

Compact Brazed Heat Exchangers
for Refrigerant, Heating and Industrial applications



Our CBE concept

The Compact Brazed Heat Exchanger (CBE) 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

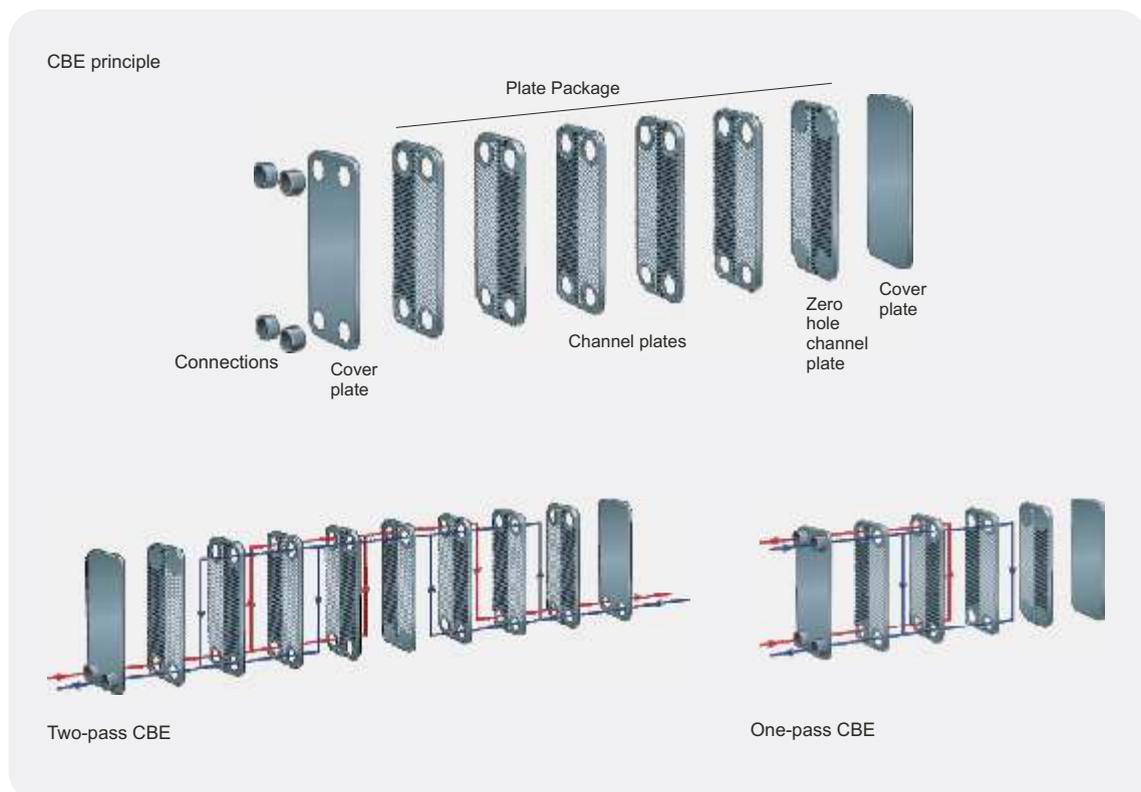
The channel plates form separate circuits for each media. The number, type and configuration of the channel plates are easy to vary to provide the thermal characteristics required.

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 a dual configuration, one flow goes through the entire unit. Special channel plates split the second flow into two separate flows running back-to-back, giving three in all.

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

Easy to install

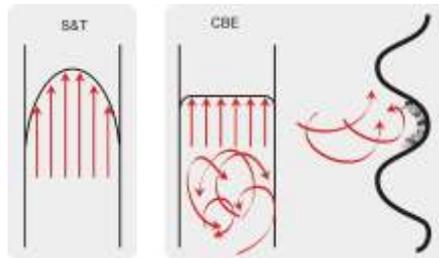
Compared with shell-and-tube models of the same capacity, our CBEs are as much as 90% smaller by weight and volume. The CBE is not only easier to transport and handle, but its size means it also offers greater design freedom. Furthermore, connections are available in a wide range of industry standards.



