BROAD CENTRAL AIR CONDITIONING (ABSORPTION LiBr+H_2O)

BROAD XI NON-ELECTRIC CHILLER

MODEL SELECTION & DESIGN MANUAL

Function
Cooling, heating, hot water (dedicatedly or simultaneously)

Application
- Provide chilled/heating water for central air conditioning system
- Produce chilled water over 41°F and heating water below 203°F

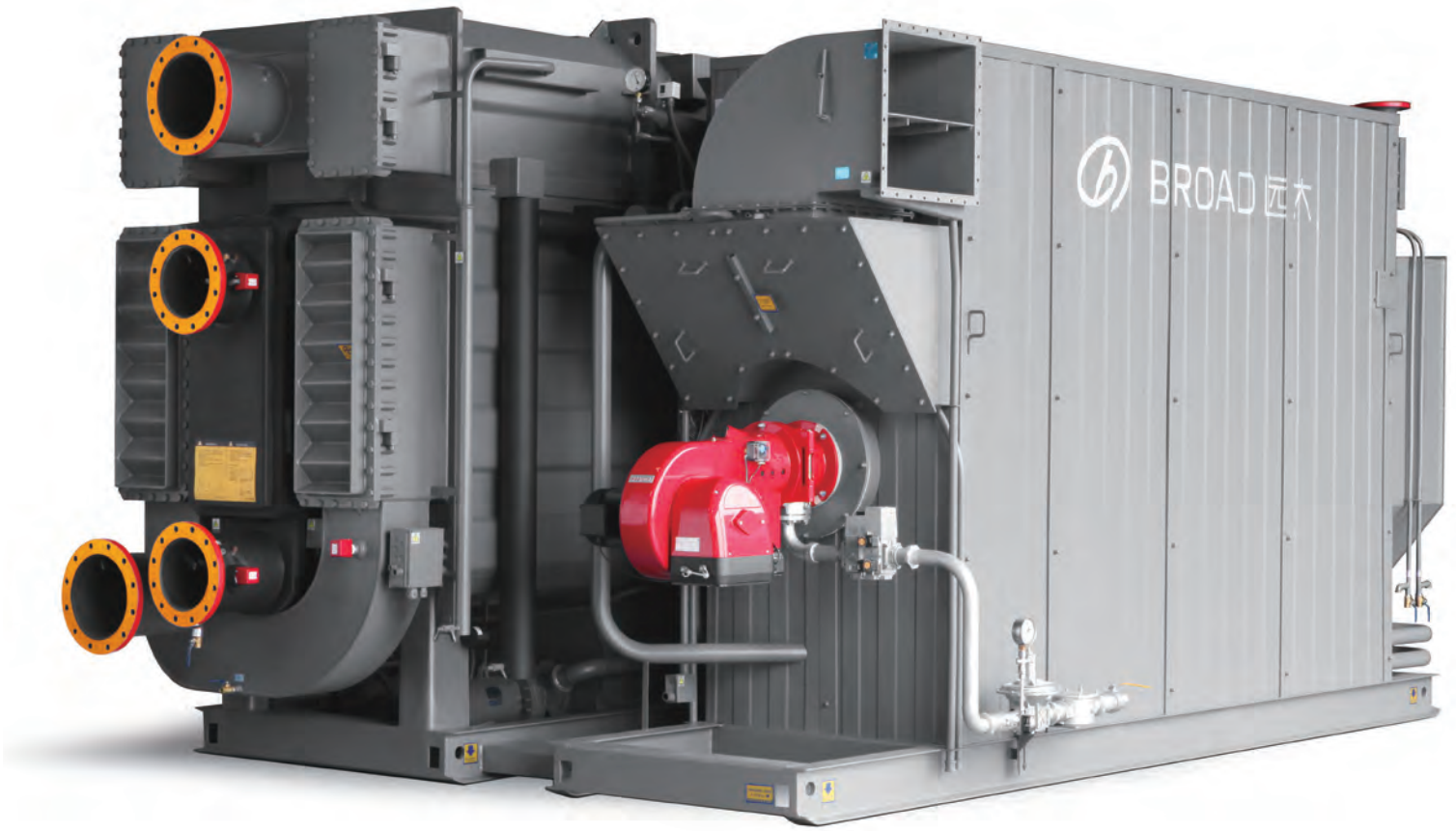
Cooling capacity
233~11,630kW
(66~3,307Rt)

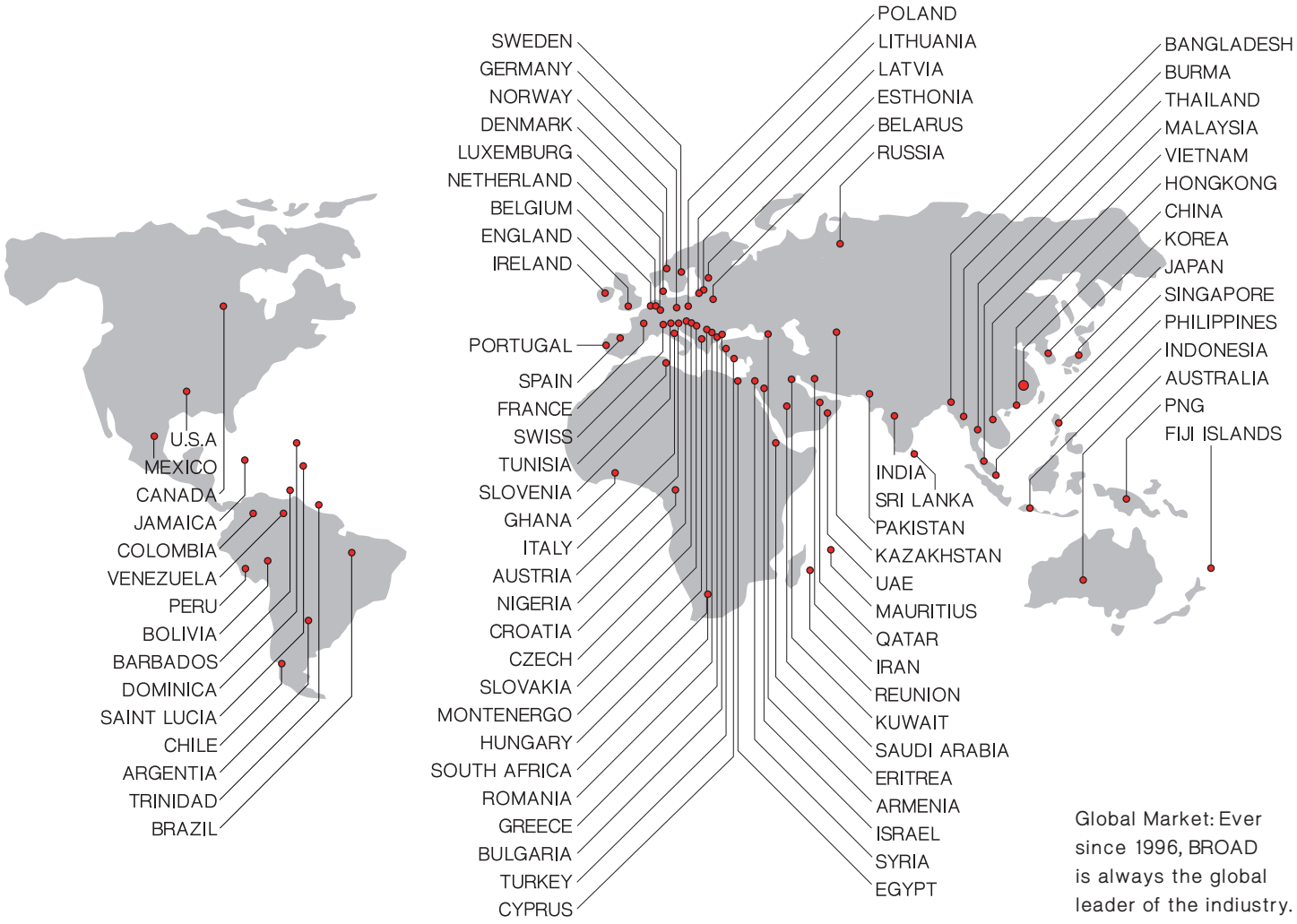
Energy sources
- Natural gas, town gas, biogas
- Gas/oil dual fuel, gas & waste heat hybrid (multiple energy)
- Waste heat from power generation industrial waste streams (steam, hot water, exhaust, etc.)

2016.05 US

(BZ200 Direct-fired Absorption Chiller)

Global internet monitoring system for BROAD non-electric chillers.
It has been operating since1996, known as the originator of "internet +"





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

SIGNIFICANCES OF BROAD NON-ELECTRIC CHILLER

1. GREEN ENERGY

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

2. SAVING ENERGY

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

3. REDUCING INVESTMENT

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

4. WORRY-FREE

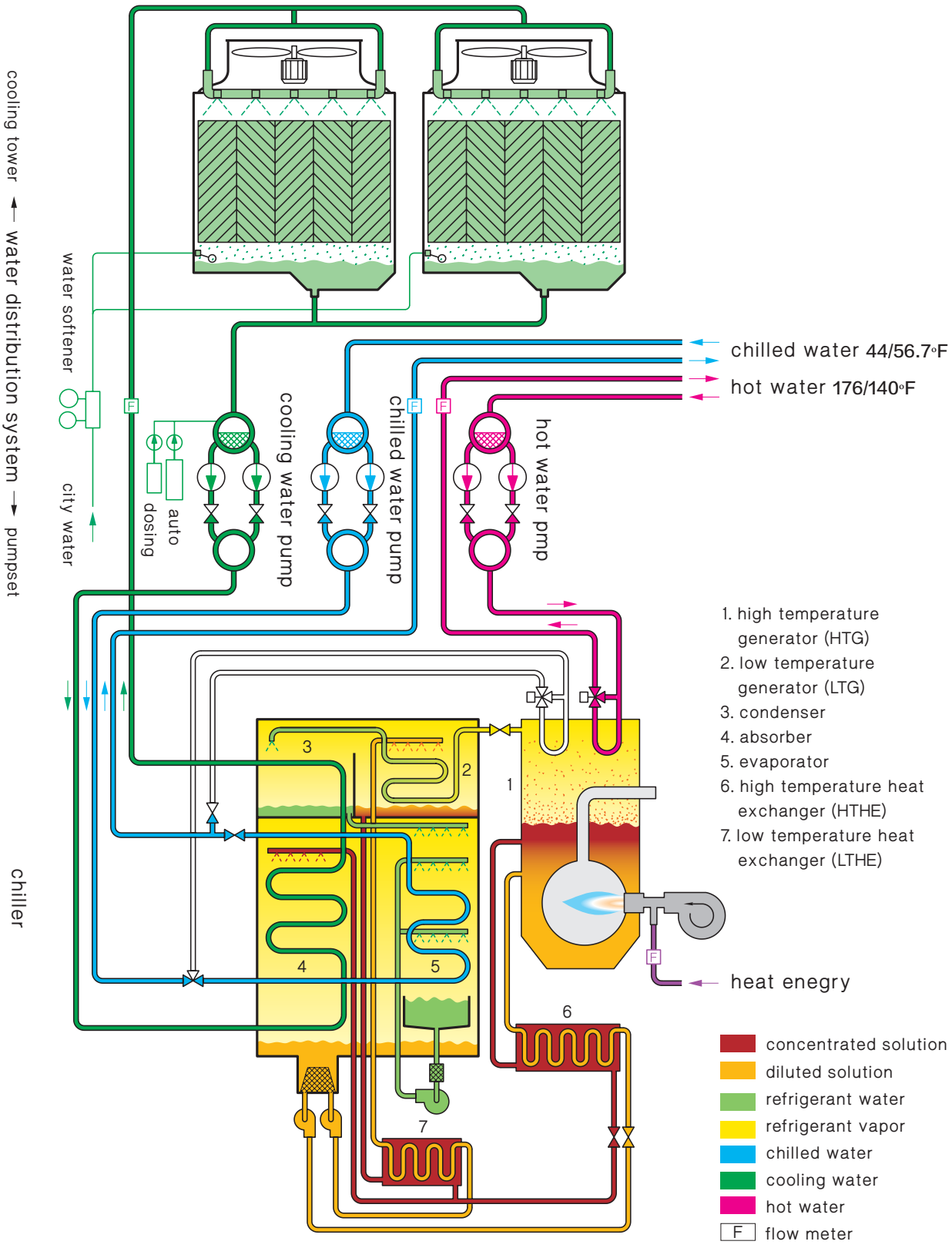
BROAD Packaged Water Distribution System eliminates troubles including system design, procurement, installation and service for customers.
BROAD Intelligent Control System (ICS) realizes operator free for chiller and water distribution system.
BROAD Internet Monitoring System realizes 24/7 fault prediction, analysis, trouble-shooting and energy-saving management. BROAD offers free monitoring service to customer during chiller's whole lifespan.

5. SAFETY AND DURABLE

Chiller works under vacuum condition which is safe to the customer.
8-level anti-explosion technologies eliminate any explosion risks in any cases (including human destruction) and BROAD over 20 years experiences proved it.
No single explosion case in BROAD 20+ years operation record.
Separate heating technology doubles the chiller lifespan (chillers over 20 years still running well).

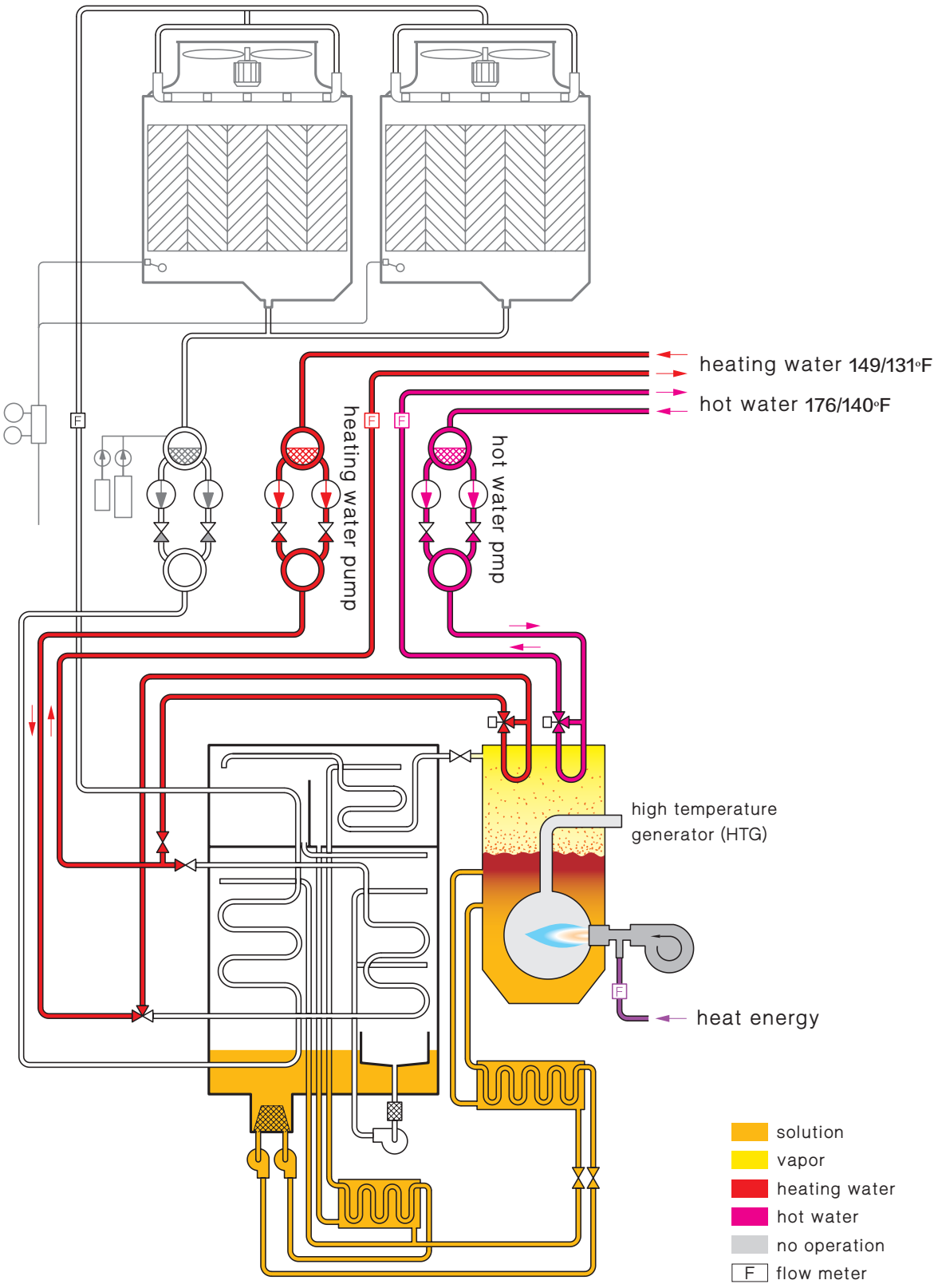
CONTENTS

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



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 to 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 a salt of strong hygroscopicity, nontoxic and harmless, with no geenhouse effect and no damage to the ozone layer.



