

Gas-Fired Double-Effect Chiller-Heater

CH-K Series: 30, 40, 50, 60, 80, 100 RT Cooling with Standard Heating Capacities



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Gas-Fired Double-Effect Chiller-Heater

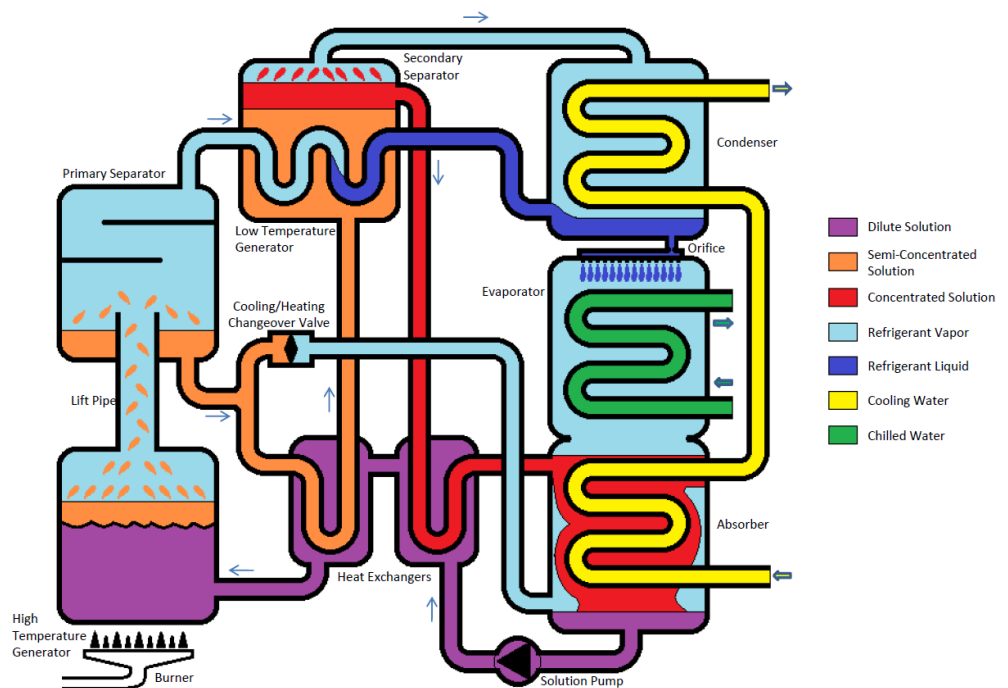
(For Commercial Applications)

Yazaki gas-fired DOUBLE-EFFECT chiller-heaters, with cooling capacities of 30 to 100 tons of refrigeration, are designed for commercial applications where chilled and hot water are used in a central air conditioning system. The condenser is water-cooled, and during cooling operation heat is rejected through a cooling tower or a ground loop.

Absorption Principle

Yazaki absorption chiller-heaters use a solution of lithium bromide and water under a very low pressure as the working fluid. Water is the refrigerant and lithium bromide is the absorbent. The double-effect absorption cycle has two generators, one directly heated by the gas-fired burner and the other heated by hot refrigerant vapor. Refrigerant, liberated by heat from the solution, produces a refrigerating effect in the evaporator when cooling water is circulated through the condenser and absorber.

Cooling Cycle



High Temperature Generator

The gas burner heats dilute lithium bromide solution in the high temperature generator and the boiling process drives the refrigerant vapor along with droplets of semi-concentrated solution up into the primary separator. The semi-concentrated solution is pre-cooled through a heat exchanger before flowing into the low temperature generator.

Low Temperature Generator

Hot refrigerant vapor from the primary separator heats the semi-concentrated solution in the low temperature generator. Refrigerant vapor released from this solution flows to the condenser while concentrated solution is pre-cooled through a heat exchanger before flowing into the absorber.

Condenser

Refrigerant vapor is condensed on the surface of the condenser coil and latent heat removed by the cooling water is rejected to a cooling tower, ground loop, or other heat rejection device. Refrigerant liquid accumulates in the condenser sump and then passes through an orifice into the evaporator.

