Installation, operating, maintenance and storage instructions for finned heat exchangers used for air heaters and coolers.

Field of application

These heat exchangers are used in the air-heating/cooling or gas-heating/cooling installations. The air or the gas is heated/cooled with thermo oil, water, water glycols or steam.

Operating parameter

The finned heat exchangers are designed to operate to a maximum overpressure of 400 bars, referring to the internal medium. The maximum working temperature is 300°C. **Maximum operating pressures and temperatures, different from the standard, are specified on the label.**
Heat exchangers with higher operating conditions are available on request.

Construction of heat exchanger

The finned heat exchanger is composed of the following parts:

a) Finned pack:

The finned pack consists of several fins made of Al, Cu, V4A or steel with thickness from 0.1 to 0.3 mm. The spaces can be made from 2 mm to 10 mm depending on the desired dimensions

b) Tubes:

The tubes are inserted in the fin pack according to the corresponding tube plan and will be bonded with the fins through a special expansion or press-on method. The tubes can be made of different materials such as Cu, Ms, steel or stainless steel.

c) Frame:

The frame holds the complete fin pack and the core tubes, giving it the necessary stability. The frame is made of galvanised steel, Al or stainless steel, depending on the requirements and allows an eventual length extension of the tubes.

Storage

The recommended storage position for the heat exchanger is vertical. Since it is difficult to remove contaminants (e.g. dust) which penetrate the fin pack, it is wise to keep the heat exchanger into closed rooms with good ventilation.
The heat exchanger is tested for strength and leakage. The tubes are filled with dry air to a test pressure level, in order to avoid medium termed inner corrosion, and placed underwater.
The circuit of liquid is sealed with caps or counter flanges with intermediate layers between the flanges. With the above conditions the heat exchanger can be stored for 6 months.
If the storage time is expected to exceed 6 months, our company will fill the heat exchangers with nitrogen.

Transport

Transport can be made individually or stacked (connected by screws) on wooden pallets.
To lift the heat exchanger use the provided stop pins. Pay attention not to damage the fins.

Installation positions and mode of functioning

Installation position for heat exchanger with liquid internal medium

Any installation position required may be used. If the installation position specified by the customer does not an allow venting and draining via the connecting branches, additional venting and draining connections are provided on the heat exchanger.

Make sure that the heat exchanger is properly vented when filling it. Install the connecting piping and any supports that may be required so that an unobstructed heat expansion of the heat exchanger is ensured.

Installation position for heat exchangers with steam as internal medium

The installation position should preferably be such that the tubes are arranged vertically. Make sure that the tubes may expand as described above. If the heat exchanger is designed for horizontal installation, it must be constructed so that the tubes are inclined towards the condensate side, or the heat exchanger must be installed with such an inclination of the tubes (about 2°). If the system works with condensate depression, a separate condensate depression device must be provided downstream of the steam operated heat exchanger.

Maintenance

Cleaning the air side

The outer heating surface should preferably be cleaned by means of compressed air or a steam jet.

Measures to avoid corrosion on the inside of the tubes

It is principally possible that corrosion occurs when the heat exchanger is operated with water. It is advisable to analyse the water in regular intervals and to adopt suitable measures when required (water treatment, chemical additives). As concerns heat exchangers operated with steam, you have to make sure that the condensate is always properly drained, in particular during downtimes.

Acceptance

The design of the heat exchangers has been based on the regulations for pressure vessels, pressure gas vessels and filling systems (Verordnung über Druckbehälter, Druckgas-behälter und Füllanlagen) and on AD Merkblätter. Within the normal range of use no acceptance is necessary. For special types acceptance will be performed by TÜV accordingly.

Repair of air heat exchanger

Repairs may be carried out only by certified specialised firms which are in the possession of the necessary approvals.

Equipment specific hints

Attention has to be given to the installation of any connections and pipings in order to avoid mechanical stress coused by extension through heating. It is recommended to use compensation elements.

Hot water- and oil heat exchanger

Controlling of the heat output in hot water and oil heated air heaters should always be via mixed control. Mixed control means that, using a secondary pump and a three way valve (driven by a motor), the flow rate of the heating medium in the air heater is kept constant. And the forward and return flow temperature of the heating medium is lowered, whereby a more uniform temperature profile of the air is achieved.

If control is performed via throttling, extreme stresses are produced, particular in hot water application, which may lead to tube breakage. Therefor, this type of control should not be used.

Water heated heat exchangers have to be protected against freezing. Damage caused by freezing does not justify a claim under guarantee. A 30% water/glycol solution is safe against freezing at a temperature down to - 20°C.

If the heat exchanger is not in operation for a longer time, water, resp. water/glycol-mix must be drained off. In addition we recommend to dry the tube system with compressed air.

ATTENTION: Never loosen the flange connections as long as the heat exchanger is under pressure. This is also valid for ventilation- and emptying outlets!!

Steam heat exchanger

Proper drainage of the condensate from the air heaters must be assured at any time. The nominal diameter of the piping connecting to the condensate offtake should normally be the same as the nominal diameter of the offtake or greater. The piping connecting to the condensate collecting tank should be installed with an inclination and should b sized so that can cope with the steam quantities generated during re- evaporation.

To discharge the system, proceed as follows:

- Switch off the fan.
- Close steam valves.
- Open discharge valves upstream of the condensate off takes.
- Slightly open steam valves until steam emerges from the discharge valves.
- Close steam valves, but leave discharge valves open. As a result, the Inner surfaces of the ribbed tubes may dry under the influence of the residual heat present in the system.

For commissioning the unit, proceed in the following order:

- Switch on fan.
- Open vent valves.
- Slightly open steam valves and wait until steam emerges from the vent and discharge valves.
- Close vent and discharge valves.
- Slowly open steam valves completely.
- Monitor the discharge of the condensate with the help of the sight glass before the condensate off take.
- Vent the system during operation from time to time.

On the steam side, part load control should preferably be performed via a reduction of the steam pressure and simultaneous reduction of the steam quantity, the steam pressure before the condensate off take having to be always higher than the pressure in the condensate network.

Where a part load control is required, a condensate off take must be provided downstream of each air heater to ensure proper drainage of the condensate. Common drainage for several air heaters connected in parallel on the air and steam side should be adopted only if no steam or condensate control is required.

Systems in which the air heaters are supplied with air from different fans, but with the same air velocities and temperatures, are also regarded as air heater systems connected in parallel at the air side.
Part load regulation through flooding of the heat exchanger tubes is not allowable, since a condensate depression will cause heat stress in the air heater, and the sudden condensation of steam bubbles in the depressed condensate (implosion) will lead to dangerous so called condensate hammers.