The heating principle

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

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

Direct-fired Absorption Chiller (DFA) Performance Data

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

Mode	BZ	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	10^4kcal/h	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2645	3307
Heating capacity	MBH	611	918	1532	2293	3061	3825	4603	6111	7660	9168	12222	153166	18374	24485	30595
Hot water. capacity	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	ft. H_2O	10	10	10	10	10	13.2	13.2	13.2	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Cooling water																
Flow rate	gpm	216	324	540	811	1083	1351	1623	2163	2706	3246	4329	5409	6492	8655	10821
Pressure drop	ft. H_2O	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	26.4	26.4	26.4	30	30	30	30
Heating water																
Flow rate	gpm	68	102	170	255	340	425	511	679	851	1019	1358	1702	2042	2721	3399
Pressure drop	ft.H_2O	6.6	6.6	6.6	6.6	6.6	6.6	6.6	10	10	13.2	13.2	16.5	16.5	20	20
Hot water																
Flow rate	gpm	15	23	38	57	76	95	114	152	190	227	303	/	/	/	/
Pressure drop	ft. H_2O	6.6	6.6	6.6	6.6	6.6	6.6	6.6	10	10	13.2	13.2	/	/	/	/
NG consumption																
Cooling	MBH	558	837	1394	2096	2797	3490	4192	5586	6989	8383	11180	13969	16766	22352	27946
Heating	MBH	657	987	1647	2465	3291	4113	4949	6571	8236	9858	13142	16469	19757	26327	32898
Hot water	MBH	294	440	734	1101	1468	1834	2201	2935	3669	4403	5870	/	/	/	/
Power demand	kW	2.3	3.8	3.9	5.1	6.8	8.8	9.9	16.3	16.6	22.4	26.6	29.3	39.3	49.7	53.3
Solution wt.	klbs	2.3	3.6	5.1	6.2	8.4	9.5	12.4	15	18.8	22.8	27.8	35.3	46.3	55.2	70.6
Unit ship wt.	klbs	11.5	17.5	21.0	27.8	34.4	39.1	46.3	60.7	70.6	/	/	/	/	/	/
Main shell ship. wt.	klbs	5.6	9.3	11.1	12.4	14.4	16.8	19.7	28.0	32.7	39.3	43.7	55.2	60.7	66.2	70.6
Operation wt.	klbs	12.8	18.8	22.8	31.1	39.5	44.6	53.4	68.6	80.1	97.7	117.6	141.4	173.1	211.3	256.2

Packaged Direct-fired Absorption Chiller (P-DFA)

Rated chilled water 44°F/56.7°F, cooling water 97.5/85°F

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
Pumpset	Chilled water pump																
	External head	ft.H_2O	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	ft.H_2O	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	ft.H_2O	23	23	23	50	50	50	50	50	50	50	50	/	/	/	/
	Power demand	kW	0.4	0.58	0.58	2.2	3.0	3.0	4.4	4.4	4.4	6.0	6.0	/	/	/	/
	Total power demand	kW	7.4	15.6	15.6	32.2	33	47	56.4	78.4	92.4	110	126	200	220	300	360
	Operation	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	/	/	/	/	/	/	/	/	/	/	/	/
Electricity & water Consumption	Total power demand	kW	15.2	30.4	30.5	37.3	39.8	55.8	66.3	94.7	109	132.4	152.6	229.3	259.3	349.7	413.3
	Water demand for cooling	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. : 44ºF/56.7ºF
2. Rated cooling W. outlet/inlet temp. : 97.5ºF/85ºF
3. Rated heating W. outlet/inlet temp. : 149ºF/131ºF
4. Rated hot W. outlet/inlet temp. : 176ºF/140ºF
5. Lowest permitted outlet temp. for chilled water: 41ºF
6. Highest permitted outlet temp. for heating/ hot water: 203ºF
7. Lowest permitted inlet temp. for cooling water: 50ºF
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. : 0.0001 $hrft^2 \cdot ºF/Btu$, for cooling W:0.00025$hrft^2 \cdot ºF/Btu$
12. Natural gas consumption is calculated: 900Btu/ft^3 (8600kcal/m^3)
13. Standard natural gas dynamic pressure is 2.3~5psig, static pressure is <7.3psig, lower or higher pressure can be accommodated to special orders
14. LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
15. Rated exhaust temp. for cooling: 320ºF
    Rated exhaust temp. for heating: 293ºF
16. Machine room ambient temperature: 41~109ºF, humidity≤85%
17. Standard climate conditions for cooling operation: temp. 96.8ºF, relative humidity 50% (wet bulb 80.6ºF)
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: 1.42 (including chiller power consumption)
    Rated heating COP: 0.93 (including chiller power consumption)
21. Life design: 30 years

Notes:
technical specification is based upon:

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

HTG (high temp. generator) Enlarged Model Performance Data

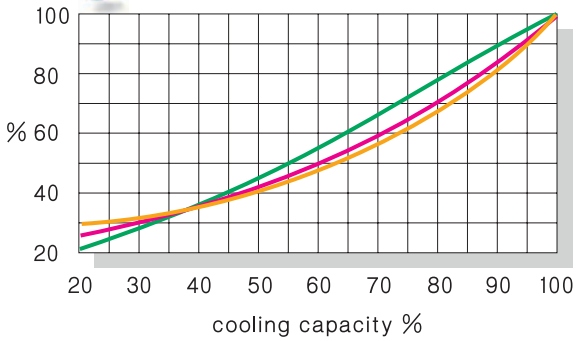
Mode BZ	Enlarged Models	Heating capacity MBH	Gas Consumption MBH
20	H_1	736	791
	H_2	859	923
	H_3	982	1056
	H_4	1105	1188
30	H_1	1103	1186
	H_2	1287	1384
	H_3	1468	1578
	H_4	1652	1776
50	H_1	1841	1980
	H_2	2149	2311
	H_3	2454	2639
	H_4	2762	2970
75	H_1	2762	2970
	H_2	3224	3467
	H_3	3682	3959
	H_4	4144	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	23063

Notes:

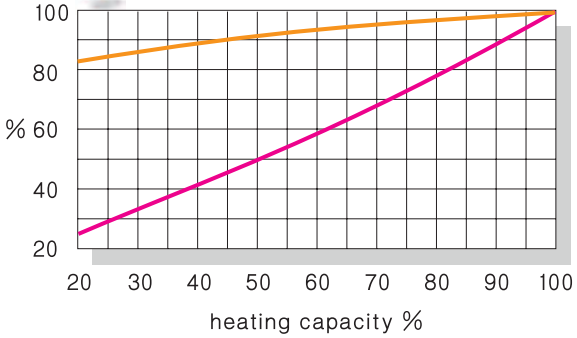
1. Heating capacity increases by 20% for each stage of HTG enlargement. No change with pumpset (excluding hot W. pump) and enclosure specs.
2. Special design is available if heating capacity is higher than above list.

Packaged DFA Performance Curves

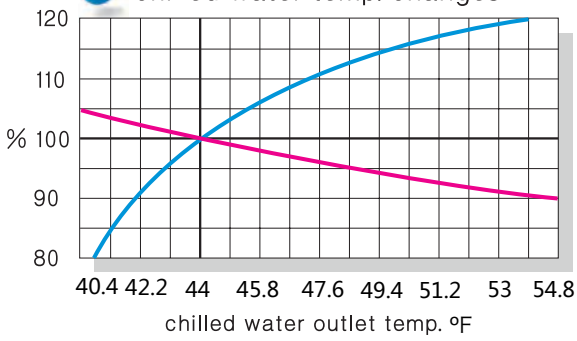
cooling capacity changes



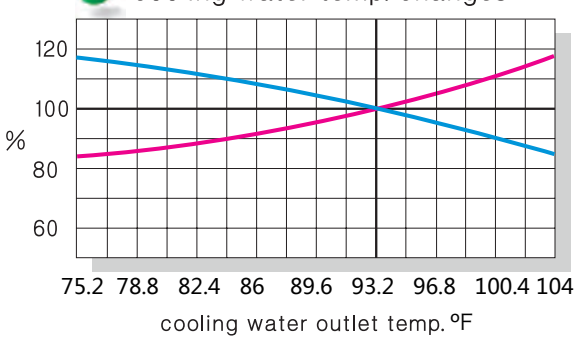
heatling capacity changes



chilled water temp. changes



cooling water temp. changes



cooling capacity — water consumption
fuel consumption — electricity consumption

Note: electricity consumption means the consumption of the chiller and pumpset.

Coefficient of Performance (COP)

Rated COP: 1.42, IPLV COP: 1.63			
Load	COP	Factor	Result
100%	1.420	0.01	0.014
75%	1.638	0.42	0.688
50%	1.692	0.45	0.761
25%	1.372	0.12	0.165

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

Emissions:

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

Operating Noise dB(A)

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

Nomenclature

B Z Y 200 XI D - 37/30 - 7/14 - 80/60 - k - H_1 - Fa - LN

- LN — Condensing Heat Recovery Chiller
- Fa — High pressure type (details in right table)
- H_1 — 20% more heating capacity
- k — Function: k-cooling-heating type, d-cooling only, default is heating, cooling and hot water
- 80/60 — hot W. outlet/inlet temp. (℃)
- 7/14 — chilled W. outlet/inlet temp. (℃)
- 37/30 — cooling W. outlet/inlet temp. (℃)
- D — Fuel type: B-oil C-LPG D-natural gas E-town gas
- XI — Generation code (XI indicates 11)
- 200 — Cooling capacity: 10^4kcal/h
- Y — Packaged chiller
- Z — Chiller type: Z-direct-fired (code of other types available in "Performance Data" pages)
- B — B-BROAD

Codes for high pressure type:

Pressure limit psig	Chilled W. Code	Cooling W. Code
150~174	Fa	Ma
175~232	Fb	Mb
233~290	Fc	Mc
291~348	Fd	Md

Model Selection & Ordering

Function selection

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

Fuel selection

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

Load selection

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

Quantity

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

Flowrate selection

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

Pressure selection

- The standard pressure limit for chilled/heating/ cooling water is 150psig. Information about high pressure type is available on page 5.
- 150~174psig 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.
- Split shipment includes two pieces as main shell and HTG. 3 pipes must be connected at jobsite. Customers need to prepare welding facilities, nitrogen and provide necessary help.

Control

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

Machine room location

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

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

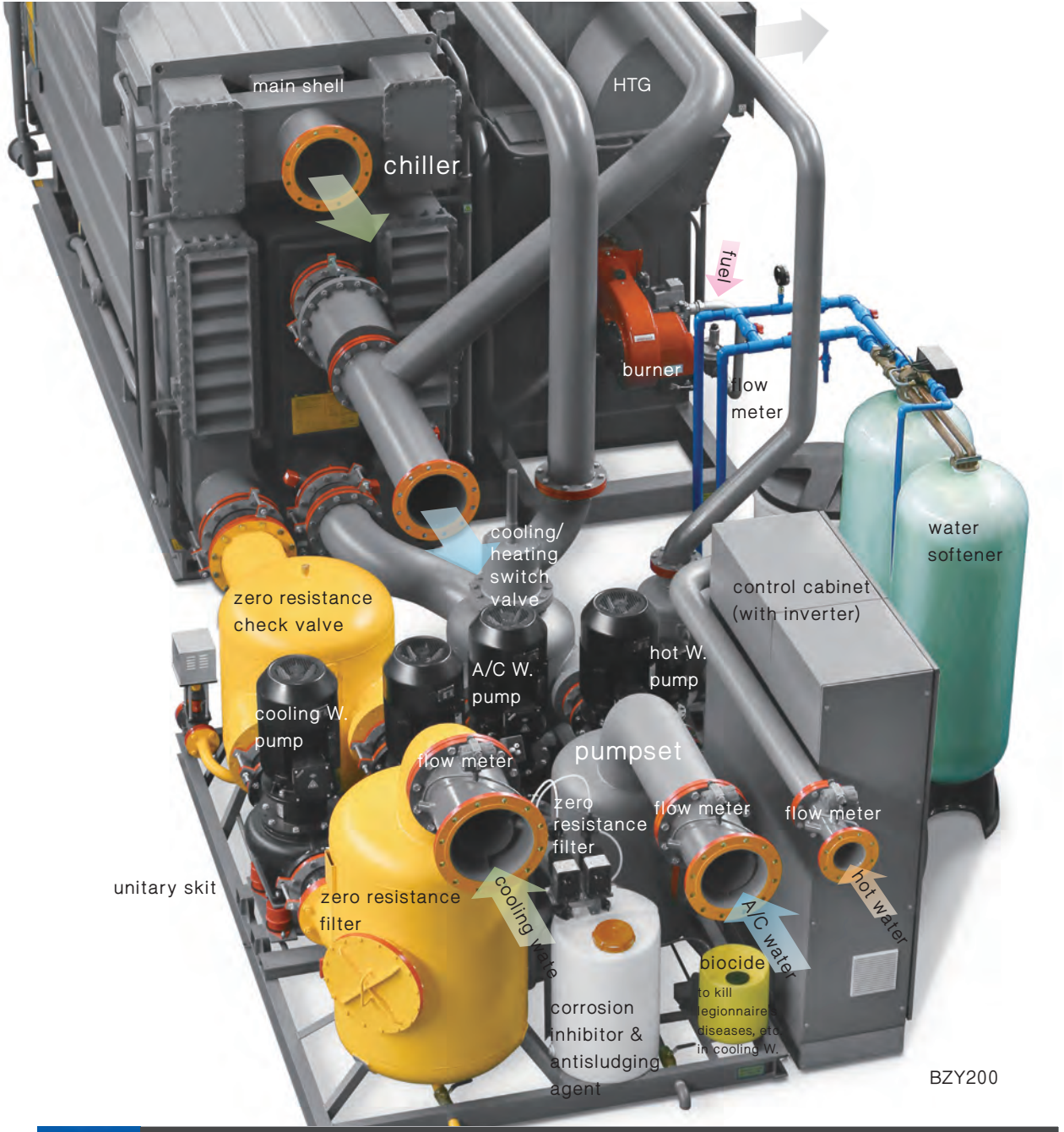
401 Hackensack Ave, Suite 503, Hackensack,NJ 07601
Tel:201-678-3010
Fax:201-678-3011
www.broadusa.com

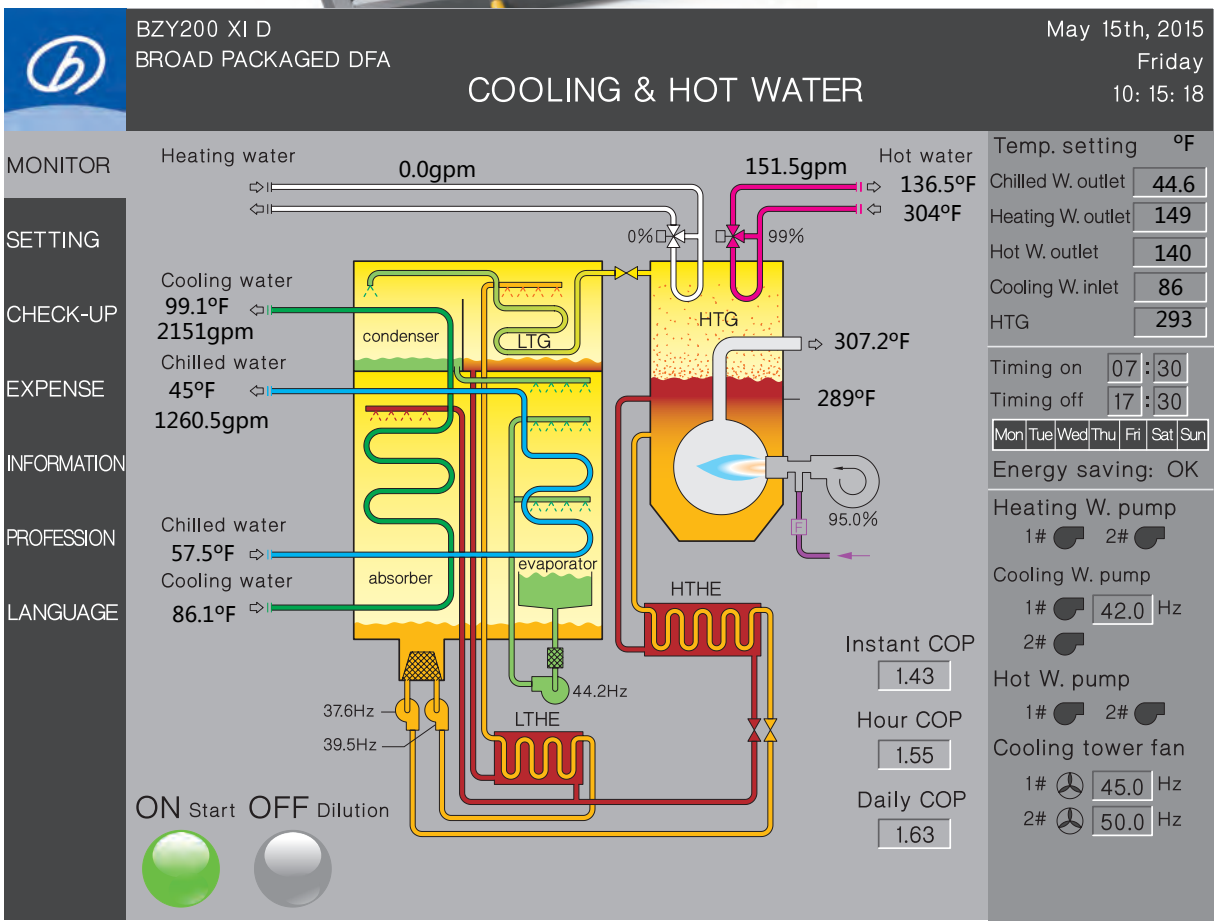
Packaged DFA Supply List

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

Notes :

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 available upon request.


main shell
HTG
chiller
fuel
burner
flow meter
water softener
cooling/ heating switch valve
zero resistance check valve
control cabinet (with inverter)
hot W. pump
A/C W. pump
cooling W. pump
flow meter
pumpset
zero resistance filter
flow meter
flow meter
unitary skit
zero resistance filter
cooling water
A/C water
hot water
biocide
to kill legionnaire diseases, etc. in cooling W.
corrosion inhibitor & antisludging agent
BZY200


BZY200 XI D
BROAD PACKAGED DFA
May 15th, 2015
Friday
10: 15: 18
COOLING & HOT WATER
MONITOR
SETTING
CHECK-UP
EXPENSE
INFORMATION
PROFESSION
LANGUAGE
Heating water
0.0gpm
151.5gpm
Hot water
136.5°F
304°F
0%
99%
Cooling water
99.1°F
2151gpm
Chilled water
45°F
1260.5gpm
condenser
LTG
HTG
307.2°F
289°F
95.0%
Chilled water
57.5°F
Cooling water
86.1°F
absorber
evaporator
HTHE
44.2Hz
37.6Hz
39.5Hz
LTHE
ON Start
OFF Dilution
Instant COP
1.43
Hour COP
1.55
Daily COP
1.63
Temp. setting °F
Chilled W. outlet 44.6
Heating W. outlet 149
Hot W. outlet 140
Cooling W. inlet 86
HTG 293
Timing on 07 : 30
Timing off 17 : 30
Mon Tue Wed Thu Fri Sat Sun
Energy saving: OK
Heating W. pump
1# 2#
Cooling W. pump
1# 42.0 Hz
2#
Hot W. pump
1# 2#
Cooling tower fan
1# 45.0 Hz
2# 50.0 Hz

Steam Chiller Performance Data

BS: steam from power generation or industrial waste streams

Mode	BS	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Cooling capacity	kW	233	349	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
	10^4kcal/h	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2645	3307
Chilled water																
Flowrate	gpm	125	187	312	469	626	780	937	1249	1563	1875	2500	3124	3749	4998	6249
Pressure drop	ftH^2O	10	10	10	10	10	13.2	13.2	13.2	16.5	16.5	20	20	20	20	20
Cooling water																
Flowrate	gpm	211	317	528	794	1059	1322	1587	2115	2646	3174	4234	5290	6349	8464	10582
Pressure drop	ftH^2O	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	26.4	26.4	26.4	30	30	30	30
Steam consumption	lb/h	516	772	1292	1938	2584	3230	3878	5170	6464	7756	10346	12928	15512	20693	25865
Power demand	kW	2.1	3.2	3.2	3.6	5.3	5.3	6.4	8.6	8.9	12.4	12.4	15.8	18.8	20.8	26.3
Solution weight	klbs	1.6	2.7	4.2	4.9	5.8	7.3	7.8	11.1	14.2	16.1	20.8	24.3	30.3	37.5	44.1
Unit ship. wt.	klbs	9.3	13.3	16.6	20.8	23.4	28.3	32.5	46.3	56.9	/	/	/	/	/	/
Main shell ship. wt.	klbs	5.6	9.3	11.1	12.4	14.4	16.8	19.7	28.0	32.7	39.3	43.7	55.2	60.7	66.2	70.6
Operation weight	klbs	10.4	14.8	18.3	23.6	28	33.1	38.6	53.6	66.6	79.0	93.1	111.4	126.8	164.3	200.7

