Brazed plate heat exchangers

A product catalogue for refrigeration

Alfa Laval brazed plate heat exchangers – compact and cost-efficient

The Alfa Laval brazed plate heat exchanger (BHE) concept is a variation on the traditional plate and frame heat exchanger, but without gaskets and frame parts. Developed in the seventies, today Alfa Laval BHEs are well-established components in refrigeration plants due to their compact, durable designs, ease of installation and cost efficient operation.

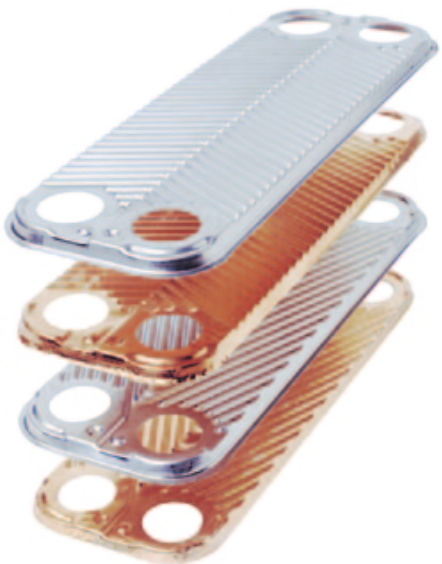
There's an Alfa Laval brazed plate heat exchanger for every duty! Alfa Laval BHEs are available in a broad range of capacities and dimensions.

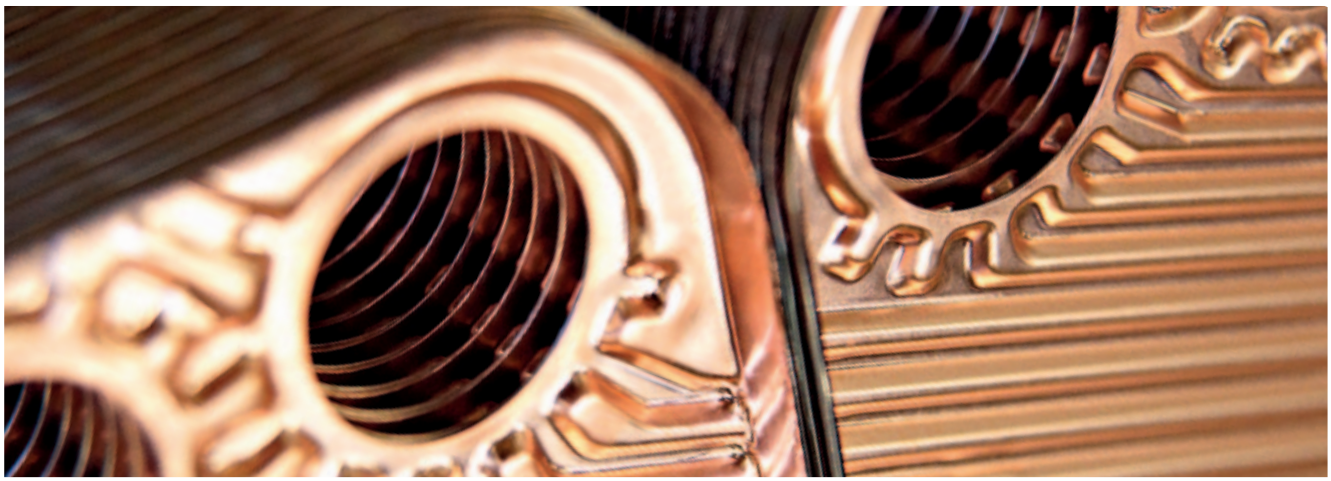
Material
The brazed plate heat exchanger (BHE) consists of thin corrugated stainless steel plates vacuum brazed together using copper as the brazing material. Although ideal for numerous applications, copper brazed units are not suitable for food applications and applications involving aggressive fluids. Here the optimal solution is an AlfaNova fusion-bonded plate heat exchanger made from 100% stainless steel.

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 the 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 lifetimes.

Since virtually all material is used for heat transfer, the BHE is very compact in size and has a low weight and a low hold-up volume. Alfa Laval offers a flexible design that can be customized to meet your specific requirements.

Alfa Laval BHEs are the most cost-efficient solution for a broad spectrum of heat transfer duties.





Flow principle
The basic flow principle in a brazed 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.

Evaporator – flow principle
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).

