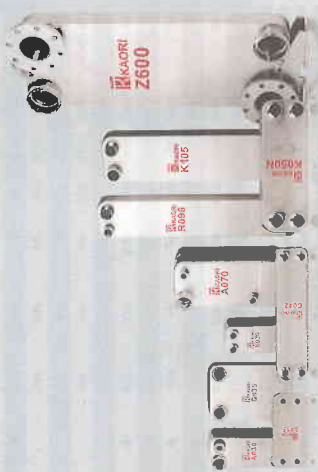




BRAZED PLATE HEAT EXCHANGER



User Manual

KAORI
KAORI HEAT TREATMENT CO., LTD.

3. Benefits

- 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 Efficiency

4. Installation

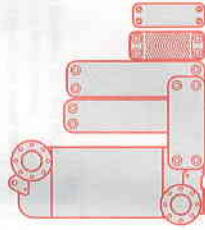


Flow Direction

Application	Type	Fluid 1 (Side 1)	Fluid 2 (Side 2)	Fluid 3 (Side 3)
Evaporator (Single refrigerant)	K, K-S, R, C	Refrigerant A2->A1	Chiller water B1->B2	
Evaporator (Dual refrigerant)	Z400, Z401, Z600	Refrigerant A2->B1	Chiller water A1->B2	
Condenser	K215, K215S	Refrigerant 1 U2->A1	Refrigerant 2 C2->A1	Chiller water E1->E2
	Z415, Z416	Refrigerant 1 U2->A2	Refrigerant 2 C2->A1	Water E1->E2
Condenser	K, K-S, R, C	Refrigerant B1->A2	Cooling water B2->B1	
	Z400, Z401, Z600	Refrigerant B1->A2	Cooling water B2->A1	

* The above flow direction is generally recommended as providing good performance. If it is different from your installation, please contact KAORI sales representative at Tel: +866-3-4626558.

1. Working Principle
2. Application
3. Benefits
4. Installation
5. Anti-Freeze Protection Methods for BPHE
6. Welding Procedure
7. Cleaning
8. Warning
9. Warranty
10. Disclaimer
11. Labeling and Marking
12. EC Declaration of Conformity



Application	Type	Fluid 1 (Side 1)	Fluid 2 (Side 2)	Fluid 3 (Side 3)
Heating, Cooling	K, K-S, R, C, E, F	Cold water (or hot oil) A2->A1	Hot oil (or cold water) B1->B2	
	Z400, Z401, Z600	Cold water (or hot oil) A2->B1	Hot oil (or cold water) A1->B2	
Oil cooler	K, K-S, P, C	Cold water (or hot oil) A2->A1	Hot oil (or cold water) B1->B2	
	Z400, Z401, Z600	Cold water (or hot oil) A2->B1	Hot oil (or cold water) A1->B2	
Air Dryer (Refrigerant)	A030, A070	Refrigerant A2->B1	Air C2-> Separator ->D2	
	A210	Refrigerant A2->B1	Air D2-> Separator ->C2	

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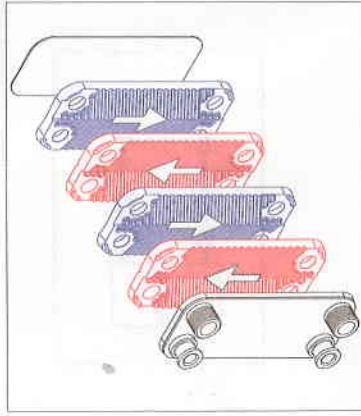
- Always install your BPHE vertically, especially for a refrigerant system. This is done to keep a minimum amount of water below the connector.
- In order to achieve high thermal efficiency and high heat transfer rates, BPHE has to be installed in a counter flow direction as the graph on the right side.