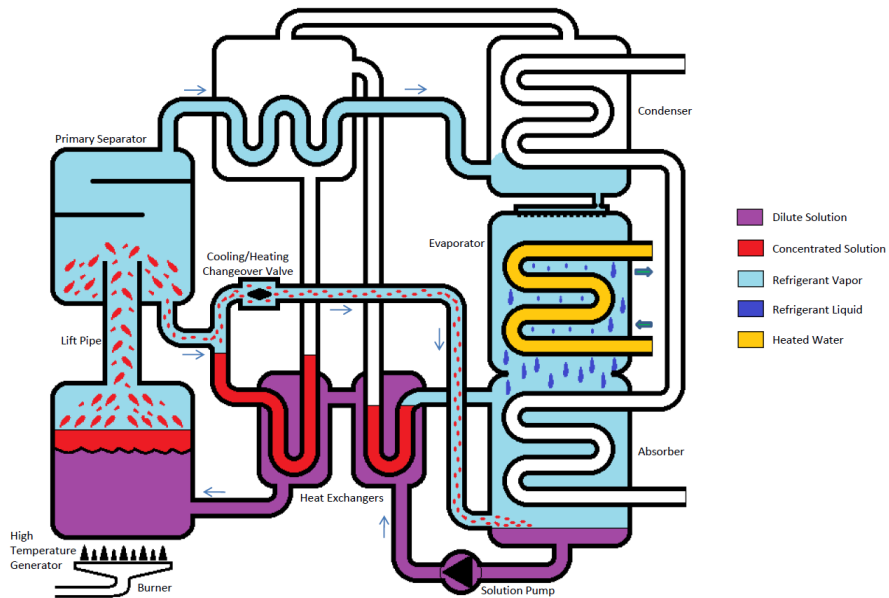
Evaporator

Pressure in the evaporator is substantially lower than the pressure in the condenser due to the influence of the absorber. As the refrigerant liquid flows into the evaporator, it boils on the surface of the chilled/hot water coil. Heat, equivalent to the latent heat of the refrigerant, is removed from the recirculating water which is chilled to 44.6°F (7°C) at standard conditions. The refrigerant vapor flows to the absorber.

Absorber

A low pressure in the absorber is maintained by the affinity of the concentrated lithium bromide solution from the separator with the refrigerant vapor formed in the evaporator. The refrigerant vapor is absorbed by the concentrated lithium bromide solution as it flows across the surface of the absorber coil. Heat of condensation and dilution are removed by the cooling water. The dilute lithium bromide solution is pre-heated through the heat exchangers before returning to the generator.

Heating Cycle



High Temperature Generator

The solution boils in the high temperature generator in a manner identical to the cooling cycle. Refrigerant vapor and concentrated solution rise into the primary separator.

Evaporator

Hot refrigerant vapor and droplets of concentrated solution flow through an open cooling/heating changeover valve into the evaporator/absorber section. Some refrigerant vapor flows into the evaporator/absorber section via the condenser. Since the pressures in the evaporator and the condenser sections are similar and there is no cooling water flow, the hot refrigerant vapor condenses on the surface of the chilled/hot water coil. Heat equivalent to the latent heat of the refrigerant is transferred to the recirculating water which is heated to 131°F (55°C) at standard conditions.

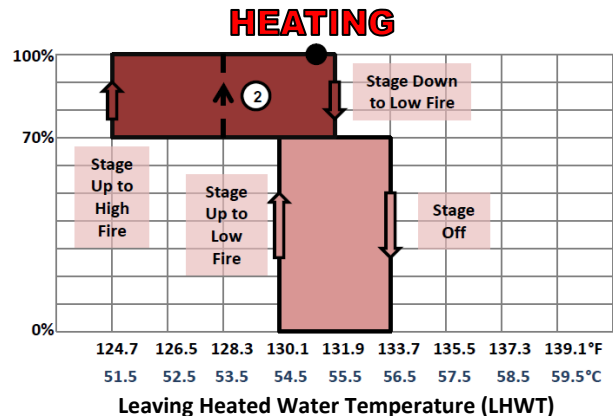
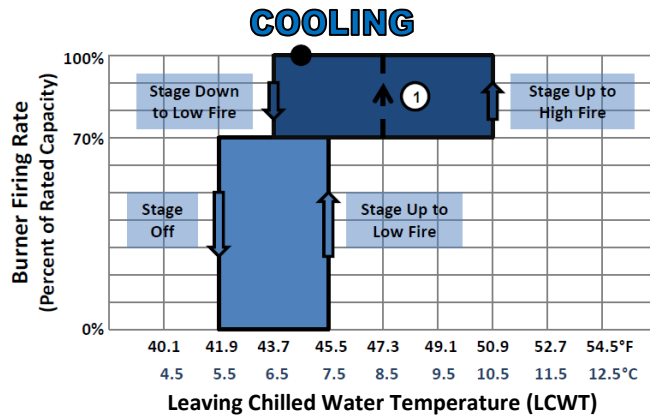
Absorber

Liquid refrigerant drips off the chilled/hot water coil into the sump to mix with the concentrated lithium bromide solution to form a dilute solution and is returned to the generator where the cycle is repeated.

