

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 CO₂ emissions are 4 times lower.
- Compared with conventional water distribution systems, BROAD packaged pumpset system reduces the rated power demand by 40-60%, and the operating electricity consumption by 60-75%.

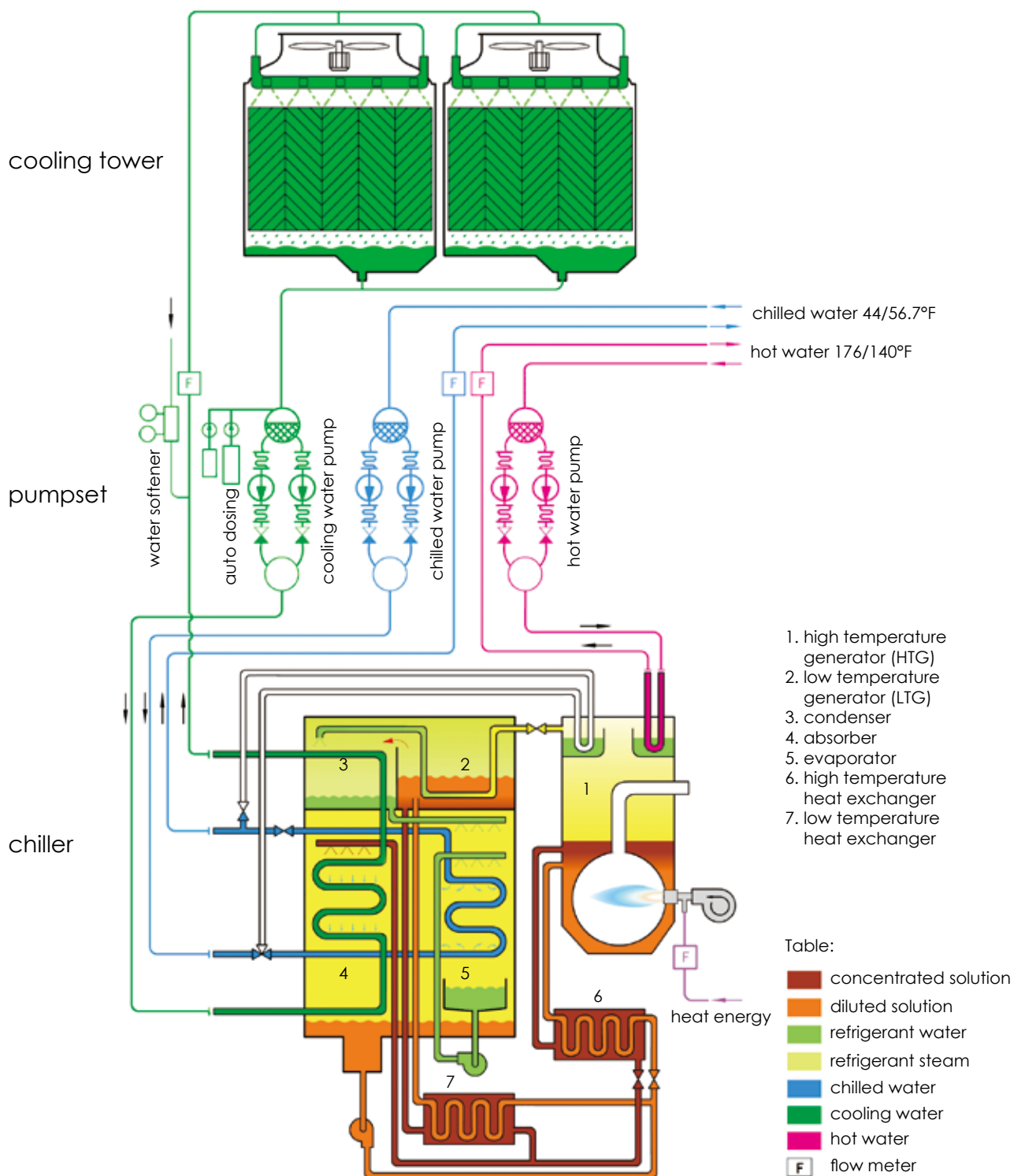


BZ200

CONTENTS

Non-electric Chiller	1
The Absorption Principle	1
Direct-fired Absorption Chiller Performance Data	3
Packaged Direct-fired Absorption Chiller Performance Data	3
HTG(high temp generator)Enlarged Model Performance Data	4
Performance Curves	5
Model Selection & Ordering	6
Supply List	7
Steam Chiller Performance Data	9
Packaged Steam Chiller Performance Data	9
Packaged Hot W/Exhaust Chiller Performance Data	11
Packaged Single-stage Steam/Hot W/Exhaust Chiller Performance Data	12
Packaged Multi-energy Chiller Performance Data	13
Model Selection Curves	15
Micro Non-electric Chiller	17
Performance Data	18
Model Selection & Ordering	19
Performance Curves	19
Design & Construction Tips	20
Dimensions	20
P&I Diagram	33
Scope of Supply/Work	39
Machine Room Construction Tips	40
Piping System	41
Control System	42
Exterior Wiring Diagram	43
List of Control System Installation	44
Transportation Tips	45
Lifting & Leveling Tips	46
Comparison	47
Energy saving comparison	47
General Comparison	48

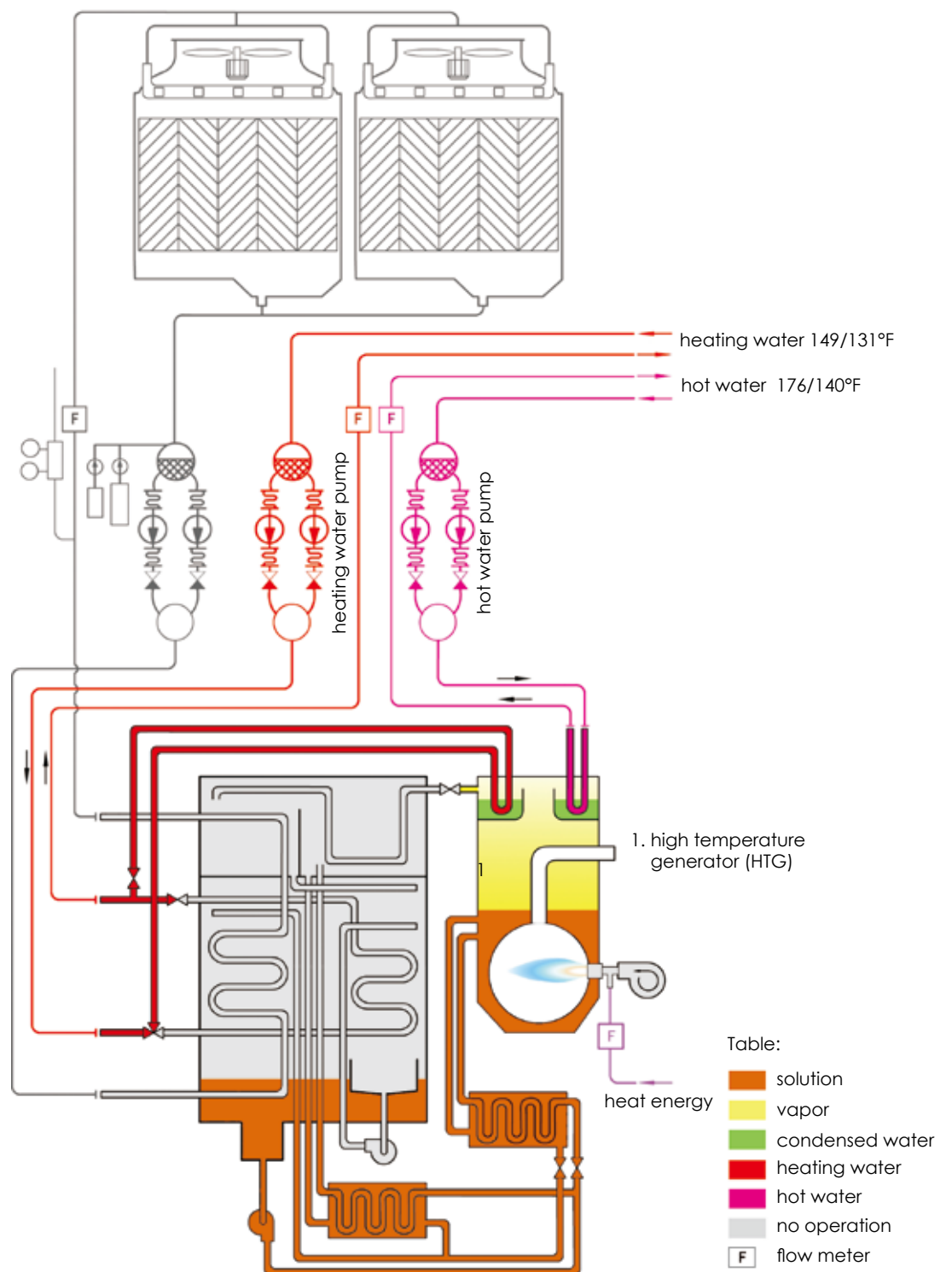
Non-electric Chiller (chiller+pumpset)



The cooling principle

The input heat energy heats LiBr solution to 284°F and generate vapor, which is then condensed into water by cooling water. When the refrigerant water enters evaporator (in high vacuum condition), its temperature goes down immediately to 41°F. And it is sprayed over the copper tubes, and chilled water from 56.7°F drop down 44°F to make cooling. The water absorbs heat from air conditioning system and evaporates, then is absorbed by concentrated LiBr solution from the generators. The cooling water takes away the heat and rejects it into the air. Diluted solution is pumped into HTG and LTG separately to be heated to begin the process all over again.

Notes: Lithium Bromide is high water absorbent salt nontoxic and harmless.



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".

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

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

Mode	BZ	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
Heating capacity	kW	179	269	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967
	MBH	611	718	1533	2294	3062	3827	4605	6114	7663	9172	12227	15323	18382	24496	30610
Hot water capacity	kW	80	120	200	300	400	500	600	800	1000	1200	1600	/	/	/	/
	MBH	273	410	683	1024	1365	1707	2048	2731	3414	4096	5461	/	/	/	/
Chilled water																
Flow rate	GPM	126	189	314	471	629	786	943	1257	1571	1886	2514	3413	3771	5029	6286
Pressure drop	ftH ₂ O	10	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	323	537	805	1074	1342	1611	2147	2684	3225	4299	5373	6446	8593	10744
Pressure drop	ftH ₂ O	16.7	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	102	169	255	339	424	510	678	849	1016	1355	1698	2037	2715	3392
Pressure drop	ftH ₂ O	6.7	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	23	38	57	26	95	114	151	189	227	303	/	/	/	/
Pressure drop	ftH ₂ O	6.7	6.7	6.7	6.7	6.7	6.7	6.7	10	10	13.4	13.4	/	/	/	/
Natural gas consumption																
Cooling	GPM	74	112	186	279	372	466	559	744	933	1117	1496	1866	2239	2988	3731
Heating	GPM	85	127	212	348	423	528	633	845	1060	1267	1689	2117	2539	3384	4228
Hot water	GPM	37	56	94	141	188	235	282	374	470	563	253	/	/	/	/
Power demand	kW	2.5	4.2	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	2.8	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	15.4	22	26.4	30.8	37.4	41.8	57.2	68.2	/	/	/	/	/	/
Main shell ship. wt.	klbs	/	/	/	/	/	/	/	/	/	33	44	53	62	64	66
HTG. wt.	klbs	/	/	/	/	/	/	/	/	/	24	28	31	38	44	62
Operation wt.	klbs	11.7	16.3	23	28	35	42	48	64	77	92	110	139	167	196	235

Packaged Direct-fired Absorption Chiller (P-DFA)

Mode		BZY	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity		RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
		kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
Pumpset	Chilled water pump																
	External head	ftH ₂ O	72	72	72	79	79	89	89	89	92	92	92	105	105	105	105
	Power demand	kW	4	7.5	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	Cooling water pump																
	External head	ftH ₂ O	33	33	33	50	50	50	50	50	53	53	53	56	56	56	56
	Power demand	kW	3	7.5	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	Hot water pump																
	External head	ftH ₂ O	23	23	23	50	50	50	50	50	50	50	50	/	/	/	/
	Power demand	kW	0.4	0.6	0.6	2.2	3.0	3.0	4.4	4.4	4.4	6.0	6.0	/	/	/	/
	Total power demand	kW	7.4	15.6	15.6	32.2	33.0	47.0	56.4	78.4	92.4	110	126	200	220	300	360
Operation wt.	klbs	1.3	1.8	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	11	/	/	/	/	/	/	/	/	/	/	/	/
	Operation wt.	klbs	5.5	9.9	11.2	/	/	/	/	/	/	/	/	/	/	/	/
Enclosure	Ventilation power demand	kW	0.3	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	1.6	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	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
	Water demand for cooling	klbs/h	1.3	2.0	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 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: 150psig (except special order)
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W, heating W, hot W: 0.0001hrft²·°F/Btu, for cooling W: 0.00025hrft²·°F/Btu
12. Natural gas consumption is calculated: 900Btu/ft³ (8051kcal/m³)
13. Standard natural gas pressure is 63~197 inchH₂O (2.3~7.3psig), 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: 5~43°C, 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. 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"

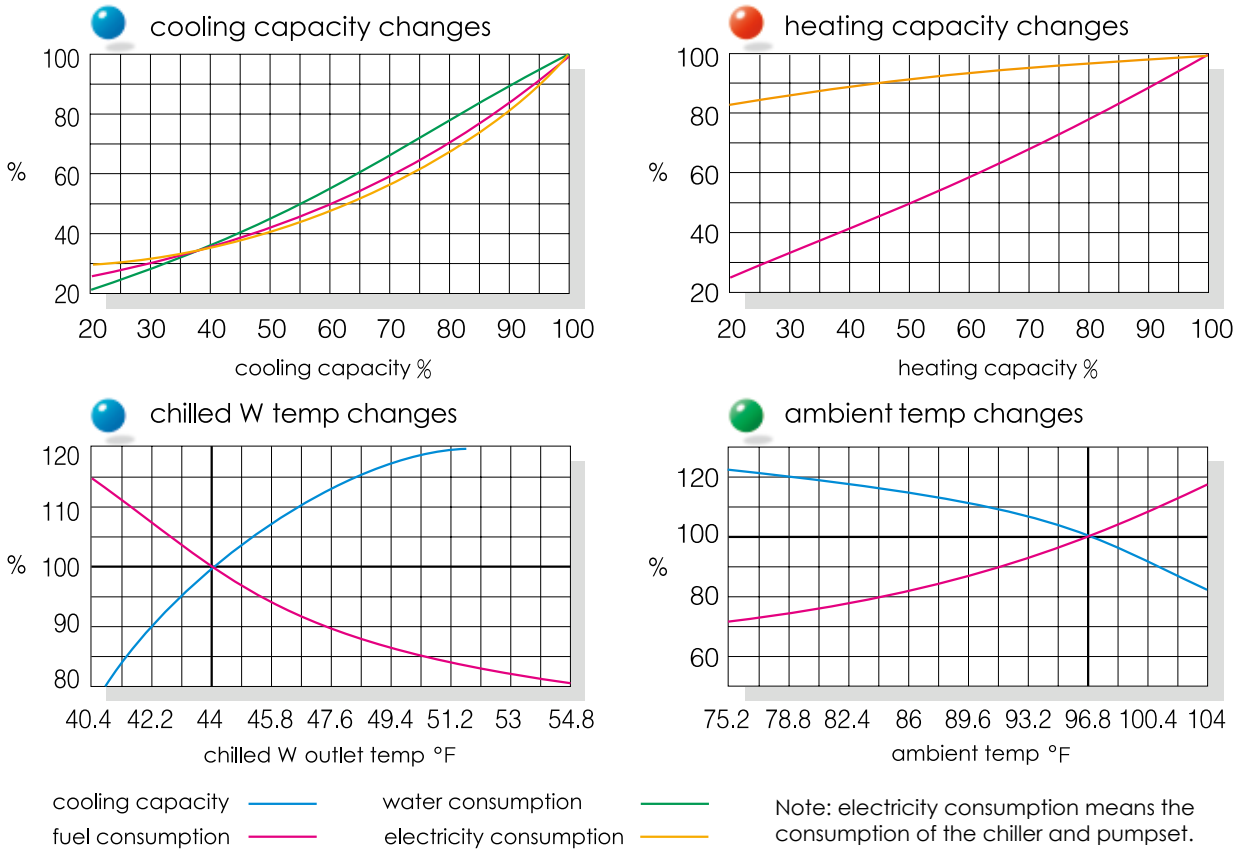
HTG(high temp generator)Enlarged Model Performance Data

Mode	Enlarged Models	Heating capacity	Consumption	Mode	Enlarged Models	Heating capacity	Consumption
BZ		MBH	MBH	BZ		MBH	MBH
20	H1	736	791	150	H1	5523	5939
	H2	859	923		H2	6444	6929
	H3	982	1056		H3	7364	7918
	H4	1105	1188		H4	8285	8909
30	H1	1103	1186	200	H1	7364	7918
	H2	1287	1384		H2	8593	9240
	H3	1468	1578		H3	9818	10557
	H4	1652	1776		H4	11046	12265
50	H1	1841	1980	250	H1	9205	9898
	H2	2149	2311		H2	10738	11546
	H3	2454	2639		H3	12275	13199
	H4	2762	2970		H4	13808	14847
75	H1	2762	2970	300	H1	11046	11877
	H2	3224	3467		H2	12887	13857
	H3	3682	3959		H3	14728	15837
	H4	4144	4456		H4	16569	17816
100	H1	3682	3959	400	H1	14728	15837
	H2	4295	4618		H2	17182	18475
	H3	4911	5281		H3	19639	21117
	H4	5523	5939	500	H1	18410	19796
125	H1	4603	4949		H2	21446	23063
	H2	5369	5773				
	H3	6136	6598				
	H4	6906	7426				

Notes:

Heating capacity increases by 20% for each stage of HTG enlargement. No change with pumpset and metal enclosure specs.

Packaged DFA Performance Curves



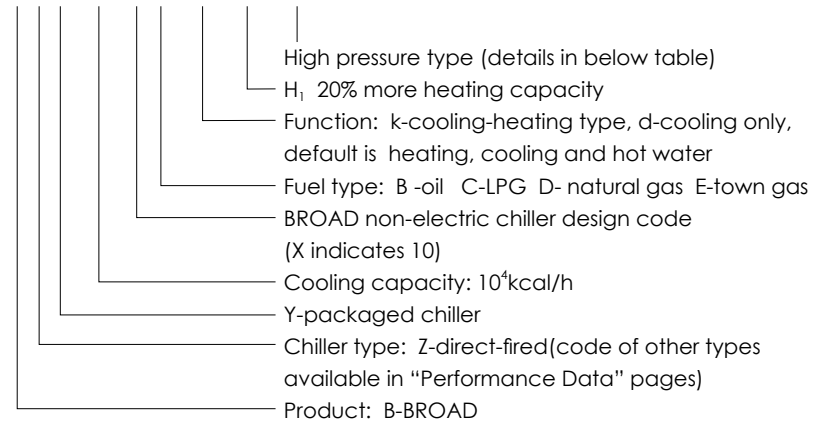
COP

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.

Nomenclature

B Z Y 200 X D - k - H₁ - Fa



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	≤64	≤66
outside	≤42	≤43	≤44
enclosure			

Emissions:

- CO/CO₂≤0.02%
- NO_x≤46ppm(O₂=5%)
- Special order: equipped electrostatic cleaner on exhaust port, and emission is almost zero

Codes for high pressure type:

Pressure limit	Chilled water code	Cooling water code
150~174psig	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.

Fuel selection

- Fuels applicable to a DFA can be: natural gas, town gas, LPG, bio-gas, light oil or recycled oil.
- Natural gas and recycled oil are priority.
- Applicable to gas/oil (for special orders)
- Different 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.
- An extra boiler is recommended to meet the excessive heating requirement when heating load exceeds 1.3 times of cooling load.

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 150psig. Information about high pressure type is available on page 5.
- 150~174 psig system: select high pressure type.
- 175~232psig system: either extra pressure type, or secondary heat exchanger, to be comprehensively evaluated.
- >232 psig system: secondary heat exchange.

Split shipment

- If limited by access of customers' machine room (or limited by container transportation), split shipment can be chosen.
- In general, chiller above 300 ton will be split into two pieces as main shell and HTG. 3 pipes must be connected at jobsite.

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: 4~6 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 USA provides factory extended warranty and maintenance service upon to 25 years, please contact office for details.

