



Features and uses of R-507

R-507 is an azeotropic mixture consisting of R-125 and R-143a. Their thermodynamic characteristics constitute the ideal replacement for R-502 in refrigeration sector at low and medium temperature. It is characterized by its chemical stability, its good thermodynamic properties and low toxicity. The main application is in low and medium temperatures for new installations.

There is also the possibility of converting an R-502 installation to R-507, by removing 95% of mineral oil or original alkyl benzene by polyolester oil. It is necessary to change the drier filter (molecular sieve XH9 recommended), replace the expansion valve by one of R-507 and oversizing the condenser.

R-507 is a mixture of HFC refrigerants, which are not compatible with traditional lubricants working with R-502. The only lubricant suitable to use is polyolester oil (POE).

Toxicity and storage

Its toxicity is very low. AEL (Allowable Exposure Limit) has a value of 100 ppm (8-hour TWA). Containers of R-507 should be stored in dry, well-ventilated and away from heat sources. Vapors are heavier than air and will tend to accumulate near the ground.

Their classification is **A1 group L1**

Security

R-507 is not toxic, not flammable, high security.
It has been classified as **A1 / group L1**.

Components

Chemical Name	% by weight	CAS N°	CE N°
Pentafluoroethane (R-125)	50	354-33-6	206-557-8
1,1,1-Trifluoroethane (R-143a)	50	420-46-2	206-996-5



Physical Properties

PHYSICAL PROPERTIES	UNITS	R-507
Molecular weight	(g/mol)	98.9
Boiling point (at 1,013 bar)	(°C)	-46.7
Critical temperature	(°C)	70.9
Critical Pressure	(Bar abs)	37.9
Critical Density	(Kg/m ³)	500
Liquid density (25°C)	(Kg/m ³)	1050
Liquid density (-25°C)	(Kg/m ³)	1248
Saturated vapour density (at -15° C)	(Kg/m ³)	19.6
Sliding boiling temperature (at 1.013 bar)	(K)	0
Vapour pressure (25°C)	(Bar abs)	12.74
Vapour pressure (-25°C)	(Bar abs)	2.58
Latent heat of vaporization at boiling point	(KJ/Kg)	200
Specific heat of liquid at (25°C)	(KJ/Kg K)	1.65
Specific heat of vapour at (25°C) (1,013 bar)	(KJ/Kg K)	0.87
Thermal conductivity of liquid (25°C)	(W/mK)	0.063
Thermal conductivity of steam (1,013 bar)	(W/mK)	0.0141
Solubility in water (25°C)	(Ppm)	Negligible
Flammability Limit (25°C)	(%vol.)	None
Toxicity (AEL)	(Ppm)	1000
ODP		0
GWP		3985*

(1) Bubble point

* According to IPPCC-AR4/CIE (Fourth Assessment Report of the Intergovernmental Panel on Climate Change) -2007.

The thermodynamic properties of R-507 are very similar to those of R-502, this is evidenced in the following example:

The operating conditions simulate an actual cycle at low temperatures, typical of commercial refrigeration.

