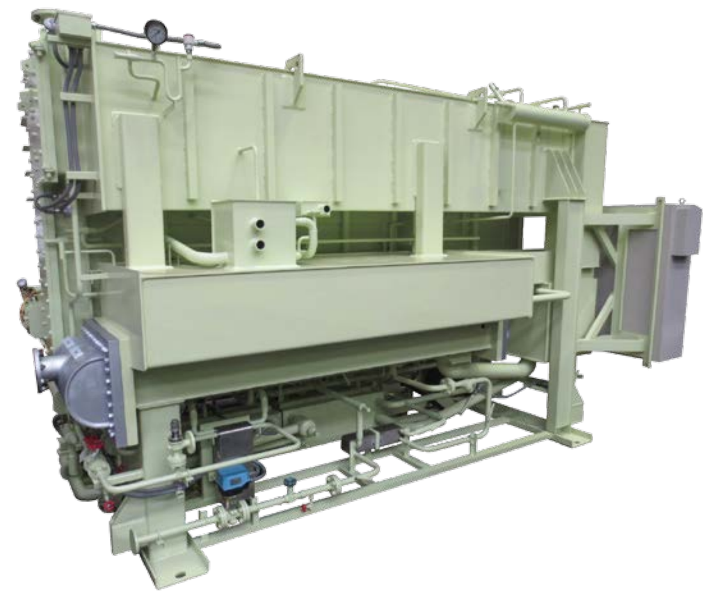
YORK®

INSTALL CONFIDENCE

YORK® YHAP-C ABSORPTION HEAT PUMPS

Johnson Controls



YORK® YHAP-C Absorption Heat Pumps

ACHIEVES HIGHEST ENERGY AND WATER SAVINGS WHILE HELPING REDUCE CO_2 EMISSIONS.

The YORK® YHAP-C absorption heat pump saves energy by transferring heat (energy) from waste heat sources to increase the temperature of supplied hot water. The additional heat (energy) required by a heat pump system is far less than needed by a boiler.

YHAP-C absorption heat pumps are ideal for district heating and industrial process heating applications, because they take advantage of waste heat energy found in industrial facilities and deliver high-temperature hot water.

Maximizing performance by design

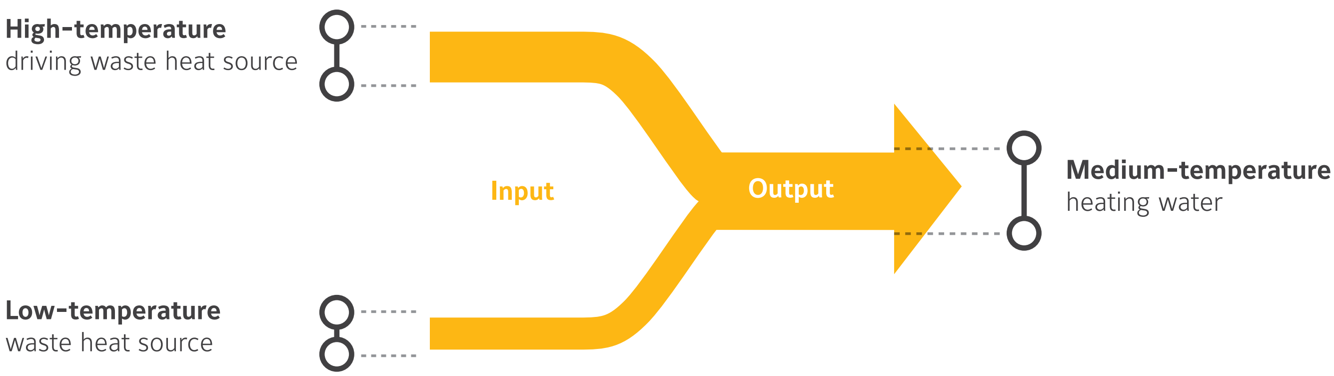
Driving heat sources: YORK® absorption heat pumps use a variety of driving heat sources, such as jacket water from a gas engine, low to high pressure steam, direct fired or even exhaust gas. As a result, the unit helps reduce primary energy consumption, water and carbon dioxide emissions. The YHAP-C design is also more efficient and reliable than conventional designs, because it employs innovative, 2-step evaporation and absorption technology.

