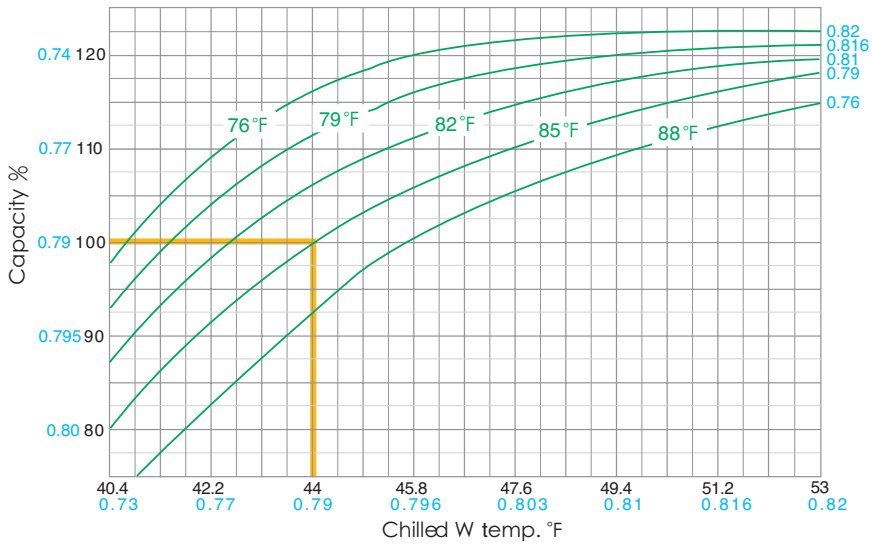
BDH



BDE



BDS



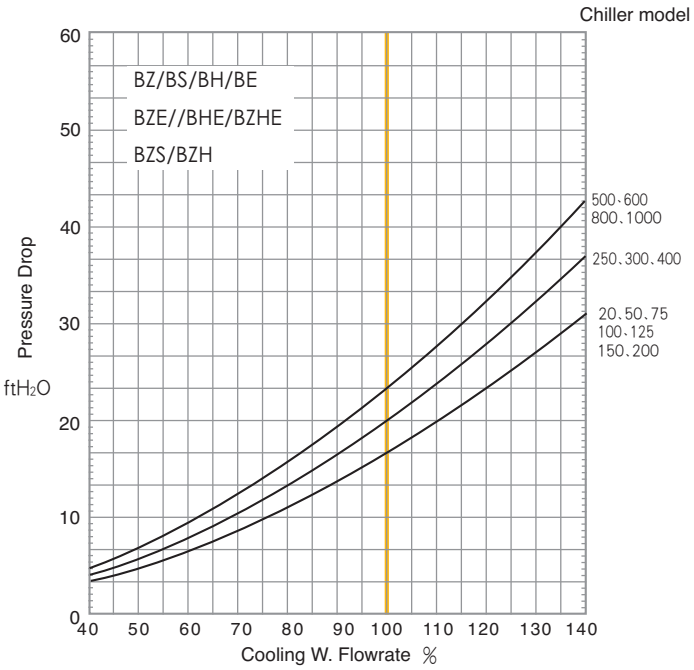
Note: The figure in blue is COP (BH, BE, BDH, BDE, BDS). Calculation is the same with BZ & BS models.

Model Selection Curves

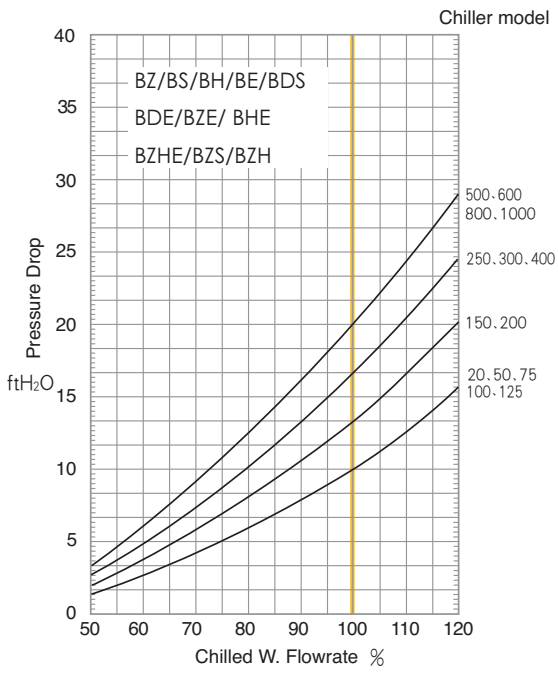
(Flowrate vs. Pressure Drop)

orange means the rated value

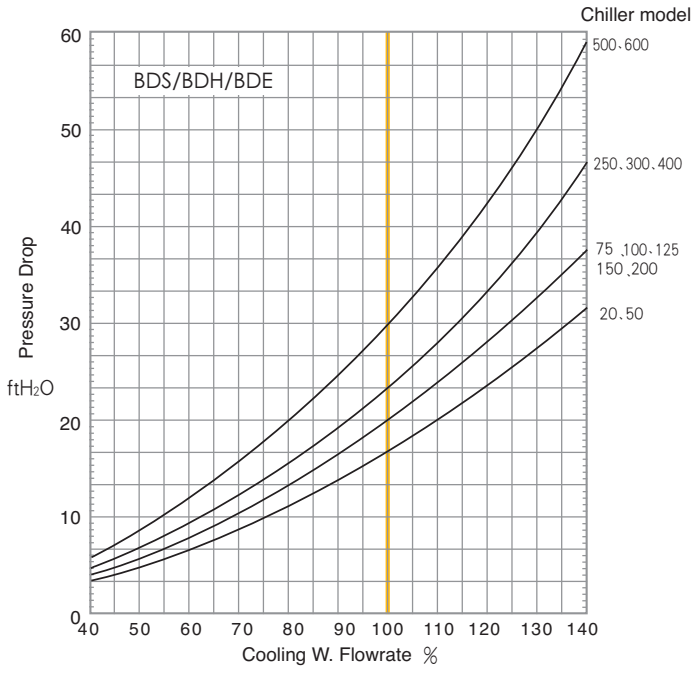
Cooling W Flowrate vs. Pressure Drop



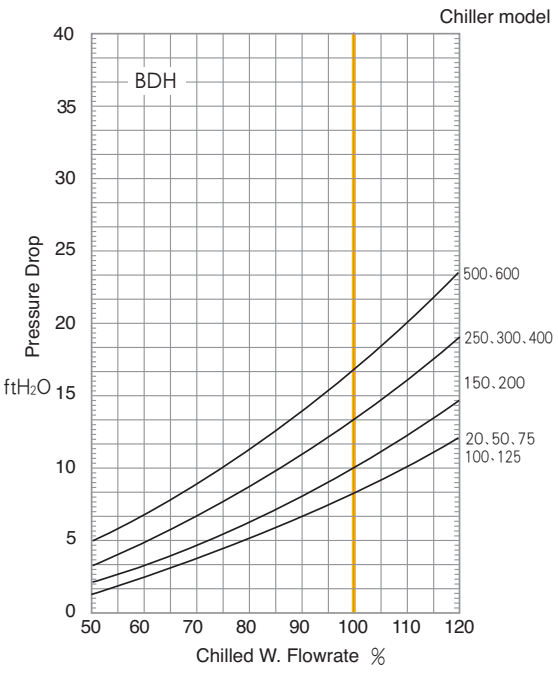
Chilled W Flowrate vs. Pressure Drop



Cooling W Flowrate vs. Pressure Drop



Chilled W Flowrate vs. Pressure Drop



Comparison between BROAD Packaged Pumpset and Conventional Machine Room Mode

Compared with conventional machine room mode, BROAD packaged pumpset system reduces the rated power demand by 40-60%, and the operating electricity consumption by 60-75% (the electricity for pumpset only amounts to 2-5% of the rated cooling capacity.)

Examples on power consumption comparison

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

Power consuming parts	Conventional machine room mode 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	63 kW	26 kW	17 kW (annual)
electricity/cooling capacity	10.8%	4.47%	2.92%
Annual operating consumption	**190 MWh**	**52 MWh (power saving is 73%)**	

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

Power consumption equipment	Conventional machine room type power demand	Packaged pumpset system	
		power demand	operating power consumption
Cooling capacity	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	327 kW	141 kW	100 kW (annual)
Electricity/cooling capacity	9.4%	4.04%	2.86%
Annual operating consumption	**1000 MWh**	**300 MWh (power saving is 70%)**	

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

Power consumption equipment	Conventional machine room type power demand	Packaged pumpset system	
		power demand	operating power consumption
Cooling capacity	550 kW	180 kW	30～180 kW
Cooling tower fan	110 kW	110 kW	22～110 kW
Chilled/heating W pump	440 kW	180 kW	90～180 kW
Total	1100 kW	470 kW	250 kW (annual)
Electricity/cooling capacity	9.5%	4.04%	2.15%
Annual operating consumption	**3300 MWh**	**750 MWh (power saving is 77%)**	

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.

Micro Non-electric Chiller (villa air conditioning)

Performance Data

Model		BCT23	BCT70	BCT115
cooling capacity	RT	6.6	20	33
	kW	23	70	115
heating capacity	MBH	78	239	392
	kW	23	70	115
hot W capacity	MBH	26	133	133
	kW	7.7	39	39
A/C water				
chilled water O/I temp	°F	44/56.7	44/56.7	44/56.7
heating water O/I temp	°F	135/122	135/122	135/122
flowrate	GPM	12.8	38	63
external head	psig	11.4	15.7	17.1
hot W				
primary heating water O/I temp	°F	176/140	176/140	176/140
flowrate	GPM	1.5	7.4	7.4
NG consumption				
cooling	MBH	71	217	357
heating	MBH	88	271	445
hot W	MBH	29.5	151	151
electricity and water consumption				
electricity for cooling	kW	1.8	5.2	7.2
electricity for heating	kW	0.7	1.7	2.3
water for cooling	lb/h	132	396	660
operating noise	dB(A)	63	65	65
ship. weight	lb	1211	3634	5462
A/C W hold-up volume	lb	22	70	105

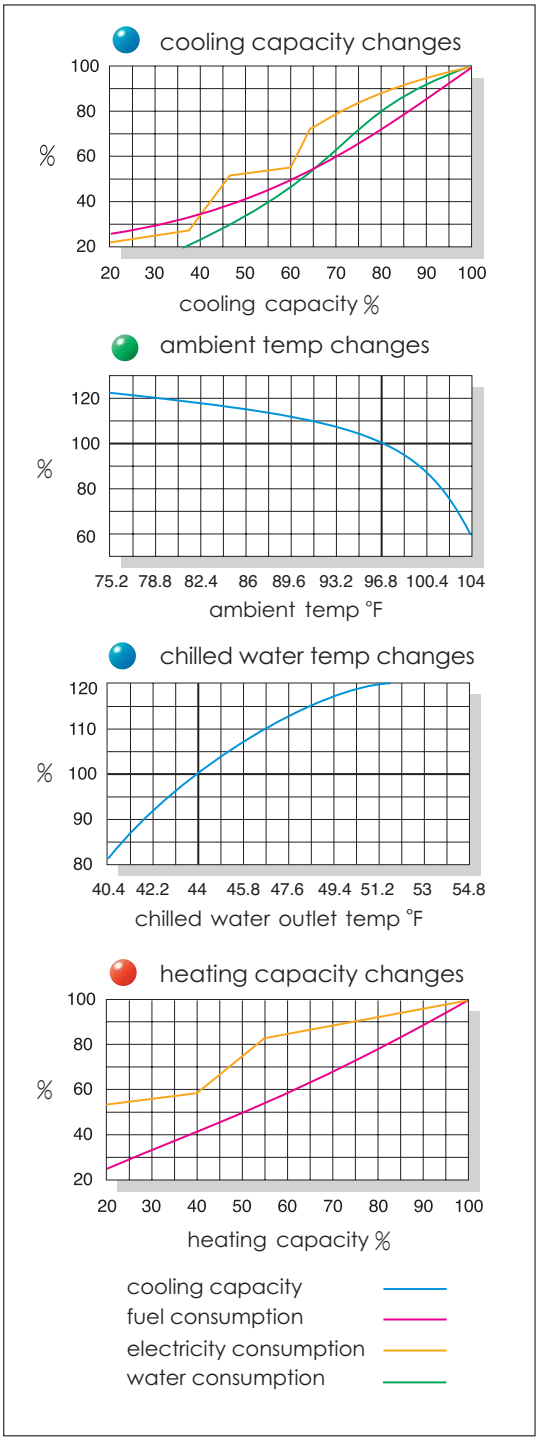
Others:

1. Fuel: NG, Town gas, LPG, Light oil, please specify it in purchase orders. Natural gas consumption is calculated by low heating 900Btu/ft^3 (8051kcal/m^3) .
2. Standard gas pressure: 0.66~2.1ftH_2O(200~650 mmH_2O). Pressure release valve has to be installed if the pressure is higher than the standard.
3. Standard condition for cooling: 96.8°F , humidity 50%. Permitted condition: summer ⩽ 113°F winter ⩾ −22°F.
4. Lowest permitted outlet temp. for chilled W: 41°F. Pressure limit for chilled/ heating/ hot W: 134ftH_2O.
5. Hot W can only be used after secondary heat exchange, otherwise it gets scaled.
6. Single phase power for BCT23 and 3 phase for BCT70/115.
7. Rated cooling COP: 110%
   Rated heating COP: 88%
8. Life design: 20 years.

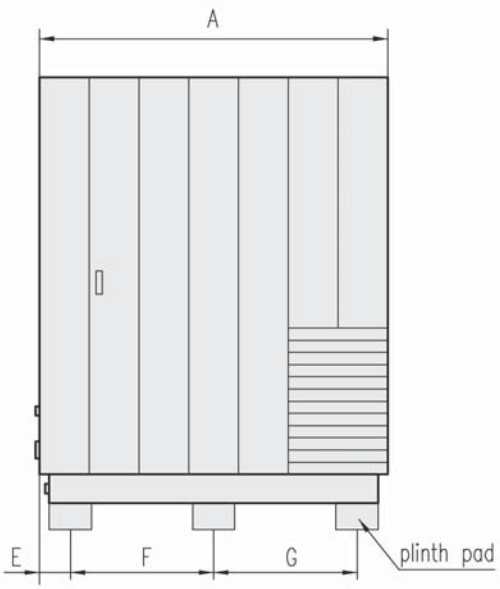
Model Selection & Ordering

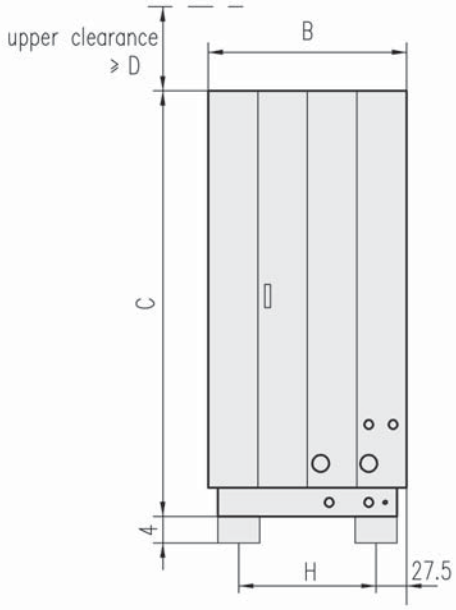
- BROAD recommendations are as follows:
  1 unit for buildings ⩽ 3240ft^2
  1~2 units for buildings ⩽ 21600ft^2
  2~3 units for buildings > 21600ft^2
  For year-round non-stop operation, at least 2 units are recommended, but standby units are not recommended. Several units can be incorporated into an integrated system.
- Lead time: 2~4 months for small quantity orders. Orders greater than 300 units, take at least 4 months.

