

BROAD X NON-ELECTRIC CHILLER

MODEL SELECTION & DESIGN MANUAL



ENERGY CONSERVATION IS
PRIORITY OF EACC



■ Function

Cooling, heating, hot water (dedicatedly or simultaneously)

■ Application

- Provide chilled/heating water for large-scale buildings
- Produce chilled water over 5°C and heating water below 95°C

■ Cooling capacity

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

■ Energy sources

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

■ Super energy-saving

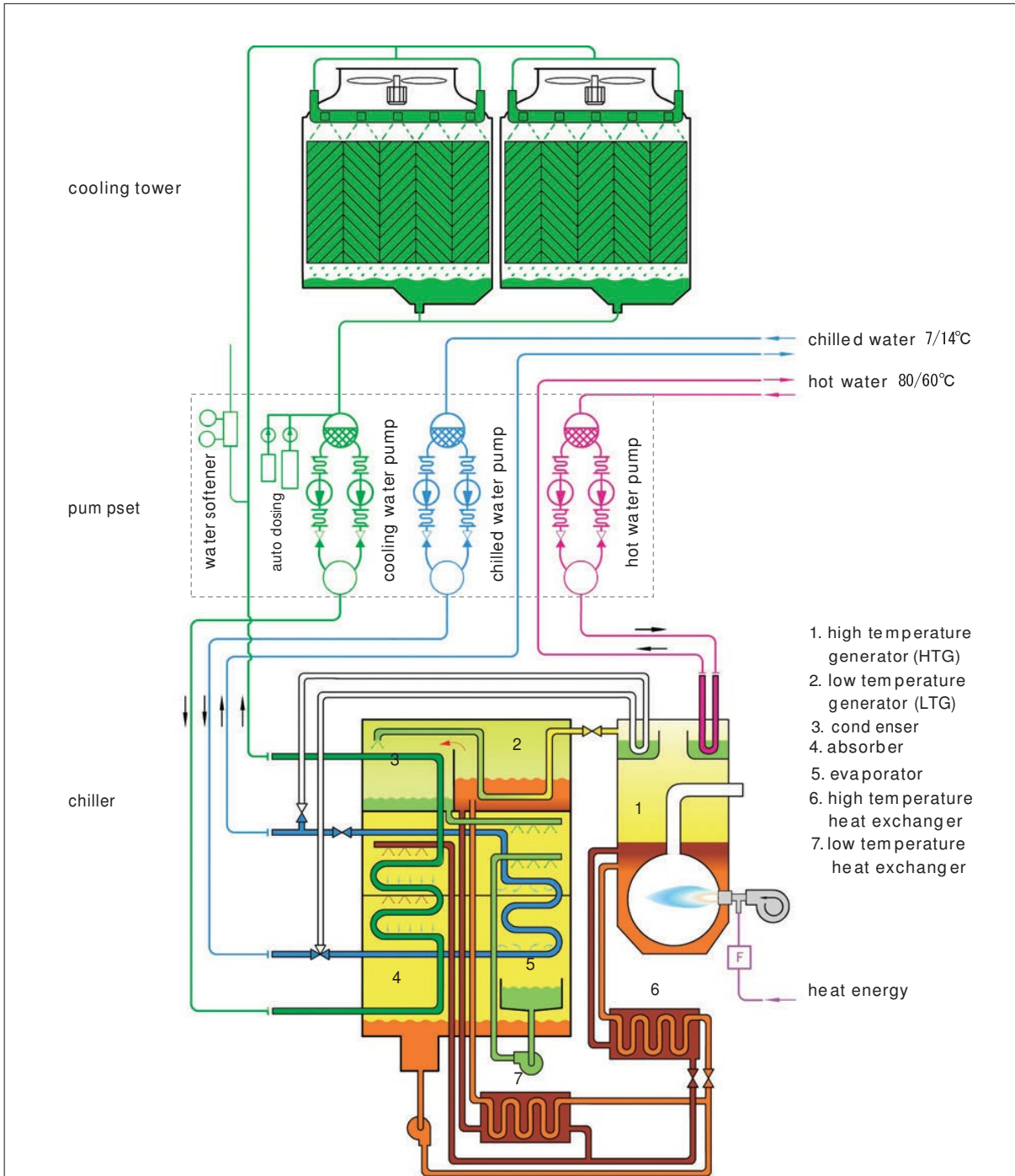
- Compared with conventional electric air conditioning, the energy efficiency of BROAD non-electric air conditioning is 2 times higher, while their CO₂ emissions are 4 times lower.
- Compared with conventional water distribution systems, BROAD packaged pumpset system reduces the rated power demand by 40-60%, and the operating electricity consumption by 60-75%.

