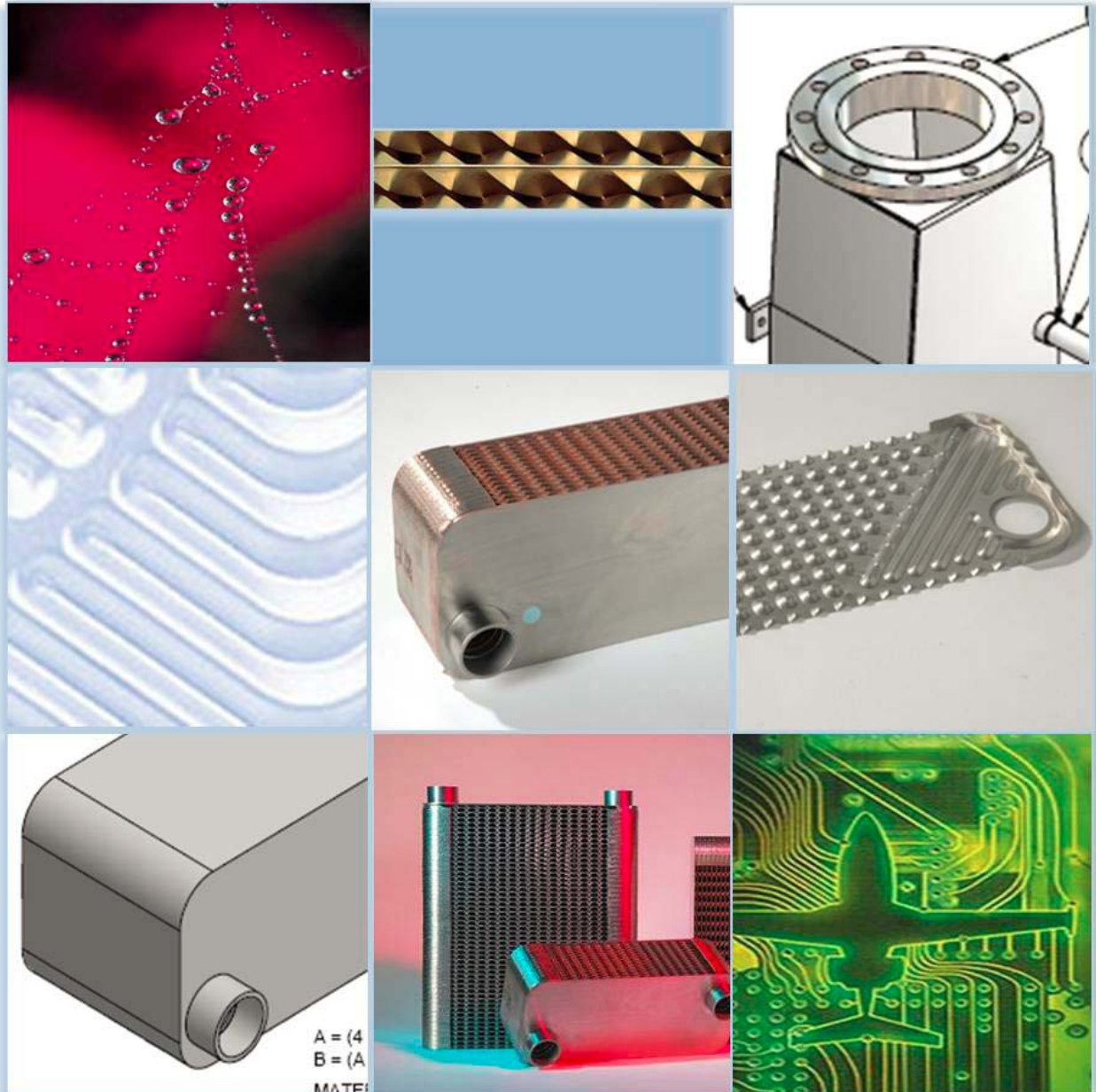


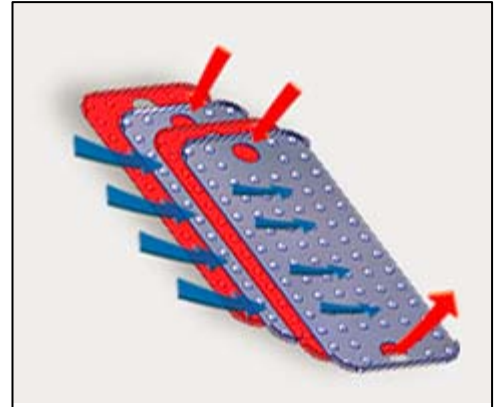
# Air Cross 21 Installation and User Manual



## Introduction

AirCross BPHE is a stainless steel cross flow plate heat exchange which is vacuum brazed with pure copper or nickel based material as the brazing medium.