Benefits

Our experience and expertise have been gained all over the world across a wide range of applications in many different climates. We aim to use the minimum amount of high-quality materials to the best effect. This has environmental benefits, keeps costs down and reduces exposure when material prices increase. Other benefits of our CBEs include:

- ▶ Optimized design for every duty with CBEs customized to customer's own specifications
- ▶ Technology with proven reliability, energy efficiency and cost effectiveness
- ▶ Extensive range of CBE models providing wide range of cooling and heating capacities
- ▶ Compact design of CBE saves space compared with S&T heat exchangers; compared with PHE heat exchangers, CBEs have no gaskets to fail, and are able to work at high temperature and pressure
- ▶ Highly turbulent flow resists scaling and fouling, and makes CBEs effectively self-cleaning



- ▶ Patented innovations such as true dual systems and double-wall solutions
- ▶ Every CBE is pressure- and leak-tested before delivery, ensuring top-quality products. All widely recognized pressure vessel codes are available as standard, such as PED, UL/CSA, KHK and the Pressure Vessel Code
- ▶ Rapid response to changes in temperature due to small hold-up volume and lower refrigerant charge
- ▶ The reassurance of compliance with standards such as ISO 9001 (quality management) and ISO 14000 (environmental)



Refrigerant Applications



Air conditioning



Industrial refrigeration



Desuperheaters



Commercial refrigeration

More efficient refrigerant applications

The refrigeration area includes all types of applications where a refrigerant is used for cooling or heating. Typical examples of refrigerant applications include chillers, refrigerant systems, brine coolers, air dryers, desuperheaters and economizers. Refrigerant applications often involve high pressure, and the robustness of our CBEs makes them an excellent choice. Our CBEs are also designed to distribute the refrigerant uniformly in the port. This gives optimal utilization of the heat-exchanging surface, and creates an extremely compact and cost-effective solution.

Chiller applications

In a chiller, a refrigerant system is used indirectly to cool residential or commercial areas, industrial fluids, etc., by utilizing the energy-absorbing effect of the evaporator. Applications include comfort chillers (water-cooled/air-cooled), supermarket systems, industrial chillers and close temperature control chillers.

Dedicated heat pumps

Dedicated heat pumps are common in climates where a low requirement for air conditioning during the summer makes reversible heat pumps less attractive. Heat pumps can be optimized for heating only, which reduces operating costs compared with reversible heat pumps. Our CBEs are very suitable for these systems, with high efficiency in a small space.

Desuperheaters (heat recovery)

Desuperheater units are located between compressors and condensers to recover and utilize the high-temperature energy of the superheated refrigerant gas. SWEP CBEs are ideal for this duty, which makes it possible to heat water to a higher temperature than would be possible in a condenser.

Economizers

An economizer uses part of the total refrigerant flow from the condenser to cool the rest of the refrigerant flow, and can be used to provide extra cooling for the compressor. The high efficiency of our CBE economizers minimizes the required temperature difference between the refrigerant flows, which in turn increases the overall efficiency of the system.

Industrial Applications

Our CBEs are rugged, compact and 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 (hydraulic, engine and transmission) and for laser and electronic systems. Our CBEs are also suitable for fuel oil heating and highly efficient cogeneration (CHP) systems.

Lube oil cooling

The reliability and compactness of our CBEs are highly valued in lube oil cooling applications, where space for the heat exchanger is often limited and access for maintenance is restricted. Typical applications include large marine engines, where our space-saving CBEs can be mounted directly on the engine.

Gearbox cooling

Our CBEs are used in gearbox cooling because of their high efficiency even at low flow rates. These characteristics are particularly important in wind power generation systems. Many windmills already benefit from the long-term efficiency, economy and reliability of our twin-circuit system.

Fuel heating

Pre-heating fuel oil reduces both pollution and fuel consumption, particularly during cold starts. It is also easier to remove unwanted water from heated oil. Our CBEs perform reliably in systems using hot water or steam.

Pharmaceutical and medical applications

Contamination must be avoided in the pharmaceutical and medical industries. Our CBEs resist corrosion and do not use gaskets. They are also easy to clean internally as well as externally. The double-walled DW-type is particularly useful because it provides extra protection and makes leaks obvious.

Laser and electronics cooling

This kind of equipment is often cooled using purified (e.g. deionized) water as a coolant in order to protect sensitive components. Water in this condition can have undesirable effects on cooling systems, which can be overcome using our all-stainless steel CBEs.