Features

- “G” Series control package utilizing VFD solution pumps are used on the 30 to 80 ton chiller-heaters.
- Each modular chiller-heater serves a dual purpose: Cooling and Heating.
- Cooling or heating operation can be selected from a remote or built-in switch with a 30-minute changeover.
- A two pipe hydronic system can be used to circulate chilled or hot water to a central air handling unit or to multiple fancoils.
- Can be vented with inexpensive Double Wall Type B Vent using Category I rules.
- Vacuum vessel is hermetically sealed at the factory for a level of vacuum integrity that is unmatched in the industry, with no field welding necessary.
- Safe, odorless, non-toxic lithium bromide and water are the working fluids and operate under a vacuum at all times.
- Proprietary solution and inhibitor blends ELIMINATE the need for regular chemical analysis, resulting in much simpler regular maintenance when compared with other manufacturers.
- Only two moving parts – the solution pump and the burner blower – are needed. We don’t use multiple pumps as some other manufacturers do, because we allow gravity to do the work for us.
- All field piping and wiring connections are conveniently located on the rear of each module.
- Built-in control panel with microprocessor control simplifies installation and maintenance.
- Safety shutdown for abnormal cooling water conditions is included in the logic of the microprocessor control.
- The DOUBLE-EFFECT absorption cycle and forced-draft burner reduce fuel consumption and require less heat to be rejected to the cooling tower, resulting in energy savings and a smaller required cooling tower size.
- UL Listed in the USA and Canada.
- Cabinets are UL50E Type 3R and are suitable for indoor or outdoor installation without modification.
- Each unit is run-tested at the factory prior to shipment. The factory trims and balances the solution concentration so you don’t have to.
- Needs no back-up power source to prevent crystallization during a power failure, as gravity alone can handle it.

Performance Characteristics



Low Fire Sequence of Operation:
 When LCWT rises to 45.5°F, the burner will fire at Low Fire. If the LCWT temperature continues to rise, the burner will stage up to High Fire at 50.9°F. Otherwise, the burner will shut down when the LCWT reaches 41.9°F.

High Fire Sequence of Operation:
 When the LCWT increases to 50.9°F (adjustable to 47.3°F) the burner goes up to High Fire. It will continue to burn in High Fire until the LCWT reaches 43.7°F at which time the burner will drop back into Low Fire and again follow the Low Fire Sequence of Operation.

Low Fire Sequence of Operation:
 When LHWT falls to 130.1°F, the burner will fire at Low Fire. If the LHWT temperature continues to fall, the burner will stage up to High Fire at 124.7°F. Otherwise, the burner will shut down when the LHWT reaches 133.7°F.

High Fire Sequence of Operation:
 When the LHWT falls to 124.7°F (adjustable to 128.3°F), the burner goes up to High Fire. It will continue to burn in High Fire until LHWT reaches 131.9°F at which time the burner will drop back into Low Fire and again follow the Low Fire Sequence of Operation.

- - Standard Design Set Point. This is the temperature that will be held when load exactly equals rated capacity. Cooling Set Point can be adjusted 1.8°F down or 16.2°F up from standard set point. Heating Set Point can be adjusted 12.6°F down or 5.4°F up from standard set point.

