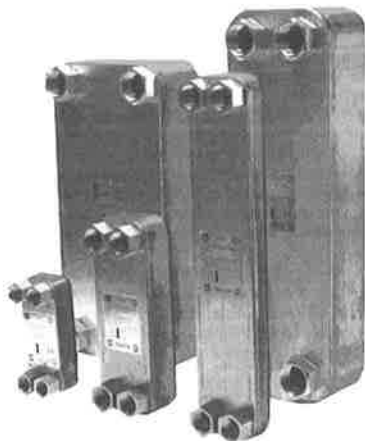


User Manual Braze Plate Heat Exchanger

HYDAC HEX Sxxx



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Please note:

Before proceeding with installation and operation read entire manual carefully. Failure to do so can cause injury or property damage.

When receiving heat exchangers, any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee. The heat exchangers may have some sharp edges so exercise caution when handling.

Provided that it is used and maintained in accordance with the generally accepted codes of good practice and the recommendations of the User manual, meets the essential safety and health requirements of the Pressure Equipment Directive 97/23/EC.

3. Advantage

HYDAC BPHE provides many great advantages:

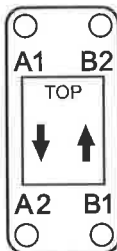
- Highly thermal efficiency
- Compact size and less weight
- High working pressure
- High thermal resistances and high operating temperature
- Lower cost for the same performances
- Lower pressure drop and high corrosion resistance
- No gaskets, no leakages
- Easy installation, easy replacement, less maintenance
- Durability

5. Specification & BPHE Dimension

Type	L1 mm	L2 mm	W1 mm	W2 mm	Weight Kg	Thickness (H) mm	Area M ² /plate	Volume Liter/Channel	Max No. of plate
HEX S400	194	154	80	40	0.8+0.050N	10.0+2.25N	0.0117	0.025	60
HEX S600	311	278	73	40	0.84+0.07N	10.0+2.30N	0.01946	0.040	60
HEX S610	306	250	106	50	1.5+0.135N	10.0+2.40N	0.0255	0.055	100
HEX S610	304	250	124	70	1.6+0.150N	10.0+2.40N	0.0300	0.065	100
HEX S615	522	466	106	50	3.1+0.220N	10.0+2.40N	0.0475	0.095	120
HEX S715	504	444	124	64	3.5+0.240N	10.0+2.40N	0.0533	0.107	120
HEX S722	613	519	186	92	7.12+0.41N	14.0+2.40N	0.09446	0.206	140
HEX S522	528	456	246	174	7.2+0.520N	11.5+2.40N	0.1099	0.232	160
HEX S210	527	430	245	148	8.5+0.490N	11.5+2.85N	0.1036	0.289	160

4. Design Condition for Copper Braze PHE

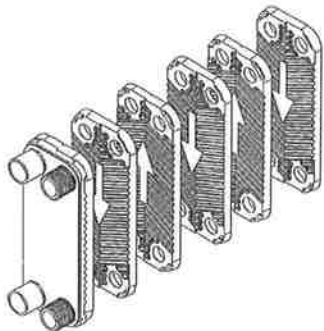
Type	Max. Allowable Pressure (PS)	Test Pressure (PT)	Working Temperature Range
HEX S400 / S500 / S610 / S510 / S615 / S715 / S722 / S522	30 Bar	45 Bar	-160~+200°C
HEX S210	16 Bar	23 Bar	



1. Working Principle

HYDAC Brazed Plate Heat Exchanger (BPHE) consists of chevron plates of acid-resistant stainless steel. Every other plate is reversed so the ridges of the herringbone pattern intersect one another on adjacent plates forming a lattice on contact points. When these points are vacuum brazed together, two separate systems of channels for two media flow in counter-current are formed. The lattice structure causes vigorous turbulence, thus, ensuring maximum heat transfer.

The BPHE is a highly efficient, corrosion-resistant and pressure-resistant heat exchanger. The standard BPHE is designed to meet 30 bar, 200°C, and the largest-size handles a maximum flow capacity of 900 liter/min.



2. Application

HYDAC BPHE can be used for various medias:

- All type of refrigerants; ammonia will be used for nickel brazed.
- Organic solvents
- Water
- Oil
- Various brine solutions (glycol mixtures, CaCl₂, alcohols etc)

HYDAC BPHE can be used:

- Heat pumps
- Industrial chiller; plastic machines, welding machines, hydraulic presses (oil), and compressor oil cooling
- Air conditioning
- Refrigeration
- Air dryer
- Water cooler; drinking water or process water for various industries
- Temperature holding for storage tanks
- Heat recovery including heat recycling from hot steam
- Indoor heating including floor heating

Refrigerant applications, BPHE function as:

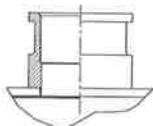
- Evaporators
- Condensers
- Super-heaters for gas
- Desuper-heaters for gas
- Subcoolers for condensate
- Economizers
- Intercoolers
- Oil coolers

6. Standardized Connections

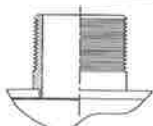
- * Connections for fluid applications are threaded connectors.
- * Connections for refrigerant units are soldered/sweat connectors.