To meet the needs of different heating applications, two types of YHAP-C absorption heat pumps are available:

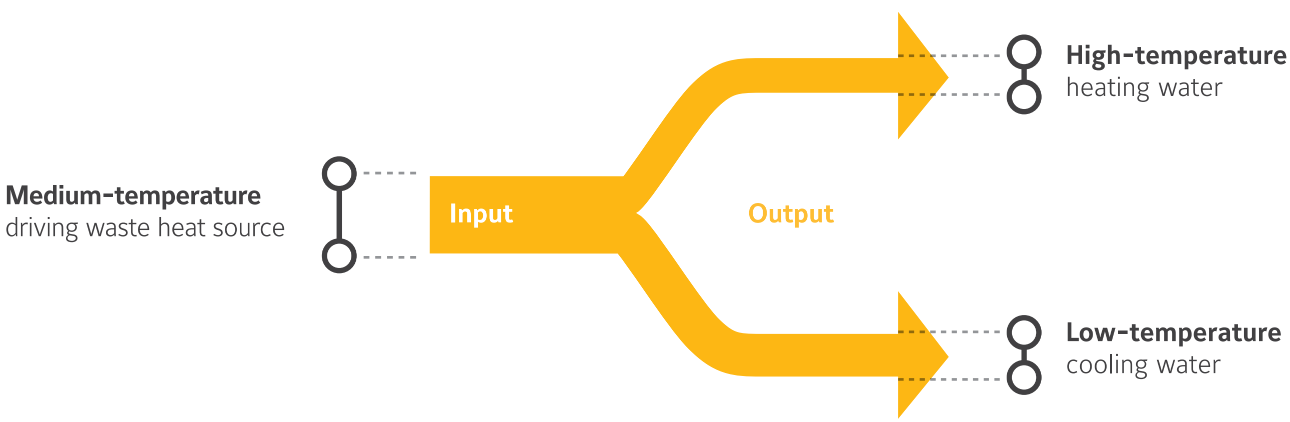
- **Type I** heat pump, also referred to as a heat amplifier, is driven by a high-temperature driving heat source in the generator section.
- **Type II** heat pump, also referred to as the heat transformer, is driven by a medium-temperature driving heat source in the generator and evaporator sections.

Two Types of YHAP-C Heat Pumps

Type I: Driven by high-temperature driving heat source in generator



Type II: Driven by medium-temperature driving heat source in generator and evaporator

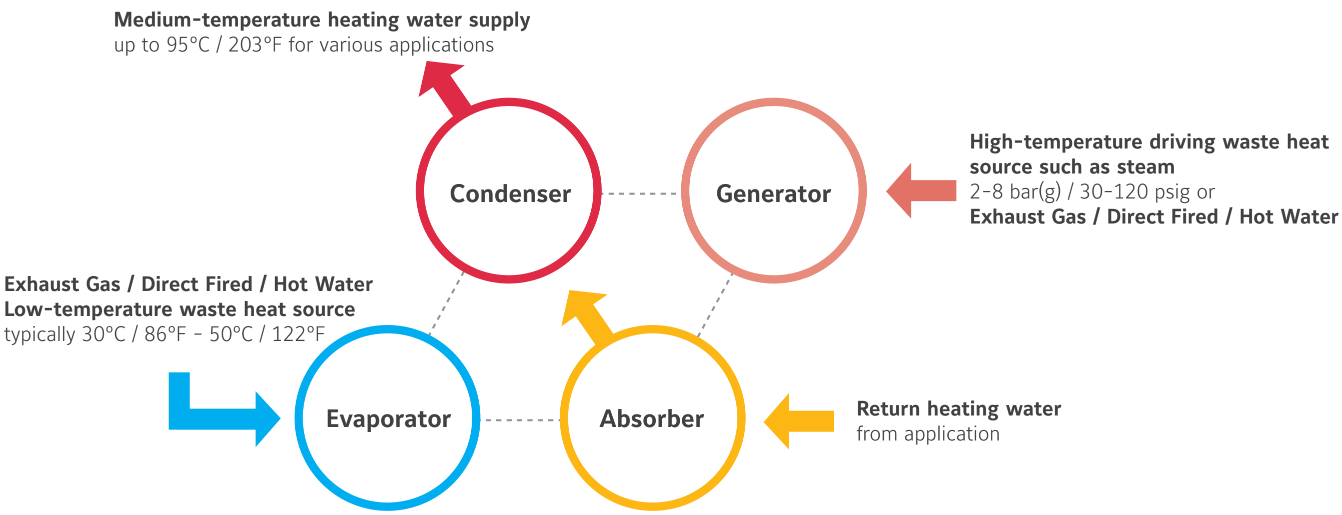


Type I

Flexible Operating Envelope

The Type I heat pump, also referred to as a heat amplifier, is driven by a high-temperature waste heat source in the generator section. The low-temperature waste heat source is fed into the evaporator section. With these two heat sources, the Type I heat pump amplifies and provides useful medium temperature heat from the absorber and condenser section.

