



## EF - Compact high efficiency evaporators

Flooded solutions for oil-free applications



EFS225, flooded evaporator

### Application

The EF flooded evaporators have been specifically design for high efficiency water chillers where oil-free turbo-compressors are used. The target of this concept of chiller is to maximize the COP (Coefficient of Performance) taking the energy efficiency to new peaks, in process cooling, air-conditioning and refrigeration applications where the operation of the cooling system is crucial and the chiller is often working at partial load. R134a is the refrigerant normally used and the absence of lubricant oil is optimizing the heat exchanger performance.

### The performance

The innovative Alfa Laval design allows to keep into reduced sizes the flooded evaporation function but beside this important aspect, EF flooded evaporators can be defined as “the most efficient evaporators on earth” as their performance in terms of approach (difference between water leaving temperature and evaporation temperature) can be really the minimum available in the industry, allowing the highest COP levels in the market. Extensive test campaign demonstrated

that in water and air-cooled chillers at nominal conditions the approach can be reduced at 0.5K (COP level 6 with a water-cooled chiller at full load).

### The design features

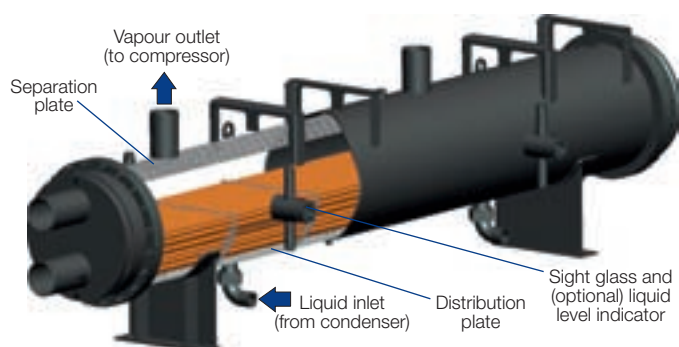
Some design characteristics:

- Integrate separator, which permits to not have an external vessel;
- High efficiency exchange tubes, design in order to maximize the refrigerant boiling performance;
- Optimal refrigerant distribution and tube geometry, preventing preferential flows;
- Optimal separation volume and plate design, ensuring that just vapour refrigerant is reaching the compressors;
- Water-side low pressure drop design;
- Global compactness, which reduces the footprint of the chiller and the refrigerant charge;
- Rich standard equipment, including compressor support, feet and refrigerant sight glasses;
- Full range of optional, including thermal insulation, liquid level management and non-standard materials.

EF Series	EFS225	EFS450	EFD450	EFS675	EFS900
Compressors	1	2	2	3	4
Refrigerant circuits	1	1	2	1	1
Cooling capacity water-cooled (kW)*	225 (64 RT)	450 (128 RT)	450 (128 RT)	675 (192 RT)	900 (256 RT)
Cooling capacity air-cooled (kW)**	275 (78 RT)	550 (156 RT)	550 (156 RT)	825 (234 RT)	1100 (313 RT)
Shell diameter (mm)	508 (20")	508 (20")	508 (20")	558 (22")	610 (24")
Total length (mm)	1878 (74")	3510 (138")	3510 (138")	4913 (193")	5913 (233")
Water passes	4	2	2	2	2

\*Water 12/7°C; evaporation 6°C \*\* Water 12/6°C; evaporation 4,5°C

## Working principle



Liquid refrigerant coming from the condenser enters the evaporator through a connection located underneath the shell. A distribution plate helps the refrigerant to flood the refrigerant circuit up to the highest row of tubes (normally placed at half of the shell height), avoiding preferential paths. When the refrigerant makes contact with the tubes, it is boiling. The evaporation process is completed as refrigerant vapour, including some liquid residual, ascends towards the compressor. The upper distribution plate blocks any remaining liquid droplets, thereby fully protecting the compressor.

## The models

The EF series include 4 evaporator models ranging from 225 kW (64 RT) to 1100 kW (313 RT) nominal cooling capacity in the single and double refrigerant circuit version. Higher capacity and special models available on request.

## Nominal data, materials and approvals

Design pressure (refrigerant-side): 17.2 bar (249 psi)

Design pressure (water-side): 16 bar (232 psi)

Pressure vessel approval available: CE (PED), ASME, GOST, SQL.

Marine approvals on request.

## Materials available

Component	Standard	Optional
Tubes	Copper (inner grooved)	AISI316L, Cu/Ni 90/10
Tube sheets	Carbon steel	AISI316L, AISI304
Water boxes	Carbon steel	AISI316L, AISI304
Shell	Carbon steel	AISI316L, AISI304

## Standard equipment

The evaporators are equipped as a standard with

- Welded feet
- Welded supports for compressors
- Refrigerant sight glasses (one per circuit)
- Flexible joint water connections (including clam and counter-pipe)

## Optional equipment

- 19 mm (3/4") thermal insulation with external protection layer
- Additional connection for liquid level management system
- Flanged water connections

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Alfa Laval reserves the right to change specifications without prior notification.

## How to contact Alfa Laval

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com).