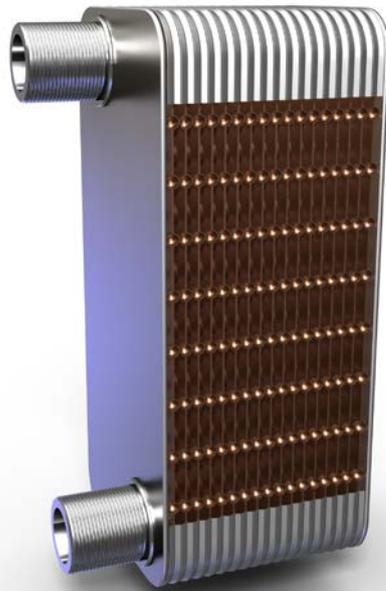




Installation and maintenance manual

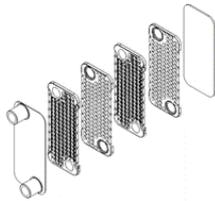
Cross product family



Version: 001
Date: 06-10-2016

General information

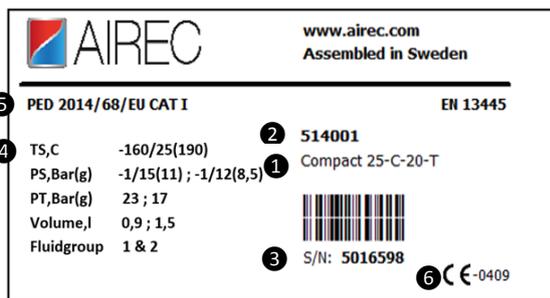
The Airec Cross exchanger is an asymmetric brazed plate heat exchanger consisting of stainless steel plates brazed together with copper or nickel. The Cross design has open sides to allow gas to enter and leave. It must have a housing in order to be functional.



Principle sketch of Cross 30

Denomination / Product identification

All Airec heat exchangers are equipped with an adhesive label that includes information about the unit.



- 1 Cross 30-C-140
Product type: Cross 30
Brazing material: N (nickel) / C (copper)
Number of plates: 140
- 2 Item number
514001
- 3 Serial number
S/N: 5016598
- 4 Operating conditions:
TS: Material temperature min/max
PS: Operating pressure min/max bar (a) side A at max temperature
PT: Test pressure Side A
Volume: side A (Litre)
Fluid group: according to approving organization
- 5 Pressure vessel classification
EN 13445
- 6 Label for CE-certified item
CE -0409

Pressure vessels

The Cross product type is manufactured according to the European Directive for Pressure Equipment (PED 97/23/EEC).
Note: The gas temperature may be considerably higher than the material temperature provided there is sufficient coolant temperature and flow.
For divergent operating conditions, please contact Airec.
For approved units, the data on the label must not be exceeded under any circumstances. The heat exchangers are designed for use with fluids according to groups 1 and 2 in PED 97/23/EEC. For operating conditions relating to the European approval PED, please see Product sheets on www.airec.com. For more information about approvals, please contact Airec.

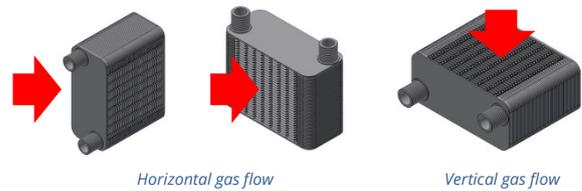
Installation

Personal protection

Suitable protective clothing, i.e. goggles, gloves and shoes, must be worn during the installation and/or maintenance of heat exchangers. Caution: filled heat exchangers may be heavy; heat exchangers may be hot from high-temperature operation; condensate may be corrosive/caustic.

Mounting the Cross

The Cross 30 can be installed with either vertical or horizontal gas flow.



Note: For condensing applications, installation must be vertical with the gas flow from the top and down through the heat exchanger. Condensate is then collected under the heat exchanger.

Never expose Cross heat exchangers to excessive pulsations (i.e. cyclic pressure or temperature changes). It is also important that no vibrations are transferred to the unit. If there is a risk of this, install vibration absorbers / muffler. If the installation allows, it is also suggested that a buffer is installed between the Cross and the support.

Whether the heat exchanger is mounted with horizontal or vertical gas flow, it must be fully supported.

