BRAZED PLATE HEAT EXCHANGERS

DHT
COMFORT SOLUTIONS

CONCEPT, PRODUCT AND APPLICATIONS

DIVERSIFIED HEAT TRANSFER, INC. • Website: www.dhtnet.com • 1-800-221-1522

Our BPHE concept

The compact Brazed Plate Heat Exchanger (BPHE) is constructed as a plate package of corrugated channel plates with a filler material between each plate. During the vacuum-brazing process, the filler material forms a brazed joint at every contact point between the plates, creating complex channels. The BPHE allows media at different temperatures to come into close proximity, separated only by channel plates that enable heat from one media to be transferred to the other with very high efficiency. The concept is similar to the older plate and frame technology, but without the gaskets and frame parts.

Simple, flexible, cost-effective

The channel plates form separate circuits for each media. The number, type and configuration of the channel plates are easy to vary to provide the thermal characteristics required.

In a one-pass configuration, the two flows are continuous through each channel plate. In a two-pass configuration, the two flows are redirected by special channel plates to give the equivalent of two units connected in series. In addition to one- and two-pass configurations, we offer a variety of other executions and customized solutions.

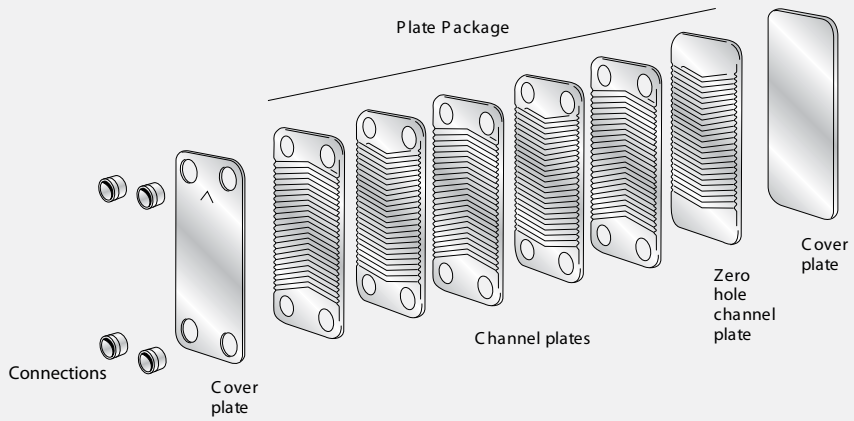
The flows inside a heat exchanger can be arranged differently to fulfill different purposes. In our BPHEs, counter-current flow is more common because it increases efficiency. However, our BPHEs also employ co-current flow where necessary in applications such as flooded evaporators.

Easy to install

Compared with shell-and-tube models of the same capacity, our BPHEs are as much as 90% smaller by weight and volume. The BPHE is not only easier to transport and handle, but its size means it also offers greater system design freedom. Furthermore, connections are available in a wide range of industry standards.

Plus we provide technical support, together with comprehensive data and application information.

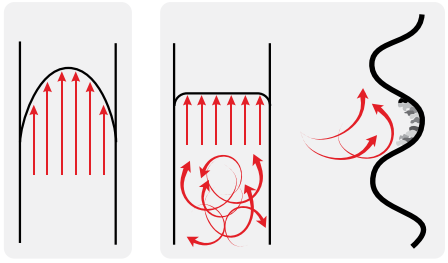
BPHE principle



Benefits

Our BPHEs were developed with experience and expertise from a wide range of applications in many different climates. We aim to maximize the performance and at the same time minimize the amount of material used. This has environmental benefits, keeps costs down and reduces exposure when material prices increase. Other benefits of our BPHEs include:

- **Tailored**: Optimized and customized
- **Performance**: Reliable, energy-efficient and cost-effective
- **Economical**: Optimal material usage
- **Versatile**: Cover a wide range of cooling and heating capacities
- **Competitive:** Save space compared with Shell & Tube heat exchangers; withstand high temperature and pressure (no gaskets), unlike PHE heat exchangers, and have minimal weight
- **Turbulent**: Resist scaling and fouling; effective self-cleaning



- **Innovative**: Patented solutions, e.g. true dual, double-wall and asymmetric BPHEs
- **Tested**: Pressure- and leak-tested. All widely recognized pressure vessel codes available, e.g. PED, KHK and UL.
- **Responsive**: Small holdup volume and lower refrigerant charge
- **Standards**: Comply with standards such as ISO 9001 (quality) and ISO 14001 (environmental)

Heating applications

Examples of applications in the heating area include heat pumps, gas/oil-fired boilers and district heating substations. The effectiveness and compactness of our BPHEs are ideal for these applications, and the overall size of the system can often be reduced considerably using a BPHE solution.

