Dry All®

Full Range of HVAC&R Line Products

Brazed Plate Heat Exchanger

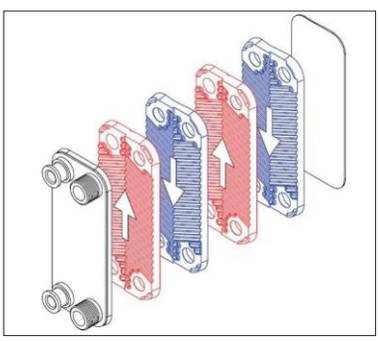
Brazed Plate Heat Exchanger working principle

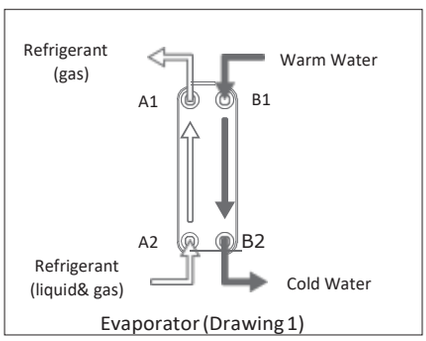
- Brazed Plate Heat Exchanger (BPHE) consists of several corrugated plates with a brazing material between each plate. The space between two adjacent plates forms the channel in which the fluids flow. During the vacuum-brazing process the brazing material forms the joint at every contact point between the plates.

- The BPHE allows media at different temperatures to come into close proximity separated by channel plates that enable heat from one media to be transferred to the other with very high efficiency.

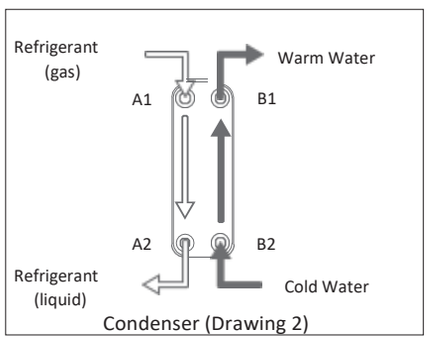
When used as Evaporator : The two phase refrigerant (vapor and liquid) enters the bottom of the exchanger. The water flows in opposite direction (counter flow) at top of the BPHE. (Refer Drawing 1)

When used as Condenser: The refrigerant enters at top of the exchanger as hot gas and the water flows in opposite direction (counter flow) at bottom of the BPHE.(Refer Drawing 2)





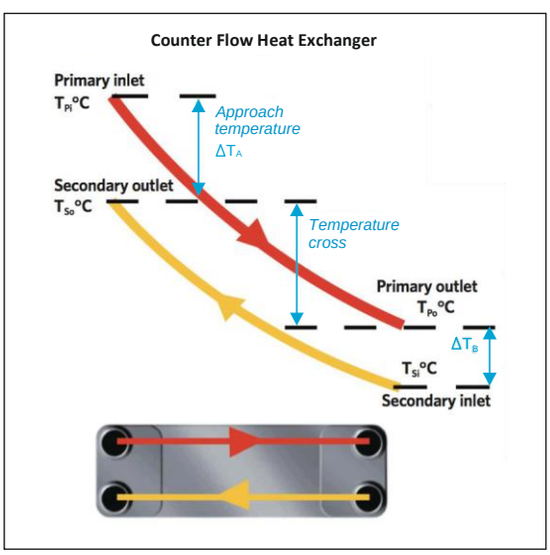
Evaporator (Drawing 1)

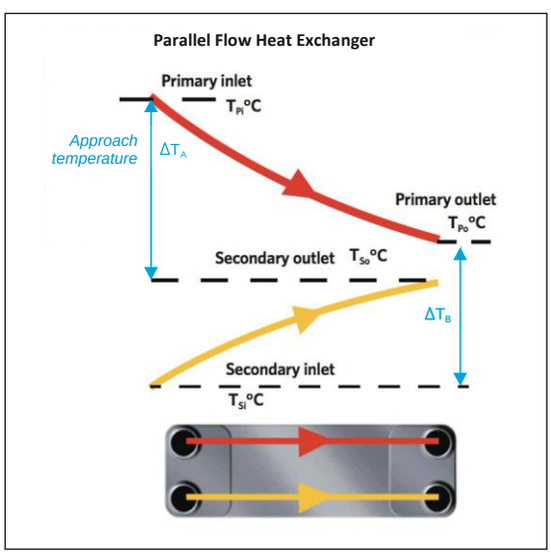


Condenser (Drawing 2)

Flow arrangement

- The BPHE flow arrangement can be either counter flow or parallel flow. Counter flow is preferred, since it enables a closer approach temperature. Approach or pinch point temperature is temperature difference between the inlet of the primary and the outlet of the secondary flows, as well as a greater total heat exchange.