Type	Threaded Connections														
	PT/NPT/GB -Male					PT/NPT/GB-Female									
	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	1/2"	3/4"	1"	1-1/8"	1-1/2"	2"	2-1/2"
HEX S400	☒	☒							☒	☒					
HEX S500	☒	☒							☒	☒					
HEX S610	☒	☒	☒						☒	☒	☒				
HEX S510	☒	☒	☒	☒					☒	☒	☒				
HEX S615			☒						☒	☒	☒				
HEX S715			☒	☒	☒				☒	☒	☒	☒			
HEX S722			☒	☒	☒	☒			☒	☒	☒	☒	☒		
HEX S522			☒	☒	☒	☒			☒	☒	☒	☒	☒	☒	
HEX S210			☒	☒	☒	☒	☒		☒	☒	☒	☒	☒	☒	☒

Type	Soldered Connections					
	1/2"	5/8"	7/8"	1-1/8"	1-3/8"	1-5/8"
	I.D 12.90mm	I.D 16.15mm	I.D 22.56mm	I.D 28.80mm	I.D 33.25mm	I.D 41.50mm
HEX S400	☒	☒				
HEX S500	☒	☒				
HEX S610	☒	☒	☒		☒	
HEX S510	☒	☒	☒	☒	☒	
HEX S615	☒	☒	☒	☒	☒	☒
HEX S715	☒	☒	☒	☒	☒	☒
HEX S722	☒	☒	☒	☒	☒	☒
HEX S522	☒	☒	☒	☒	☒	☒
HEX S210	☒	☒	☒	☒	☒	☒



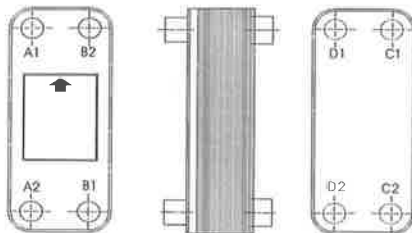
Soldered Connections



Threaded Connections

7. Installation Guide

- Illustration of 1 : General purpose of BPHE
 2 : Types of fluid applied
 3 : Arrangements of fluids directions



Application	Fluid 1	Fluid 2	Fluid 3
Evaporator (single refrigerant)	Refrigerant A2→A1	Chiller water B2→B1	
Evaporator (dual refrigerant)	Refrigerant 1 A2→A1	Chiller water B2→B1	Refrigerant 2 C2→C1
Condenser	Refrigerant A1→A2	Cooling water B1→B2	
Heating, Cooling	Cold water A2→A1	Hot water B2→B1	
Oil cooler	Cooling water A1→A2	Oil B1→B2	
Air Dryer (Refrigerant)	Refrigerant A2→A1	Air D2→(D1)→(B2)→B1→Separator→C1→C2	
Air&Oil cooling (Air compressor)	Oil A2→A1	Cooling water D2→(D1)→(B2)→B1	Air C1→C2

*Always install your BPHE vertically, especially for a refrigerant system, in order to be secured and keep less volume of water below the connector.

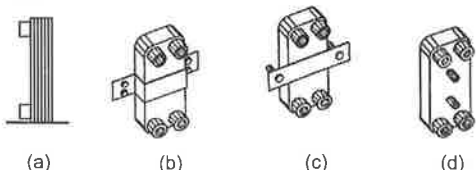
* In order to achieve high thermal efficiency and high heat transfer rates, BPHE is better to be installed in counter flow direction.

*When BPHE works as an Evaporator, the two-phased (liquid and gas) refrigerant enters the evaporator at the bottom left connector and the single-phased (gas) refrigerant leaves the evaporator from the top left connector after heat transferring. The water enters at the top right connector and leaves from the bottom right. In the case of evaporator, heat is transferred from water to refrigerant and both fluids are in counter flow direction.

*When BPHE works as a condenser, the single-phased (gas) refrigerant enters the condenser at top left connector and the single-phased (liquid) refrigerant leaves the condenser from the bottom left connector. The water enters the condenser at bottom right and leaves the condenser from top right. In the case of condenser, heat is transferred from refrigerant to water and both fluids are in counter flow direction.

*Mounting suggestions: There are four different ways to mount the BPHE:

(a) Bottom support (b) Sheet metal bracket, (c) Crossbar & bolts, (d) Stud bolts



-All items should be supported independently.

-Do not apply excessive forces to the fittings.

-Except for small in sized HYDAC HEX S400, brazed PHE cannot fasten directly to the fittings/piping.

-Using flexible hoses or vibration dampers to reduce pulsation, shock or vibrations those are caused by the operating system.

8. Anti-Freezing Protection Methods for BPHE.

-Any formation of freezing or icing will damage BPHE and the refrigeration system. The following methods will prevent BPHE from freezing up.

-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 the water to freeze up. As a result, evaporator is being expanded and finally cracked open, especially the bottom portion of the PHE. Since bottom portion has the lowest temperature.

-To start the refrigeration system, always starting with the water pump for a few minutes, and then starting the compressor. To stop the system, always stopping with the compressor, and then stopping the water pump.