Boilers

Our BPHEs are used in residential gas/oil-fired boilers to provide hot tap water. We have a dedicated product range with small, compact and efficient BPHEs that deliver high comfort and efficiency in your system.

Heat pumps

Our BPHEs work efficiently with other heat pump components to upgrade renewable energy absorbed from the ground or ambient air to provide hot water for space heating and tap water. The versatility of our BPHEs enables them to be used in reversible systems, where they also can deliver cooling. Our BPHEs handle tight temperature approaches, which decreases the work input needed in the compressor and hence increases the COP (Coefficient of Performance) for your system.

District heating

District heating systems distribute heat produced centrally to consumers for space heating and hot tap water. Our BPHEs operate efficiently and reliably in district heating substations to transfer heat from the network to the domestic heating circuit.

Solar

With their small CO footprint, our BPHEs are ideal for smart solar heating systems. Solar heating has the obvious environmental and economic advantages that the energy supplied is free and renewable. Careful design incorporating our BPHEs delivers reliability, efficiency and minimal running costs.

Air conditioning applications

Our BPHEs efficiently provide cooling water for air conditioning. This makes it possible to maintain a constant comfortable temperature in offices, hospitals, homes and other locations.

Chillers

In a chiller, a refrigerant cycle is used indirectly to cool homes or commercial areas via the energy-absorbing effect of the evaporator. We have a wide range of BPHEs that work efficiently as dedicated evaporators in both air- and water-cooled chillers. We also offer reliable BPHEs as condensers to reject the heat in water-cooled chillers. Our BPHEs also have proven excellent performance as economizers and desuperheaters, improving system efficiency.

Absorption chillers

Our BPHEs improve the efficiency of absorption chillers, where as subcoolers and preheaters they can optimize the system. Absorption chillers are an alternative when electricity is limited or heat is abundant. Instead of using the conventional refrigerant cycle, high-temperature heat is used as the main energy source. The refrigerant is usually water and the absorbent is a lithium bromide solution. Our BPHEs have a proven ability to withstand lithium bromide, which is corrosive, thanks to their high-quality materials and our excellent system expertise.

Refrigeration applications

Our wide range of BPHEs covers several heat transfer functions in refrigeration applications, where they help keep things cool efficiently and with consideration to the environment. Refrigeration applications often involve high pressure, so the robustness of our BPHEs makes them an excellent choice. Our BPHEs are designed to distribute the refrigerant uniformly over the plate. This gives optimal utilization of the heat-exchanging surface, and creates an extremely compact and cost-effective solution.

Transport

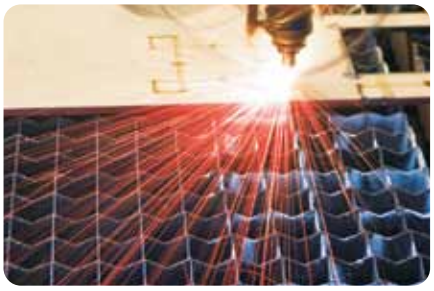
Our BPHEs are used in container chillers and freezers used to transport fruit, fish and other temperature-sensitive goods. Our BPHEs are commonly used as economizers in these systems, where they boost efficiency.

Supermarkets

In supermarkets, cooling is needed at medium temperature for display cases and at low temperature for deep freezers. Our BPHEs fulfill several functions in supermarket refrigeration systems, where they work safely and reliably as evaporators, condensers, economizers and desuperheaters.