Packaged Steam Chiller Performance Data

Rated chilled water 44°F/56.7°F,Cooling water 97.5°F/85°F

Mode		BSY	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
Pumpset	A/C water pump																
	External head	ftH^2O	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 W. pump																
	External head	ftH^2O	33	33	33	49	49	49	49	49	52.5	52.5	52.5	56	56	56	56
	Power demand	kW	3	7.5	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	Total power demand	kW	7	15	15	30	30	44	52	74	88	104	120	200	220	300	360
	Operation Wt.	klbs	1.1	1.5	1.8	7.3	7.3	7.9	8.2	13.9	14.6	15.9	19.4	13/19	13.5/19.4	13.5/21.6	21.2/21.6
Cooling tower	Power demand	kW	5.5	11	11	/	/	/	/	/	/	/	/	/	/	/	/
	Operation Wt.	klbs	5.5	9.9	11.2	/	/	/	/	/	/	/	/	/	/	/	/
Electricity & Water consumption	Total power demand	kW	14.6	29.2	29.2	33.6	35.3	49.3	58.4	82.6	96.9	116.4	132.4	215.8	238.8	320.8	386.3
	Water demand for cooling	klbs/h	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

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 temp. for chilled water: 41°F
5. Lowest permitted inlet temp. 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.: 0.0001 $hrft^2 \cdot °F/Btu$, for cooling W.:0.00025$hrft^2 \cdot °F/Btu$
11. LiBr Solution concentration: 52%. Solution is included in unit shipment 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: 1.50 (including chiller power consumption)
15. Life design: 30 years

Performance Curves

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

Coefficient of Performance (COP)

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

Notes:

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

Operating Noise dB(A)

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

Nomenclature

B S Y 200 XI 0.8 - Fa

- Fa: High pressure type
- 0.8: Steam inlet gauge pressure: 0.8 MPa
- XI: Generation code (XI indicates 11)
- 200: Cooling capacity: 10^4 kcal/h
- Y: Packaged chiller
- S: Chiller type: S (steam type)
- B: BROAD

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

Hot W./ Exhaust Chiller Performance Data

BH/BE: hot water/exhaust from power generation or industrial waste streams

Code	Mode	Cooling capacity	Heating capacity	Chilled W.		Cooling W.		Heating W.		Hot W. Consump-tion	Exhaust consumption		Power demand	Solution Wt.	Unit ship. Wt.	Main shell ship. Wt.	Chiller opera-tion Wt.
				flow rate	Pressure drop	flow rate	Pressure drop	flow rate	Pressure drop		Cooling	Heating					
		RT	MBH	gpm	ftH²O	gpm	ftH²O	gpm	ftH²O	gpm	lb/h	lb/h	kW	klbs	klbs	klbs	klbs
Two-stage hot water chiller BH hot water 356°F	20	66	/	126	10	211	16.5	/	/	41	/	/	2.1	1.6	9.5	5.6	11.1
	30	99	/	189	10	317	16.5	/	/	62	/	/	3.2	2.5	13.3	9.3	15.3
	50	165	/	314	10	528	16.5	/	/	103	/	/	3.2	3.1	17.2	11.1	19.9
	75	248	/	471	10	794	16.5	/	/	155	/	/	3.6	4.5	26.1	12.4	30.0
	100	331	/	630	10	1059	16.5	/	/	207	/	/	5.3	6.2	29.6	14.4	34.7
	125	413	/	788	13.2	1322	16.5	/	/	258	/	/	5.3	8.0	35.1	16.8	40.8
	150	496	/	942	13.2	1587	16.5	/	/	310	/	/	6.4	10.6	41.7	19.7	48.3
	200	611	/	1259	13.2	2115	16.5	/	/	413	/	/	8.6	12.4	51.9	28.0	59.6
	250	827	/	1572	16.5	2646	26.4	/	/	517	/	/	8.9	16.1	62.2	32.7	72.4
	300	992	/	1889	20	3174	26.4	/	/	620	/	/	12.4	18.8	/	39.3	88.9
	400	1323	/	2514	20	4234	26.4	/	/	828	/	/	12.4	24.1	/	43.7	108.1
	500	1653	/	3144	20	5290	30	/	/	1034	/	/	15.8	30.9	/	55.2	136.7
	600	1984	/	3773	20	6349	30	/	/	1241	/	/	18.8	37.3	/	60.7	150.8
	800	2646	/	5033	20	8464	30	/	/	1655	/	/	20.8	46.3	/	66.2	192.3
	1000	3307	/	6292	20	10582	30	/	/	2069	/	/	26.3	56.3	/	70.6	231.5
Two-stage exhaust chiller BE exhaust 932°F	20	66	522	126	10	211	16.5	58	6.6	/	3175	3373	2.1	2.5	13.3	5.6	14.4
	30	99	1191	189	10	317	16.5	87	6.6	/	4758	5046	3.2	3.8	18.3	9.3	19.9
	50	165	1310	314	10	528	16.5	146	6.6	/	7950	8419	3.2	5.3	23.2	11.1	25.4
	75	248	1962	471	10	794	16.5	218	6.6	/	11936	12615	3.6	7.8	29.8	12.4	33.1
	100	331	2617	630	10	1059	16.5	291	6.6	/	15906	16839	5.3	8.9	38.0	14.4	42.4
	125	413	3272	788	13.2	1322	16.5	364	6.6	/	19897	21061	5.3	11.1	41.1	16.8	45.5
	150	496	3927	942	13.2	1587	16.5	436	6.6	/	23880	25232	6.4	14.4	51.2	19.7	55.6
	200	661	5234	1259	13.2	2115	16.5	582	10	/	31832	33728	8.6	17.7	68.4	28.0	75.2
	250	827	6544	1572	16.5	2646	26.4	727	10	/	39808	41967	8.9	20.3	/	32.7	85.8
	300	992	7851	1889	16.5	3174	26.4	872	13.2	/	47758	50463	12.4	25.4	/	39.3	109.2
	400	1323	10468	2514	20	4234	26.4	1163	13.2	/	63717	67456	12.4	33.1	/	43.7	135.0
	500	1653	13085	3144	20	5290	30	1454	16.5	/	79619	84191	15.8	43.3	/	55.2	170.9
	600	1984	15702	3773	20	6349	30	1745	16.5	/	95530	101442	18.8	50.8	/	60.7	198.5
	800	2645	20940	5033	20	8464	30	2327	20	/	127426	134655	20.8	59.6	/	66.2	241.5
	1000	3307	26174	6292	20	10582	30	2908	20	/	159274	168383	26.3	68.4	/	70.6	264.6

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 temp. for chilled water: 41°F
7. Lowest permitted inlet temp. for cooling water: 50°F
8. Adjustable chilled water flowrate: 50%~120%
9. Pressure limit for chilled/cooling water: 150psig (except special order)
10. Adjustable load: 5%~115%
11. Fouling factor for chilled W., heating W.: 0.0001 $hrft^2 \cdot °F/Btu$, for cooling W:0.00025$hrft^2 \cdot °F/Btu$
12. LiBr Solution concentration: 54%, solution is included in unit shipment Wt.
13. Machine room ambient temperature: 41~109.4°F, humidity ⩽ 85%
14. Rated cooling COP: 1.50 (including chiller power consumption)
    Rated heating COP for exhaust chiller: 0.93 (including chiller power consumption)
16. Life design: 30 years
17. Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list information

Single-stage Steam/ Hot W. Chiller Performance Data

BDS/BDH: steam/hot water from power generation, solar panels or industrial waste streams

Code	Mode	Cooling capacity	Chilled W. flow rate	Chilled W. Pressure drop	Cooling W. flow rate	Cooling W. Pressure drop	Steam consump-tion	Hot W. consump-tion	Power demand	Solution Wt.	Unit ship. Wt.	Main shell ship. Wt.	Chiller operation Wt.
		RT	gpm	ftH^2O	gpm	ftH^2O	lb/h	gpm	kW	klbs	klbs	klbs	klbs
Single-stage steam chiller BDS steam 14.5psig	20	66	125	10	287	28	1008	/	2.5	1.4	7.1	/	8.0
	30	99	187	10	431	28	1515	/	2.5	1.5	12.0	/	13.7
	50	165	312	10	718	28	2526	/	2.8	2.5	14.8	/	17.5
	75	248	469	10	1079	28	3788	/	4.7	3.1	17.7	/	22.3
	100	331	626	10	1440	28	5053	/	4.9	4.0	20.6	/	25.4
	125	413	780	13.2	1797	28	6318	/	4.9	5.1	25.2	/	30.0
	150	496	937	13.2	2158	28	7584	/	5.6	6.2	28.7	/	33.8
	200	661	1249	13.2	2876	28	10110	/	7.5	8.9	39.7	/	46.8
	250	827	1563	16.5	3598	33	12639	/	9.3	11.1	47.2	/	56.5
	300	992	1875	16.5	4316	33	15170	/	10.1	12.4	58.0	/	69.3
	400	1323	2500	20	5756	33	20223	/	13.9	14.4	64.6	/	80.3
	500	1653	3124	20	7191	33	25278	/	15.7	22.1	/	60.7	103.0
	600	1984	3749	20	8631	33	30331	/	19.4	24.3	/	67.3	118.0
	800	2645	4998	20	11507	40	40437	/	25.2	28.7	/	70.6	150.6
	1000	3307	6249	20	14387	40	50563	/	26.2	33.8	/	72.8	183.0
Single-stage hot water chiller BDH hot water 208°F	20	60	113	8.3	267	25	/	105	2.5	1.4	7.3	/	8.6
	30	86	163	8.3	382	25	/	158	2.5	1.6	12.0	/	14.2
	50	146	276	8.3	649	25	/	263	2.8	2.5	15.3	/	18.6
	75	218	412	8.3	969	25	/	395	4.7	3.1	17.9	/	23.0
	100	292	552	8.3	1298	25	/	527	4.9	4.0	21.2	/	26.5
	125	365	690	10	1623	25	/	659	4.9	5.1	26.1	/	31.6
	150	439	830	10	1952	25	/	791	5.6	6.2	29.4	/	34.9
	200	585	1106	10	2601	25	/	1054	7.5	8.9	40.6	/	49.0
	250	730	1380	13.2	3246	30	/	1317	9.3	11.1	47.9	/	58.9
	300	877	1657	13.2	3899	30	/	1582	10.1	12.4	59.1	/	73.7
	400	1169	2209	16.5	5198	30	/	2108	13.9	14.4	66.6	/	85.6
	500	1461	2761	16.5	6496	30	/	2635	15.7	22.1	/	28.5	110.3
	600	1754	3315	16.5	7799	30	/	3162	19.4	24.3	/	32.0	127.0
	800	2327	4397	20	10347	33	/	4215	25.2	28.7	/	32.0	159.9
	1000	2909	5497	20	12934	33	/	5271	26.2	33.8	/	33.0	196.3

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 chilled W. outlet/inlet temp.: 44°F/56.7°F
4. Rated cooling W. outlet/inlet temp.: 97.5°F/85°F
5. Lowest permitted outlet temp. for chilled water: 41°F
6. Lowest permitted inlet temp. for cooling water: 50°F
7. Adjustable chilled water flowrate: 50%~120%
8. Pressure limit for chilled/cooling water:150psig (except special order)
9. Adjustable load: 5%~115%
10. Fouling factor for chilled W.: 0.0001 $hrft^2 \cdot °F/Btu$, for cooling W:0.00025$hrft^2 \cdot °F/Btu$
11. LiBr Solution concentration: 43%, solution is included in unit shipment Wt.
12. Machine room ambient temperature: 41~109.4°F, humidity≤ 85%
13. Rated cooling COP for single-stage steam chiller: 0.79 (including chiller power consumption)
    Rated cooling COP for single-stage hot W. chiller: 0.76 (including chiller power consumption)
14. Life design: 30 years
15. Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list information

Multi-energy Chiller Performance Data BZEY/BHEY/

BZHE: gas (oil) and waste heat hybrid (multi-energy chiller)

Code	Mode	Cooling capacity	Heating capacity	Hot water capacity	Chilled W.		Heating W.		Hot W.		Cooling W.		Power demand	Solution wt.
					flow rate	Pressure drop	flow rate	Pressure drop	flow rate	Pressure drop	flow rate	Pressure drop		
		RT	MBH	MBH	gpm	ftH^{2}O	gpm	ftH^{2}O	gpm	ftH^{2}O	gpm	ftH^{2}O	kW	klbs
Exhaust & direct-fired chiller BZE exhaust 932°F gas/oil	20	66	611	273	126	10	67	6.6	15	6.6	209	16.5	2.3	3.1
	30	99	918	409	189	10	102	6.6	23	6.6	313	16.5	3.8	4.6
	50	165	1532	682	314	10	170	6.6	38	6.6	524	16.5	3.9	6.0
	75	248	2293	1024	471	10	255	6.6	57	6.6	784	16.5	5.1	8.2
	100	331	3061	1365	630	10	339	6.6	76	6.6	1048	16.5	6.8	10.6
	125	413	3825	1706	788	13.2	424	6.6	95	6.6	1308	16.5	8.8	12.1
	150	496	4603	2047	942	13.2	511	6.6	114	6.6	1572	16.5	9.9	16.3
	200	661	6111	2730	1259	13.2	674	10	151	10	2096	16.5	16.3	19.8
	250	827	7660	3412	1572	16.5	850	10	189	10	2620	26.4	16.6	23.1
	300	992	9168	4094	1889	16.5	1017	13.2	337	13.2	3144	26.4	22.4	28.7
	400	1323	12222	5459	2514	20	1356	13.2	303	13.2	4192	26.4	26.6	35.3
	500	1653	15316	/	3144	20	1695	16.5	/	/	5235	30	29.3	44.8
	600	1984	18374	/	3773	20	2039	16.5	/	/	6283	30	39.3	57.3
	800	2646	24485	/	5033	20	2717	20	/	/	8379	30	49.7	65.0
	1000	3307	30595	/	6292	20	3395	20	/	/	10475	30	53.3	75.0
Hot W. & exhaust chiller BHE exhaust 932°F hot W. 208°F	20	66	522	/	126	10	51	5.0	/	/	231	20	2.1	2.6
	30	99	785	/	189	10	86	6.6	/	/	323	20	3.2	4.4
	50	165	1310	/	314	10	129	5.0	/	/	577	20	3.2	5.7
	75	248	1962	/	471	10	193	5.0	/	/	863	20	3.6	8.2
	100	331	2617	/	630	10	257	5.0	/	/	1154	20	5.3	9.5
	125	413	3272	/	788	13.2	321	5.0	/	/	1440	20	5.3	11.7
	150	496	3927	/	942	13.2	388	5.0	/	/	1730	20	6.4	15.2
	200	661	5234	/	1259	13.2	515	8.3	/	/	2312	20	8.6	18.5
	250	827	6544	/	1572	16.5	643	8.3	/	/	2884	26.4	8.9	21.6
	300	992	7851	/	1889	16.5	771	11.6	/	/	3465	26.4	12.4	27.3
	400	1323	10468	/	2514	20	1026	11.6	/	/	4619	26.4	12.4	35.3
	500	1653	13085	/	3144	20	1290	15	/	/	5772	30	15.8	44.3
	600	1984	15702	/	3773	20	1545	15	/	/	6926	30	18.8	56.4
	800	2646	20939	/	5033	20	2056	18.2	/	/	9233	30	20.8	63.9
	1000	3307	26173	/	6292	20	2571	18.2	/	/	11545	30	26.3	72.8
Hot W. & exhaust & direct-fired chiller BZHE exhaust 932°F hot W. 208°F gas/oil	20	66	611	273	126	10	67	6.6	15	6.6	231	20	2.3	4.0
	30	99	918	409	189	10	102	6.6	23	6.6	347	20	3.8	5.7
	50	165	1532	682	314	10	170	6.6	38	6.6	577	20	3.9	6.6
	75	248	2293	1024	471	10	255	6.6	57	6.6	863	20	5.1	8.8
	100	331	3061	1365	630	10	339	6.6	76	6.6	1154	20	6.8	12.1
	125	413	3825	1706	788	13.2	424	6.6	95	6.6	1440	20	8.8	14.3
	150	496	4603	2047	942	13.2	511	6.6	114	6.6	1730	20	9.9	17.2
	200	661	6111	2730	1259	13.2	674	10	151	10	2312	20	16.3	23.1
	250	827	7660	3412	1572	16.5	850	10	189	10	2884	26.4	16.6	26.5
	300	992	9168	4094	1889	16.5	1017	13.2	227	13.2	3465	26.4	22.4	31.3
	400	1323	12222	5459	2514	20	1356	13.2	303	13.2	4619	26.4	26.6	37.0
	500	1653	15316	/	3144	20	1695	16.5	/	/	5772	30	29.3	48.5
	600	1984	18374	/	3773	20	2039	16.5	/	/	6926	30	39.3	61.7
	800	2646	24485	/	5033	20	2717	16.5	/	/	9233	30	49.7	69.4
	1000	3307	30595	/	6292	20	3395	16.5	/	/	11545	30	53.3	81.6