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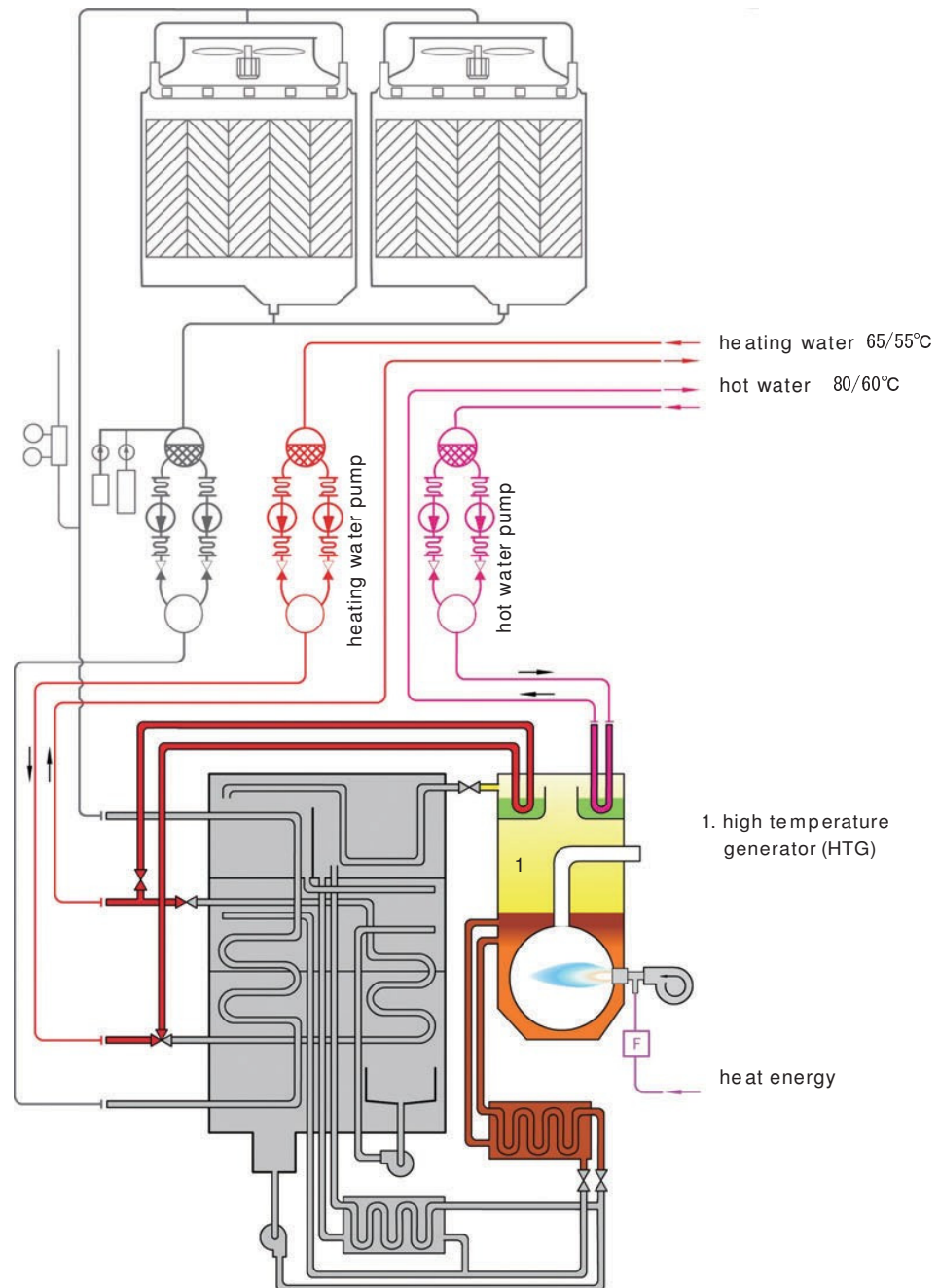
Non-electric Chiller (chiller+pumpset)

The Absorption Principle



The cooling principle

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



The heating principle

The input heat energy heats the LiBr solution. The vapor produced by the solution heats the heating water or hot water in tubes, while condensate returns to the solution to be heated and the cycle repeats.

