

Glossary

Standards:

HACCP

Hazard Analysis Critical Control Points

- Preventative system with the aim of guaranteeing the safety of food and for consumers
- Integrated into German law since 1998 as part of the food hygiene ordinances

EN 328

European standard 328

- April 2003: heat exchanger testing procedure for determining performance criteria of forced convection Air Coolers
- Takes new refrigerants into consideration, e.g. R 404A, R 407C, R 410A

Thermodynamics / heat flow::

t_{L1}

Air inlet temperature into the air cooler

t_{L2}

Air discharge temperature from the air cooler

t_0

Evaporating temperature at the evaporator outlet (coil suction / suction line)

t_{0h}

Overheating temperature (at the suction line connection of the evaporator)

DT1

Temperature difference between the air inlet temperature and the evaporating temperature

K

Kelvin

- SI unit for thermodynamic temperature
- Used to specify temperature differences

Overheating ratio Dt_{0h} or Δt_{0h}

- Indicator for optimum expansion valve setting
- Difference between t_{0h} and t_0 divided by the difference between t_{L1} and t_0
- $\Delta t_{0h} = t_{0h} - t_0 / t_{L1} - t_0$
- Optimum 0,65
- „ Δt_{0h} “ 0,65 yields an evaporator rating of 100%
- For deviations, see Küba expansion calculator
- $Dt_{0h} < 0,65$: Open E-valve
- $Dt_{0h} > 0,65$: Close E-valve

\dot{Q}_0

Cooling capacity

- Unit: kW

k-Wert

Heat transfer coefficient

- Unit: W/m²K
- Measure of the heat flow at a temperature difference of 1 K per second through 1m² component
- For heat exchangers, depending on: materials used, thickness of the material, tube arrangement, form of fins, degree of frost build-up or contamination

\dot{V}_L

Air flow rate or air quantity (of the air cooler)

- Unit: m³/h

w_L

Air speed

- Unit: m/s

Air throw

Air throw range in metres

- Distance from air cooler to the point at which the air speed falls below 0,50 m/sec.

Δp

Pressure drop

- e.g. in tubes that carry refrigerant or coolant (tubing network)
- Air friction losses

Heat exchanger:

A

Surface

Calculating surface area in accordance with Eurovent:

- Unit: m²
- For exchange surfaces available for heat transfer The fin surface for tube channels is deducted. Fin sections, cut edges (fin thickness) and edge waves are not taken into consideration.
- Calculating formula in accordance with Eurovent:
 $A = 2(LZ-1) \times (LB \times LL - D2 \times \pi \times RZ/4) + RZ \times D \times \pi \times Li$
 Li = Finned length
 LA = Fin spacing
 LB = Fin width
 LL = Fin length
 LZ = Number of fins = $(Li / LA) + 1$
 D = Tube outer diameter
 RZ = Number of tubes = $RR \times RL$
 RL = Tube length (perpendicular to air flow)
 RR = Number of tubes (parallel to air flow)

Glossary

HFE

High Flux Efficiency

- Küba high performance fin/tube system
 - That means:
 - all significant parameters for heat transfer, from refrigerant to chilled air, have been optimised.
 - In particular, that means:
 - Maximum internal heat transfer by adapting refrigerant or coolant speed with
 - a) tube diameter, wall thickness and spacing, the type and number of internal fins in Cu tubes
 - b) the number of refrigerant or coolant circuits and line lengths of individual distributions
 - c) determination of the required diameters of the connections for entering and exiting the coolers
 - Maximum surface use by optimising external heat transfer with
 - a) the correct fin thickness, fin fold form and height of folds
 - b) lowest possible pressure drop on the air side
 - c) correct expansion diameter for pressure tight fitting of the fins on the core tube. Too much expansion leads to material elongation and causes hairline cracks that negatively affect temperature range. With too little expansion, a pressure tight connection cannot form between the tube and the fin, which prevents good heat transfer.

Acoustics / sound:

LW(A)

Sound power level (evaluated „A“)

- Logarithmic scale, computed
- Not dependent on distance or installation location
- Sound intensity comparison for forced convection
 - Air Coolers only allowed using sound power
- dB (A)

Lp(A)

Acoustic pressure level (evaluated „A“)

- Value from microphone
- Dependent on distance and installation location of the sound source
- dB(A)

Operating period

- Cooling period between two defrosting cycles
- End of the operating period is defined by the start of fluctuation in the evaporating or overheating temperature in the range of a few Kelvin.

Küba CAL® distributor

- Patented refrigerant distributor for evaporators with multiple injection
- Proven in thousands of applications over 30 years of use

Mode of operation:

First, the approaching mixture of liquid moisture and vapours is separated

- Moisture collects in the lower section of the distributor and flows over grooves into the distributor tubes.
- Vapours remain in the upper section and flow up into the distributor tubes
 - The separated phases can easily be divided into the required number of distributions/ injections
- Liquid moisture and vapours are brought together again
 - The high speed of the vapours in the distributor tubes generates negative pressure and pulls the liquid moisture

Advantages:

- lower pressure drop in the distributor system
- optimum refrigerant distribution in all working areas
- maximum surface use and 100% cooling capacity for all operating conditions