Contact info

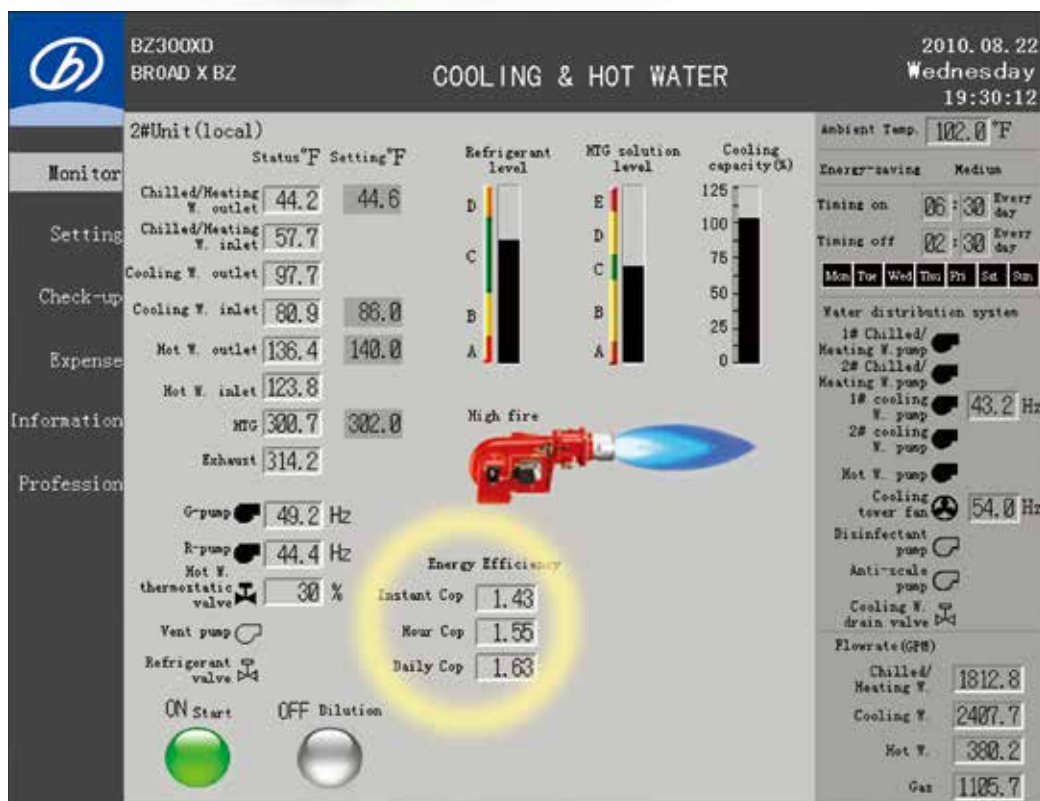
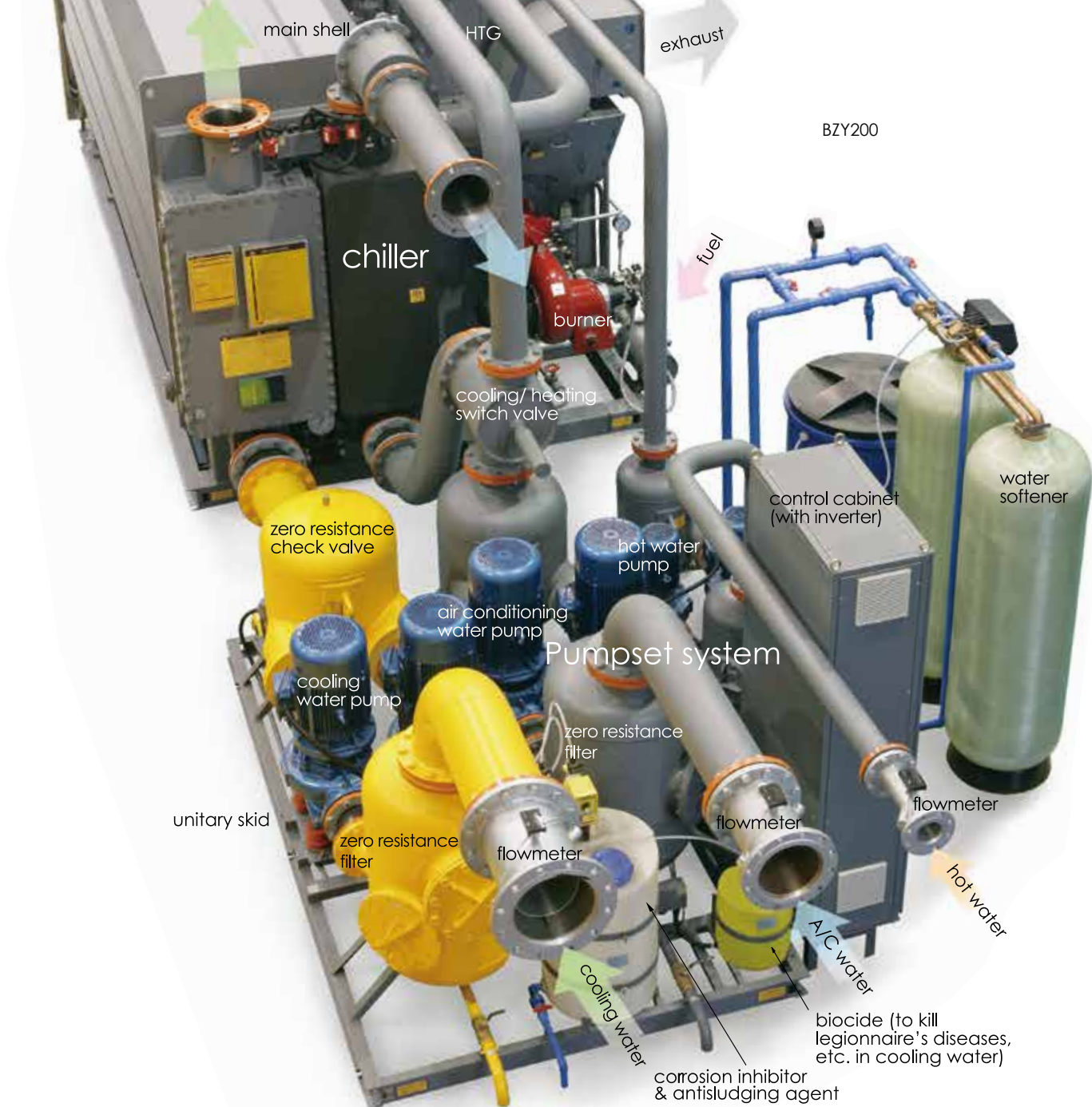
401 Hackensack Ave, Suite 503, Hackensack, NJ 07601
Tel: 201-678-3010
Fax: 201-678-3011
www.broadusa.com

Packaged DFA Supply List

Products	Category	Item	Remarks
Chiller	Main shell	Main shell body	Includes LTG, condenser, evaporator, absorber, cold/heat insulation
		Auto purge/vent system	Includes falling head auto purge device, auto air vent device
		Solution pump, refrigerant pump	Welded canned type
		Low temp heat exchanger	Plate type 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 BY30 & 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(optional)	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, BY30, BY50 only one pump)
		Cooling water pump	Two pumps (BY20, BY30, BY50 only one pump)
		Hot water pump	Two pumps (BY20, BY30, 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 BZY20 & BZY30 BZY50)
		Auto dosing device	Automatically charge biocide corrosion 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	Fiber reinforced plastics 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.



Steam Chiller Performance Data

BSY: Steam from power generation or industrial waste streams

Mode	BS	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
Chilled W																
Flowrate	GPM	126	189	314	471	629	786	943	1257	1571	1886	2514	3413	3771	5029	6286
Pressure drop	ftH ₂ O	10	10	10	10	10	10	13.4	13.4	16.7	16.7	16.7	20	20	20	20
Cooling W																
Flowrate	GPM	215	318	537	805	1074	1342	1610	2147	2684	3225	4299	5372	6446	8593	10745
Pressure drop	ftH ₂ O	16.7	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	547	820	1365	2053	2734	3424	4115	5482	6862	8234	10988	13731	16479	21978	27464
Power demand	kW	1.7	3.2	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	1.5	2.4	4.2	5.7	6.6	9	10.1	14.8	16.5	21.8	24.7	32.2	38.6	50	62.2
Unit ship. wt	klbs	8.8	13	16.5	19.8	25.4	30.9	35.3	46.3	57.3	/	/	/	/	/	/
Main shell ship. wt	klbs	/	/	/	/	/	/	/	/	/	33.1	44.1	52.9	61.7	63.9	66.2
HTG. wt	klbs	/	/	/	/	/	/	/	/	/	11	13.2	17.6	19.8	24.3	28.7
Operation weight	klbs	9.9	14.6	18.7	22	28.7	35.3	39.7	52.9	66.2	77.2	94.8	119.1	138.9	165.4	187

Packaged Steam Chiller Performance Data

Mode	BSY	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
Pumpset	Chilled/heating W. pump															
	External head	ftH ₂ O	72	72	72	79	79	89	89	89	92	92	92	105	105	105
	Power demand	kW	4	7.5	7.5	15	15	22	30	37	44	60	60	110	110	180
	Cooling W. pump															
	External head	ftH ₂ O	33	33	33	49	49	49	49	52.49	52.49	52.49	56	56	56	56
	Power demand	kW	3	7.5	7.5	15	15	22	22	37	44	44	60	90	110	180
	Total power demand	kW	7	15	15	30	30	44	52	74	88	104	120	200	220	360
Cooling tower	Operation weight	klbs	1.1	1.5	1.76	7.3	7.3	7.94	8.2	13.9	14.6	15.9	19.4	13/19	13.5/19.4	21.2/21.6
	Power demand	kW	5.5	11	11	/	/	/	/	/	/	/	/	/	/	/
Enclosure	Operation weight	klbs	5.5	9.9	11.2	/	/	/	/	/	/	/	/	/	/	/
	Ventilation power demand	kW	0.3	0.3	0.3	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	3.0	3.0	3.0
Electricity and water consumption	Weight	klbs	1.1	1.5	1.76	7.5	7.5	8.6	8.6	11.47	12.3	13.89	15	24	25	34
	Total power demand	kW	14.5	30.6	30.6	35.6	38.3	52.3	60.3	85.7	100.2	117.7	135.2	219.7	243.7	397.9
Electricity and water consumption	Water demand for cooling	klbs/h	1.3	2	3.3	4.4	6.6	8.4	9.9	13	16.5	19.8	26.46	33	39.7	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: 150psig (except special order)
9. Adjustable load: 5%~115%
10. Fouling factor for chilled W, heating W, hot W: 0.0001hrft²·°F/Btu, for cooling W: 0.00025hrft²·°F/Btu
11. LiBr Solution concentration: 52%. Solution weight is included in unit ship. wt.
12. Machine room ambient temperature: 41°F~109.4°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

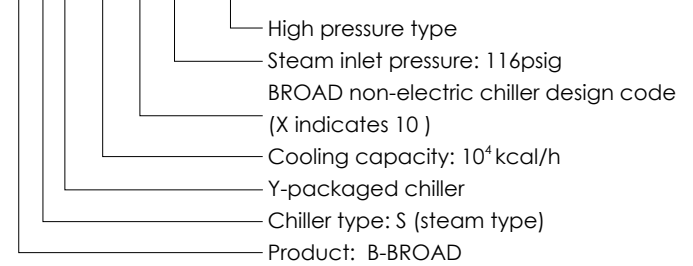
Note: The integrated part load value (IPLV) reflects chiller's actual COP in operation.
Condition & formula base on ARI560

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

B S Y 200 X 0.8 - Fa



Note: High pressure type (see P5)

Model Selection & Ordering

Steam selection

Please specify saturated steam pressure and temperature. The temperature of overheated steam should be ≤356°F (except special order)

Other factors

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

Supply list

Refer to packaged DFA supply list on P7



BS500

Packaged Hot W/Exhaust chiller Performance Data

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

Code	Mode	Cooling capacity		Heating capacity		Chilled W		Cooling W		heating W		Hot water consump.	Exhaust consump.		Power demand	Solution wt.	Unit ship. wt.	Main shell ship wt.	HTG. wt.	Chiller operation weight
		kW	RT	kW	MBH	Flow-rate	Pressure drop	Flow-rate	Pressure drop	Flow-rate	Pressure drop		Cooling	Heating						
Two-stage hot water chiller BH hot water 356°F	20	233	66	/	/	126	10	215	16.73	/	/	44.5	/	/	1.7	2.2	9.9	/	/	11
	30	349	99	/	/	189	10	318	16.73	/	/	66.9	/	/	3.2	2.6	13.7	/	/	15.2
	50	582	165	/	/	314	10	537	16.73	/	/	110.96	/	/	4.3	4.9	17.6	/	/	19.8
	75	872	110	/	/	471	10	806	16.73	/	/	166.4	/	/	4.6	6.2	20.9	/	/	24.3
	100	1163	331	/	/	630	10	1074	16.73	/	/	222.4	/	/	6.8	7.5	26.46	/	/	28.7
	125	1454	413	/	/	788	10	1343	16.73	/	/	278.4	/	/	6.8	9.7	30.9	/	/	33.1
	150	1745	496	/	/	942	13.4	1612	16.73	/	/	334.6	/	/	6.8	10.8	35.3	/	/	39.7
	200	2326	611	/	/	1259	13.4	2149	16.73	/	/	444.7	/	/	10.2	15.7	46.3	/	/	52.9
	250	2908	827	/	/	1572	16.7	2686	20.07	/	/	559.2	/	/	10.2	17.2	57.3	/	/	66.2
	300	3489	992	/	/	1889	16.7	3227	20.07	/	/	669	/	/	11.72	23.4	/	33.1	13.2	77.2
	400	4652	1323	/	/	2514	16.7	4302	20.07	/	/	894	/	/	13.2	26.7	/	44.1	15.4	99.2
	500	5815	1653	/	/	3144	20	5376	23.4	/	/	1114	/	/	17.7	32.6	/	52.9	19.8	121.3
	600	6978	1984	/	/	3773	20	6450	23.4	/	/	1139	/	/	20.7	39.9	/	61.7	24.3	145.5
	800	9304	2646	/	/	5033	20	8599	23.4	/	/	1788	/	/	25.9	53.4	/	63.9	30.9	174.2
	1000	11630	3307	/	/	6292	20	10752	23.4	/	/	2232	/	/	34.9	62.3	/	66.2	37.5	202.9
Two-stage exhaust chiller BE exhaust 932°F	20	233	66	153	522	126	10	215	16.73	57.7	6.7	/	3367	3367	1.7	3.3	14.3	/	/	15.4
	30	349	99	230	1191	189	10	318	16.73	86.3	6.7	/	5072	5072	3.2	4.9	19.6	/	/	21.2
	50	582	165	384	1310	314	10	537	16.73	144	6.7	/	8410	8410	4.3	7.7	26.5	/	/	27.6
	75	872	110	575	1962	471	10	806	16.73	216	6.7	/	12639	12639	4.6	9.7	30.9	/	/	35.3
	100	1163	331	767	2617	630	10	1074	16.73	288	6.7	/	16845	16845	6.8	12.6	39.7	/	/	44.1
	125	1454	413	959	3272	788	10	1343	16.73	360	6.7	/	21094	21094	6.8	14.6	48.5	/	/	52.9
	150	1745	496	1151	3927	942	13.4	1612	16.73	431	6.7	/	26348	26348	6.8	16.8	55.1	/	/	59.5
	200	2326	611	1534	5234	1259	13.4	2149	16.73	577	10	/	33760	33760	10.2	23.8	72.8	/	/	79.4
	250	2908	827	1918	6544	1572	16.7	2686	20.07	718	10	/	42260	42260	10.2	26.7	/	28.7	26.5	92.6
	300	3489	992	2301	7851	1889	16.7	3227	20.07	863	13.4	/	50714	50714	11.72	34.8	/	33.1	33.1	110
	400	4652	1323	3068	10468	2514	16.7	4302	20.07	1154	13.4	/	67699	67699	13.2	40.1	/	44.1	39.7	136.7
	500	5815	1653	3835	13085	3144	20	5376	23.4	1440	16.7	/	84562	84562	17.7	50.7	/	52.9	46.3	165.4
	600	6978	1984	4602	15702	3773	20	6450	23.4	1735	16.7	/	101486	101486	20.7	64.2	/	61.7	55.1	200.7
	800	9304	2646	6137	20940	5033	20	8599	23.4	2303	20	/	135350	135350	25.9	80.5	/	63.9	70.6	242.5
	1000	11630	3307	7671	26174	6292	20	10752	23.4	2880	20	/	169136	169136	34.9	90.4	/	66.2	88.2	275.6

General Conditions:

- Rated hot W inlet/outlet temp for hot W chiller: 356°F/329°F
- Rated exhaust inlet/outlet temp for exhaust chiller: 932°F/320°F
- Rated chilled W outlet/inlet temp: 44°F/56.7°F
- Rated cooling W outlet/inlet temp: 97.5°F/85°F
- Rated heating W outlet/inlet temp for two-stage exhaust chiller: 149°F/131°F
- Lowest permitted outlet temperature for chilled water: 41°F
- Lowest permitted inlet temperature for cooling water: 50°F
- Adjustable chilled water flowrate: 50%~120%
- Pressure limit for chilled/cooling water: 150psig (except special order)
- Adjustable load: 5%~115%
- Fouling factor for chilled W, heating W, hot W: 0.0001hrft² °F/Btu, for cooling W: 0.00025hrft² °F/Btu
- LiBr Solution concentration: 52%, solution weight is included in unit shipment wt.
- Machine room ambient temperature: 41°F~109.4°F, humidity ≤ 85%
- Rated cooling COP: 1.41
- Rated heating COP for exhaust chiller: 0.93
- Life design: 25 years
- 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 BDSY/BDHY/BDEY: steam/hot water/exhaust
(pumpset, enclosure data are the same as steam chiller)

Code	Model	Cooling capacity		Chilled W		Cooling W		Steam con-sump.	Hot water con-sump.	Exhaust con-sump.	Power de-mand	Solution wt.	Unit ship. wt.	Main shell ship. wt.	Chiller operation weight
				Flowrate	Pres-sure drop	Flow-rate	Pres-sure drop								
		kW	RT	GPM	ftH ₂ O	GPM	ftH ₂ O	lb/h	GPM	lb/h	kW	Klbs	Klbs	Klbs	Klbs
Single-stage steam chiller BDS steam 14.5psig	20	233	66	126	10	285	16.7	1005	/	/	2.5	1.5	7.7	/	8.8
	30	349	99	189	10	428	16.7	1516	/	/	2.5	1.8	9.9	/	11.2
	50	582	165	314	10	713	16.7	2525	/	/	2.5	3.7	14	/	15
	75	872	248	471	10	1069	20	3776	/	/	5.3	4.8	19	/	21
	100	1163	331	629	10	1425	20	5040	/	/	5.7	5.3	23	/	25
	125	1454	413	786	10	1782	20	6307	/	/	5.7	7.0	27	/	31
	150	1745	496	943	13.4	2138	20	7574	/	/	5.7	7.7	31	/	35
	200	2326	661	1257	13.4	2847	20	10092	/	/	8.6	12.1	44	/	48
	250	2908	827	1571	16.7	3560	23	12619	/	/	10.1	13.2	52	/	57
	300	3489	992	1886	16.7	4272	23	15148	/	/	10.1	18.1	62	/	68
	400	4652	1323	2514	16.7	5698	23	20195	/	/	13.9	19.6	70	/	81
Single-stage hot water chiller BDH hot water 208°F	500	5815	1653	3143	20	7119	30	25257	/	/	13.8	25.8	/	59	97
	600	6978	1984	3771	20	8545	30	30307	/	/	17.5	31.9	/	64	108
	20	209	60	113	8.4	262	16.7	/	108	/	2.5	1.5	7.7	/	8.8
	30	302	86	169	8.4	385	16.7	/	159	/	2.5	1.8	9.9	/	11.2
	50	512	146	277	8.4	642	16.7	/	264	/	2.5	3.7	14	/	15
	75	767	218	415	8.4	959	20	/	396	/	5.3	4.8	19	/	21
	100	1023	292	553	8.4	1280	20	/	528	/	5.7	5.3	23	/	25
	125	1279	365	691	8.4	1602	20	/	660	/	5.7	7.0	27	/	31
	150	1535	439	830	10	1923	20	/	793	/	5.7	7.7	31	/	35
	200	2046	585	1106	10	2561	23	/	1057	/	8.6	12.1	44	/	48
	250	2558	730	1383	13.4	3203	23	/	1321	/	10.1	13.2	52	/	57
Single-stage exhaust chiller BDE exhaust 572°F	300	3069	877	1659	13.4	3841	23	/	1590	/	10.1	18.1	62	/	68
	400	4092	1169	2231	13.4	5122	23	/	2118	/	13.9	19.6	70	/	81
	500	5115	1461	2766	16.7	6402	30	/	2646	/	13.8	25.8	/	59	97
	600	6138	1754	3319	16.7	7682	30	/	3179	/	17.5	31.9	/	64	108
	20	233	66	126	10	285	16.7	/	/	12383	2.5	1.8	8.8	/	9.7
	30	349	99	189	10	428	16.7	/	/	18668	2.5	2.6	11	/	12.1
	50	582	165	314	10	713	16.7	/	/	31124	2.5	4.6	15	/	17
	75	872	248	471	10	1069	20	/	/	46567	5.3	5.5	20	/	20
	100	1163	331	629	10	1425	20	/	/	62164	5.7	6.2	24	/	24

General Conditions:

- Rated saturated steam pressure for BDS chiller 14.5psig. Rated condensate temperature for BDS chiller: 203°F
- Rated hot W inlet/outlet temp for single-stage hot W chiller: 208°F/190°F
- Rated exhaust inlet/outlet temp for single-stage exhaust chiller: 572°F/266°F
- Rated chilled W outlet/inlet temp: 44°F/56.7°F
- Rated cooling W outlet/inlet temp: 97.5°F/85°F
- Lowest permitted outlet temperature for chilled water: 41°F
- Lowest permitted inlet temperature for cooling water: 50°F
- Adjustable chilled water flowrate: 50%~120%
- Pressure limit for chilled/cooling water: 150psig (except special order)
- Adjustable load: 5%~115%
- Fouling factor for chilled W, heating W, hot W: 0.0001hrft² °F/Btu, for cooling W: 0.00025hrft² °F/Btu
- LiBr Solution concentration: 50%. Solution weight is included in unit shipment wt.
- Machine room ambient temperature: 41°F~109.4°F, humidity ≤ 85%
- Rated COP: single-stage steam chiller and exhaust chiller: 0.79, single-stage hot W chiller: 0.76
- Life design: 25 years
- Please refer to P5, P6 & P7 for performance curve, model selection & ordering and supply list information.