Lube oil cooling



Gearbox cooling



Pharmaceutical and medical applications



Laser and electronics cooling

Heating Applications



Tap water

Our CBEs are used in heating applications ranging from the hot water supply in a single apartment to district heating sub-stations. Compact and efficient, our CBEs are easy to integrate into domestic water heaters and boilers, yet also suitable for industrial-scale heating applications. Our expertise in heat exchange is also being applied in areas such as solar heating, where the energy used is free but efficiency is at a premium.

Tap (hot) water

Hot tap water is supplied from dedicated water heaters, or boilers that also provide hot water for heating. The water supplied can be heated by steam or hot water. Our CBEs are used economically in both instantaneous and semi-instantaneous systems in many parts of the world.



Steam heating

Steam heating

Steam is widely used for heating, both domestically and industrially. It does not require pumps, and it can be used in tall buildings where water systems are unsuitable. Our CBEs are rugged and reliable, with excellent resistance to the conditions found in steam systems.



Space heating

Space heating

In many parts of the world, space heating is provided via district heating systems that use energy from a variety of sources. Local requirements (e.g. a single building) are met by substations. Our CBEs are an excellent choice for substations, because they are efficient, reliable and easy to integrate with other components.



Solar heating

Solar heating

From an environmental point of view, solar heating has the obvious attraction that the energy supplied is free. Running costs are minimal, but careful design is required to ensure reliability and efficiency. We have built up extensive expertise in applying our CBEs in solar heating systems.

Manufacturing

For us, the keys to world-class manufacturing are competence and efficiency. Over the years, we have acquired enormous competence in every aspect of CBE manufacturing. This is reflected in the recent opening of our new state-of-the-art factory in Suzhou, China, which joins our others in Sweden, Switzerland, the United States, Slovakia and Malaysia.

We use Statistical Process Control (SPC) throughout manufacturing to analyze and evaluate the mass of production data and to identify deviations from control values. Alongside SPC, we use Six Sigma to control defects and Lean manufacturing to minimize waste and optimize work flows.

Simulation

Simulation reinforces R&D creativity and is one of the most important stages in the development of new and existing CBEs. It accelerates time-to-volume and improves the functionality of new products.

Tooling

We precision-mill our own press tools in a totally integrated CAD/CAM process. This assures quality and availability at a vital stage in production, and guarantees consistency from series to series.

Laboratory

We have our own fully developed R&D laboratory, which has facilities for testing the heat transfer capacity of single-phase and two-phase applications, flow distribution, strength, mechanical and thermal fatigue performance, etc.

Materials

We have developed far-reaching specifications, and buy only from certified suppliers. This ensures that our products have a long and reliable service life backed up by the traceability demanded by many third-party approvals. Manufacturing is available in both 316 and 304 steel.

Pressing

We produce channel plates 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 CBEs.

Brazing

Meticulous brazing is the key to leak-free, corrosion-resistant heat exchangers. We have developed specific brazing programs, with precisely adapted heating and cooling cycles, for every combination of materials and size of heat exchanger.

Testing

We leak- and pressure-test all heat exchangers produced, 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 CO₂, are helping countries comply with their Kyoto targets, but they have been difficult to use efficiently. We now offer CBEs optimized for these refrigerants.

R410A

Our P-range 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-range consists of 6 single- and dual-circuit CBEs working in a wide capacity range from 20 kW to 400 kW.



R134a

Our S-range is dedicated to applications using the refrigerant R134a. The S-range includes the DS500, which is the largest true dual evaporator and represents a major step forward in CBE capacity for R134a applications. The DS500 can handle capacities up to 600 kW and competes vigorously in a market previously dominated by shell-and-tube heat exchangers.

CO₂

CO₂ has great potential as a refrigerant, but its operating conditions are very demanding. Our C-range CBEs perform efficiently with CO₂ in chiller systems with capacities of 350 kW and more. For transcritical systems, our B16DW is approved for operation at up to 140 bar.

Our patterns

Corner passage pattern

Our CPP (Corner Plate Passage) 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.

Asymmetric flow

Our innovative and patented new asymmetrical plate pattern enables CBEs to transfer more heat using less material (kW/kg basis). Quite apart from

the environmental gains, this 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.