Specifications – Imperial Units

These models use the "G" control package			CH-K	30	40	50	60	80	100	
Model			CH-K	30	40	50	60	80	100	
Capacity	Cooling	High Fire	MBTUh	360	480	600	720	960	1200	
		Low Fire	MBTUh	270	360	450	454	672	840	
	Heating	High Fire	MBTUh	278	371	464	556	724	976	
		Low Fire	MBTUh	209	278	348	350	507	683	
	Cooling C.O.P.				1.1					1.02
Capacity Control (High / Low)				100% / 75%			100%/63%	100% / 70%		
Chilled / Hot Water	Cooling		°F	54.5 Inlet / 44.6 Outlet						
	Heating	Inlet	°F	123.3				123.6	122.9	
		Outlet	°F	131.0						
	Rated Water Flow		GPM	72.6	96.8	121	145.1	193.5	241.9	
	Evaporator Pressure Loss (note #2)		PSI	9.2				11.4	14.1	
	Maximum Operating Pressure		PSI	85.3						
	Water Retention Volume		Gal	18	23	29	34	64	81	
Cooling Water	Total Heat Rejection		MBTUh	638	851	1064	1276	1684	2176	
	Inlet Temperature		°F	85.1						
	Outlet Temperature		°F	95.7				95.5	95.9	
	Rated Water Flow		GPM	120.8	161	201.3	241.5	322	402.5	
	Condenser / Absorber Press. Loss (note #2)		PSI	9.9			12.8	9.2	14.9	
	Maximum Operating Pressure		PSI	85.3						
	Water Retention Volume		Gal	38.3	47.6	62.1	78.2	108.6	141.1	
Electrical	Power Supply			208V or 230V / 60 Hz / 3-Phase						
	Consumption (note #3)		Watts	900	1200	1250	1600	1800	2500	
	Minimum Circuit Amps		Amps	14	15.9		18	18.6		
	MOCP – Max. Fuse Size		Amps	15	20					
Burner	Burner Input (note #1)	High Fire	MBTUh	327	436	545	655	873	1176	
		Low Fire	MBTUh	245	327	409	413	611	823	
	Supply Gas Pressure	Inches W.C.	5 – 10.5" w.c.				7 – 10.5" w.c.			
	Type		Forced Draft with Category I Venting							
	Gas		Dedicated: Natural or Propane. Not convertible.							
	Ignition Type		Intermittent or Interrupted Spark							
Flame Detection		Optical or UV Scanner								
Construction	Dimensions (note #4: Height) (note #5: Depth)	Width	Inches	57.5			70.1		72.4	
		Depth	Inches	60.6			70.1		74.8	
		Height	Inches	79.1						94.5
		Height w/ Vent Cap Installed	Inches	96.1						111.1
	Weight	Dry	Lbs	3950	4230	5090	5310	7500	8600	
		Operating	Lbs	4475	4860	5990	6330	9105	10355	
Cabinet			NEMA 3R, Silver Metallic Pre-Painted Hot Dip Zinc-Coated Sheet Steel							
Noise Level		dB(A)	63	62	64	67				
Piping	Chilled / Hot Water		Inches	2 NPT	2-1/2 NPT		3 NPT	4 Flanged		
	Cooling Water		Inches	2-1/2 NPT	3 NPT			5 Flanged		
	Gas		Inches	1-1/2 NPT			2 NPT		2-1/2 NPT	
	Flue Diameter		Inches	6.3			7.1			

- NOTES:**
1. Fuel input is based on the Higher Heating Value of gas. Burner efficiency = 83%.
 2. Pressure Loss ratings are +/- 10%.
 3. Power Consumption does not include external pumps or cooling tower fan motors.
 4. "Height" does not include level bolts, but "Height with Vent Cap" includes both vent cap and the level bolts.
 5. "Depth" does not include Junction Box. Add 3.9" to Depth Dimension to include Junction Box.
 6. Specifications are based upon water in all fluid circuits and fouling factor of 0.0005 ft²-hr-°F/Btu.

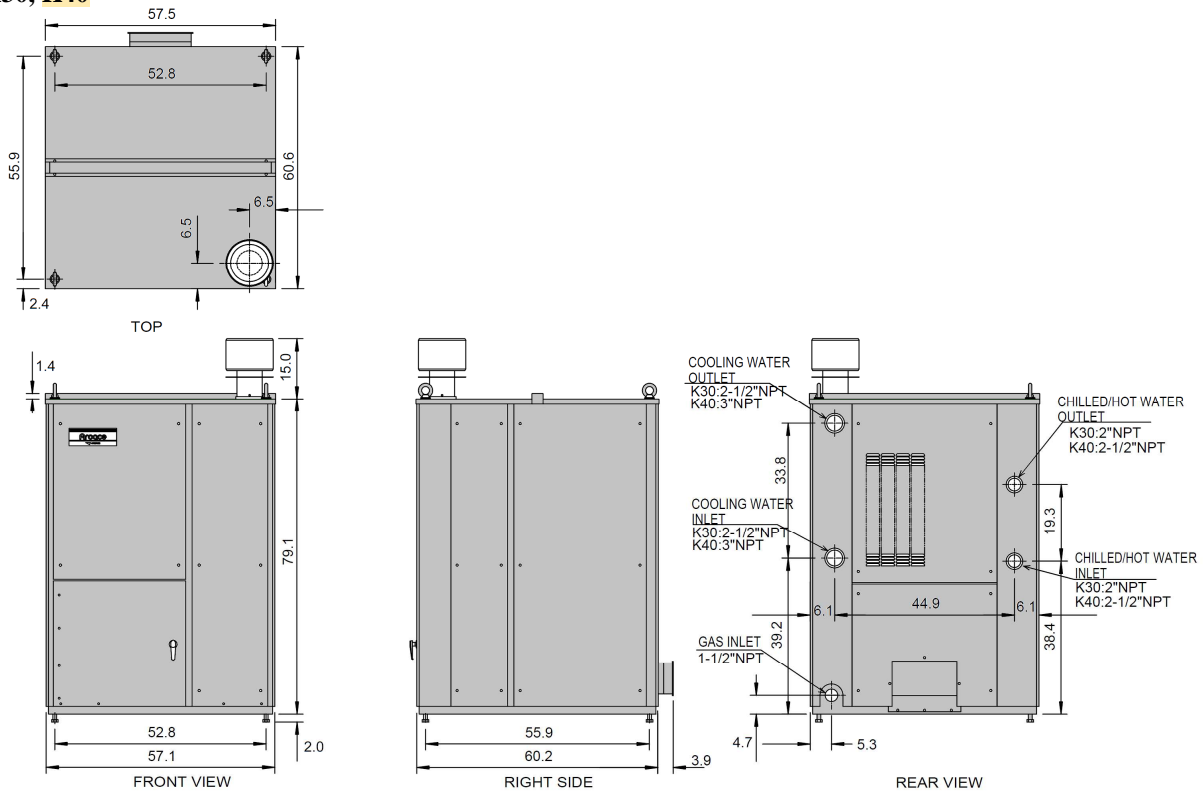
Specifications – Metric Units (all values converted from Imperial Units)