Energy consumption							Unit ship. wt.	Main shell ship. wt.	Operation wt.
Cooling			Heating		Hot water				
NG	Exhaust	Hot W.	NG	Exhaust	NG	Exhaust			
MBH	lb/h	gpm	MBH	lb/h	MBH	lb/h	klbs	klbs	klbs
558	952	/	657	1012	294	1012	12.6	5.5	13.4
837	1426	/	987	1515	440	1515	18.7	9.3	20.1
1394	2385	/	1647	2526	734	2526	23.8	11.0	24.7
2096	3580	/	2465	3785	1101	3785	30.9	12.3	33.3
2797	4771	/	3291	5051	1468	5051	38.6	14.3	42.8
3490	5968	/	4113	6318	1834	6318	44.7	16.8	47.2
4192	7165	/	4949	7571	2201	7571	52.9	19.6	57.8
5586	9550	/	6571	10119	2935	10119	68.3	28.0	74.3
6989	11942	/	8236	12590	3669	12590	/	32.6	87.7
8383	14328	/	9858	15139	4403	15139	/	39.2	106.0
11180	19116	/	13142	20236	5870	20236	/	43.7	128.7
13969	23885	/	16469	25258	/	/	/	55.1	154.8
16766	28660	/	19757	30432	/	/	/	60.6	186.7
22352	38228	/	26327	40397	/	/	/	70.5	239.2
27946	47783	/	32898	50514	/	/	/	75.0	269.4
/	3175	29	/	3373	/	/	15.2	6.0	17.0
/	4758	44	/	5046	/	/	20.9	9.7	23.1
/	7950	72	/	8419	/	/	25.8	11.9	29.3
/	11936	109	/	12615	/	/	32.6	13.9	37.7
/	15906	145	/	16839	/	/	40.1	16.3	45.2
/	19897	181	/	21061	/	/	44.3	19.4	49.8
/	23880	217	/	25232	/	/	53.6	22.0	59.1
/	31832	290	/	33728	/	/	72.8	30.9	82.0
/	39808	362	/	41967	/	/	/	36.2	94.1
/	47758	435	/	50463	/	/	/	44.8	117.9
/	63717	581	/	67456	/	/	/	50.0	147.7
/	79619	722	/	84191	/	/	/	62.8	184.1
/	95530	867	/	101442	/	/	/	70.5	216.7
/	127426	1158	/	134655	/	/	/	70.5	258.8
/	159274	1449	/	168383	/	/	/	75.0	306.4
558	952	29	657	1012	294	1012	13.7	6.0	15.2
837	1426	44	987	1515	440	1515	20.3	9.7	22.0
1394	2385	72	1647	2526	734	2526	25.4	11.9	27.6
2096	3580	109	2465	3785	1101	3785	32.6	13.9	37.7
2797	4771	145	3291	5051	1468	5051	40.3	16.3	46.1
3490	5968	181	4113	6318	1834	6318	48.5	19.4	54.7
4192	7165	217	4949	7571	2201	7571	56.4	22.0	62.8
5586	9550	290	6571	10119	2935	10119	72.8	30.9	81.6
6989	11942	362	8236	12590	3669	12590	/	36.2	97.2
8383	14328	435	9858	15139	4403	15139	/	44.8	118.6
11180	19116	581	13142	20236	5870	20236	/	50.0	145.1
13969	23885	722	16469	25258	/	/	/	62.8	175.5
16766	28660	867	19757	30432	/	/	/	70.5	216.5
22352	38228	1158	26327	40397	/	/	/	70.5	270.7
27946	47783	1449	32898	50514	/	/	/	75.0	322.8

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 temp. for chilled water: 41°F
6. Highest permitted outlet temp. for heating/ hot water: 203°F
7. Lowest permitted inlet temp. 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. 150psig (except special order)
11. Adjustable load: 5%~115%
12. Fouling factor for chilled W.,heating W.: 0.0001 $hrft^2 \cdot °F/Btu$, for cooling W:0.00025 $hrft^2 \cdot °F/Btu$,
13. LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
14. Natural gas consumption is calculated: 900Btu/ft^3(8600kcal/Nm^3)
15. Standard natural gas pressure is 2.3~7.3psig (63~197 inchH2O), lower or higher pressure can be commodated to special orders
16. Machine room ambient temperature: ,41~109.4°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 accommondated into special orders
19. Energy consumption is for separate operation of heat source and fuel
20. Life design: 30 years
21. Please refer to P5, P6 & P7 for performance curves, model selection & ordering and supply list

Note:
exhaust, hot water, steam, natural gas can be combined in special order

Condensing Heat Recovery Chiller Performance Data

Mode		BZ	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
Condensing Heat Recovery Condition	Cooling capacity	RT	66	99	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
		10^4kcal/h	20	30	50	75	100	125	150	200	250	300	400	500	600	800	1000
	Hot W. capacity	MBH	273	409	682	1024	1365	1706	2047	2730	3412	4095	5459	6824	8189	10919	13649
	Chilled water																
	Flowrate	gpm	126	189	314	471	630	788	942	1259	1572	1889	2514	3144	3773	5032	6292
	Pressure drop	ftH^{2}O	10	10	10	10	10	13.2	13.2	13.2	16.5	16.5	20	20	20	20	20
	cooling water																
	Flowrate	gpm	195	291	484	726	969	1211	1453	1937	2422	2906	3875	4843	5812	7749	9682
	Pressure drop	ftH^{2}O	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	20	20	20	20	20	20	20
	Hot water																
	Flowrate	gpm	15	23	38	57	76	95	114	151	189	227	304	379	453	608	757
	Pressure drop	ftH2O	6.6	6.6	6.6	6.6	6.6	6.6	6.6	10	10	13.2	13.2	13.2	16.5	16.5	16.5
	NG consumption																
	Cooling	MBH	430	644	1073	1608	2145	2682	3218	4290	5364	6435	8580	10725	12870	17160	21450
	Hot water	MBH	294	440	734	1101	1468	1834	2201	2935	3669	4403	5870	7338	8806	11741	14676
Heating Condition	Heating capacity	kW	179	269	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967
		MBH	611	918	1532	2293	3061	3825	4603	6111	7660	9168	12222	15317	18374	24486	30597
	Heating water																
	Flowrate	gpm	67	102	170	255	339	424	511	674	850	1017	1356	1695	2039	2717	3395
	Pressure drop	ftH^{2}O	6.6	6.6	6.6	6.6	6.6	6.6	6.6	10	10	13.2	13.2	16.5	16.5	20	20
	NG consumption	MBH	657	987	1647	2466	3291	4113	4949	6571	8237	9859	13142	16470	19757	26329	32900
Power demand		kW	2.3	3.8	3.9	5.1	6.8	8.8	9.9	16.3	16.6	22.4	26.6	29.3	39.3	49.7	53.3
Solution Wt.		klbs	2.2	3.5	5.1	6.2	8.4	9.5	12.3	15.0	18.7	22.7	27.8	35.3	46.3	55.1	70.5
Unit ship. Wt.		klbs	11.5	17.4	20.9	27.8	34.4	39.0	46.3	60.6	70.5	/	/	/	/	/	/
Main shell ship. Wt.		klbs	5.5	9.3	11.0	12.3	14.3	16.8	19.6	28.0	32.6	39.2	43.7	55.1	60.6	66.1	70.5
Operation Wt.		klbs	12.8	18.7	22.7	31.1	39.5	44.5	53.4	68.6	80.0	97.7	117.5	141.3	173.1	211.2	256.2

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 hot W. outlet/inlet temp.: 176°F/140°F
4. Rated heating W. outlet/inlet temp.: 149°F/131°F
5. Lowest permitted outlet temp. for chilled water: 41°F
6. Highest permitted outlet temp. for heating/ hot water: 203°F
7. Lowest permitted inlet temp. 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., hot W., heating W.: 0.0001 hrft^2・°F/Btu, for cooling W:0.00025hrft^2・°F/Btu
12. The NG consumption data under condensing heat recovery condition when chilled W. and hot W. working simultaneously
13. Natural gas consumption is calculated: 900Btu/ft^3 (8600kcal/Nm^3)
14. Standard natural gas dynamic pressure is 2.3~5psig, static pressure is < 7.3psig, lower or higher pressure can be accommodated to special orders
15. LiBr Solution concentration: 54%. Solution is included in unit shipment Wt.
16. Machine room ambient temperature: 41~109.4°F, humidity ⩽ 85%
17. Rated cooling COP: 1.85 Rated heating COP: 0.93 (including chiller power consumption)
18. Life design: 30 years

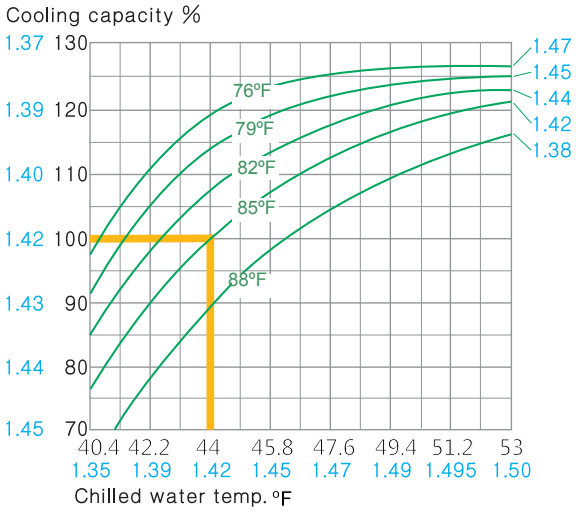
Note:
the dimension is the same as DFA chiller

Model Selection Curves

(orange means the rated value)

chilled/cooling water temp., cooling capacity, COP

BZ

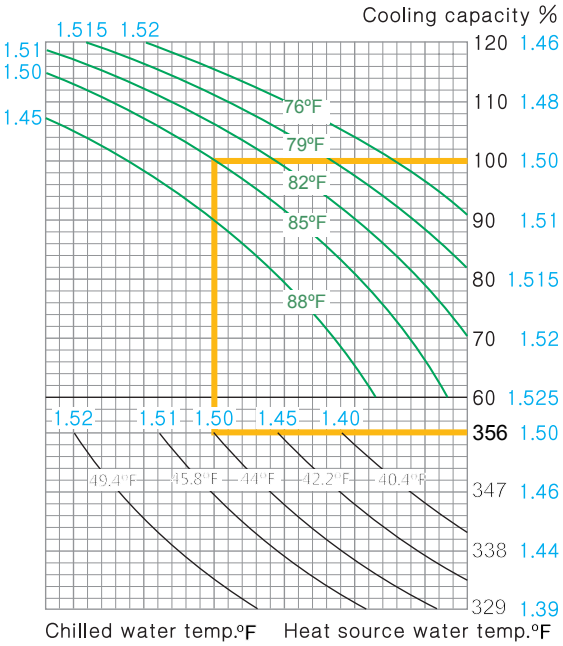


Notes:

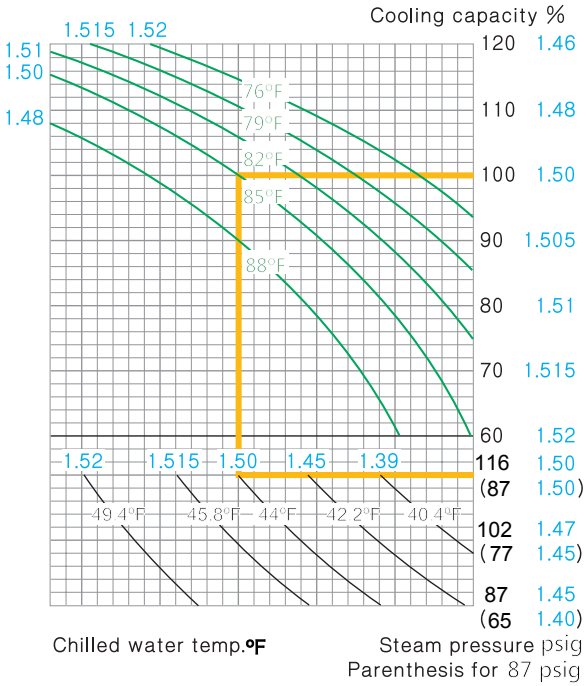
the figure in blue is COP. In calculation, 3 COP values are added and then divided by 3. e.g.

1. Cooling capacity is 100%, cooling water temp. is 82.4°F, then chilled water temp. is 43°F,COP is1.419; i.e. (1.42+1.44+1.419)/3=1.419
2. Chilled water temp. is 50°F, cooling water temp. is 86°F, then cooling capacity is 116%, COP=1.435
3. Cooling capacity is 90%, chilled water is 42.8°F , then cooling water temp. is 86°F, COP=1.413

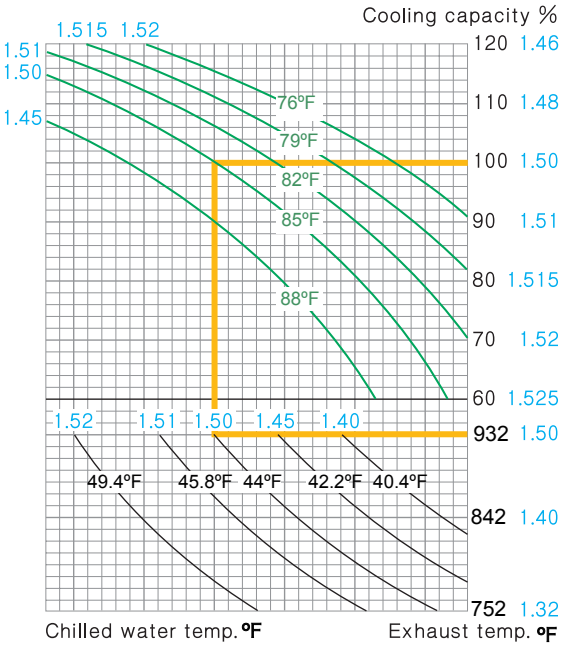
BH



BS



BE



Notes:

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

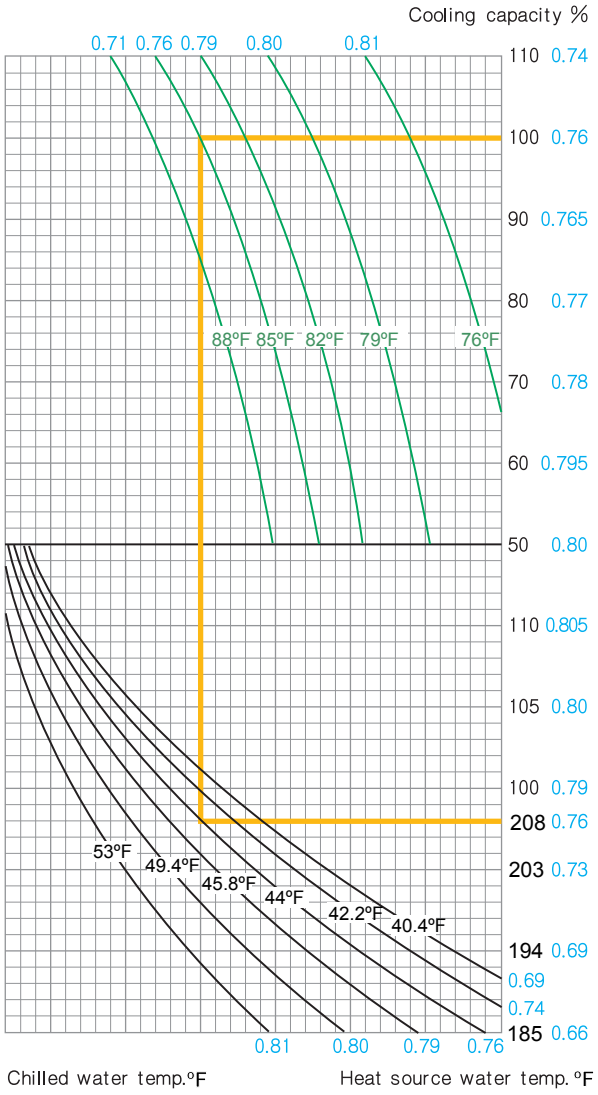
1. Cooling capacity is 100%, steam pressure 87psig, cooling water temp. is 82°F, then chilled water temp. is 46.1°F, COP is 1.494; i.e. (1.50+1.43+1.51+1.516)/4=1.494
2. Steam pressure 102 psig, chilled water temp. is 45.8°F, cooling water temp. is 82°F, then cooling capacity is 106%, COP=1.496
3. Cooling capacity is 90%, steam pressure 116psig, chilled water temp. is 42.2°F, then cooling water temp. is 85.7°F, COP=1.488

Model Selection Curves

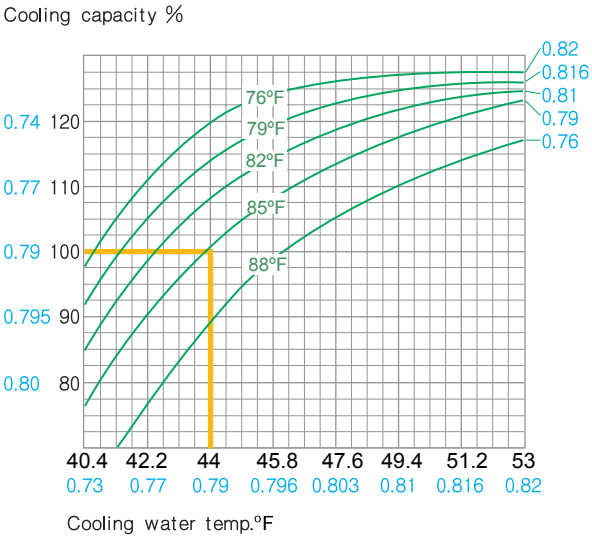
(orange line means the rated value)