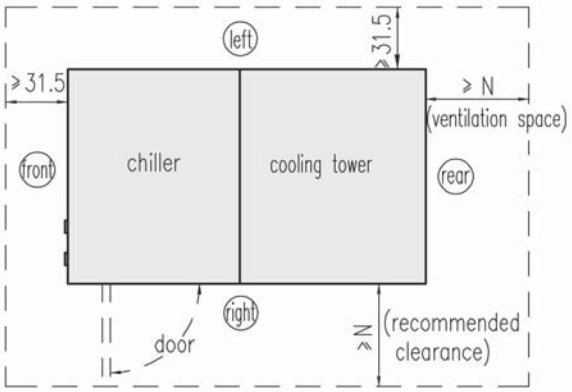
Performance Curves

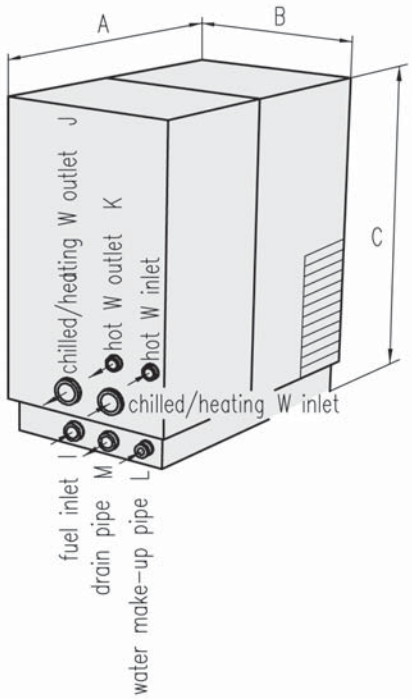


Micro Non-electric Chiller Dimensions







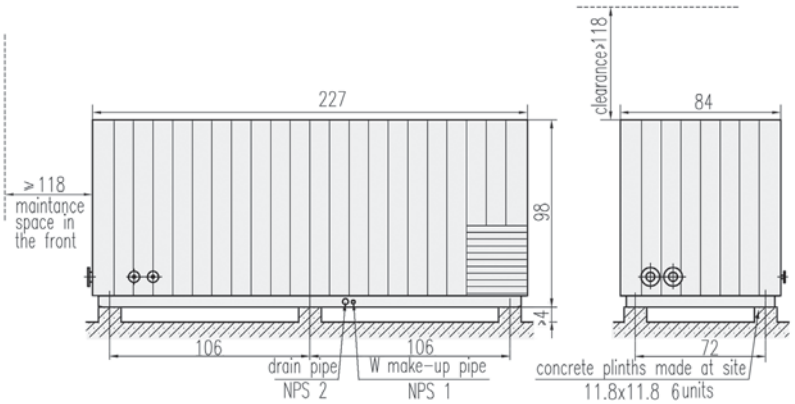


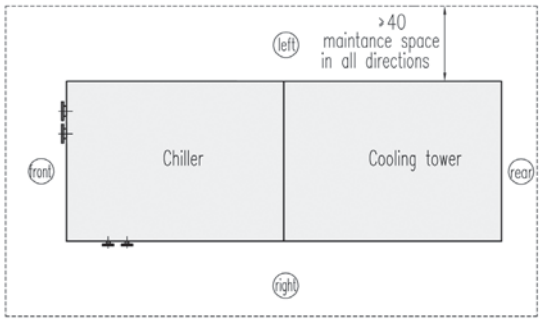
Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N
BCT23	53	32.5	88	78.5	4.5	15.5	30.5	27	NPT ¾	NPT 1½	NPT ½	NPT ½	NPT ¾	31.5
BCT70	88.5	63.5	88	98.5	5.5	35.5	41.5	57.5	NPT 1½	NPT 2½	NPT 1½	NPT ½	NPT 1½	39.5
BCT115	109	63.5	88	98.5	5.5	40	57.5	57.5	NPT 1½	NPT 2½	NPT 1½	NPT ½	NPT 1½	39.5

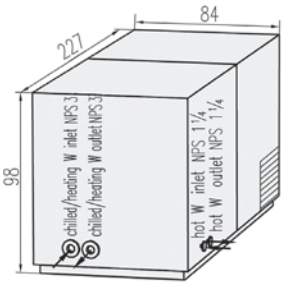
Note: All units are in inch.

Packaged DFA Dimensions

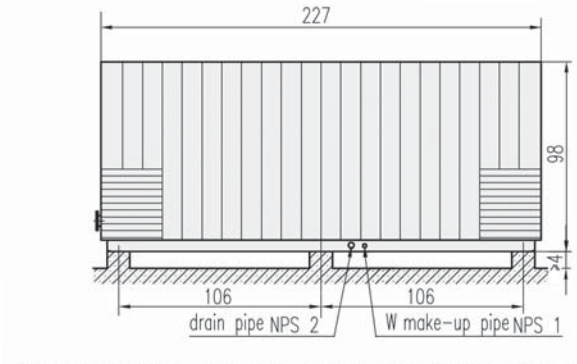
BYZ20

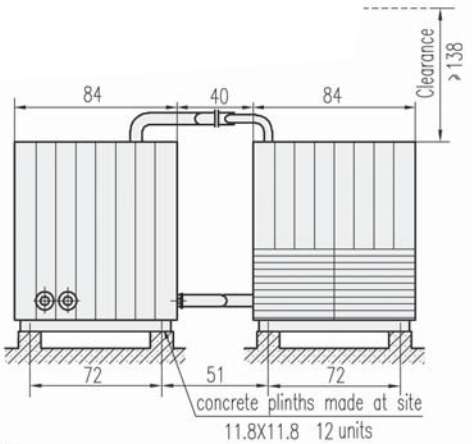


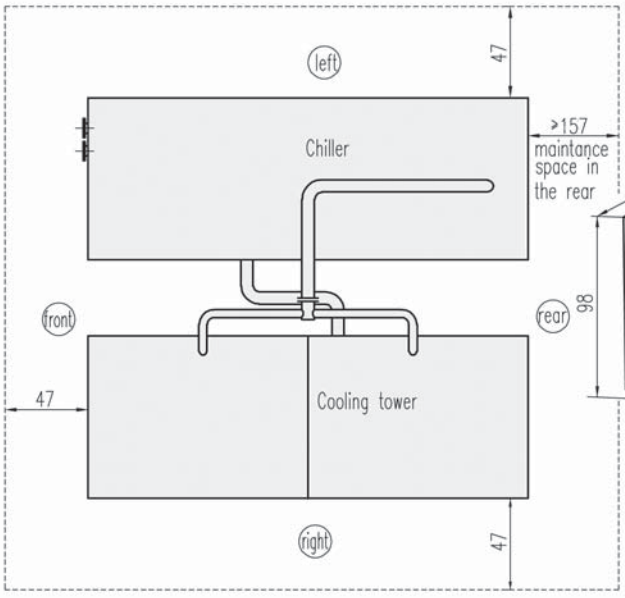


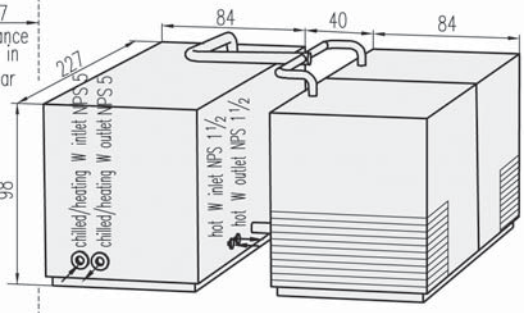


BYZ50



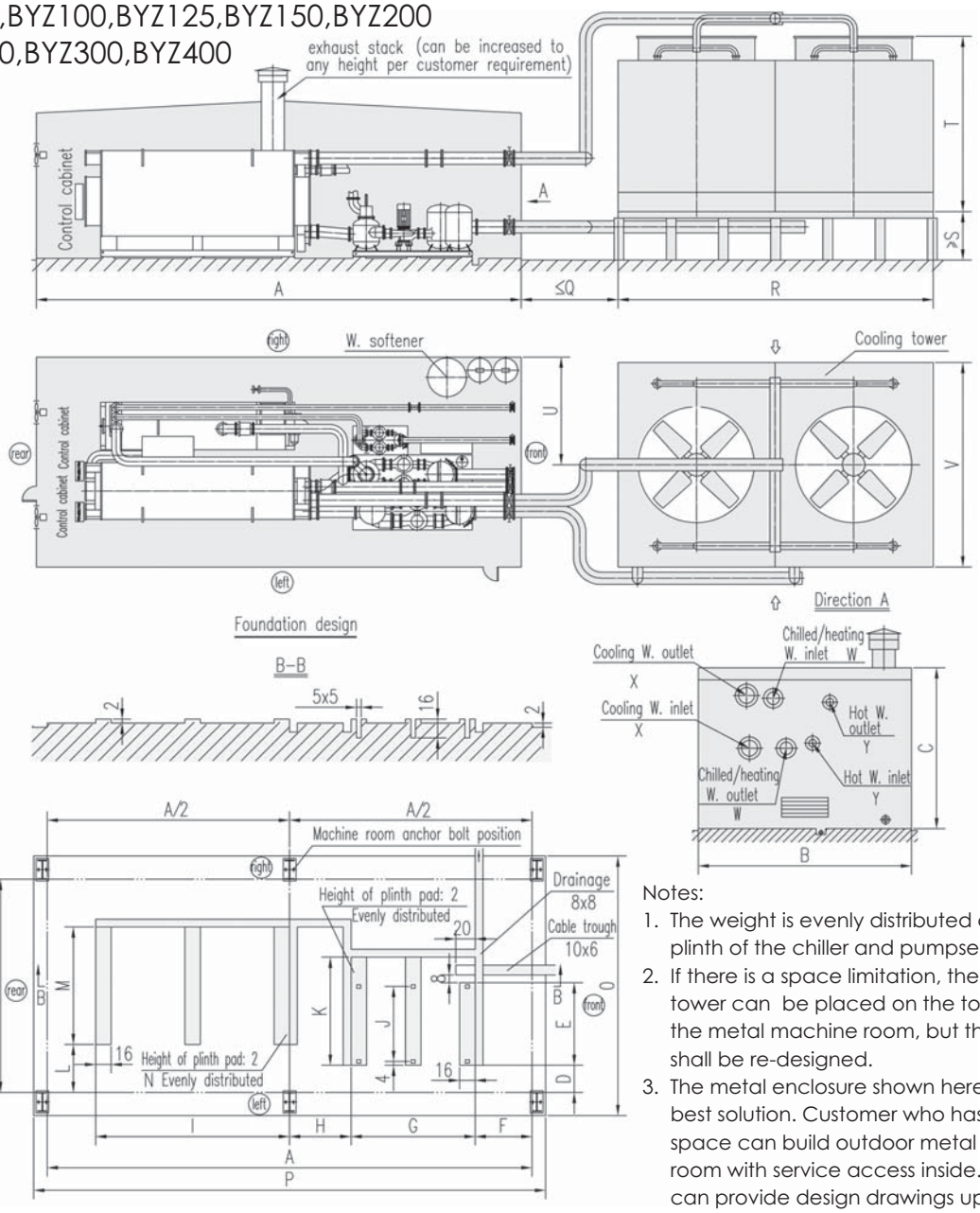






Packaged DFA Dimensions (with metal machine room)

BYZ75,BYZ100,BYZ125,BYZ150,BYZ200
BYZ250,BYZ300,BYZ400



Notes:

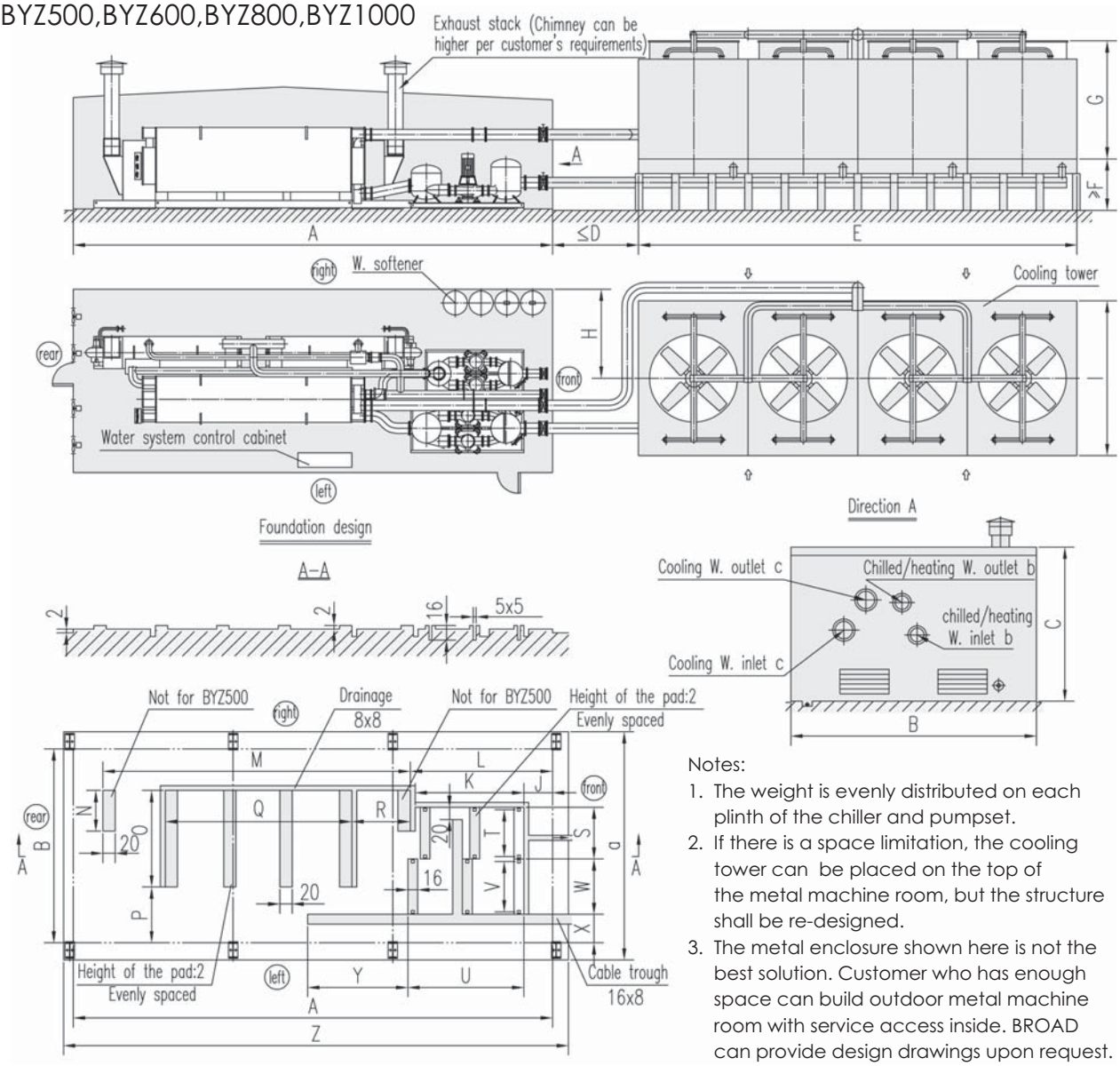
1. The weight is evenly distributed on each plinth of the chiller and pumpset.
2. If there is a space limitation, the cooling tower can be placed on the top of the metal machine room, but the structure shall be re-designed.
3. The metal enclosure shown here is not the best solution. Customer who has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

Model	A	B	C	D	E	F	G	H	I	J	K	L	M
BY75	394	177	127	25	80.5	38	106.5	42.5	157.5	72.5	105	35	87.5
BY100	394	177	127	27.5	80.5	23	116	47	157.5	72.5	105	35.5	97
BY125	453	177	145	22.5	83.5	32.5	114	52.5	197	75.5	108	31.5	100.5
BY150	453	177	145	23	83.5	39.5	114	51	197	75.5	109.5	31.5	105
BY200	492	197	163	26.5	89	38	126	62.5	197	81	115	37	125
BY250	531	197	167	24.5	89	40	126	65.5	236	81	115	34.5	128
BY300	551	217	168	29	93	40.5	136	64	236	85	125.5	40	147.5
BY400	551	236	192	28	98	43.5	104.5	71	236	90	301	38	157.5

Model	N	O	P	Q	R	S	T	U	V	W	X	Y
BY75	2	212.5	421	59	197	75	146	110	153.5	NPS 6	NPS 8	NPS 2½
BY100	2	212.5	421	59	228.5	77	170	98.5	161.5	NPS 6	NPS 8	NPS 2½
BY125	3	212.5	480	79	242	82	190	114.5	224.5	NPS 8	NPS 10	NPS 3
BY150	3	212.5	480	79	242	82	190	118	224.5	NPS 8	NPS 10	NPS 3
BY200	3	236	520	79	281.5	102	214	112	224.5	NPS 10	NPS 12	NPS 5
BY250	3	236	560	79	352.5	103.5	214	118	249	NPS 10	NPS 14	NPS 5
BY300	3	256	579	98	352.5	104.5	214	124.5	249	NPS 12	NPS 14	NPS 5
BY400	3	275.5	598	118	384	115	214	131.5	249	NPS 12	NPS 16	NPS 6

Packaged DFA Dimensions (with metal machine room)