Professional support



SSP – the soft way to get hard facts

You can easily identify the optimal CBE solution for your application using our dimensioning software, SSP, which handles Single phase, Condenser and Evaporator calculations. Its advanced calculation models use your input data to calculate which CBE will be most efficient for your application. The software also proposes an exact specification for your particular model: connections, fluids, size restrictions, etc. The software is available for download free of charge (see www.swep.net), and is easy to use thanks to its intuitive user interface.

Quick guides

The market's most comprehensive handbooks on heat transfer are available to download free of charge from www.swep.net or on CD-ROM from your local SWEP representative. These three digital handbooks give you first-class technical

information on Refrigerant, Heating and Industrial applications: everything from the basics of heat transfer to discussions of specific applications.

Quick selector

The Quick selector (available to use free of charge on www.swep.net) helps you quickly select the CBE you need. You can choose from a wide variety of applications, from a small boiler to a 250 kW district heating installation.

Cross-reference guide

If you are already using a heat exchanger from another company, the Cross-reference guide on www.swep.net will make it easy to change to our CBEs. Simply choose your existing manufacturer, model and number of plates, and the guide will suggest a suitable replacement from our range.

A CBE type for every need

The flexibility of our CBEs 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 CBE. 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.



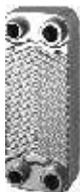
P-type

The P-type evaporator has been developed from the V-type to optimize performance with the refrigerant R410A. This refrigerant has been designed to minimize ozone depletion and global warming in line with the Kyoto Protocol. The P-type is used in lower capacity heat pump and chiller applications.



S-type

The S-type evaporator has been developed from the V-type to optimize performance with the refrigerant R134a. This refrigerant has also been designed to minimize ozone depletion and global warming, in line with the Kyoto Protocol. The S-type is used over a wide range of capacities at the lower end of the scale in heat pump and chiller applications.



E-type

The E-type is the most efficient CBE on the market today, with almost all the material contributing to the heat transfer process. The E-type has been developed for low-pressure boiler applications (water to water) and moderate temperatures.



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, each 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, each secondary circuit remains in contact with a primary circuit. The DV-type is optimized for evaporation, with innovative technology to distribute the vapor 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. This refrigerant has been designed to minimize ozone depletion and global warming in line with the Kyoto Protocol. 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. This refrigerant has also been designed to minimize ozone depletion and global warming in line with the Kyoto Protocol. 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 CBEs (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.



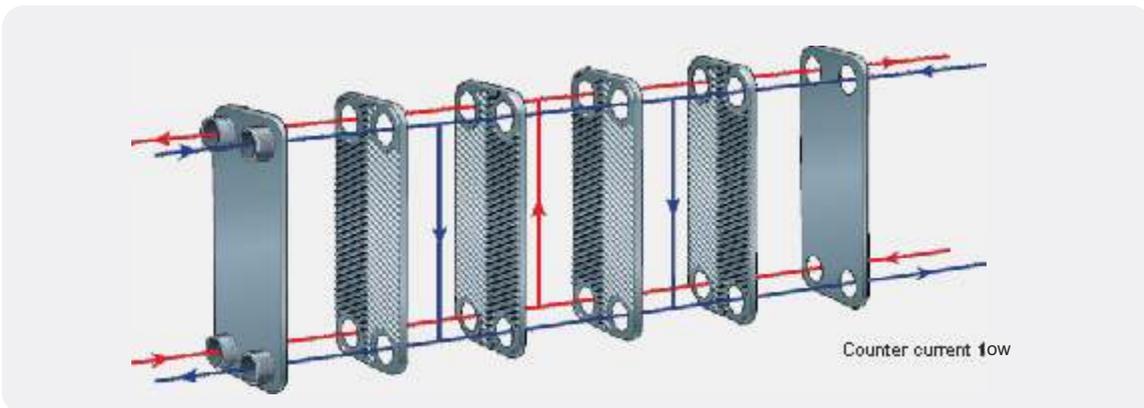
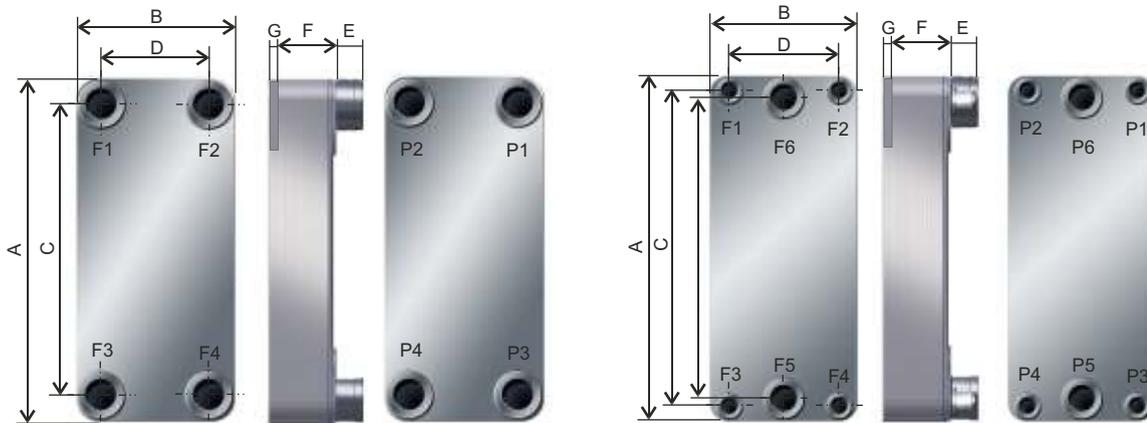
M-type (Minex)