As "separate heating" is adopted, the heating cycle becomes very simple, just like a vacuum boiler. Therefore, the life span of the chiller can be doubled.

A separate heat exchanger can provide dedicated hot water while cooling or heating operation is stopped.

So, only BROAD has the unique technology in the world that can realize "three functions in one unit".

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

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

Model	BYZ	20	50	75	100	125	150	200	250	300	400	500	600	800	1000	
chiller	cooling capacity	kW	233	582	872	1163	1454	1745	2326	2908	3489	4652	5815	6978	9304	11630
		Rt	66	165	248	331	413	496	661	827	992	1323	1653	1984	2646	3307
	heating capacity	kW	179	449	672	897	1121	1349	1791	2245	2687	3582	4489	5385	7176	8967
	hot water capacity	kW	80	200	300	400	500	600	800	1000	1200	1600	/	/	/	/
	chilled water															
	flow rate	m ³ /h	28.6	71.4	107	143	179	214	286	357	429	571	714	857	1143	1429
	pressure drop	kPa	30	30	30	30	30	40	40	50	50	50	60	60	60	60
	cooling water															
	flow rate	m ³ /h	48	120	180	240	300	360	481	601	722	962	1203	1443	1924	2405
	pressure drop	kPa	50	50	50	50	50	50	50	60	60	60	70	70	70	70
	heating water															
	flow rate	m ³ /h	15.3	38.5	57.9	77.1	96.4	116	154	193	231	308	386	463	617	771
	pressure drop	kPa	20	20	20	20	20	20	30	30	40	40	50	50	60	60
	hot water															
	flow rate	m ³ /h	3.4	8.6	12.9	17.2	21.5	25.8	34.4	43.0	51.6	68.8	/	/	/	/
	pressure drop	kPa	20	20	20	20	20	20	30	30	40	40	/	/	/	/
	natural gas consumption															
	cooling	m ³ /h	17.1	42.7	64.1	85.5	107	128	171	214	257	342	427	513	684	855
	heating	m ³ /h	19.3	48.3	72.2	96.5	121	145	193	241	289	385	483	579	772	964
	hot water	m ³ /h	8.8	22	33	44	55	66	88	110	132	176	/	/	/	/
power demand	kW	2.5	5.8	6.1	9.8	9.8	11.6	16.7	16.7	21.7	25.2	31.9	40.7	49.9	63.3	
solution wt.	t	1.1	2.6	3.2	3.9	4.9	5.6	8	9	11.7	13.5	17	21.6	28.7	34.7	
unit ship. wt.	t	5	10	12	14	17	19	26	31	/	/	/	/	/	/	
main shell ship. wt.	t	2.5	4.5	5	6.5	7.5	8.5	11	13	15	20	24	28	29	30	
operation wt.	t	5.3	10.6	13	16	19	22	29	35	42	50	63	76	89	107	
pumpset	Chilled water pump															
	external head	mH ₂ O	19	19	20	20	22	22	22	22	22	26	26	26	26	
	power demand	kW	4	7.5	15	15	22	30	37	44	60	60	110	110	150	180
	cooling water pump															
	external head	mH ₂ O	10	10	10	10	10	10	10	10	10	10	10	10	10	
	power demand	kW	3	7.5	15	15	22	22	37	44	44	60	90	110	150	180
	hot water pump															
	external head	mH ₂ O	7	7	12	12	12	12	12	12	12	/	/	/	/	
	power demand	kW	0.4	0.6	2.2	3	3	4.4	4.4	4.4	6	6	/	/	/	/
	total power demand	kW	7.4	15.6	32.2	33	47	56.4	78.4	92.4	110	126	200	220	300	360
operation wt.	t	0.6	0.9	3.8	3.8	4.2	4.3	7.1	7.4	8.1	9.7	5.9/8.6	6.1/8.6	6.1/9.8	9.6/9.8	
cooling tower	power demand	kW	5.5	11	/	/	/	/	/	/	/	/	/	/	/	
	operation wt.	t	2.5	5.1	/	/	/	/	/	/	/	/	/	/	/	
Enclosure	ventilation power demand	kW	0.3	0.3	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0	3.0	3.0	3.0	
	weight	t	0.5	0.8	3.4	3.4	3.9	3.9	5.2	5.6	6.3	6.8	11.0	11.5	14.5	15.5
Electricity and water consumption	total power demand	kW	15.7	32.7	39.3	44.3	58.3	69.5	96.6	111.1	133.7	153.2	233.9	263.7	352.9	426.3
	water consumption (cooling)	t/h	0.6	1.5	2	3	3.8	4.5	6	7.5	9	12	15	18	24	30