BYZ500,BYZ600,BYZ800,BYZ1000



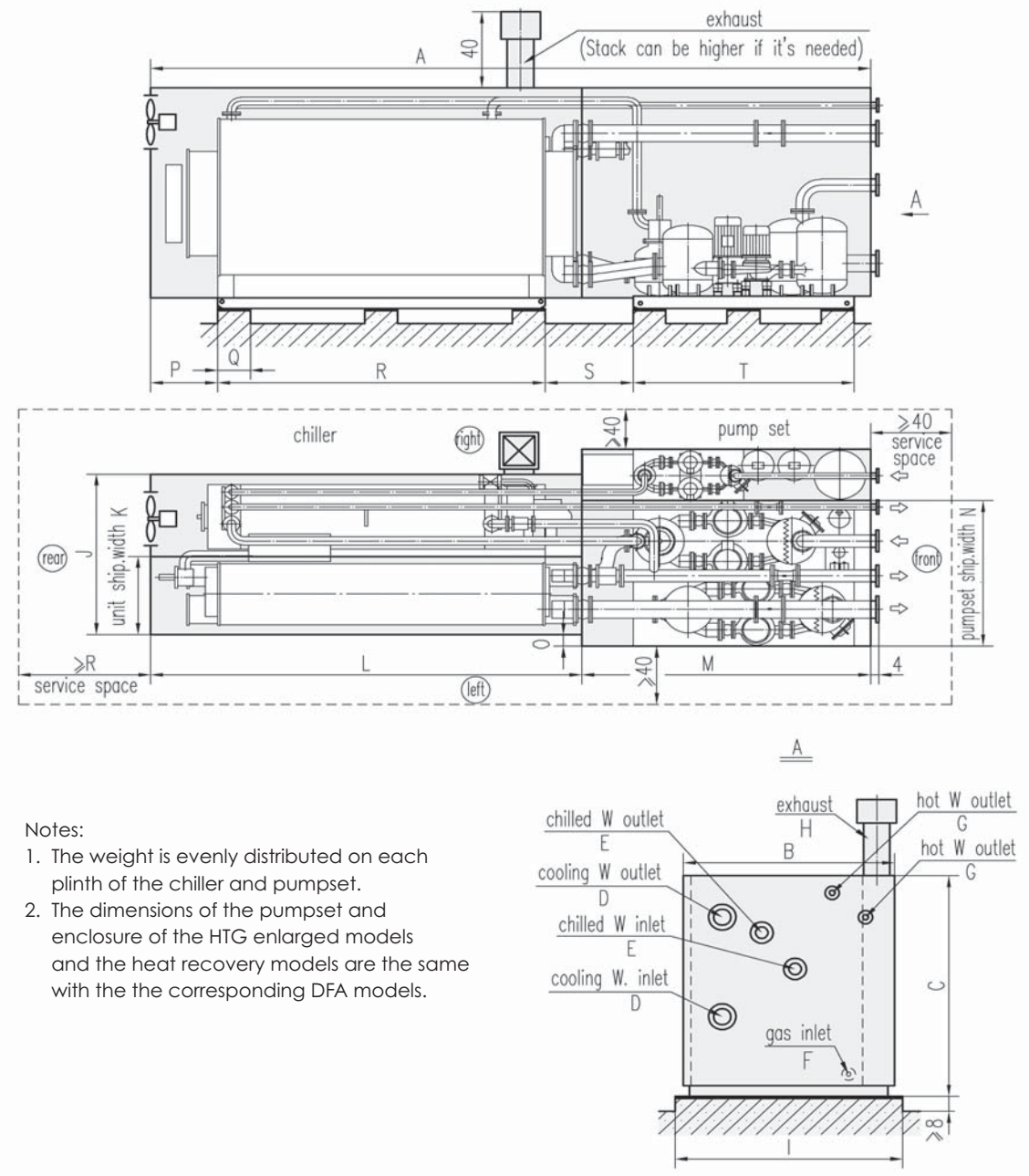
Notes:

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 drawings upon request.

Model	A	B	C	D	E	F	G	H	I	J
BY500	669	256	177	118	528	126.5	214	138.5	249	38
BY600	768	256	197	138	703	127	214	143.5	249	46
BY800	768	283	216.5	138	766	133	214	136	249	42
BY1000	835	283	216.5	157.5	957	138	214	136	249	55.5
Model	K	L	M	N	O	P	Q	R	S	T
BY500	128.5	/	/	/	162.5	51.5	315	297.5	53	47.5
BY600	157.5	223	512	65.5	147	57	315	98.5	58.5	53
BY800	157.5	219	512	71	161.5	67.5	315	98.5	56.5	51
BY1000	157.5	272	512	81	165.5	46	394	59	60	54
Model	U	V	W	X	Y	Z	a	b	c	
BY500	181	67	72.5	35.5	149.5	705	299	NPS 14	NPS 16	
BY600	181	67	72.5	37	165.5	803	299	NPS 16	NPS 18	
BY800	197	68.5	74	40	181	803	327	NPS 18	NPS 20	
BY1000	197	68.5	74	36	181	872	327	NPS 18	NPS 20	

Packaged DFA Dimensions (with enclosure)

BYZ75, BYZ100, BYZ125, BYZ150



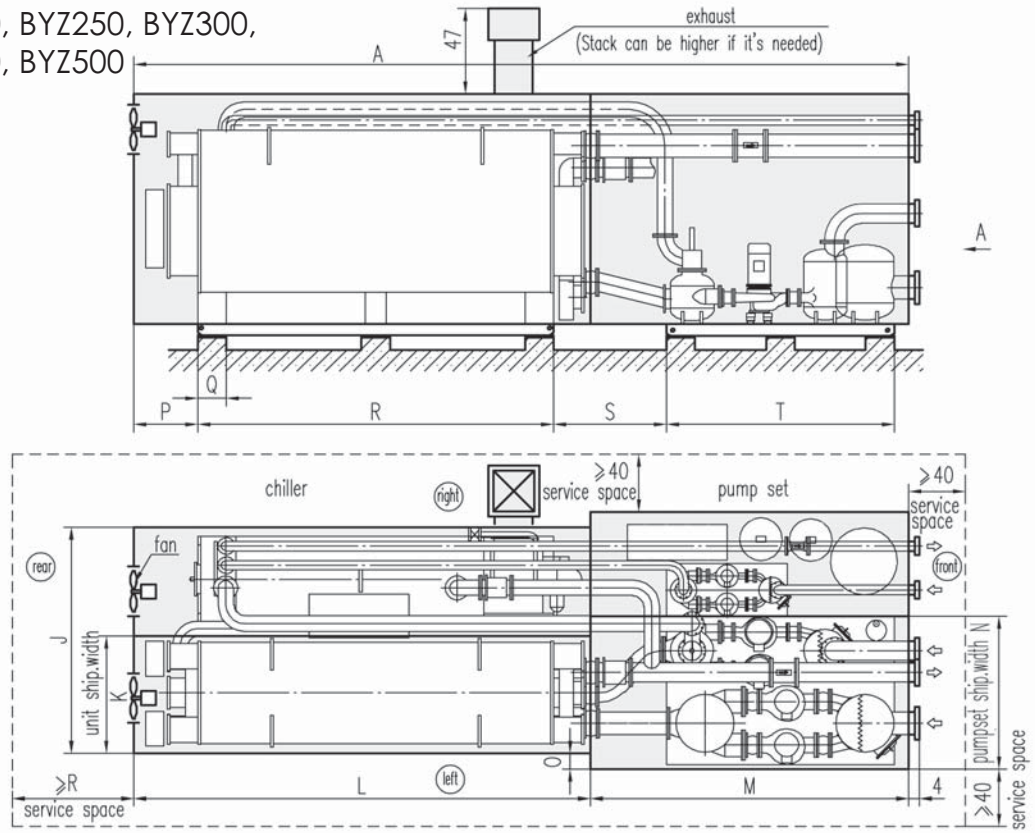
Notes:

1. The weight is evenly distributed on each plinth of the chiller and pumpset.
2. The dimensions of the pumpset and enclosure of the HTG enlarged models and the heat recovery models are the same with the the corresponding DFA models.

Model	A	B	C	D	E	F	G	H	I	J
BYZ75	347.5	103.5	116	NPS 8	NPS 6	NPS 1	NPS 2½	12.5×12.5	111.5	82.5
BYZ100	354.5	103.5	116	NPS 8	NPS 6	NPS 1½	NPS2½	14×14	111.5	97.5
BYZ125	397.5	125	117	NPS 10	NPS 8	NPS 1½	NPS 3	15.5×15.5	133	100
BYZ150	397.5	128	134	NPS 10	NPS 8	NPS 1½	NPS 3	17.5×17.5	136	108
Model	K	L	M	N	O	P	Q	R	S	T
BYZ75	43.5	191	156.5	76	8	33.5	15.5	157.5	42.5	106.5
BYZ100	53	240	114	76	8	33.5	155	157.5	47	114
BYZ125	53	252	145.5	78.5	35	34.5	15.5	197	52.5	114
BYZ150	57	252	145.5	78.5	0	34.5	15.5	197	52.5	114

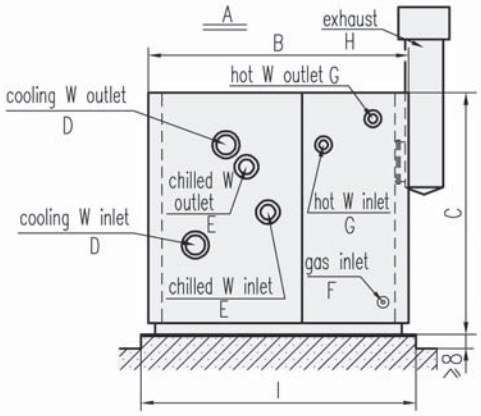
Packaged DFA Dimensions (with enclosure)

BYZ200, BYZ250, BYZ300,
BYZ400, BYZ500



Notes:

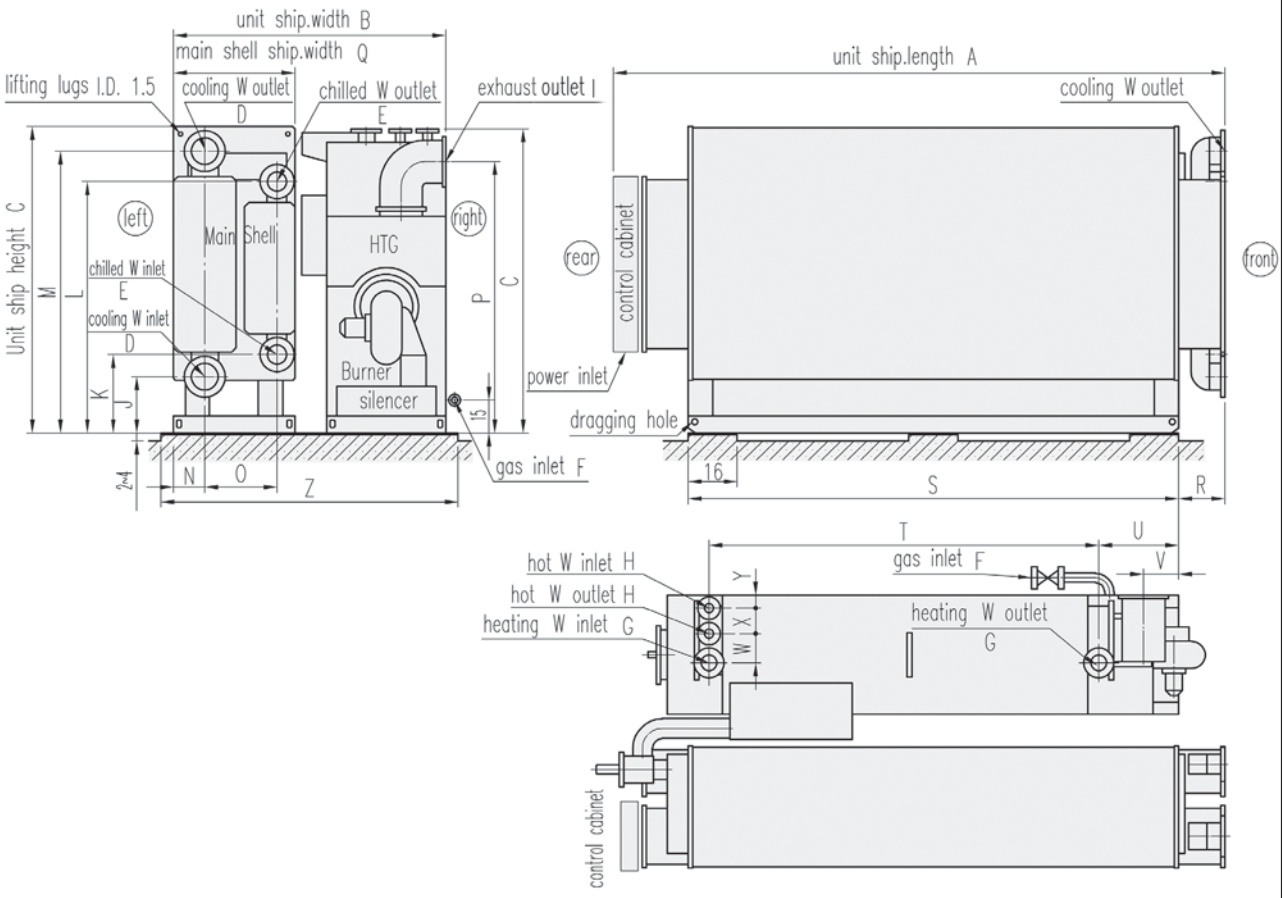
1. The weight is evenly distributed on each plinth of the chiller and pumpset.
2. The dimensions of the pumpset and enclosure of the HTG enlarged models and the heat recovery models are the same with the the corresponding DFA models.



Model	A	B	C	D	E	F	G	H	I	J
BYZ200	425	140	134	NPS 12	NPS 10	NPS 2	5	22×22	149.5	125
BYZ250	449	140	135.5	NPS 14	NPS 10	NPS 2	5	22×22	149.5	125
BYZ300	496	149.5	135.5	NPS 14	NPS 10	NPS 2	5	24×24	157.5	140
BYZ400	502	165.5	149.5	NPS 16	NPS 12	NPS 2½	5	28×28	173	157.5
BYZ500	630	157.5	149.5	NPS 16	NPS 14	NPS 3	/	31×31	181	157.5
Model	K	L	M	N	O	P	Q	R	S	T
BYZ200	62.5	254	171.5	84.5	7.5	35.5	15.5	197	59	126
BYZ250	62.5	189.5	159.5	84.5	7.5	31.5	15.5	236	51	126
BYZ300	78.5	346.5	149.5	59	9.5	43.5	15.5	236	69	136
BYZ400	78.5	252.5	149.5	59	9.5	43.5	15.5	236	73	145.5
BYZ500	78.5	429	201	84.5	16.5	43.5	19.5	315	78.5	181

DFA Dimensions

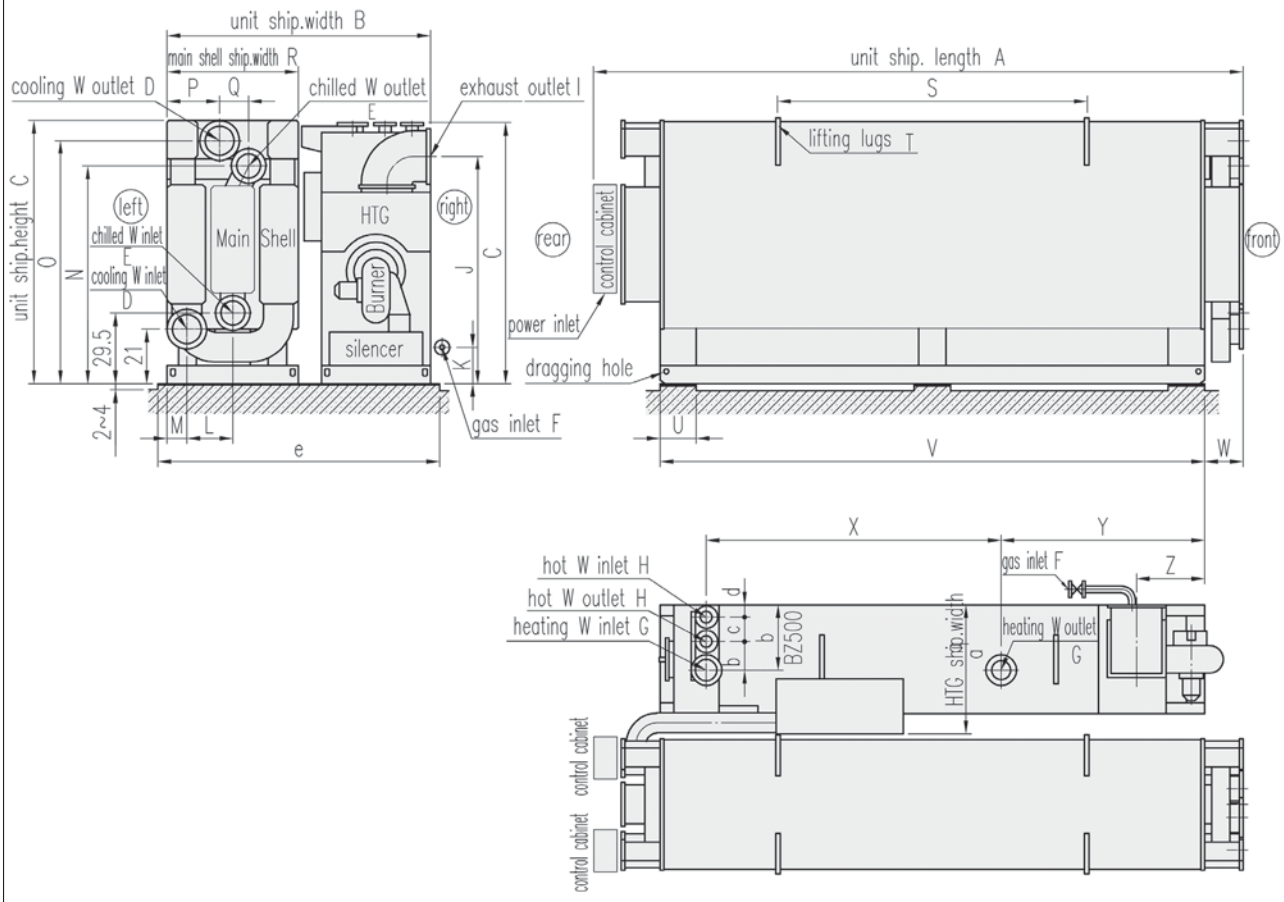
BZ75, BZ100, BZ125, BZ150



Model	A	B	C	D	E	F	G	H	I
BZ75	201	80.5	98.5	NPS 8	NPS 6	NPS 1	NPS 4	NPS 2½	12.5×12.5
BZ100	202	94	98.5	NPS 8	NPS 6	NPS 1½	NPS 5	NPS 2½	14×14
BZ125	244	94	98.5	NPS 10	NPS 8	NPS 1½	NPS 6	NPS 3	15.5×15.5
BZ150	244	101	114	NPS 10	NPS 8	NPS 1½	NPS 6	NPS 3	17.5×17.5
Model	J	K	L	M	N	O	P	Q	R
BZ75	17.5	23.5	82.5	90.5	8.5	17.5	87.5	39	15
BZ100	17.5	23.5	82.5	90.5	10	20.5	87	46	15
BZ125	17.5	23.5	82.5	90.5	10	20.5	82.5	46	15
BZ150	21.5	29.5	94.5	106.5	11	20.5	98.5	48.5	16.5
Model	S	T	U	V	W	X	Y	Z	
BZ75	157.5	125	25.5	12	8.5	8	4	88.5	
BZ100	157.5	125	25.5	11	9.5	8.5	4	102	
BZ125	197	127	54	25	10	8.5	4.5	102	
BZ150	197	127	54	24.5	10	8.5	4.5	109	