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

Dimensional data

CBE Model	E5AS	B5	B8/BX8T	B15	B10T	B12	B16	B16DW	B25T	B28	B80
A (mm)	192	187	310	465	289	287	376	377	526	526	526
B (mm)	73	72	72	72	119	117	119	119.5	119	119	119
C (mm)	154	154	278	432	243	234	320	329	479	470	470
D (mm)	40	40	40	40	72	63	63	72	72	63	63
E (mm)	0	20.1	20.1	20.1	20.1	27.1	27.1	20.1	20.1	27.1	27.1
F (mm)	2+2.17×(NP-2)	4.3+2.24×NP	4.3+2.24×NP	4.3+2.24×NP	4+2.24×NP	4.4+2.24×NP	4+2.24×NP	4+2×NP	4+2.24×NP	4+2.24×NP	4+2.24×NP
G (mm)	7	7	7	7	6	6	6	6	6	6	6
Evaporator distributor types	-	-	-	-	V	-	-	-	V	-	V, P, Q*
Max number of plates	40	60	60	60	140	140	140	140	140	140	140
Max flow capacity water (m ³ /h)	4	4	4	4	12	22	22	15	12	22	22
Min standard connection size (inch)	1/4"	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	1/4"	1/2"	1/2"	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"	1 1/4"	1 1/4"

* Specially developed for NHP Nordic Heat Pump



B35	B120T	B200T	B50	B57	B60	B400T	B427	B439	B500T	DP200	DP400	DP500
393	525	525	525	693	374	694	694	979	979	525	694	980
243	243	243	243	243	364	304	304	304	304	243	304	304
324	456	448.5	441	600	277	601	567	854	854	456	604	866
174	174	450	159	148	267	597	179	179	179	174	216	191
27.1	27.1	54.2	54.2	54.2	54.2	54.2	54.2	27.1	27.1	27.1	54.2	27.1
8+2.34×NP	10+2.29×NP	10+2.29×NP	12+2.34×NP	16+2.44×NP	16+2.14×NP	18+2.29×NP	22+2.29×NP	12+2.29×NP	12+2.29×NP	10+2.29×NP	12+2.39×NP	12+2.29×NP
3	4	4	1	1	1.5	0	0	6	6	3	0	0
V	V, P	V, P	-	-	-	V, P, S	V	-	V, S	V, P	V, P, S	V, S
250	250	250	280	280	300	300	280	360	360	202	282	294
35	35	55	70	78	78	100	160	160	160	35	78	106
1"	7/8"	7/8"	2"	1 1/2"	2"	1 1/8"	1 5/8"	1 5/8"	1 3/8"	7/8"	1 1/8"	1 5/8"
1 1/2"	2"	2"	2 1/2"	2 1/2"	2 1/2"	3"	4"	4"	4"	2"	3"	3"

Installation

General (one phase)

The CBE shall be connected so that circuits flow counter currently to maximize performance of the CBE. Piping to the CBE shall be installed so that no pulsations or pressure peaks (from e.g. pump, valves, compressor, etc.) are transferred to the CBE. 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 CBE.