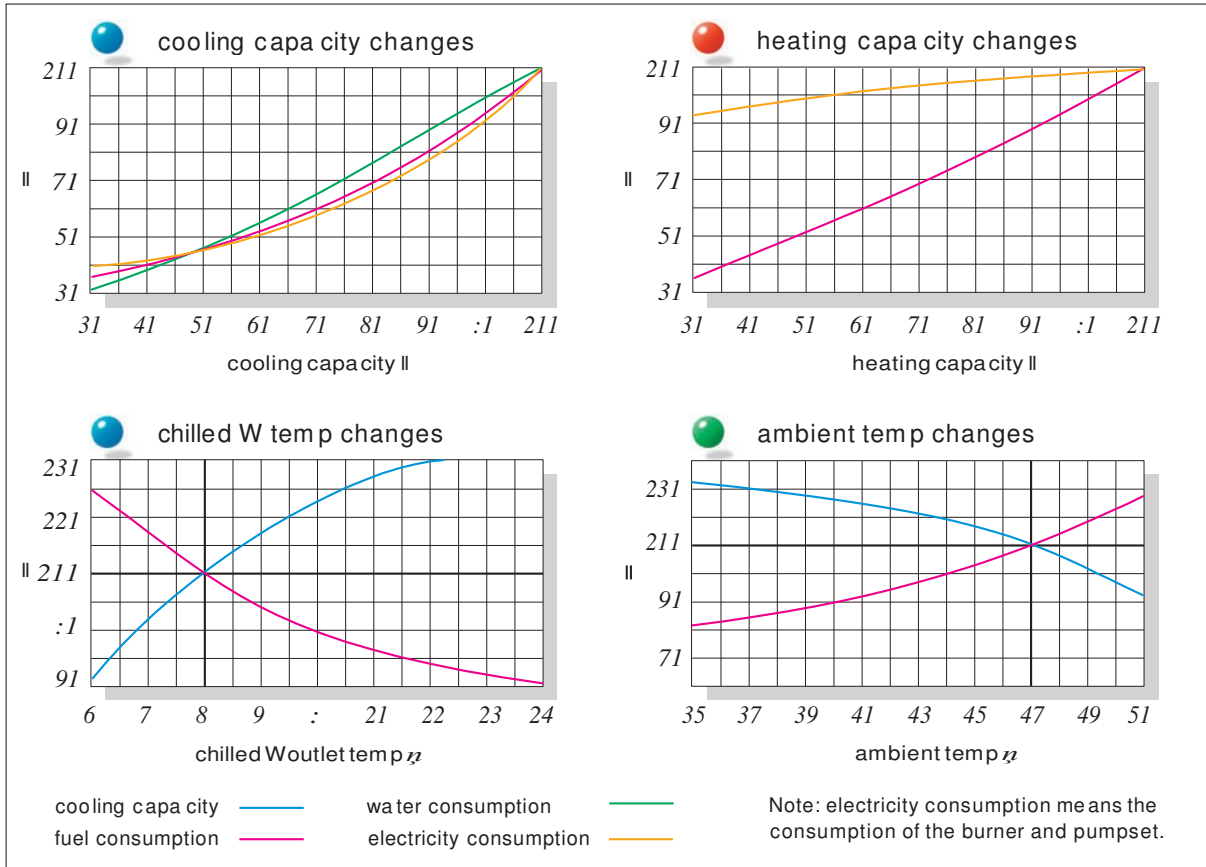
HTG(high temp generator)Enlarged Model Performance Data