DFA Dimensions

BZ200, BZ250, BZ300, BZ400, BZ500

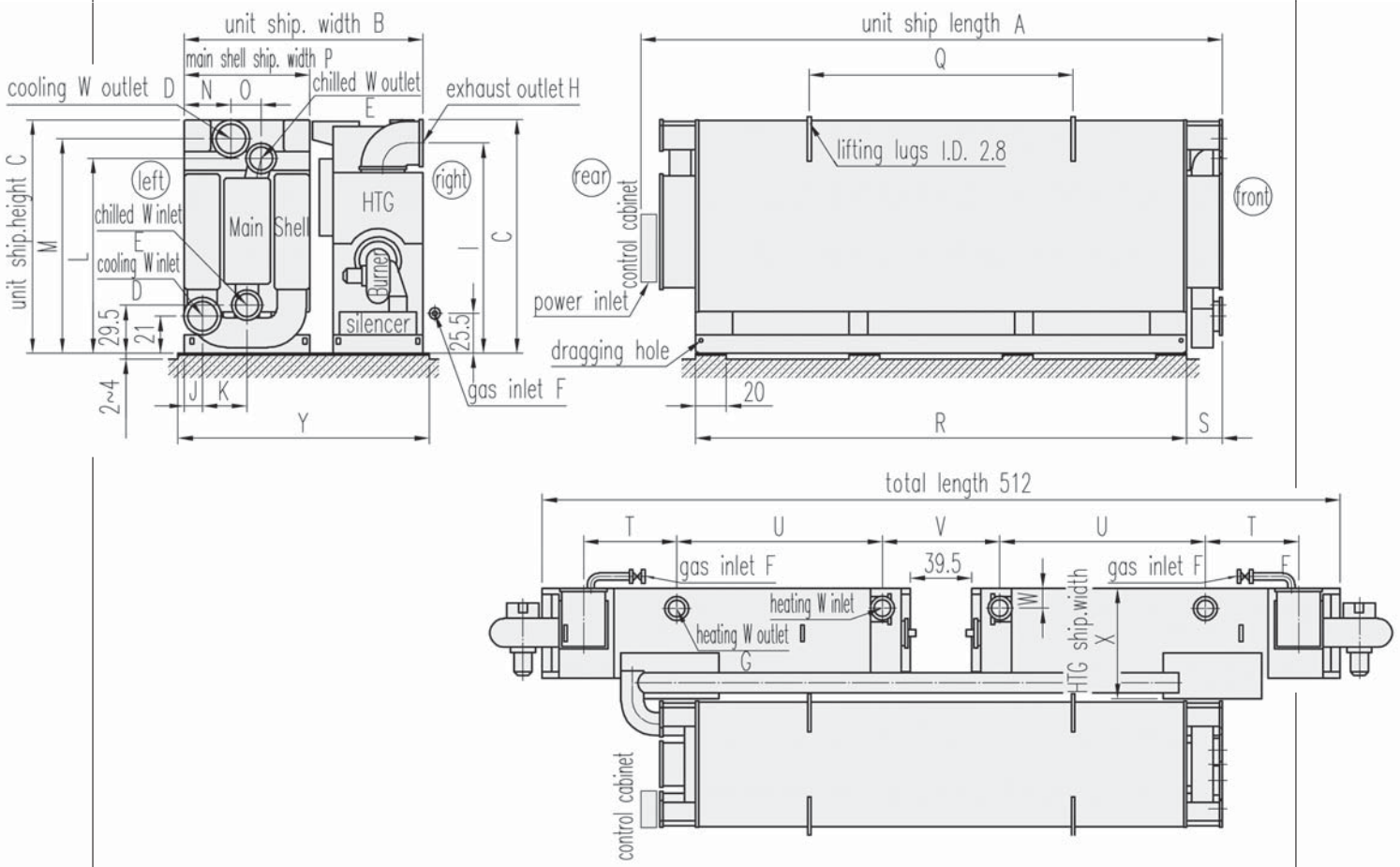


Model	A	B	C	D	E	F	G	H	I	J	K
BZ200	242.5	127.5	118	NPS 12	NPS 10	NPS 2	NPS 8	NPS 5	22×22	97	19.5
BZ250	286	127.5	118	NPS 14	NPS 10	NPS 2	NPS 8	NPS 5	22×22	99	19.5
BZ300	286	141	118	NPS 14	NPS 12	NPS 2½	NPS 8	NPS 5	24×24	98	19.5
BZ400	290.5	153	134.5	NPS 16	NPS 12	NPS 2½	NPS 10	NPS 6	28×28	114.5	25.5
BZ500	369	158	134.5	NPS 16	NPS 14	NPS 3	NPS 10	/	31×31	116	25.5

Model	L	M	N	O	P	Q	R	S	T	U	V
BZ200	17	11.5	93	105	28.5	11	67	118	I.D. 2.3	15.5	197
BZ250	16.5	12	92.5	104.5	28.5	13.5	67	134	I.D. 2.3	15.5	236
BZ300	20.5	12	94	104.5	29	16	76	134	I.D. 2.3	15.5	236
BZ400	22	13	107	119	31	17	80.5	134	I.D. 2.3	15.5	236
BZ500	22.5	12.5	107	119	29.5	19	80.5	169.5	I.D. 2.8	19.5	315

Model	W	X	Y	Z	a	b	c	d	e
BZ200	16.5	128	53	22	59	12.5	10.5	5.5	131.5
BZ250	18.5	128	88	29.5	59	12.5	10.5	5.5	131.5
BZ300	18.5	128	88	28.5	62	12.5	10.5	5.5	145
BZ400	21	130	87	26.5	62	14	12	6	157
BZ500	21	130	140.5	78	75	15.5	/	/	162

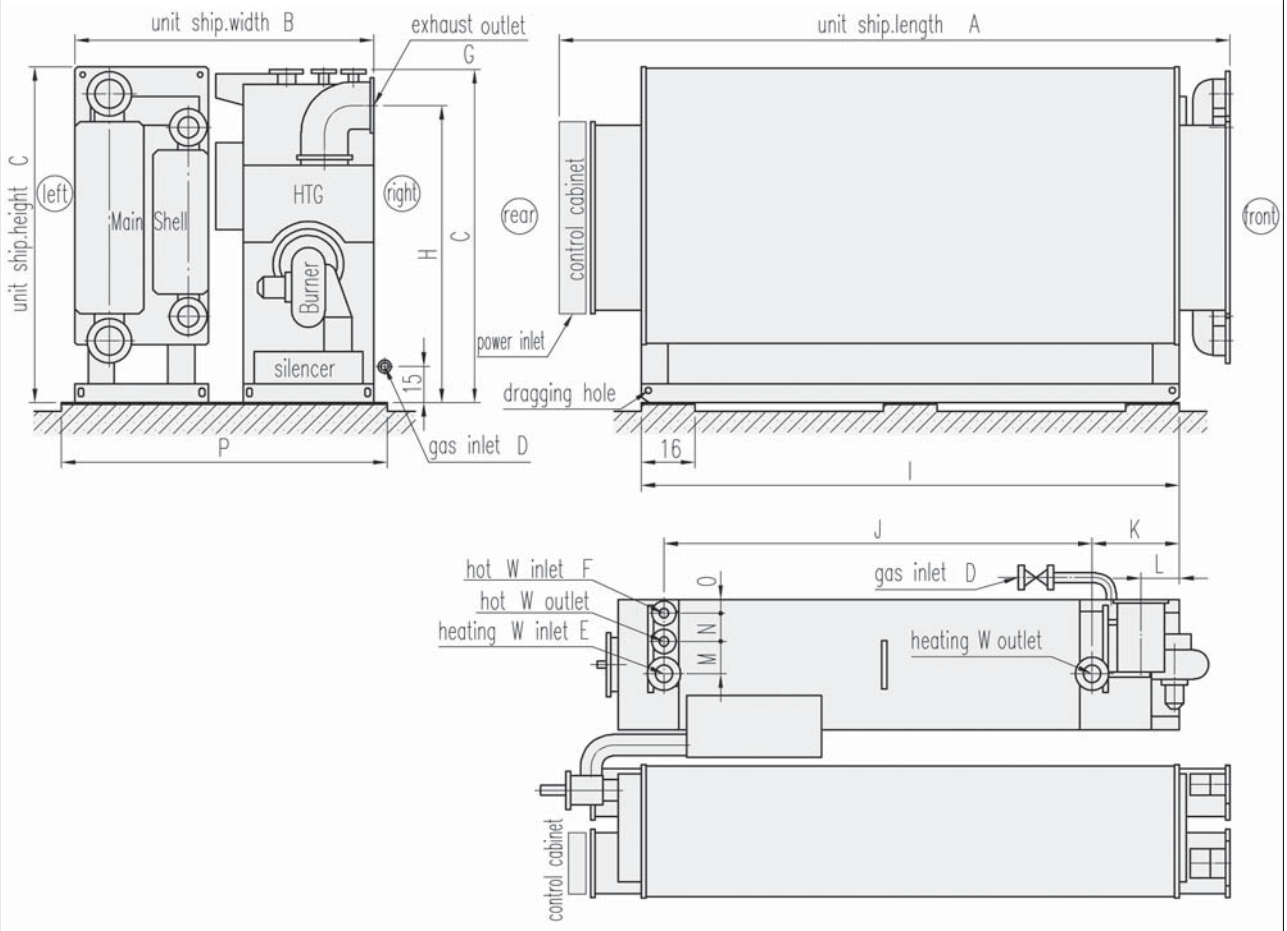
BZ600, BZ800, BZ1000



Model	A	B	C	D	E	F	G	H	I
BZ600	374	150	134.5	NPS 18	NPS 16	NPS 2½	NPS 8	24×24	114.5
BZ800	377	172	154	NPS 200	NPS 18	NPS 2½	NPS 10	28×28	134.5
BZ1000	456	172	154	NPS 200	NPS 18	NPS 3	NPS 10	31×31	136
Model	J	K	L	M	N	O	P	Q	R
BZ600	12	25.5	108	125.5	33.5	15	85	169.5	315
BZ800	13	27.5	124	143	36.5	16	91	169.5	315
BZ1000	13	27.5	124	143	36.5	16	91	197	393.5
Model	S	T	U	V	W	X	Y		
BZ600	23	60	128	79.5	12	63	154		
BZ800	25	60.5	130	77.5	13.5	73	176		
BZ1000	25	62	130	77.5	15.5	75	176		

HTG Enlarged Model Dimensions

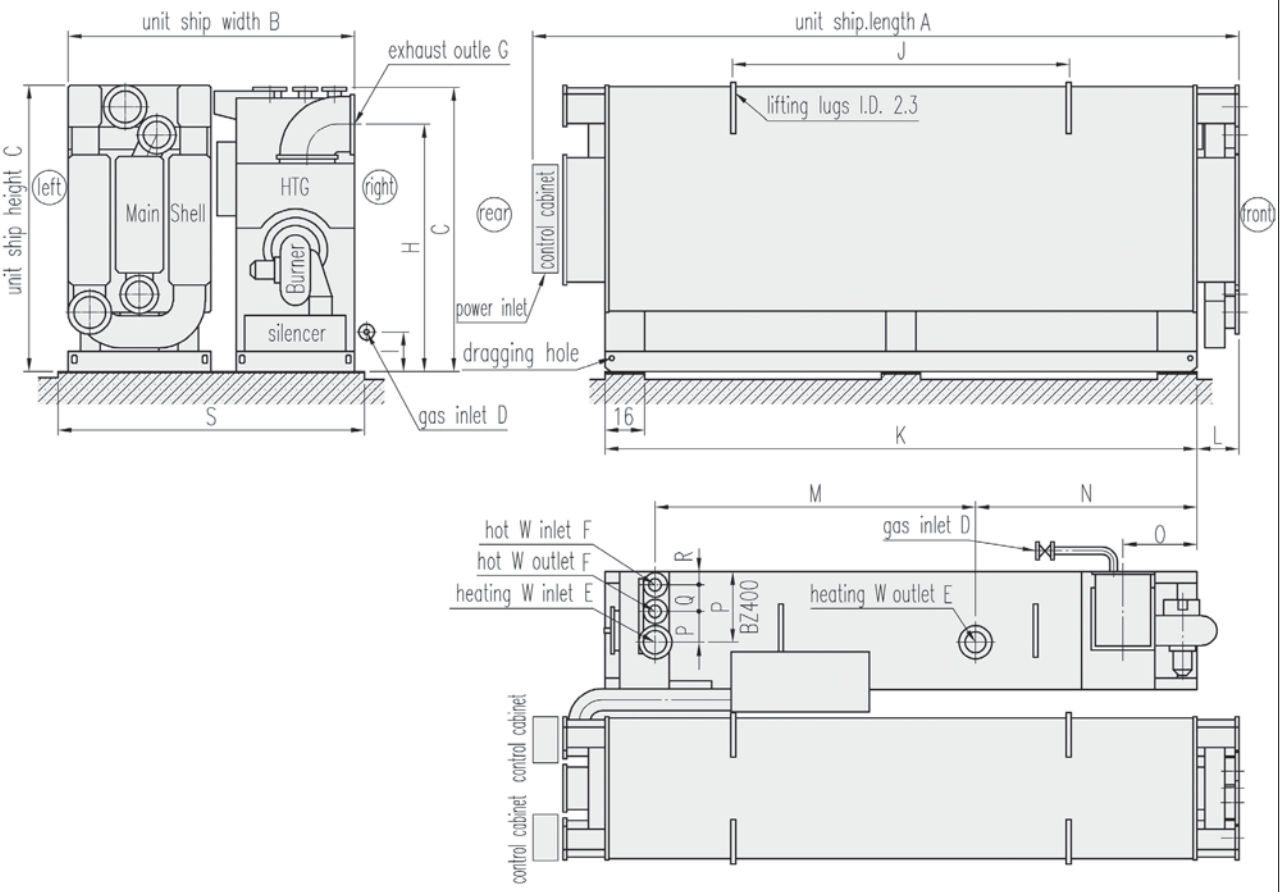
BZ75, BZ100, BZ125, BZ150



HTG Enlarged H_3,H_4 dimensions (HTG Enlarged H_1,H_2 is the same size with standard models)
(Refer to P30 of the DFA standard model for dimensions not shown in the drawing)

Model	A	B	C	D	E	F	G	H
BZ75	201	87	98.5	NPS 1½	NPS 5	NPS 2½	14×14	87
BZ100	202	94	98.5	NPS 1½	NPS 6	NPS 3	15.5×15.5	81.5
BZ125	244	101	98.5	NPS 1½	NPS 6	NPS 3	17.5×17.5	83
BZ150	244	105	114	NPS 2	NPS 8	NPS 5	22×22	99.5
Model	I	J	K	L	M	N	O	P
BZ75	157.5	125	25.5	11	8.5	8	4	95
BZ100	157.5	127	29.5	1	10	8.5	4.5	102
BZ125	197	127	54	24.5	10	8.5	4.5	109
BZ150	197	128	53	22	13	11	6	113