Packaged Multi-energy Chiller Performance Data

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

Code	Mode	Cooling capacity		Heating capacity		Hot water capacity		Hilled W		Heating water		Hot water		Cooling W		Power demand	Solution wt.
		kW	RT	kW	MBH	kW	MBH	Flow-rate	Pressure drop	Flow-rate	Pressure drop	Flow-rate	Pressure drop	Flow-rate	Pressure drop		
Exhaust & direct-fired chiller BZE exhaust 932°F gas/oil	20	233	66	179	612	80	273	126	10	67	6.7	15	6.7	208	16.7	2.5	2.9
	30	349	99	269	917	120	409	189	10	102	6.7	23	6.7	323	16.7	4.2	3.5
	50	582	165	449	1530	200	683	314	10	169	6.7	38	6.7	520	16.7	5.8	6.2
	75	872	248	672	2295	300	1024	471	10	255	6.7	57	6.7	779	16.7	6.1	7.7
	100	1163	331	897	3061	400	1365	629	10	339	6.7	76	6.7	1039	16.7	9.8	9.7
	125	1454	413	1121	3824	500	1707	786	10	424	6.7	95	6.7	1299	16.7	9.8	11.9
	150	1745	496	1349	4589	600	2048	943	13.4	510	6.7	114	6.7	1559	16.7	11.6	13.4
	200	2326	661	1791	6119	800	2730	1257	13.4	674	10	151	10	2078	16.7	16.7	18.7
	250	2908	827	2245	7649	1000	3412	1571	16.7	849	10	189	10	2598	20	16.7	22
	300	3489	992	2687	9179	1200	4096	1886	16.7	1016	13.4	227	13.4	3118	20	21.7	28
	400	4652	1323	3582	12238	1600	5460	2514	16.7	1355	13.4	303	13.4	4157	20	25.2	32.8
	500	5815	1653	4489	15298	/	/	3143	20	1695	16.7	/	/	5196	23.4	31.9	41.8
	600	6978	1984	5385	18357	/	/	3771	20	2037	16.7	/	/	6235	23.4	40.7	50.9
	800	9304	2646	7176	24476	/	/	5029	20	2715	20	/	/	8314	23.4	49.9	66.5
	1000	11630	3307	8967	30595	/	/	6286	20	3392	20	/	/	10392	23.4	63.3	79.7
Hot W & exhaust chiller BHE exhaust 932°F hot W 208°F	20	233	66	153	522	/	/	126	10	58	5	/	/	231	16.7	1.7	3.5
	30	349	99	230	785	/	/	189	10	86	6.7	/	/	323	16.7	3.2	5
	50	582	165	384	1310	/	/	314	10	144	5	/	/	576	16.7	4.3	7.9
	75	872	248	575	1962	/	/	471	10	215	5	/	/	862	16.7	4.6	10
	100	1163	331	767	2617	/	/	629	10	288	5	/	/	1153	16.7	6.8	12.8
	125	1454	413	959	3272	/	/	786	10	360	5	/	/	1439	16.7	6.8	15
	150	1745	496	1151	3927	/	/	943	13.4	431	5	/	/	1729	16.7	6.8	17.2
	200	2326	661	1534	5324	/	/	1257	13.4	576	8.4	/	/	2310	16.7	10.2	24.2
	250	2908	827	1918	6544	/	/	1571	16.7	717	8.4	/	/	2882	20	10.2	27.8
	300	3489	992	2301	7851	/	/	1886	16.7	862	11.7	/	/	3463	20	11.7	35.7
	400	4652	1323	3068	10468	/	/	2514	16.7	1153	11.7	/	/	4615	20	13.2	41.2
	500	5815	1653	3835	13085	/	/	3143	20	1439	15	/	/	5768	23.4	17.7	52.2
	600	6978	1984	4602	15702	/	/	3771	20	1734	15	/	/	6921	23.4	20.7	65.6
	800	9304	2646	6137	20940	/	/	5029	20	2301	18.4	/	/	9227	23.4	25.9	81.9
	1000	11630	3307	7671	26174	/	/	6286	20	2878	18.4	/	/	11537	23.4	34.9	92.5
Hot W & exhaust & direct-fired chiller BZHE exhaust 932°F hot W 208°F	20	233	66	179	612	80	273	126	10	67	6.7	15	6.7	231	16.7	2.5	3.1
	30	349	99	269	917	120	409	189	10	102	6.7	23	6.7	323	16.7	4.2	3.7
	50	582	165	449	1530	200	683	314	10	169	6.7	38	6.7	576	16.7	5.8	6.4
	75	872	248	672	2295	300	1024	471	10	255	6.7	57	6.7	862	16.7	6.1	7.9
	100	1163	331	897	3060	400	1365	629	10	339	6.7	76	6.7	1153	16.7	9.8	10
	125	1454	413	1121	3824	500	1707	786	10	424	6.7	95	6.7	1439	16.7	9.8	12.3
	150	1745	496	1349	4589	600	2048	943	13.4	510	6.7	114	6.7	1729	16.7	11.6	13.9
	200	2326	661	1791	6119	800	2730	1257	13.4	674	10	151	10	2310	16.7	16.7	19.2
	250	2908	827	2245	7649	1000	3412	1571	16.7	849	10	189	10	2882	20	16.7	23.1
	300	3489	992	2687	9179	1200	4096	1886	16.7	1016	13.4	227	13.4	3463	20	21.7	28.8
	400	4652	1323	3582	12238	1600	5460	2514	16.7	1355	13.4	303	13.4	4615	20	25.2	33.9
	500	5815	1653	4489	15298	/	/	3143	20	1695	16.7	/	/	5768	23.4	31.9	43.4
	600	6978	1984	5385	18357	/	/	3771	20	2037	16.7	/	/	6921	23.4	40.7	52.4
	800	9304	2646	7176	24476	/	/	5029	20	2715	20	/	/	9227	23.4	49.9	68
	1000	11630	3307	8967	30595	/	/	6286	20	3392	20	/	/	11537	23.4	63.3	82

Energy consump						Unit	Main	HTG.	Operation
Cooling			Heating		Hot water		ship. wt.	shell wt.	wt.
NG	Exhaust	Hot W	NG	Exhaust	NG	Exhaust	wt.	ship wt.	wt.
MBH	lb/h	GPM	MBH	lb/h	MBH	lb/h	klbs	klbs	klbs
583	1009	/	622	1009	293	1009	13	/	/
876	1520	/	993	1520	441	1520	18	/	/
1459	2520	/	1663	2520	740	2520	24	/	/
2188	3789	/	2481	3789	1104	3789	31	/	/
2918	5049	/	3390	5049	1475	5049	40	/	/
3647	6323	/	4129	6323	1841	6323	46	/	/
4376	7596	/	4961	7596	2205	7596	50	/	/
5835	10118	/	6629	10118	2935	10118	68	/	/
7294	12665	/	8292	12665	3681	12665	/	29	31
8753	15201	/	9924	15201	4411	15201	/	33	33
11670	20281	/	13232	20281	5869	20281	/	44	35
14589	25346	/	16477	25346	/	/	/	53	46
17507	30417	/	19846	30417	/	/	/	62	57
23342	40566	/	26436	40566	/	/	/	64	53
29178	50693	/	33066	50693	/	/	/	66	75
/	3364	29	/	3364	/	/	14	/	/
/	5067	44	/	5067	/	/	20	/	/
/	8402	72	/	8402	/	/	26	/	/
/	12628	108	/	12628	/	/	33	/	/
/	16829	145	/	16829	/	/	42	/	/
/	21074	180	/	21074	/	/	49	/	/
/	25321	212	/	25321	/	/	56	/	/
/	33728	290	/	33728	/	/	75	/	/
/	42220	364	/	42220	/	/	/	29	31
/	50667	435	/	50667	/	/	/	33	46
/	67606	580	/	67606	/	/	/	44	48
/	84483	722	/	84483	/	/	/	53	64
/	101391	867	/	101391	/	/	/	62	82
/	135222	1157	/	135222	/	/	/	64	93
/	168977	1448	/	168977	/	/	/	66	104
583	1009	29	622	1009	293	1009	14	/	/
876	1520	44	993	1520	441	1520	19	/	/
1459	2520	72	1663	2520	740	2520	25	/	/
2188	3789	108	2481	3789	1104	3789	33	/	/
2918	5049	145	3390	5049	1475	5049	42	/	/
3647	6323	180	4129	6323	1841	6323	48	/	/
4376	7596	212	4961	7596	2205	7596	54	/	/
5835	10118	290	6629	10118	2935	10118	73	/	/
7294	12665	364	8292	12665	3681	12665	/	29	33
8753	15201	435	9924	15201	4411	15201	/	33	35
11670	20281	580	13232	20281	5869	20281	/	44	42
14589	25346	722	16477	25346	/	/	/	53	55
17507	30417	867	19846	30417	/	/	/	62	66
23342	40566	1157	26436	40566	/	/	/	64	82
29178	50693	1448	33066	50693	/	/	/	66	110

General Conditions:

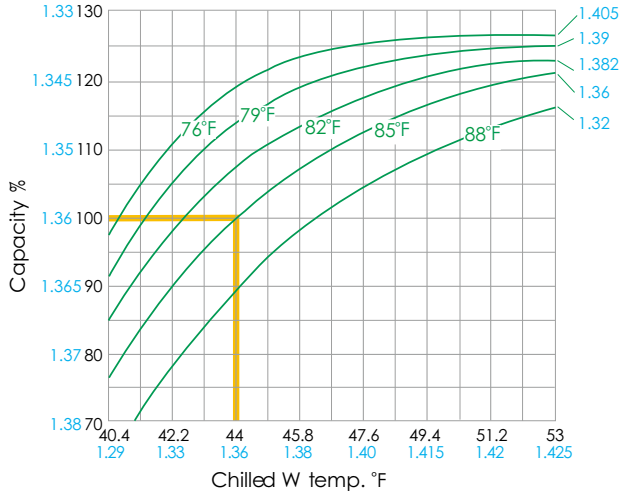
1. Rated chilled W outlet/inlet temp: 44°F/56.7°F
2. Rated cooling W outlet/inlet temp: 97.5°F/85°F
3. Rated heating W outlet/inlet temp: 149°F/131°F
4. Rated hot W outlet/inlet temp: 176°F/140°F
5. Lowest permitted outlet temperature for chilled water: 41°F
6. Highest permitted outlet temperature for heating/ hot water: 203°F
7. Lowest permitted inlet temperature for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120%
9. Adjustable heating/hot water flowrate: 65%~120%
10. Pressure limit for chilled W, cooling W, heating W, hot W 0.8MPa (except special order)
11. Adjustable load: 5%~115%
12. ouling factor for chilled W, heating W, hot W: 0.0001hrft²·°F/Btu, for cooling W:0.00025hrft²·°F/Btu
13. LiBr Solution concentration: 52%. Solution weight is included in unit ship. wt.
14. Natural gas consumption is calculated: 10kWh/m³(8600kcal/m³).
15. Standard natural gas pressure is 2.3~7.3psig(63~197 inchH₂O), lower or higher pressure can be ccommodated to special orders
16. Machine room ambient temperature: 41°F~109°F, humidity ≤ 85%
17. Standard climate conditions for cooling operation: 96.8°F, relative humidity 50%(wet bulb 80.6°F)
18. Exhaust provides 30% of the total capacity per standard design of BZE/BZHE. Over 30% can be accommodated into special orders.
19. Energy consumption is for separte operation of heat source and fuel
20. Life design: 25 years
21. Please refer to P5, P6 & P7 for performance curve, model selection & ordering and supply list information

Model Selection Curves

(orange means the rated value)

chilled/cooling water temp, cooling capacity, COP

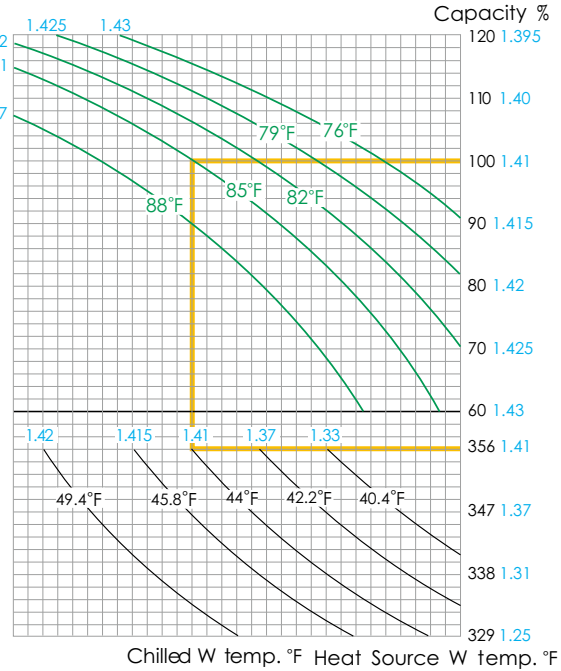
BZ



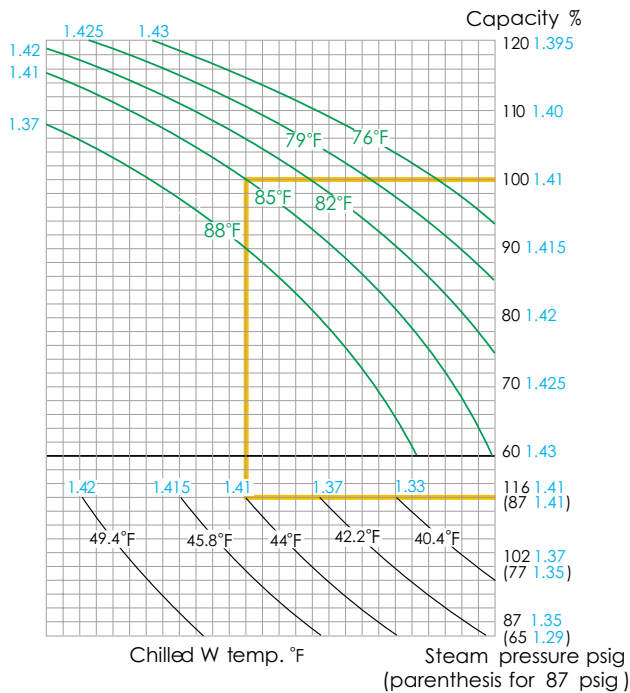
Notes: The figure in blue is COP. In calculation, 3 COP values are added and then divided by 3. e.g.

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

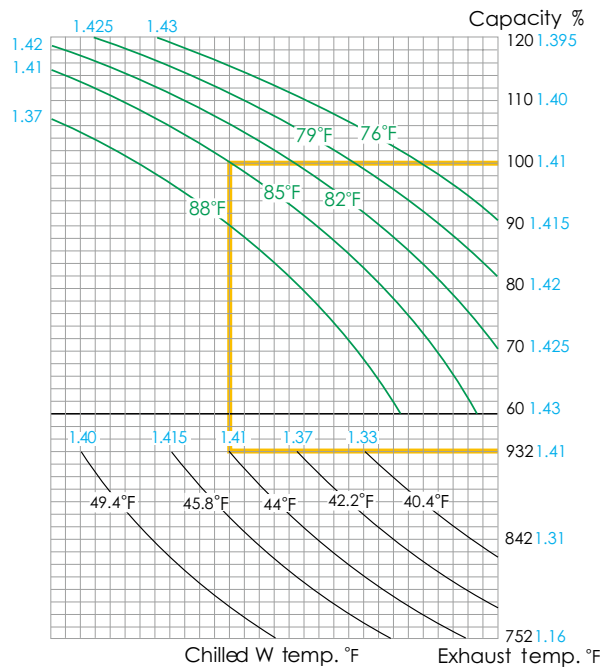
BH



BS



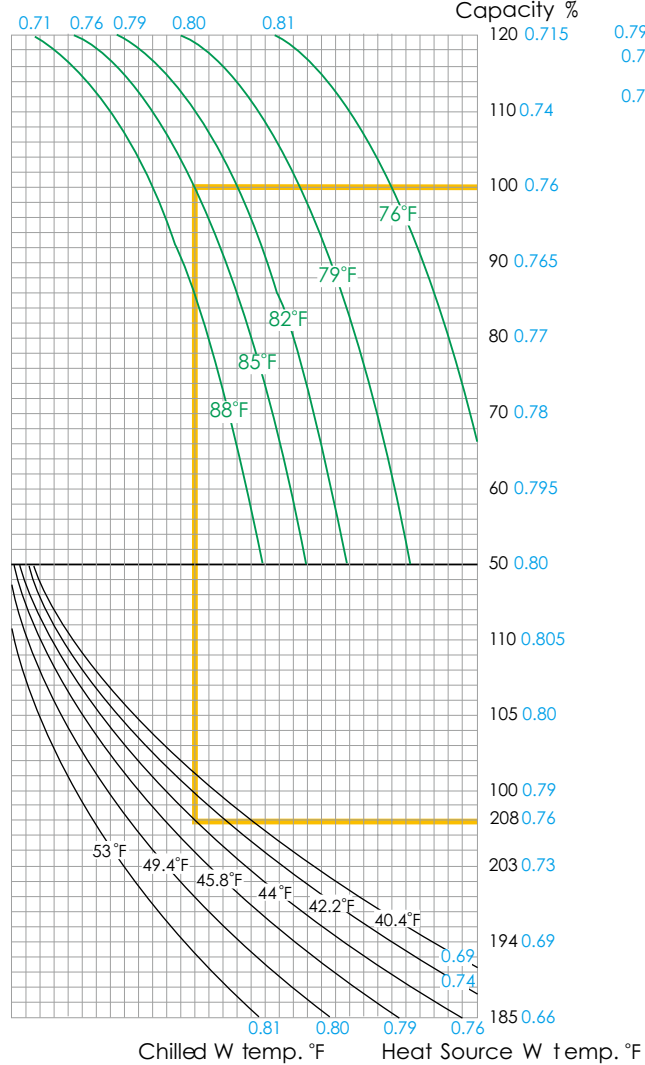
BE



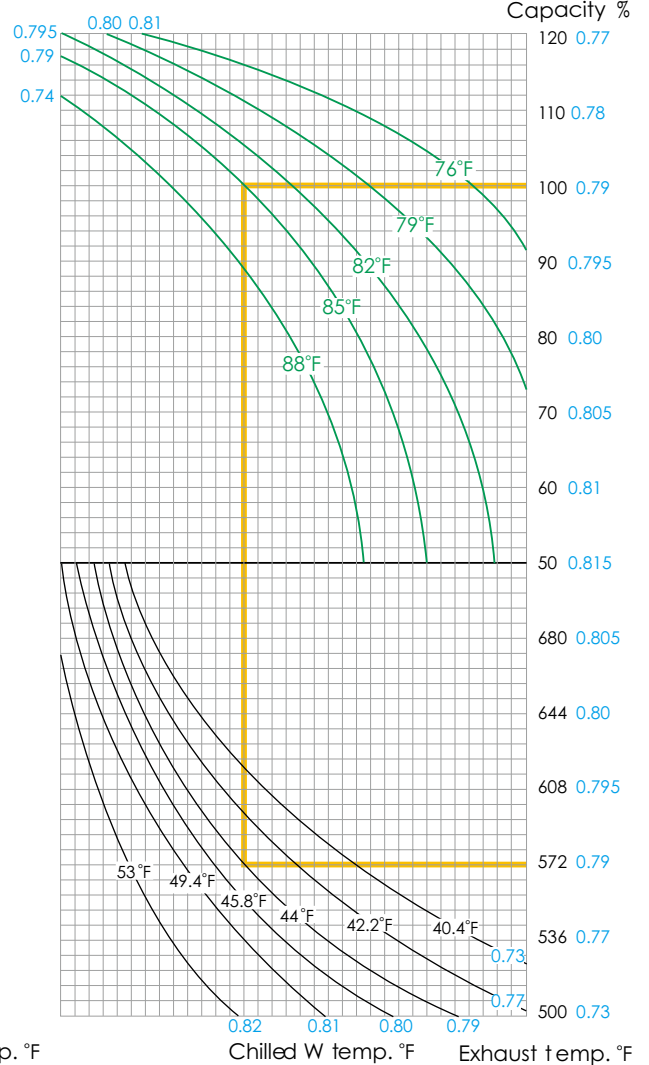
Notes: The figure in blue is COP. In calculation, 4 COP values are added and then divided by 4. e.g.