How it Works

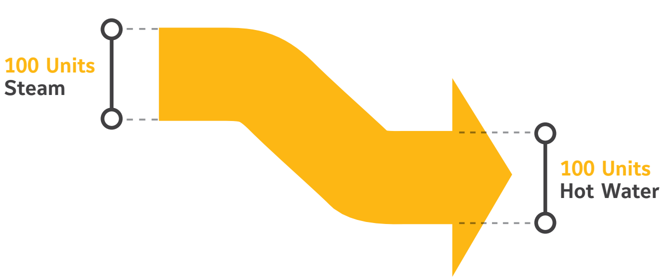


Heat Balance

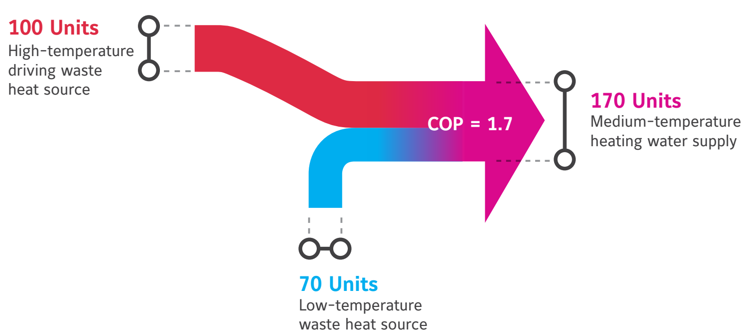
Compared to the typical steam boiler's 0.93 Coefficient of Performance (COP), the Type I unit provides a COP as high as 1.7*, delivering up to 95°C (203°F) hot water for various heating applications. This unit also provides a good turndown over a range of heating loads.

Performance of Boiler Compared to Absorption Heat Pump

Steam from Boiler



Absorption Heat Pump (Single Effect)



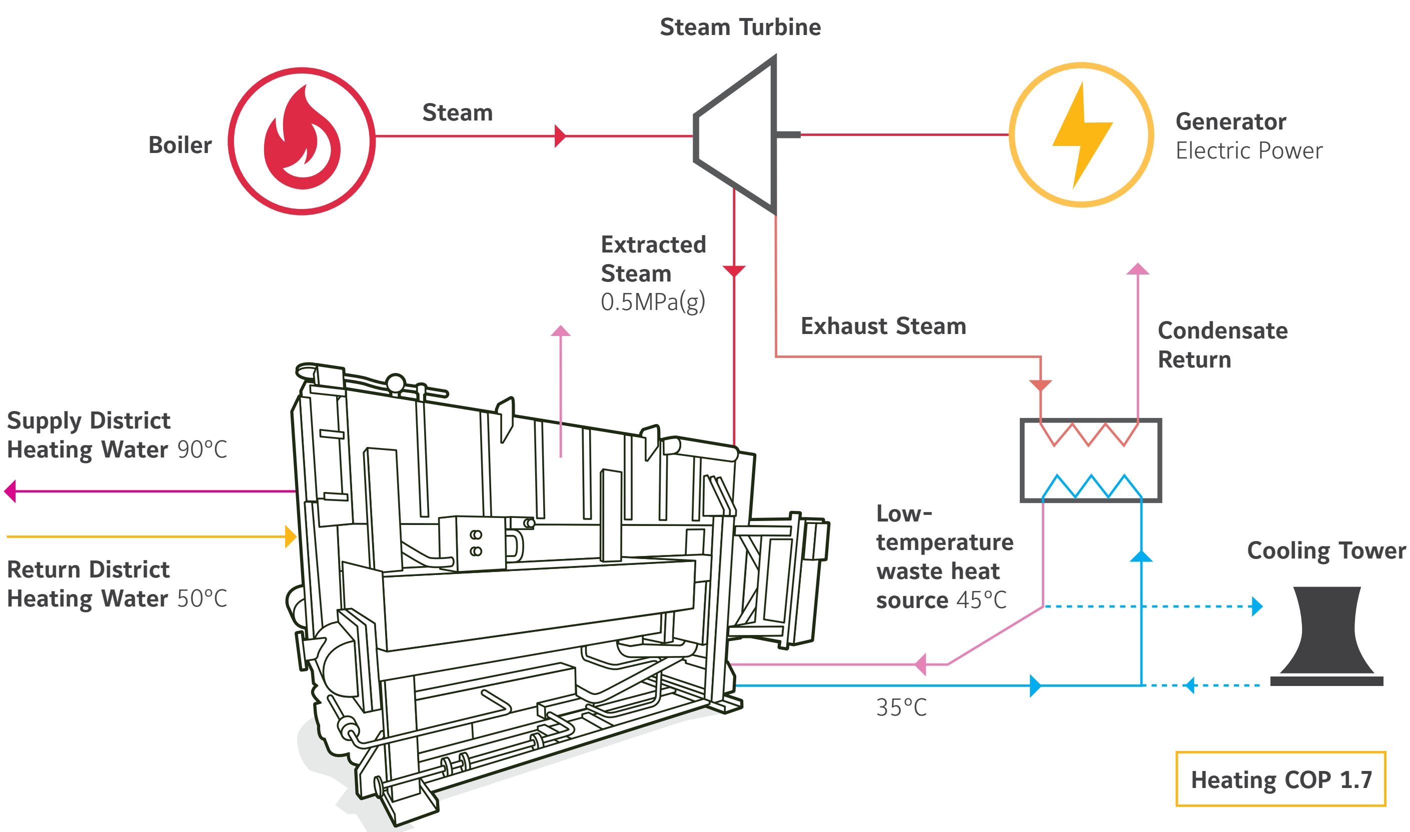
*YORK double-effect absorption heat pumps are also available with heating COP as high as 2.3 on a case by case basis.