BZ200, BZ250, BZ300, BZ400



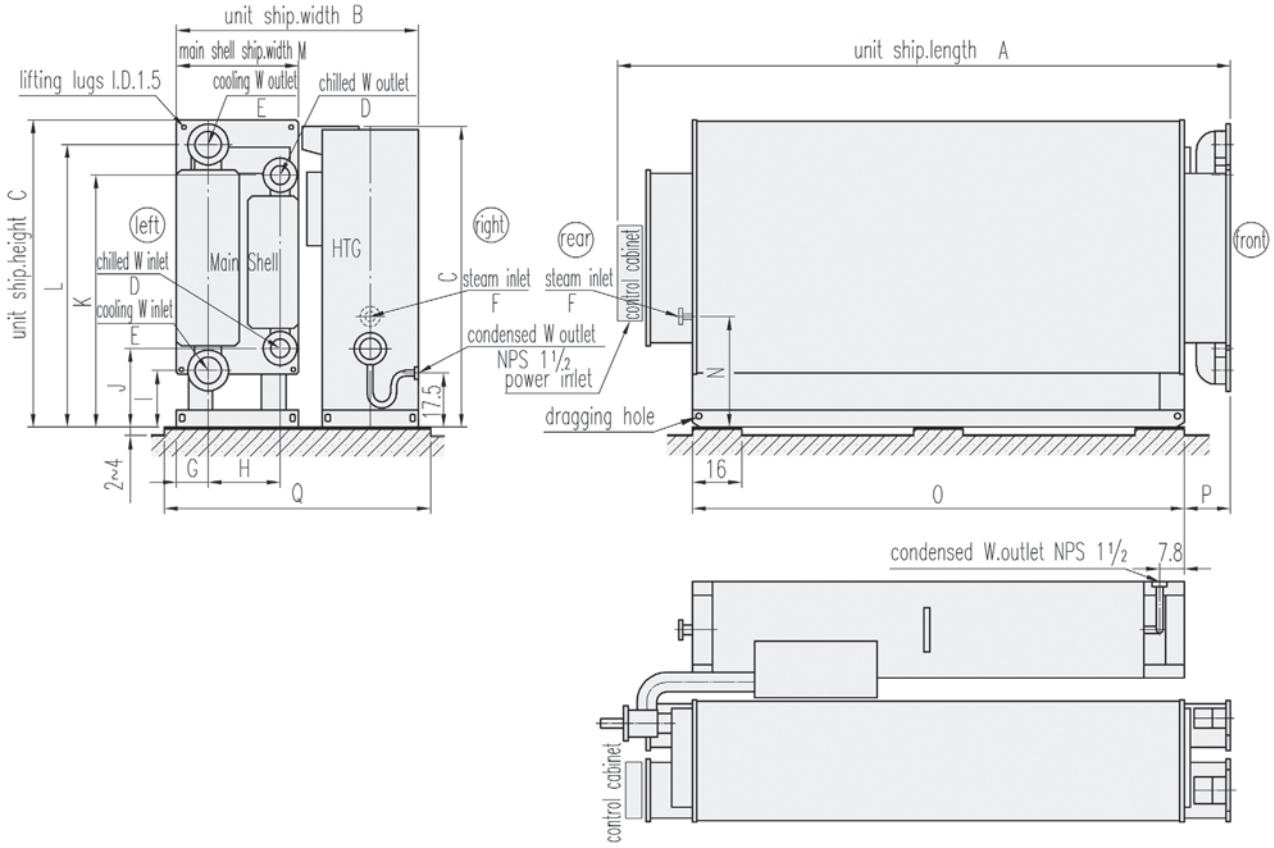
HTG Enlarged H_3,H_4 dimensions (HTG Enlarged H_1,H_2 is the same size with standard models)
(Refer to P31 of the DFA standard model for dimensions not shown in the drawing)

Model	A	B	C	D	E	F	G	H	I	J
BZ200	242.5	126	118	NPS 2	NPS 8	NPS 5	22×22	97	19.5	118
BZ250	286	132.5	118	NPS 2½	NPS 8	NPS 5	24×24	98	19.5	134
BZ300	286	148.5	118	NPS 2½	NPS 10	NPS 6	28×28	106	19.5	134
BZ400	290.5	158	134.5	NPS 3	NPS 10	/	31×31	116	25.5	134

Model	K	L	M	N	O	P	Q	R	S
BZ200	197	16.5	128	65	6.5	13	11	6	130
BZ250	236	18.5	128	88	28.5	13	11	6	136
BZ300	236	18.5	130	87	26.5	15.5	12	8	152.5
BZ400	236	21	130	86.5	25	15.5	/	/	162

Steam Chiller Dimensions

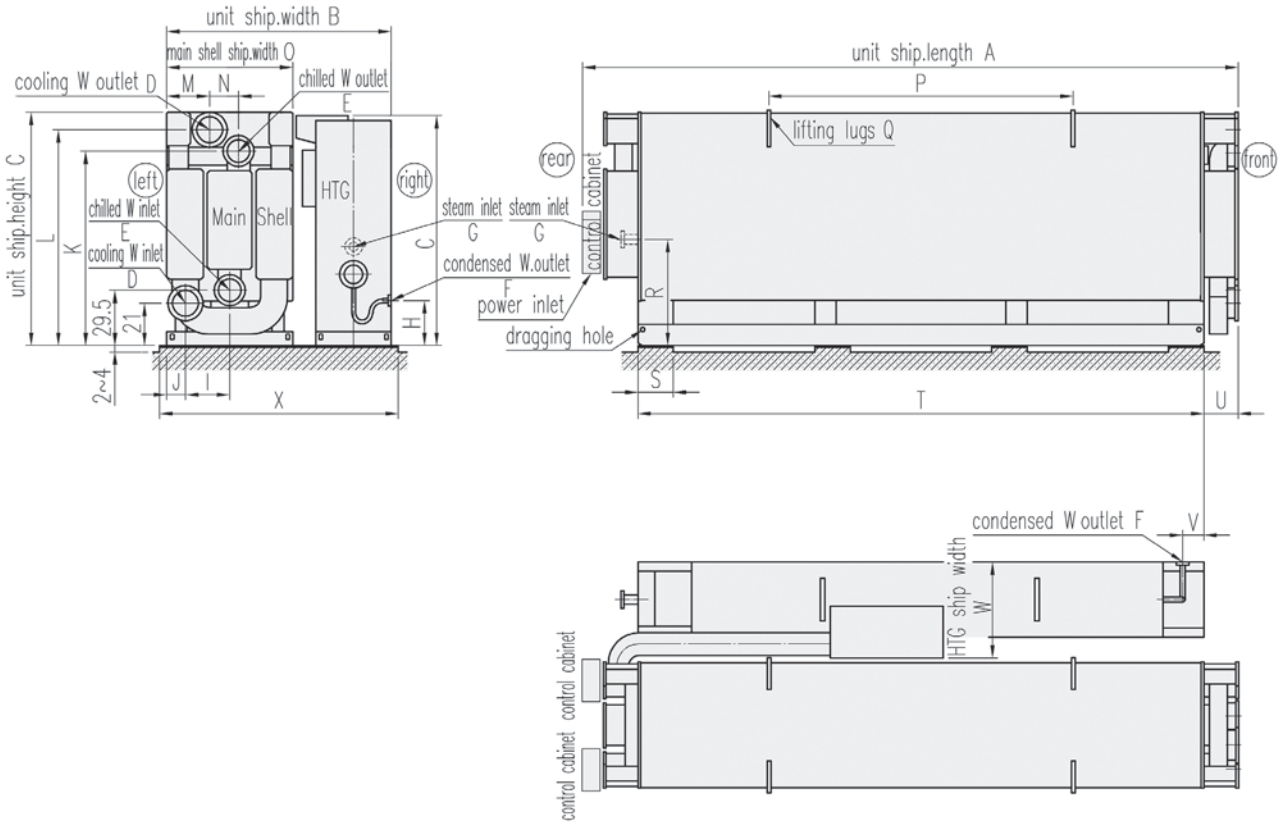
BS75, BS100, BS125, BS150



Model	A	B	C	D	E	F	G	H	I
BS75	201	75	98.5	NPS 6	NPS 8	NPS 1½	8.5	17.5	18
BS100	202	84.5	98.5	NPS 6	NPS 8	NPS 2	10	20.5	18
BS125	244	84.5	98.5	NPS 8	NPS 10	NPS 2	10	20.5	18
BS150	244	90.5	114	NPS 8	NPS 10	NPS 2½	11	20.5	23.5

Model	J	K	L	M	N	O	P	Q
BS75	25	82.5	90.5	39	42.5	157.5	15	78.5
BS100	25	82.5	90.5	46	35.5	157.5	15	88.5
BS125	25	82.5	90.5	46	35.5	197	16.5	88.5
BS150	30.5	94.5	106.5	48.5	52	197	16.5	92

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

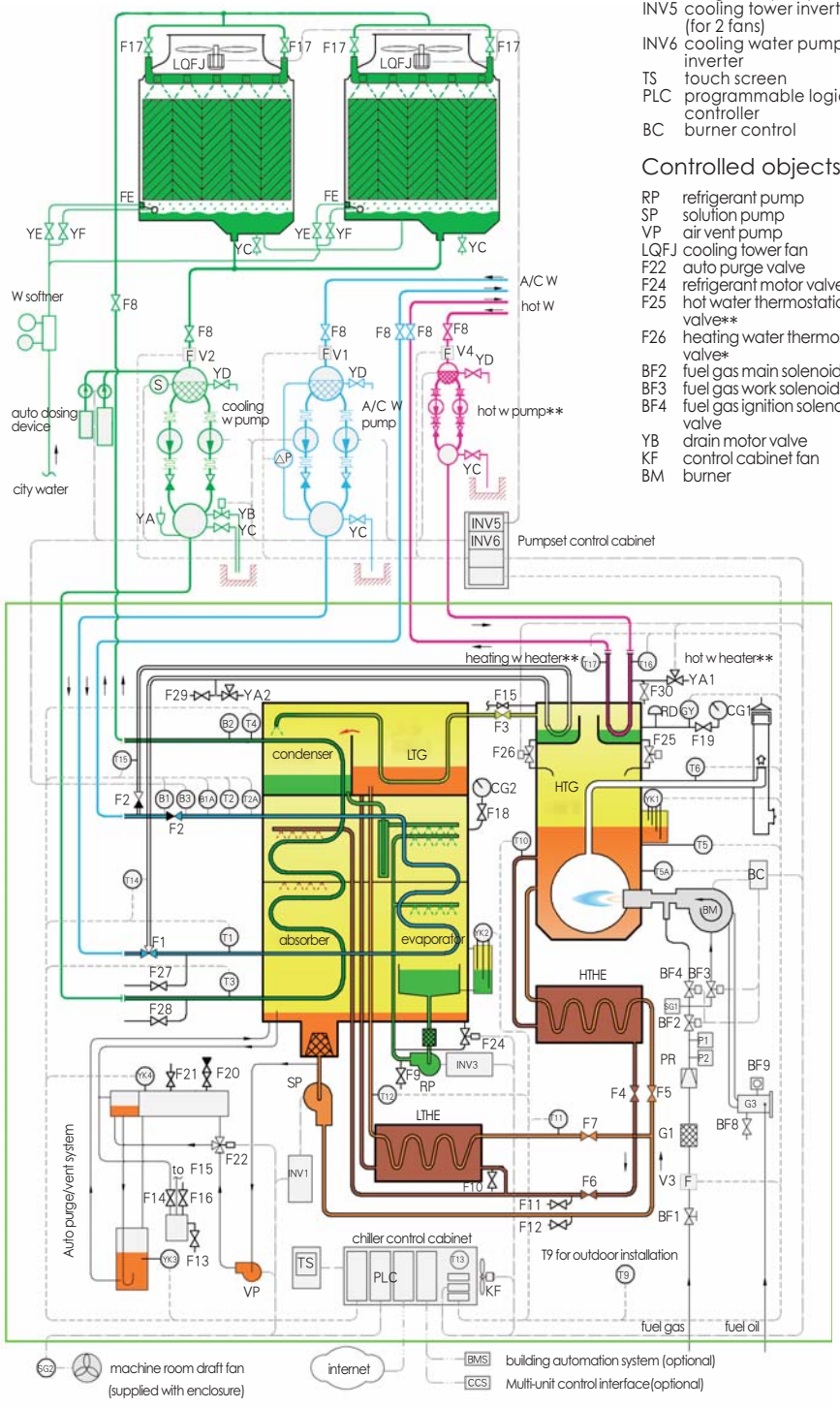


Model	A	B	C	D	E	F	G	H	I	J	K	L
BS200	242.5	115.5	118	NPS 12	NPS 10	NPS 1½	NPS 3	21.5	17	11.5	93	105
BS250	286	115.5	118	NPS 14	NPS 10	NPS 1½	NPS 3	21.5	16.5	12	92.5	104.5
BS300	286	131.5	118	NPS 14	NPS 12	NPS 2	NPS 4	21.5	20.5	12	94	104.5
BS400	290.5	137	134.5	NPS 16	NPS 12	NPS 2	NPS 4	23.5	22	13	107	119
BS500	369	137	134.5	NPS 16	NPS 14	NPS 2	NPS 5	23.5	22.5	12.5	107	119
BS600	374	143.5	138	NPS 18	NPS 16	NPS 2½	NPS 5	23.5	25.5	12	108	127.5
BS800	377	159.5	154	NPS 20	NPS 18	NPS 2½	NPS 6	23.5	27.5	13	124	143
BS1000	456	158	154	NPS 20	NPS 18	NPS 2½	NPS 6	23.5	27.5	13	124	143

Model	M	N	O	P	Q	R	S	T	U	V	W	X
BS200	28.5	11	67	118	I.D. 2.3	46	15.5	197	16.5	8	47	114
BS250	28.5	13.5	67	134	I.D. 2.3	46	15.5	236	18.5	8	47	114
BS300	29	16	76	134	I.D. 2.3	46	15.5	236	18.5	8	53	130
BS400	31	17	80.5	134	I.D. 2.3	55	15.5	315	21	12	55	136
BS500	29.5	19	80.5	169.5	I.D. 2.8	55	19.5	315	21	12	55	136
BS600	33.5	15	85	169.5	I.D. 2.8	55	19.5	315	23	12	55	143
BS800	36.5	16	91	169.5	I.D. 2.8	66.5	19.5	315	25	12	67	157.5
BS1000	36.5	16	91	197	I.D. 2.8	66.5	19.5	393.5	25	12	67	156

Note: Some dimension drawings are not included in this manual. Please request from BROAD or download CAD files from www.broad.com.

Packaged DFA P&I Diagram



Control devices:

INV1	solution pump inverter
INV3	refrigerant pump inverter
INV5	cooling tower inverter (for 2 fans)
INV6	cooling water pump inverter
TS	touch screen
PLC	programmable logic controller
BC	burner control

Controlled objects:

RP	refrigerant pump
SP	solution pump
VP	air vent pump
LQFJ	cooling tower fan
F22	auto purge valve
F24	refrigerant motor valve
F25	hot water thermostatic valve**
F26	heating water thermostatic 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**
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
V1	chilled/heating W flowmeter
V2	cooling W flowmeter
V3	gas flowmeter
V4	hot W flowmeter
S	conductivity sensor
ΔP	differential pressure sensor (optional)
SG1	burner gas leakage sensor
SG2	machine room gas leakage sensor

Others:

F1	chilled /heating W inlet three-way 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
F7	LTG 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 & mannual valve
F21	nitrogen charging valve
F27	chilled water drain valve
F28	cooling water drain valve
F29	heating water drain valve*
F30	hot water drain valve**
YA1	hot water 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
P2	upper limit pressure switch
PR	fuel gas pressure regulator
G1	gas filter
G3	oil filter
YA	auto air vent
YC	manual vent valve

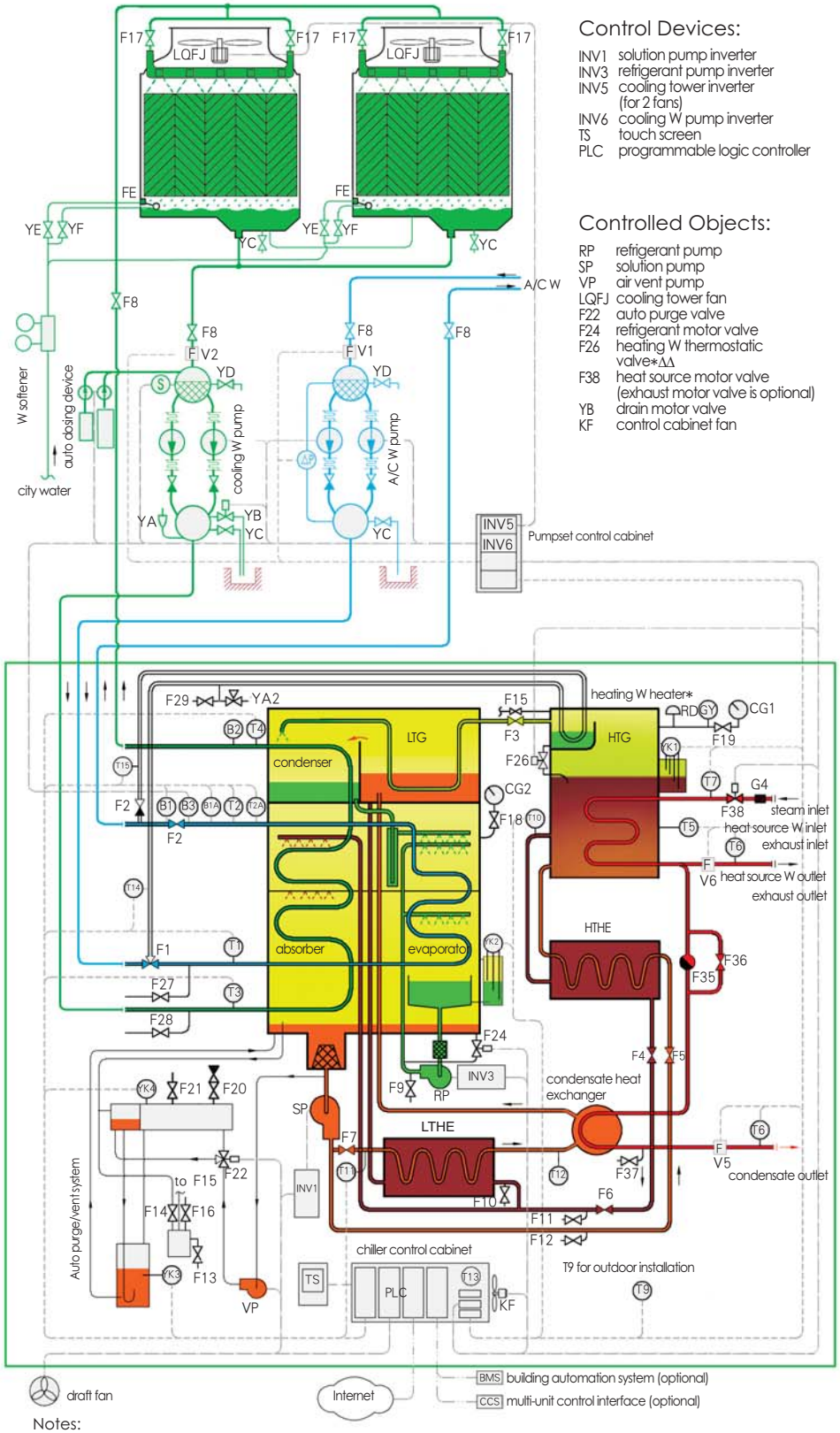
Notes:

