PROPERTIES OF REFRIGERANTS

This table gives physical properties of compounds that have been used as working fluids in traditional refrigeration systems or are under consideration as replacements in newer systems. Some are also used as solvents and blowing agents. Many of the compounds listed are believed to be less harmful to the environment than the traditional halocarbons refrigerants.

Compounds are listed by their ASHRAE standard refrigerant designations (Reference 1), which appear in the first column. These codes are often prefixed by symbols such as CFC– (for chlorofluorocarbon), HCFC– (for hydrochlorofluorocarbon), or simply R– (for refrigerant). The molecular formula and CAS Registry Number are also given. The properties tabulated are:

t_m normal melting point in °C
t_b normal boiling point in °C (at 101.325 kPa or 760 mmHg)
t_c critical temperature in °C
TLV Threshold Limit Value, which is the maximum safe concentration in air in the workplace, expressed as the time–weighted average (TWA) in parts per million by volume over an 8–hr workday and 40–hr workweek. A value followed by C is an absolute ceiling limit.

References

1. *ASHRAE Standard 34–1997*, Number Designation and Safety Classification of Refrigerants.
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Further references and additional data on the critical properties may be found in the table "Critical Constants" in this section.

Code	Name	Molecular formula	CAS Reg. No.	t_m/°C	t_b/°C	t_c/°C	TLV
10	Tetrachloromethane	CCl_4	56–23–5	–22.62	76.8	283.4	5
11	Trichlorofluoromethane	CCl_3F	75–69–4	–110.44	23.7	197.9	1000C
12	Dichlorodifluoromethane	CCl_2F_2	75–71–8	–158	–29.8	111.80	1000
12B1	Bromochlorodifluoromethane	$CBrClF_2$	353–59–3	–159.5	–3.7	153.73	
12B2	Dibromodifluoromethane	CBr_2F_2	75–61–6	–110.1	22.76	198.1	100
13	Chlorotrifluoromethane	$CClF_3$	75–72–9	–181	–81.4	29	
13B1	Bromotrifluoromethane	$CBrF_3$	75–63–8	–172	–57.8	67.0	1000
14	Tetrafluoromethane	CF_4	75–73–0	–183.60	–128.0	–45.5	
20	Trichloromethane	$CHCl_3$	67–66–3	–63.41	61.17	263.2	10
21	Dichlorofluoromethane	$CHCl_2F$	75–43–4	–135	8.9	178.43	10
22	Chlorodifluoromethane	$CHClF_2$	75–45–6	–157.42	–40.7	96.3	1000
22B1	Bromodifluoromethane	$CHBrF_2$	1511–62–2	–145	–14.6	138.83	
23	Trifluoromethane	CHF_3	75–46–7	–155.2	–82.1	25.83	
30	Dichloromethane	CH_2Cl_2	75–09–2	–97.2	40	237	50
31	Chlorofluoromethane	CH_2ClF	593–70–4	–135.1	–9.1	154	
32	Difluoromethane	CH_2F_2	75–10–5	–136.8	–51.6	78.41	
40	Chloromethane	CH_3Cl	74–87–3	–97.7	–24.09	143.10	50
41	Fluoromethane	CH_3F	593–53–3	–141.8	–78.4	44.6	
50	Methane	CH_4	74–82–8	–182.47	–161.48	–82.59	1000
110	Hexachloroethane	C_2Cl_6	67–72–1	186.8	184.7 sp	422	1
111	Pentachlorofluoroethane	C_2Cl_5F	354–56–3	101.3	138		
112	1,1,2,2-Tetrachloro-1,2-difluoroethane	$C_2Cl_4F_2$	76–12–0	24.8	92.8	278	500
112a	1,1,1,2-Tetrachloro-2,2-difluoroethane	$C_2Cl_4F_2$	76–11–9	41.0	92.8		500
113	1,1,2-Trichloro-1,2,2-trifluoroethane	$C_2Cl_3F_3$	76–13–1	–36.22	47.7	214.1	1000
113a	1,1,1-Trichloro-2,2,2-trifluoroethane	$C_2Cl_3F_3$	354–58–5	14.37	45.5	209.7	
114	1,2-Dichloro-1,1,2,2-tetrafluoroethane	$C_2Cl_2F_4$	76–14–2	–92.53	3.5	145.63	1000
114a	1,1-Dichloro-1,2,2,2-tetrafluoroethane	$C_2Cl_2F_4$	374–07–2	–56.6	3.4	145.4	
114B2	1,2-Dibromotetrafluoroethane	$C_2Br_2F_4$	124–73–2	–110.32	47.35	214.6	
115	Chloropentafluoroethane	C_2ClF_5	76–15–3	–99.4	–39.1	80.0	1000
116	Hexafluoroethane	C_2F_6	76–16–4	–100.05	–78.1	20	
120	Pentachloroethane	C_2HCl_5	76–01–7	–28.78	162.0		
121	1,1,2,2-Tetrachloro-1-fluoroethane	C_2HCl_4F	354–14–3	–82.6	116.7		
121a	1,1,1,2-Tetrachloro-2-fluoroethane	C_2HCl_4F	354–11–0	–95.3	117.1		
122	1,2,2-Trichloro-1,1-difluoroethane	$C_2HCl_3F_2$	354–21–2	–140	71.9		