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)

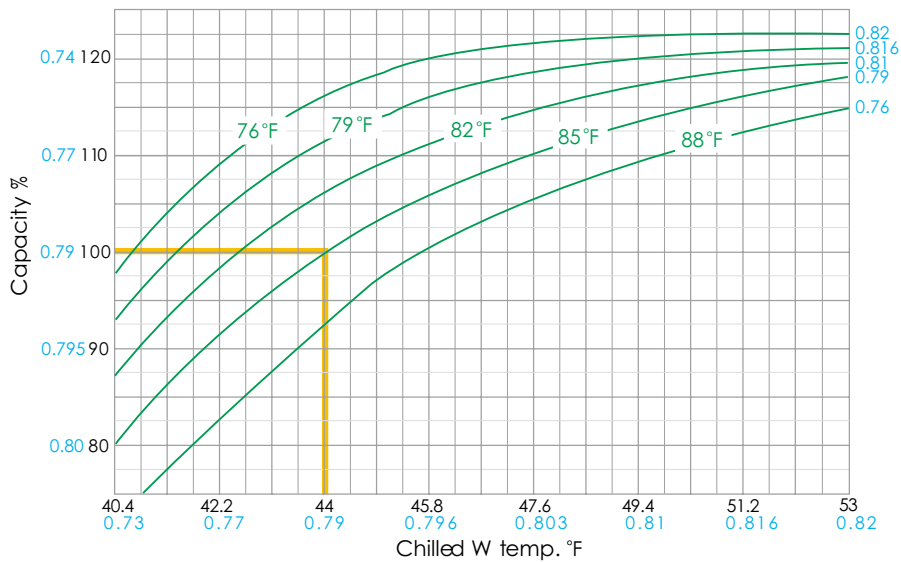
BDH



BDE



BDS



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

Micro Non-electric Chiller (villa air conditioning)



Performance Data

Model		BCT23	BCT70	BCT115
cooling capacity	kW	23	70	115
	RT	6.6	20	33
heating capacity	kW	23	70	115
	MBH	78	239	392
hot W capacity	kW	7.7	39	39
	MBH	26	133	133
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:

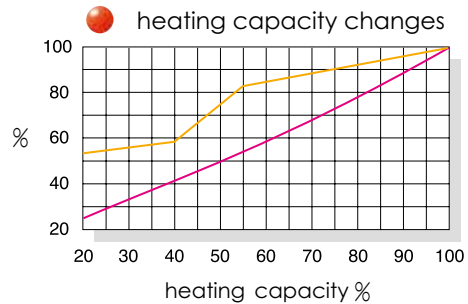
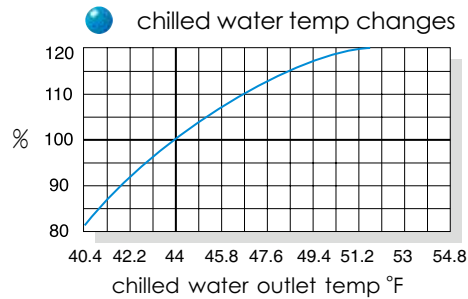
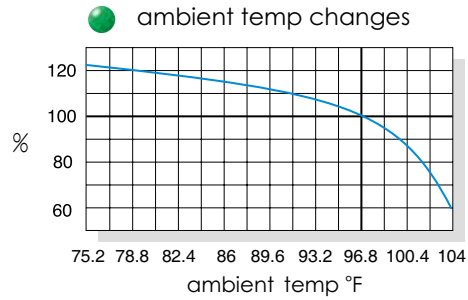
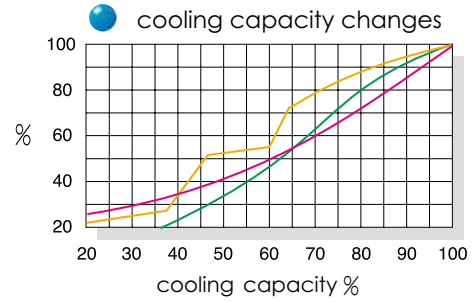
1. Fuel: NG, Town gas, LPG, Light oil, please specify it in purchase orders.
2. Natural gas consumption is calculated 900 Btu/ft³ (8,051kcal/m³).
3. Standard gas pressure: 7.9~25.2 inchH₂O(0.28~0.88psig). Pressure release valve has to be installed if the pressure is higher than the standard.
4. Standard condition for cooling: 96.8°F , humidity 50%.
5. Permitted condition: summer ≤ 113°F winter ≥ -22°F.
6. Lowest permitted outlet temp. for chilled W: 41°F. Pressure limit for chilled/ heating/ hot W: 134ftH₂O(56psig).
7. Hot W can only be used after secondary heat exchange, otherwise it gets scaled.
8. Single phase power for BCT23 and 3 phase for BCT70/115.
9. Rated cooling COP: 110% Rated heating COP: 88%.

Model Selection & Ordering

- BROAD recommendations are as follows:
 - 1 unit for buildings $\leq 3240 \text{ ft}^2$
 - 1~2 units for buildings $\leq 21600 \text{ ft}^2$
 - 2~3 units for buildings $> 21600 \text{ ft}^2$
- 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

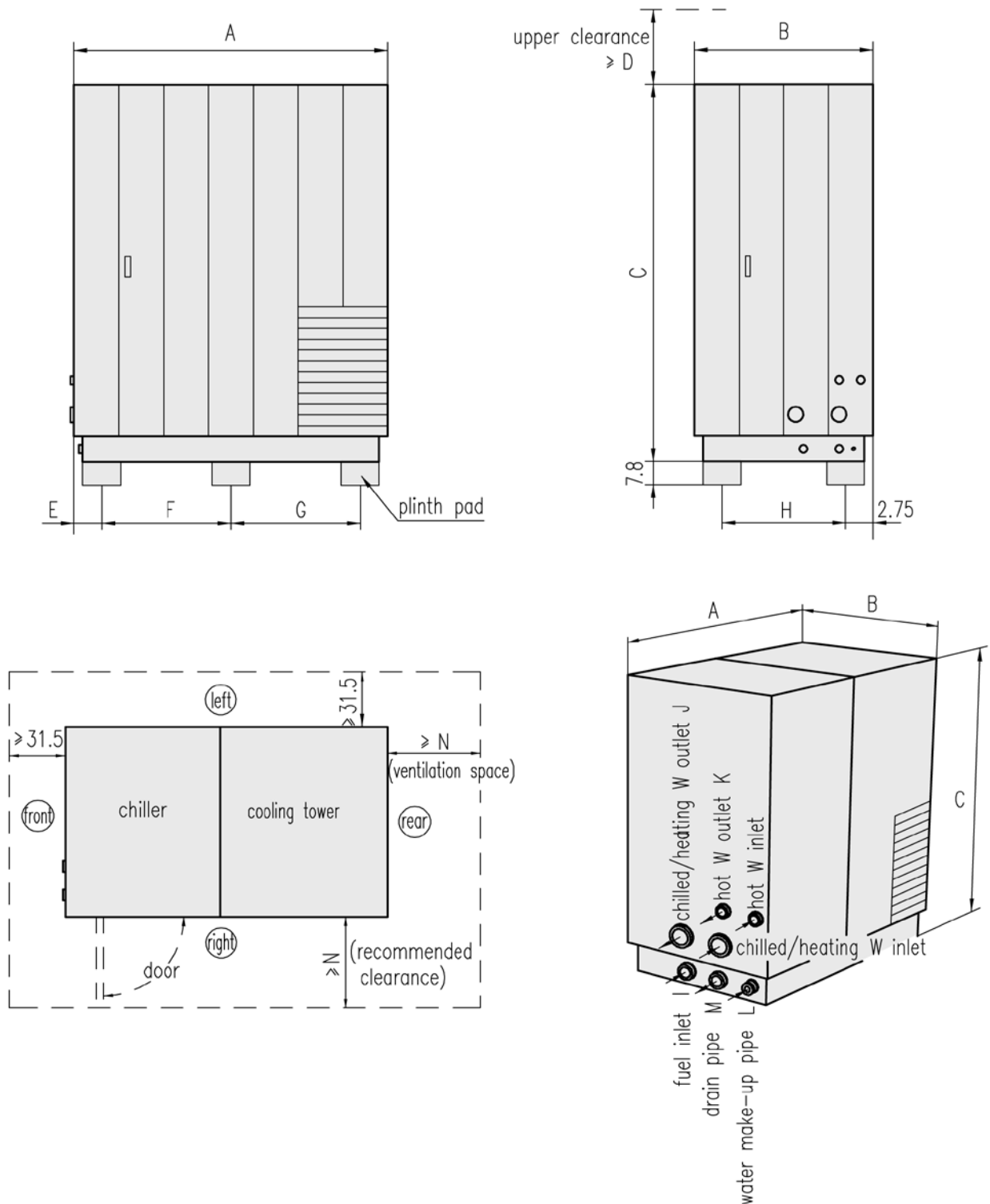


Performance Curves



cooling capacity ————
 fuel consumption ————
 electricity consumption ————
 water consumption ————

Micro Non-electric Chiller Dimensions

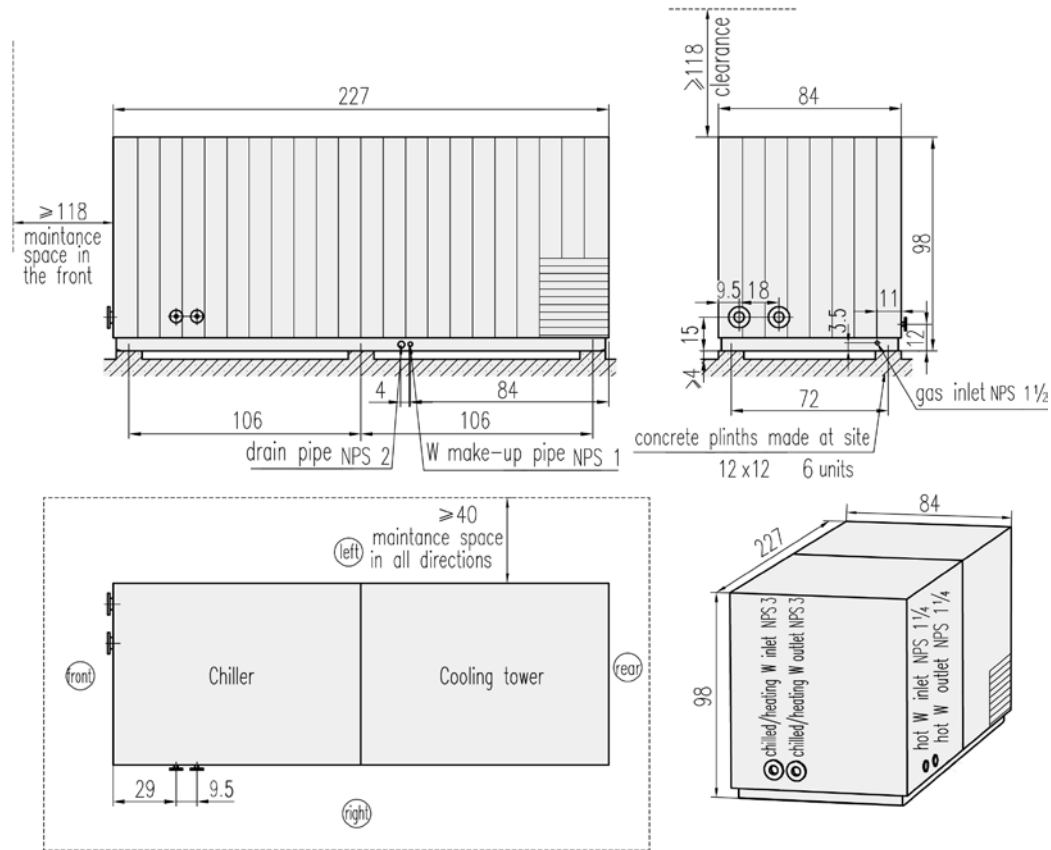


Mode	A	B	C	D	E	F	G	H	I	J	K	L	M	N
BCT23	53	32.5	88	78.5	4.5	15.5	30.5	27	NPT ¾	NPT 1½	NPT ½	NPT ½	NPT ¾	31.5
BCT70	88.5	63.5	88	98.5	5.5	35.5	41.5	57.5	NPT 1½	NPT 2½	NPT 1½	NPT ½	NPT 1½	39.5
BCT115	109	63.5	88	98.5	5.5	40	57.5	57.5	NPT 1½	NPT 2½	NPT 1½	NPT ½	NPT 1½	39.5

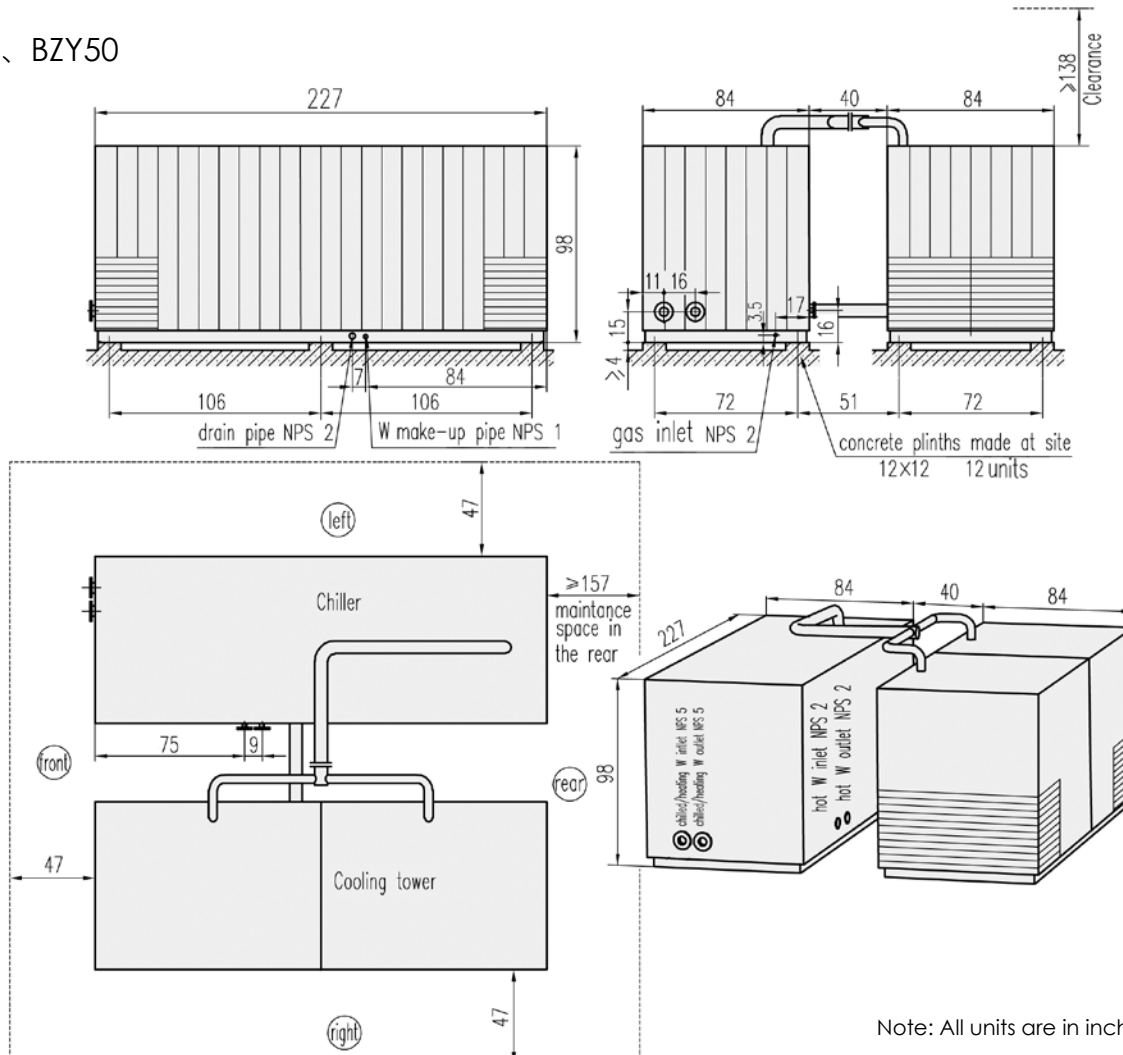
Note: All units are in inch.

Packaged DFA

BZY20



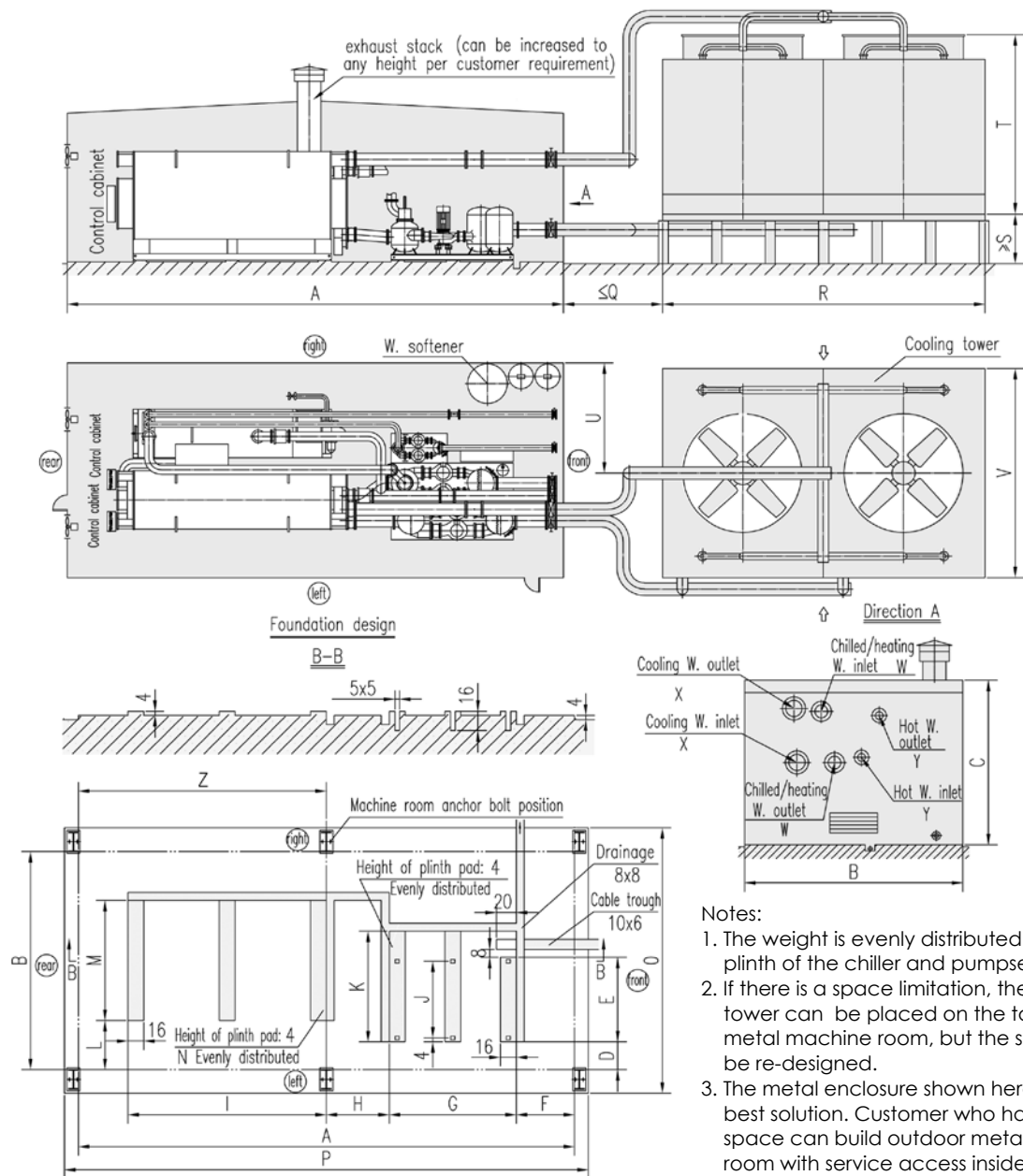
BZY30、BZY50



Note: All units are in inch.

Packaged DFA Dimensions (with metal machine room)

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



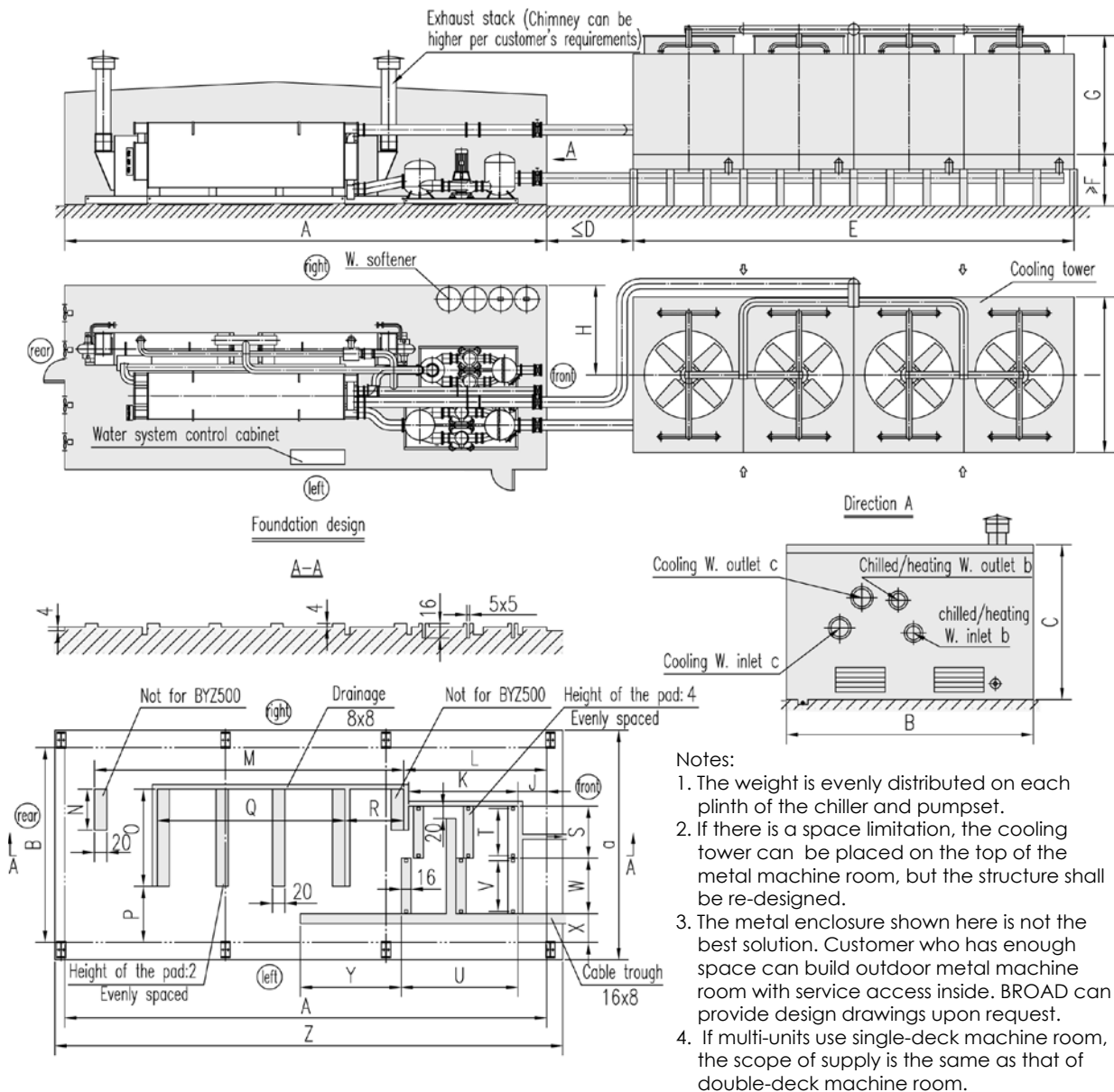
1. The weight is evenly distributed on each plinth of the chiller and pumpset.
2. If there is a space limitation, the cooling tower can be placed on the top of the metal machine room, but the structure shall be re-designed.
3. The metal enclosure shown here is not the best solution. Customer who has 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
BZY75	394	177	127	25	77	30	106	42	157	69	101	34	90.5
BZY100	394	177	127	29	75	25	114	47	157	67	99	35	102
BZY125	453	177	145	22.5	80.5	32	114	52	197	72.5	105	31	102
BZY150	453	177	145	22.5	80.5	38	114	52	197	72.5	106	30.5	110
BZY200	492	197	163	27	87	38	126	62	197	79	113	38	134
BZY250	531	197	167	21	87	38	126	66	236	79	113	31	134
BZY300	551	217	168	29	87	40.5	136	69	236	79	119	41	145.5
BZY400	570	236	192	24.5	98	43	145.5	73	236	90	128.5	35.5	157
Model	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
BZY75	2	212.5	421	59	163.5	81	122.5	127	154	NPS 6	NPS 8	NPS 2½	181
BZY100	2	212.5	421	59	205	80	123	92	170	NPS 6	NPS 8	NPS 2½	181
BZY125	3	212.5	480	79	241	83	144	88.5	239	NPS 8	NPS 10	NPS 3	206.5
BZY150	3	212.5	480	79	241	83	144	88	239	NPS 8	NPS 10	NPS 3	206.5
BZY200	3	236	519.5	79	289	98.5	144	98	252	NPS 10	NPS 12	NPS 5	226
BZY250	3	236	559	79	337	101	144	78.5	269	NPS 10	NPS 14	NPS 5	246
BZY300	3	256	579	94	337	101.5	144	89	269	NPS 12	NPS 14	NPS 5	256
BZY400	3	275.5	598	118	290	102	226	118	269	NPS 12	NPS 16	NPS 6	256

Note: All units are in inch.

