



## Brazed heat exchangers

A product catalogue for refrigeration



The brazed plate heat exchanger (BHE) is a well-established component in a refrigeration plant. In refrigeration plants 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.

The BHE is an efficient solution for a range of functions in the refrigeration plant. 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.



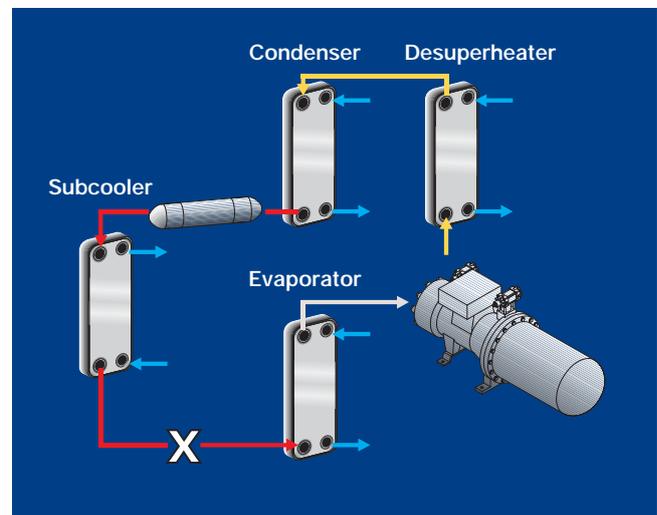
Air conditioning



Commercial refrigeration



Industrial refrigeration



Chiller component scheme



- 1 Extensive range of BHE models providing wide range of cooling capacities from 0.5 to 500 kW.
- 2 Patented innovations, the Equalancer and Dualaced systems, give high heat transfer performance.
- 3 Equalancer system provides a heat transfer surface saving of -15% compared to BHE with traditional distribution system.
- 4 -40% m<sup>3</sup>/kW space saving due to the compact design of BHE compared to Shell and Tube heat exchangers.
- 5 +7% water chiller COP due to high BHE performance compared to traditional heat exchangers.
- 6 Rapid response to changes in temperature due to small hold-up volume and lower refrigerant charge.
- 7 Optimized design for every duty with customized BHE configuration to customer's own specifications.
- 8 All widely recognized pressure vessel codes available as standard.
- 9 Every BHE is pressure and leak tested before delivery, ensuring top quality products.

# The Alfa Laval brazed heat exchanger

Developed in the late seventies, the Alfa Laval BHE is the original brazed plate heat exchanger. The BHE concept is a variation on the traditional plate and frame heat exchanger, but without gaskets and frame parts.

- Compact and durable
- Easy to install
- Cost efficient



## Material

The brazed plate heat exchanger (BHE) consists of thin corrugated stainless steel plates which are vacuum brazed together using copper as the brazing material. Copper brazed units can be used for numerous of applications. However, for food applications and applications involving aggressive fluids, copper brazed units are not suitable. For those applications, the optimal solution is an AlfaNova Fusion Plate Heat Exchanger made of 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 brazed heat exchangers are brazed at all contact points, ensuring optimal heat transfer efficiency and pressure resistance. The plates are designed to achieve 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 customer-specific requirements. Alfa Laval brazed plate heat exchangers ensure the customer the most cost-efficient solution for his heat transfer duties.





- First class manufacturing facilities
- High and consistent quality
- Leak and pressure testing of all units before delivery

### Flow principle

The basic flow principle in a brazed heat exchanger for HVAC applications is parallel and current 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.