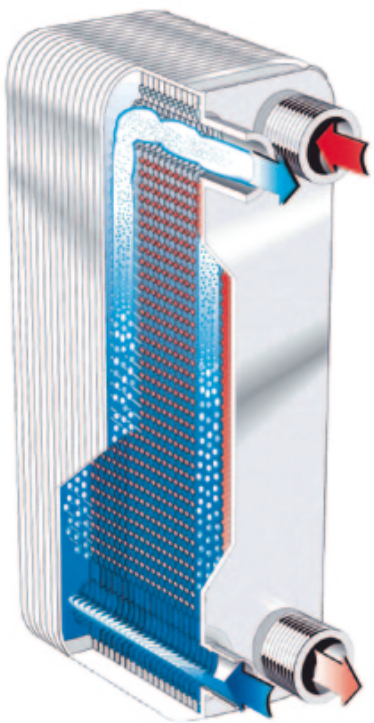
The two phase refrigerant (vapour + liquid) enters the bottom left of the exchanger with a vapour quality depending on the operating condition of the plant.

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”.

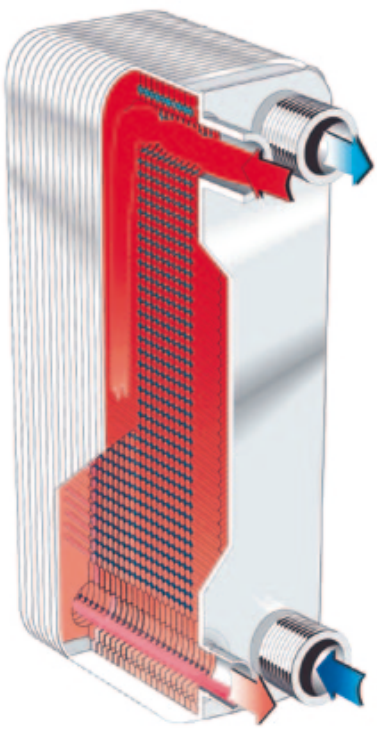
In the illustration of an evaporator the dark and light blue arrows show the location of the refrigerant connections. The water (brine) to be cooled flows counter current in the opposite channel; the dark and light red arrows show the location of the water (brine) connections.

Condenser – flow principle
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.

Innovation that boosts performance

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

Equalancer system
Alfa Laval Research & Development 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

The two phase flow coming into the evaporators is mixed by the patented distribution system “EQ”, which stabilizes the flow and increases performance. The performance of the evaporators in the AlfaChill series (AC10, AC30, AC70, AC120, AC230 and AC500) has been continuously improved.

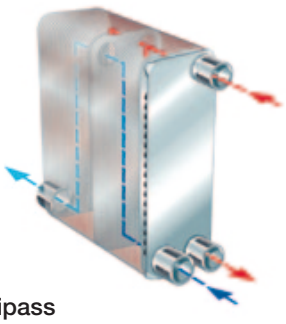
Using the patented Equalancer system it is possible to obtain a double mixing of refrigerant into two successive volumes.

This ensures a more balanced distribution system through all the plate channels, which reduces 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 system
The real dual circuit patented by Alfa Laval in a solution with diagonal flow is obtained by means of pressed plates. The BHE can be connected with 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. Alfa Laval has implemented the Dualaced real dual circuit (DQ) in the AC230 and AC500 BHE models.



Multipass
The design options of the brazed heat exchanger are extensive.

The heat exchanger can be designed as a multipass unit, different types of connections are available, and there is the option of choosing the location of the connections.

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

Important components in refrigeration applications

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

Alfa Laval offers a complete portfolio of extreme high pressure BHEs. They are ideal for all the different applications in transcritical CO_2 systems. In refrigeration applications where Alfa Laval BHEs are installed, typical equipment includes:

Chiller
Cools water or brine and rejects 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
A type of water chiller that 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 cool to air or water. The heated water warms up air in the air conditioning system. Another variation of this system is ground source heat pumps, using the earth or water surface to add or reject the heat.

BHEs in refrigeration applications
The BHE is an efficient solution for a range of functions in refrigeration applications. 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:

- Evaporator, dry expansion, cooling water,
- Condenser, rejecting or recovering heat to water,
- Desuperheater for partial heat recovery to water,
- Economizer, cooling liquid refrigerant and superheating vapour refrigerant.

Other possible functions
- Subcooler to cool down the liquid refrigerant using well water,
- Intermediate heat exchangers used in the absorption cycle to preheat the diluted solution or to pre-cool the concentrated solution.