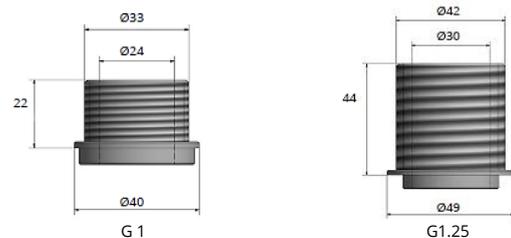


The Cross 30 must have a housing in order to be functional. The Cross module should be installed in the housing in such a manner that it is easy to connect the coolant piping.

Note: Never expose the Cross 30 to excessive thermal or mechanical forces.

Connections

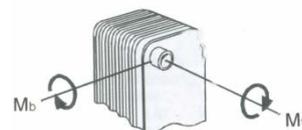
The Cross is available with threaded liquid connections, ISO-G 1" or 1.25" with length 22 mm or 44 mm.



Available connections

The maximum allowable connection loads given below are valid for low cycle fatigue. If high cycle fatigue is involved, a special analysis should be carried out. The following limits for moment should not be exceeded.

	Max. Bending moment	Torque moment
Connections	20 Nm	70 Nm



Maximum moments onto connections

System assembly

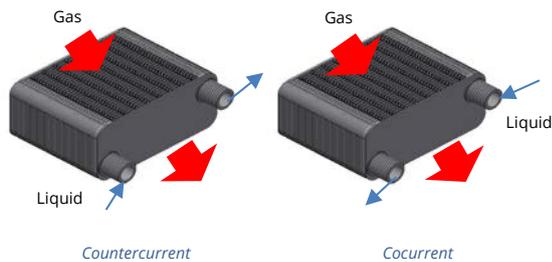
The Cross 30 may be installed as a single module or in a system including several Cross 30 units. In systems, the Cross 30 units can be mounted in parallel or serial configuration for liquid flow and gas flow. To obtain the calculated performance, it is important that heat exchangers are installed in accordance with the configuration in AirecCalc. See the calculation report. Note: Wrongly installed piping will jeopardize the performance of the installation.

Flow direction may be:

Cocurrent = fluids flow in the same direction through the heat exchanger

or

Countercurrent = fluids flow in opposite directions through the heat exchanger.



Housing the Cross

The Cross design has open sides to allow gas to enter and leave. It must have a housing to be functional. The Cross heat exchanger must be mounted in the housing according to the Cross design guidelines.

When mounting the Cross in the housing, treat the heat exchanger with care. Do not use excessive force, or bend or weld the heat exchanger. Never expose the housing to excessive pulsations (i.e. cyclic pressure or temperature changes) or vibrations, because there is a risk that these are transferred to the Cross heat exchanger unit. If there is any risk of excessive pulsation or vibration, install vibration absorbers / muffler on the housing.

The water connections should not be directly welded to the housing, because thermal expansion may cause severe damage to the heat exchanger. Material deformation due to differences between the internal and external pressures may also damage the heat exchanger.

Operating conditions

The Cross is used with a liquid on the circuit with connections and a gas on the open side. The heat exchanger must operate in line with approved design parameters: temperatures, pressures and flow rates.

Liquid side

Typical medias are ethylene/propylene glycol, thermal oil, water or other liquid non-corrosive to stainless steel. It is important that the liquid is of good quality without contamination or corrosive substances. The medias should not contain particles or any other undissolved matter, we recommend that a strainer with a size of 16-20 mesh (*number of openings per inch*) is installed before the Cross 30. The particles could otherwise block the channels, causing bad performance, increased pressure drop and the risk of boiling.

Systems with water or another evaporating liquid must be equipped with the necessary bleed valve mounted in a position higher than the heat exchanger. Air/gas inside the liquid channels will reduce heat transfer and water circulation, which also could cause boiling.

The liquid flow must be constant and with sufficient pressure to keep its evaporating/boiling temperature above the plate temperature. Local evaporation/boiling will adversely affect heat transfer and water circulation, and may lead to a risk of serious

damage to the heat exchanger. Note: The pressure at the coolant outlet must be high enough to avoid boiling.

The Cross must always have the cooling fluid circulating fully before the hot gas enters the heat exchanger.

The coolant must NEVER be allowed to freeze.

Never expose the Cross heat exchanger to excessive liquid pulsations (i.e. cyclic pressure or temperature changes).

