Brazed plate heat exchangers

For the refrigeration industry

Important components in refrigeration applications

Installed for a wide range of duties in refrigeration applications worldwide, Alfa Laval's high performance Brazed plate heat exchangers (BHEs) offer highest heat transfer performance with maximum reliability and cost efficiency.

The two typical equipment used in refrigeration are chiller and heat pump.

Chiller
Chillers are cooling water or brine and rejecting the heat to air or water. The water is transported by a hydraulic system through different types of heat exchanger to cool air in an air conditioning system or to cool manufacturing or industrial processes. Two basic systems are normally used to drive chillers: a compressor driven by an electric motor, based on a vapour compression refrigeration cycle; or a heat-driven system (steam, burning natural gas), based on an absorption refrigeration cycle.

Heat pump
Heat pumps are a type of water chillers which can also run in a reverse cycle, also called a water-source heat pump. In this case the primary function is heating water and rejecting the heat to air or water. The heated water warms up air in the air conditioning system. Another variation of this system is ground source heat

Technical specifications

AC230 brazed plate heat exchanger with a single refrigerant circuit unit. It is suitable to work as an evaporator and as condenser.

CB60, copper brazed plate heat exchanger. The brazing material seals and holds the plates together at the contact points ensuring optimal heat transfer efficiency and pressure resistance.

AXP52 is a brazed plate heat exchanger with thin external frames that withstands operating pressures of 130 bar. AXP52 is specially designed to fulfill the need when using CO_2 as refrigerant in subcritical and transcritical applications.

Evaporator

AC	AC16	AC18	AC30EQ
Capacity, kW/(HP)	1-5 (1,3-6,7)	2-10 (2,7-13,4)	3-30 (4-40)
Double circuit	No	No	No
Design pressure, Bar/(Psig)	32 (464)	32 (464)	35 (507)
High Pressure ACH, Bar/(Psig)	45 (653)	45 (653)	50 (650)
Height, a, mm/(inch)	210 (8,27)	316 (12,4)	325 (12.8)
Width, b, mm/(inch)	74 (2,91)	74 (2,91)	93 (3.66)
Vertical connection distance, c, mm/(inch)	172 (6,78)	278 (10,9)	269 (10.59)
Horizontal connection distance, d, mm/(inch)	40 (1,57)	40 (1,57)	39 (1.53)

Condenser

CB	CB16	CB18	CB30
Capacity kW/(HP)	1-5 (1,3-6,7)	2-10 (2,7-13,4)	5-40 (6.7-54)
Design pressure, Bar/(Psig)	10 (145)	10 (145)	40 (450)
High Pressure CBH, Bar/(Psig)	32 (464)	32 (464)	50 (653)
Height, a, mm/(inch)	210 (8,27)	316 (12,4)	313 (12.32)
Width, b, mm/(inch)	74 (2,91)	74 (2,91)	113 (4.45)
Vertical connection distance, c, mm/(inch)	172 (6,78)	278 (10,9)	250 (9.84)
Horizontal connection distance, d, mm/(inch)	40 (1,57)	40 (1,57)	50 (1.97)

Evaporator, gas cooler, economizer and desuperheater for transcritical C

AXP, CBXP	AXP10	AXP14	CBXP27
Capacity, kW/(HP)	2-15 (2.7-20)	10-35 (13.4-47)	40-70 (53.6-94)
Pressure, Bar/(Psig)	154 (2233)	140 (2030)	90 (1305)
Height, a, mm/(inch)	190 (7.48)	190 (7.48)	310 (12.20)
Width, b, mm/(inch)	76 (2.99)	76 (2.99)	111 (4.37)
Vertical connection distance, c, mm/(inch)	154 (6.06)	154 (6.06)	250 (9.84)
Horizontal connection distance, d, mm/(inch)	40 (1.57)	40 (1.57)	50 (1.97)

pumps, using the earth or water surface to take the heat.

Refrigeration systems
The BHEs provide an efficient solution for a range of functions in the equipment in these refrigeration systems. The most common of these involve transferring heat from two basic media: the refrigerant as the primary fluid (HFC or natural gas) and water or brines as the secondary fluid.

Alfa Laval offers a complete portfolio of BHEs for the following applications:

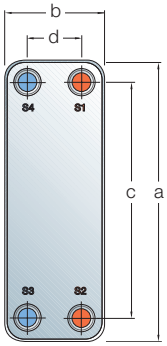
- Evaporator (dry expansion) to cool water,
- Condenser to reject or recover heat to water,
- Desuperheater for partial heat recovery to water,
- Economizer to cool liquid refrigerant and superheat vapour refrigerant,
- Subcooler to cool down the liquid refrigerant,
- Intermediate heat exchanger in the absorption cycle to preheat the diluted solution and to pre-cool the concentrated solution
- NEW! Gas cooler (transcritical CO_2) to reject or recover heat to water.

