



# R-11 and R-12

## R-11

**Composition:** 100% trichlorofluoromethane (CCl<sub>3</sub>F)

**Application:** Large low pressure centrifugal chillers

**Performance:** Industry standard choice until 1990's

**Lubricant:** Compatible with mineral oil

**Retrofitting:**

- R-123 is being successfully used to retrofit R-11 chillers
- Retrofit jobs are usually done in cooperation with equipment manufacturers

## R-12

**Composition:** 100% dichlorodifluoromethane (CCl<sub>2</sub>F<sub>2</sub>)

**Application:** Large centrifugal chillers, open drive AC, process cooling, high-medium-low temperature refrigeration (large and small systems)

**Performance:** Industry standard choice until 1990's

**Lubricant:** Compatible with mineral oil

**Retrofitting:**

- Consult the comments on Pages 9 and 10  
See Section II, pages 92-98 for detailed discussion

[ PRESSURE-TEMP CHART ]

R-11 psig	TEMP. (°F)	R-12 psig
	-40	11.0"
	-35	8.4"
	-30	5.5"
	-25	2.3"
27.0"	-20	0.6
26.5"	-15	2.4
26.0"	-10	4.5
25.4"	-5	6.7
24.7"	0	9.2
23.9"	5	11.8
23.1"	10	14.6
22.1"	15	17.7
21.1"	20	21.0
19.9"	25	24.6
18.6"	30	28.5
17.2"	35	32.6
15.6"	40	37.0
13.9"	45	41.7
12.0"	50	46.7
10.0"	55	52.0
7.8"	60	57.7
5.4"	65	63.8
2.8"	70	70.2
0.0	75	77.0
1.5	80	84.2
3.2	85	91.8
4.9	90	99.8
6.8	95	108
8.8	100	117
10.9	105	127
13.2	110	136
15.6	115	147
18.2	120	158
21.0	125	169
24.0	130	181
27.1	135	194
30.4	140	207
34.0	145	220
37.7	150	234

[ PHYSICAL PROPERTIES OF REFRIGERANTS ]

	National R-11	National R-12
Environmental Classification	CFC	CFC
Molecular Weight	137.4	120.9
Boiling Point (1atm, °F)	74.7	-21.6
Critical Pressure (psia)	639.3	600
Critical Temperature (°F)	388	233.5
Critical Density (lb./ft <sup>3</sup> )	34.6	35.3
Liquid Density (70° F, lb./ft <sup>3</sup> )	92.73	82.96
Vapor Density (bp, lb./ft <sup>3</sup> )	0.365	0.393
Heat of Vaporization (bp, BTU/lb.)	77.9	71.2
Specific Heat Liquid (70 °F, BTU/lb. °F)	0.2093	0.2324
Specific Heat Vapor (1atm, 70 °F, BTU/lb. °F)	0.1444 (sat)	0.1455
Ozone Depletion Potential (CFC 11 = 1.0)	1.0	1.0
Global Warming Potential (CO <sub>2</sub> = 1.0)	4750	10910
ASHRAE Standard 34 Safety Rating	A1	A1

[ AVAILABLE IN SIZES ]

REFRIGERANT	Type	Size
R-11	Drum	100 lb.
R-12	Cylinder	30 lb.



# Thermodynamic Properties of R-11

TEMP. (°F)	Pressure Liquid (psia)	Density Liquid (lb/ft <sup>3</sup> )	Density Vapor (lb/ft <sup>3</sup> )	Enthalpy Liquid (Btu/lb)	Enthalpy Vapor (Btu/lb)	Entropy Liquid (Btu/R-lb)	Entropy Vapor (Btu/R-lb)
30	5.6	95.93	0.1481	14.14	95.94	0.03112	0.1982
35	6.3	95.54	0.1654	15.16	96.56	0.03321	0.1977
40	7.0	95.14	0.1842	16.19	97.17	0.03528	0.1973
45	7.9	94.75	0.2047	17.23	97.79	0.03733	0.1970
50	8.8	94.35	0.2269	18.26	98.41	0.03937	0.1966
55	9.8	93.95	0.2509	19.30	99.02	0.04139	0.1963
60	10.9	93.55	0.2769	20.34	99.64	0.04340	0.1960
65	12.1	93.14	0.3049	21.39	100.3	0.04540	0.1957
70	13.4	92.73	0.3351	22.44	100.9	0.04738	0.1955
75	14.8	92.32	0.3676	23.49	101.5	0.04935	0.1952
80	16.3	91.91	0.4024	24.54	102.1	0.05131	0.1950
85	17.9	91.50	0.4397	25.60	102.7	0.05326	0.1948
90	19.7	91.08	0.4797	26.66	103.3	0.05519	0.1946
95	21.6	90.66	0.5224	27.73	103.9	0.05711	0.1945
100	23.6	90.23	0.5680	28.80	104.5	0.05902	0.1943
105	25.7	89.81	0.6167	29.87	105.1	0.06092	0.1942
110	28.1	89.38	0.6684	30.94	105.7	0.06281	0.1941
115	30.5	88.94	0.7235	32.02	106.3	0.06469	0.1940
120	33.2	88.51	0.7820	33.11	106.9	0.06656	0.1939
125	36.0	88.07	0.8442	34.20	107.5	0.06842	0.1939
130	38.9	87.62	0.9101	35.29	108.1	0.07027	0.1938
135	42.1	87.17	0.9799	36.39	108.7	0.07211	0.1937
140	45.4	86.72	1.054	37.49	109.3	0.07394	0.1937
145	49.0	86.26	1.132	38.59	109.9	0.07576	0.1937
150	52.8	85.80	1.215	39.70	110.5	0.07758	0.1936
155	56.7	85.33	1.302	40.82	111.0	0.07939	0.1936
160	60.9	84.86	1.394	41.94	111.6	0.08119	0.1936
165	65.3	84.39	1.492	43.06	112.2	0.08298	0.1936
170	70.0	83.91	1.594	44.19	112.7	0.08476	0.1936
175	74.9	83.42	1.702	45.33	113.3	0.08654	0.1936
180	80.0	82.93	1.816	46.47	113.8	0.08832	0.1936
185	85.4	82.43	1.936	47.62	114.4	0.09008	0.1936
190	91.1	81.93	2.062	48.77	114.9	0.09184	0.1936
195	97.1	81.42	2.195	49.93	115.4	0.09360	0.1937
200	103.3	80.90	2.335	51.09	116.0	0.09535	0.1937
205	109.8	80.38	2.482	52.26	116.5	0.09710	0.1937
210	116.7	79.85	2.636	53.44	117.0	0.09884	0.1937
215	123.8	79.31	2.799	54.62	117.5	0.1006	0.1937
220	131.3	78.76	2.970	55.82	118.0	0.1023	0.1938
225	139.1	78.21	3.149	57.01	118.5	0.1040	0.1938
230	147.2	77.65	3.338	58.22	118.9	0.1058	0.1938
235	155.6	77.08	3.536	59.43	119.4	0.1075	0.1938
240	164.5	76.50	3.745	60.65	119.8	0.1092	0.1938