Type I Industrial Application

The Type I unit produces a high amount of medium-temperature heat from the absorber and condenser section based on a relatively smaller amount of high-temperature waste heat in the generator section and low-temperature waste heat in the evaporator section.

In this Type I application, the extracted steam at 0.5 MPa(g) from the power steam turbine is the driving heat source in the generator section. The water diverted from the cooling tower is the low-temperature waste heat source that is fed into the evaporator section. The heat pump delivers 90°C (194°F) from the absorber and condenser section, which can be used for district heating or boiler feed water pre-heating. This application saves primary energy, reduces steam and water consumption and helps cut emissions.

With a Type I absorption heat pump, it is typical to have a heating COP of 1.7, meaning 1.7 units of heat is obtained from the absorber and condenser with a 1.0 unit of driving heat source in the generator and .7 units being in the evaporator section.

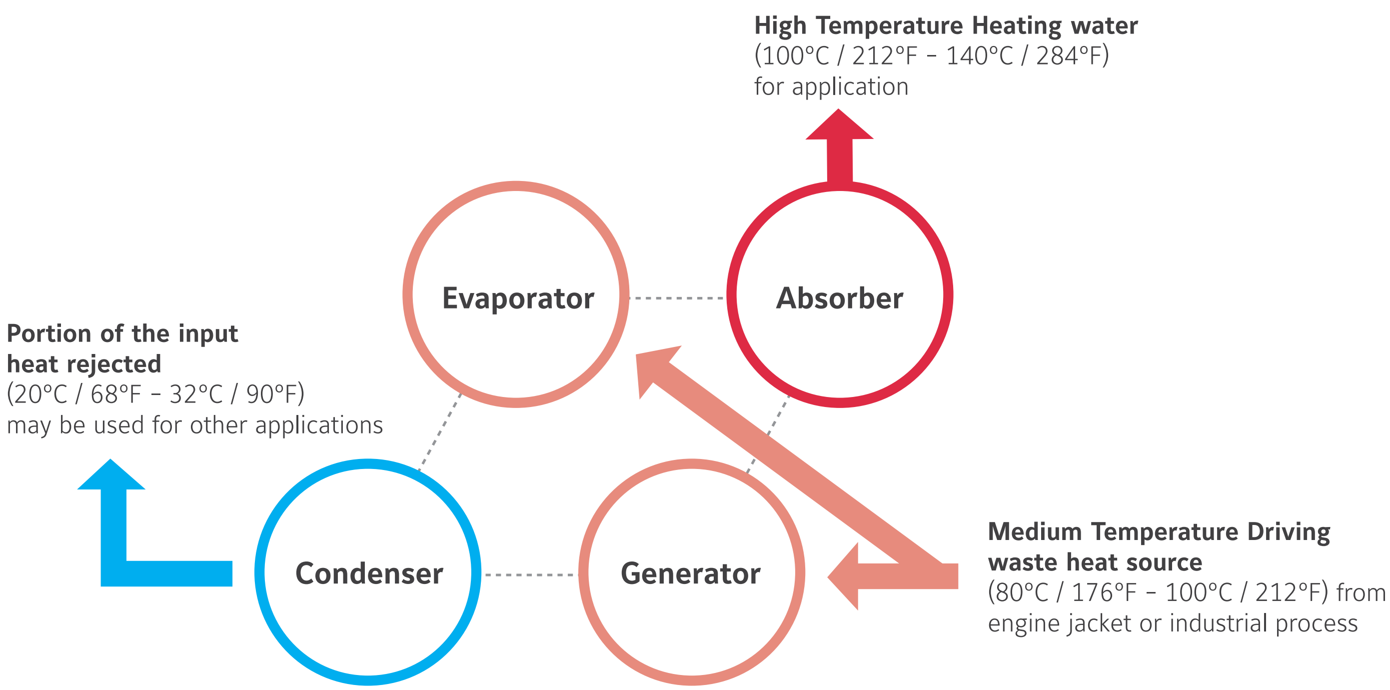


Type II

Flexible Operating Envelope

The Type II heat pump, also referred to as a heat transformer, is driven by a medium-temperature waste heat source in the generator and evaporator sections. This unit transforms and provides small, useful high-temperature heat from the absorber section. The rejected heat from the condenser can be used as the cooling water for other applications.

