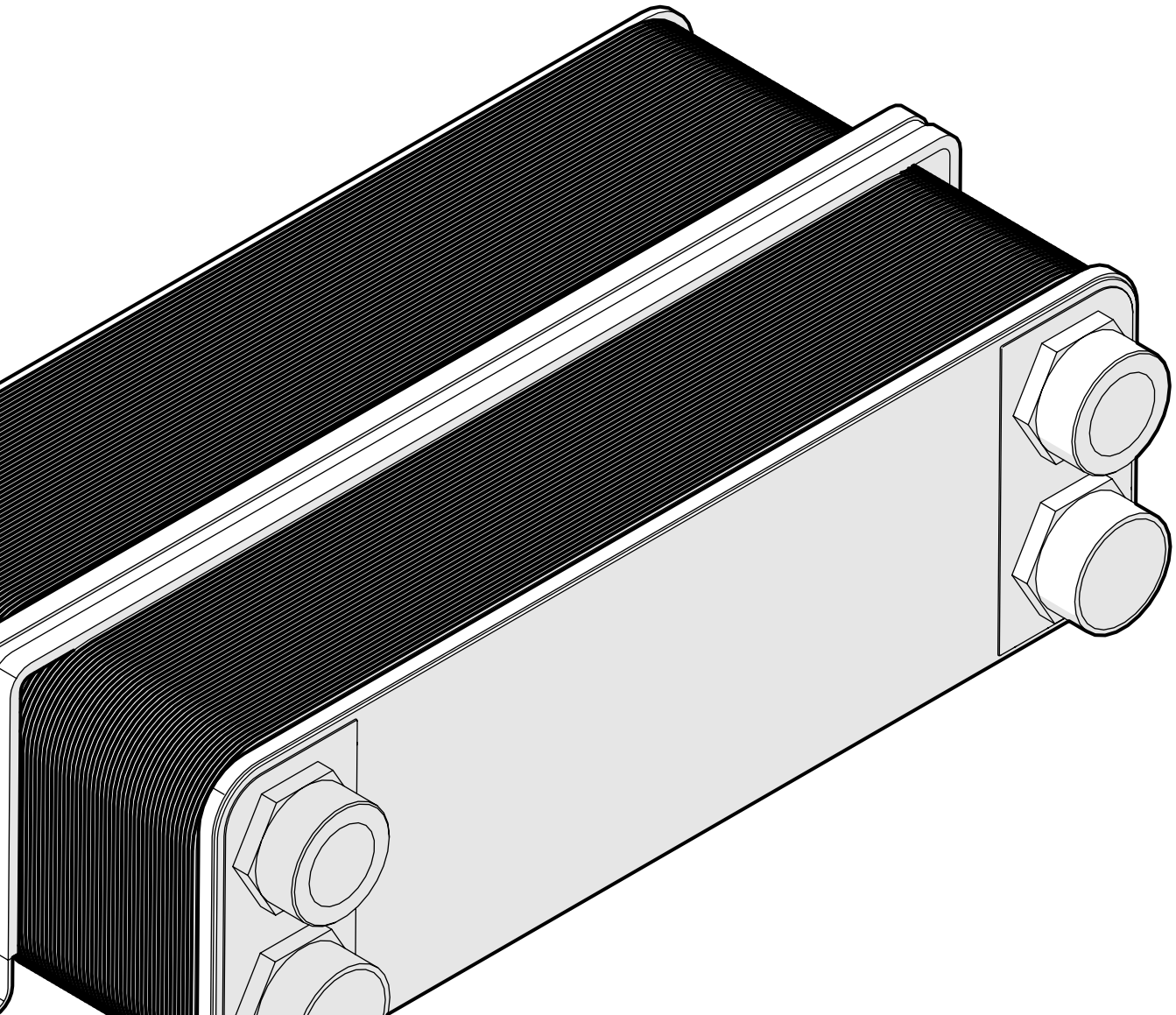
Hydro Lync

*Engineering Excellence*

CE

EC Regulation
Directive 97/23/ EC

# HPC Series
## User's Guide



# Working Principle

HPC 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 HPC BPHEs very efficient.

We continue to provide a wide range or product choices, including working pressure from 2 to 140 bar, and the working temperature from -196°C to 900°C. 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.

# Applications

HPCs, are the best suited for heat transfer between the following mediums.

