Refrigerants and lubricants

GENERAL INFORMATION

When choosing a refrigerant, different aspects must be taken into consideration:
- Legislation (now and in the future)
- Safety
- Application envelope in relation to expected running conditions.
- Compressor capacity and efficiency
- Compressor manufacturer recommendations & guidelines

Additional points could influence the final choice:
- Environmental considerations
- Standardisation of refrigerants and lubricants
- Refrigerant cost
- Refrigerant availability

The table below gives an overview of the different refrigerant-lubricant-compressor combinations for Maneurop®, MT & MTZ compressors.

Refrigerant	Type	Lubricant type	Compressor type	Danfoss Maneurop lubricant	Application
R22	HCFC	Mineral	MT	White oil, **160P**	Medium / High Temperature
R407C	HFC	Polyolester	MTZ	Polyolester oil **160PZ**	Medium / High temperature
R134a	HFC	Polyolester	MTZ	Polyolester oil **160PZ**	Medium / High temperature
R404A	HFC	Polyolester	MTZ	Polyolester oil **160PZ**	Medium temperature
R507	HFC	Polyolester	MTZ	Polyolester oil **160PZ**	Medium temperature
Transitional refrigerants, R22 based		Alkylbenzene (ABM)	MT	Alkylbenzene oil **160 ABM** **Note:** Initial mineral oil charge has to be replaced by 160 ABM oil.	Medium / High temperature
Hydrocarbons		Danfoss Maneurop does not authorise the use of hydrocarbons in their compressors			

The Montreal protocol states that CFC refrigerants such as R12 and R502 may no longer be applied in new installations in the signatory members countries.

Therefore capacity and other data for these refrigerants are not published in this document. Danfoss Maneurop, MT compressors however are suitable for use with these refrigerants and can still be used as replacements in existing installations.

R22

R22 is an HCFC refrigerant and is still a wide use today. It has a low ODP (Ozone Depletion Potential) and therefore will be phased out in the future. Check local legislation.

Always use Maneurop® White oil. The Maneurop®, MT compressor is dedicated for R22 and is supplied with an initial mineral oil charge. Use the application envelopes on page 8 and performance tables on page 10-11 to select the correct compressor.

R407C

Refrigerant R407C is an HFC refrigerant with similar thermodynamic properties to those of R22. R407C has zero ozone depletion potential (ODP=0). Many installers and OEMs consider R407C to be the standard alternative for R22. R407C is a zeotropic mixture and has a temperature glide of about 6 K.

For more specific information about zeotropic refrigerants; refer to section "zeotropic refrigerant mixtures". R407C must be charged in the liquid phase. Always use the Maneurop® MTZ compressors with Danfoss Maneurop 160PZ polyolester oil, which is supplied with the MTZ compressor for R407C applications. Use the application envelope on page 8 and performance tables on page 12-13 to select the correct compressor. Maneurop® MT compressors should never be used with R407C, even when the mineral oil is replaced with polyolester oil.