Industrial applications

Our BPHEs are robust, compact, cost-effective and reliable over long periods with minimal maintenance – all vital qualities in industrial applications. We bring immense international experience to this area, which includes cooling for oil, laser and electronic systems. Our BPHEs are also suitable for fuel oil heating and highly efficient cogeneration (CHP) systems. The BPHE's flexible design and the ability to customize both the plate and brazing materials frequently mean unbeatable performance compared with conventional heat exchangers.



Oil cooling

Our wide range of BPHEs covers the needs of several different types of oil cooling e.g. hydraulic, engine and transmission oil cooling. The reliability and compactness of our BPHEs are highly valued in oil cooling applications, where space for the heat exchanger is often limited and access for maintenance is restricted.

Manufacturing

Our brazed plate heat exchangers have proven to deliver high performance... with thermal efficiency and cost effectiveness. That's because DHT BPHEs are the product of state-of-the-art manufacturing, involving statistical process control, precision tooling and laboratory-driven innovation. Other manufacturing features and controls include:

Materials

There are far-reaching specifications and purchasing only from certified suppliers. This ensures that our products have a long and reliable service life backed up with the traceability demanded by many third-party approvals. Manufacturing is available in AISI-316, AISI-304, and SMO-254.

Pressing

Channel plates are produced on automatic integrated press lines that guarantee consistently high quality.This precise and carefully supervised process ensures cost-effective manufacturing and maximal efficiency for each of our BPHEs.

Brazing

Meticulous brazing is the key to leak-free, corrosion-resistant heat exchangers. Special brazing programs are applied, with precisely adapted heating and cooling cycles, for every combination of materials and size of heat exchanger. The most common filler material is copper, but nickel is also available.

Testing

All heat exchangers produced are leak tested, regardless of the model, size and type of connection. Heat exchangers are normally pressure-tested at 1.5 times the maximum working pressure.

Optimized for new refrigerants

Environmentally friendly

Older refrigerants are being displaced by modern alternatives on environmental grounds. Today's preferred refrigerants, such as R410A, R134a and CO_2, are helping countries comply with their Kyoto targets, but they have been difficult to use efficiently. We now offer BPHEs optimized for these refrigerants.

R410A

Our P-type is optimized for the refrigerant R410A, which is regarded as a long-term global HCFC replacement. R410A achieves the same amount of cooling with less refrigerant, enabling the design of more compact systems. The P-type consists of several single- and dual-circuit BPHEs working in a wide capacity range from 68k Btu's to 1.3 MM Btu's.

R134a

Our S-range is dedicated to applications using the refrigerant R134a. The S-type includes the DS500, which is the largest true dual evaporator and represents a major step forward in BPHE capacity for R134a applications. The DS500 can handle capacities up to 2 MM Btu's/hr. and competes vigorously in a market previously dominated by shell-and-tube heat exchangers.

CO_2

CO_2 has great potential as a refrigerant, but its operating conditions are very demanding. We have BPHEs that performs efficiently with CO in chiller systems with capacities of 1.2 MM Btu's and more. For transcritical systems, our B16DW is approved for operation at up to 2,030 psi.

Our patterns

Corner passage pattern

Our CPP (Corner Passage Pattern) technology is based on a uniquely designed channel plate. It directs the cooling media around the port in a special way, opening up a larger area for heat transfer in the port area. This significantly improves heat transfer and hence efficiency.

Our innovative and patented new asymmetrical plate pattern enables BPHEs to transfer more heat using less material (Btu's/lb. basis). Apart from the environmental gains, this also means that systems can now be smaller than competing solutions with comparable performance.

The X-plate

Another high-tech innovation is our new X-plate design. This offers not only higher performance but also increased mechanical strength. Brought together in the X-plate, these two characteristics enable us to use even less material to even greater effect.

A BPHE type for every need

The flexibility of our BPHEs makes them an excellent choice for many applications. The wide range of plate sizes, plate pattern combinations and connections enables a virtually unlimited number of combinations. You should be able to find a solution for your application among the models below.

B-type

The B-type is our original BPHE. Its unique plate geometry, modular design and economical long manufacturing runs mean the product is easy to customize for many different applications.

V-type

The V-type has been developed from the original B-type to achieve optimized performance as evaporators over a very wide capacity range. The refrigerant inlet has special technology to distribute the refrigerant evenly in each channel.