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

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 Steam Chiller

(similar for BYS: steam chiller, BYH: hot W chiller, BYE: exhaust chiller)



Control Devices:

INV1	solution pump inverter
INV3	refrigerant pump inverter
INV5	cooling tower inverter (for 2 fans)
INV6	cooling W pump inverter
TS	touch screen
PLC	programmable logic controller

Controlled Objects:

RP	refrigerant pump
SP	solution pump
VP	air vent pump
LQFJ	cooling tower fan
F22	auto purge valve
F24	refrigerant motor valve
F26	heating W thermostatic valve*ΔΔ
F38	heat source motor valve (exhaust motor valve is optional)
YB	drain motor valve
KF	control cabinet fan

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
T6	heat source outlet temp sensor
T7	heat source 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*ΔΔ
T15	heating W outlet temp sensor*ΔΔ
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 vent probe
V1	A/C W flow meter
V2	cooling W flow meter
V5	condensate flow meter (optional) Δ
V6	heat source W flow meter (optional) ΔΔΔ
S	conductivity sensor
ΔP	differential pressure sensor (optional)

Others:

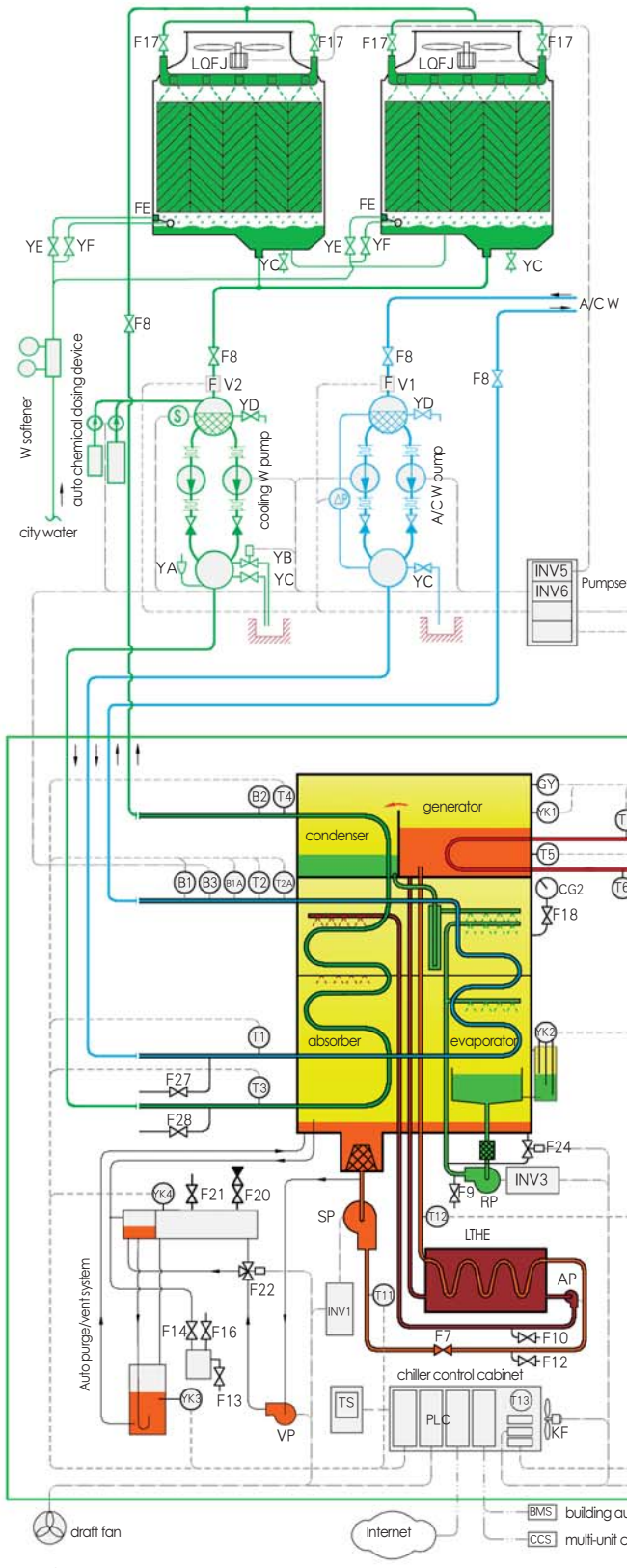
F1	chilled/heating W inlet three-way valve
F2	A/C W outlet check valve*ΔΔ
F3	steam angle valve
F4	concentrated solution angle valve
F5	diluted solution angle valve
F6	HTG concentration regulating valve
F7	LTG concentration regulating valve
F8	water system shutoff valve
F9	refrigerant sampling valve
F10	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 & mannual valve
F21	nitrogen charging valve
F27	chilled W drain valve
F28	cooling W drain valve
F29	heating W drain valve
F35	steam trap
F36	condensate by-pass valve
F37	anti-freeze drain valve
YA2	heating W pressure release valve
FE	auto W make-up valve
YA	auto air vent
YC	manual drain valve
YD	discharge valve
YE	W make-up valve
YF	manual W make-up valve
CG1	HTG compound gauge
CG2	main shell compound gauge
G4	filter (N/A for exhaust chiller)
RD	rupture disc

Notes:

1. ▭ chiller scope.
2. The components marked with "Δ" for steam chiller, and marked with "ΔΔ" for exhaust chiller, "ΔΔΔ" for hot W chiller.
3. The components marked with "*" are N.A with cooling only models.
4. Line type: actuator signal output
   sensor signal input
   communication

Packaged Single-stage Steam Chiller

(similar for BYDS: Single-stage steam chiller, BYDH: Single-stage hot W chiller, BYDE: Single-stage exhaust chiller)



Control Devices:

INV1	solution pump inverter
INV3	refrigerant pump inverter
INV5	cooling tower inverter (for 2 fans)
INV6	cooling W pump inverter
TS	touch screen
PLC	programmable logic controller

Controlled Objects:

RP	refrigerant pump
SP	solution pump
VP	air vent pump
AP	absorption pump
LQFJ	cooling tower fan
F22	auto purge valve
F24	refrigerant motor valve
F38	heat source motor valve (exhaust motor valve is optional)
YB	drain motor valve
KF	control cabinet fan

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	generator temp sensor
T6	heat source W outlet temp sensor
T7	heat source W inlet temp sensor
T9	ambient temp sensor
T11	crystallization sensor
T12	control cabinet temp sensor
T13	heating W inlet 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	generator solution level probe
YK2	refrigerant level probe
YK3	non-condensable probe
YK4	auto purge sensor
V1	A/C W flow meter
V2	cooling W flow meter
V5	condensate flow meter(optional) Δ heat source W flow meter ΔΔΔ
S	conductivity sensor
ΔP	differential pressure sensor(optional) Δ

Others:

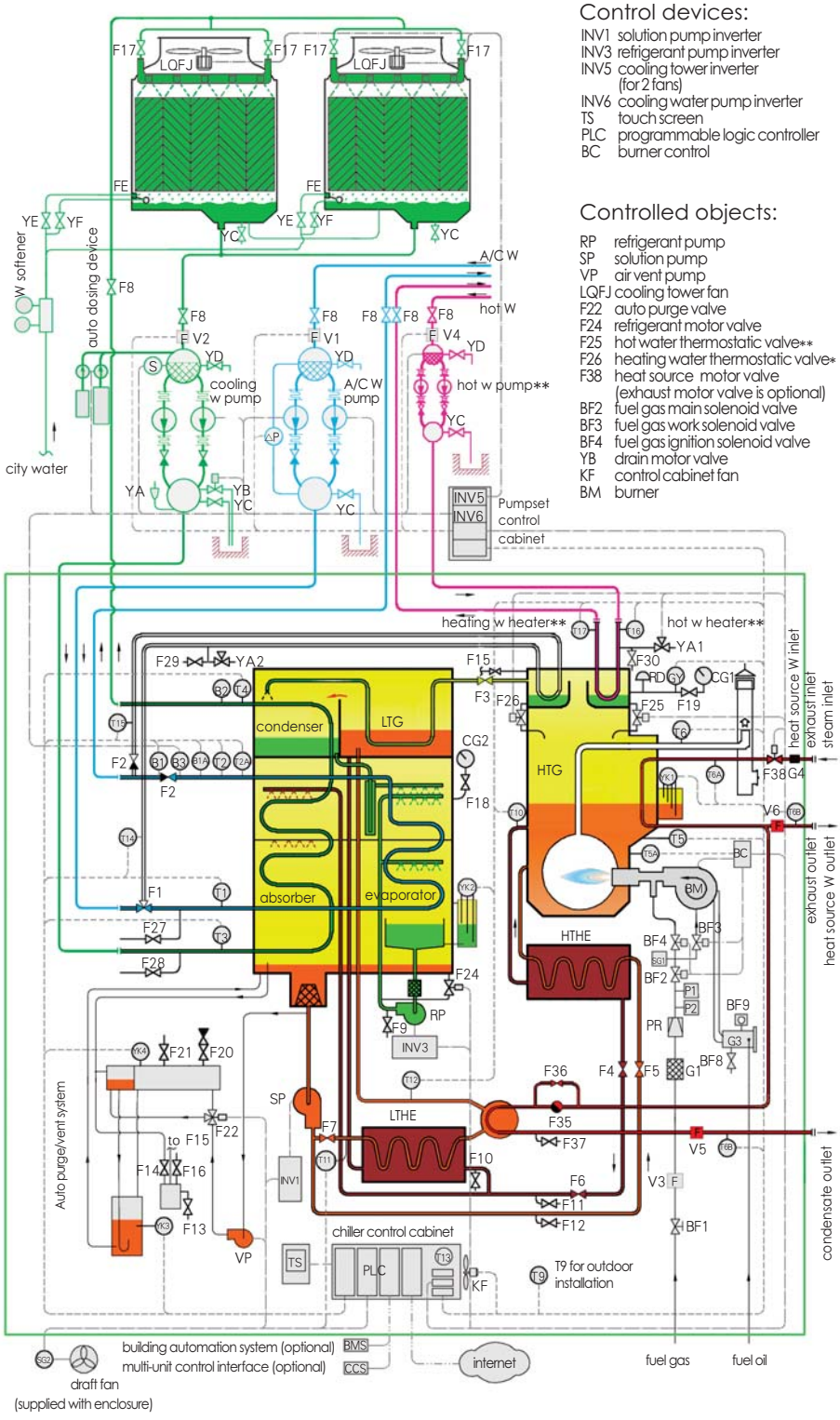
F7	concentration regulating valve
F8	W system shut-off valve
F9	refrigerant sampling valve
F10	concentrated solution sampling valve
F12	diluted solution sampling valve
F13	main purge valve
F14	direct purge valve
F16	HTG purge valve
F17	sampling purge valve
F18	balance valve
F20	vacuum vent valve & mannual valve
F21	vacuum purge valve
F23	nitrogen charging valve
F27	vacuum vent shut-off valve
F28	chilled W drain valve
FE	cooling W drain valve
YA	auto W make-up valve
YC	auto vent valve
YD	manual drain valve
YE	discharge valve
YF	W make-up valve
CG2	manual W make-up valve
G4	compound gauge
	filter(N/A for exhaust type)

Notes:

1. ▭ chiller scope.
2. The components marked with "Δ" for steam chiller, and marked with "ΔΔ" for exhaust chiller, "ΔΔΔ" for hot W chiller.
3. Line type: actuator signal output
   sensor signal input
   communication

Packaged Steam & Direct-fired Chiller

(similar for BYZS: Direct-fired & steam chiller, BYZH: Direct-fired & hot W chiller, BYZE: Direct-fired & exhaust chiller)



Control devices:

INV1 solution pump inverter
INV3 refrigerant pump inverter
INV5 cooling tower inverter (for 2 fans)
INV6 cooling water pump inverter
TS touch screen
PLC programmable logic controller
BC burner control

Controlled objects:

RP refrigerant pump
SP solution pump
VP air vent pump
LQFJ cooling tower fan
F22 auto purge valve
F24 refrigerant motor valve
F25 hot water thermostatic valve**
F26 heating water thermostatic valve*
F38 heat source motor valve (exhaust motor valve is 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
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**
T6A waste heat inlet temp sensor
T6B waste heat outlet 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
V1 chilled/heating W flowmeter
V2 cooling W flowmeter
V3 gas flowmeter
V4 hot W flowmeter
V5 condensate flow meter (optional) Δ
V6 heat source W flow meter (optional) ΔΔΔ
S conductivity sensor
ΔP differential pressure sensor (optional)
SG1 burner gas leakage sensor
SG2 machine room gas leakage sensor

Others:

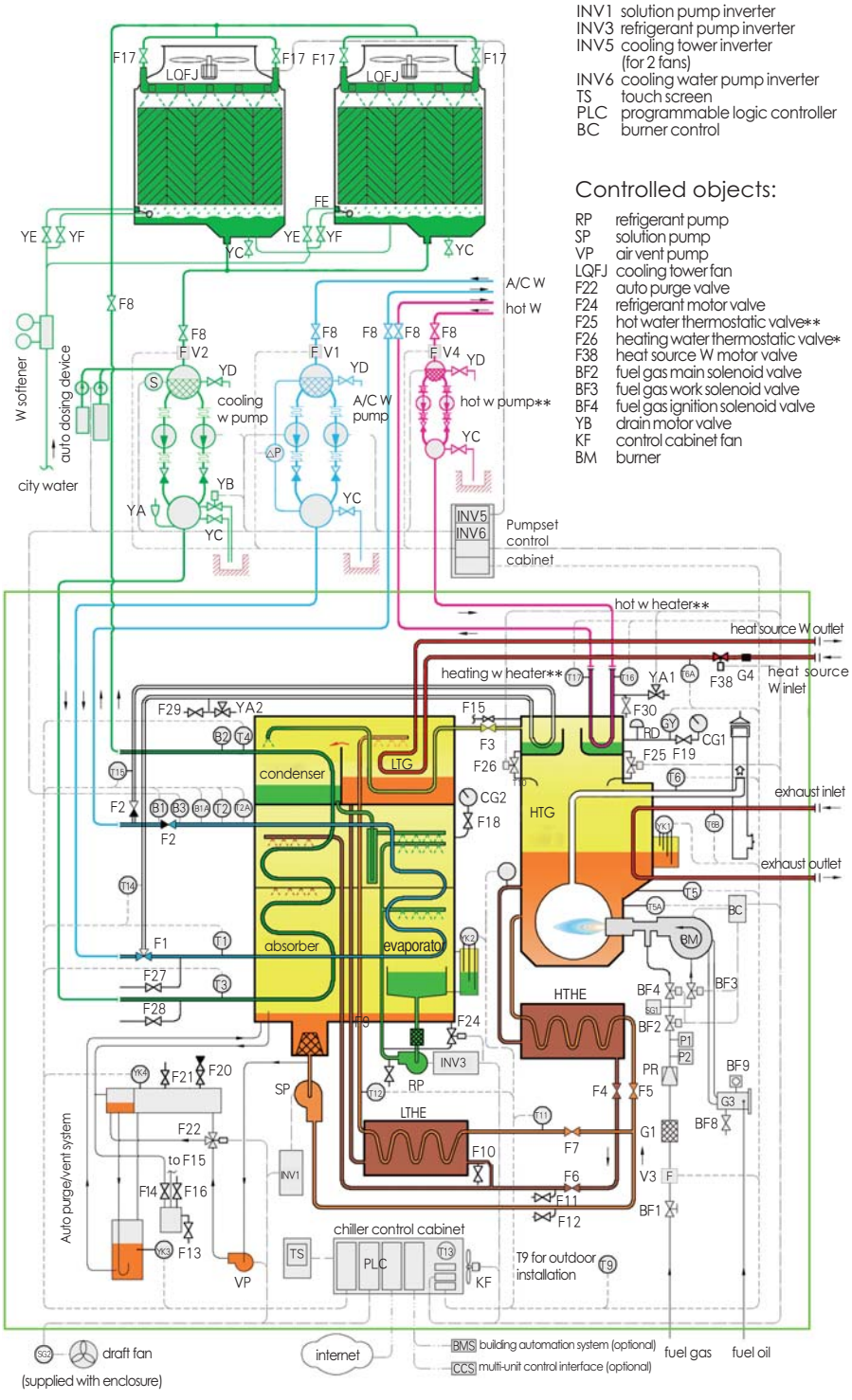
F1 chilled/heating W inlet three-way valve
F2 chilled/heating W outlet single valve*
F3 steam angle valve
F4 concentrated solution angle valve
F5 diluted solution angle valve
F6 HTG concentration regulating valve
F7 LTG concentration regulating valve
F8 water system shutoff valve
F9 refrigerant sampling 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 & mannual valve
F21 nitrogen charging valve
F23 vacuum vent shut-off valve
F27 chilled water drain valve
F28 cooling water drain valve
F29 heating water drain valve*
F30 hot water drain valve**
F35 steam trap Δ
F36 condensate by-pass valve Δ
F37 anti-freeze drain valve Δ
YA1 hot water 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
P2 upper limit pressure switch
PR fuel gas pressure regulator
G1 gas filter
G3 oil filter
G4 filter ΔΔΔ
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. The components marked with "Δ" for steam chiller, and marked with "ΔΔ" for exhaust chiller, "ΔΔΔ" for hot W chiller.
3. Parts marked with "**" are not applicable to cooling/heating type, and those marked with "*" & "**" are not applicable to cooling only type.
4. Line type:
   - actuator output
   - sensor input
   - communication