Code	Name	Molecular formula	CAS Reg. No.	t_m/°C	t_b/°C	t_c/°C	TLV
122a	1,2,2-Trichloro-1,2-difluoroethane	$C_2HCl_3F_2$	354–15–4	–174	72.5		
122b	1,1,1-Trichloro-2,2-difluoroethane	$C_2HCl_3F_2$	354–12–1		73		
123	2,2-Dichloro-1,1,1-trifluoroethane	$C_2HCl_2F_3$	306–83–2	–107	27.82	183.68	
123a	1,2-Dichloro-1,1,2-trifluoroethane	$C_2HCl_2F_3$	354–23–4	–78	29.5	188.4	
124	1-Chloro-1,2,2,2-tetrafluoroethane	C_2HClF_4	2837–89–0		–12	122.50	
124a	1-Chloro-1,1,2,2-tetrafluoroethane	C_2HClF_4	354–25–6	–117	–11.7	126.7	
125	Pentafluoroethane	C_2HF_5	354–33–6	–103	–48.1	66.02	
E125	Trifluoromethyl difluoromethyl ether	C_2HF_5O	3822–68–2	–157	–38	80.8	
130	1,1,2,2-Tetrachloroethane	$C_2H_2Cl_4$	79–34–5	–42.4	145.2	388.00	1
131	1,1,2-Trichloro-2-fluoroethane	$C_2H_2Cl_3F$	359–28–4		102.4		
132	1,2-Dichloro-1,2-difluoroethane	$C_2H_2Cl_2F_2$	431–06–1	–101.2	59.6		
132b	1,2-Dichloro-1,1-difluoroethane	$C_2H_2Cl_2F_2$	1649–08–7	–101.2	46.2		
133	1-Chloro-1,2,2-trifluoroethane	$C_2H_2ClF_3$	431–07–2		17.3		
133a	2-Chloro-1,1,1-trifluoroethane	$C_2H_2ClF_3$	75–88–7	–105.5	6.1	151.86	
133b	1-Chloro-1,1,2-trifluoroethane	$C_2H_2ClF_3$	421–04–5		12		
134	1,1,2,2-Tetrafluoroethane	$C_2H_2F_4$	359–35–3	–89	–19.9	118.59	
134a	1,1,1,2-Tetrafluoroethane	$C_2H_2F_4$	811–97–2	–103.3	–26.08	101.03	
E134	Bis(difluoromethyl) ether	$C_2H_2F_4O$	1691–17–4		2	147.10	
140	1,1,2-Trichloroethane	$C_2H_3Cl_3$	79–00–5	–36.3	113.8	329	10
140a	1,1,1-Trichloroethane	$C_2H_3Cl_3$	71–55–6	–30.01	74.09	272	350
141	1,2-Dichloro-1-fluoroethane	$C_2H_3Cl_2F$	430–57–9	–60	73.8		
141b	1,1-Dichloro-1-fluoroethane	$C_2H_3Cl_2F$	1717–00–6	–103.5	32.0	204.1	
142	1-Chloro-2,2-difluoroethane	$C_2H_3ClF_2$	338–65–8		35.1		
142b	1-Chloro-1,1-difluoroethane	$C_2H_3ClF_2$	75–68–3	–130.8	–9.1	137.19	
143	1,1,2-Trifluoroethane	$C_2H_3F_3$	430–66–0	–84	3.7	156.6	
143a	1,1,1-Trifluoroethane	$C_2H_3F_3$	420–46–2	–111.3	–47.25	72.71	
143m	Methyl trifluoromethyl ether	$C_2H_3F_3O$	421–14–7	–149	–23.66	104.87	
E143a	2,2,2-Trifluoroethyl methyl ether	$C_3H_5F_3O$	460–43–5		31.62	175.83	
150	1,2-Dichloroethane	$C_2H_4Cl_2$	107–06–2	–35.7	83.5	288	10
150a	1,1-Dichloroethane	$C_2H_4Cl_2$	75–34–3	–96.9	57.3	250	100
151	1-Chloro-2-fluoroethane	C_2H_4ClF	762–50–5		52.8		
151a	1-Chloro-1-fluoroethane	C_2H_4ClF	1615–75–4		16.2		
152	1,2-Difluoroethane	$C_2H_4F_2$	624–72–6		26		
152a	1,1-Difluoroethane	$C_2H_4F_2$	75–37–6	–117	–24.05	113.5	
160	Chloroethane	C_2H_5Cl	75–00–3	–138.4	12.3	187.2	100