P-type

The P-type evaporator has been developed from the V-type to optimize performance with the refrigerant R410A. The P-type is used as an evaporator in heat pump and chiller applications over a wide range of capacities.

S-type

The S-type evaporator has been developed from the V-type to optimize performance with the refrigerant R134a. The S-type is used as an evaporator in heat pump and chiller applications.

VH-type – high-performance evaporator

The VH-type has been developed from the V-type for improved performance with the refrigerant R407C in a high efficiency range. The VH-type can be used as an evaporator in chiller and heat pump applications.

DB-type

Our patented true dual-circuit product puts the secondary circuit in contact with two primary circuits. Even if one primary circuit is shut off, the secondary circuit remains in contact with a primary circuit. These advantages make the DB-type the natural choice for flexible chillers, climate control and high-precision systems for food cooling cabinets in supermarkets.

DV-type

Our patented true dual-circuit product puts the secondary circuit in contact with two primary circuits. Even if one primary circuit is shut off, the secondary circuit remains in contact with a primary circuit. The DV-type is optimized for evaporation, with innovative technology to distribute the refrigerant evenly in the heat exchanger.

DP-type

The DP-type evaporator is also based on our true dual-circuit concept, and is optimized for the refrigerant R410A. Applications include flexible chillers, climate control and high-precision food cooling cabinets in supermarkets.

DS-type

The DS-type evaporator is also based on our true dual-circuit concept, and is optimized for the refrigerant R134a. Applications include flexible chillers, climate control and high-precision food cooling cabinets in supermarkets.

BDW-type

The Double Wall concept is designed for applications requiring high thermal efficiency and no risk of internal leakage between the two fluids, such as in the food and pharmaceutical industries. In the unlikely event of a leak, water seeps out between the vented double walls to the atmosphere, giving a visual indication of a fault.

ADWIS – Air Dryer With Integrated Separator

We have achieved breakthrough compactness with the ADWIS, which is one of the smallest air dryers on the market. The ADWIS combines two BPHEs (a refrigerated heat exchanger and a recovery unit) sandwiching an integrated separator in a modular design. This highly cost-effective solution offers stable high performance, convenient drainage and simple insulation.

M-type (Minex)

The M-type is a hybrid PHE (plate and frame heat exchanger) sealed by gaskets instead of brazing material. It is a small unit, so it does not need the typical support frame used for traditional PHEs. Like our BPHEs, the Minex is available in various combinations of materials.