Packaged DFA Dimensions(with metal machine room)

BZY500、BZY600、BZY800、BZY1000

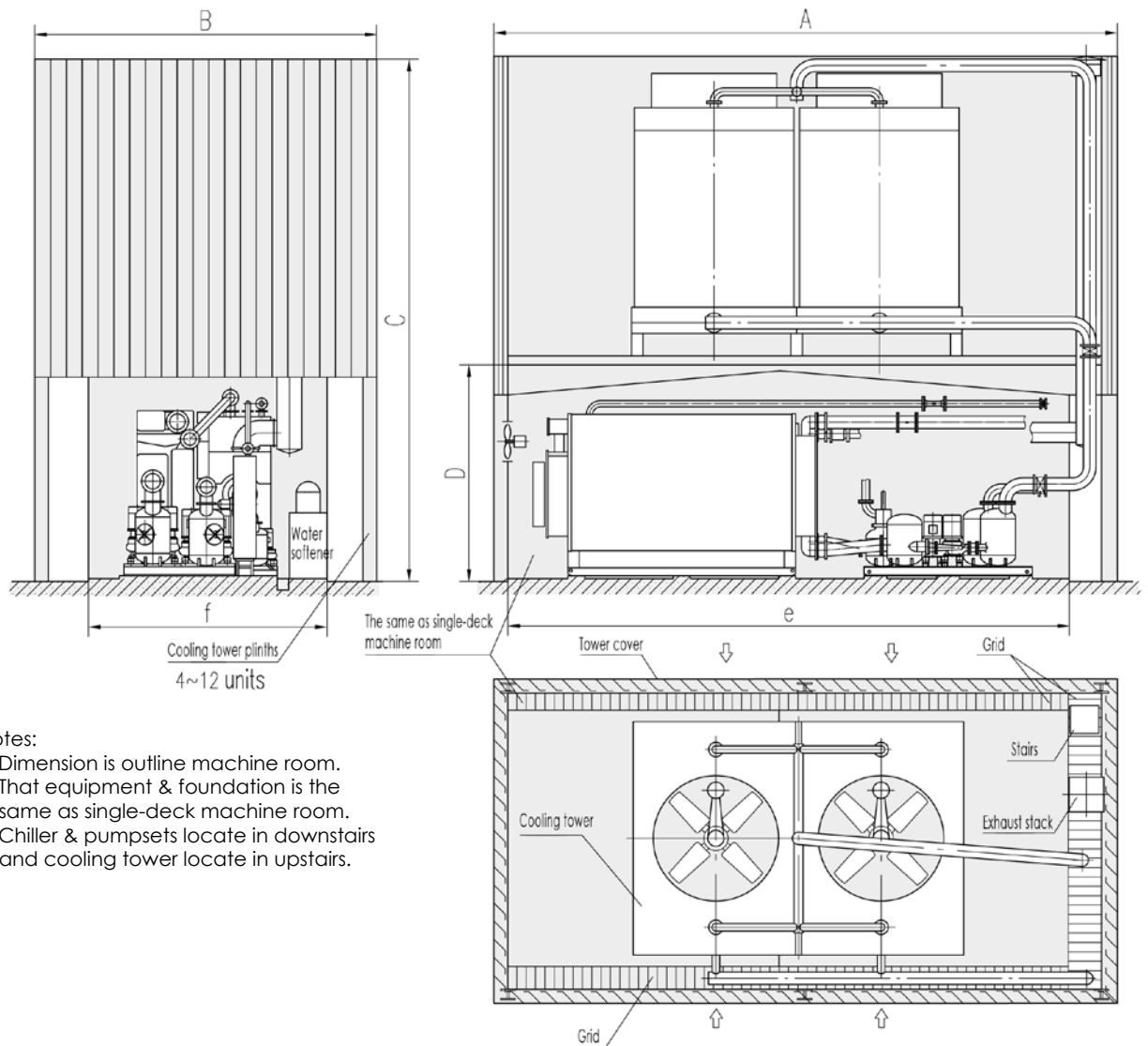


Mode	A	B	C	D	E	F	G	H	I	J
BZY500	669	256	177	118	507	129.5	144	131	269	38
BZY600	768	256	197	138	677.5	133	144	162	269	46
BZY800	768	283.5	216.5	138	584	137	226	134.5	269	42
BZY1000	834.5	283.5	216.5	157.5	728	140	226	144.5	269	55
Model	K	L	M	N	O	P	Q	R	S	T
BZY500	128	/	/	/	161.5	51.5	315	298	53	47.5
BZY600	157.5	223	512	72	153.5	57	315	98.5	58.5	53
BZY800	157.5	223	512	79	177	67.5	315	98.5	56.5	51
BZY1000	157.5	272	512	92	177	67	394	59	60	54
Model	U	V	W	X	Y	Z	a	b	c	
BZY500	181	53.5	59	35.5	149.5	705	299	NPS 14	NPS 16	
BZY600	181	53.5	59	44	165	803	299	NPS 16	NPS 18	
BZY800	197	53.5	59	52.5	181	803	327	NPS 18	NPS 20	
BZY1000	197	53.5	59	51	181	872	327	NPS 18	NPS 20	

Note: All units are in inch.

Packaged DFA Dimensions (with enclosure)

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



Notes:

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

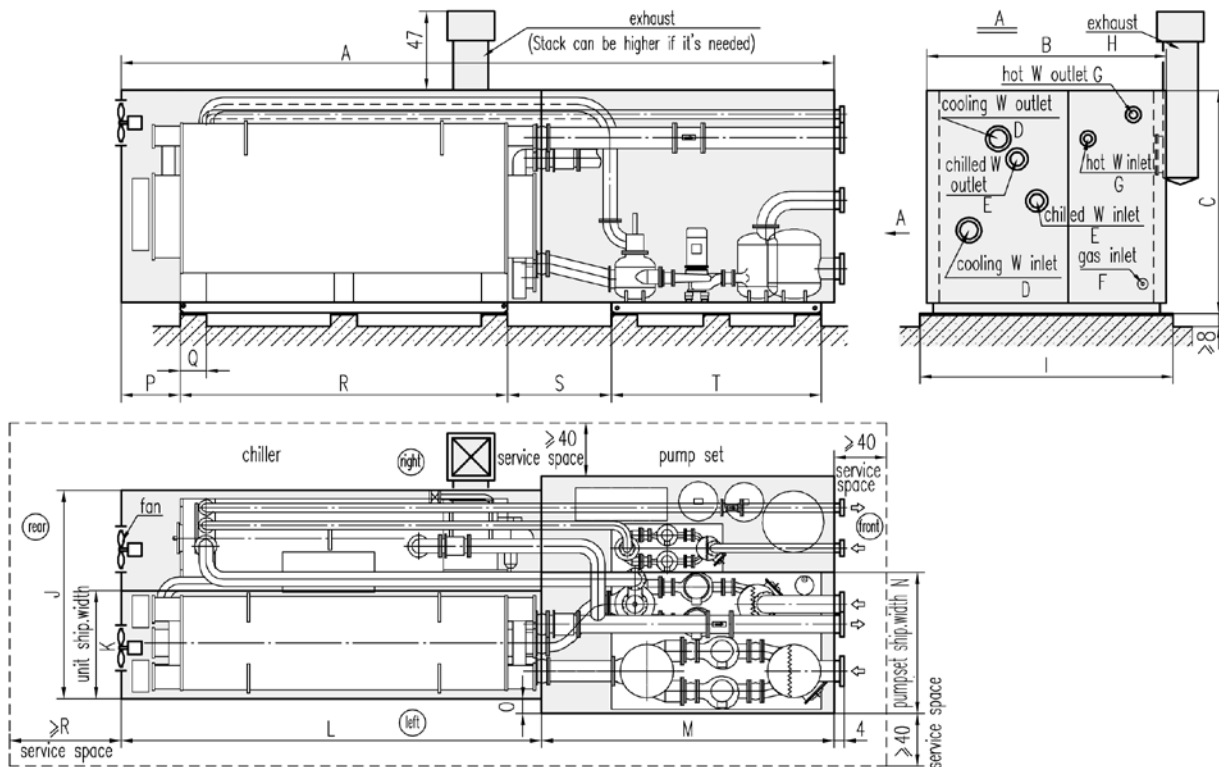
Dimensions of double-deck machine room

Code	Mode	A	B	C	D	e	f
1	BZY75、BZY100	453	216.5	354.5	130	394	177
2	BZY125、BZY150	512	268	394	149.5	453	177
3	BZY200	551	268	433	165.5	492	197
4	BZY250BZY300、BZY400 BZY75×2、BZY100×2 BZY125×2、BZY150×2	630	315	453	193	571	295
5	BZY500、BZY600 BZY200×2、BZY250×2	827	374	492	201	768	354.5
6	BZY800 BZY300×2、BZY200×3	827	413.5	492	220.5	768	394
7	BZY1000 BZY400×2	984	453	531.5	220.5	834.5	433
8	BZY600×2、BZY400×3	827	787.5	492	201	827	787.5
9	BZY800×2、BZY500×3	827	827	492	220.5	827	827
10	BZY1000×2	984	866	531.5	220.5	984	866

Note: All units are in inch.

Packaged DFA Dimensions (with enclosure)

BZY75、BZY100、BZY125、BZY150、BZY200、BZY250、BZY300、BZY400、BZY500

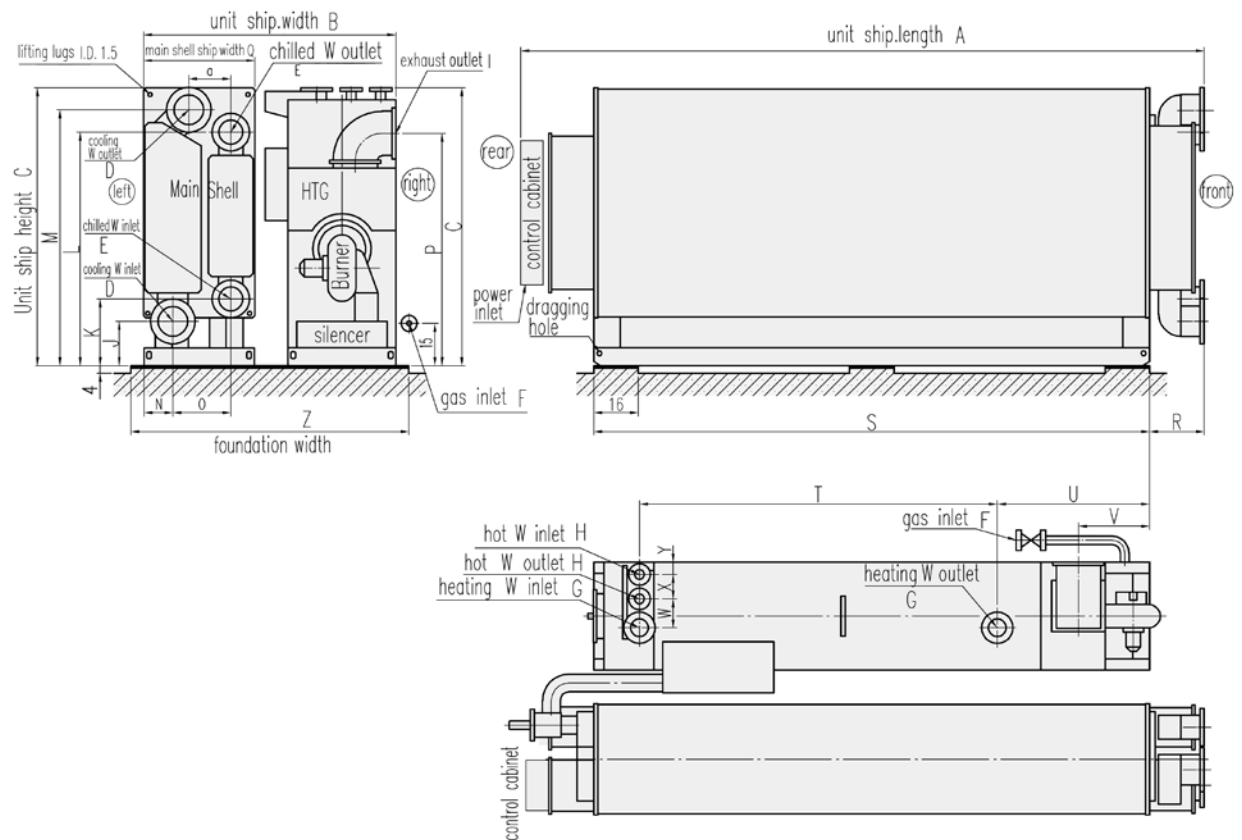


Mode	A	B	C	D	E	F	G	H	I	J
BZY75	347.5	103.5	116	NPS 8	NPS 6	NPS 1	NPS 2½	13×13	111.5	82.5
BZY100	354.5	103.5	116	NPS 8	NPS 6	NPS 1½	NPS2½	14×14	111.5	97.5
BZY125	397.5	125	117	NPS 10	NPS 8	NPS 1½	NPS 3	16×16	133	100
BZY150	397.5	128	134	NPS 10	NPS 8	NPS 1½	NPS 3	17×17	136	108
BZY200	425	140	134	NPS 12	NPS 10	NPS 2	5	22×22	149.5	125
BZY250	449	140	135.5	NPS 14	NPS 10	NPS 2	5	22×22	149.5	125
BZY300	496	149.5	135.5	NPS 14	NPS 10	NPS 2	5	24×24	157.5	140
BZY400	502	165.5	149.5	NPS 16	NPS 12	NPS 2½	6	28×28	173	157.5
BZY500	630	157.5	149.5	NPS 16	NPS 14	NPS 3	/	31×31	181	157.5
Mode	K	L	M	N	O	P	Q	R	S	T
BZY75	43.5	191	156	76	8	33.5	16	157.5	43.5	106
BZY100	53	240	114	76	6	33.5	16	157.5	47	114
BZY125	53	252	145.5	79	3.5	34	16	197	52.5	114
BZY150	57	252	145.5	79	0	34	16	197	52.5	114
BZY200	62.5	254	171.5	84	7.5	35.5	16	197	59	126
BZY250	62.5	289.5	159.5	84	7.5	31.5	16	236	51	126
BZY300	79	346.5	149.5	59	9.5	43	16	236	69	136
BZY400	79	352.5	149.5	59	8	43	16	236	73	145.5
BZY500	79	429	201	84	16.5	43	19.5	315	78.5	181

Note: All units are in inch.

DFA Dimensions

BZ75、BZ100、BZ125、BZ150

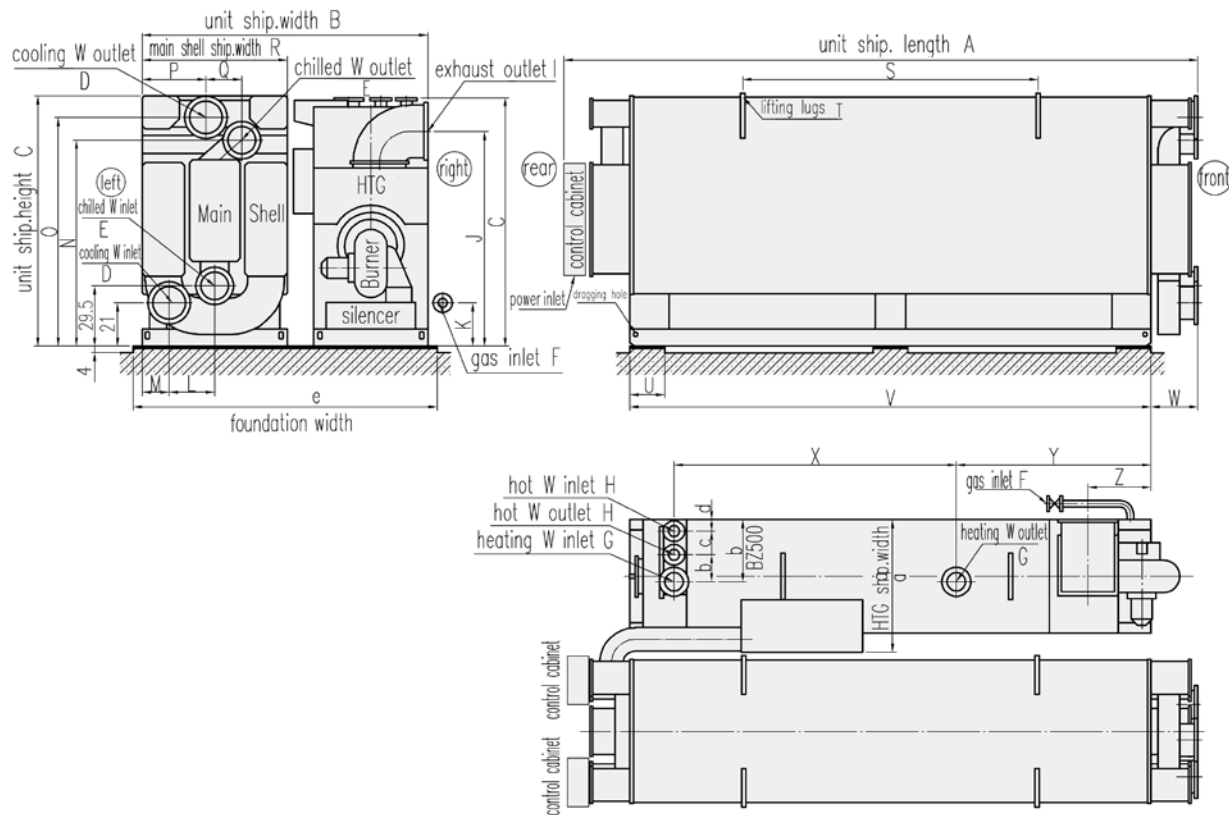


Mode	A	B	C	D	E	F	G	H	I
BZ75	213.5	84.5	99	NPS 8	NPS 6	NPS 1	NPS 4	NPS 2½	12.5×12.5
BZ100	213.5	96.5	99	NPS 8	NPS 6	NPS 1½	NPS 5	NPS 2½	14×14
BZ125	258	96.5	99	NPS 10	NPS 8	NPS 1½	NPS 6	NPS 3	16×16
BZ150	260	104.5	115.5	NPS 10	NPS 8	NPS 1½	NPS 6	NPS 3	17.5×17.5
Mode	J	K	L	M	N	O	P	Q	R
BZ75	16	23.5	82.5	90.5	8	17	87.5	49	19
BZ100	16	23.5	82.5	90.5	10	20.5	87	57	19
BZ125	16	23.5	82.5	90.5	10	20.5	82	61	21
BZ150	19.5	27.5	94.5	106.5	11	20	98.5	61	21
Mode	S	T	U	V	W	X	Y	Z	a
BZ75	157.5	125	25.5	12	8.5	8	4	90.5	15
BZ100	157.5	125	25.5	11	9.5	8	4	102.5	15
BZ125	197	127	127	25	10	8.5	4.5	102.5	15
BZ150	197	127	127	24.5	10	8.5	4.5	110	8.5

Note: All units are in inch.