Model	Enlarged Models	Heating capacity	NG Consumption
BZ		kW	m ³ /h
20	H ₁	215	23.2
	H ₂	251	27.1
	H ₃	287	31.0
	H ₄	323	34.9
50	H ₁	538	58.2
	H ₂	628	67.9
	H ₃	717	77.6
	H ₄	807	87
75	H ₁	807	87
	H ₂	942	101
	H ₃	1076	116
	H ₄	1211	130
100	H ₁	1076	116
	H ₂	1255	136
	H ₃	1435	155
	H ₄	1614	175
125	H ₁	1345	145
	H ₂	1569	170
	H ₃	1793	194
	H ₄	2018	218
150	H ₁	1614	175
	H ₂	1883	204
	H ₃	2152	233
	H ₄	2421	263
200	H ₁	2152	233
	H ₂	2511	271
	H ₃	2869	310
	H ₄	3228	349
250	H ₁	2690	291
	H ₂	3138	340
	H ₃	3587	388
	H ₄	4035	437
300	H ₁	3228	348
	H ₂	3766	407
	H ₃	4304	465
	H ₄	4842	522
400	H ₁	4304	465
	H ₂	5021	542
	H ₃	5739	619
500	H ₁	5380	582
	H ₂	6277	679

General Conditions:

1. Rated chilled W outlet/inlet temp: 7°C/14°C
 2. Rated cooling W outlet/inlet temp: 37°C/30°C
 3. Rated heating W outlet/inlet temp: 65°C/55°C
 4. Rated hot W outlet/inlet temp: 80°C/60°C
 5. Lowest permitted outlet temperature for chilled water: 5°C
 6. Highest permitted outlet temperature for heating/hot water: 95°C
 7. Lowest permitted inlet temperature for cooling water: 10°C
 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: 0.8MPa (except special order)
 10. Adjustable load: 5%~115%
 11. Fouling factor for chilled W, cooling W, heating W, hot W: 0.086m²·K/kW
 12. Natural gas consumption is calculated:
10kWh/m³ (8600kcal/m³)
 13. Standard natural gas pressure is 16~50kPa (1600~5000mmH₂O), lower or higher pressure can be accommodated to special orders
 14. LiBrSolution concentration: 52%. Solution weight is included in unit shipment weight.
 15. Rated exhaust temp for cooling: 160°C
Rated exhaust temp for heating: 145°C
 16. Machine room ambient temperature: 5~43°C, humidity ≤ 85%
 17. Standard climate conditions for cooling operation: temp 36°C, relative humidity 50% (wet bulb 27°C)
 18. Heating capacity and hot water capacity refer to the capacity in separate operation, which is adjustable within this range
 19. Power demand of cooling, heating, hot W is under rated working condition.
 20. Rated cooling COP: 1.36
Rated heating COP: 0.93
 21. Heating capacity increases by 20% for each stage of HTG enlargement. No change with pumpset and metal enclosure specs.
 22. Life design: 25 years
- Notes: Technical specification is based upon Japanese Industry Standard JIS B 8622 "Absorption Chiller" or based upon ARI 560 standard "Absorption Water Chilling And Water Heating Packages"

Packaged DFA Performance Curves



COP

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

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

Environmental Protection Features

Operating Noise dB(A)

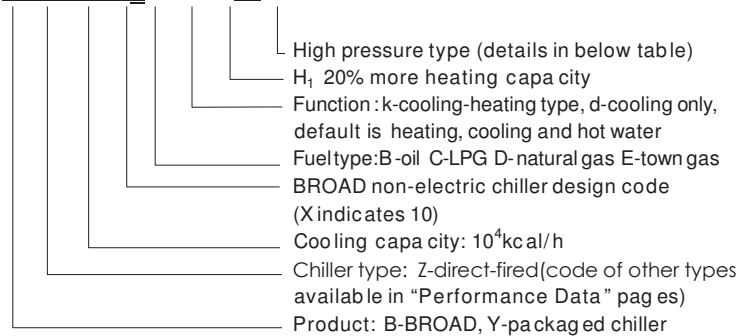
Model BYZ	20~50	75~200	≥250
DFA	≤57	≤58	≤60
pumpset	≤57	≤57	≤59
cooling tower	≤62	/	/
outside enclosure	≤40	≤41	≤42

Emissions:

CO/CO₂≤0.02% NO_x≤46ppm (O₂=5%)

Nomenclature

BY Z 100 X D - k - H₁ - Fa



Codes for high pressure type:

pressure limit	chilled water code	cooling water code
0.81~1.2MPa	Fa	Ma
1.21~1.6MPa	Fb	Mb
1.61~2.0MPa	Fc	Mc
2.01~2.4MPa	Fd	Md