

Danfoss Scroll MLZ & Maneurop® MTZ

Released for R407A / R407F refrigerants

Refrigerant introduction and performance overview

R407A and R407F are two HFC refrigerants with similar properties. Both have a GWP below 2200 and comply with the EU F-gas regulation. They can be used as alternatives to R404A and R507 refrigerants in MBP applications.

Designation	Composition	ODP	GWP	Safety group	Boiling temp °C	Temp glide °C	Critical temp °C	Critical pressure bar	Cond temp @ 26babs
R404A	52% R143a - 44% R125 - 4% R134a	0	3900	A1	-47	0.8	71.6	37.3	55
R507	50% R143a - 50% R125	0	4000	A1	-46.7	0	71	37.15	54
R407A	40% R134a - 40% R125 - 20% R32	0	2107	A1	-38.9	6.42	82	45.15	56
R407F	40% R134a - 30% R125 - 30% R32	0	1824	A1	-46	6.4	83	47.5	57

Zeotropic refrigerant mixtures

R407A / R407F are zeotropic mixture (like R407C). The composition of vapour and liquid changes during the phase transition. The composition change causes phase shift and temperature glide.

Phase shift

In system components where both vapour and liquid phases are present (evaporator, condenser, liquid receiver), the liquid phase and vapour phase do not have the same composition. In fact both phases form two different refrigerants. Therefore zeotropic refrigerants need some special attention. Zeotropic refrigerants must always be charged in liquid phase. Flooded evaporators should not be applied in systems with zeotropic refrigerants.

Temperature glide

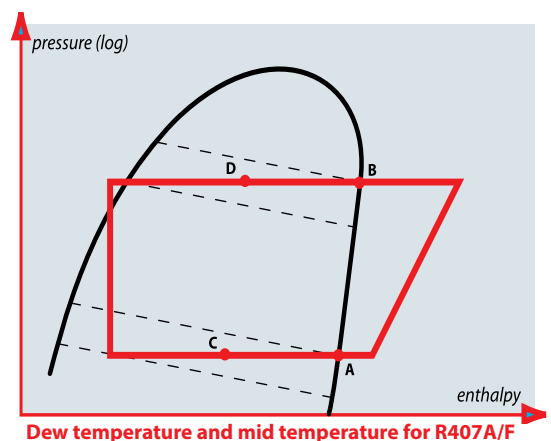
During the evaporating and the condensing process at constant pressure, the refrigerant temperature will decrease in the condenser and rise in the evaporator. Therefore when speaking about evaporating and condensing temperatures, it is important to indicate whether this is a dew point temperature or a mid point value. In the figure below, the dotted lines are lines of constant temperature.

They do not correspond to the lines of constant pressure.

Points A and B are dew point values. These are temperatures on the saturated vapour line.

Points C and D are mid point values. These are temperatures which correspond more or less with the average temperature during the evaporating and condensing process.

For the same R407A/F cycle, mid point temperatures are typically about 2°C lower than dew point temperatures. According to EN12900 recommendations, Danfoss Commercial Compressors use dew point temperatures for selection tables and application envelopes etc.



**Performance comparison
R404A vs R407A or R407 F**

Performance comparisons of refrigerants with negligible glide to one with significant glide should always be done at mid temperature reference. For the same R407A/F cycle, the mid points are typically 2°C lower than the dew point temperatures of R404A. Subsequently, the To/Tc mid point of R404A is equivalent to To +2°C /Tc+2°C of the dew point of R407A/F.

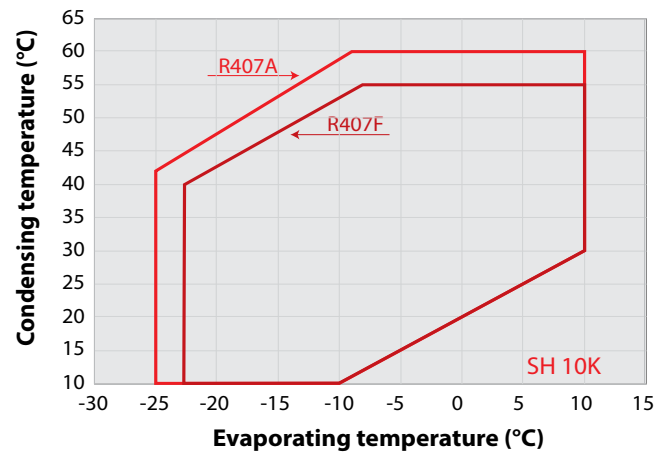
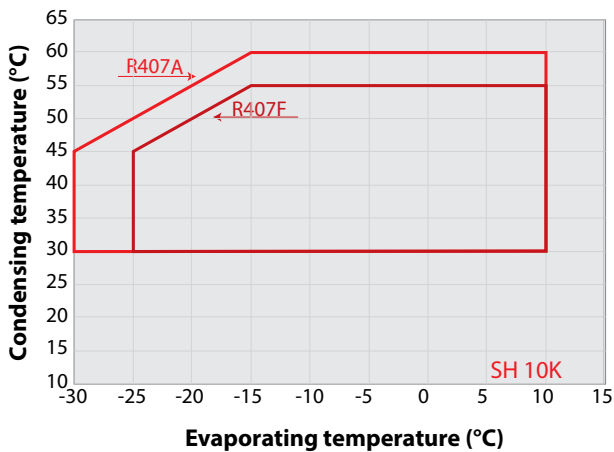
Example of comparison of R404A with R407F:

Models	Refrigerant	Conditions	Cooling Capacity	Power Input	COP
MTZ80-4	R404A dew point	-10/45°C SH: 10K / SC: 0K	10466 W	5609 W	1.87 W/W
cannot be compared with					
MTZ80-4	R407F dew point	-10/45°C SH: 10K / SC: 0K	10138 W	5038 W	2.01 W/W
can be compared with					
MTZ80-4	R407F dew point	-8/47°C SH: 10K / SC: 0K	10851 W	5354 W	2.03 W/W

MTZ

MLZ

Operating envelopes at dew point



Performance data

MTZ model	50 Hz, EN12900 ratings					
	To: -10 °C, Tc: 45°C, SC: 0 K, SH: 10 K					
	R407A			R407F		
	Cooling capacity W	Power input kW	C.O.P. W/W	Cooling capacity W	Power input kW	C.O.P. W/W
MTZ018-4	1 740	1.02	1.71	1 850	1.08	1.71
MTZ022-4	2 390	1.26	1.90	2 540	1.33	1.91
MTZ028-4	3 130	1.67	1.87	3 320	1.76	1.89
MTZ032-4	3 630	1.84	1.97	3 860	1.94	1.99
MTZ036-4	4 260	2.19	1.95	4 520	2.31	1.96
MTZ040-4	4 890	2.51	1.95	5 170	2.65	1.95
MTZ044-4	4 890	2.36	2.07	5 200	2.49	2.09
MTZ050-4	5 700	2.73	2.09	6 060	2.90	2.09
MTZ056-4	6 120	2.98	2.05	6 500	3.16	2.06
MTZ064-4	7 270	3.57	2.04	7 730	3.78	2.04
MTZ072-4	8 130	3.98	2.04	8 640	4.21	2.05
MTZ080-4	9 540	4.76	2.00	10 140	5.04	2.01
MTZ100-4	11 200	5.74	1.95	11 900	6.07	1.96
MTZ125-4	14 330	7.17	2.00	15 220	7.58	2.01
MTZ144-4	16 870	8.32	2.03	17 910	8.78	2.04
MTZ160-4	18 520	9.42	1.97	19 670	9.95	1.98

MLZ model	50 Hz, EN12900 ratings					
	To: -10 °C, Tc: 45°C, SC: 0 K, SH: 10 K					
	R407A			R407F		
	Cooling capacity W	Power input kW	C.O.P. W/W	Cooling capacity W	Power input kW	C.O.P. W/W
MLZ015T4	3 010	1.55	1.94	3 270	1.66	1.97
MLZ019T4	3 900	2.04	1.91	4 230	2.19	1.94
MLZ021T4	4 110	2.21	1.86	4 460	2.37	1.89
MLZ026T4	5 170	2.71	1.91	5 610	2.90	1.94
MLZ030T4	6 300	2.99	2.11	6 840	3.20	2.14
MLZ038T4	7 290	3.47	2.10	7 920	3.72	2.13
MLZ042T5	8 360	4.53	1.85	9 080	4.85	1.87
MLZ045T4	8 900	4.55	1.96	9 660	4.87	1.99
MLZ048T4	9 780	5.01	1.95	10 620	5.37	1.98
MLZ058T4	11 190	5.69	1.97	12 150	6.09	2.00
MLZ066T4	13 090	6.78	1.93	14 210	7.26	1.96
MLZ076T4	14 350	7.51	1.91	15 580	8.04	1.94

To: Evaporating temperature at dew point (saturated suction temperature)
 Tc: Condensing temperature at dew point (saturated discharge temperature)
 SC: Subcooling
 SH: Superheat