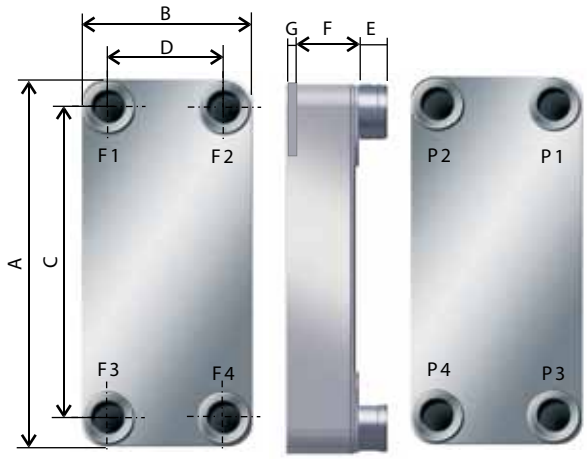
Dimensional data

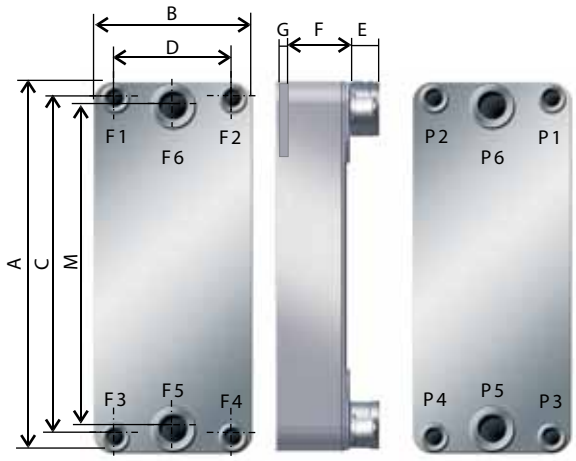
BPHE Model	B5	BX8T	B8T	B15	B10T	B12	B16	B16DW	B25T
A (inch)	7.36	12.4	12.48	18.31	11.38	11.2	14.8	14.84	20.71
B (inch)	2.83	2.87	2.99	2.83	4.69	4.60	4.69	4.70	4.69
C (inch)	6.06	10.94	10.94	17.01	9.57	9.33	12.6	12.95	18.86
D (inch)	1.57	1.57	1.57	1.57	2.83	2.48	2.48	2.83	2.83
E (inch)	0.79	0.79	0.79	0.79	0.79	1.06	1.07	0.79	0.79
F (inch)	0.17+0.09×NoP	0.08+0.09×NoP	0.16+0.09×NoP	0.17+0.09×NoP	0.16+0.09×NoP	0.17+0.08×NoP	0.16+0.09×NoP	0.16+0.08×NoP	0.16+0.09×NoP
G (inch)	0.28	0.28	0.28	0.28	0.24	0.23	0.24	0.24	0.24
Evaporator distributor types	-	-	-	-	V	-	-	-	V
Max number of plates	60	60	60	70	140	140	140	140	140
Max flow capacity water (gal/hr)	1056	1056	1056	1056	3170	5811	5811	3962	3170
Min standard connection size (inch)	1/4"	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	1/4"	1/2"
Max standard connection size (inch)	3/4"	3/4"	3/4"	3/4"	1"	1 1/4"	1 1/4"	3/4"	1"

* Specially developed for NHP Nordic Heat Pump

BPHE Model	B65	B400T	B427	B439	B500T	DB200	D300	DB400	DB500
A (inch)	34.02	27.32	27.32	38.54	38.54	20.67	20.47	27.32	38.58
B (inch)	14.29	11.97	11.97	11.97	11.97	9.57	9.37	11.97	11.97
C (inch)	28.78	23.66	22.32	33.62	33.62	17.95	17.68	23.78	34.09
D (inch)	9.04	8.09	7.05	7.05	7.05	6.85	6.3	8.50	7.52
E (inch)	2.13	2.13	2.13	1.07	1.07	1.07	1.07	2.13	1.07
F (inch)	0.67+0.09×NoP	0.71+0.09×NoP	0.87+0.09×NoP	0.47+0.09×NoP	0.47+0.09×NoP	0.39+0.09×NoP	0.39+0.08×NoP	0.47+0.09×NoP	0.47+0.09×NoP
G (inch)	0.02	0	0	0.24	0.24	0.12	0.16	0	0
M (inch)						17.95	15.35	23.23	32.91
Evaporator distributor types	V	V, P, S, VH	V	-	S, VH	V,P	P	V, P, S	S
Max number of plates	360	280	280	360	360	202	250	282	294
Max flow capacity water (gal/hr)	52834	26417	42267	42267	42267	9246	21133	20605	28000
Min standard connection size (inch)	2 1/2"	1 1/8"	1 5/8"	1 5/8"	1 3/8"	7/8"	1 1/4"	1 1/8"	1 5/8"
Max standard connection size (inch)	4"	3"	4"	4"	4"	2"	3"	3"	3"