AC70X	AC112	AC220EQ	AC230DQ AC230EQ	AC232DQ	AC500DQ AC500EQ
10-90 (13,4-120)	30-200 (40-270)	50-200 (67-270)	50-200 (67-270)	30-250 (40-330)	150-600 (200-805)
No	No	No	Yes	Yes	Yes
32 (464)	37 (537)	37 (537)	32 (464)	47 (682)	32 (464)
45 (653)	51 (740)	51 (740)	45 (653)	53 (769)	45 (653)
526 (20.71)	616 (24.25)	616 (24.25)	490 (19.29)	490 (19.29)	739 (29.09)
112 (4.41)	191 (7.52)	191 (7.52)	250 (9.84)	250 (9.84)	322 (12.68)
466 (18.35)	519 (20.43)	519 (20.43)	400/369 (15.75/14.53)	400/369 (15.75/14.53)	632/568 (24.88/22.36)
50 (1.97)	92 (3.62)	92 (3.62)	155 (6.1)	155 (6.1)	205 (8.07)

CB60	CB62	CB110	CB112	CB200	CB300	CB400
50-100 (67-134)	50-100 (67-134)	50-220 (67-295)	50-220 (67-295)	150-350 (200-469)	150-450 (200-605)	150-600 (200-805)
40 (450)	40 (450)	37 (537)	37 (537)	30 (363)	33 (370)	35 (464)
50 (653)	50 (653)	51 (595)	51 (595)	37 (406)		
527 (20.75)	531 (20.91)	616 (24.25)	616 (24.25)	742 (29.21)	990 (38.98)	990 (38.98)
113 (4.45)	115 (4.53)	191 (7.52)	191 (7.52)	324 (12.76)	366 (14.41)	390 (15.35)
466 (18.35)	476 (18.74)	519 (20.43)	519 (20.43)	622 (24.49)	816/861 (32.12/33.90)	825 (32.48)
50 (1.97)	60 (2.36)	92 (3.62)	92 (3.62)	205 (8.07)	213.5 (8.40)	225 (8.86)

O_2 applications

CBXP52	AXP27	AXP52
40-100 (53.4-134)	10-100 (13.4-134)	10-150 (13,4-200)
90 (1305)	130 (1885)	130 (1885)
526 (20.71)	362 (14.25)	582 (22.91)
111 (4.37)	160 (6.30)	160 (6.30)
466 (18.35)	250 (9.84)	466 (18.35)
50 (1.97)	50 (1.97)	50 (1.97)



Innovation that boosts performance

Alfa Laval brazed plate heat exchangers (BHEs) feature the Equalancer system and Dualaced technology – patented innovations which ensure high heat transfer performance. There are numerous design options to choose from.

Alfa Laval R&D has developed innovative solutions for the refrigerant fluid distribution inside a BHE. These have been laboratory tested using HCFC and HFC refrigerants with excellent results.

Equalancer system "EQ"
The two phase flow coming into the evaporators is mixed by the patented Equalancer distribution system "EQ", which stabilizes the flow and increases performance.


Equalancer

Using the Equalancer it is possible to obtain a double mixing of refrigerant into two successive volumes. This ensures a more balanced distribution system through all the plate channels, reducing fluctuations in the super-heating effect.

Pressed into the plate, the Equalancer system guarantees high quality and repeatability of plate design and performance.

The Equalancer system does not have an adverse effect on the BHE operating as condenser since the pressure drop is negligible.

Dualaced technology "DQ"
The real dual circuit patented by Alfa Laval is a solution with diagonal flow.

BHEs using Dualaced technology have two independent refrigerant circuits. The special design ensures that each refrigerant circuit is in contact with the entire water flow. The main advantage is that at partial load (only one compressor running) water cooling is uniform and performance is maximized.

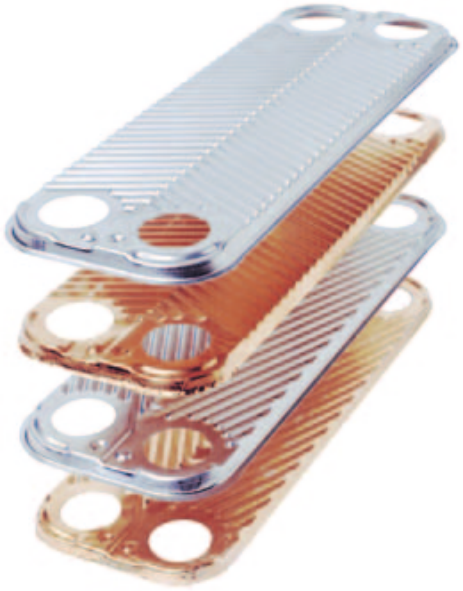
Why choose Alfa Laval Brazed plate heat exchangers?

