



R12 REPLACEMENTS

		R134a	R12	RS-24	RS-25	R413A	R409A	R401A	R401B
Molecular weight		102.0	120.9	102.6	120.1	104.0	97.4	94.4	92.8
Boiling point (1 atm)	°C	-26.1	-29.8	-28.6 ⁽¹⁾	-27.5 ⁽¹⁾	-36.0 ⁽¹⁾	-34.5 ⁽¹⁾	-33.1 ⁽¹⁾	-34.7 ⁽¹⁾
	°F	-15.1	-21.6	-19.5 ⁽¹⁾	-17.5 ⁽¹⁾	-31.0 ⁽¹⁾	-29.6 ⁽¹⁾	-27.6 ⁽¹⁾	-30.4 ⁽¹⁾
Temperature glide	°C	0	0	0.5	0.5	6	8	4	4.5
Critical temperature	°C	101.1	112.0	101.0	102.3	101.3	107.0	108	106.1
	°F	214.0	233.6	213.8	216.1	214.3	224.6	226	233.0
Critical pressure	kPa	4067	4116	4097	4040	4110	4600	4604	4682
	psia	590	597	594	581	596	667	668	679
Liquid density at 25°C	kg/m ³	1206	1311	1184	1215	1188	1220	1193	1188
Density of saturated vapour at 25°C	kg/m ³	32.4	37.3	30.9		3.9 ⁽⁴⁾	4.97 ⁽⁴⁾	29.0	30.7
Specific heat of liquid at 25°C	kJ/kg°C	1.43	1.00	1.45	1.35	1.52	1.25	1.26	1.26
Specific heat of vapour at 1 atm & 25 °C	kJ/kg°C	0.874	0.606	0.863		0.817	0.703	0.734	0.722
Vapour pressure at 25°C	kPa	660.5	643	707 ⁽¹⁾	670 ⁽¹⁾	785 ⁽¹⁾	814 ⁽¹⁾	783.0 ⁽¹⁾	827.0 ⁽¹⁾
	psia	95.8	93.3	102.6 ⁽¹⁾	97.2 ⁽¹⁾	113.8 ⁽¹⁾	118.0 ⁽¹⁾	113.6 ⁽¹⁾	120.0 ⁽¹⁾
Latent heat of vaporisation at boiling point	kJ/kg	215	165	218	196 ⁽¹⁾	212	220	234	236
Ozone Depletion Potential	ODP	0	1	0	0	0	0.048	0.037	0.035
Flammability limit in air (1 atm)	vol%	None	None	None	None	None	None	None	None
Inhalation exposure (8 hr day & 40 hr week)	ppm	1000	1000	1000	1000	1000	1000	800	840

(1) Bubble point

(2) 30°C

(3) 20°C

(4) Boiling point



R12 REPLACEMENTS

		R401C	R405A	R406A	R407D	R414A	R416A	39TC
Molecular weight		101.0	111.9	89.9	91.0	96.9	111.9	121.4
Boiling point (1 atm)	°C	-28.4 ⁽¹⁾	-27.3 ⁽¹⁾	-32.3 ⁽¹⁾	-39.5 ⁽¹⁾	-35.1 ⁽¹⁾	-23.4 ⁽¹⁾	-24.7 ⁽¹⁾
	°F	-19.0 ⁽¹⁾	-17.1 ⁽¹⁾	-26.2 ⁽¹⁾	-39.1 ⁽¹⁾	-31.2 ⁽¹⁾	-10.0 ⁽¹⁾	-12.5 ⁽¹⁾
Temperature glide	°C	6		8.5	6.5	8	1.5	0.5
Critical temperature	°C	112.7	106.1	114.5	102.4	118.3	108.2	110.6
	°F	234.9	233.0	238.1	216.3	244.9	228.8	231.1
Critical pressure	kPa	4366	4260	4581			4016	3742
	psia	633	618	664			583	543
Liquid density at 25°C	kg/m ³	1207	1220 ⁽²⁾	1148 ⁽³⁾	1160	1167 ⁽³⁾	1248 ⁽³⁾	1280
Density of saturated vapour at 25°C	kg/m ³	25.9		20.1 ⁽³⁾	37.4	24.9 ⁽³⁾	25.1 ⁽³⁾	6.1 ⁽⁴⁾
Specific heat of liquid at 25°C	kJ/kg°C							1.33
Specific heat of vapour at 1 atm & 25 °C	kJ/kg°C							0.974
Vapour pressure at 25°C	kPa	656 ⁽¹⁾	636 ^{(1) (3)}	633 ^{(1) (3)}	868 ⁽¹⁾	688 ^{(1) (3)}	505 ^{(1) (3)}	619 ⁽¹⁾
	psia	95.1 ⁽¹⁾	92.2 ^{(1) (3)}	91.8 ^{(1) (3)}	125.8 ⁽¹⁾	99.8 ^{(1) (3)}	73.2 ^{(1) (3)}	89.8 ⁽¹⁾
Latent heat of vaporisation at boiling point	kJ/kg			243	243	225	199	182
Ozone Depletion Potential	ODP	0.03	0.028	0.057	0	0.037	0.012	0
Flammability limit in air (1 atm)	vol%	None	None	None	None	None	None	None
Inhalation exposure (8 hr day & 40 hr week)	ppm	1000		1000	1000			

(1) Bubble point

(2) 30°C

(3) 20°C

(4) Boiling point