The top and bottom plates including side A connections are brazed to the plate package. AirCross BPHE is an extremely compact and efficient conventional CBE. The construction ensures that every plate separates the primary (hot) and secondary (cold) fluid. This fact, together with the use of high heat conductivity materials, guarantees high efficiency.



## Asymmetrical design

AirCross BPHE is unique as the design is ideal for applications with a smaller flow rate at high pressure on the one side, (Side A), and a larger flow rate at with lower pressure on the other side. (Side B)

The AirCross BPHE offers this optimized asymmetrical design in several ways:

- Different sizes for the connections In and Out

Side A: Round connections

Side B: Totally open with large inlet and outlet surfaces

- Different channel lengths

Side A: 260 mm

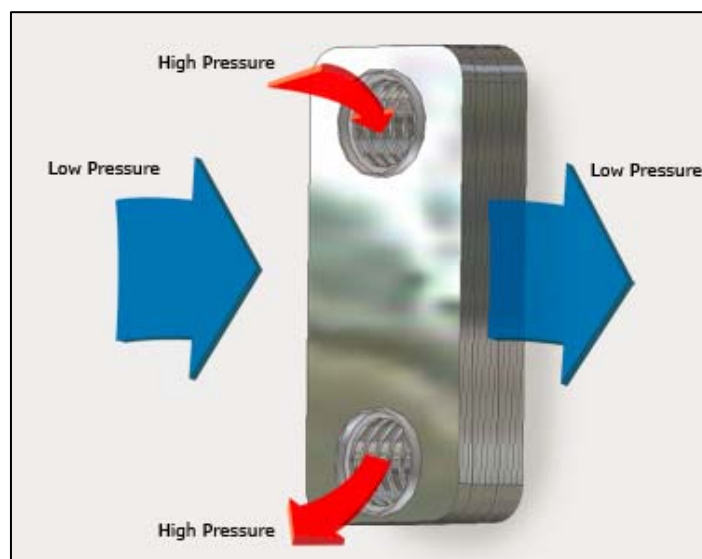
Side B: 110 mm

- Different channel areas and volumes

Due to AirCross BPHE special plate design the volume/channel is much bigger on side B than on side A.

Volume/Side A channel: 0,05 l

Volume/Side B channel: 0,12l



The first channel against the top plate is a half gas channel side B. The last channel against the bottom plate is also a half gas channel, side B.

## Application and Media

AirCross BPHE is designed for applications with a constant and defined gas flow on one side and medium with higher density on the other side. For such applications AirCross BPHE offers a thermal efficiency on the side B, and a compactness which is significantly better than other heat exchanger solutions. The high efficiency means that AirCross BPHE can heat or cool the side B fluid to a temperature very close to the incoming temperature of the Side A fluid.

Normally AirCross BPHE is used with a liquid on side A and gas on side B.

### Typical media for side A

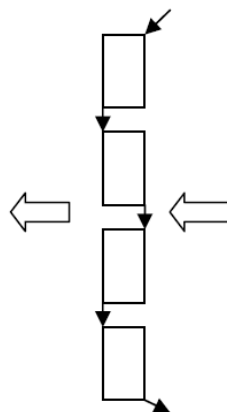
- Ethylene or Propylene glycol
- Water
- Refrigerants
- Oil/ Hydraulic-, thermal-, mineral-, vegetable-
- Other for stainless steel non corrosive liquids

### Typical media for side B

- Air
- Flue gas from burning natural gas, biogas, propane, light oil.
- Exhaust gas from engines using above fuels
- High pressure gas or air
- Nitrogen and other not oxidizing media
- Hot or humid process gases
- Other for stainless steel non corrosive gases

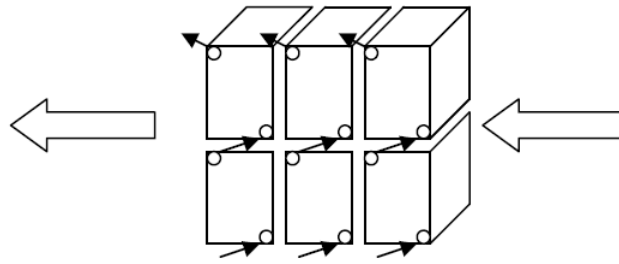
## System design

AirCross BPHE can be installed either as a single module or in a system including more than one AirCross BPHE. In the latter case the heat exchanger modules can be mounted in parallel or serial configuration on side A and Side B.