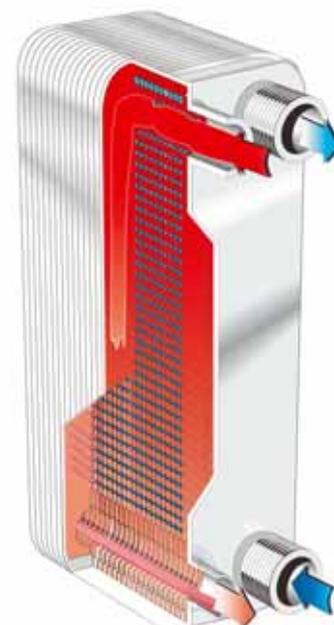
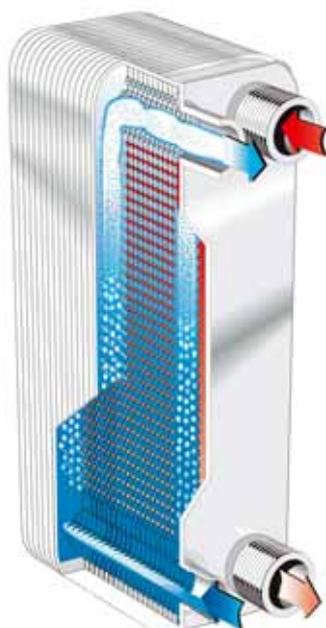
### Evaporator flow principle

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 enclosed

evaporator picture 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.

### Brazed plate condensers – 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 enclosed condenser picture the light and dark blue arrows show the location of the refrigerant connections. The cooling water (brine) flows counter current in the opposite channel and is heated. The light and dark red arrows indicate the locations of the water (brine) connections.



## 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.

The two phase flow coming into the evaporators is mixed by the patented distribution systems "X" or "EQ" which stabilizes the flow and increases performance.

The performance of the evaporators in the AlfaChill series (AC30, 50, 80, 120, 130 and 250) has been continuously improved. Using the patented Equalancer system it is possi-

ble 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 superheating effect.

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

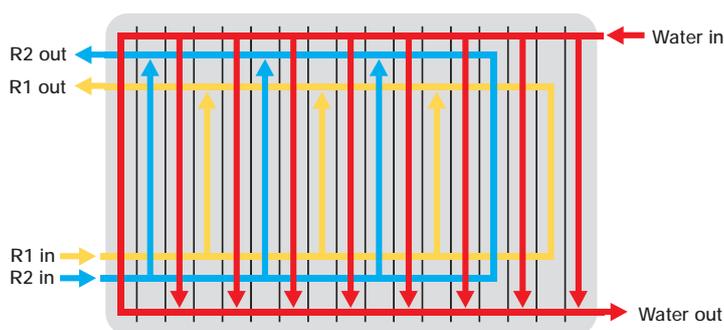
The Equalancer system does not have an adverse effect on the BHE operating as condenser since the pressure drop is negligible.



## Dualaced system

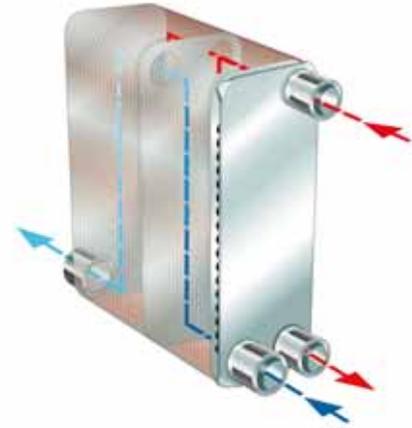
The real dual circuit patented by Alfa Laval in a solution with diagonal flow is obtained by means of pressed plates. The BHE can be connected with two independent refrigerant circuits. The special design ensures that each refrigerant circuit is in contact with the entire water flow. The main advantage 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 AC80, 130 and 250 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 HVAC applications and available from stock. Naturally, customer-specific designs are available on request.



## Production

Alfa Laval is leading the trend towards optimal quality. We do it with advanced production technology in high volumes. We do it with new technology through constant research and development. We do it through deliveries and service. As a leading global manufacturer we do it by offering a complete range of heat exchangers. Our knowledge gives you the best

solutions, products with higher technical performance and a focus on energy savings. Quality must prevail through the whole chain from development to after-sales. All our brazed heat exchangers are individually leak and pressure tested to ensure first-class quality, and Alfa Laval has approvals from all major approval bodies.