DFA Dimensions

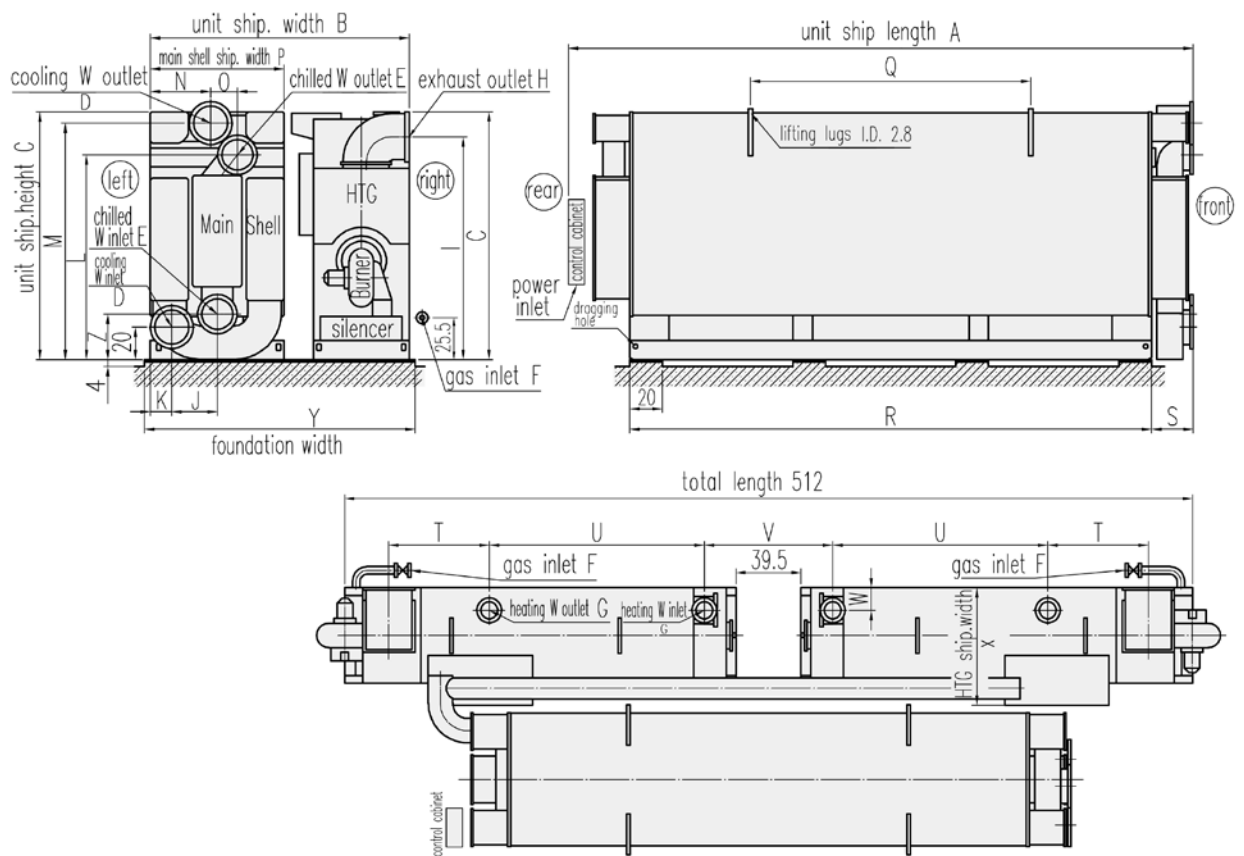
BZ200、BZ250、BZ300、BZ400、BZ500



Mode	A	B	C	D	E	F	G	H	I	J	K
BZ200	260	126	118	NPS 12	NPS 10	NPS 2	NPS 8	NPS 5	22×22	97	19.5
BZ250	303	126	118	NPS 14	NPS 10	NPS 2	NPS 8	NPS 5	22×22	99	19.5
BZ300	313	139	118	NPS 14	NPS 12	NPS 2½	NPS 8	NPS 5	24×24	98	19.5
BZ400	313	151.5	134	NPS 16	NPS 12	NPS 2½	NPS 10	NPS 6	28×28	114.5	25.5
BZ500	392	161.5	134	NPS 16	NPS 14	NPS 3	NPS 10	/	31×31	116	25.5
Mode	L	M	N	O	P	Q	R	S	T	U	V
BZ200	17	11.5	93	105	28.5	11	82.5	118	I.D. 2.4	16	197
BZ250	16.5	12	92.5	104.5	28.5	13.5	82.5	134	I.D. 2.4	16	236
BZ300	20.5	12	94	104.5	29	16	94.5	134	I.D. 2.4	16	236
BZ400	22	13	107	119	31	17	100.5	134	I.D. 2.4	16	236
BZ500	22.5	12.5	107	119	29.5	19	98.5	169	I.D. 2.8	19.5	315
Mode	W	X	Y	Z	a	b	c	d	e		
BZ200	21	128	53	22	66	12.5	10.5	5.5	130		
BZ250	23	128	88	29.5	65	12.5	10.5	5.5	130		
BZ300	23	128	88	28.5	69	12.5	10.5	5.5	145.5		
BZ400	23	130	87	26.5	73	14	12	5.5	157.5		
BZ500	23	130	140.5	140.5	82.5	16	/	/	161.5		

Note: All units are in inch.

BZ600、BZ800、BZ1000

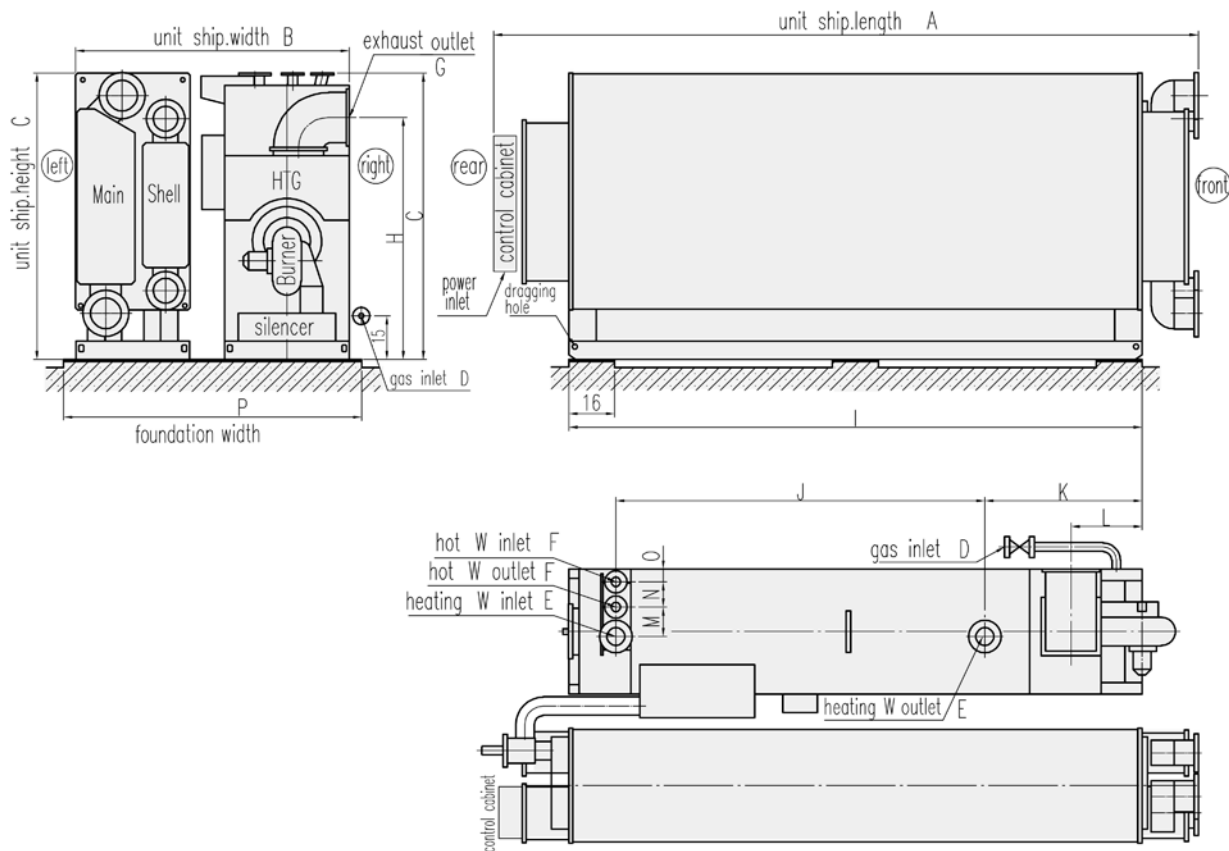


Mode	A	B	C	D	E	F	G	H	I
BZ600	386	152	145.5	NPS 18	NPS 16	NPS 2½	NPS 8	24×24	114.5
BZ800	388	172	154	NPS 200	NPS 18	NPS 2½	NPS 10	28×28	134.5
BZ1000	456	172	154	NPS 200	NPS 18	NPS 3	NPS 10	31×31	136
Mode	J	K	L	M	N	O	P	Q	R
BZ600	24	13.5	109	130.5	34	12	89	177	315
BZ800	27.5	13	124	143	36.5	16	80.7	177	315
BZ1000	27.5	13	124	143	36.5	16	80.7	197	393.5
Mode	S	T	U	V	W	X	Y	Z	
BZ600	25	60	128	79.5	12	69	153.5	27.5	
BZ800	27	60.5	130	77.5	13.5	73	163.5	27.5	
BZ1000	27	62	130	77.5	16	82.5	169	31	

Note: All units are in inch.

HTG Enlarged Model Dimensions

BZ75、BZ100、BZ125、BZ150

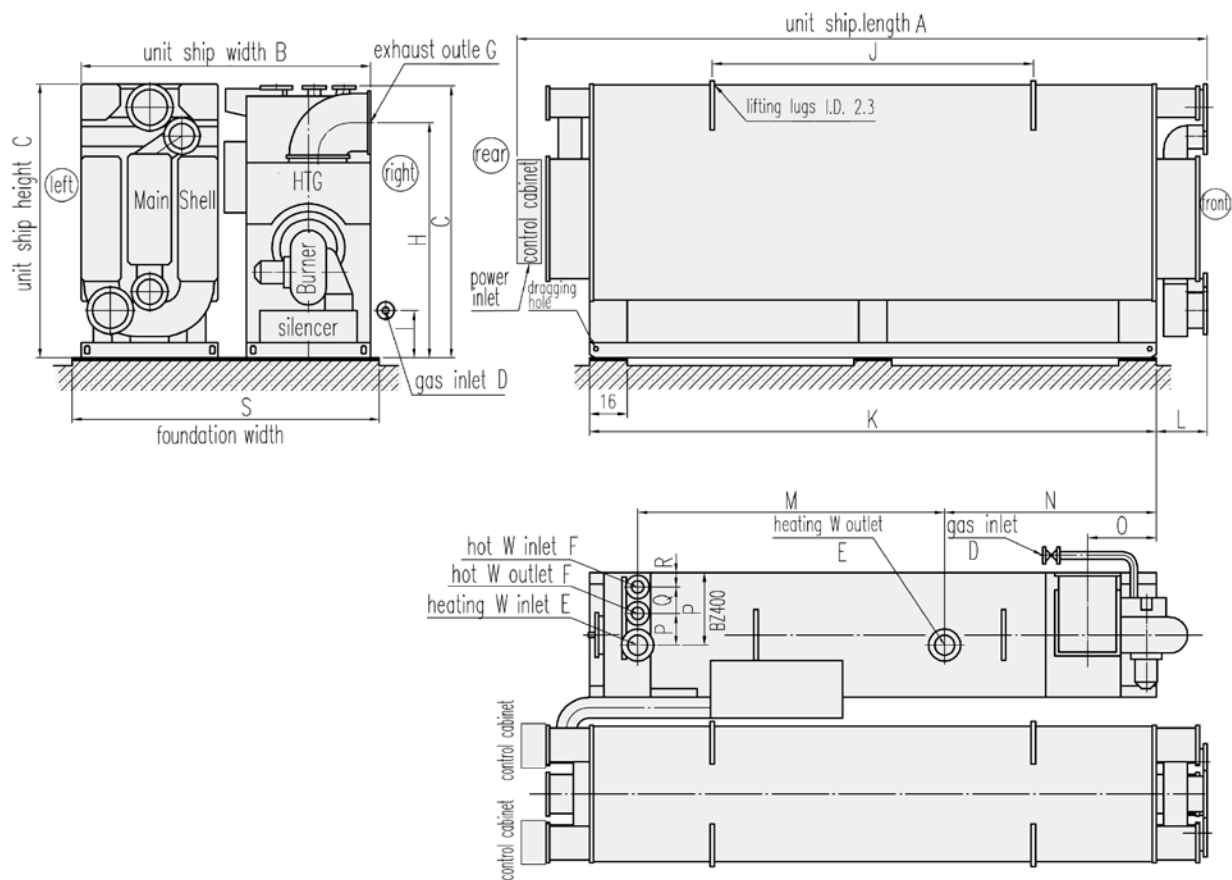


HTG Enlarged H3,H4 dimensions (HTG Enlarged H1,H2 is the same size with standard models)
(Refer to P26 of the DFA standard model for dimensions not shown in the drawing)

Mode	A	B	C	D	E	F	G	H
BZ75	213.5	88.5	99	NPS 1½	NPS 5	NPS 2½	14×14	87
BZ100	213.5	95	99	NPS 1½	NPS 6	NPS 3	16×16	82
BZ125	258	98.5	99	NPS 1½	NPS 6	NPS 3	17×17	83
BZ150	260	104.5	115.5	NPS 2	NPS 8	NPS 5	22×22	99.5
Mode	I	J	K	L	M	N	O	P
BZ75	157.5	125	25.5	11	8.5	8	4	94.5
BZ100	157.5	127	29.5	1	10	8	4.5	102.5
BZ125	197	127	54	24.5	10	8.5	4.5	110
BZ150	197	128	53	22	13	11	6	114

Note: All units are in inch.

BZ200、BZ250、BZ300、BZ400



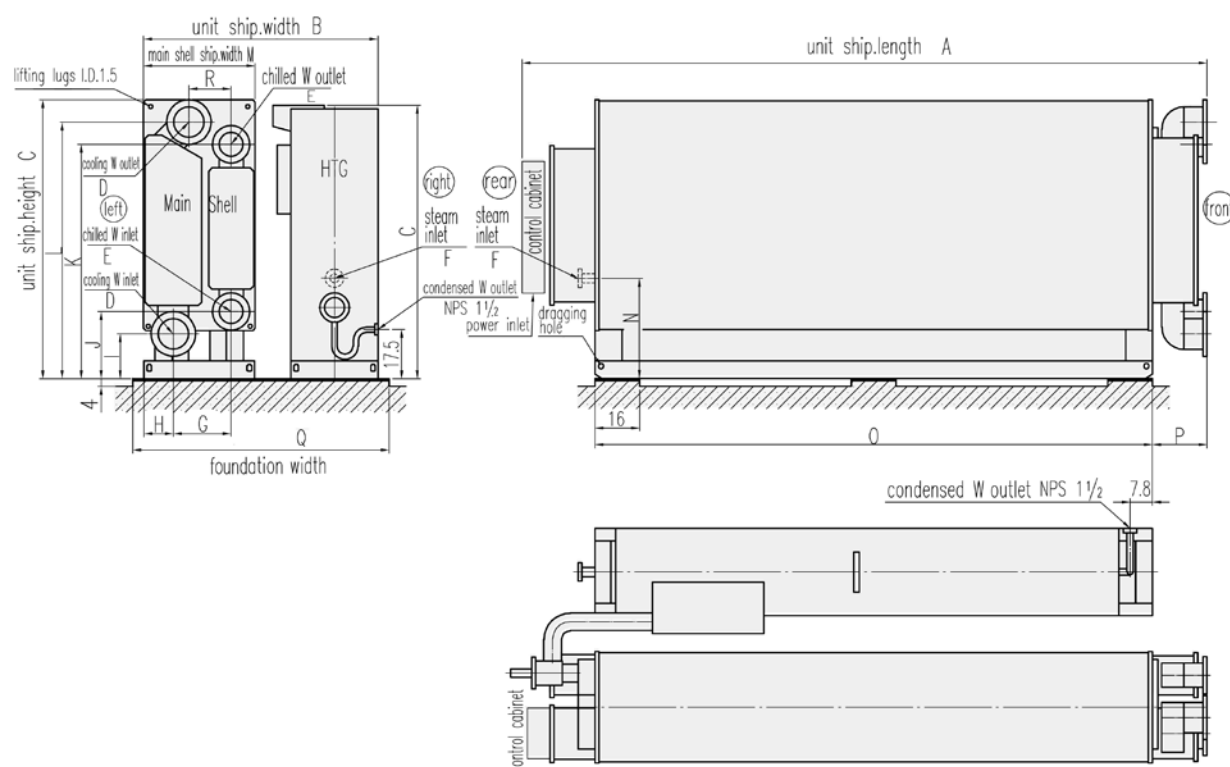
HTG Enlarged H3,H4 dimensions (HTG Enlarged H1,H2 is the same size with standard models)
(Refer to P27 of the DFA standard model for dimensions not shown in the drawing)

Mode	A	B	C	D	E	F	G	H	I	J
BZ200	260	126	118	NPS 2	NPS 8	NPS 5	22×22	97	19.5	118
BZ250	303	130	118	NPS 2½	NPS 8	NPS 5	24×24	98	19.5	134
BZ300	313	144.5	118	NPS 2½	NPS 10	NPS 6	28×28	106	19.5	134
BZ400	313	158	134	NPS 3	NPS 10	/	31×31	116	25.5	134
Mode	K	L	M	N	O	P	Q	R	S	
BZ200	197	21	128	65	6	13	11	6	124	
BZ250	236	23	128	88	28.5	13	11	6	128	
BZ300	236	23	130	87	26.5	16	12	8	147.5	
BZ400	236	23	130	86.5	25	16	/	/	165.5	

Note: All units are in inch.

Steam Chiller Dimensions

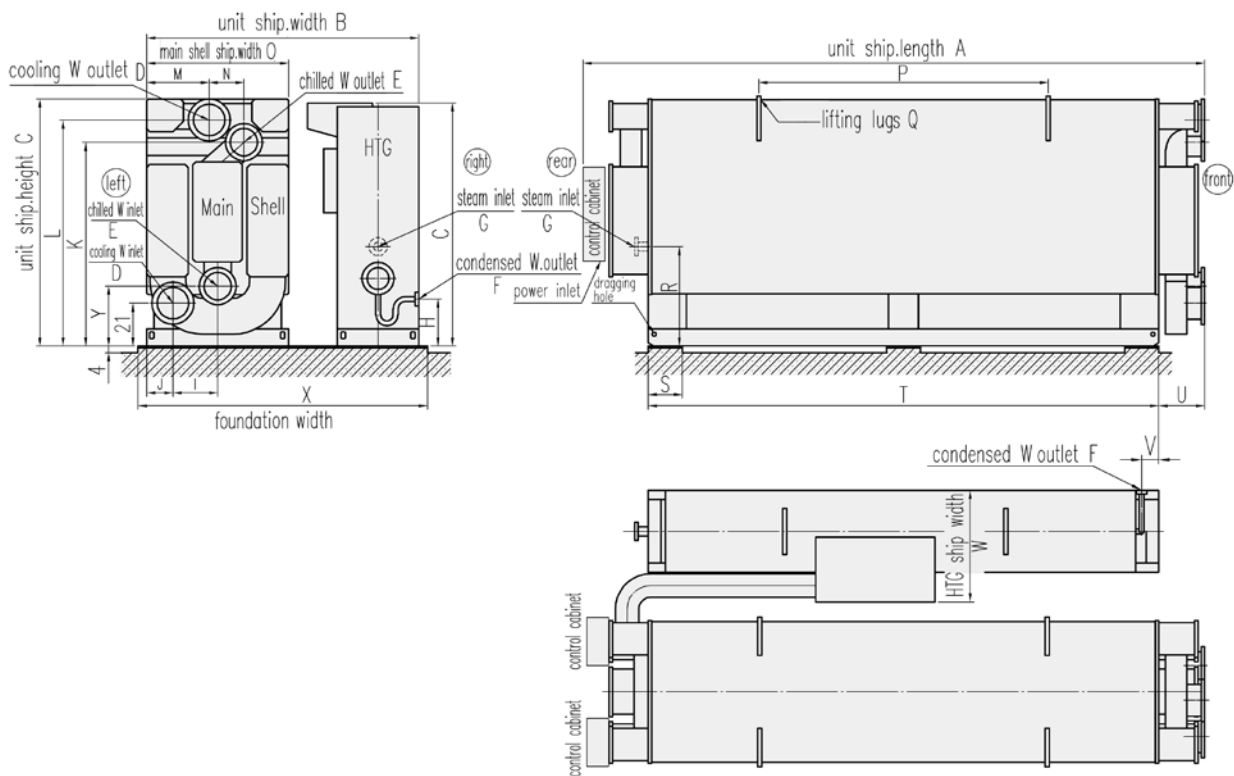
BS75、BS100、BS125、BS150



Mode	A	B	C	D	E	F	G	H	I
BS75	213.5	75	99	NPS 8	NPS 6	NPS 1 1/2	17.5	8	16
BS100	213.5	82.5	99	NPS 8	NPS 6	NPS 2	20.5	10	16
BS125	258	82.5	99	NPS 10	NPS 8	NPS 2	20.5	10	16
BS150	260	90.5	115.5	NPS 10	NPS 8	NPS 2 1/2	20	11	19.5
Mode	J	K	L	M	N	O	P	Q	R
BS75	23.5	82.5	90.5	49	42.5	157.5	19	79	15
BS100	23.5	82.5	90.5	57	35.5	157.5	19	90.5	15
BS125	23.5	82.5	90.5	61	35.5	197	21	90.5	15
BS150	27.5	94.5	106.5	61	52	197	21	94.5	8.5

Note: All units are in inch.