4 x AirCross

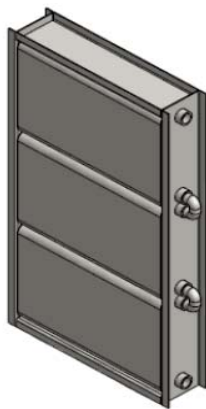
Parallel on side B for minimum pressure drop. Serial on side A for max velocity and turbulence.



6 x AirCross

2 in parallel and 3 in series for side B/the low pressure flow.

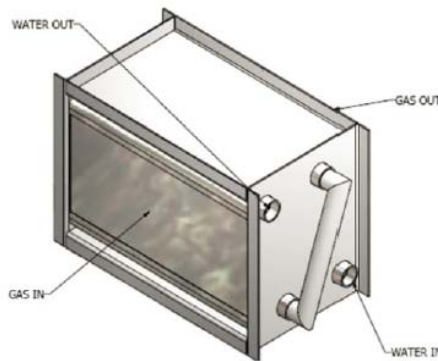
3 in parallel and 2 in series for side A / the high pressure side.



3 x AirCross

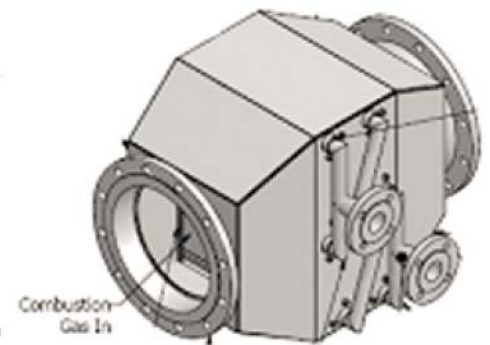
Parallel on side B

Serial on side A. Complete with flanged frame.



2 x AirCross

Serial counter flow on both side A and side B. Complete with flanged frame.



3 x AirCross

2 in parallel and 2 in serial counter flow on both side A and side B. Complete with housing and DN-connections on all four sides.

## Pressure test and operating limits

Every Air rCross 21 has passed the following tests to assure gas tight operation with room air conditions:

Side A Pressure test: 24 bar

Side A Vacuum test: 0.00005 bar

## Temperature limits

The maximum temperature is 225 °C for above pressure limits. Higher temperature can be accepted at lower pressure.

## Installation

Flow direction, Side A

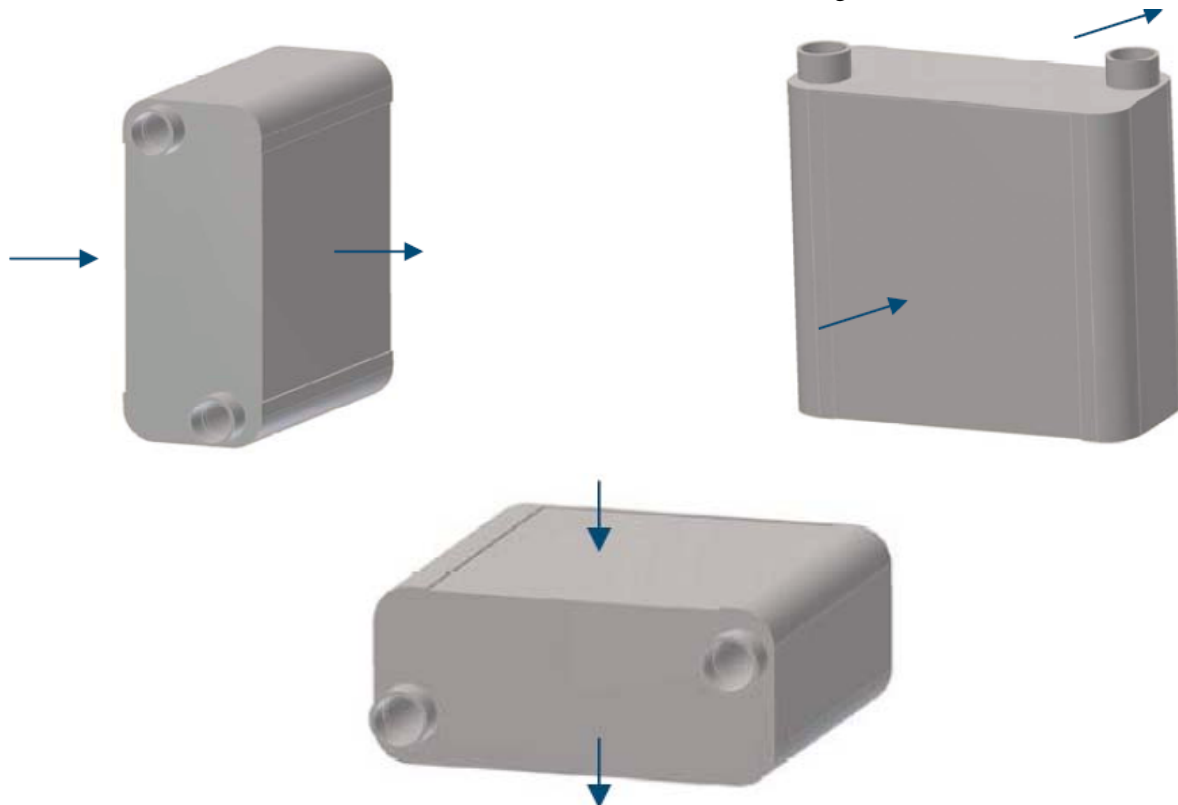
In one phase applications, either connection can be used as Inlet or Outlet