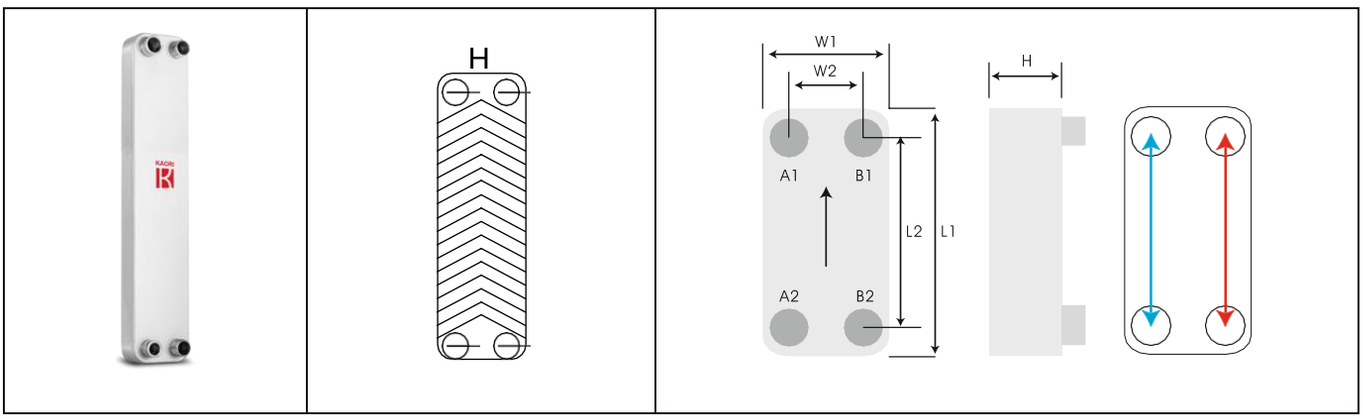




R Series High Heat Treatment Performance Brazed Plate Heat Exchanger

R series BPHE is specially designed for R410A system. Heat treatment efficiency is 10% more than normal BPHE

Dimensional Details:



Performance Data								
Sr. No.	Model no	Capacity in TR* Evaporator	Capacity in TR* Condenser	No of plate (N)	Heat Transfer Area/plate (m2)	Total Heat Transfer Area (m2)	Volume/channel (Litre)	Total Volume (Litre)
1	DA-R050-14CS47	1.5	2.0	14	0.0255	(N-2)*0.0255	0.038	(N-1)*0.038
2	DA-R050-20CS7P8	2.0	3.0	20	0.0255	(N-2)*0.0255	0.038	(N-1)*0.038
3	DA-R050-30CS7P8	3.0	4.0	30	0.0255	(N-2)*0.0255	0.038	(N-1)*0.038
4	DA-R050-44CS7P8	5.0	6.0	44	0.0255	(N-2)*0.0255	0.038	(N-1)*0.038
5	DA-R095-H38B-S9	7.5	8.5	38	0.0475	(N-2)*0.0475	0.076	(N-1)*0.076
6	DA-R095-H44B-S9	10	11	44	0.0475	(N-2)*0.0475	0.076	(N-1)*0.076

Dimensional Data								
Sr. No.	Model no	Capacity in TR*	L1(mm)	L2(mm)	W1 (mm)	W2 (mm)	H Thickness (mm)	Weight (Kg)
1	DA-R050-14CS47	1.5	306	250	106	50	10.0+1.80*N	1.32+0.089*N
2	DA-R050-20CS7P8	2.0	306	250	106	50	10.0+1.80*N	1.32+0.089*N
3	DA-R050-30CS7P8	3.0	306	250	106	50	10.0+1.80*N	1.32+0.089*N
4	DA-R050-44CS7P8	5.0	306	250	106	50	10.0+1.80*N	1.32+0.089*N
5	DA-R095-H38B-S9	7.5	522	466	106	50	10.0+1.85*N	2.73+0.160*N
6	DA-R095-H44B-S9	10	522	466	106	50	10.0+1.85*N	2.73+0.160*N

Connection Size					
Sr. No.	Model no	Capacity in TR*	Ref IN (A1) Soldered	Ref OUT (A2) Soldered	Water IN/OUT (B1/B2) PT Thraded
1	DA-R050-14CS47	1.5	7/8”	1/2”	1”
2	DA-R050-20CS7P8	2.0	7/8”	7/8”	1”
3	DA-R050-30CS7P8	3.0	7/8”	7/8”	1”
4	DA-R050-44CS7P8	5.0	7/8”	7/8”	1”
5	DA-R095-H38B-S9	7.5	1-1/8”	1-1/8”	1”
6	DA-R095-H44B-S9	10	1-1/8”	1-1/8”	1”

All Capacities are declared at following Working Conditions

Application : Evaporator
Refrigerant : R410A
Evaporation Temperature : 2ºC
Water Inlet Temperature : 12ºC
Water Outlet Temperature : 7ºC

Application : Condenser
Refrigerant : R410A
Condensing Temperature : 40ºC
Water Inlet Temperature : 30ºC
Water Outlet Temperature : 35ºC

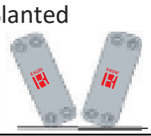
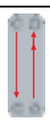
Application