Why choose Alfa Laval BHEs?

- 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.

Technical specifications

Values are given in European units of measurement

Evaporator

AC	AC10	AC-30EQ	AC-70X	AC-120EQ	AC-230DQ AC-230EQ	AC-500DQ AC-500EQ
Capacity (kW)	0.5-4	3-30	10-90	50-200	50-200	150-600
Double circuit					Yes	Yes
Design pressure (Bar)	33	35	32	32	32	32
High Pressure ACH (Bar)		50	45	45	45	45
Height, a (mm)	207	325	526	617	490	739
Width, b (mm)	77	93	112	192	250	322
Vertical connection distance, c (mm)	172	269	466	519	400/369	632/568
Horizontal connection distance, d (mm)	42	39	50	92	155	205

Condenser

BHE	AC10	CB30	CB60	CB62	CB76	CB200	CB300	CB400
Capacity (kW)	0.5-4	5-40	50-100	50-100	50-220	150-350	150-450	150-600
Design pressure (Bar)	33	40	40	40	34	30	33	35
High Pressure CBH (Bar)		50	50	50	45	37		
Height, a (mm)	207	313	527	531	618	742	990	990
Width, b (mm)	77	113	113	115	191	324	366	390
Vertical connection distance, c (mm)	172	250	466	476	519	622	816/861	825
Horizontal connection distance, d (mm)	42	50	50	60	92	205	213,5	225

Evaporator, gas cooler, economizer and desuperheater for transcritical CO_2 applications

TRANSCRITICAL CO_2	AXP10	AXP14	CBXP27	CBXP52	AXP27	AXP52
Capacity (kW)	2-15	10-35	40-70	40-100	10-100	10-150
Pressure (Bar)	154	140	90	90	130	130
Height, a (mm)	190	190	310	526	362	582
Width, b (mm)	76	76	111	111	160	160
Vertical connection distance, c (mm)	154	154	250	466	250	466
Horizontal connection distance, d (mm)	40	40	50	50	50	50

Values are given in US units of measurement

Evaporator

AC	AC10	AC-30EQ	AC-70X	AC-120EQ	AC-230DQ AC-230EQ	AC-500DQ AC-500EQ
Capacity (HP)	0.7-5.4	4-40	13-120	67-270	67-270	200-805
Double circuit					Yes	Yes
Design pressure (Psig)	450	507	464	464	464	464
High Pressure ACH (Psig)		650	653	653	653	653
Height, a (inch)	8.15	12.8	20.71	24.29	19.29	29.09
Width, b (inch)	3.03	3.66	4.41	7.56	9.84	12.68
Vertical connection distance, c (inch)	6.77	10.59	18.35	20.43	15.75/14.53	24.88/22.36
Horizontal connection distance, d (inch)	1.65	1.53	1.97	3.62	6.1	8.07

Condenser (economizer, desuperheater)

BHE	AC10	CB30	CB60	CB62	CB76	CB200	CB300	CB400
Capacity (HP)	0.7-5.4	6.7-54	67-134	67-134	67-295	200-469	200-605	200-805
Design pressure (Psig)	450	450	450	450	435	363	370	464
High Pressure CBH (Psig)		653	653	653	653	406		
Height, a (inch)	8.15	12.32	20.75	20.91	24.33	29.21	38.98	38.98
Width, b (inch)	3.03	4.45	4.45	4.53	7.52	12.76	14.41	15.35
Vertical connection distance, c (inch)	6.77	9.84	18.35	18.74	20.43	24.49	32.12/33.90	32.48
Horizontal connection distance, d (inch)	1.65	1.97	1.97	2.36	3.62	8.07	8.40	8.86

Evaporator, gas cooler, economizer and desuperheater for transcritical CO_2 applications

TRANSCRITICAL CO_2	AXP10	AXP14	CBXP27	CBXP52	AXP27	AXP52
Capacity (HP)	2.7-20	13.4-47	53.6-94	53.4-134	13.4-134	13.4-200
Pressure (Psig)	2233	2030	1305	1305	1885	1885
Height, a (inch)	7.48	7.48	12.20	20.71	14.25	22.91
Width, b (inch)	2.99	2.99	4.37	4.37	6.30	6.30
Vertical connection distance, c (inch)	6.06	6.06	9.84	18.35	9.84	18.35
Horizontal connection distance, d (inch)	1.57	1.57	1.97	1.97	1.97	1.97

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, food-stuffs, 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

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