Technical Information Crossflow Heat Exchangers

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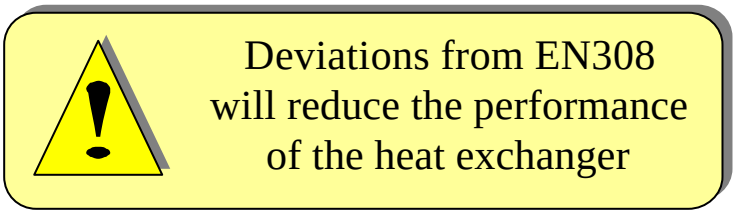
Design Guidelines

It is very important to be aware of that the performance (efficiency, pressure drop) that is calculated for an air-to-air plate heat exchanger as a component is valid under the following conditions:

- The velocity profiles entering the heat exchanger should be fully developed, i.e. the mass flows must be the same in all parts of the heat exchanger.

- The temperature profiles entering the heat exchanger should also be fully developed.

These are the only realistic conditions for which a general calculation of air-to-air plate heat exchangers can be based upon. It also makes it possible to compare the performance of different exchangers in a correct way.



All deviations from these conditions will reduce the heat exchangers efficiency and it is therefore very important to take this into account, as far as it is possible, when making the design of the air handling unit.

A technical correct result considering given effects due to uneven velocity and/or temperature over the exchanger can only be evaluated when the corresponding profile is known.

Heatex shall be glad to help evaluate the effects of any given velocity and/or temperature profile.

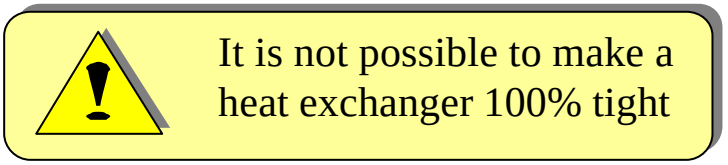
An even velocity distribution is best achieved by the following:

- Avoid sharp bends immediately before and after the heat exchanger.
- Place the fans on the exit side of the heat exchanger so they are sucking air through the exchanger.
- If the pressure drop in the heat exchanger is very small then the air distribution can be helped by placing a filter or another restriction that creates a pressure drop just before the heat exchanger.

Other things to take into account in the design of an air handling unit are for instance:

Condensation (see also “Condensation in heat exchangers”)
Where it is important to make sure that the condensate can leave the heat exchanger without restricting the air flow. Completely horizontal plates should be avoided.

Leakage
Air that is by-passing the heat exchanger or leakage between the two sides in the heat exchanger will reduce performance and may also carry particles, odours, and condensate between the two sides. A good sealing between the heat exchanger frame and the air handling unit is very important just as it is important that the internal leakage in the heat exchanger is as small as possible.



It is not possible to make a heat exchanger 100% tight so if it is unacceptable with condense water on the supply side the design of the air handling unit must be made in such a way that there always will be a higher pressure on the supply side than on the exhaust side.

As a guide to help choosing the correct heat exchanger size for a given airflow the diagram below can be used. The diagram shows for each heat exchanger size of width 1000 mm, the maximum airflow and nominal plate distance for achieving minimum 50% efficiency (dry) and maximum 250 Pa pressure drop. A wider heat exchanger will give a lower pressure drop and a bigger heat exchanger or a smaller plate distance will give a higher efficiency.

When the correct heat exchanger size has been chosen there are several options to choose from such as integrated by-pass section, damper, epoxycoated aluminium plates, painted framework, sealing material for higher temperatures, different corner profiles etc. (See datasheets for more information.)
In the final selection price versus performance must be evaluated.