*Two phase applications*



## Flow direction, Side B

AirCross BPHE can be installed with both vertical and horizontal Side B, gas direction.



**Notice:** For condensing side B the gas must flow vertically down through the heat exchanger. The condensate is then collected under the heat exchanger.

### Important rules for installation

Vibrations, pulsations, rapid pressure- or temperature changes must not be transferred to the heat exchanger. In such cases a vibration- or pulsation damper is recommended. Flexible connections may be necessary



Regardless of whether the heat exchanger is mounted with horizontal or vertical gas flow the heat exchanger must have full support from below. For vibrations or pulsations a rubber gasket is also recommended.

### Connections on the high pressure side A

All types of side A round connections are brazed to the heat exchanger during the vacuum brazing process. This gives a tight and strong seal. Care must be taken during installation as large bending moments can damage the heat exchanger and cause leakage.

The following limits for moment should not be exceeded.



**Max. Bending moment:** 20 NM

**Torque moment:** 70 NM

The round connections should be soldered using a solder with a minimum of 45% silver. If needed protect the heat exchanger from the flame. To cool the heat exchanger during the operation a wet rag can be wound around the connections to reduce the heat transferred. For welding (of the connections) to the top, proper cooling is even more critical. Welding of the connections to the connecting frames or the housing is NOT allowed, if that can cause mechanical forces on the connections or the top plate.

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## Start up and operation

AirCross BPHE has no moving parts or electrical components.

It is essential to adhere to the following rules:

- For a gas temperature above 225°C the start up must first take place on the cooling liquid side. AirCross BPHE must have full circulation with the cooling fluid before the hot gas hits the heat exchanger plates.
- The system with water or other evaporating liquid on Side A must be equipped with necessary air vent(s) mounted in a position higher than the heat exchanger. Air inside the liquid channels will reduce heat transfer and water circulation.
- The liquid in side A must be at sufficient pressure so that its evaporating/boiling temperature is above the plate temperature. Normally the required water pressure is around 3 bar. Local evaporation/boiling will adversely effect heat transfer and water circulation.
- The heat exchanger must operate in line with approved design parameters; temperatures, pressures and flow rates

## Maintenance

Regular inspections should check the following:

- Dirt build-up in the channels and in the heat exchanger inlet.
- The plate surfaces regarding corrosion.
- Seal and gaskets.
- External components such as valves, dampers and controls.

## Cleaning

AirCross BPHE has a turbulent flow characteristic that normally reduces fouling and dirt build up. Dirt build up can seriously reduce heat transfer capacity and increase pressure drop.

**Side A** For instance for extremely hard water combined with a high temperature, cleaning is required. The same rules apply for AirCross BPHE/Side A as for traditional CBE's, (Compact Brazed Exchangers). Re-circulation cleaning liquid, (CIP-Cleaning In Place). A solution of 5% phosphoric acid or 5% oxalic acid in water is recommended to chemically clean the channels. The flow rate of the cleaning liquid should be greater than the design liquid flow, and it should flow in the reverse direction through the heat exchanger compared to the plates. After the cleaning process the heat exchanger must be flushed thoroughly with clean water before start-up.

**Side B** Heavy condensation can wash the heat exchanger and will reduce dirt build-up. AirCross BPHE has open channels at both ends that can be optically checked. For dry dirt such as carbon, ashes or dust, most of the dirt sticks to the inlet surface. Cleaning with compressed air or high pressure water up to 200 bars is normally effective. For instance with exhausts from diesel, vegetable oils or biogas combustion, cleaning can be required after 1000 hours operation. For greasy dirt such as oil, a suitable cleaning liquid is recommended.