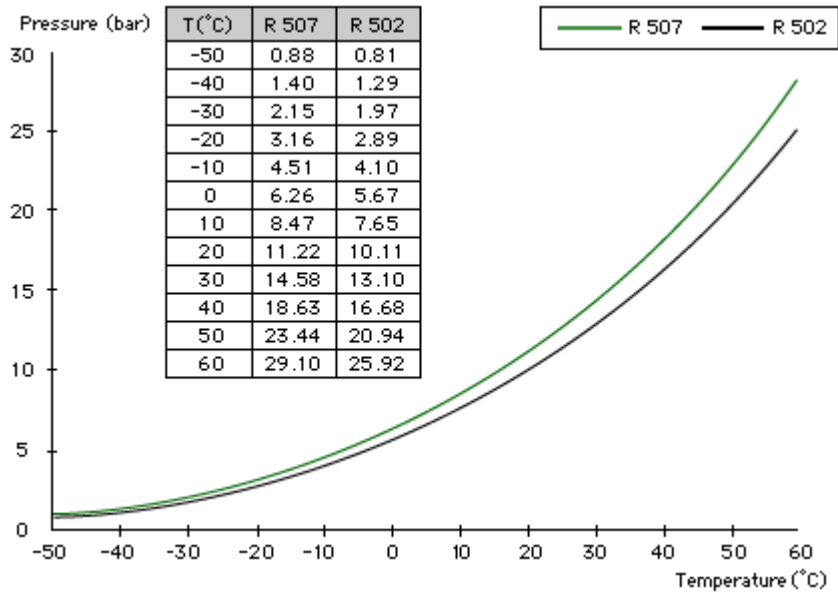
1. Temperature at Evaporator inlet: -40 ° C
2. Temperature at Condenser inlet: 45 ° C
3. Suction superheated steam: 40 ° C
4. Super cooled liquid: 5 ° C

Isentropic Compression ratio: 1

	R-507	R502
Evaporating pressure (bar)	1.41	1.3
Condensing pressure (bar)	20.93	18.72
Compression work	14.8	14.4
Compressor discharge temperature (°C)	93	103
COP	1.8	1.9
Net cooling capacity (KJ/Kg)	83.5	83.4
Volumetric capacity of refig. (KJ/m ³)	527	543
Temperature slide (evaporation) (°C)	0	0
Temperature slide (condensation) (°C)	0	0



Pressures R-502 - R-507 comparative



Thermodynamic properties

TEMP. (°C)	PRESSURE (kPa)		DENSITY (kg/m3)		ENTHALPY (kJ/kg)		ENTROPY (kJ/kg.K)	
	BUBBLE	DEW	BUBBLE	DEW	BUBBLE	DEW	BUBBLE	DEW
-50	88.0	88.0	1328.0	4.892	135.6	333.4	0.7417	1.6280
-45	112.0	112.0	1312.0	6.137	141.7	336.4	0.7687	1.6220
-40	140.8	140.8	1297.0	7.618	147.9	339.4	0.7954	1.6170
-35	175.2	175.1	1281.0	9.366	154.1	342.3	0.8218	1.6120
-30	215.7	215.6	1264.0	11.420	160.4	345.3	0.8479	1.6080
-25	263.1	262.9	1248.0	13.800	166.8	348.1	0.8738	1.6040
-20	318.0	317.8	1231.0	16.570	173.3	350.9	0.8994	1.6010
-15	381.3	381.0	1213.0	19.770	179.8	353.7	0.9248	1.5980
-10	453.7	453.4	1195.0	23.440	186.4	356.4	0.9500	1.5960
-5	536.1	535.7	1176.0	27.650	193.2	359.0	0.9751	1.5930
0	629.3	628.7	1157.0	32.460	200.0	361.5	1.0000	1.5910
5	734.0	733.4	1138.0	37.950	206.9	363.9	1.0250	1.5890
10	851.4	850.6	1117.0	44.230	214.0	366.2	1.0500	1.5870
15	982.2	981.3	1095.0	51.390	221.2	368.4	1.0740	1.5850
20	1127.0	1126.0	1073.0	59.580	228.5	370.4	1.0990	1.5830
25	1288.0	1287.0	1049.0	68.980	236.0	372.2	1.1240	1.5810
30	1465.0	1464.0	1024.0	79.800	243.7	373.9	1.1490	1.5780
35	1660.0	1659.0	996.5	92.340	251.7	375.2	1.1740	1.5750
40	1874.0	1873.0	967.2	107.000	259.8	376.2	1.2000	1.5720
45	2109.0	2107.0	935.2	124.400	268.3	376.8	1.2260	1.5670
50	2365.0	2363.0	899.4	145.400	277.2	376.8	1.2530	1.5610



Mollier Diagram