chilled/cooling water temp., cooling capacity, COP

BDH



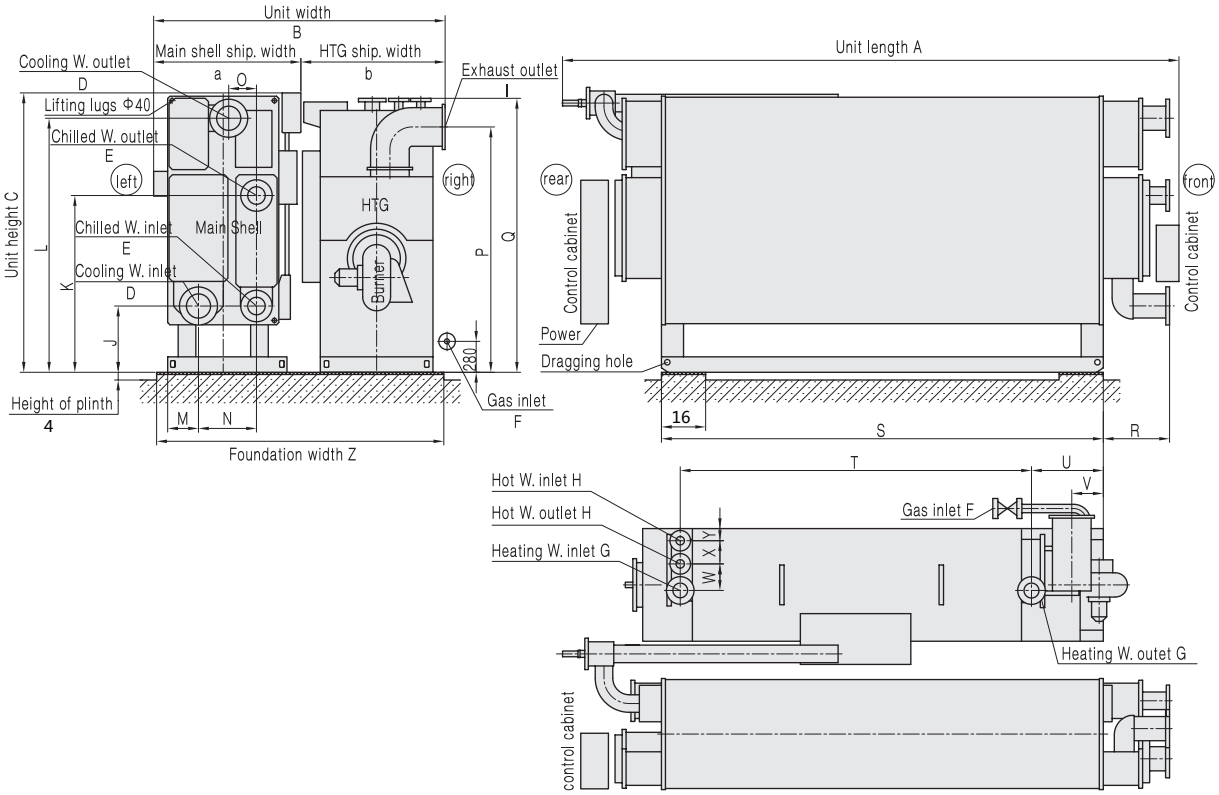
BDS



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

DFA Dimensions

BZ75/BZ100/BZ125/BZ150



unit: inch

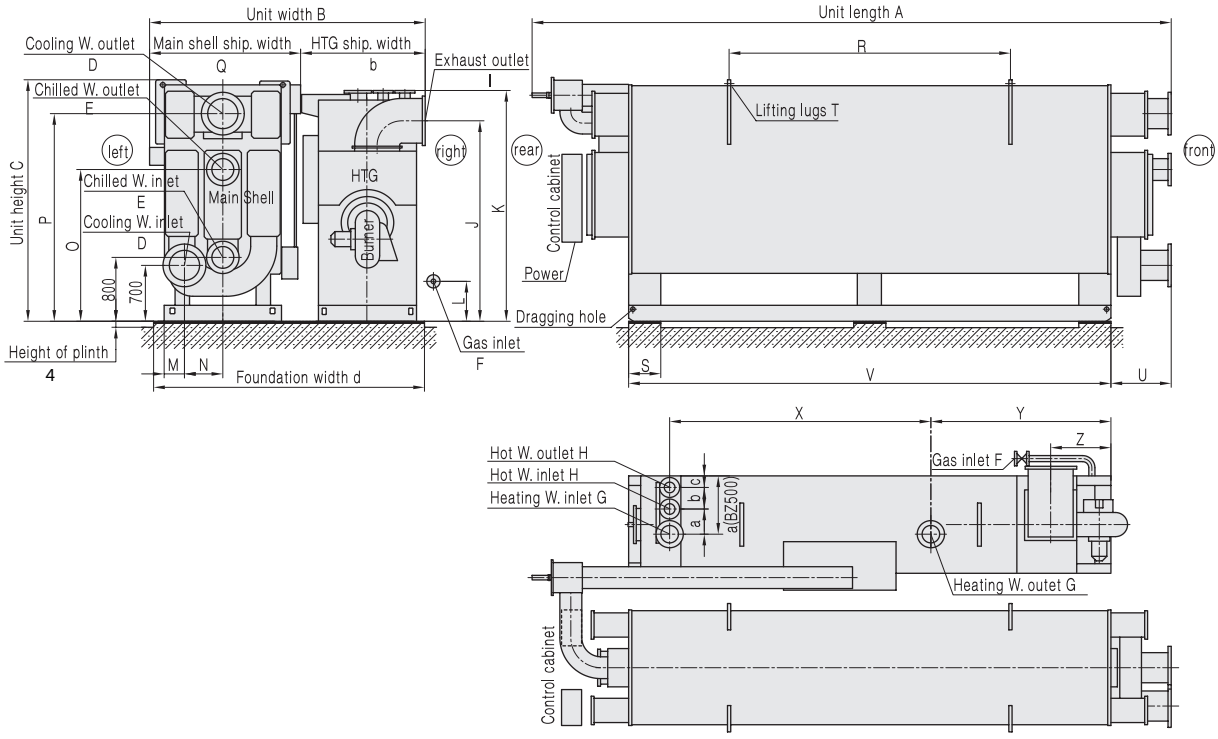
Mode	A	B	C	D	E	F	G	H	I	J
BZ75	220.5	90.5	99.5	NPS8	NPS6	NPS1	NPS4	NPS2.5	12.5×12.5	23.5
BZ100	219.5	104.0	99.5	NPS8	NPS6	NPS1.5	NPS5	NPS2.5	14.0×14.0	23.5
BZ125	250.5	97.5	94.5	NPS10	NPS8	NPS1.5	NPS6	NPS3	16.0×16.0	22.5
BZ150	264.0	109.0	115.5	NPS10	NPS8	NPS1.5	NPS6	NPS3	17.0×17.0	31.5

Mode	K	L	M	N	O	P	Q	R	S	T
BZ75	63.0	90.5	9.0	17.0	6.5	87.5	97.5	23.5	157.5	125.0
BZ100	63.0	90.5	11.0	20.5	2.0	87.5	97.5	23.5	157.5	125.0
BZ125	60.0	86.0	12.0	19.5	3.0	78.0	93.5	26.0	187.0	120.5
BZ150	75.0	106.5	13.5	20.5	4.5	98.5	113.5	27.5	197.0	127

Mode	U	V	W	X	Y	Z	a	b
BZ75	25.5	12.0	8.5	8.0	4.5	90.5	45.0	45.5
BZ100	25.5	11.0	9.5	8.5	4.5	102.5	52.5	51.5
BZ125	51.0	24.0	10.0	8.5	4.5	99.0	50.0	48.0
BZ150	54.0	24.5	10.0	8.5	4.5	110.0	53.0	55.5

DFA Dimensions

BZ200/BZ250/BZ300/BZ400/BZ500



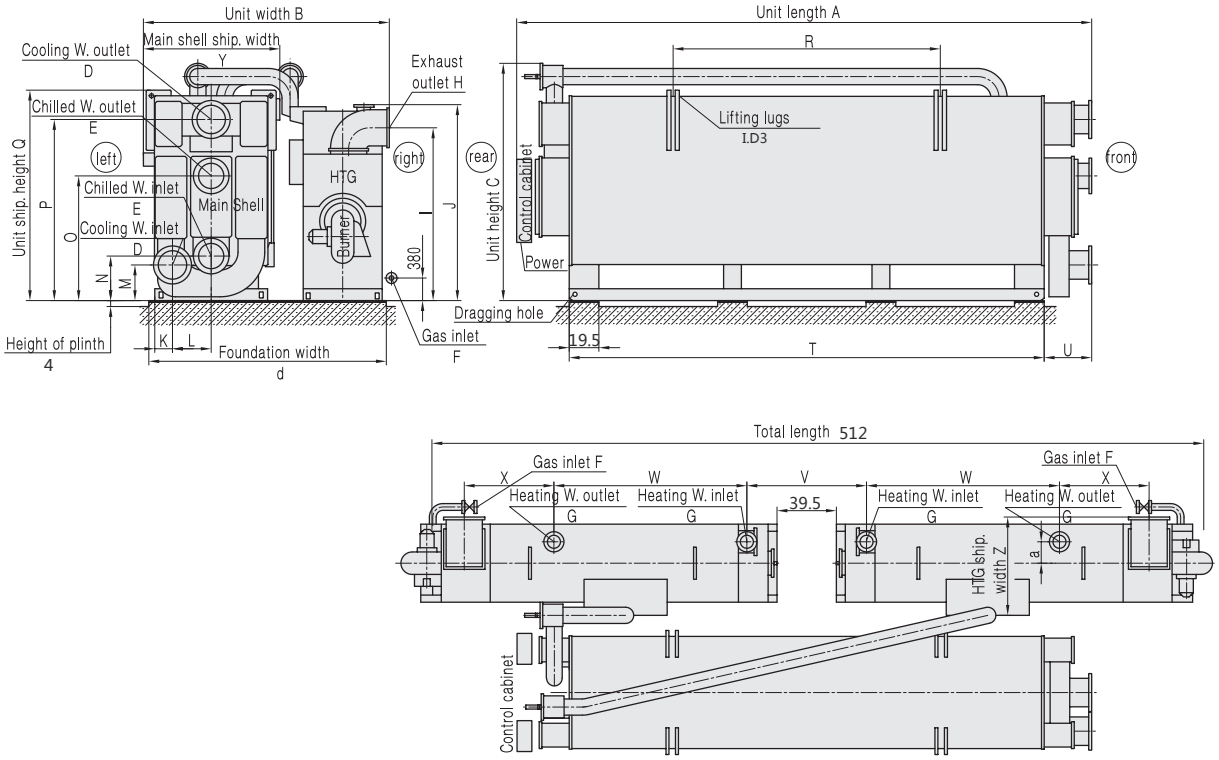
unit: inch

Mode	A	B	C	D	E	F	G	H	I	J
BZ200	266.0	133.0	119.0	NPS12	NPS10	NPS2	NPS8	NPS5	22.0×22.0	99.0
BZ250	313.0	133.0	120.0	NPS14	NPS10	NPS2	NPS8	NPS5	22.0×22.0	99.0
BZ300	316.0	147.5	120.0	NPS14	NPS12	NPS2.5	NPS8	NPS5	24.0×24.0	98.0
BZ400	318.0	160.0	139.5	NPS16	NPS12	NPS2.5	NPS10	NPS6	28.0×28.0	114.0
BZ500	399.0	168.0	139.5	NPS16	NPS14	NPS3	NPS10	/	31.0×31.0	116.0

Mode	K	L	M	N	O	P	Q	R	S	T
BZ200	114.0	12.5	10.0	18.5	75.0	102.5	74.0	114.0	16.0	I.D2
BZ250	114.0	12.5	10.0	18.5	75.0	102.5	74.0	138.0	16.0	I.D2
BZ300	114.0	15.0	10.6	22.5	75.0	102.5	83.5	138.0	16.0	I.D2
BZ400	129.5	15.0	11.0	24.5	83.0	120.0	88.0	138.0	16.0	I.D3
BZ500	129.5	15.0	11.0	24.5	83.0	120.0	90.5	177.0	20.0	I.D3

Mode	U	V	W	X	Y	Z	a	b	c	d
BZ200	27.5	197.0	67.0	128.0	53.0	22.0	12.4	10.5	5.0	134.0
BZ250	29.5	236.0	67.0	128.0	88.0	29.5	12.4	10.5	6.0	134.0
BZ300	29.5	236.0	72.5	128.0	88.0	28.5	12.4	10.5	6.0	146.0
BZ400	29.5	236.0	82.0	129.0	88.0	26.6	14.4	12.0	7.0	157.5
BZ500	29.5	315.0	90.5	130.0	140.5	78.1	15.7	/	/	165.0

BZ600/BZ800/BZ1000



unit: inch

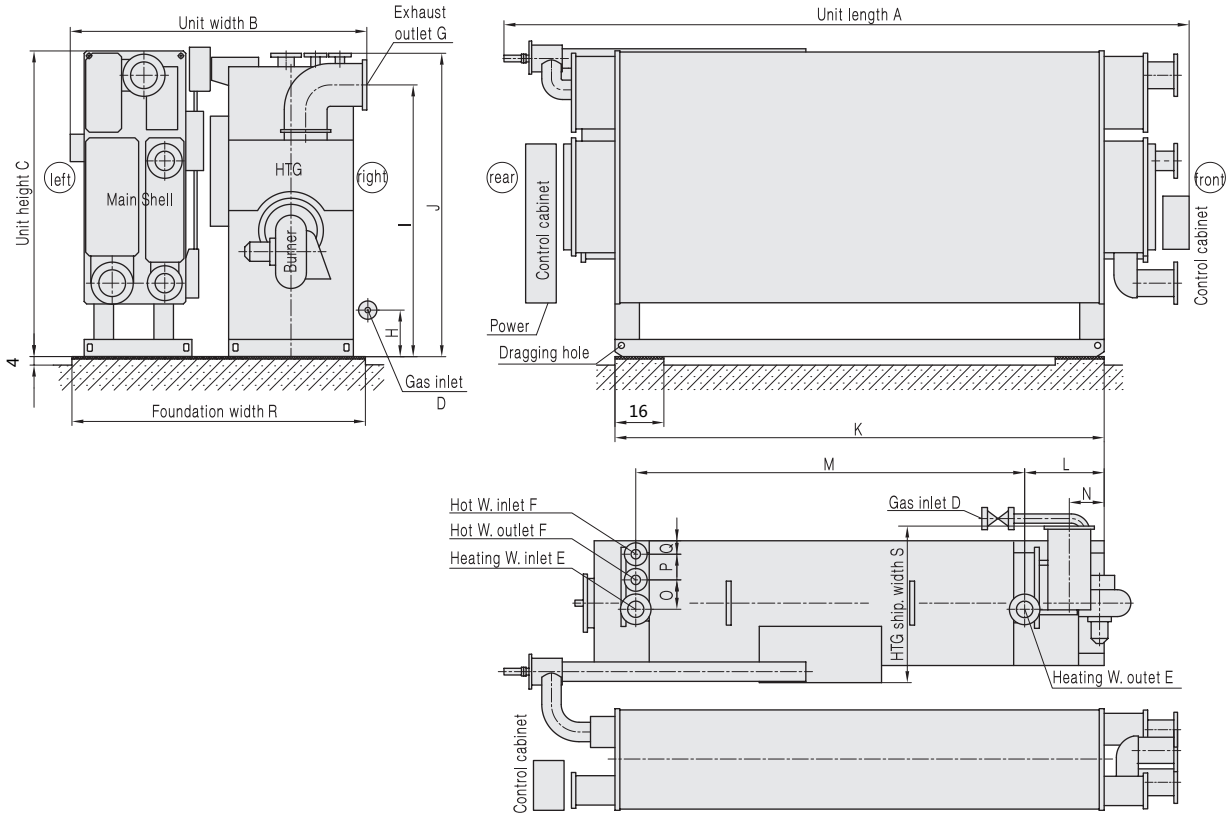
Mode	A	B	C	D	E	F	G	H	I
BZ600	381.0	161.5	157.5	NPS18	NPS16	NPS2.5	NPS8	24.0×24.0	114.0
BZ800	385.0	175.0	175.5	NPS20	NPS18	NPS2.5	NPS10	28.0×28.0	130.0
BZ1000	464.0	180.0	178.0	NPS20	NPS18	NPS3	NPS10	31.0×31.0	132.0

Mode	J	K	L	M	N	O	P	Q	R
BZ600	130.0	12.0	25.5	23.5	29.5	83.0	120.0	139.5	177.0
BZ800	146.0	13.0	26.5	20.0	28.5	94.5	136.0	157.0	177.0
BZ1000	146.0	13.0	26.5	20.0	28.5	94.5	136.0	157.0	185.0

Mode	S	T	U	V	W	X	Y	Z	a
BZ600	157.5	315.0	31.5	79.0	128.0	59.5	92.5	73.0	14.0
BZ800	173.0	315.0	33.5	77.5	130.0	60.5	102.5	78.0	15.5
BZ1000	177.0	394.0	33.5	77.0	130.0	62.0	102.5	78.0	15.5

DFA Enlarged Model Dimensions

BZ75/BZ100/BZ125/BZ150



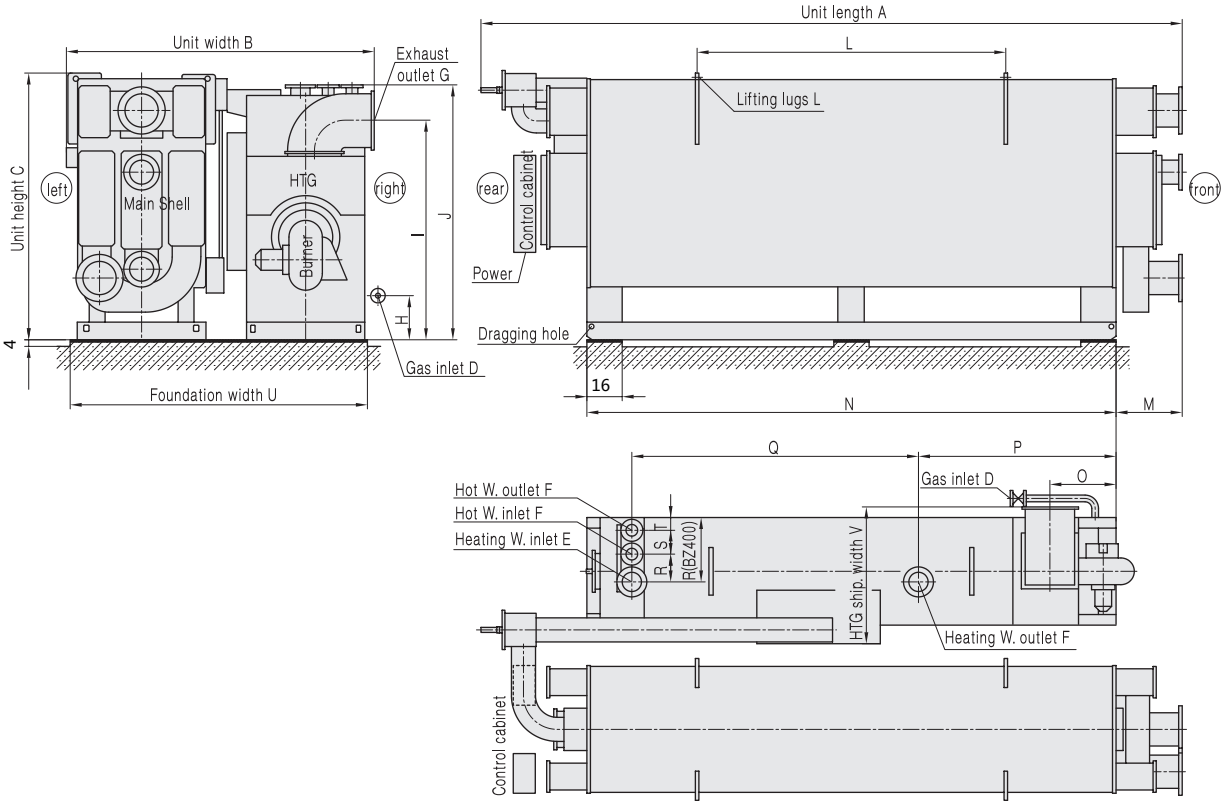
HTG Enlarged H_3, H_4 dimensions (HTG Enlarged H_1, H_2 is the same size with standard models)
(Refer to P22 of the DFA standard model for dimensions not shown in the drawing)

unit: inch

Mode	A	B	C	D	E	F	G	H	I	J
BZ75	220.5	95.5	101.5	NPS1.5	NPS5	NPS2.5	14.0×14.0	11	86.5	97.5
BZ100	220.0	104.0	101.5	NPS1.5	NPS6	NPS3	16.0×16.0	11	80.0	97.5
BZ125	265.5	108.0	103.5	NPS1.5	NPS6	NPS3	17.0×17.0	11	83.0	98.5
BZ150	264.0	112.0	119.0	NPS2	NPS8	NPS5	22.0×22.0	12.5	99.0	114.0

Mode	K	L	M	N	O	P	Q	R	S
BZ75	157.5	25.5	125.0	11.0	9.5	8.0	4.0	94.5	55.0
BZ100	157.5	29.5	127.0	13.0	10.0	9.0	4.0	102.5	55.0
BZ125	197.0	54.0	127.0	24.5	10.0	9.0	4.0	110.0	61.0
BZ150	197.0	53.0	128.0	22.0	12.5	10.5	5.0	114.0	67.0

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 P23 of the DFA standard model for dimensions not shown in the drawing)