How it Works



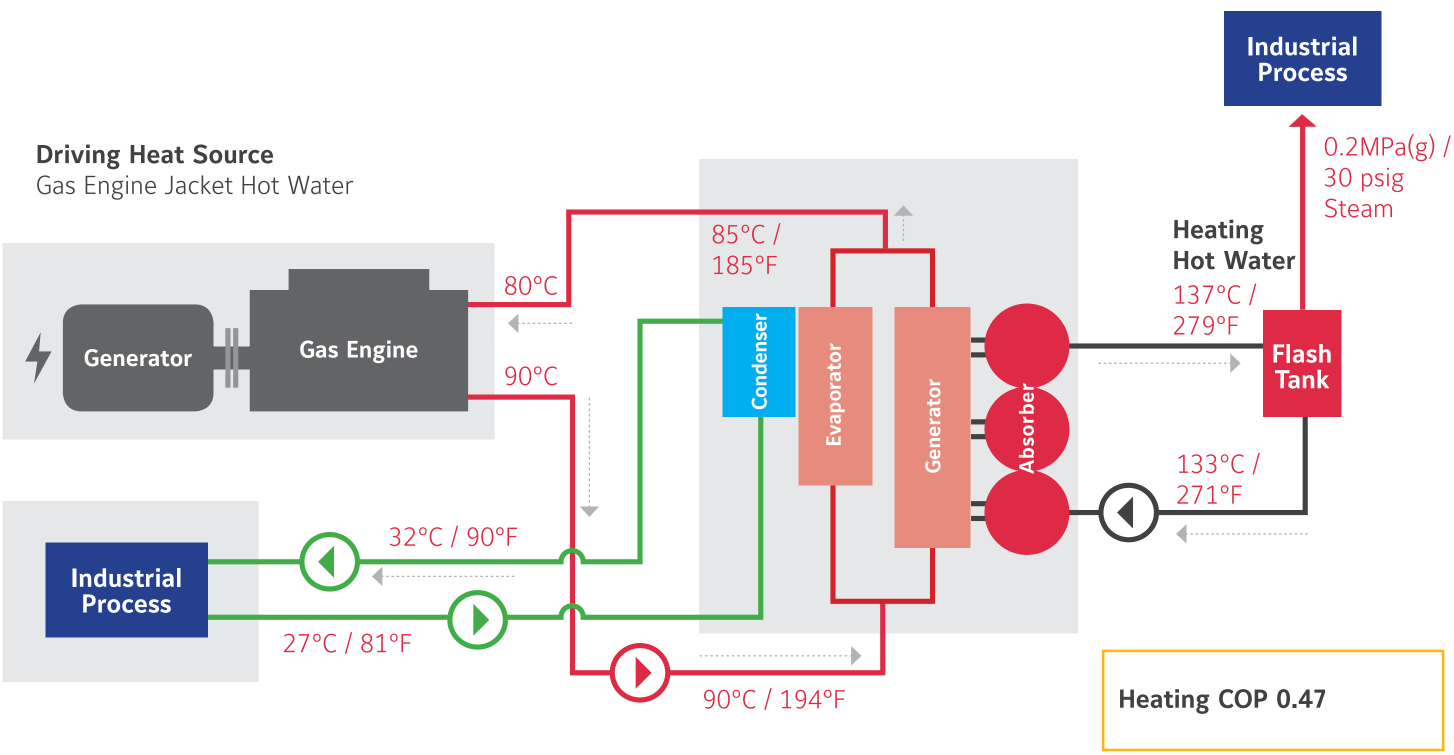
Heat Balance

The Type II heat pump with a COP of 0.47 can deliver high-temperature hot water up to 140°C (284°F), which is ideal for industrial processes. This unit also provides a good turndown over a range of heating loads.

Type II Industry Application Process Heating Application

With a Type II absorption heat pump, it is typical to have a heating COP of 0.47, meaning 0.47 units of heat is obtained from the absorber with a 1.0 unit of driving heat source in the evaporator and generator. The 0.53 units of heat rejected in the condenser can be used for other process applications.

In this Type II absorption heat pump application, the jacket water of the gas engine at 90°C (194°F) is the driving heat source. The heat pump delivers 137°C (279°F) from the absorber section that can be flashed in a tank to produce low-pressure steam at 0.2 MPa(g) for process heating. A portion of the input heat is rejected through the condenser section and is used for other purposes in the facility.



