



R-11 and R-12

R-11

Composition: 100% trichlorofluoromethane (CCl₃F)

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 (CCl₂F₂)

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 ³)	34.6	35.3
Liquid Density (70° F, lb./ft ³)	92.73	82.96
Vapor Density (bp, lb./ft ³)	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 ₂ = 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-12

TEMP. (°F)	Pressure Liquid (psia)	Density Liquid (lb/ft ³)	Density Vapor (lb/ft ³)	Enthalpy Liquid (Btu/lb)	Enthalpy Vapor (Btu/lb)	Entropy Liquid (Btu/R-lb)	Entropy Vapor (Btu/R-lb)
-60	5.4	96.63	0.1537	-4.145	70.99	-0.01010	0.1779
-55	6.2	96.14	0.1756	-3.115	71.56	-0.00754	0.1770
-50	7.1	95.66	0.1999	-2.081	72.13	-0.00501	0.1761
-45	8.1	95.17	0.2268	-1.043	72.70	-0.00249	0.1753
-40	9.3	94.68	0.2565	0.000	73.27	0.00000	0.1746
-35	10.6	94.18	0.2890	1.047	73.84	0.00247	0.1739
-30	12.0	93.68	0.3247	2.098	74.41	0.00493	0.1732
-25	13.5	93.18	0.3637	3.154	74.98	0.00736	0.1726
-20	15.2	92.67	0.4063	4.214	75.55	0.00978	0.1720
-15	17.1	92.16	0.4525	5.280	76.11	0.01218	0.1715
-10	19.2	91.65	0.5028	6.350	76.68	0.01457	0.1710
-5	21.4	91.13	0.5573	7.425	77.24	0.01693	0.1705
0	23.8	90.61	0.6162	8.505	77.80	0.01929	0.1700
5	26.4	90.08	0.6798	9.591	78.35	0.02162	0.1696
10	29.3	89.55	0.7483	10.68	78.90	0.02395	0.1692
15	32.4	89.02	0.8221	11.78	79.45	0.02625	0.1688
20	35.7	88.48	0.9013	12.88	80.00	0.02855	0.1685
25	39.3	87.93	0.9864	13.99	80.54	0.03083	0.1681
30	43.1	87.38	1.078	15.10	81.07	0.03310	0.1678
35	47.2	86.82	1.175	16.22	81.61	0.03536	0.1675
40	51.6	86.25	1.279	17.35	82.13	0.03761	0.1673
45	56.3	85.68	1.391	18.48	82.65	0.03984	0.1670
50	61.3	85.10	1.510	19.62	83.17	0.04207	0.1668
55	66.6	84.52	1.637	20.77	83.68	0.04428	0.1665
60	72.3	83.92	1.772	21.92	84.18	0.04649	0.1663
65	78.4	83.32	1.915	23.08	84.67	0.04869	0.1661
70	84.8	82.71	2.068	24.25	85.16	0.05088	0.1659
75	91.5	82.09	2.231	25.43	85.64	0.05306	0.1657
80	98.7	81.47	2.404	26.61	86.11	0.05524	0.1655
85	106.3	80.83	2.588	27.80	86.58	0.05740	0.1653
90	114.3	80.18	2.783	29.01	87.03	0.05957	0.1651
95	122.7	79.52	2.991	30.22	87.47	0.06173	0.1649
100	131.6	78.85	3.211	31.44	87.90	0.06388	0.1648
105	141.0	78.16	3.445	32.67	88.32	0.06603	0.1646
110	150.8	77.46	3.694	33.91	88.73	0.06818	0.1644
115	161.1	76.75	3.958	35.16	89.12	0.07032	0.1642
120	172.0	76.02	4.238	36.43	89.50	0.07247	0.1640
125	183.3	75.28	4.537	37.70	89.87	0.07461	0.1638
130	195.2	74.51	4.855	38.99	90.22	0.07676	0.1636
135	207.7	73.73	5.193	40.30	90.55	0.07890	0.1634
140	220.7	72.93	5.554	41.61	90.86	0.08106	0.1632
145	234.4	72.10	5.939	42.95	91.15	0.08321	0.1629
150	248.6	71.24	6.351	44.30	91.42	0.08538	0.1627
155	263.5	70.36	6.792	45.67	91.66	0.08755	0.1624
160	279.0	69.45	7.265	47.06	91.87	0.08973	0.1621