Stacking machine



Brazing oven



Testing machine

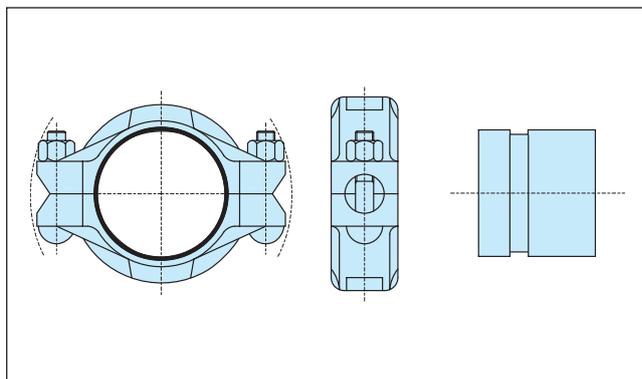
**Cleaning-In-Place (CIP)**

All types of heat exchangers need to be cleaned regularly to remove deposits such as scale, sludge and microorganisms. Alfa-CIP is a convenient solution that carefully removes the deposit on all heat transfer surfaces in the heat exchanger. Alfa-CIP 75, 200 and 400 are constructed in stainless steel using high quality components (pumps, valves etc.) according to ISO 9001 and with the CE-mark. The smaller units Alfa-CIP 20 and 40 are made of industrial grade plastic. Alfa-CIP is mobile due to its compact design. The units have reversible flow, and Alfa-CIP 75, 200 and 400 also have a built in heater. All cleaning detergents used by Alfa Laval are environmentally friendly and do not damage the equipment.



**KIT water connections**

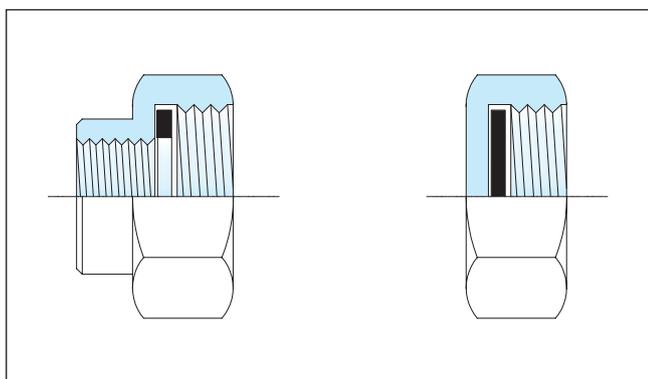
The KIT is for flexible joint connection Vicatolic or Gruvlock type. They are based on two components the clamp with gasket seal and the counter pipe. The seal is in EPDM and therefore must not be used in contact with oil and hydrocarbons in general and outside the temperature range of -40/+80 °C. For these or other special applications, to evaluate which type of seal should be used, contact the Alfa Laval sales department.



BHE type	To fit conn. type	Pipe size	Type
AC130	P32	2"	Flexible joint KIT
AC130	P31	2" 1/2	Flexible joint KIT
AC250	P35	3"	Flexible joint KIT

**Kit adaptor sensors and blinding plugs**

These extra connections are normally used with 6 connections BHE, material is stainless steel AISI 316L. The adaptor KIT is mainly used to fit in the water temperature relief sensors for the chiller control devices. Blinding plugs are common tap to close connections are not used.



BHE type	To fit conn. type	Adaptor size	Type
AC30 CB26/27H CB52 AC50	B21	from 1" to 1/2"	Int. threaded (ISO 228/1-G)
AC50	B32	from 1"1/4 to 1/2"	Int. threaded (ISO 228/1-G)
CB76 AC130	B23	from 1"1/4 to 1/2"	Int. threaded (ISO 228/1-G)

**Feet and mounting brackets**

CB26/27 and larger units can be delivered with feet or mounting brackets. These make the installation work easier and minimise stresses in the connected pipes. The unit can also be bolted to the floor. AC30, CB26/27, AC50, AC80, CB76 and AC120 can be wall mounted using the standard feet frame.

AC130 and AC250 can be supplied with feet and a lifting hook to ensure safe and functional installation.

**Alfa Laval in brief**

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

Our equipment, systems and services are dedicated to assisting customers in optimizing the performance of their processes. Time and time again.

We help them heat, cool, separate and transport products such as oil, water, chemicals, beverages, foodstuff, 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](http://www.alfalaval.com)

Alfa Laval reserves the right to change specifications without prior notification

© 2004 Alfa Laval

ECR00010EN 0410

EQUALANCER and DUALACED are trademarks owned by Alfa Laval Corporate AB.