Type I Single-Effect Steam Fired Absorption Heat Pump Specification Sheet

<Single Module>

MODEL		YHAP-C	630EXW2STNG	700EXW2STNG	800EXW2STNG	900EXW2STNG	1000EXW4STNG	1120EXW4STNG
Pressure Vessel Code		-	**China Pressure Vessel Code**					
Standard		-	**GB**					
Heating Capacity		kW	6,300	7,000	8,000	9,000	10,000	11,000
Hot Water	Fluid	-	**Fresh water**					
	-Density	kg/m3	979.4	979.4	979.4	979.4	979.4	979.4
	-Specific heat	kJ/kgK	4.188	4.188	4.188	4.188	4.188	4.188
	Connection (inlet)	A	200	250	250	250	300	300
	Connection (outlet)	°C	200	250	250	250	300	300
	Inlet temperature	°C	50	50	50	50	50	50
	Outlet temperature	°C	85	85	85	85	85	85
	Flow volume	m3/h	158.0	175.5	200.6	225.7	250.8	275.8
	Pressure drop	kPa	84	72	61	82	75	59
	Pass	-	8	7	6	6	7	6
	Fouling factor	m2K/kW	**0.044**					
	Max. operating pressure	MPaG	**0.8**					
Heat Source Water	Fluid	-	**Fresh water**					
	Amount of heat	kW	2,657	2,953	3,375	3,797	4,218	4,640
	-Density	kg/m3	994.0	994.0	994.0	994.0	994.0	994.0
	-Specific heat	kJ/kgK	4.179	4.179	4.179	4.179	4.179	4.179
	Connection (inlet)	A	200	200	250	250	250	250
	Connection (outlet)	A	200	200	250	250	250	250
	Inlet temperature	°C	38	38	38	38	38	38
	Outlet temperature	°C	30	30	30	30	30	30
	Flow volume	m3/h	287.9	319.9	365.6	411.3	457.0	502.7
	Pressure drop	kPa	98	58	85	116	62	83
	Pass	-	4	3	3	3	3	3
	Fouling factor	m2K/kW	**0.018**					
	Max. operating pressure	MPaG	**0.8**					
Driving heat source	Fluid	-	**Steam**					
	Amount of heat	kW	3,642	4,047	4,625	5,203	5,781	6,359
	Connection (inlet)	A	150	200	200	200	200	200
	Connection (outlet)	A	40	50	50	50	50	65
	Inlet pressure	MPaG	**0.5**					
	Outlet pressure (steam condensate)	MPaG	**0.1**					
	Inlet temperature	°C	**158**					
	Outlet temperature (steam condensate)	°C	**< 90**					
	Flow volume	kg/h	5,468	6,076	6,944	7,812	8,680	9,548
	Fouling factor	m2K/kW	**0.018**					
	Max. operating pressure	MPaG	**1.0**					
Power	Power supply	-	**AC380V 50Hz 3ph**					
	Electric capacity	kVA	16.0	16.0	17.5	17.5	24.4	24.4
	Power consumption	kW	12.8	12.8	14	14	19.5	19.5
Pump rated output	Solution circulation pump	kW	5.5	5.5	5.5	5.5	7.5	7.5
	Solution spray pump	kW	2.2	2.2	2.2	2.2	3.7	3.7
	Refrigerant pump	kW	0.4	0.4	1.3	1.3	1.5	1.5
	Vacuum pump	kW	**0.4**					
Weight	Max. shipping	ton	26	28	29	31	35	41
	LiBr, Refrigerant shipment condition	-	included	included	included	included	included	included
	Operation	ton	29	31	33	35	41	47
Outline dimension	Length	m	5.5	6	6.7	7.3	6	6.7
	Width	m	3.1	3.1	3.1	3.1	3.2	3.2
	Height	m	3.4	3.4	3.4	3.4	3.9	3.9
Tube extracting space		m	4.5	5	5.7	6.3	5	5.7
Hot insulation area		m2	39	44	47	50	40	45
Holding volume	Hot Water	m3	2.4	2.6	2.8	2.9	3.7	4
	Heat Source Water	m3	1.1	1.2	1.3	1.4	2.1	2.3
	Steam condensate	m3	0.2	0.2	0.2	0.2	0.3	0.3
Noise level		dB(A)	**85**					
Installation place		-	**Indoor / non-hazardous**					

(Continued)

1250EXW4STNG	1400EXW4STNG	1500EXW4STNG	1600EXW4STNG	1680EXW4STNG	1800EXW4STNG	1900EXW4STNG	2000EXW4STNG
China Pressure Vessel Code							
GB							
12,500	14,000	15,000	16,000	17,000	18,000	19,000	20,000
979.4	979.4	979.4	979.4	979.4	979.4	979.4	979.4
4.188	4.188	4.188	4.188	4.188	4.188	4.188	4.188
350	350	350	400	400	400	400	400
350	350	350	400	400	400	400	400
50	50	50	50	50	50	50	50
85	85	85	85	85	85	85	85
313.4	351.1	376.1	401.2	426.3	451.4	476.4	501.5
83	60	72	85	55	63	72	82
6	5	5	5	4	4	4	4
0.044							
0.8							
Fresh water							
5,273	5,906	6,328	6,749	7,172	7,593	8,015	8,437
994.0	994.0	994.0	994.0	994.0	994.0	994.0	994.0
4.179	4.179	4.179	4.179	4.179	4.179	4.179	4.179
300	300	300	300	350	350	350	350
300	300	300	300	350	350	350	350
38	38	38	38	38	38	38	38
30	30	30	30	30	30	30	30
571.3	639.8	685.5	731.2	777.0	822.6	868.3	914.0
40	50	61	73	87	102	119	138
2	2	2	2	2	2	2	2
0.018							
0.8							
Steam							
7,226	8,093	8,671	9,250	9,827	10,406	10,984	11,562
250	250	250	250	250	300	300	300
65	65	65	65	65	80	80	80
0.5							
0.1							
158							
< 90							
10,849	12,151	13,019	13,888	14,755	15,624	16,491	17,360
0.018							
1.0							
AC380V 50Hz 3ph							
24.4	24.4	24.4	24.4	24.4	36.7	36.7	36.7
19.5	19.5	19.5	19.5	19.5	29.4	29.4	29.4
7.5	7.5	7.5	7.5	7.5	11.0	11.0	11.0
3.7	3.7	3.7	3.7	3.7	7.5	7.5	7.5
1.5	1.5	1.5	1.5	1.5	2.2	2.2	2.2
0.4							
44	48	51	47	48	51	53	55
included	included	included	separated	separated	separated	separated	separated
50	55	58	61	63	66	69	72
7.3	8	8.5	9	9.5	10	10.5	11
3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
6.3	7	7.5	8	8.5	9	9.5	10
49	53	56	59	63	66	69	72
4.3	4.6	4.8	5	5.2	5.4	5.6	5.8
2.4	2.6	2.7	2.8	2.9	3	3.1	3.3
0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.5
85							
Indoor / non-hazardous							