Refrigerant(Gas) Piping:

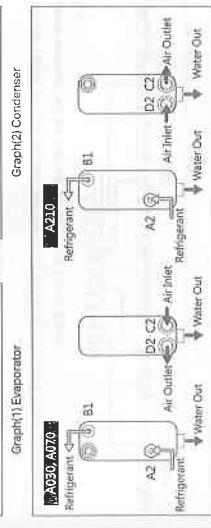
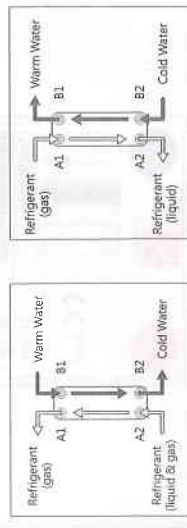
- **Graph(1) Evaporator:** the two-phased (liquid and gas) refrigerant enters the evaporator at the bottom left connector (A2) and the single-phased (gas) refrigerant leaves the evaporator from the top left connector (A1) after the heat transfer process. The water enters at the top right connector (B1) and leaves from the bottom right (B2). In the case of the evaporator, heat is transferred from water to refrigerant and both fluids are in counter flow direction as the graph (1) shown below.
- **Graph(2) Condenser:** the single-phased (gas) refrigerant enters the condenser at top left connector (A1) and the single-phased (liquid) refrigerant leaves the condenser from the bottom left connector (A2). The water enters the condenser at bottom right (B2) and leaves the condenser from top right (B1). In the case of the condenser, heat is transferred from

Kaori's standard Brazed Plate Heat Exchanger (BPHE) is made by stainless steel chevron plates, brazed with copper or nickel. The brazing process seals the plates together making extremely durable. The spaces in between the plates become flow channels with one fluid flowing in odd number channels and the other in the even number channels. Heat exchange occurs through the designed plates over a large surface area making Kaori BPHEs very efficient.

We continue to provide a wide range of product choices, including working pressure from 2 to 140 bar, and the working temperature from -196°C to 900°C. Kaori's long experience in manufacturing and expertise in thermal technology allows us to be flexible in customizing our heat exchangers to meet you where you are. Kaori's BPHEs can be customized to handle a wide range of systems and capacities, and paired with the right connectors you need for easy installation.



- **Graph(3a) Air Dryer a. A030, A070:** the refrigerant enters from the bottom left connector (A2), after the heat transfer process, the refrigerant leaves from the top right connector (B1), and the air enters from the bottom right connect of the reverse side (C2). When air flows through the separator, the water pours from the bottom connector, and the dry air leaves from the bottom left connector (D2) as the graph(3) shown on the left.
- **Graph(3b) Air Dryer b. A210:** the refrigerant enters from the bottom left connector (A2), after the heat transfer process, the refrigerant leaves from the top right connector (B1), and the air enters from the bottom left connect of the reverse side (D2). When air flows through the separator, the water pours from the bottom connector, and the dry air leaves from the bottom right connector (C2) as the graph(3) shown on the right.



Graph(3) for air dryer

Kaori BPHEs are the best suited for heat transfer between the following mediums.

- All types of refrigerants (gases).
- Water
- Oil
- Various brine solutions (glycol mixtures, Ethylene Glycol, Propylene Glycol, alcohols)
- Organic solvents

Application in strong acid or alkali (e.g. NH3) is suggested to use nickel-brazed plate heat exchangers.

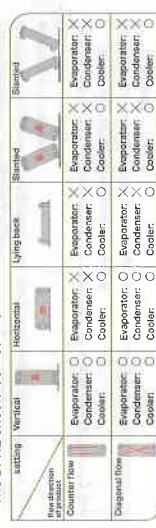
Kaori BPHE can be used in:

- Heat Pumps and Solar Hot Water.
- Boilers, Domestic Heating, Floor Heating
- Chillers
- Refrigeration
- Refrigerated Showcase, Transport Refrigeration Systems
- Refrigerated Air Dryer, Temperature and Humidity Chambers
- Water Cooler (Drinking Water or Process Water for Various Industries)
- ORC Waste Heat Recovery Generator
- Fuel Cell, CHP, Wind Power
- Gear Box
- Plastic Machines, Welding Machines, Hydraulic Presses (Oil), and Compressor Oil Cooling

In refrigeration cycle, BPHE are widely used as:

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

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



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

Mounting suggestions for KAORI BPHE, are shown below:



- 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 losing torque(MIN) (kgf-cm)	Fifth time losing torque(MIN) (kgf-cm)
M8	30.6	4.60	3.06
M6	61.2	9.67	6.12
M10	107.1	15.3	10.2
M12	158.1	23.4	16.3

This chart is based on ISO 23320:1997(E) Table 8. Over-torque of the heat exchanger connections can result in damage on stud bolts.