These models use the "G" control package			CH-K	30	40	50	60	80	100	
Model			CH-K	30	40	50	60	80	100	
Capacity	Cooling	High Fire	kW	105	140	175	211	281	351	
		Low Fire	kW	79	105	131	133	197	246	
	Heating	High Fire	kW	81	109	136	163	212	286	
		Low Fire	kW	61	81	102	103	149	200	
	Cooling C.O.P.				1.1					1.02
Capacity Control (High / Low)				100% / 75%			100%/63%	100% / 70%		
Chilled / Hot Water	Cooling		°C	12.5 Inlet / 7.0 Outlet						
	Heating	Inlet	°C	50.7				50.9	50.5	
		Outlet	°C	55.0						
	Rated Water Flow		l/sec	4.6	6.1	7.6	9.2	12.2	15.3	
	Evaporator Pressure Loss (note #2)		kPa	63.4				78.6	97.0	
	Maximum Operating Pressure		kPa	588						
	Water Retention Volume		liters	68	87	110	129	242	307	
Cooling Water	Total Heat Rejection		kW	187	249	312	376	494	638	
	Inlet Temperature		°C	29.5						
	Outlet Temperature		°C	35.4				35.2	35.5	
	Rated Water Flow		l/sec	7.6	10.2	12.7	15.2	20.3	25.4	
	Condenser / Absorber Press. Loss (note #2)		kPa	68.3			88.3	63.4	103.0	
	Maximum Operating Pressure		kPa	588						
	Water Retention Volume		liters	145	180	235	296	411	534	
Electrical	Power Supply			208V or 230V / 60 Hz / 3-Phase						
	Consumption (note #3)		Watts	900	1200	1250	1600	1800	2500	
	Minimum Circuit Amps		Amps	14	15.9		18	18.6		
	MOCP – Max. Fuse Size		Amps	15	20					
Burner	Burner Input (note #1)	High Fire	kW	96	128	160	192	256	345	
		Low Fire	kW	72	96	120	121	179	242	
	Supply Gas Pressure		kPa	1.25 – 2.6				1.75 – 2.6		
	Type			Forced Draft with Category I Venting						
	Gas			Dedicated: Natural or Propane. Not convertible.						
	Ignition Type			Intermittent or Interrupted Spark						
	Flame Detection			Optical or UV Scanner						
Construction	Dimensions (note #4: Height) (note #5: Depth)	Width	mm	1460			1780		1840	
		Depth	mm	1540			1780		1900	
		Height	mm	2010						2400
		Height w/ Vent Cap Installed	mm	2440						2820
	Weight	Dry	kg	1792	1919	2309	2409	3402	3901	
		Operating	kg	2030	2250	2717	2872	4130	4697	
	Cabinet			NEMA 3R, Silver Metallic Pre-Painted Hot Dip Zinc-Coated Sheet Steel						
Noise Level		dB(A)	63	62	64	67				
Piping	Chilled / Hot Water		Inches	2 NPT	2-1/2 NPT		3 NPT	4 Flanged		
	Cooling Water		Inches	2-1/2 NPT	3 NPT			5 Flanged		
	Gas		Inches	1-1/2 NPT			2 NPT		2-1/2 NPT	
	Flue Diameter		mm	160			180			

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Dimensions (CH-K Series)

CH-K30, K40



CH-K50, K60