Heating capacity up to 40,000 kW available with twin module.

Type I Single Effect Steam Fired Absorption Heat Pump Electrical Data

2016.02.16/REV00

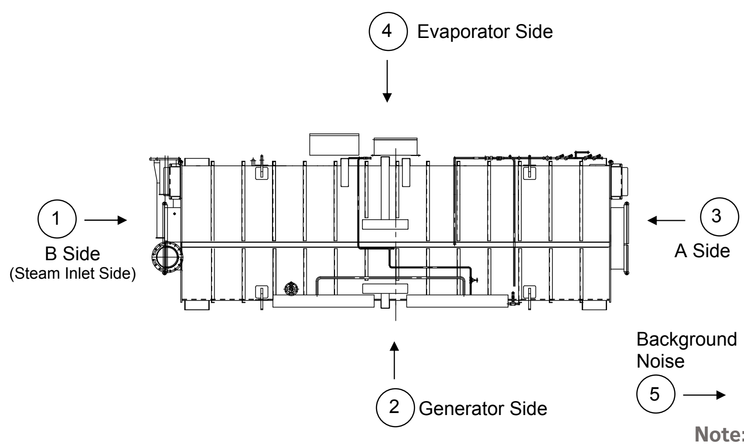
HEAT PUMP MODEL YHAP-C	POWER SOURCE (VOLTAGE-PH-HZ)	MAIN BREAKER		SOLUTION CIRCULATION PUMP			SOLUTION SPRAY PUMP			REFRIGERANT PUMP			VACUUM PUMP			CAPACITY	CONSUMPTION	SCCR
		RATED CURRENT	FRAME SIZE	KW	FLA	LRA	KW	FLA	LRA	KW	FLA	LRA	KW	FLA	LRA	KVA	KW	KA
630EXW2STNG	AC380V-3Ph-50Hz	40	63	5.5	14.2	60.0	2.2	6.5	20.3	0.4	1.6	4.2	0.4	1.2	2.4	16.0	12.8	6
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0		1.65	4.4		1.2	2.4	16.1	12.9	6
700EXW2STNG	AC380V-3Ph-50Hz	40	63	5.5	14.2	60.0	2.2	6.5	20.3	0.4	1.6	4.2	0.4	1.2	2.4	16.0	12.8	6
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0		1.65	4.4		1.2	2.4	16.1	12.9	6
800EXW2STNG	AC380V-3Ph-50Hz	40	63	5.5	14.2	60.0	2.2	6.5	20.3	1.3	3.9	11.9	0.4	1.2	2.4	16.0	12.8	6
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0		3.8	12.8		1.2	2.4	16.1	12.9	6
900EXW2STNG	AC380V-3Ph-50Hz	40	63	5.5	14.2	60.0	2.2	6.5	20.3	1.3	3.9	11.9	0.4	1.2	2.4	16.0	12.8	6
	AC400V-3Ph-50Hz				13.5	63.0		6.2	21.0		3.8	12.8		1.2	2.4	16.1	12.9	6
1000EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1120EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1250EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1400EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1500EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1600EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1680EXW4STNG	AC380V-3Ph-50Hz	50	63	7.5	19.8	68.6	3.7	10.6	34.0	1.5	4.7	12.5	0.4	1.2	2.4	24.4	19.5	6
	AC400V-3Ph-50Hz				19.2	72.0		10.1	36.0		4.5	13.0		1.2	2.4	24.7	19.8	6
1800EXW4STNG	AC380V-3Ph-50Hz	100	125	11.0	27.5	99.1	7.5	19.8	68.6	2.2	6.5	20.3	0.4	1.2	2.4	36.7	29.4	6
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0		6.2	21.0		1.2	2.4	37.1	29.7	6
1900EXW4STNG	AC380V-3Ph-50Hz	100	125	11.0	27.5	99.1	7.5	19.8	68.6	2.2	6.5	20.3	0.4	1.2	2.4	36.7	29.4	6
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0		6.2	21.0		1.2	2.4	37.1	29.7	6
2000EXW4STNG	AC380V-3Ph-50Hz	100	125	11.0	27.5	99.1	7.5	19.8	68.6	2.2	6.5	20.3	0.4	1.2	2.4	36.7	29.4	6
	AC400V-3Ph-50Hz				26.3	104.0		19.2	72.0		6.2	21.0		1.2	2.4	37.1	29.7	6