Gas side

The gas media should not be corrosive to the heat exchanger. The gas flow must be started after, or simultaneously to, the start of the liquid flow. If the liquid flow is interrupted, the gas must be stopped or caused to by-pass the Cross heat exchanger to avoid boiling on the liquid side.

The Cross heat exchanger must not be operated in such a manner that stagnant condensate is allowed to accumulate.

Never expose the Cross heat exchanger to excessive gas pulsations (i.e. cyclic pressure or temperature changes).

The heat exchanger must NEVER be operated without a coolant flow.

Operational start-up

Make sure that:

- If there is a risk of high temperatures, the unit is insulated as a precaution to avoid injuries.
- Installation has been carried out according to the flow schedule / drawing and recommendations.
- Connections are tight.
- No vibrations or pulsations are transferred to the Cross 30.
- The liquid side is filled and deaerated.
- The flow rate and pressure on the liquid side are correct before gas flow is started.
- The temperature and flow rates are according to specification.
- There is appropriate drainage to deal with any condensation.

Maintenance

The Cross has no moving parts or electrical components.

The following should be inspected regularly:

- Operational design conditions for the system being maintained, and meeting the calculated / design values (leaving temp., pressure drop).
- Increased pressure drop and decreased thermal efficiency over time are signs of possible fouling.
- Connections for tightness.
- Gas channels for accumulated dirt.
- Plate surfaces for corrosion.
- Seal and gaskets.
- External components such as valves, dampers and controls.

Cleaning

The normally high degree of turbulence in the Cross gives a self-cleaning effect in the liquid channels, which reduces fouling and the build-up of contamination, which can seriously reduce heat transfer capacity and increase pressure drop.

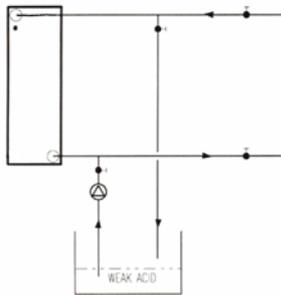
Cleaning liquid side

In some applications, the fouling tendency can be very high, for example with extremely hard water at high temperatures. In such cases, the Cross can always be cleaned by:

- Circulating a 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 the flow should be in the

opposite direction through the heat exchanger relative to the flow in normal operation.

- ATTENTION: After cleaning, it is very important to flush the heat exchanger thoroughly with clean water before start-up.



Example of CIP set-up

Cleaning gas side

Heavy condensation can have a self-cleaning effect, washing the Cross and reducing dirt build-up on the gas side. The Cross 30 has open gas channels at both ends that can be checked visually. 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 bar is normally effective. Exhausts from diesel, vegetable oils or biogas combustion may require regular cleaning.

For greasy dirt such as oil, a suitable cleaning liquid is recommended. When using cleaning liquid it is important to flush the Cross thoroughly with clean water before start-up.

Storage

The Cross must always be stored in a dry and protective environment. The temperature should not be below 1 °C and not over 50 °C for long-term storage (more than 4 weeks). During long operational stand-by periods, the system should be inspected for contamination on the liquid and gas sides. If necessary, clean the Cross according to the cleaning instructions. Liquid sides containing water should be drained.

Warranty

Airec offers a 12-month warranty from the date of installation, but in no case longer than 18 months from the date of delivery. The warranty covers only manufacturing and material defects (poor workmanship and/or faulty material).

The warranty does not cover damage caused by mechanical (including fatigue damage due to vibrations/pulsations) and/or thermal stress.

The warranty does not cover damage caused by corrosion.

The warranty does not cover damages caused by dirt build up and/or fouling.

For further information please see www.airec.com/support/download.

Disclaimer

The performance of the Cross is based on installation, maintenance and operating conditions being in conformance with this manual. Airec cannot assume any liability for Cross heat exchangers that do not meet these criteria.

Declaration of Conformity

It is hereby confirmed that the products Cross family has been designed, manufactured, tested and documented to fulfil the category requirements in the Pressure Equipment EC Directive 97/23/EC and the new Pressure Equipment Directive 2014/68/EU, module B (production) + D (no. 15-1002306-100). The products have been designed according to standard 13445.

Notified body: Inspecta 0409, PO Box 30100, SE-104 25 Stockholm, Sweden.

Further information on the product identification label on respective product.

AIREC AB

Signature:

Sven Persson

For further information, please consult Airec's technical information or your local Airec representative.



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