Packaged Multi-energy Chiller

(similar for BYZHE: Hot W, exhaust & direct-fired chiller)



Control devices:

INV1	solution pump inverter
INV3	refrigerant pump inverter
INV5	cooling tower inverter (for 2 fans)
INV6	cooling water pump inverter
TS	touch screen
PLC	programmable logic controller
BC	burner control

Controlled objects:

RP	refrigerant pump
SP	solution pump
VP	air vent pump
LQFJ	cooling tower fan
F22	auto purge valve
F24	refrigerant motor valve
F25	hot water thermostatic valve**
F26	heating water thermostatic valve*
F38	heat source W motor 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**
T6A	heat source W inlet temp sensor
T6B	exhaust inlet 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
V1	chilled/heating w flowmeter
V2	cooling W flowmeter
V3	gas flowmeter
V4	hot W flowmeter
S	conductivity sensor
ΔP	differential pressure sensor (optional)
SG1	burner gas leakage sensor
SG2	machine room gas leakage sensor

Others:

F1	chilled/heating W inlet three-way 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
F7	LTG 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 & mannual valve
F21	nitrogen charging valve
F23	vacuum vent shut-off valve
F27	chilled water drain valve
F28	cooling water drain valve
F29	heating water drain valve*
F30	hot water drain valve**
YA1	hot water 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
P2	upper limit pressure switch
PR	fuel gas pressure regulator
G1	gas filter
G3	oil filter
G4	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

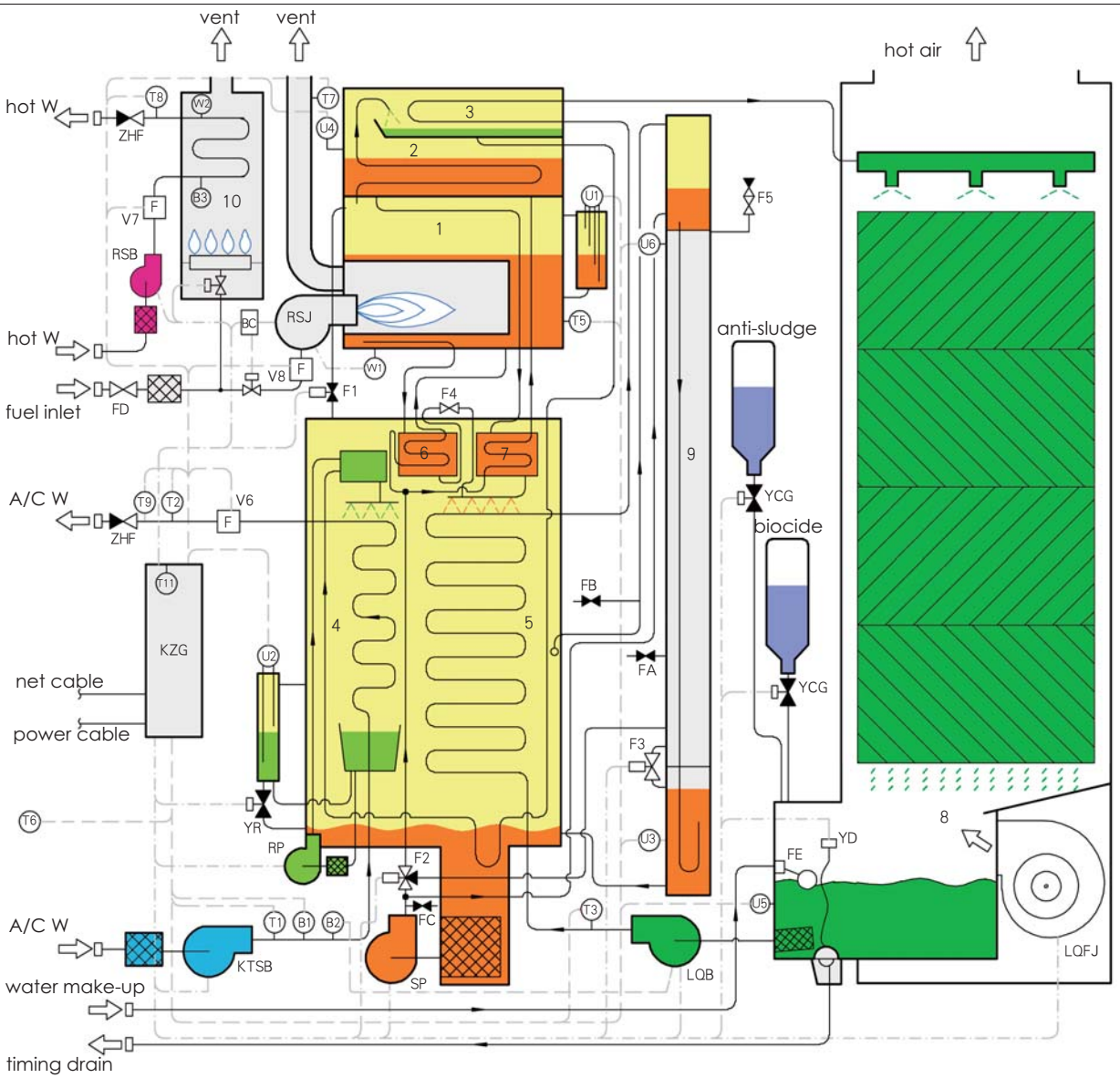
Notes: 1. ▭ chiller scope

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

Mico Non-electric chiller



1	HTG	SP	solution pump	V7	heating W flow meter	FF	vent shut-off valve	T11	control cabinet temp sensor
2	LTG	RP	refrigerant pump	V8	gas flowmeter	ZHF	check valve	W1	HTG temp switch
3	condenser	KTSB	chilled/heating W pump	YR	refrigerant valve	KZG	outdoor control cabinet	W2	hot W temp switch
4	evaporator	LQB	cooling W pump	YD	drain device(timer on)	BC	burner control	B1	A/C W flow switch
5	absorber	RSB	hot W pump	FE	water make-up floating ball valve	T1	A/C W inlet temp sensor	B2	A/C W flow switch
6	HTHE	LQFJ	cooling tower fan	YCG	cooling water quality stabilizer valve(manual)	T2	A/C W outlet temp sensor	B3	hot W flow switch
7	LTHE	RSJ	burner	FA	non-condensable chamber purge valve(manual)	T3	cooling W outlet temp sensor	U1	HTG solution level probe
8	cooling tower	F1	cooling/heating switch	FB	direct purge valve(manual)	T5	HTG temp sensor (to PLC)	U2	refrigerant level probe
9	auto purge device	F2	vent three-way valve	FC	solution valve(manual)	T6	ambient temp sensor	U3	non-condensable sensor
10	hot W heater*	F3	vent reflow valve	FD	fuel valve(manual)	T7	exhaust temp sensor	U4	LTG crystallization sensor
		F4	HTG concentration regulating valve			T8	hot W temperature sensor	U5	cooling W level probe
		F5	vacuum vent valve & mannual valve			T9	A/C W calibration temp sensor	U6	vent over level probe
		V6	chilled/heating W flowmeter						

Notes:

1. Parts marked with " * " are for hot water, not applicable to cooling-heating type.
   Parts marked with " ** " are for heating operation, not applicable to cooling only type.

2. Line type:
   ——— actuator output
   - - - - - sensor input

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 engineering	Power supply to enclosure		✓	3 phase, 4 wires
	Internet connection	✓		Network cable to the enclosure is to be provided by users
	Grounding		✓	Place special grounding terminal with grounding resistance ⩽ 4Ω 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		✓	⩾ BY400 model, a crane must be provided by customer
	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 32°F.
Commissioning	Jobsite chiller commissioning	✓		User provides energy and air conditioning load. Customers need to pay BROAD for commissioning.
Operation & maintenance	Operator training on site	✓		
	Regular maintenance	✓		Paid service contract can be signed after the warranty period.

Machine Room Construction Tips

Machine room

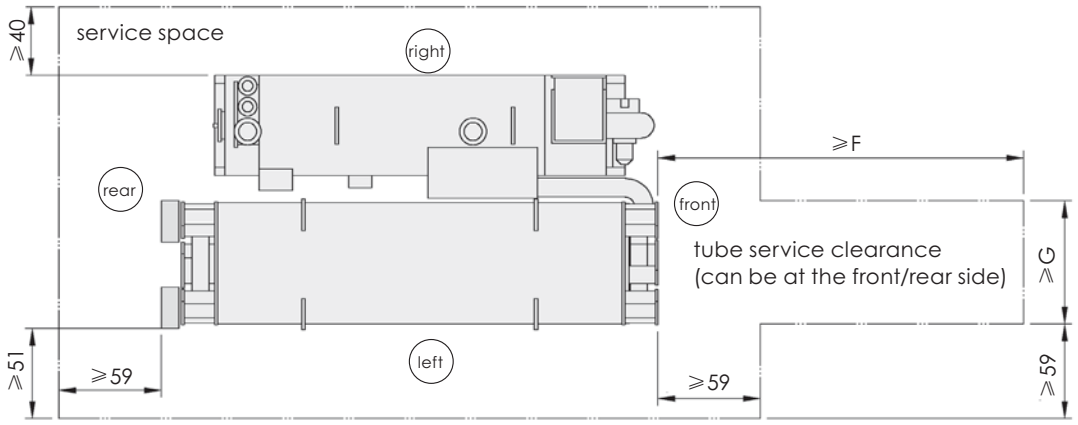
Machine rooms must be well ventilated with temp. humidity control and drain functions. It contains the service space.

Attention should be paid to machine room built by customers:

- 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 machine rooms every 4 hours and make up the combustion air. The volume of combustion air for a DFA is estimated at 14 ft^3 for every MBH fuel.
- Drainage: 1. Chiller foundation must be on a high level in the machine room. 2. All discharge pipes and drain pipes must be visible above the drainage. 3. 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 41-109°F . Lower temperature may crack copper 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

Foundation

- 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 quake 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.



Service space: unit: mm

Model	20	50	75	100	125	150	200	250	300	400	500	600	800	1000
F	90.5	126	145.5	145.5	177	177	177	216.5	216.5	216.5	275.5	275.5	275.5	354.5
G	25.5	31.5	35.5	43.5	45.5	51	67	67	77	82.5	94.5	94.5	102.5	102.5

1. If the machine room is smaller than the above size, please contact BROAD for a solution.
2. F, G is the tube service clearance that can use space of water pumps, doors or windows and can also be shared by 2 chillers.
3. It is recommended that the height of the machine room be 500mm higher than that of chillers.

Piping System

Gas system

- The standard pressure is 5.2-16.4ftH_2O. Lower or higher pressure can be accommodated to 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 87psig 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 40 inch 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 4 inch higher than the burner.
- Oil pipe should be copper pipe or seamless steel pipe and leakage test should be taken at 116psig 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 precision metering device.

Steam system

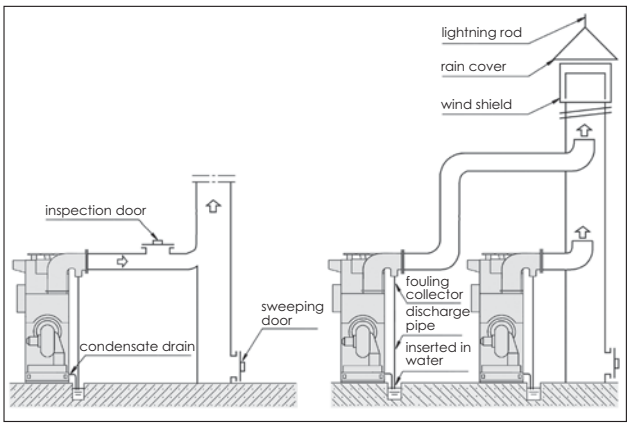
- The supply of the steam should be pressure-stable. The upper limit should not be over 110% of the rated pressure. If the pressure may exceed the upper limit, a regulating valve should be equipped in the pipeline.
- Safety valve should be fixed in the steam inlet pipeline. The protection value is adjusted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

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 fouling.
- 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, pump set and cooling tower should be in one to one correspondence to achieve more energy saving.
- BROAD packaged chiller (pumpset) has introduced auto dosing system to solve the conventional problems with cooling water system such as corrosion inhibitor and biocide, especially legionnaire. There is a motor drain valve at the bottom of cooling water system (It's with BROAD packaged chiller supply).
- When the distance between cooling tower and machine room is≤98ft, the cooling water pipe diameter can follow the dimension drawing. If it's 98-295ft, the pipe diameter shall be one size larger. If it's >295ft, the pipe diameter shall be two size larger.
- 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 and hot 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 240 inch far from the chimney, or the chimney should be 80 inch higher than the top of the cooling tower. Otherwise the exhaust may access the cooling tower and cause corrosion to copper tubes inside the chiller.
- 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,BY50 must adopt secondary heat exchange.

Exhaust system

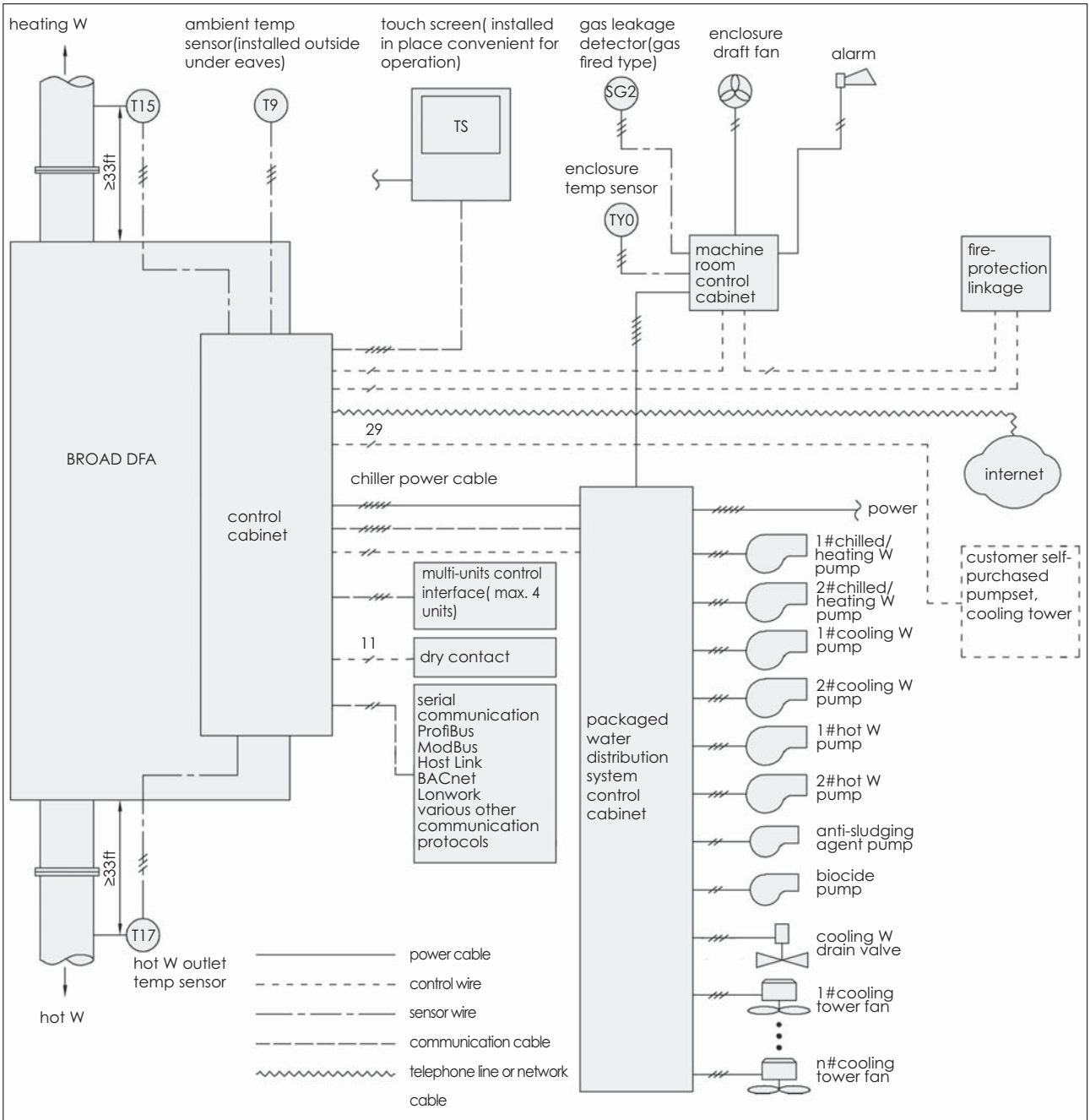
- It is recommended independent stack be used for each chiller. If chillers have to share a common stack due to space limitation, the shared stack must be inserted type and the main stack must be bigger and higher to avoid any interference from each other. Exhaust motor valve shall be installed for each exhaust duct to avoid 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 16.8ft^3 per MBH fuel input. 118-197inch/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 80 inch higher than the cooling tower. Otherwise the flue gas may get into cooling tower and damage the chiller.
- The rated exhaust temperature is 320°F. However, selection of insulation materials and design of fire isolation area should be based on 572°F temperature for safety concern.