Specifications

TECHNICAL SPECIFICATIONS

Compressor model	Displacement		Cyl. number	Oil charge	Net weight	Design versions**						
						motor voltage code						
	(cm³/rev)	(m³/h)*		(dm³)	(kg)	1	3	4	5	6	7	9
MT / MTZ 18 JA	30.23	5.26	1	0.95	21	S-VE	S-VE	S-VE	S-VE	-	-	-
MT / MTZ 22 JC	38.12	6.63	1	0.95	21	S-VE	S-VE	S-VE	S-VE	S-VE	-	-
MT / MTZ 28 JE	48.06	8.36	1	0.95	23	S-VE	S-VE	S-VE	S-VE	S-VE	-	-
MT / MTZ 32 JF	53.86	9.37	1	0.95	24	S-VE	S-VE	S-VE	S-VE	S-VE	S-VE	S-VE
MT / MTZ 36 JG	60.47	10.52	1	0.95	25	S-VE	S-VE	S-VE	S-VE	S-VE	-	-
MT / MTZ 40 JH	67.89	11.81	1	0.95	26	S-VE	S-VE	S-VE	-	S-VE	-	-
MT / MTZ 44 HJ	76.22	13.26	2	1.8	35	S-VE	S-VE	S-VE	-	S-VE	-	-
MT / MTZ 45 HJ	76.22	13.26	2	1.8	37	S-VE	S-VE	S-VE	-	-	-	-
MT / MTZ 50 HK	85.64	14.90	2	1.8	35	S-VE	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 51 HK	85.64	14.90	2	1.8	37	S-VE	S-VE	S-VE	-	S-VE	-	-
MT / MTZ 56 HL	96.13	16.73	2	1.8	37	S-VE	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 57 HL	96.13	16.73	2	1.8	39	S-VE	S-VE	S-VE	-	-	-	-
MT / MTZ 64 HM	107.71	18.74	2	1.8	37	S-VE	S-VE	S-VE	-	S-VE	-	S-VE
MT / MTZ 65 HM	107.71	18.74	2	1.8	39	S-VE	S-VE	S-VE	-	S-VE	-	-
MT / MTZ 72 HN	120.94	21.04	2	1.8	40	-	S-VE	S-VE	-	S-VE	-	S-VE
MT / MTZ 73 HN	120.94	21.04	2	1.8	41	-	S-VE	S-VE	-	S-VE	-	-
MT / MTZ 80 HP	135.78	23.63	2	1.8	40	-	S-VE	S-VE	-	S-VE	-	S-VE
MT / MTZ 81 HP	135.78	23.63	2	1.8	41	-	S-VE	S-VE	-	-	-	-
MT / MTZ 100 HS	171.26	29.80	4	3.9	60	-	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 125 HU	215.44	37.49	4	3.9	64	-	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 144 HV	241.87	42.09	4	3.9	67	-	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 160 HW	271.55	47.25	4	3.9	69	-	S-VE	S-VE	-	S-VE	S-VE	S-VE
MT / MTZ 200 HSS	342.52	2 x 29.80	8	10.4	170	-	S	S	-	S	-	-
MT / MTZ 250 HUU	430.88	2 x 37.49	8	10.4	175	-	S	S	-	S	-	-
MT / MTZ 288 HVV	483.74	2 x 42.09	8	10.4	178	-	S	S	-	-	-	-
MT / MTZ 320 HWW	543.10	2 x 47.25	8	10.4	180	-	S	S	-	S	-	-

* *At 2900 rpm*
** *S & VE versions, see table on page 4.*

NOMINAL PERFORMANCE
R22, R407C - 50 HZ

	NOMINAL RATINGS * MT - R22				NOMINAL RATINGS ** MTZ - R407C			
Compressor model	Cooling capacity (W)	Power input (kW)	Current input (A)	COP (W/W)	Cooling capacity (W)	Power input (kW)	Current input (A)	COP (W/W)
MT / MTZ 18 JA	3881	1.45	2.73	2.68	3726	1.39	2.47	2.68
MT / MTZ 22 JC	5363	1.89	3.31	2.84	4777	1.81	3.31	2.64
MT / MTZ 28 JE	7378	2.55	4.56	2.89	6137	2.35	4.39	2.61
MT / MTZ 32 JF	8064	2.98	4.97	2.70	6941	2.67	5.03	2.60
MT / MTZ 36 JG	9272	3.37	5.77	2.75	7994	3.12	5.71	2.56
MT / MTZ 40 JH	10475	3.85	6.47	2.72	9128	3.61	6.45	2.53
MT / MTZ 44 HJ	11037	3.89	7.37	2.84	9867	3.63	6.49	2.72
MT / MTZ 50 HK	12324	4.32	8.46	2.85	11266	4.11	7.34	2.74
MT / MTZ 56 HL	13771	5.04	10.27	2.73	12944	4.69	8.36	2.76
MT / MTZ 64 HM	15820	5.66	9.54	2.79	14587	5.25	9.35	2.78
MT / MTZ 72 HN	17124	6.31	10.54	2.71	16380	5.97	10.48	2.74
MT / MTZ 80 HP	19534	7.13	11.58	2.74	18525	6.83	11.83	2.71
MT / MTZ 100 HS	23403	7.98	14.59	2.93	22111	7.85	13.58	2.82
MT / MTZ 125 HU	30429	10.66	17.37	2.85	29212	10.15	16.00	2.88
MT / MTZ 144 HV	34340	11.95	22.75	2.87	32934	11.57	18.46	2.85
MT / MTZ 160 HW	38273	13.39	22.16	2.86	37386	13.28	21.40	2.82
MT / MTZ 200 HSS	46807	15.97	29.19	2.93	43780	15.54	26.90	2.82
MT / MTZ 250 HUU	60858	21.33	34.75	2.85	57839	20.09	31.69	2.88
MT / MTZ 288 HVV	68379	23.91	45.50	2.87	65225	22.92	36.56	2.85
MT / MTZ 320 HWW	76547	26.79	44.32	2.86	74024	26.30	42.37	2.81