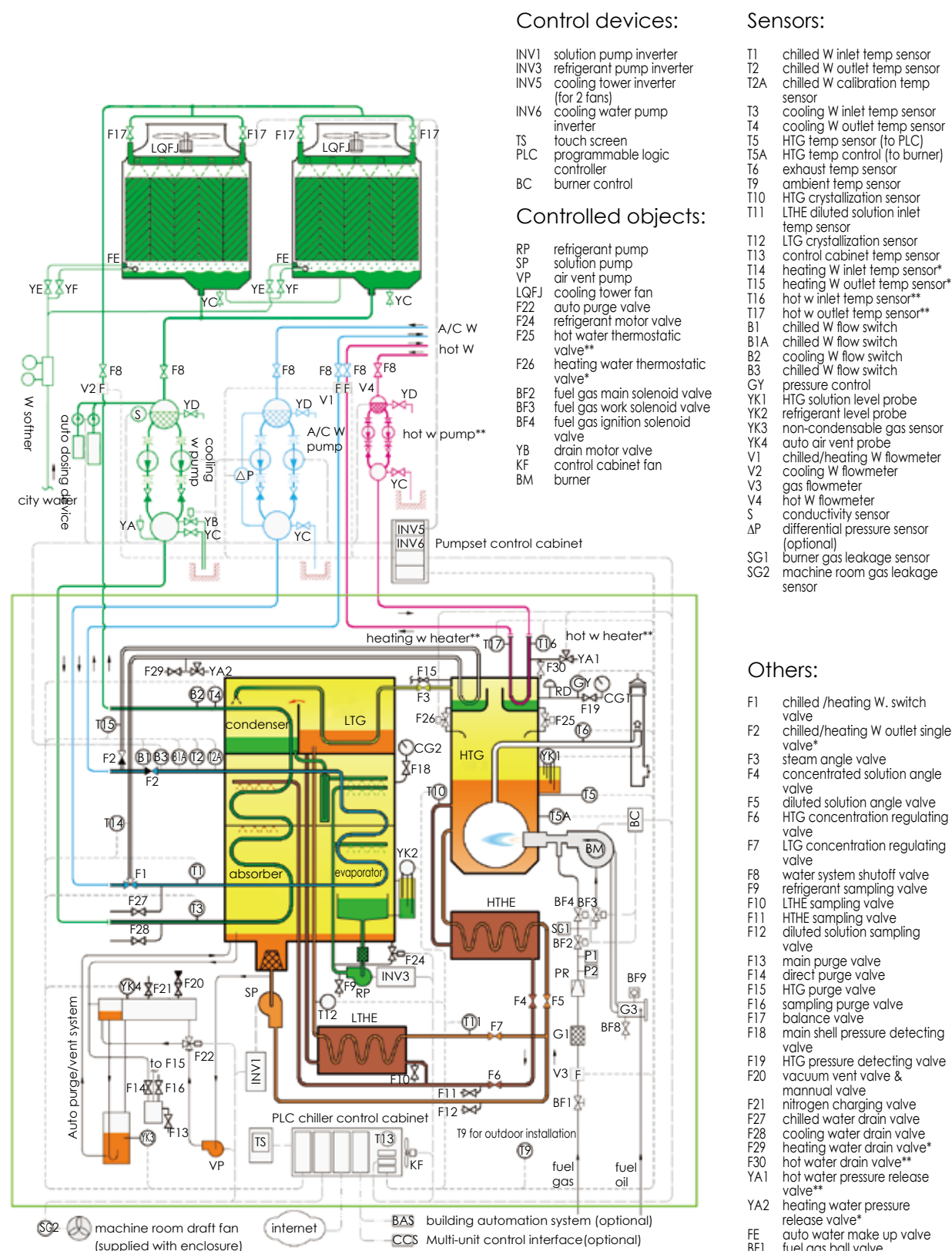
BS200、BS250、BS300、BS400、BS500、BS600、BS800、BS1000



Mode	A	B	C	D	E	F	G	H	I	J	K	L	M
BS200	260	112	118	NPS 12	NPS 10	NPS 1½	NPS 3	22	17	12	93	105	29
BS250	303	112	118	NPS 14	NPS 10	NPS 1½	NPS 3	22	16	12	93	104	29
BS300	313	131	118	NPS 14	NPS 12	NPS 2	NPS 4	22	21	12	94	104	29
BS400	313	137	134	NPS 16	NPS 12	NPS 2	NPS 4	24	22	13	107	119	31
BS500	382	137	134	NPS 16	NPS 14	NPS 2	NPS 5	24	22	12	107	119	30
BS600	386	143	146	NPS 18	NPS 16	NPS 2½	NPS 5	24	24	13	109	130	34
BS800	388	159	154	NPS 20	NPS 18	NPS 2½	NPS 6	24	27	13	124	143	36
BS1000	456	159	154	NPS 20	NPS 18	NPS 2½	NPS 6	24	27	13	124	143	36
Mode	N	O	P	Q	R	S	T	U	V	W	X	Y	
BS200	11	83	118	2.4	46	16	197	21	8	47	118	28	
BS250	13	83	134	2.4	46	16	236	23	8	47	118	28	
BS300	16	94	134	2.4	46	16	236	23	8	53	134	28	
BS400	17	100	134	2.4	55	16	236	23	12	55	138	28	
BS500	19	98	169	2.8	55	20	315	23	12	55	138	28	
BS600	12	99	177	2.8	55	20	315	25	12	55	146	28	
BS800	16	81	177	2.8	67	20	315	27	12	67	161	28	
BS1000	16	81	197	2.8	67	20	394	27	12	67	161	31	

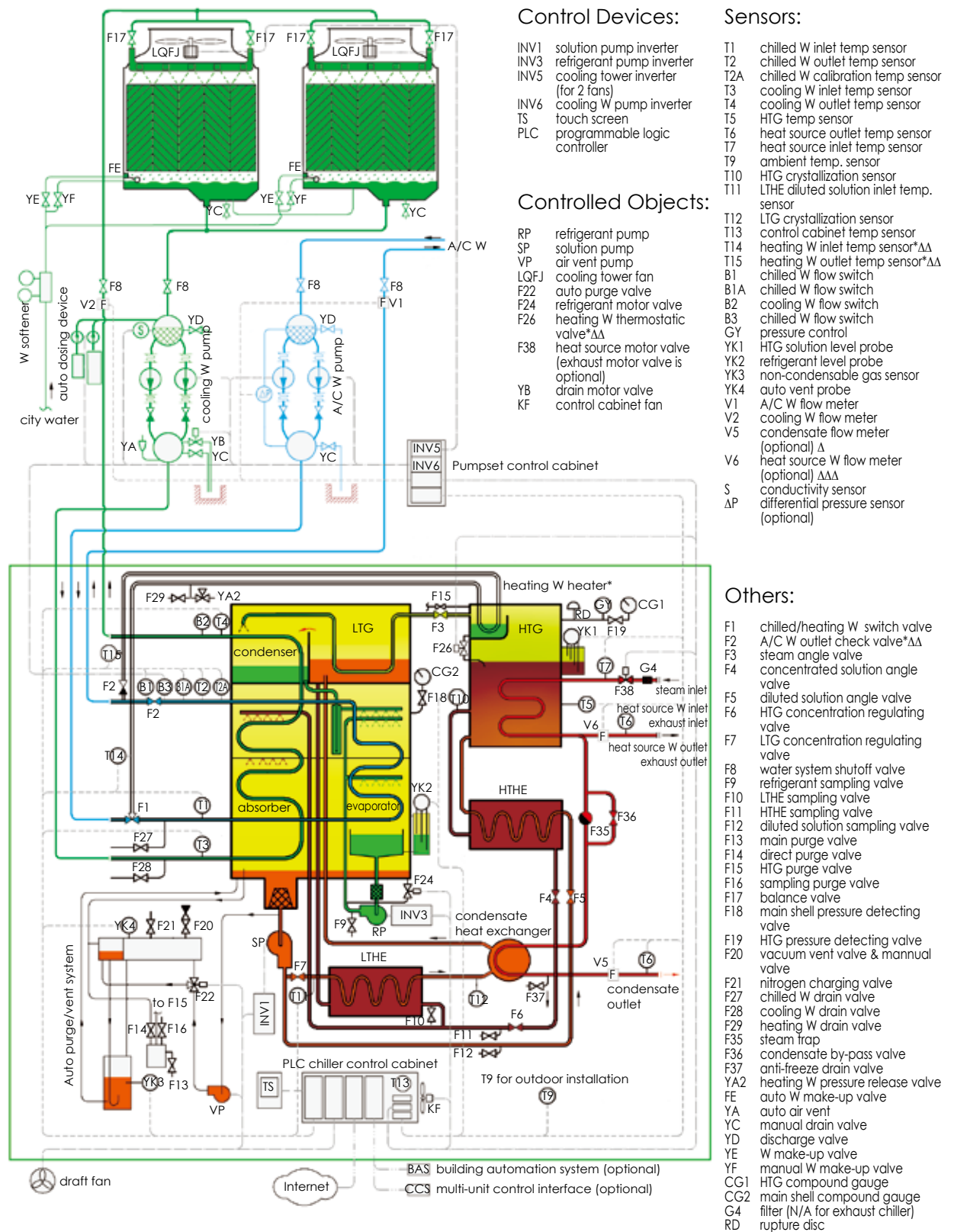
Note: All units are in inch. Some dimension drawings are not included in this manual.
Please request from BROAD or download CAD files from www.broad.com.

Packaged DFA P&I Diagram



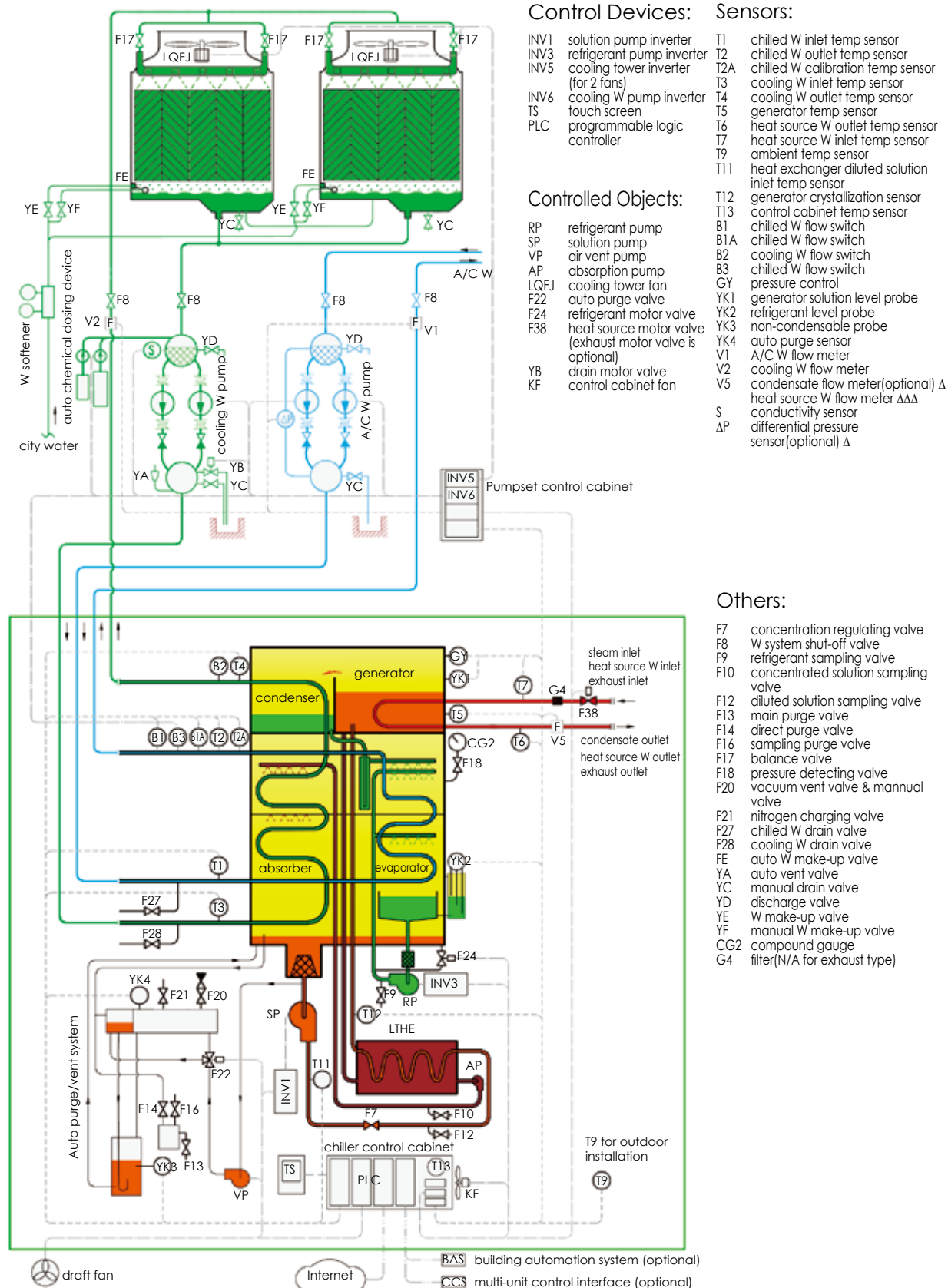
Packaged Steam Chiller

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

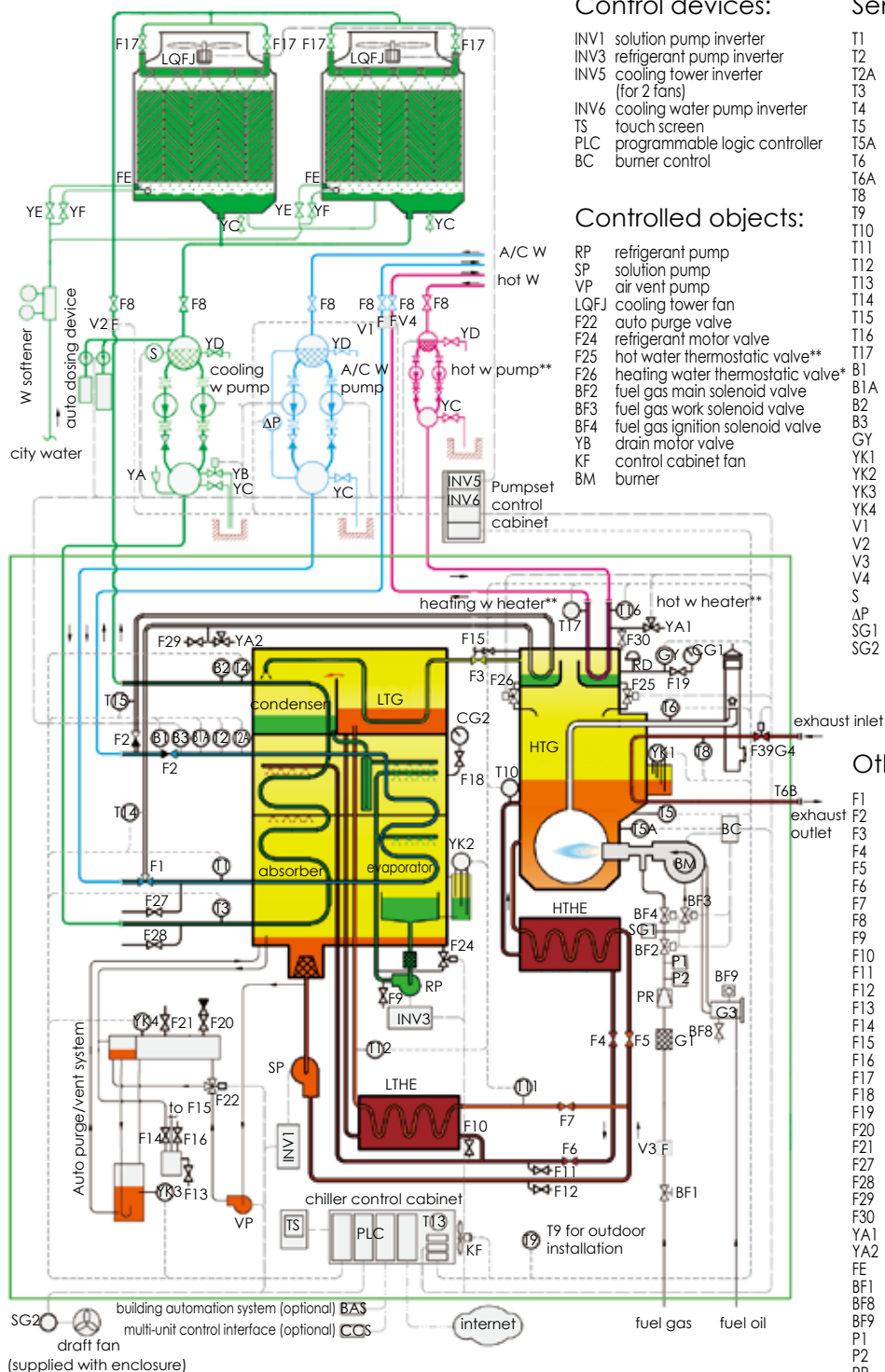


Packaged Single-stage Steam Chiller

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



Packaged Exhaust & Direct-fired Chiller



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

Sensors:

- | | |
|------|---|
| T1 | chilled W inlet temp sensor |
| T2 | chilled W outlet temp sensor |
| T2A | chilled W calibration temp sensor |
| T3 | cooling W inlet temp sensor |
| T4 | cooling W outlet temp sensor |
| T5 | HTG temp sensor (to PLC) |
| T5A | HTG temp control (to burner) |
| T6 | exhaust temp sensor |
| T6A | waste heat outlet temp sensor |
| T8 | exhaust inlet temp sensor |
| T9 | ambient temp sensor |
| T10 | HTG crystallization sensor |
| T11 | LTHF 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 |
| AP | differential pressure sensor (optional) |
| SG1 | burner gas leakage sensor |
| SG2 | machine room gas leakage sensor |


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

Others:

- | | |
|-----|--|
| F1 | chilled/heating W switch valve |
| F2 | chilled/heating W outlet single valve* |
| F3 | steam angle valve |
| F4 | concentrated solution angle valve |
| F5 | diluted solution angle valve |
| F6 | HTG concentration regulating valve |
| 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 & manual 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 |
| L1 | 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 |
| 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:

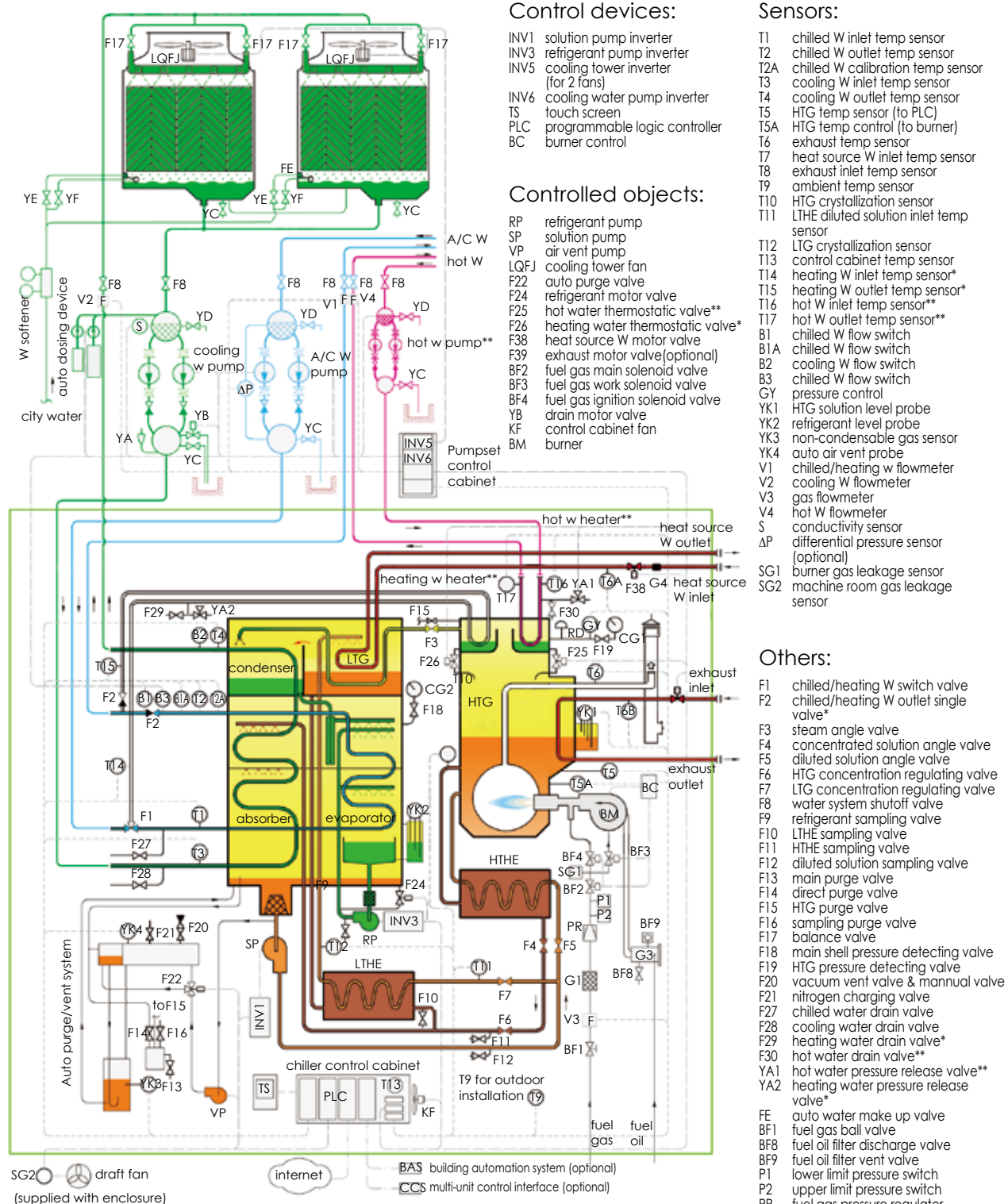
1.  chiller scope
2. Parts marked with "***" are not applicable to cooling/ heating type, and those marked with "**" & "*" are not applicable to cooling only type.