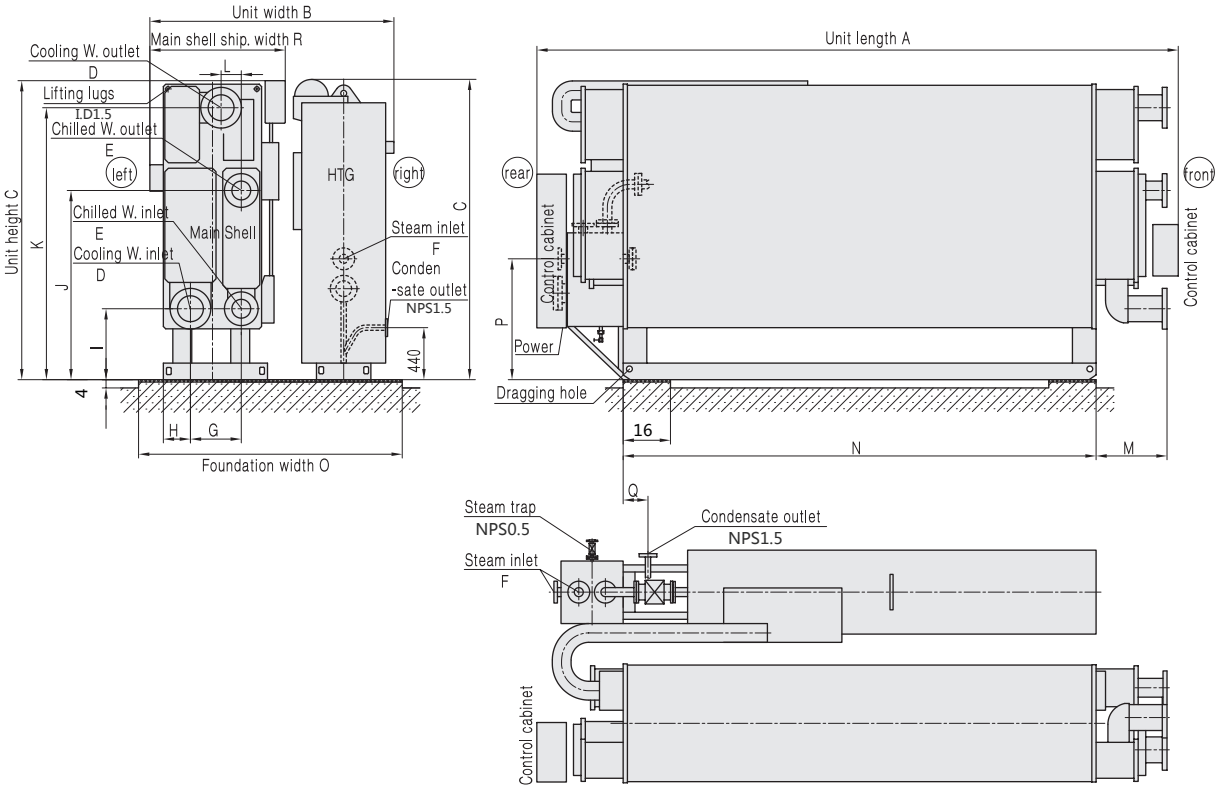
unit: inch

Mode	A	B	C	D	E	F	G	H	I	J	K
BZ200	266.0	133.0	119.5	NPS2	NPS8	NPS5	22.0×22.0	12.5	99.0	114.0	114.0
BZ250	313.0	137.5	120.0	NPS2.5	NPS8	NPS5	24.0×24.0	15.0	98.0	114.0	138.0
BZ300	316.0	153.0	120.0	NPS2.5	NPS10	NPS6	28.0×28.0	15.0	107.0	122.0	138.0
BZ400	318.0	164.5	138.0	NPS3	NPS10	/	31.0×31.0	15.0	116.0	129.5	138.0

Mode	L	M	N	O	P	Q	R	S	T	U	V
BZ200	I.D2	27.5	197.0	6.5	65.0	128.0	12.5	10.5	6.0	134.0	67.0
BZ250	I.D2	29.5	236.0	28.5	88.0	128.0	12.5	10.5	6.0	134.0	72.5
BZ300	I.D2	29.5	236.0	26.5	87.0	131.0	14.5	12.0	7.0	149.5	82.0
BZ400	I.D3	29.5	236.0	24.5	87.0	131.0	16.0	/	/	165.0	90.5

Steam Chiller Dimensions

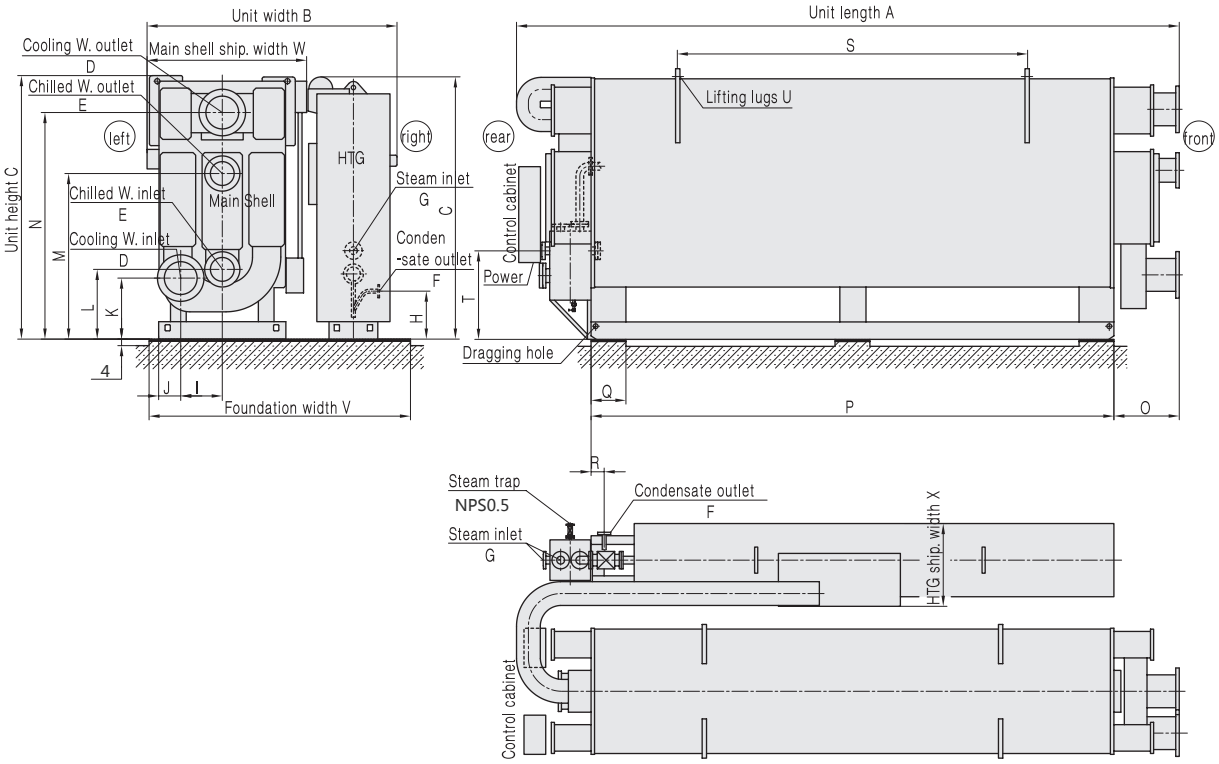
BS75/BS100/BS125/BS150



units: inch

Mode	A	B	C	D	E	F	G	H	I
BS75	220.5	79.0	99.5	NPS8	NPS6	NPS2	17.0	9.0	23.5
BS100	220.0	87.5	99.5	NPS8	NPS6	NPS2.5	21.0	11.0	23.5
BS125	265.5	87.5	101.0	NPS10	NPS8	NPS2.5	21.0	12.0	23.5
BS150	264.0	92.5	117.5	NPS10	NPS8	NPS2.5	21.0	13.5	31.5
Mode	J	K	L	M	N	O	P	Q	R
BS75	63.0	90.5	7.0	23.5	157.5	79.0	40.5	12.5	47.0
BS100	63.0	90.5	10.0	23.5	157.5	90.5	40.0	8.0	55.0
BS125	63.0	90.5	9.0	27.5	197.0	90.5	40.0	9.0	55.0
BS150	75.0	106.0	7.5	27.5	197.0	94.5	40.0	9.0	55.0

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



units: inch

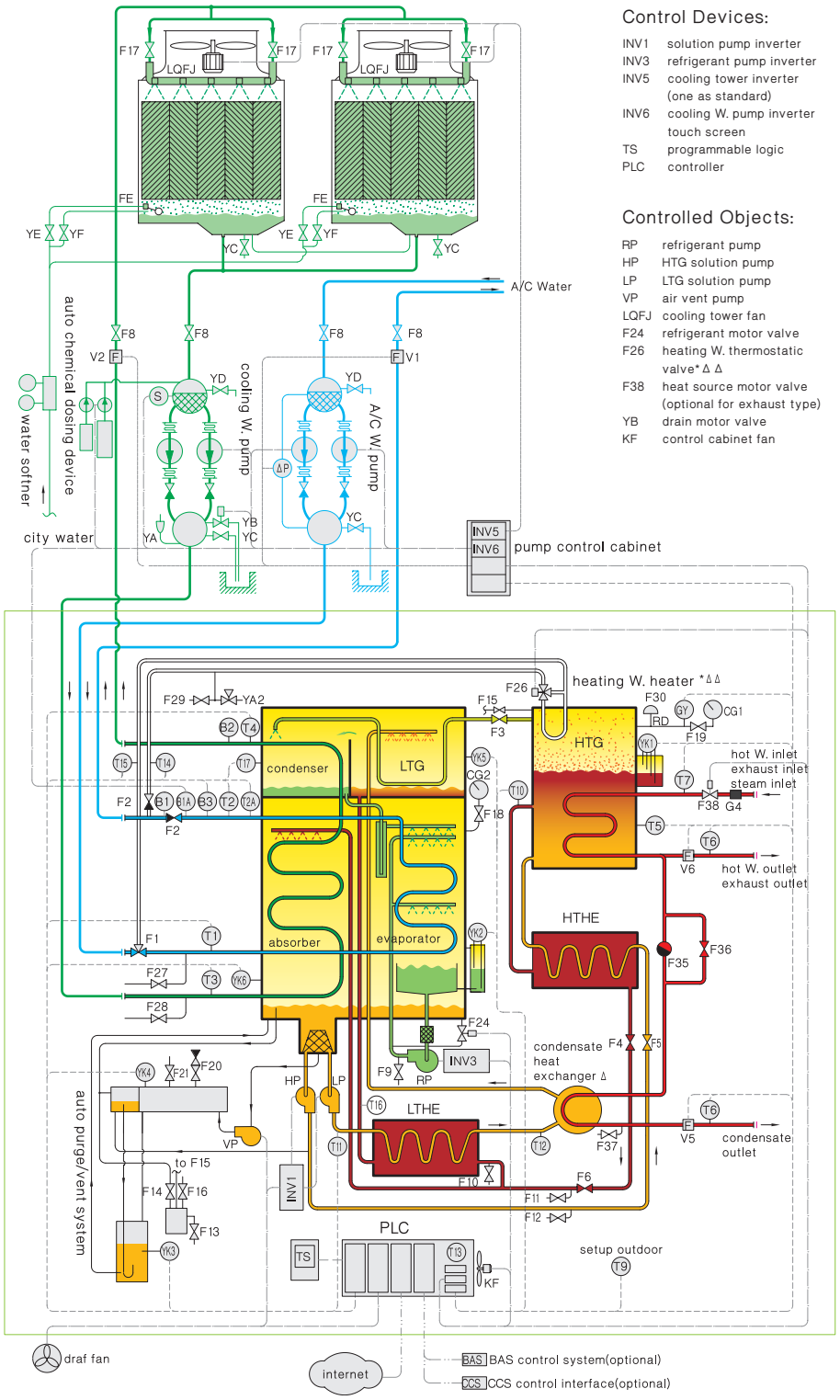
Mode	A	B	C	D	E	F	G	H	I	J	K	L
BS200	256.0	112.5	119.0	NPS12	NPS10	NPS1.5	NPS3	22.0	19.0	10.0	27.5	31.5
BS250	299.0	115.5	119.0	NPS14	NPS10	NPS1.5	NPS3	22.0	19.0	10.0	27.5	31.5
BS300	301.5	128.0	119.0	NPS14	NPS12	NPS2	NPS4	22.0	22.5	10.5	27.5	31.5
BS400	305.5	136.5	139.5	NPS16	NPS12	NPS2	NPS4	23.5	24.5	11.0	27.5	31.5
BS500	386.0	140.5	139.5	NPS16	NPS14	NPS2	NPS5	23.5	24.5	11.0	27.5	31.5
BS600	381.0	144.0	154.0	NPS18	NPS16	NPS2.5	NPS5	23.5	25.5	12.0	23.5	29.5
BS800	385.0	161.5	172.0	NPS20	NPS18	NPS2.5	NPS6	23.5	26.5	13.0	20.0	28.5
BS1000	464.5	161.5	174.5	NPS20	NPS18	NPS2.5	NPS6	23.5	26.5	13.0	20.0	28.5

Mode	M	N	O	P	Q	R	S	T	U	V	W	X
BS200	75.0	102.5	27.5	197.0	16.0	7.0	114.0	40.0	I.D2	118.0	74.0	47.0
BS250	75.0	102.5	29.5	236.0	16.0	6.0	138.0	40.0	I.D2	118.0	74.0	47.0
BS300	75.0	102.5	29.5	236.0	16.0	5.5	138.0	39.5	I.D2	134.0	83.5	53.0
BS400	83.0	120.0	29.5	236.0	16.0	3.0	138.0	39.5	I.D3	138.0	88.0	55.0
BS500	83.0	120.0	29.5	315.0	20.0	48.0	177.0	53.0	I.D3	138.0	90.5	55.0
BS600	83.0	120.0	31.5	315.0	20.0	49.0	177.0	53.0	I.D3	146.0	92.5	59.0
BS800	94.5	136.0	33.5	315.0	20.0	48.5	177.0	52.5	I.D3	161.5	102.5	75.0
BS1000	94.5	136.0	33.5	394.0	20.0	47.0	185.0	52.5	I.D3	161.5	102.5	79.0

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

Steam Chiller

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



Control Devices:

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

Controlled Objects:

RP	refrigerant pump
HP	HTG solution pump
LP	LTG solution pump
VP	air vent pump
LQFJ	cooling tower fan
F24	refrigerant motor valve
F26	heating W. thermostatic valve* Δ Δ
F38	heat source motor valve (optional for exhaust type)
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* Δ Δ
T15	heating W. outlet temp. sensor* Δ Δ
T16	LTG temp. sensor
T17	condenser temp. sensor
B1	chilled W. flow switch
B1A	chilled W. flow switch
B2	cooling W. flow switch
B3	chilled W. flow switch
GY	pressure control
YK1	HTG solution level probe
YK2	refrigerant level probe
YK3	non-condensable gas sensor
YK4	auto vent probe
YK5	LTG solution level probe
YK6	absorber solution level probe
V1	A/C W. flowmeter
V2	cooling W. flowmeter (⩾BY75)
V5	condensate flowmeter(optional) Δ
V6	heat source W. flowmeter (optional) Δ Δ Δ
S	conductivity sensor (⩾BY75)
ΔP	differential pressure sensor (optional)

Others:

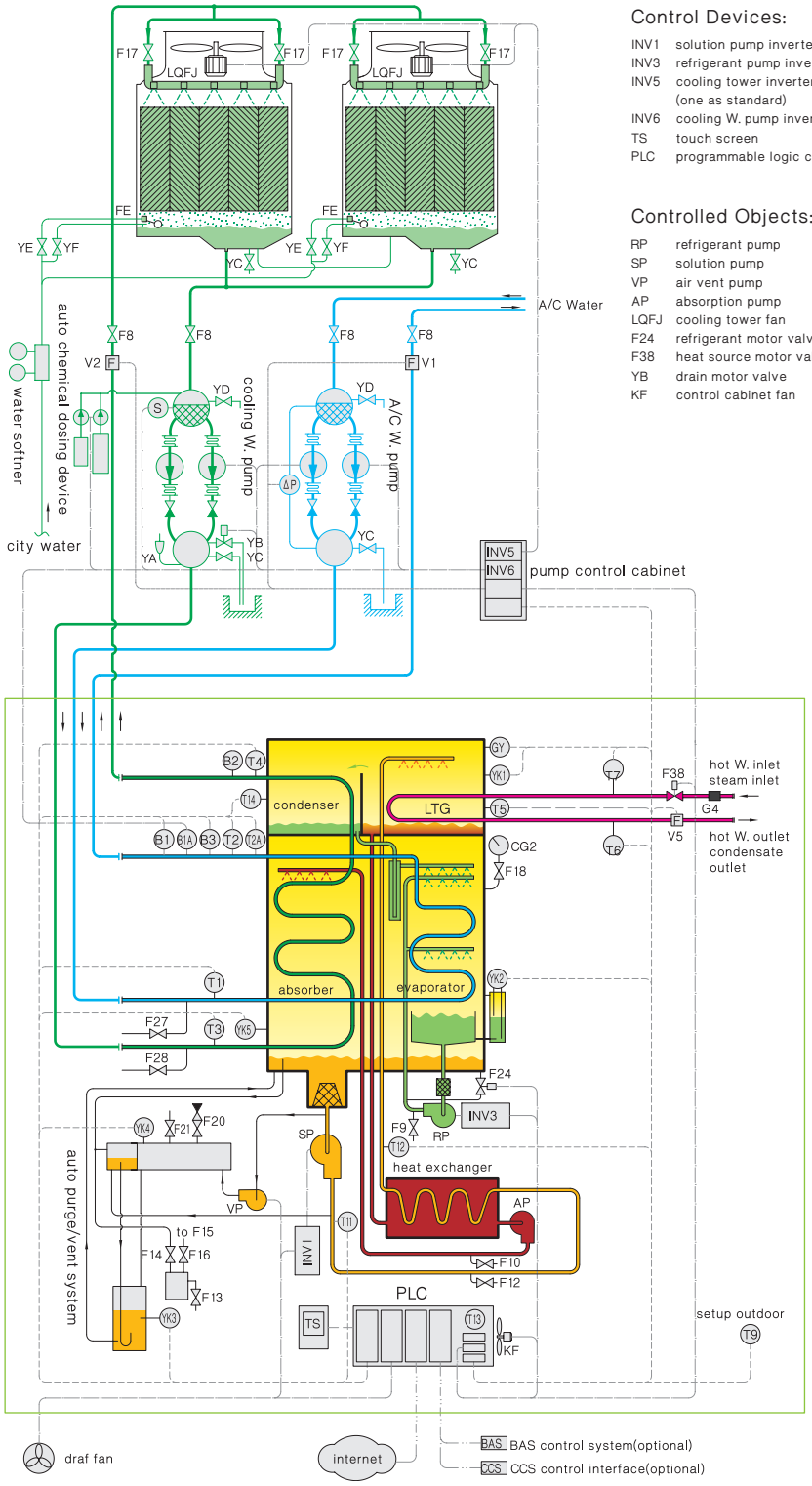
F1	chilled/heating W. switch valve* Δ Δ
F2	A/C W. outlet check valve* Δ Δ
F3	steam angle valve
F4	concentrated solution angle
F5	diluted solution angle valve
F6	HTG concentration regulating valve
F8	water system shutoff valve
F9	refrigerant sampling valve
F10	LTHE sampling valve
F11	HTHE sampling valve
F12	diluted solution sampling valve
F13	main purge valve
F14	direct purge valve
F15	HTG purge valve
F16	sampling purge valve
F17	balance valve
F18	main shell pressure detecting valve
F19	HTG pressure detecting valve
F20	vacuum vent valve & manual valve
F21	nitrogen charging valve
F27	chilled W. drain valve
F28	cooling W. drain valve
F29	heating W. drain valve* Δ Δ
F35	steam trap Δ
F36	condensate by-pass valve Δ
F37	anti-freeze drain valve Δ
YA2	heating W. pressure release valve* Δ Δ
FE	auto water makeup valve
YA	auto air vent
YC	manual drain valve
YD	discharge valve
YE	water makeup valve
YF	manual water makeup valve
CG1	HTG compound gauge
CG2	main shell compound gauge
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 "Δ Δ" for exhaust chiller, "Δ Δ Δ" 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