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

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

HPC 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, HPC are widely used as:

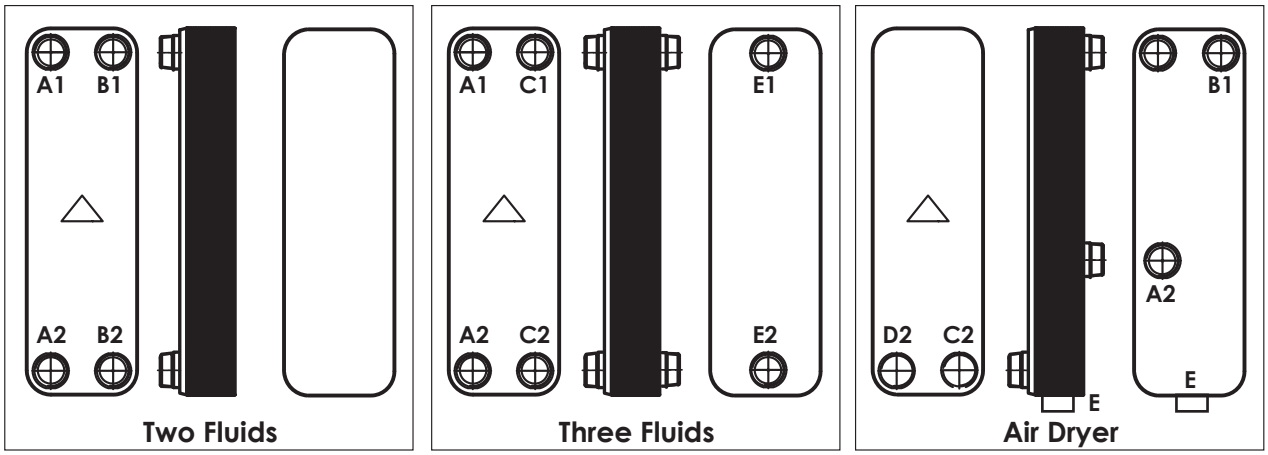
- Evaporator
- Condenser
- De-superheater
- Subcooler
- Economizer
- Pre-cooler
- Inter-cooler
- Water / Oil cooler

# 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

# Installation

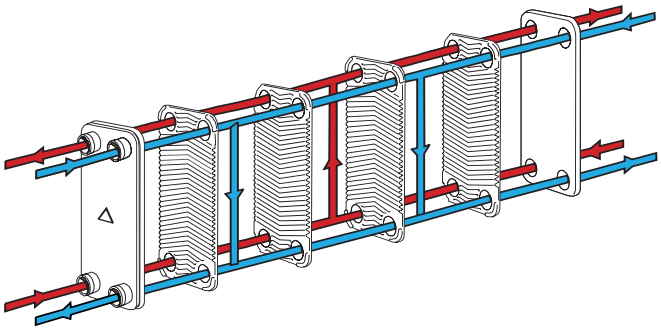
## 1. Flow Direction




| Application | Type | Fluid 1 (Side1) | Fluid 2 (Side 2) | Fluid 3 (Side 3) |
|---|---|---|---|---|
| Evaporator (Single Refrigerant) | K, K-S, R ,C | Refrigerant A2->A1 | Chiller water B1->B2 | |
| | Z400, Z401, Z600 | Refrigerant 1 A2->B1 | Chiller water A1->B2 | |
| Evaporator (Dual refrigerant) | K215, K215S | Refrigerant 1 A2->A1 | Refrigerant 2 C2->C1 | Chiller water E1->E2 |
| | Z415, Z416 | Refrigerant 1 A2->C1 | Refrigerant 2 C2->A1 | Water E1->E2 |
| Condenser | K, K-S | Refrigerant A1->A2 | Cooling water B2->B1 | |
| | Z400, Z401, Z600 | Refrigerant B1->A2 | Cooling water B2->A1 | |
| Application | Type | Fluid 1 (Side1) | 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, BL, H, JX** | **Cold water (or hot oil) B1->B2** | **Hot oil (or cold water) A2->A1** | |
| | Z400, Z401, Z600 | Refrigerant 1 A2->B1 | Hot oil (or cold water) A1->B2 | |
| Air Dryer (Refrigerant) | A030, A070 | Refrigerant A2->B1 | Air C2-> Separator ->D2 | |
| | A210 | Refrigerant B1->A2 | Air D2-> Separator ->C2 | |

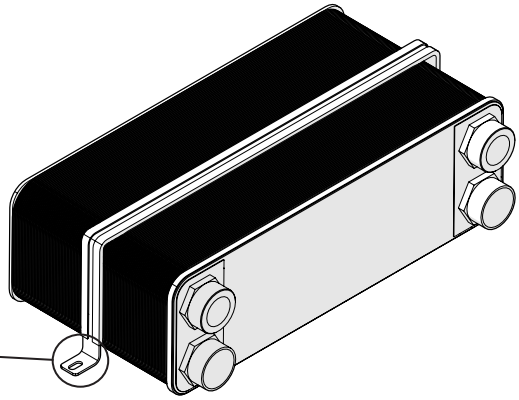
**** The above flow direction is generally recommended as providing good performance. If it is different from your installation, please contact HydroLync sales representative.***

- 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, HPC has to be installed in a counter flow direction as the illustation the right side.