3. Line type:

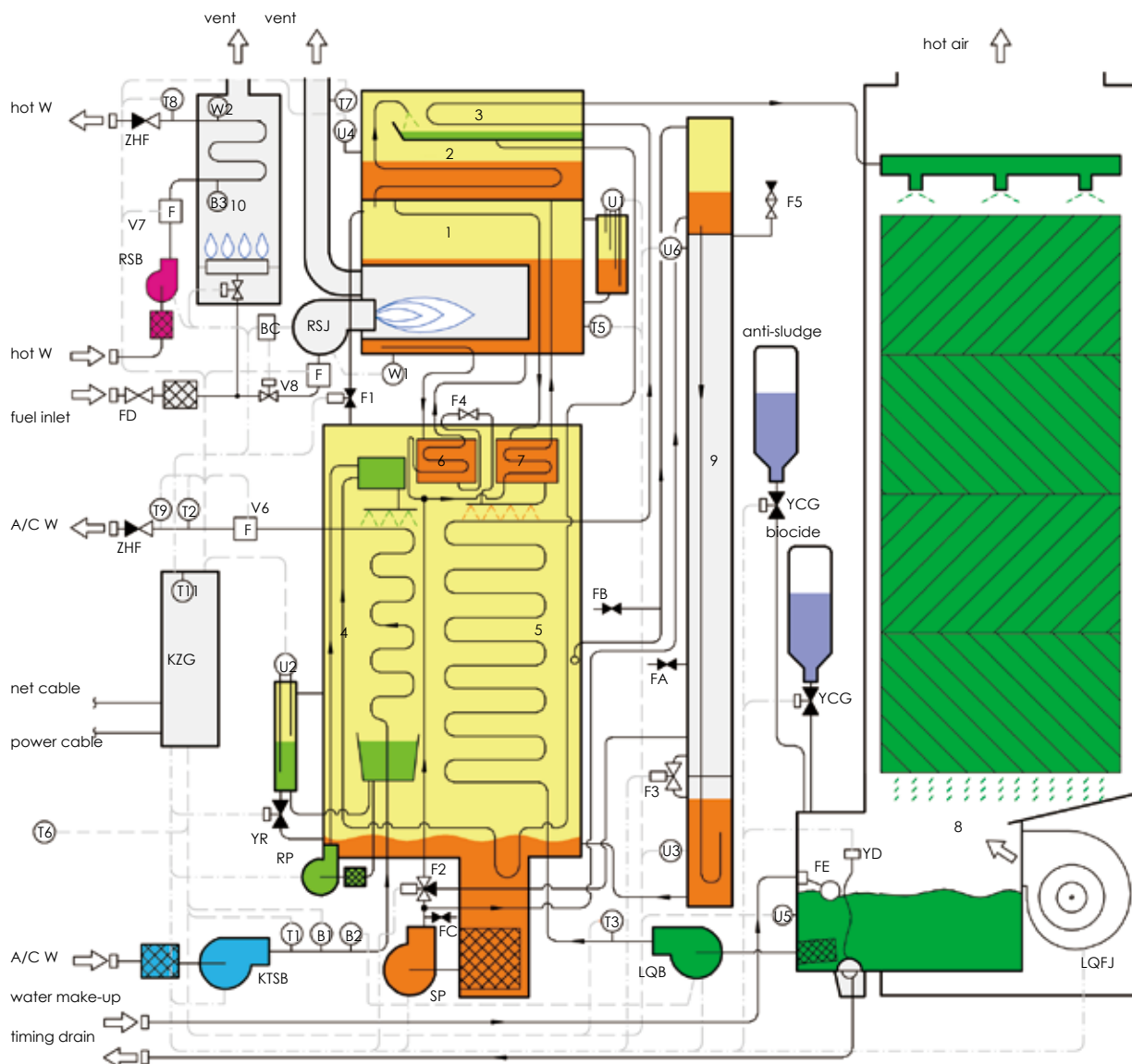
- Line type:
- actuator output
 - sensor input
 - .-.-.- communication

Packaged Multi-energy Chiller

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



Micro Non-electric Chiller



Note:

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

Note:

- 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)	√		Option
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 $\leq 4\Omega$ near water system control cabinet
Construction & installation	Foundation		√	Enclosure should be installed after foundation is completed
	Installation of metal enclosure		√	
	Pipe connection between chiller and pumpset		√	\geq BY400 model, a crane must be provided by customer
	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 warranty	√		Option

Machine Room Construction Tips

Machine room

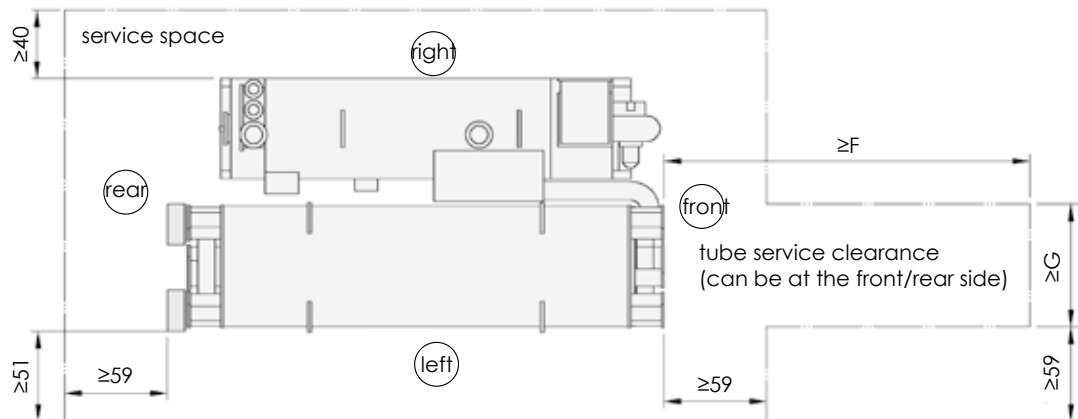
Machine rooms must be well ventilated with temp. humidity control and drain functions. It contains the service space.

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 2X machine rooms every hour and make up the combustion air. The volume of combustion air for a DFA is estimated at 14 ft³ for every MBH fuel.
- Drainage:
 - a. Chiller foundation must be on a high level in the machine room.
 - b. All discharge pipes and drain pipes must be visible above the drainage.
 - c. Machine room in basement must be built above a water ditch, which is equipped with an auto level-controlled submerged pump.
- Temperature: Machine room temperature must be controlled within 41~109°F. Lower temperature may result in freezing of water system which could damage chiller; 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 earthquake source or special anti-vibration requirement, please specify in a purchase order).
 - b. Anchor bolts must be pre-installed for pumpset foundation per dimension drawings.



Service space:

unit: inch

Mode	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 20 inch higher than that of chillers.

Piping System

Gas system

- The standard pressure is 63~197 inchH₂O (2.3~7.3 psig). 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 87 psig air when gas piping system is completed.
- When two or more units are connected in parallel, a buffer pipe (with diameter 3~6 times of the main pipe) must be installed at the main pipe to avoid flameout due to gas low pressure caused by simultaneous startup. Manual drain valve should be equipped at the bottom of the buffer tube.
- Customers are required to inform BROAD of the fuel type, heating value and pressure so that a burner can be properly selected and the gas pipe diameter can be notified to customers. Then customers can design filter, flow meter, ball valve, diffuser tube and pressure meter. BROAD is responsible for installation of gas train valves within supply scope. External gas piping system is to be installed by customers to 1m distance from the burner.
- The ball valve of BROAD gas valve train must be closed if customers need to test piping pressure so that gas train valve will not be damaged by high pressure.
- A gas leakage alarm (acting value must be set 20% lower than danger value lower limit) must be equipped in machine room and be linkage controlled with draft fans. Machine room must be well ventilated all the time.

Oil system

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

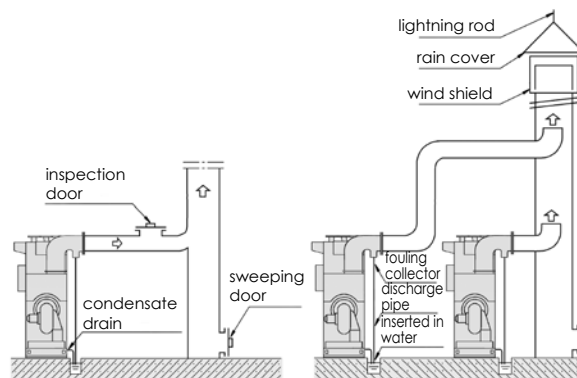
Water system

- 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 ≤ 98 ft, the cooling water pipe diameter can follow the dimension drawing. If it's 98~295 ft, the pipe diameter shall be one size larger. If it's >295 ft, 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

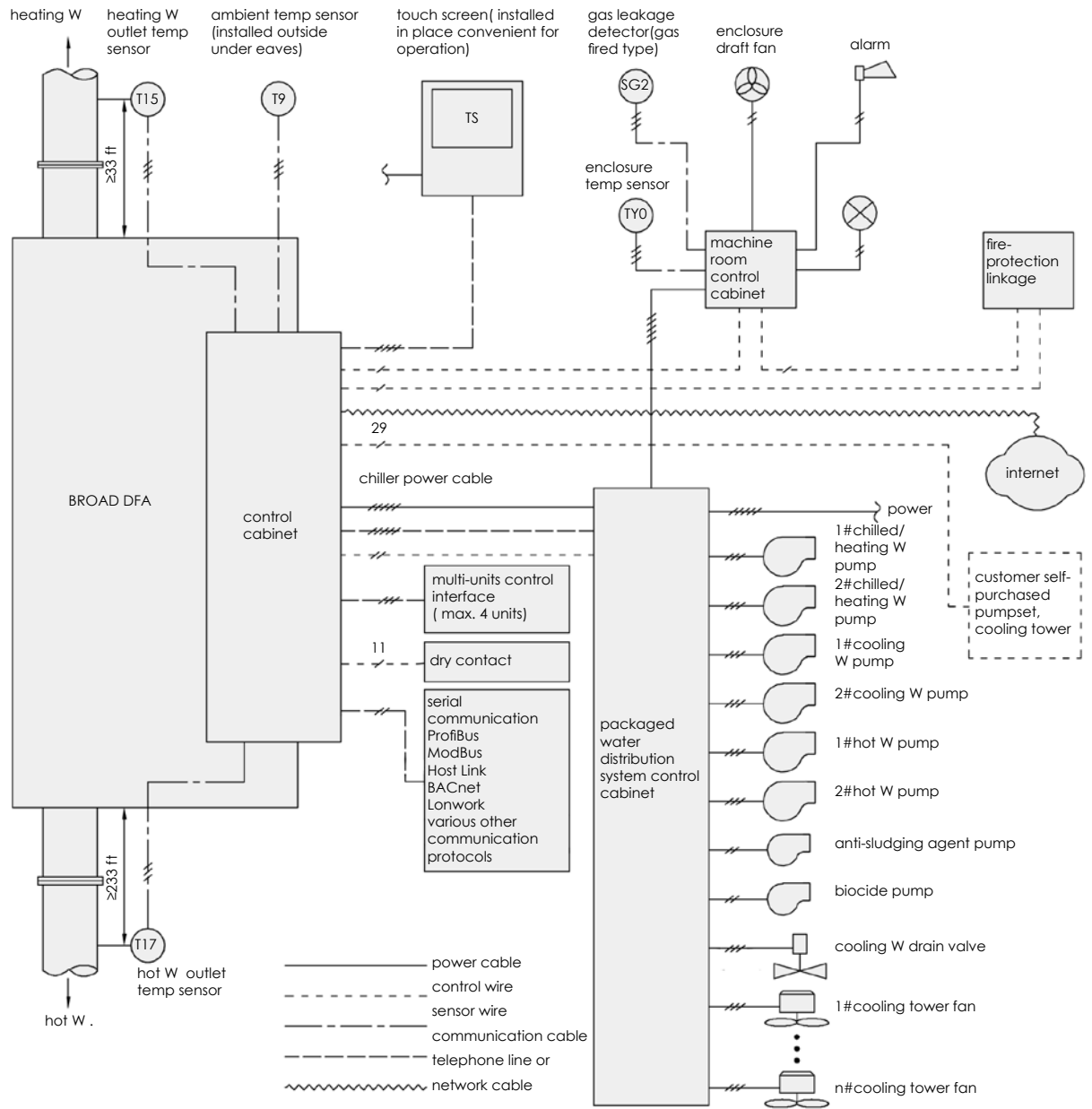
- It is recommended independent stack be used for each chiller. If chillers have to share a common stack due to space limitation, the shared stack must be inserted type and the main stack must be bigger and higher to avoid any interference from each other. Exhaust motor valve shall be installed for each 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 16.8 ft³ per kW 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.

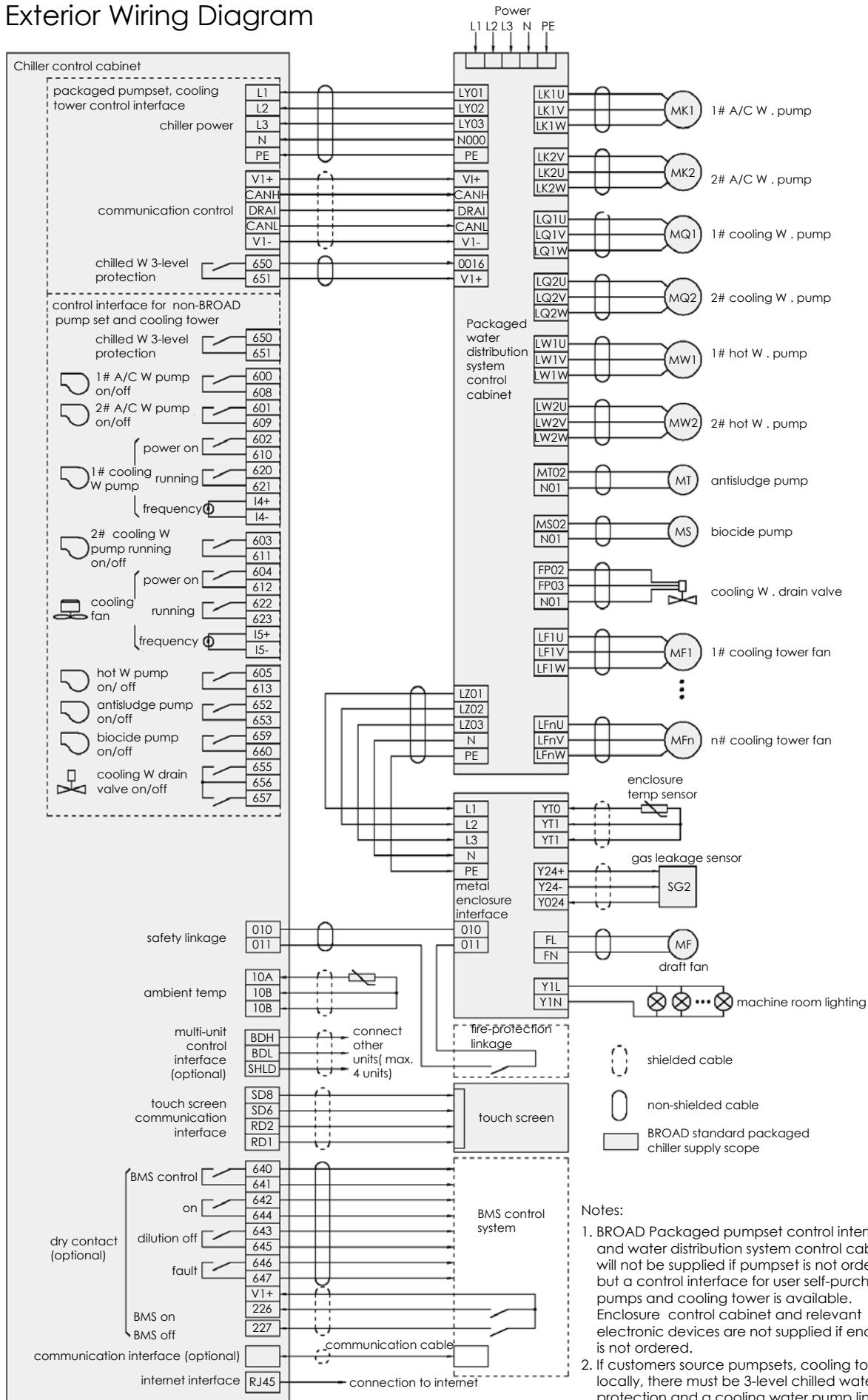
Control System



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 Wiring Diagram



List of Control System Installation

Item		Installation position and requirement	Material	Source	BROAD scope	Customer scope
Chiller	Chiller and pumpset grounding	Grounding resistance $\leq 4\Omega$	Grounding wire	Customer	/	Grounding setup and wiring
	Chiller power	Control cabinet of chiller and water system	5-core cable (33 ft 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 (98 ft 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 33 ft)	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 33 ft away from the chiller	3-core cable (standard cable is 33 ft)	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 BY30 BY50 in two pieces.
- BY75~1000 chiller and pumpset are to be shipped separately.
- BY75~400: pumpset and control cabinet are to be shipped in 3 pieces. BY500~1000: pumpset and control cabinet are to be shipped in 3~5 pieces (A/C water pumpset, cooling water pumpset and control cabinet)
- All equipment can be containerized as per "Container Arrangement Reference".
- Chillers \leq BZ75, BE75, BS100 (Max. width \leq 83 inch) in single piece.
- Other units will be in 2~4 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 Packing & Transportation Regulations" for container arrangement and safe transportation.

Container arrangement reference:

Mode	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:

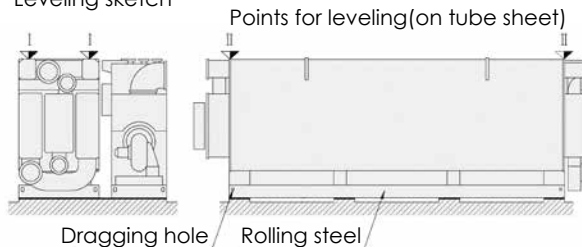
1. Models marked with "*" are in one-piece shipment, and the rest in split shipment.
2. For chillers over model 500 (main shell weight exceeds requirement), there might be some changes as per actual condition.
3. In case some countries may have limitation on dimension and weight, loading shall be arranged accordingly.
4. BCT container arrangement:
 - 20'GP: BCT16: 13 units; or BCT23: 10 units; or BCT70: 3 units; or BCT115: 2 units;
 - 40'GP: BCT16: 13 units; or BCT23: 20 units;
 - 40'HQ: BCT70: 7 units; or BCT115: 4 units.

Lifting & Leveling Tips

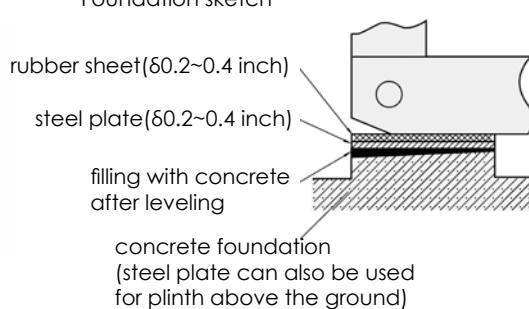
- Lifting must be done by qualified rigging companies that are properly insured.
- The crane must be supported by crossties and firm foundation to prevent it from sinking. Check the crane steel ropes and hooks before lifting to prevent any accident. The lifting intersection angle must be less than 90° . It is strictly prohibited to lift the chiller with a single steel rope. When the chiller is lifted 0.79 inch 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 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 0.06 inch.
- 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

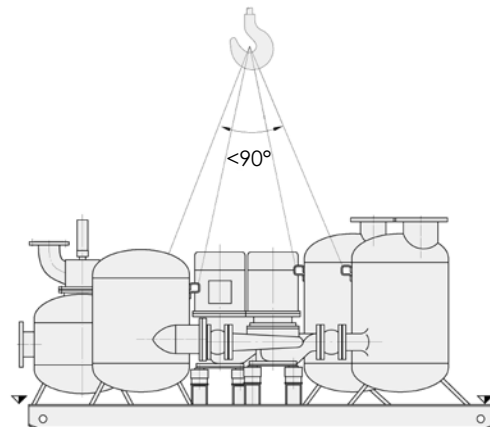
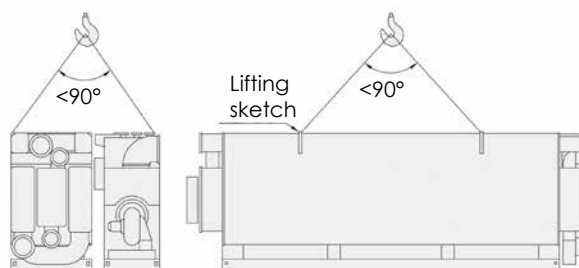
Leveling sketch



Foundation sketch



Lifting sketch



Comparison

Energy saving comparison

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 582kW/165Rt chillers)

Power consuming parts	Conventional machine room mode power demand	Packaged pumpset power demand	operating power consumption
Cooling water pump	8.53 RT	2.13 RT	0.57~2.13 RT
Cooling tower fan	3.13 RT	3.13 RT	0.85~3.13 RT
Chilled/heating W pump	6.26 RT	2.13 RT	2.13 RT
Total	17.91 RT	7.39 RT	4.83 RT (annual)
electricity/cooling capacity	10.8%	4.47%	2.92%
Annual operating consumption	54023 RT	14785 RT (power saving is 73%)	

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

Power consumption equipment	Conventional machine room type power demand	Packaged pumpset system power demand	operating power consumption
Cooling capacity	51.18 RT	12.51 RT	3.13~12.51 RT
Cooling tower fan	10.52 RT	10.52 RT	1.71~10.52 RT
Chilled/heating W pump	31.28 RT	17.06 RT	8.53~17.06 RT
Total	92.98 RT	40.1 RT	28.43 RT (annual)
Electricity/cooling capacity	9.4%	4.04%	2.86%
Annual operating consumption	284333 RT	85300 RT (power saving is 70%)	

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

Power consumption equipment	Conventional machine room type power demand	Packaged pumpset system power demand	operating power consumption
Cooling capacity	156.38 RT	51.18 RT	8.53~51.18 RT
Cooling tower fan	31.28 RT	31.28 RT	6.26~31.28 RT
Chilled/heating W pump	125.1 RT	51.18 RT	25.59~51.18 RT
Total	312.77 RT	133.64 RT	71.08 RT (annual)
Electricity/cooling capacity	9.5%	4.04%	2.15%
Annual operating consumption	938300 RT	213250 RT (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.



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



BROAD AIR CONDITIONING
远大空调有限公司

Hackensack office:

401 Hackensack Ave,
Suite 503, Hackensack,
NJ 07601

Tel: 201-678-3010

Fax: 201-678-3011

www.broadusa.com

CA office:

750 Terrado Plaza,
Suite 243 Covina,
CA 91723

Tel: (626)967-8651

Fax: (626)967-8654



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

2013.09

The Second Edition Quantity: 2,000

BY164-13 © 2013