Single-stage Steam Chiller

(similar for BDS: Single-stage steam chiller, BDH: Single-stage hot W chiller, BDE: Single-stage exhaust chiller)



Control Devices:

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

Controlled Objects:

RP	refrigerant pump
SP	solution pump
VP	air vent pump
AP	absorption pump
LQFJ	cooling tower fan
F24	refrigerant motor valve
F38	heat source motor valve
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	heat exchanger diluted solution inlet temp. sensor
T12	generator crystallization sensor
T13	control cabinet temp. sensor
T14	condenser temp. sensor
B1	chilled W. flow switch
B1A	chilled W. flow switch
B2	cooling W. flow switch
B3	chilled W. flow switch
GY	pressure control
YK1	generator solution level probe
YK2	refrigerant level probe
YK3	non-condensable probe
YK4	auto purge sensor
YK5	absorber solution level probe
V1	A/C W. flow meter
V2	cooling W. flow meter (≥BY75)
V5	condensate flow meter (optional)Δ heat source W. flow meter (optional)ΔΔΔ
S	conductivity sensor (≥BY75)
ΔP	differential pressure sensor (optional)

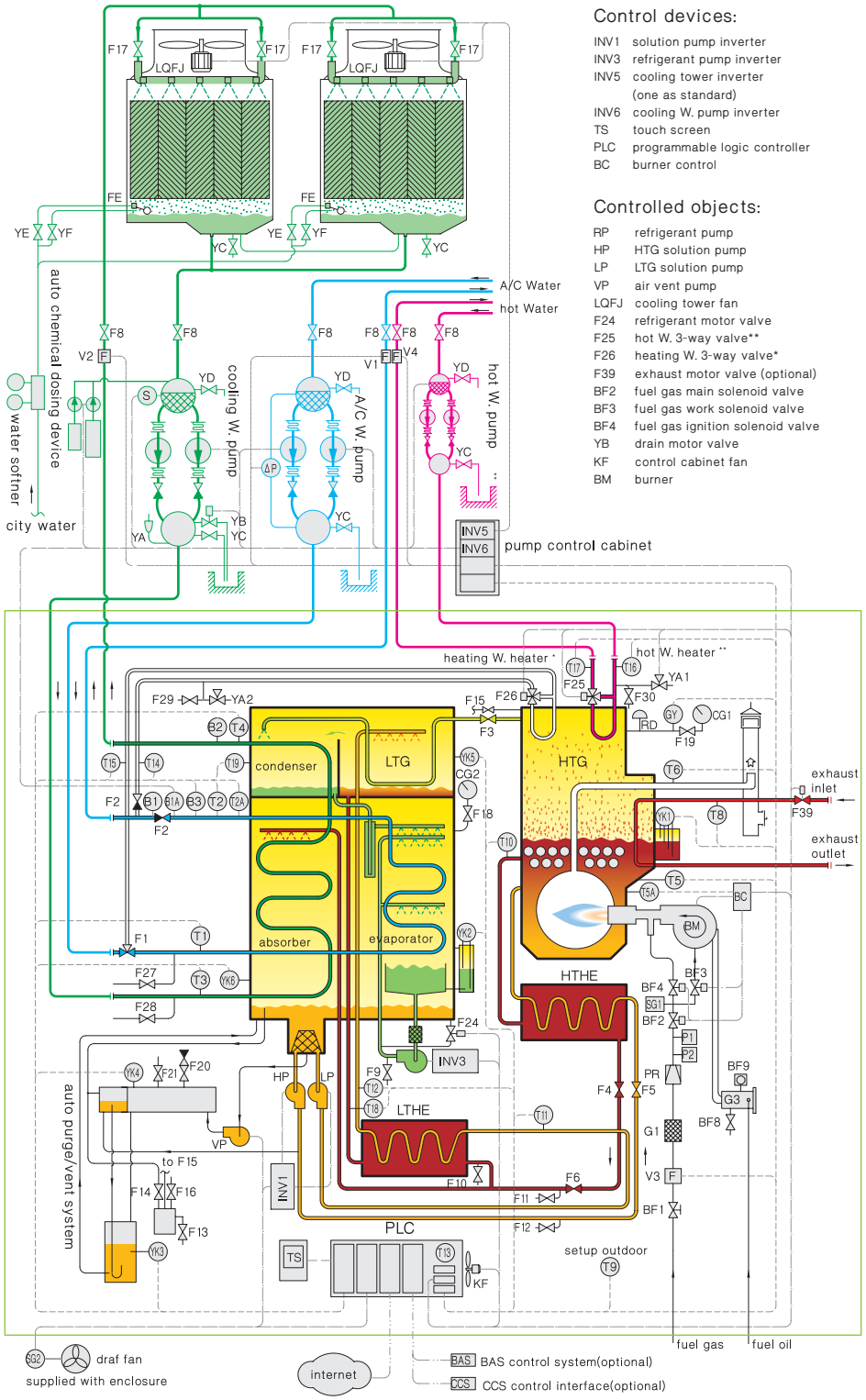
Others:

F8	water system shut-off valve
F9	refrigerant sampling valve
F10	concentrated solution sampling valve
F12	diluted solution samplin valve
F13	main purge valve
F14	direct purge valve
F16	sampling purge valve
F17	balance valve
F18	pressure detecting valve
F20	vacuum vent valve & manual valve
F21	nitrogen charging valve
F27	chilled W. drain valve
F28	cooling W. drain valve
FE	auto water makeup valve
YA	auto vent valve
YC	manual drain valve
YD	discharge valve
YE	water makeup valve
YF	manual water makeup valve
CG2	compound gauge
G4	filter

Notes:

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

Exhaust & Direct-fired Chiller



Control devices:

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

Controlled objects:

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

Sensors:

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

Others:

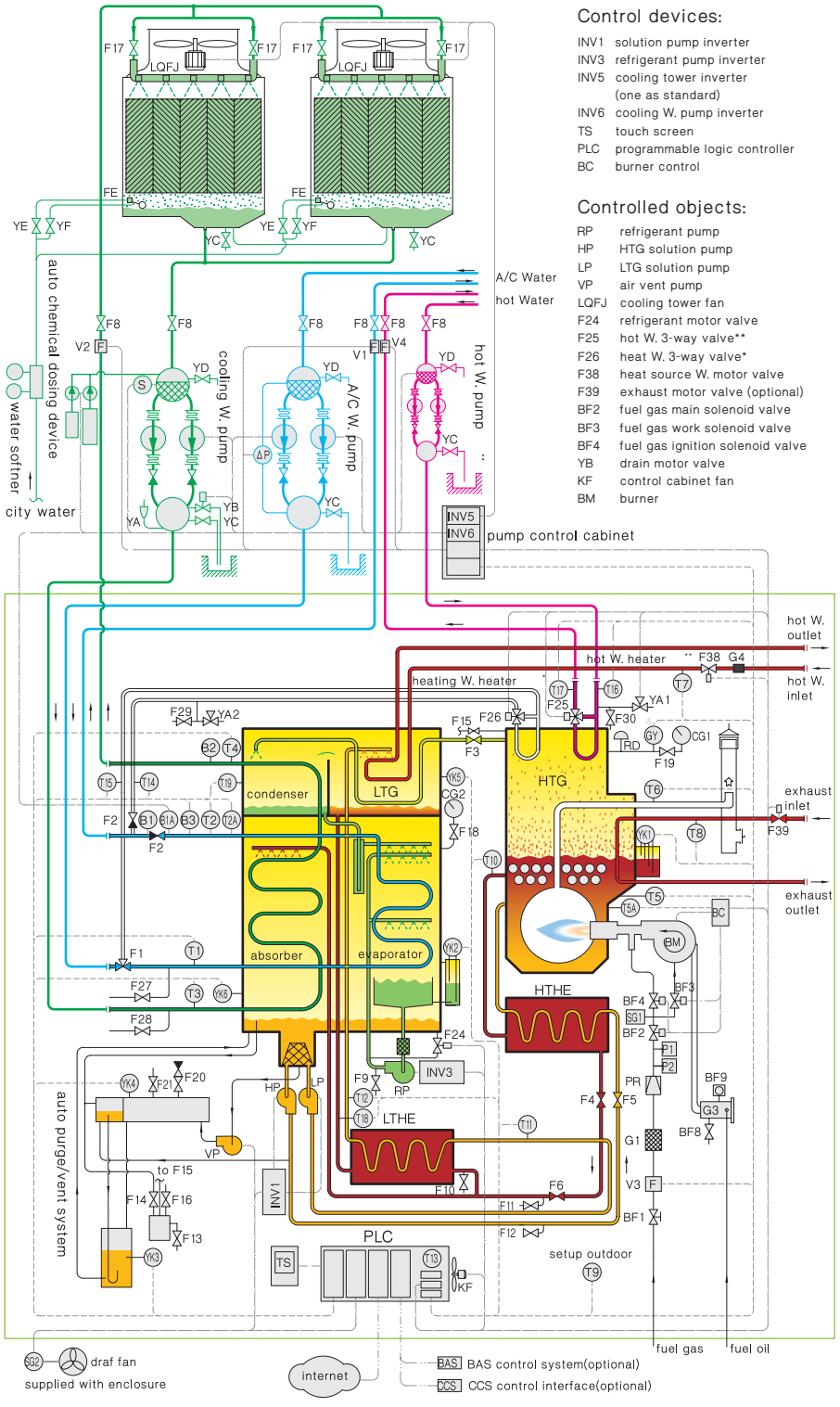
F1	chilled/heating W. switch valve*
F2	chilled/heating W. outlet single valve*
F3	steam angle valve
F4	concentrated solution angle valve
F5	diluted solution angle valve
F6	HTG concentration regulating valve
F8	water system shutoff valve
F9	refrigerant sampling valve
F10	LTHE sampling valve
F11	HTHE sampling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

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

Multi-energy Chiller

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



Control devices:

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

Controlled objects:

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

Sensors:

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

Others:

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

Notes:

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

Scope of Supply/Work

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

Machine Room Construction Tips

Machine room

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

Attention should be paid to machine room built by customers:

・Please refer to dimension drawings for plinth dimensions.

・Load capacity:

a. The machine room foundation load is recommended as 1.5 times of the operation weight.

b. Make sure that the foundation is level without sinking or overload (for rooftop installation).

c. The load of a chiller is evenly distributed on the contact surface between the frame base rolling steel and the plinth.

・Anchor bolts:

a. Chiller can be placed on the foundation directly without bolts (if there is a strong earthquake source or special anti-vibration requirement, please specify in a purchase order).

b. Anchor bolts must be pre-installed for pumpset foundation per dimension drawings.

Foundation

・Ventilation:
poor ventilation leads to high humidity in the machine room, which may erode the unit.
So serious attention should be paid to ventilation in the machine room. Please ventilate 2X machine rooms every hour and make up the combustion air. The volume of combustion air for a DFA is estimated at 14 ft^3 for every MBH fuel.

・Drainage:

a. Chiller foundation must be on a high level in the machine room.

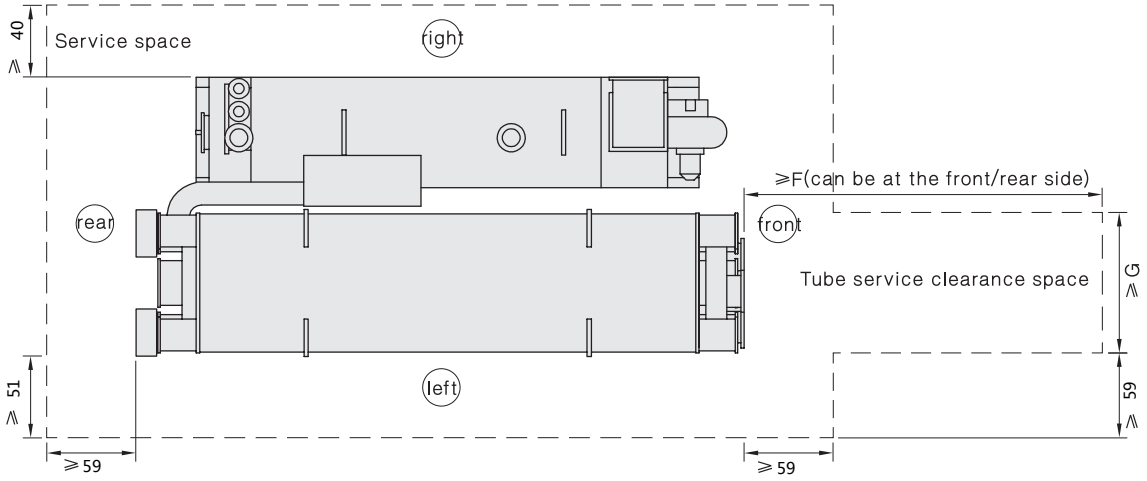
b. All discharge pipes and drain pipes must be visable above the drainage.

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 crack heat exhange 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



Service space Unit: inch

Model	20	50	75	100	125	150	200	250	300	400	500	600	800	1000
F	90.5	126.0	197.0	197.0	236.0	236.0	236.0	275.5	275.5	315.0	315.0	315.0	315.0	394.0
G	25.5	31.5	35.5	43.0	45.0	51.0	67.0	67.0	77.0	83.0	94.5	94.5	102.5	102.5

Remark:

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. It could be the space of water pumps, doors or windows and can also be shared by two chillers.
3. It is recommended that the height of the machine room be 500mm higher than that of chillers.

Piping System

Gas system

- The gas dynamic pressure is 2.3~5psig, and static pressure is <7.3psig, the pressure not in this range can be accommodated by special orders.
- Drain valve should be installed at the lowest part of gas pipes. All connecting pipes must be cleaned and tested for air tightness with 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 metering device to make energy saving management.

Steam system

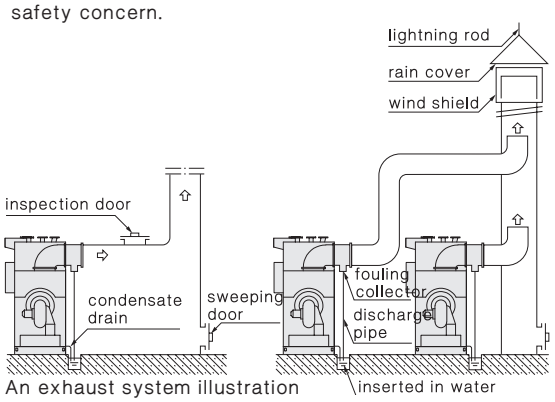
- The supply of the steam should be pressure-stable. The upper limit should not be over 110% of the rated pressure. If the pressure may exceed the upper limit, a regulating valve should be equipped in the pipeline.
- Safety valve should be fixed in the steam inlet pipeline. The protection value is adjusted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

Water system

- The initial filling of the chilled/heating water must be with soft water. The leakage rate should be less than 10% every year, or else large amount of city water makeup will cause water system scaling.
- Minor leakage in chilled/heating water system is made up from the expansion water tank. An open expansion water tank instead of a closed expander is recommended for pressure balance. The water expansion volume is calculated as 4% of total water volume in the system.
- Chiller, pumpset and cooling tower should be in one to one correspondence to achieve better energy efficient.
- Regarding to BROAD non-packaged chiller, the heating water and hot water three-way valve is installed in customer's piping system, and it will be packaged separately and delivery together with chiller.
- Auto dosing system should be in stalled in cooling water pipe or cooling tower. Auto drain valve (motor valve) should be set at the lowest point of cooling water system. (BROAD packaged pumpset included)
- When the distance between cooling tower and machine room is ≤98 ft, the cooling water pipe diameter can follow the dimension drawing. If it's 98-295 ft, the pipe diameter shall be enlarged one size. If it's >295 ft, the pipe diameter shall be enlarged two size.
- In water system, zero resistance filter with section area 8-15 times larger than pipe section area instead of Y-shape filters shall be used to minimize the water resistance.
- Soft connector must be installed at inlet/outlet of chilled/cooling water system. The weight of the external piping system can never be borne by the chiller.
- The installation site of the cooling tower should be far from heat source and power, especially should be at least 240 inch far from the chimney, or the chimney should be 80 inch higher than the top of the cooling tower. Othewise the exhaust may access the cooling tower and cause corrosion to copper tubes of the chiller.
- The cooling tower and cooling water system should be far from pollution source like acid and alkali. If there is a pollution source, information should be delieved when ordering thus special treatment could be applied.
- Piping requirements: all pipes and valves should not go across the space above the chiller to avoid chiller damage caused by pipe installation, maintenance or leakage.
- Secondary heat exchange hot water system is recommended for areas with very hard water.
- Hot W. system for BY20, BY30, BY50 must adopt secondary heat exchange.