NOMINAL RATINGS* MT HIGH EFFICIENCY COMPRESSORS R22 - 50HZ

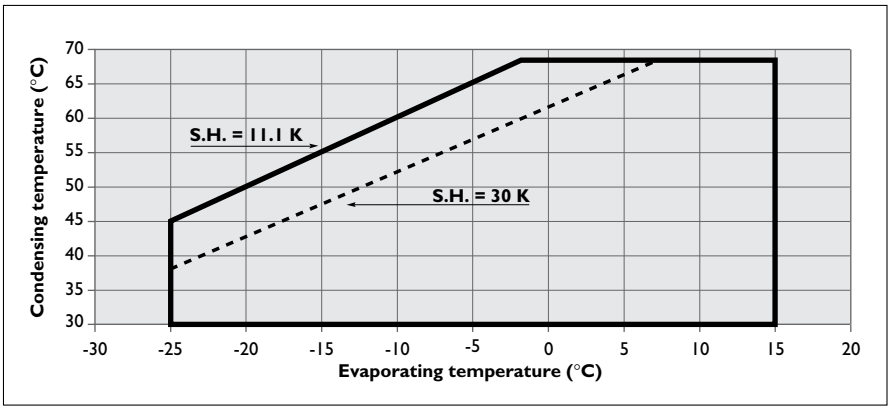
Compressor	Cooling capacity (W)	Power input (kW)	Current input (A)	COP (W/W)
MT 45 HJ	10786	3.62	6.86	2.98
MT 51 HK	12300	4.01	7.86	3.07
MT 57 HL	13711	4.54	9.24	3.02
MT 65 HM	15763	5.23	8.81	3.01
MT 73 HN	17863	5.98	9.99	2.99
MT 81 HP	20298	6.94	11.27	2.93

* *Ratings at ARI conditions with R22: 7.2°C evaporating temperature, 54.4°C condensing temperature, 8.3 K subcooling, 11.1 K superheat, 50 Hz, 400 V.*

** *Ratings at ARI conditions with R407C at dew point: 7.2°C evaporating temperature, 54.4°C condensing temperature, 8.3 K subcooling, 11.1 K superheat, 50 Hz, 400 V.*

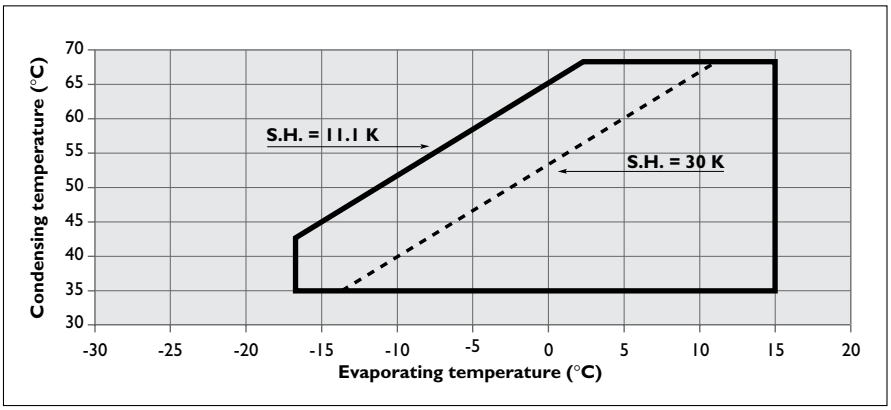
Capacity and power input data ± 5%.