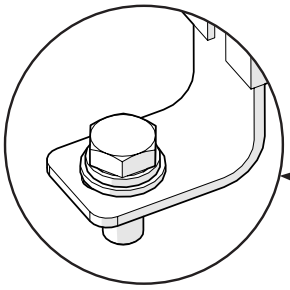


## 2. Mounting

- Never expose the unit to pulsations or excessive cyclic pressure or temperature changes. It is also important that no vibrations are transferred to the heat exchanger. If there is a risk of this, inst all vibration absorbers. For large connection diameters, we advise you to use an expanding device in the pipeline. It is also suggested that e.g. a rubber mounting strip should be used as a buffer between the HPC and the mounting clamp.
- Mounting suggestion for HPCs is shown right side. For smaller HPCs, it is also possible to mount the unit by simply suspending it from the pipes/connections.



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



**Torque on stud bolts guide**

| Item | "First time bolting torque(MAX) (kgf-cm)" | "First time loosing torque(MIN) (kgf-cm)" | "Fifth time loosing torque(MIN) (kgf-cm)" |
|---|---|---|---|
| M6 | 30.6 | 4.6 | 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 base on ISO 2320:1997(E) Table 8. Over-torque of the heat exchanger connections can result in damage on stud bolts.*

## 3. Anti-Freeze Protection Methods for HPCs

Any freezing or icing will damage HPC and the refrigeration system. The following methods will minimize HPC 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 HPC 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 first 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 be 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.

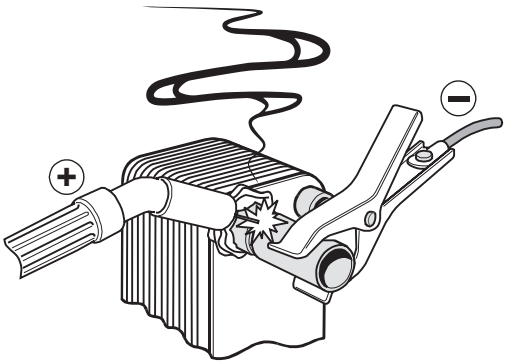
**(3) Water Temperature Sensor**

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**

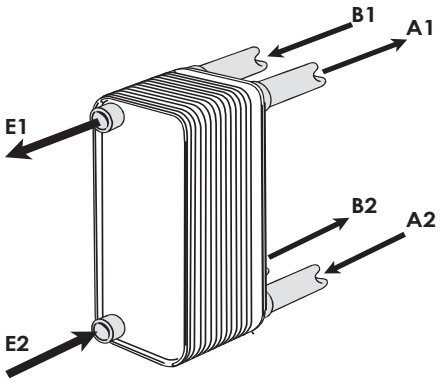
Installation of a water flow switch in the water circuit can prevent possible HPC freezing due to low water flow rate. Usually, low water flow rate may be caused by malfunction of water pump, leaking pipes, pipe blockage due to pipe contamination or dirty filter.

## 4. Welding Procedure




Cleaning and degreasing the surface of copper pipes and BPHE connectors before welding. 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 weld the copper pipe into the connector at a maximum temperature of 650°C. After soldering, clean and dry the connector and HPCs.

## 5. Cleaning




While fouling on the plate heat exchangers, back flushing is always possible to remove most of the soft debris that is blocking the inside. Weak acids with concentration less than 5%; for example: citric, acid oxalic acid add in a tank. For optimum cleaning, the cleaning solution flow rate should be a minimum of 1.5 times the normal flow rate, preferably in a back-flush mode. After use, do not forget to rinse the heat exchanger carefully with clean water. A solution of 1-2% sodium hydroxide (NaOH) or sodium bicarbonate (NaHCO ) before the last rinse 3 ensures that all acid is neutralized. Clean at regular intervals. If the acidity is too high, the copper and stainless steel inside the HPC may be etched or corroded.