Type I Single Effect Steam Fired Absorption Heat Pump Noise Data

LOCATION	OVERALL	OCTAVE BAND									
		31.5HZ	63HZ	125HZ	250HZ	500HZ	1KHZ	2KHZ	4KHZ	8KHZ	16KHZ
1	80/ 83	37 / 76	48 / 74	57 / 73	64 / 73	69 / 72	73 / 73	75 / 74	75 / 74	70 / 71	56 / 63
2	77 / 83	40 / 79	49 / 75	56 / 72	62 / 71	68 / 71	70 / 70	71 / 70	70 / 69	70 / 71	53 / 60
3	75 / 83	41 / 80	49 / 75	59 / 75	62 / 71	65 / 68	69 / 69	71 / 70	67 / 66	58 /59	44 / 51
4	78 / 84	40 / 79	50 / 76	61 / 77	64 / 73	71 / 74	71 / 71	74 / 73	71 / 70	65 / 66	50 / 57
5	64 / 80	37 / 76	44 / 70	60 / 76	56 / 65	54 / 57	57 / 57	56 / 55	50 / 49	36 / 37	26 / 33

* Position of Measuring instrument

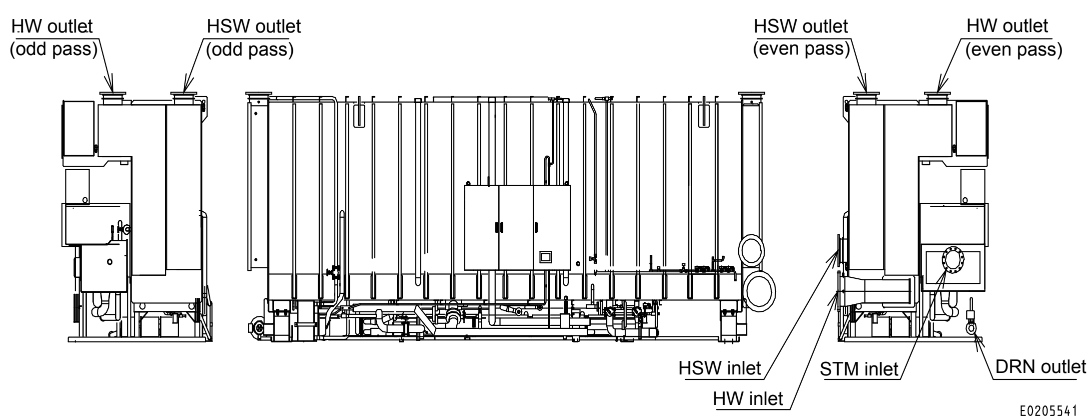
Height: 1.5m, Horizon: 1.0m (from heat pump surface)

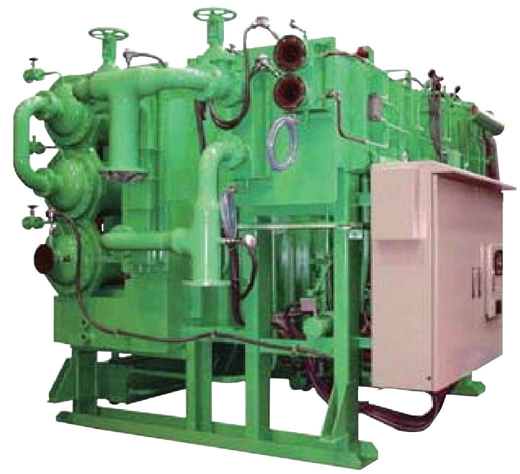


Note: Data provided for reference purposes only.

Type I Single Effect Steam Fired Absorption Heat Pump Nozzle Arrangement

HEAT SOURCE	MODEL	NOZZLE LOCATION							
		HOT WATER (HW)			HEAT SOURCE WATER (HSW)			STEAM (STM)	STEAM DRAIN (DRN)
		INLET	OUTLET		INLET	OUTLET		INLET	OUTLET
Steam	Type I Heat Pump	B	Odd Pass	A	B	Odd Pass	A	B	B
			Even Pass	B		Even Pass	B		





Why install anything but YORK®?

You want high performance. You expect efficiency.

When your reputation is at stake, it's smart to demand nothing less than YORK® technology and service. That's because we provide local service and parts to keep your equipment operating at peak performance year after year. Enjoy the peace of mind knowing that trained service experts and Original Equipment Manufacturer parts are available from Johnson Controls – the largest HVAC service and preventative maintenance organization in the world.

YORK®
INSTALL CONFIDENCE

Johnson Controls