- Compact, durable designs with consistently high quality; ease of installation.
- Extensive range of BHE models providing cooling capacities from 0.5 to 600 kW.
- Equalancer system provides a substantial saving in heat transfer surface compared to BHEs with traditional distribution system.
- Cost efficient: space savings due to the compact design of BHEs compared to shell-and-tube heat exchangers.
- Rapid response to temperature changes due to small hold-up volume and lower refrigerant charge.
- Optimized design for every duty with customized BHE configuration to customer's own specifications.
- All widely recognized pressure vessel codes available as standard.
- Every BHE is pressure and leak tested before delivery, ensuring top quality products.
- Alfa Laval offers first-class manufacturing facilities, global presence and high product availability.
- Alfa Laval's continuous investments in R&D ensure the most competitive solutions.

Brazed plate heat exchangers – compact and cost-efficient

The first Alfa Laval brazed plate heat exchangers (BHEs) were developed in the seventies. Today they are well-established components in refrigeration systems due to their compactness, durable designs, ease of installation and cost efficient operation.

Material
The brazed plate heat exchanger (BHE) consists of thin corrugated stainless steel plates vacuum brazed together using copper as the brazing material.



Design
Brazing the stainless steel plates together eliminates the need for sealing gaskets and thick frame plates. As well as holding the plates together at their contact points, the brazing material seals the package. Alfa Laval's BHEs are brazed at all contact points, ensuring optimal heat transfer efficiency and pressure resistance. The plates are designed to provide the longest possible lifetime.

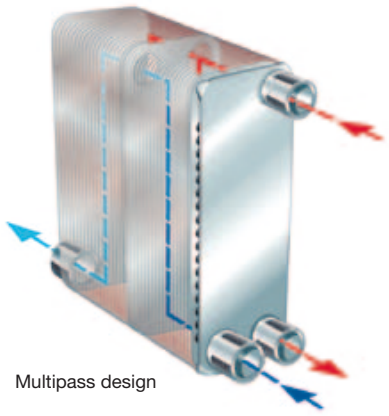
Since virtually all surfaces of the brazed plate heat exchanger actively contribute to heat transfer, the BHE is very compact in size, and it has a low weight and a low hold-up volume.

Alfa Laval offers a wide range of standard heat exchanger models and sizes, tailor-made for a wide scope including refrigeration applications. Standard configurations are available from stock and customer-specific designs are available on request.

Flow principle
The basic flow principle in a brazed plate heat exchanger for refrigeration applications is parallel or diagonal flow to achieve the most efficient heat transfer process.

In a single pass design, all connections are located on one side of the heat exchanger, making installation very easy.

Multipass design and different types of connections are available. Optionally, the location of connections can be chosen.



Multipass design

Flow principle in Evaporator design
The channels formed between the corrugated plates and corners are arranged so that the two media flow through alternate channels, always in opposite directions (counter current flow).

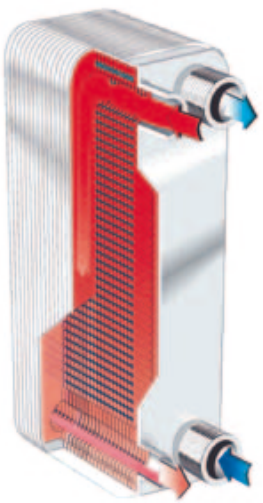
The two phase refrigerant (vapour and liquid) enters the bottom left of the exchanger with a vapour quality depending on the operating condition of the plant. Evaporation of the liquid phase takes place inside the channels and some degrees of superheat are always requested, which is the reason why the process is called "dry expansion".

In the illustration of an evaporator the dark and light blue arrows show the location of the refrigerant connections. The water (brine) to be cooled flows counter current in the opposite channel; the dark and light red arrows show the location of the water (brine) connections.

Flow principle in Condenser design
The main components are the same as for the evaporator. The refrigerant enters at top left of the exchanger as hot gas and starts to condense on the surface of the channels until fully condensed, and is then slightly subcooled. The process is called "free condensation".

In the illustration of a condenser the light and dark blue arrows show the location of the brine connections. The refrigerant flows counter current in the opposite channel and is cooled. The light and dark red arrows indicate the locations of the refrigerant connections.

Evaporator, showing flow principle.



Condenser, showing flow principle.

Alfa Laval in brief

Alfa Laval is a leading global provider of specialized products and engineered solutions.

Our equipment, systems and services are dedicated to helping customers to optimize the performance of their processes. Time and time again.

We help our customers to heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuffs, starch and pharmaceuticals.

Our worldwide organization works closely with customers in almost 100 countries to help them stay ahead.

How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com

ERC00358EN 1208