## 6. Warning

- Maintain a safe work environment to get a risk free of Personal injury or equipment damage. For example: when lifting 3M separation is recommended.
- Fluid that is explosive, extremely flammable, highly toxic, highly corrosive, or hazardous in nature cannot be used with the HPC. Examples are nitric acid, sulfuric acid, ammonia (for copper models) etc.
- When the water applied to the HPC is of unknown quality, filter and strainer <1mm should be placed at the water inlet of HPC to filter out the dirt or large particles.
- Mesh size of around 16 is suitable for most cases. Blockage of evaporator due to dirt or large particles will reduce the flow rate of water which might cause freezing effect and consequently damage the integrity of the HPC.
- Chlorinated water, seawater, etc. are not suitable for HPC due to their corrosive nature on regular stainless steel and copper. Please refer to the regulations as below chart.
- Ground water with high levels of sulfuric compound, sulfuric acid, or low PH value, may cause gradual copper corrosion and damage the HPC in a few years.
- Rubber strips should always cover the bottom edge of the HPC in order to protect the hand and wrist against the sharp metal edges. If the rubber strip is not a required part of your order, be careful of the sharp metal edge.
- When moving the HPC, always wear gloves and pay attention to the sharp edges around the bottom of HPC. Our HPC can come without the rubber protective strip at your request.
- Storage in a dry and heated warehouse between 1°C and 50°C is required.

## 7. Warranty

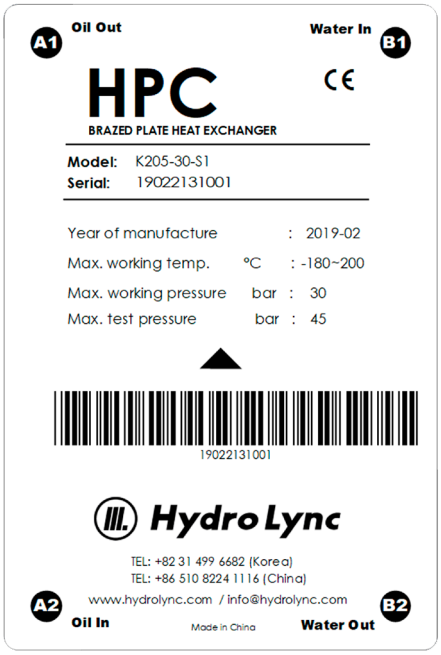
- Warranty period is standard 12 months from the date of shipment under normal use. The warranty covers manufacturing defects only. This regulation is not applied if you have received an advance notice that HydroLync will not provide the product warranty because of the unsuitable working environment.
- Exclusive warranty are:
  (1) Altered working condition or repaired in a manner affecting the efficiency of performance of the unit.
  (2) Damages caused by freezing, flood, fire, any natural disaster or accident.
  (3) Damages caused by incorrectly installed or operated.
  (4) The HPC is surrounded by corrosive environment.
  (5) Claims due to sediment deposits.

## 8. Disclaimer

HydroLync takes every care to assure the accuracy of the information, however, the information is provided as it is for a reference and is not subject to guarantee. The information may be changed or updated without notice. HydroLync is not liable for any direct or indirect damages of any kind arising use of the information.

## 9. Labeling and Marking

The right side nameplate is an example of HPC K205 type. Model name will be shown on the label attached. For tracking purposes, a serial number and a barcode will be printed on the label.




example:

1 9 0 2 2 1 3 1 0 0 1 - 3 0 M

- Number of plates: 30
- Serial number: 001
- Furnance Number: 3
  Furnance Batch: 1
- Produced Date: 2019/02/21

## 10. Water Quality Standard

| "Substances dissolved in water" | Concentration | Stainless steel | Copper |
|---|---|---|---|
| pH Value | <6.0 | X | X |
| | 6.0 - 9.0 | X / O | O |
| | >9.0 | O | O |
| Electrical conductivity | <500 [μ S/cm] | O | O |
| | >500 [μ S/cm] | O | X |
| $Cl^-$ | <300 | O | O |
| | >300 | X | X |
| $SO_4^{-2}$ | <50 | O | O |
| | 50 – 300 | O | X |
| | >300 | X | X |
| $CaCO_3$ | <50 | O | O |
| | >50 | X | X |
| Fe | <0.3 | O | O |
| | >0.3 | O | X |
| $NH_3$ | <2 | O | O |
| | 2-20 | O | X |
| | >20 | O | X |
| $NO_3$ | <100 | O | O |
| | >100 | O | X |
| $S^{-2}$ | | X | X |
| $SiO_2$ | <30 | O | O |
| $NH4^+$ | <0.1 | O | O |
| Free chlorine | <0.1 | O | O |
| $CO_3^{-2}$ | <0.4 | O | O |

1. *The Water Quality for Heat Exchanger should be applied to above standard.*
2. *When using De-ionized water, pure water, extra pure water, nickel brazed is recommended*
3. *If you are concerning about certain elements which are not listed in this chart, please contact our sales representative.*

# Hydro Lync

## Engineering Excellence

## Contact us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