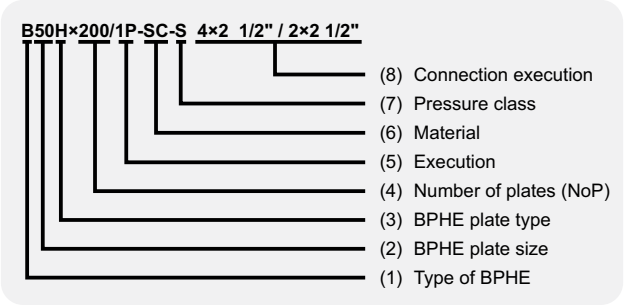
BPHE Model	B28	B80	B35	B120T	B200T	B50	B56	B57	B60
A (inch)	20.71	20.71	15.4	20.67	20.67	20.67	20.67	27.28	14.72
B (inch)	4.69	4.69	9.57	9.57	9.57	9.57	9.57	9.57	14.33
C (inch)	18.5	18.5	12.76	17.95	17.66	17.36	16.93	23.62	19.81
D (inch)	2.48	2.48	6.85	6.85	6.44	6.26	5.82	5.83	10.5
E (inch)	1.07	1.07	1.07	1.07	2.13	2.13	2.13	2.13	2.13
F (inch)	0.16+0.09×NoP	0.16+0.09×NoP	0.31+0.09×NoP	0.39+0.09×NoP	0.39+0.09×NoP	0.47+0.09×NoP	0.55+0.1×NoP	0.63+0.1×NoP	0.63+0.08×NoP
G (inch)	0.24	0.24	0.12	0.16	0.16	0.04	0.12	0.04	0.06
Evaporator distributor types	-	V, P, Q*	V	V,P	V,P	-	-	-	-
Max number of plates	140	140	250	250	250	280	250	280	300
Max flow capacity water (gal/hr)	5811	5811	9246	9246	14529	18492	20605	20605	20605
Min standard connection size (inch)	1/2"	1/2"	1"	7/8"	7/8"	2"	2"	1 1/2"	2"
Max standard connection size (inch)	1 1/4"	1 1/4"	1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"





Denomination

A BPHE should in principle always be denominated as shown in figure 1. The different groups (1) to (8) are explained below.



Installation

General (one phase)

The BPHE shall be connected so that the fluids flow counter currently to maximize performance of the BPHE. Piping to the BPHE shall be installed so that no pulsations or pressure peaks (from e.g. pump, valves, compressor, etc.) are transferred to the BPHE. If the media contains particles larger than 1 mm it is recommended that a filter of mesh size 16-20 is installed in front of the BPHE.