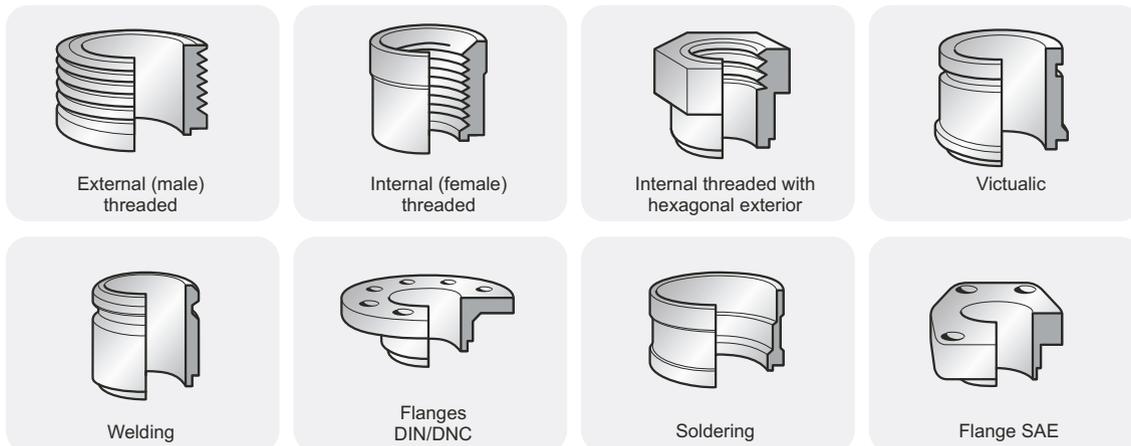
Evaporator

The CBE 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 CBE 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).

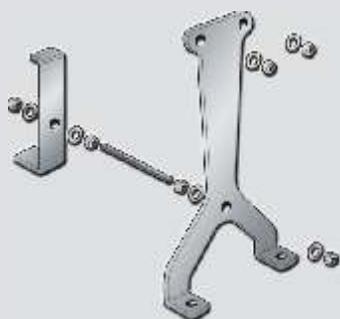
Standard connection types



Accessories

Our accessories meet the same high standards as our CBEs 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 CBE to be cleaned quickly and economically without removing it from the system.

Support legs



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

Heating insulation



HVAC insulation boxes have been developed mainly for use in heating applications at up to 130°C, and are available for most CBEs. Fitting the insulation box to the CBE is quick and easy.

Counter flanges



Compac counter flanges have been developed to fit our CBE range perfectly, and are available for most DN flange sizes used for our CBEs.

CIP Cleaning unit



Flows in CBEs 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 - Load to be heat exchanged: _____ kW

Side 1	Media:		Side 2	Media:	
	Temperature in:	°C		Temperature in:	°C
	Temperature out:	°C		Temperature out:	°C
	Flow rate:	l/min		Flow rate:	l/min
	Max pressure drop:	kPa		Max pressure drop:	kPa

Evaporator and economizer applications - Load to be heat exchanged: _____ kW

Side 1 (evaporated media)	Media:		Side 2 (media to be cooled)	Media:	
	Evap temp. (dew point):	°C		Temperature in:	°C
	Superheating:	K		Temperature out:	°C
	Flow rate:	kg/h		Flow rate:	l/min
			Max pressure drop:	kPa	

Condenser and desuperheater applications - Load to be heat exchanged: _____ kW

Side 1 (condensing media)	Media:		Side 2 (media to be heated)	Media:	
	Hot gas temperature in:	°C		Temperature in:	°C
	Cond. temperature:	°C		Temperature out:	°C
	Sub cooling:	K		Flow rate:	l/min
	Flow rate:	kg/h		Max pressure drop:	kPa

Additional information:

Send the Design sheet to your local SWEP contact or e-mail it to: info@swep.net

SWEP is the world's leading supplier of compact brazed heat exchangers (CBEs). These products are used where heat needs to be transferred efficiently in air conditioning, refrigeration, heating and industrial applications. SWEP has annual sales of USD 250 million and is close to its customers, with representation in more than 50 countries and its own dedicated sales force in more than 20 countries. Highly efficient production units in Sweden, Switzerland, the USA, Malaysia, Slovakia and China enable SWEP to serve customers all over the world. SWEP is part of the global Dover Corporation, which is a multi-billion-dollar, NYSE-traded, diversified manufacturer of a wide range of proprietary products and components for industrial and commercial use.