Operating envelopes



Application Envelope for MT compressors with

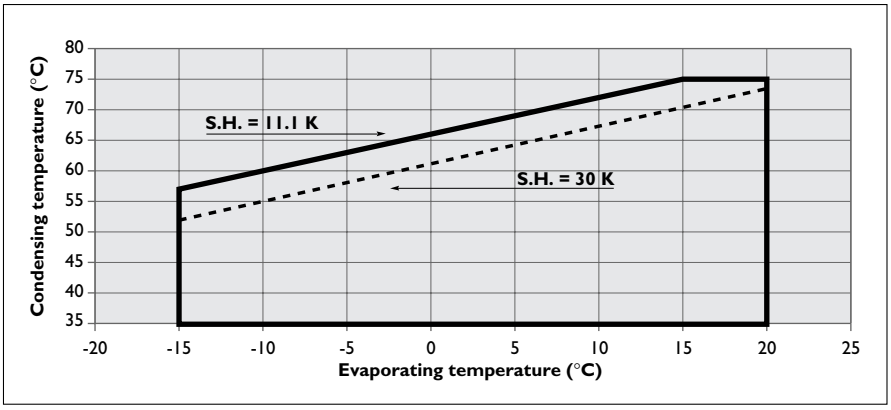
R22



Application Envelope for MTZ compressors with

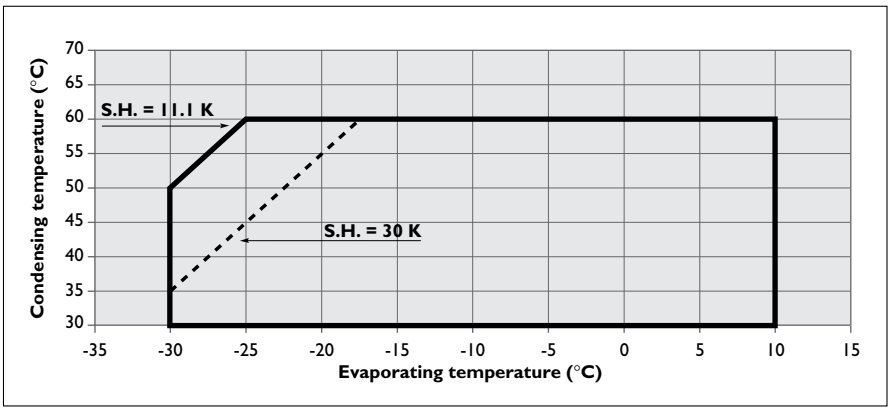
R407C

at DEW POINT



Application Envelope for MTZ compressors with

R134a



Application Envelope for MTZ compressors with

R404A/R507

ZEOTROPIC REFRIGERANT MIXTURES

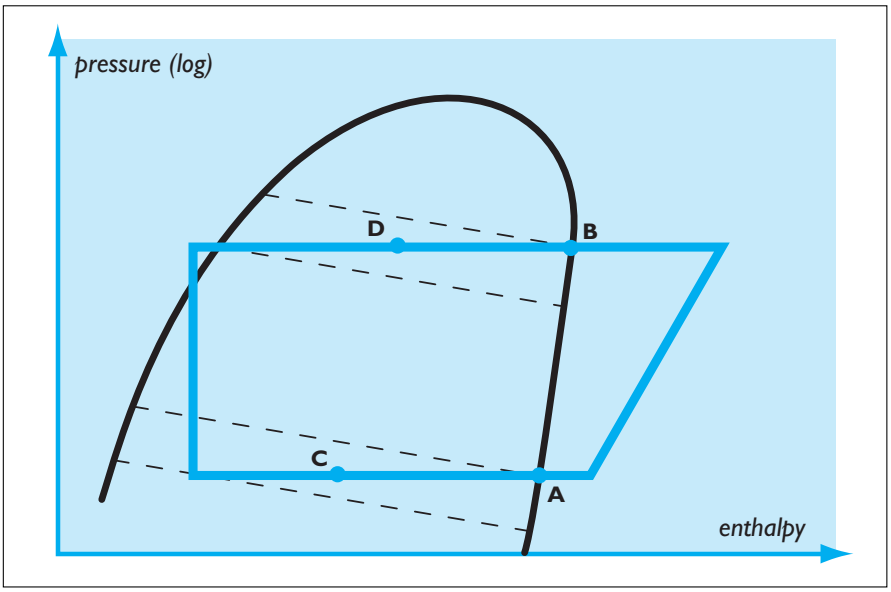
Refrigerant mixtures can be either zeotropic or azeotropic.
An azeotropic mixture (like R502 or R507) behaves like a pure refrigerant. During a phase transition (from vapour to liquid or from liquid to vapour) the composition of vapour and liquid stays the same.
In a zeotropic mixture (like R407C) on the other hand the composition of vapour and liquid changes during the phase transition. When the effect of this phase transition is very small, the mixture is often called a near-azeotropic mixture. R404A is such a near-azeotropic mixture.

The composition change has two resulting effects:

Phase shift
In system components where both vapour and liquid phase 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 and suction accumulators should not be applied in systems with zeotropic refrigerants. This also applies to near-azeotropic mixtures.

Temperature glide
During the evaporating process 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 MEAN 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 MEAN point values. These are temperatures which correspond more or less with the average temperature during the evaporating and condensing process. For the same R407C cycle, MEAN point temperatures are typically about 2 to 3°C lower than DEW point temperatures. According to Asercom recommendations, Danfoss Maneurop uses DEW point temperatures for selection tables and application envelopes etc.
To obtain exact capacity data at mean point temperatures, the mean point temperatures must be converted to dew point temperatures with help of refrigerant data tables from the refrigerant manufacturer.



DEW temperature and MEAN temperature for
R407C