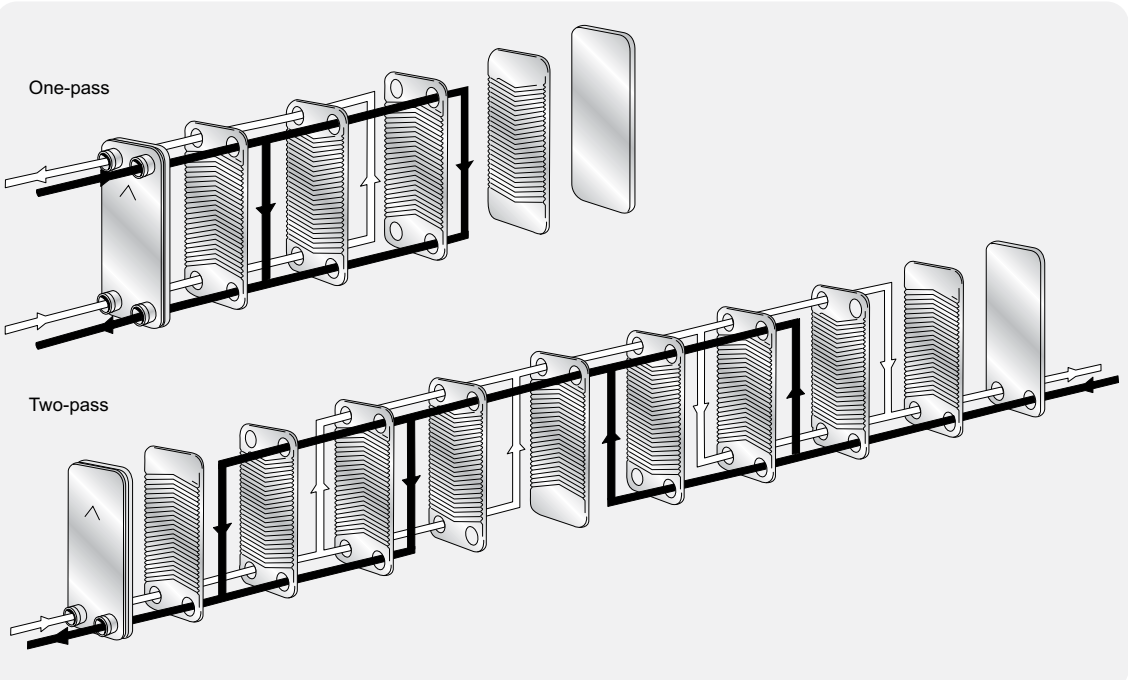
Evaporator

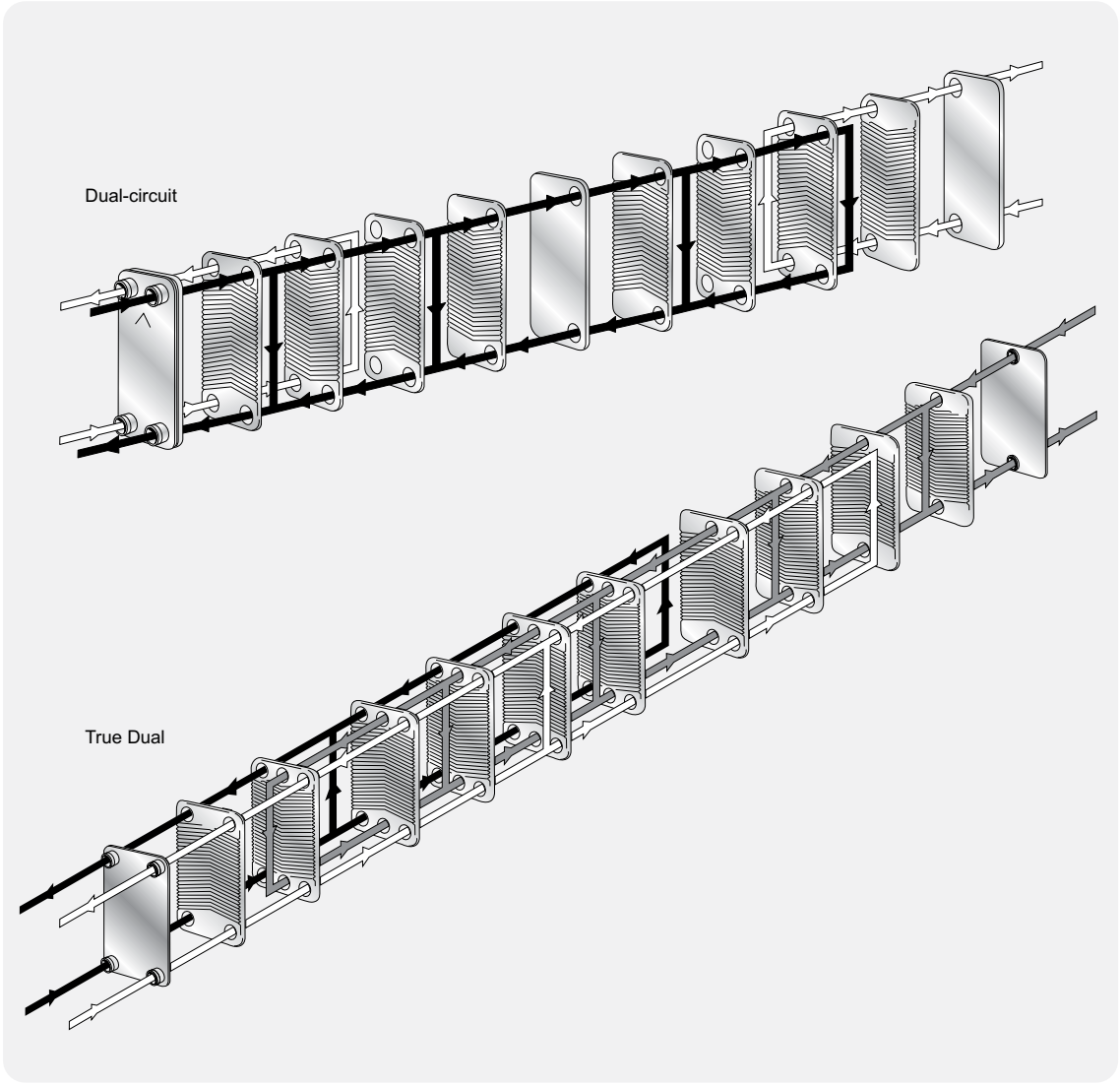
The BPHE shall be installed standing with the refrigerant inlet connected to the lower port (F3 or P3) and with the refrigerant outlet at the upper port (F1 or P1).