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

A low-pressure cut-off switch shall be installed and the value shall be set properly. 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 thermostat is to prevent evaporation temperature going under 0°C. If evaporation temperature is always above 0°C, than water has no chance to freeze up and expand.

(3) Water Temperature Sensor

Installation of an Anti-freezing temperature sensor near the water outlet is another method to prevent the water from freezing up. The setting temperature is suggested at 4°C for buffering purpose.

(4) Water Flow Switch

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

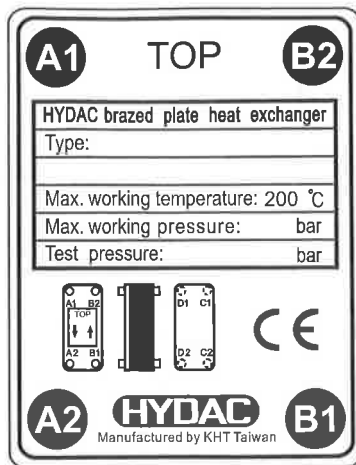
12. Warranty Terms

- Free of charge if what defects are caused by manufacturing material or manufacturing workmanship.
- Warranty Period is 12 months after exit factory delivery or else, by contract with the purchaser.

- Exceptions are:

- (1) The failure or malfunction of BPHE is caused by improper or negligent usage of BPHE.
- (2) Malfunctions from Freezing or icing, flood, fire, or any natural disaster, or accident.
- (3) Damages cause by improper or faulty installation, or product exposed to corrosive elements harmful to the structure.

13. Label and Marking



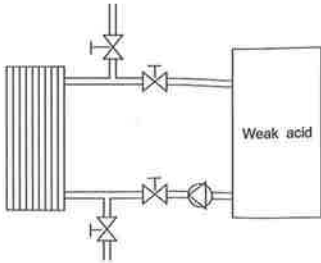
For tracking purposes, model name and serial number will be embossed on the plate of the front cover below the two upper connectors of the BPHE.

9. Soldering Instruction

Cleaning and degreasing the surface of copper pipes and PHE connectors before soldering is important. To avoid the inside of copper pipes and BPHE from Oxidation, protect the inside with N_2 -gas. Put 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 max. of 800°C. After soldering, clean and dry the connection and BPHE.

10. Cleaning

Cleaning of fouled plate heat exchangers is important. Back flushing will remove most of the soft debris that is blocked the inside. The solution used by back flushing shall be weak acid with concentration less than 5%, for example citric acid. If acidity is too high, the copper and stainless steel, which is inside the PHE, might be etched or corroded. Before restarting the system, flush the plate heat exchanger with large amounts of fresh water to purge any remaining acid solution.



EC DECLARATION OF CONFORMITY

According to the following EC Directive

-Pressure Equipment Directive: 97/23/EC

Brazed Plate Heat Exchangers (BPHE)

Type: _____
Pressure Bearing Material:

- Steel 304 (ASTM A240 or JIS G4304/G4305)
 Steel 316 (ASTM A240 or JIS G4304/G4305)

Provided that it is used and maintained in accordance with the generally accepted codes of good practice and the recommendations of the User Manual, this device meets the essential safety and health requirements of the Pressure Equipment Directive.

To prevent the most specific risks of this device, the safety and compliance with the essential requirements of the Directive have been applied. The design, fabrication, inspection and testing should comply with: ASME Boiler and Pressure Vessel Code Section VIII, and EN 14276-1 Pressure equipment for refrigerating system and heat pumps, Part 1: Vessels – General requirement. Brazing Procedure Reference: EN 14276-1, Annex B, and ASME Section IX

For the procedure of EC conformity assessment, the manufacturer chooses Module DI for the complete serials of products, which covers the Category I, II at present, and are used for Fluids in Group 2 of pressure vessel equipment. Notified Body is DET NORSKE VERITAS and the Identification number is 0575.

11. Warning

- Fluid that is explosive, extremely flammable, highly toxicant, highly corrosive, hazardous or etc. Cannot apply to BPHE. Examples are ammonia, nitric acid, sulfuric acid, etc.
- When unknown quality of water is applied to BPHE, filter and strainer should be place at the water inlet of BPHE to filter out the dirt or large particles. Mesh size of around 20 is suitable for most cases. Blockage of evaporator due to dirt or large particles will reduce the flow rate of water then the water will freeze up, consequently might cause the crack of the BPHE.
- Chlorinated water, seawater, etc. are not suitable for BPHE because it will corrode and damage the BPHE. For example, swimming pool water.
- Solution which applied to BPHE shall have PH value range between 6 ~ 8.
- Ground water with high sulfuric compound, sulfuric acid, low PH value, may cause gradual copper corrosion and damage the BPHE in a few years.
- Rubber ring always mounts or adheres the bottom edge of the BPHE in order to protect the hand and wrist against the sharp metal edges. If the rubber ring is not a required part of your order, watch out for the sharp metal edge.
- When moving BPHE, always wear gloves and pay attention to the sharp edges around the bottom of BPHE. Some BPHE comes with rubber strips that covers the sharp edge of the BPHE but some does not. It all depends on your request.

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