In refrigeration cycle, BPHE are widely used as:

- Evaporator
- Condenser
- Sub cooler
- Economizer
- Pre-cooler
- Inter-cooler
- Water / Oil cooler

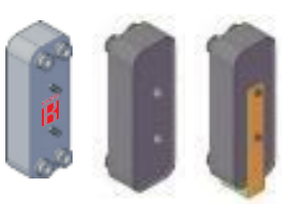
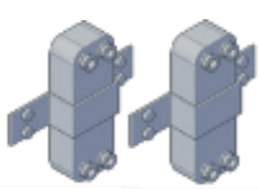
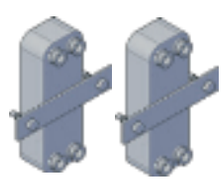
Installation of Brazed Plate Heat Exchanger

- The BPHE should be mounted in an upright position.
- Use flexible hoses or vibration dampers to reduce pulsation to protect the heat exchanger against vibration, thermal and hydraulic induced stress.
- All items should be supported independently.
- The BPHE should be installed as per below instruction:

Setting Flow Direction of Product	Vertical 	Horizontal 	Lying Back 	Slanted 	Slanted 
Counter Flow 	Evaporator: ✓ Condenser: ✓ Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓
Diagonal Flow 	Evaporator: ✓ Condenser: ✓ Cooler: ✓	Evaporator: ✓ Condenser: ✓ Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓	Evaporator: X Condenser: X Cooler: ✓

X: Not recommended, it might reduce the heat transfer performance

- Mounting suggestions for KAORI BPHE, are shown below:

			
A. Stud Bolt	B. Sheet Metal Bracket	C. Crossbar & Bolt	D. Floor Stand

- To avoid damage on stud bolts caused by excessive force, please refer to the reference chart below when installing stud bolts.

Item	First time bolting torque(MAX) (kgf-cm)	First time looking torque(MIN) (kgf-cm)	Fifth time looking torque(MIN) (kgf-cm)
M6	30.6	4.60	3.06
M8	61.2	8.67	6.12
M10	107.1	15.3	10.2
M12	158. 1	23.4	16.3

This chart is based on ISO 2320:1997(E) Table 8. Over-torque of the heat exchanger connection can result in damage on stud bolts.

Benifits & Features of BPHE

- Highly Efficient Thermal Design - High Performance
- More Efficient Use of Materials – Cost Effective
- Mass Reduction in Size – Compact, Less Space, Less Weight
- Proven and Reliable Quality - Long Life Time Durability
- Flexible in Customizing – Increase Production Efficient

Anti-Freeze Protection Methods for BPHE

Any freezing or icing will damage BPHE and the refrigeration system. The following method will minimize BPHE from freezing:

- Use Strainer or filter <1mm, 16 mesh before inlet water.
- Use brine (e.g. glycol) when evaporation temperature is close to the freezing point.
- Low working pressure will cause low evaporation temperature. If the evaporation temperature is below 0˚C, it will cause water to freeze. Since the bottom portion has the lowest temperature, it is the most likely spot for the BPHE to crack.
- To start the refrigeration system, always start the water pump for a few minutes and then start the compressor. To stop the system, always stop the compressor and then stop the water pump to avoid pump down operation.

(1) Low Pressure Cut-off Switch (LP)

A low-pressure cut-off switch should be installed with properly set values. When the actual evaporation pressure is lower than the setting value, the compressor will cut off automatically.

(2) Low Temperature Thermostat (LT)

The function of the thermostat is to prevent evaporation temperature going under 0˚C. If evaporation temperature is always above 0˚C, then water has no chance to freeze and expand.

(3) Water Temperature Sensor

Installation of an antifreeze temperature sensor near the water outlet is another method to prevent the water from freezing. The suggested setting temperature is at 4˚C for buffering purposes.

(4) Water Flow Switch

Installation of a water flow switch in the water circuit can prevent possible BPHE freezing due to low water flow rate. Usually, low water flow rate may be caused by malfunction of water pump, leaking pipes, pipe blockage due to pipe contamination or dirty filter.

Brazing Procedure

Clean and decrease the surface of copper pipes and BPHE connectors before brazing. To avoid oxidation in the copper pipes and BPHE, protect the inside with N2-gas. Place the BPHE on a flat surface and wrap a wet rag around the connectors to protect the BPHE from excessive heating. **Use a 40~45% silver alloy soldering rod to braze the copper pipe into the connector at a maximum temperature of 650°C**. After soldering, clean and dry the connector and BPHE.

Cleaning

While fouling on the BPHE, it is possible to remove most of the debris that is blocking the inside circuit by back flushing. Weak acids with concentration less than 5%; (for example: citric, acid oxalic acid) add in a tank. Circulate the cleaning solution. Before restarting the system, flush the plate heat exchanger with large amounts of fresh water to purge any remaining acid solution. If the acidity is too high, the copper and stainless steel inside the BPHE may be etched or corroded.

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