Condenser

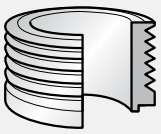
The BPHE shall be installed standing with the refrigerant inlet connected to the upper port (F1 or P1) and with the refrigerant outlet at the lower port (F3 or P3).

Execution examples





Standard connection types

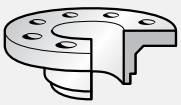

External (male) thread

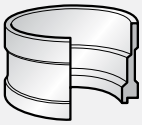

Internal (female) thread


Internal thread with hexagonal exterior


Victualic


Weld


Flange DIN/DNC

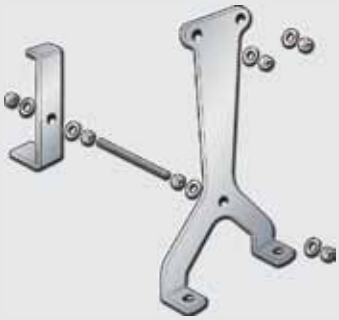

Solder


Flange SAE

Accessories

Our accessories meet the same high standards as our BPHEs because they are produced to our specification by rigorously selected manufacturers. The high-quality materials are carefully chosen for compatibility, while the accurate dimensions save you time and money on installation. With our accessories you have the assurance that everything will fit and perform the way the design engineers intended. The comprehensive range includes flanges, stud bolts, support legs and insulation, as well as CIP (Cleaning in place) kits that allow a BPHE to be cleaned quickly and economically without removing it from the system.

Support equipment



When you need mechanical support for one of our heat exchangers, we have tailor-made support legs and wall mounting kits available. Each kit comes correctly sized and complete with all fixings, ready for use on site. For the speed and convenience of first-time assembly, our support equipment cannot be beaten.

Insulation

Insulation for heat exchangers can improve the performance of the BPHE depending on the internal and external temperatures. It also reduces energy losses in the system, protects the units from freezing and external corrosion and finally ensures that the ambient environment is protected.

Counter connections

Counter connections have been developed to fit our BPHE range perfectly, and are available for most DN/DNC flanges and many weld and solder sizes.

CIP Cleaning unit

Flows in BPHEs are normally highly turbulent, which means the channels are self-cleaning. However, in some applications the fouling tendency can be very high, e.g. when using extremely hard water at high temperatures. In such cases it is always possible to clean the heat exchanger by circulating a cleaning liquid (CIP - Cleaning In Place). Use a tank with weak acid (5% phosphoric acid or, if the heat exchanger is cleaned frequently, 5% oxalic acid). Pump the cleaning liquid through the heat exchanger.

Design data Sheet

Company:	E-mail:
Name:	Phone:

General one phase application - Heat load: _____ Btu / hr

Side 1	Media:			Side 2	Media:		
	Temperature in:		°F		Temperature in:		°F
	Temperature out:		°F		Temperature out:		°F
	Flow rate:		Gal/m		Flow rate:		Gal/m
	Max pressure drop:		Psi		Max pressure drop:		Psi

Evaporator and economizer applications - Heat load: _____ Btu hr

Side 1 (evaporated media)	Media:			Side 2 (media to be cooled)	Media:		
	Evap temp. (dew point):		°F		Temperature in:		°F
	Superheating:		°F		Temperature out:		°F
	Flow rate:		Gal/m		Flow rate:		Gal/m
					Max pressure drop:		Psi

Condenser and desuperheater applications - Heat load: _____ Btu / hr

Side 1 (condensing media)	Media:			Side 2 (media to be heated)	Media:		
	Hot gas temperature in:		°F		Temperature in:		°F
	Cond. temperature:		°F		Temperature out:		°F
	Sub cooling:		°F		Flow rate:		Gal/m
	Flow rate:		Gal/m		Max pressure drop:		Psi

Additional information:

Copy and send Design sheet to your local DHT contact or e-mail it to: dht@dhtnet.com

Diversified Heat Transfer, Inc.

Manufacturers and Designers Since 1938

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