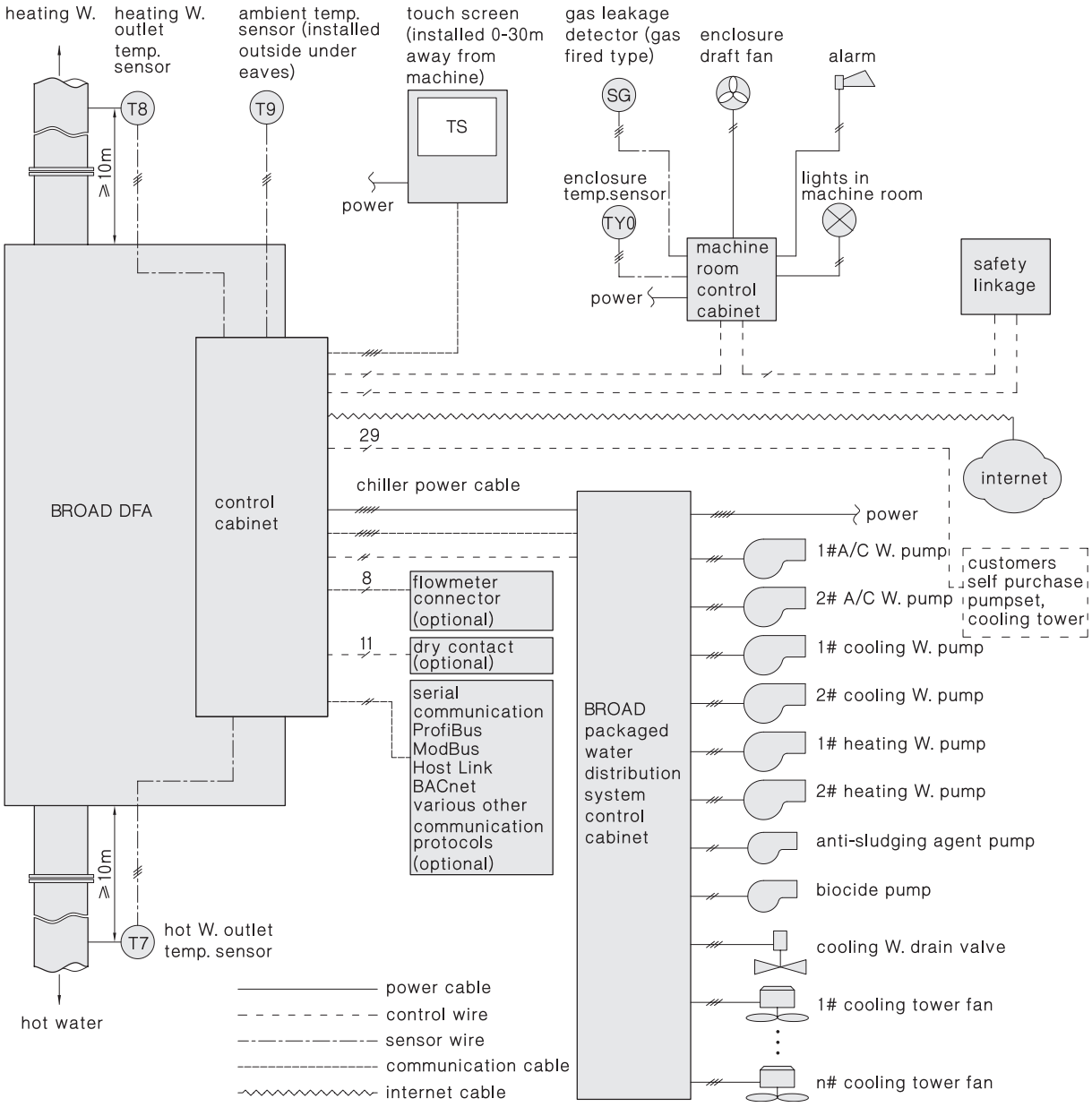
Exhaust system

- It is recommended independent stack be used for each chiller. If chillers have to share a common stack due to space limitation, the shared stack must be inserted type and the main stack must be bigger and higher to avoid any interference from each other. Exhaust motor valve shall be installed for each exhaust duct to avoid condensate corrosion caused by exhaust entering into chillers that are not in operation.
- The exhaust volume is dependent on the fuel heat input. It is estimated at 16.8 ft^3m per KW fuel input. 118-197 inch/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 outlet 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

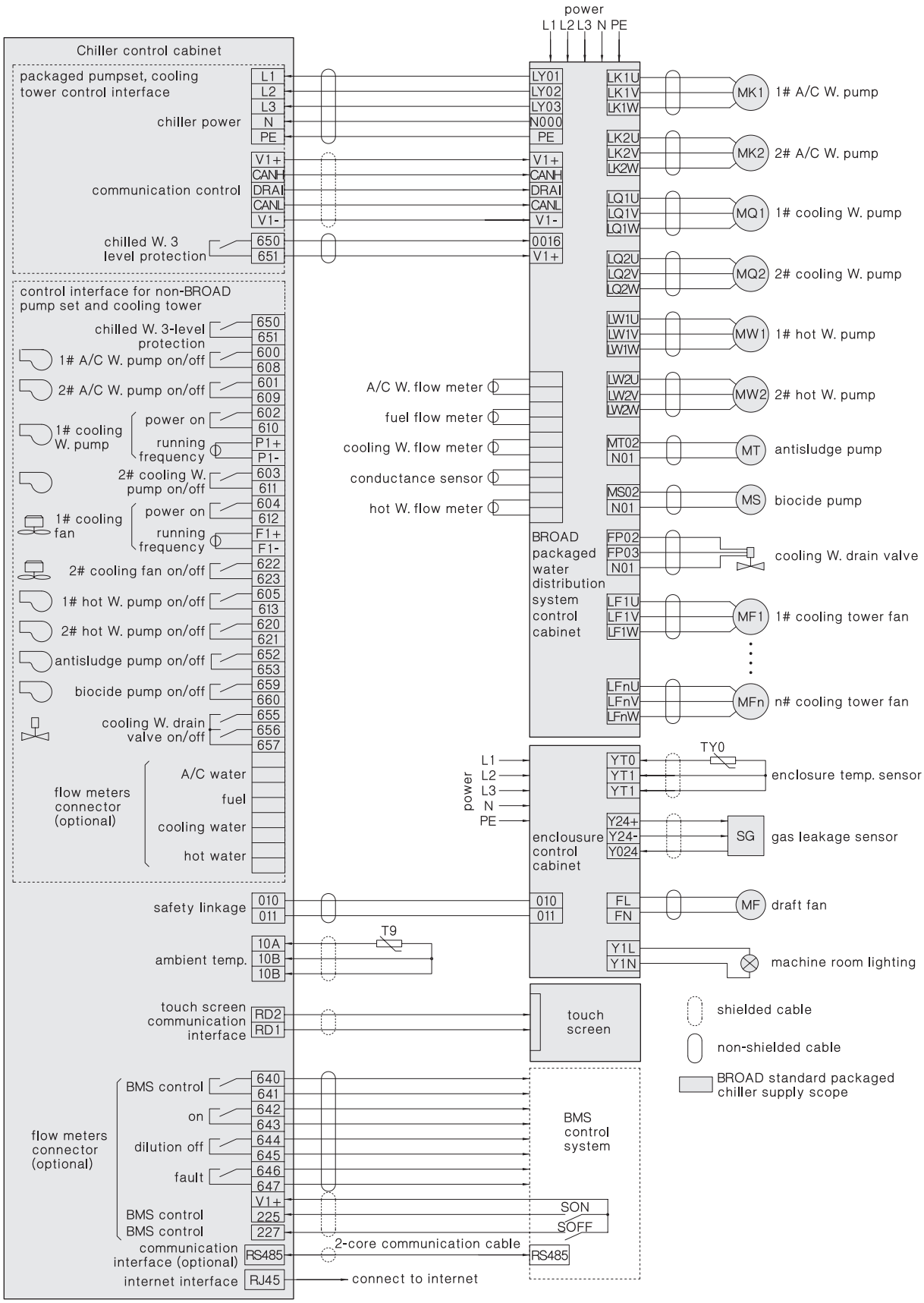
Control System



Notes:

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

Exterior Wiring Diagram



Notes:

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

List of Control System Installation

Item		Installation position and requirement	Material	Source	BROAD scope	Customer scope
Chiller	Chiller and pumpset grounding	Grounding resistance≤4Ω	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	2-core shielded cable (98 ft standard supply)	BROAD	Wiring inside chiller control cabinet	Cable installation
	Network monitoring	Chiller control cabinet	Network cable	Custome	Wiring inside chiller control cabinet	Cable installation, wiring at building side
	BMS interface(optional)	Chiller control cabinet	Communication cable (for serial communication), 11-core cable (for dry contact)	Custome	Wiring inside chiller control cabinet	Cable installation, wiring at building side
	Ambient temperature sensor	Ventilation and avoid direct sunlight	3-core cable (standard cable is 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 10m 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	Custome	Wiring inside chiller control cabinet	Cable & control cabinet installation
	Wiring between chiller and water distribution system control cabinet	Between chiller and water distribution system control cabinet	Cable supply as per packaged chiller	BROAD	Wiring inside chiller control cabinet	Cable installation
	Wiring between pumpset and water distribution system control cabinet	Between water distribution system control cabinet and pumpset	Cable supply as per standard pumpset	BROAD	Wiring inside chiller control cabinet	Cable installation

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

Transportation Tips

Shipping status

- BY20 is to be shipped in one piece, while BY30 BY50 in two pieces.
- BY75-1000 chiller and pumpset are to be shipped separately.
- BY75-400: pumpset and control cabinet are to be shipped in 3 pieces. BY500-1000: pumpset and control cabinet are to be shipped in 3-5 pieces (A/C water pumpset, cooling water pumpset and control cabinet)
- All equipment can be containerized as per "Container Arrangement Reference".
- Chillers ≤ BZ75, BE75, BS100 (Max. width ≤ 83 inch) in single piece.
- Other units will confirm the shipment depends on design drawings, split in 2-4 pieces shipment.
- If limited by site space or machine room access, the unit can also be split (or split with steel frame) 2~6 pieces shipment.
- When the unit reaches the machine room, the split pieces need to be connected by BROAD welders. The customer needs to prepare welding facilities, nitrogen and other necessary assistance.
- Solution is charged into the chiller when a unit is shipped in one piece, and packed separately for split shipment or for single-piece shipment with unit shipping weight over 70 klbs.
- BROAD can arrange transportation and insurance on behalf of customers. If customers manage it by themselves, please refer to "BROAD Chiller Packing & Transportation Regulations" for container arrangement in advance, so as to make sure safety transportation.

Container arrangement reference:

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

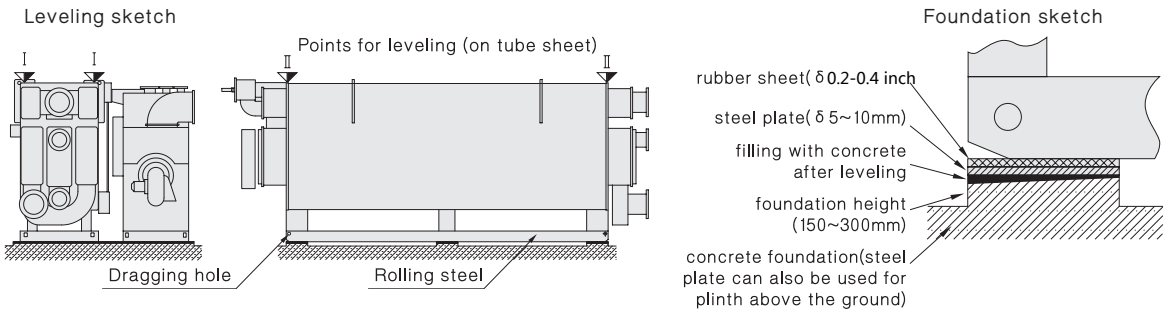
Notes:

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

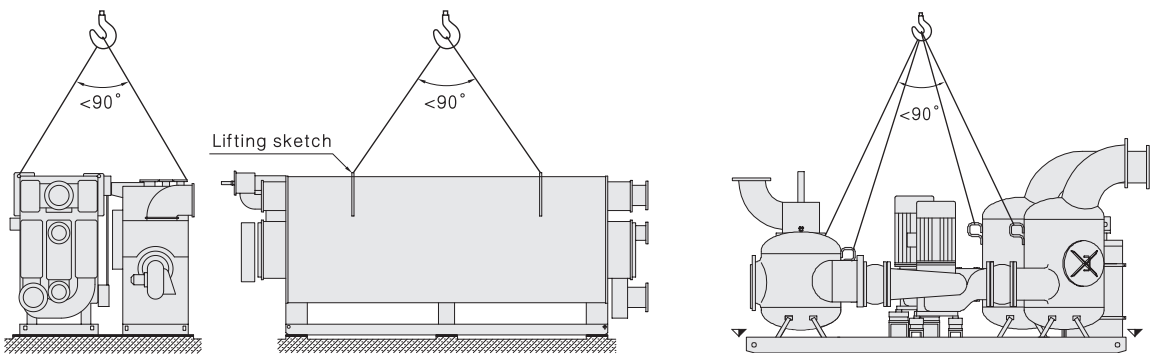
Lifting & Leveling Tips

- Before the chiller is positioned, concrete foundation plinths must be molded and leveled. The level degree is <1.5‰, height of foundation is 6-12 inch. When machine room height allows, the higher, the better for maintenance. Then locate the chiller without bolts. (If there is strong vibration source or a special anti-vibration requirement, it should be stated before placing order). The pumpset shall be fixed by anchor bolts. The foundation must be level and solid to make sure no sink or overload (when the unit is installed on the top of roof).
- Lifting must be done by qualified lifting companies that are properly insured.
- The crane must be supported by 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 0.8 inch above the carriage or the ground, it should be kept for a little while. Lift the chiller slowly if everything is OK.
- If limited by loading height, loading angle or machine room access, the professional lifting company must make special plan with BROAD team together to avoid any risks.
- The landing of the chiller must be with care. Crash landing is strictly forbidden! As the unit is a vacuum device, any impact on the chiller is strictly forbidden!
- When moving the chiller, only round steels or thick steel tubes can be used as rollers instead of wooden sticks. Only drag the dragging hole on the rolling steel do not place forces on other part of the chiller. Lift the unit first with jacks under the rolling steel before rigging. Both sides of HTG and main shell must be lifted simultaneously.
- For multiple chillers of split shipment, please make sure the original matching between HTG and the main shell. Please locate the chiller according to chiller joint drawing and make sure the joint gap is less than 0.06 inch.
- After chiller positioning, please adjust leveling and lay thin steel plate where it is uneven to guarantee compact contact between the chiller and base. Take tube sheet as the leveling point and make front/rear and left/right leveling (check level height of every part by acrylic tube). It should be leveled within 0.8/1000 both lengthwise and sidewise. Leveling must be done within 2 hours after locating the chiller, otherwise the chiller base will be damaged.
- The chiller must be located levelly and its steel frame bases must match the plinth, the weight of the chiller must be evenly balanced on the plinth. Otherwise, the chiller may be twisted slowly, which will finally result in damage due to leakage.
- The chiller should be protected by full time personnel during transportation & installation. No access for unauthorized persons. Valves of the chiller are forbidden to be screwed. If the machine room is still under construction, preauctions are essential to avoid chiller get damaged or dirty. No scraping the paint or insulation layer.

Sketch of leveling and foundation



Lifting sketch



Energy saving comparison

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

Examples on power consumption comparison

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

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

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

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

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

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

Notes:

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

Why electricity saving ?

· Saving from design:

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

· Saving from operation:

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

Comprehensive Comparison

Mode	BROAD Non-electric Chillers	Other Non-electric Chillers	Electric Chillers
Investment	Low · Chiller price is high but water distribution system invests is low. (design+equipment+installation+commissioning+machine room) · Small footprint · Smaller equipment selection. (Refer to P6)	High · Chillers are less expensive but customers' self-purchased water distribution system costs high · Need separate hot water system. · Prevalently oversized equipment selection	Higher · Electricity demand is 8-10 times more than that of non-electric chillers · Need boiler (boiler room) for heating · High investment on water distribution system. · Prevalently oversized equipment selection
Function	Three functions in one unit Provide cooling, heating and hot water simultaneously or dedicatedly, and automatically adjust all temperatures	Two functions in one unit	Only one function heat pump has two functions, but its heating capacity is reduced dramatically or even lost when the ambient temperature is low
Energy Efficiency	Energy saving is visible · Ultrasonic flow meters are installed on all pipes (fuel, chilled/heating water, cooling water, hot water) to reflect the energy efficiency directly or indirectly · The touch screen real time displays (and records) cooling capacity and energy efficiency · Dozens of energy saving patents assure initial and long-term energy efficiency, such as auto purge and air vent (without a vacuum pump n the life span), plate heat exchanger,upward spraying, refrigerant anti-overflow, turbulator in fir tubes, etc. · Cooling water system is equipped with water softner and biocide & antisludge auto dosing device to eliminate energy waste and cooling capacity decrease caused by fouling · Conduct yearly energy consumption investigation and diagnosis to each user · BROAD chillers are proven that at least 50% more energy saving per our energy investigation to thousands of users	Energy consumption is not transparent · No flow meters. · No energy efficiency display · No auto air vent device so energy efficiency drops periodically.	Not energy-saving · Energy mode not energy-saving. · No flow meters · No energy efficiency · Tear & wear of moving parts causing energy efficiency decrease
Reliability	Pursuing "zero fault" · The annual "tube freezing" rate in evaporator is as low as 0.05%, as it is equipped with 3-level temperature sensors, 3-level flow switches and ultrasonic flow meters* · "Separate heating" reduces number of parts involved in heating by 80%+, and doubles the lifespan of the main shell · "Auto purge/ vent" prevents metals from corrosion and makes sure no cooling capacity decrease · Water distribution system is factory made so that industrialization of central air conditioning is materialized. All aspects from designing to component qualitycontrol, production, testing, site commissioning and maintenance are integrated into a uniform quality control system · All materials and components are outsourced from world' s top manufacturers (quality comes first at any time) · BROAD offer free global network monitoring service to customers during chiller's whole lifespan · Design lifespan of BROAD non-electric chiller is 30 years	Numerous faults · Annual "tube freezing"rate exceeds 5% · Main shell heating brings many faults and short life design · No auto air vent device causes periodical cooling capacity and energy efficiency decrease · Water distribution system is designed individually, purchased separately and installed by non-professionals with quality risks · Since it does not include cooling water auto treatment device, the copper tubes that get scaled · must be cleaned by acid, which will easily cause attenuation or even puncture of the copper tubes	Many faults · Number of moving parts is several times more than that of non- electric chillers, and they are easy to be damaged · Water distribution system is designed individually, purchased separately and installed by non-professionals with great quality risks · Since it does not include cooling water auto treatment device, the copper tubes that easily get scaled must be cleaned by acids, which will easily cause attenuation or even puncture of the copper tubes
Safety	Risk free · The world' s only non-electric chiller with complete American and European safety certificates · High temperature generator is equipped with 8-level mechanical and electronic anti-explosion devices to ensure explosion free (even in case of sabotage) · Cooling water system is with auto biocide device to eliminate legionnaires'disease	Risky · Not completely certified · No comprehensive anti-explosion measures · No biocide dosing	Risky · Explosion risks for compessors · Working under positive pressure condition
Uncertain	Customers are worry-free & carefree · A single purchase order to solve all ordering,installation and operation problems · Automatic operation of the equipment and system makes full-time operator unnecessary · Provide life-long maintenance & repair, or even operation management service (energy management contract). Life-long quality commitment	Customers are not carefree · Purchase and installation of water distribution system are troublesome · The whole system is a combination of products from many manufacturers, make it impossible to actualize automation · Poor after-sale service	Customers are not carefree · Purchase and installation of water distribution system are troublesome · The whole system is a combination of products from many manufacturers, making it impoissble to actualize automation · Poor after-sale service

Note: ultrasonic flow meters is optional.

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

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