An exhaust system illustration

Ventilation system is included in machine room supply if BROAD packaged chiller is ordered.

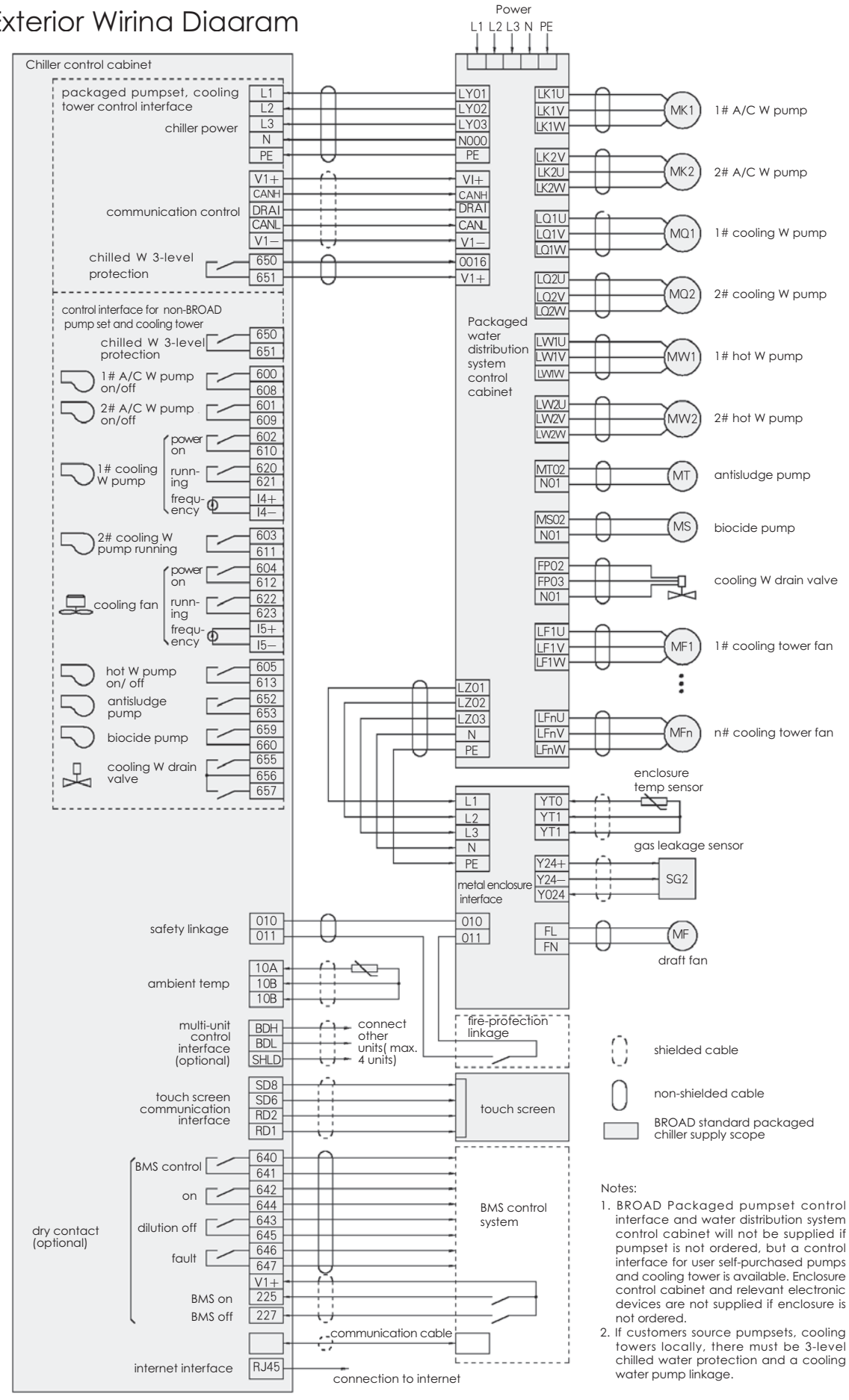
Control System



Notes:

1. BROAD Packaged chiller control system includes control interfaces for chiller, pumpset, cooling tower, outdoor enclosure, internet remote monitoring, BMS and multiple-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. The customers who order several standard packaged chillers can choose multiple-unit control interface, which can automatically control the number of operational chillers according to load changes.
4. BMS control interface includes "Serial Communication" and "Dry-contact" options. Serial Communication interface can be either HostLink, ModBus, ProfiBus, BACnet or Lonwork protocol. They are all options.
5. If the customer does not order pumpset, standard control interface for pumpset and cooling tower will be provided.

Exterior Wirina Diaaram



Notes:

1. BROAD Packaged pumpset control interface and water distribution system control cabinet will not be supplied if pumpset is not ordered, but a control interface for user self-purchased pumps and cooling tower is available. Enclosure control cabinet and relevant electronic devices are not supplied if enclosure is not ordered.
2. If customers source pumpsets, cooling towers locally, there must be 3-level chilled water protection and a cooling water pump linkage.

List of Control System Installation

Item		Installation position and requirement	Material	Source	BROAD scope	Customer scope
Chiller	chiller and pumpset grounding	grounding resistance ⩽4Ω	grounding wire	customer	/	grounding setup and wiring
	chiller power	control cabinet of chiller and water system	5-core cable (33ft 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 32 - 86°F	5-core shielded cable (98ft standard supply)	BROAD	Wiring inside chiller control cabinet	cable installation
	network monitoring	chiller control cabinet	network cable	customer	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)	customer	Wiring inside chiller control cabinet	cable installation, wiring at network side
	ambient temperature sensor	ventilation and avoid direct sunlight	3-core cable (standard cable is 33ft)	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 33ft away from the chiller	3-core cable (standard cable is 33ft)	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	customer	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

Transportation Tips

Shipping status

- BY20 is to be shipped in one piece, while 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 ⩽ 83inch) in single piece.
- Other units will be in 2-6 pieces shipment.
- If limited by site space or machine room access, small unit can also be split shipment (or split with steel frame), or steel-joint split shipment (i.e. the main shell and HTG are split and soldered by steel plates, which will be cut off before entering the machine room).
- 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 help.
- 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 70 klbs.
- BROAD can arrange transportation and insurance on behalf of customers. If the customer chooses to arrange by themselves, please refer to" BROAD Chiller Transportation Regulations" for container arrangement and safe transportation.

Container arrangement reference:

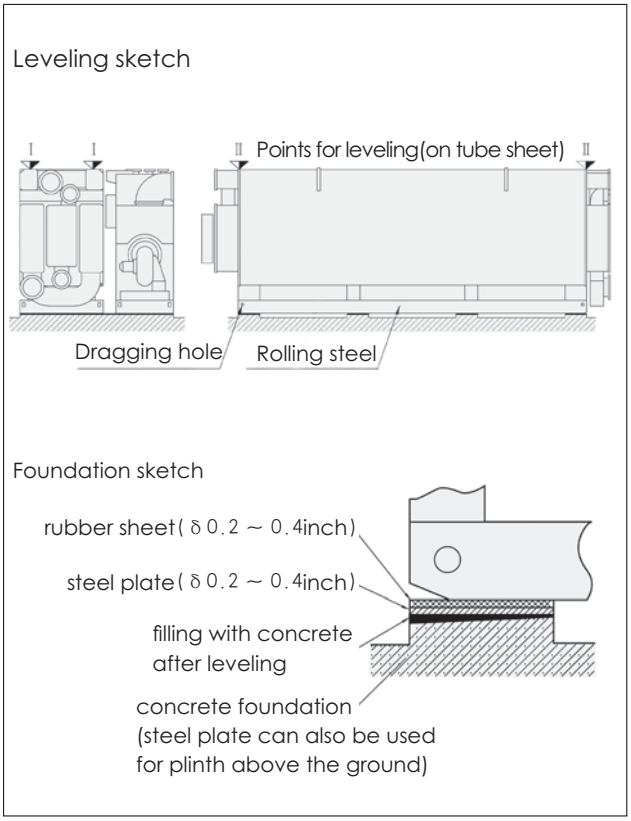
Model	BZ	With BY pump set	BYZ enclosure	BE	BS(BH)	BZHE	BDH(S)
20	20'GP*	/*	40'HQ(BY20)*	20'GP*	20'GP*	20'GP*	20'GP*
50	20'GP*	/*	40'HQ(BY50)*	20'GP*	20'GP*	20'GP*	40'HQ*
75	40'HQ*	20'GP	40'OT×2	40'HQ*	40'HQ*	40'HQ+20'GP*	40'HQ*
100	40'HQ	20'GP×2	40'OT×2	40'HQ	40'HQ*	40'HQ+20'GP	40'HQ*
125	40'HQ+20'GP	40'GP	40'OT×2	40'HQ+20'GP	40'HQ+20'GP	40'HQ ×2	40'OT*
150	40'OT+20'GP	40'GP	40'OT×2+20'GP	40'OT+20'GP	40'OT	40'OT×2	40'OT*
200	40'OT+20'OT	40'GP+20'GP	40'OT×2+20'GP	40'OT+20'OT	40'OT+20'GP	40'OT×2	40'OT*
250	40'OT×2	40'GP+20'GP	40'OT×2+20'GP	40'OT×2	40'OT×2	40'OT×2	40'OT*
300	40'OT×2	40'GP+20'GP	40'OT×3	40'OT×2+20'GP	40'OT×2	40'OT×2+20'GP	40'OT+20'GP*
400	40'OT×2 +20'GP	40'GP×2	40'OT×3+20'GP	40'OT×2+40'GP	40'OT×2	40'OT×2+40'GP	40'FR+20'GP*
500	40'OT×2 +20'GP	40'GP×2	40'OT×3 +20'GP	40'OT×3	40'OT×2 +20'GP	40'OT×2 +40'GP	40'FR+20'GP*
600	40'FR +40'OT×2 +20'GP	40'GP×2 +20'GP	/	40'FR+40'OT×2 +20'GP	40'FR+40'OT +20'GP	40'FR+40'OT×2 +20'GP	
800	40'FR×2 +40'OT×2 +40'GP	40'GP×3 +20'GP	/	40'FR×2 +40'OT×2 +40'GP+20'GP	40'FR×2 +40'OT +40'GP	40'FR×2+40'OT×2 +40'GP+20'GP	
1000	40'FR×2 +40'OT×2 +40'GP +20'GP	40'GP×3 +20'GP	/	40'FR+40'OT×2 +40'GP×2	40'FR×2 +40'OT×1 +40'GP	40'FR×2+40'OT×2 +40'GP×2	

Notes: 1. Models marked with " * " are in one-piece shipment, and the rest 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. BCT container arrangement:
   - 20'GP: BCT16:13 units; orBCT23:10 units; or BCT70:3 units; or BCT115:2 units;
   - 40'GP: BCT16:13 units; orBCT23:20 units;
   - 40'HQ: BCT70:7 units; or BCT115:4 units.

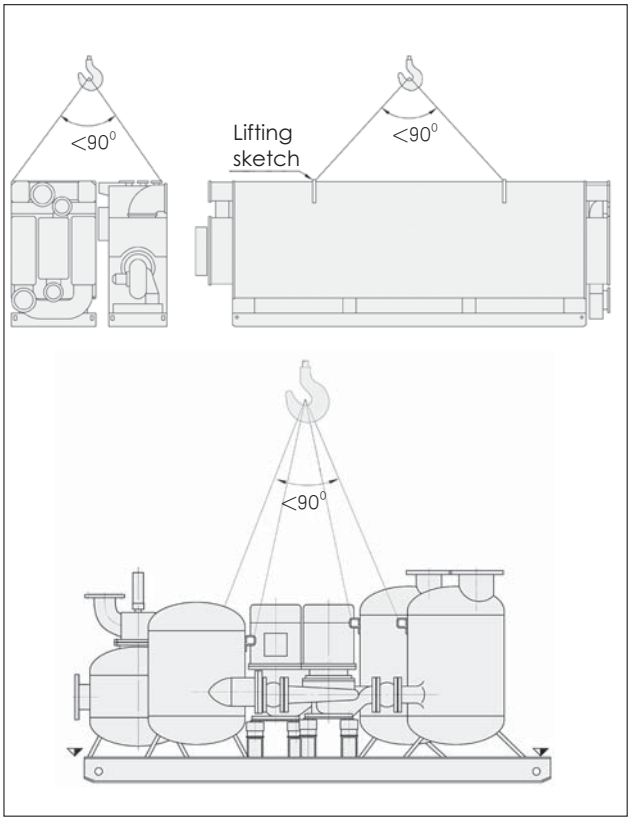
Lifting & Leveling Tips

- Lifting must be done by qualified lifting companies that are properly insured.
- The crane must be supported by crossties 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 0.8inch above the carriage or the ground, it should be kept for a little while. Lift the chiller slowly if everything is OK.
- 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.
- Before the chiller is located, concrete foundation plinths must be molded and leveled.
- Then locate the chiller without bolts. (If there is a strong vibration source or a special anti-vibration requirement, it should be stated before ordering). 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 roof).
- 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 0.06inch.
- After chiller locating, 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 to the chiller or valves for unauthorized persons. Valves of the chiller are forbidden to be screwed. If the machine room is under construction, protective measures are needed to avoid damage or dirt to the chiller. Do not scrape the paint or insulation layer.

Sketch of leveling and foundation



Lifting sketch



Price Information

Price comparison among chillers of different energies:

To help customer select a proper model based on a comprehensive evaluation on the investment & energy-saving benefits, chiller prices (approximate) of different energies are now listed as follows:

No.	Name & Code		Energies	Prices
1	Direct-Fired Absorption Chiller	BZ	direct fired	100%
2	Steam Chiller	BS	steam	76%
3	Hot W Chiller	BH	hot W	84%
4	Exhaust Chiller	BE	exhaust	98%
5	Single-Stage Steam Chiller	BDS	steam	65%
6	Single-Stage Hot W Chiller	BDH	hot W	71%
7	Single-Stage Exhaust Chiller	BDE	exhaust	81%
8	Direct-Fired & Exhaust Chiller	BZE	100% direct fired, 30% exhaust	150%
			100% direct fired, 50% exhaust	170%
			100% direct fired, 100% exhaust	195%
9	Hot W & Exhaust & Direct-Fired Chiller	BZHE	100% direct fired, 30% exhaust, 23% hot W	165%
			100% direct fired, 50% exhaust, 23% hot W	190%
			100% direct fired, 100% exhaust, 23% hot W	215%
10	Exhaust & Hot W Chiller	BHE	100% direct fired, 23% hot W	110%
11	Direct-Fired & Steam Chiller	BZS	100% direct fired, 100% steam	135%
12	Direct-Fired & Hot W Chiller	BZH	100% direct fired, 100% hot W	145%

Other factors on price: for every 1.8°F of decrease in chilled water temperature, or every 3.6°F of increase in cooling water temperature, the price increase is around 20%. Accurate figure to be given by model selection result.

ISO9001

BROAD central air conditioning has obtained all certification of ISO,CE, UL, ETL, ASME, and other international certication

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