161	Fluoroethane	C_2H_5F	353–36–6	–143.2	–37.7	102.16	
170	Ethane	C_2H_6	74–84–0	–182.79	–88.6	32.17	1000
216ca	1,3-Dichloro-1,1,2,2,3,3-hexafluoropropane	$C_3Cl_2F_6$	662–01–1	–125.4	35.7	180	
218	Perfluoropropane	C_3F_8	76–19–7	–147.70	–36.6	71.9	
227ca2	Trifluoromethyl 1,1,2,2-tetrafluoroethyl ether	C_3HF_7O	2356–61–8	–141	–3	114.63	
227ea	1,1,1,2,3,3,3-Heptafluoropropane	C_3HF_7	431–89–0	–131	–16.4	101.74	
227me	Trifluoromethyl 1,2,2,2-tetrafluoroethyl ether	C_3HF_7O	2356–62–9		–9.6		
236ea	1,1,1,2,3,3-Hexafluoropropane	$C_3H_2F_6$	431–63–0		6.1	139.23	
236fa	1,1,1,3,3,3-Hexafluoropropane	$C_3H_2F_6$	690–39–1	–93.6	–1.0	124.92	
236me	1,2,2,2-Tetrafluoroethyl difluoromethyl ether	$C_3H_2F_6O$	57041–67–5		23.35	155.80	
245ca	1,1,2,2,3-Pentafluoropropane	$C_3H_3F_5$	679–86–7		25.0	174.42	
245cb	1,1,1,2,2-Pentafluoropropane	$C_3H_3F_5$	1814–88–6		–17.4	106.96	
245fa	1,1,1,3,3-Pentafluoropropane	$C_3H_3F_5$	460–73–1		15.3	154.05	
245mc	Methyl pentafluoroethyl ether	$C_3H_3F_5O$	22410–44–2		5.59	133.65	
245mf	Difluoromethyl 2,2,2-trifluoroethyl ether	$C_3H_3F_5O$	1885–48–9		29.24	170.84	
245qc	Difluoromethyl 1,1,2-trifluoroethyl ether	$C_3H_3F_5O$	69948–24–9		43.1		
254pc	Methyl 1,1,2,2-tetrafluoroethyl ether	$C_3H_4F_4O$	425–88–7	–107	37.1		
290	Propane	C_3H_8	74–98–6	–187.63	–42.1	96.68	1000
C316	1,2-Dichloro-1,2,3,3,4,4-hexafluorocyclobutane	$C_4Cl_2F_6$	356–18–3	–24.2	59.5	224	
C317	1-Chloro-1,2,2,3,3,4,4-heptafluorocyclobutane	C_4ClF_7	377–41–3	–39.1	25		
C318	Perfluorocyclobutane	C_4F_8	115–25–3	–40.19	–5.9	115.31	
347mcc	Perfluoropropyl methyl ether	$C_4H_3F_7O$	375–03–1		34.23	164.55	
347mmy	Perfluoroisopropyl methyl ether	$C_4H_3F_7O$	22052–84–2		29.34	160.15	
600	Butane	C_4H_{10}	106–97–8	–138.3	–0.5	151.97	1000
600a	Isobutane	C_4H_{10}	75–28–5	–159.4	–11.73	134.6	1000

Code	Name	Molecular formula	CAS Reg. No.	t_m/°C	t_b/°C	t_c/°C	TLV
610	Diethyl ether	$C_4H_{10}O$	60–29–7	–116.2	34.5	193.5	400
611	Methyl formate	$C_2H_4O_2$	107–31–3	–99	31.7	214.0	100
717	Ammonia	H_3N	7664–41–7	–77.73	–33.33	132.3	25
744	Carbon dioxide	CO_2	124–38–9	–56.56	–78.5 sp	30.98	5000
764	Sulfur dioxide	O_2S	7446–09–5	–75.5	–10.05	157.6	2
1112a	1,1-Dichloro-2,2-difluoroethene	$C_2Cl_2F_2$	79–35–6	–116	19		
1113	Chlorotrifluoroethene	C_2ClF_3	79–38–9	–158.2	–27.8	106	
1114	Tetrafluoroethene	C_2F_4	116–14–3	–131.15	–75.9	33.3	2
1120	Trichloroethene	C_2HCl_3	79–01–6	–84.7	87.21	271.0	50
1130	*trans*-1,2-Dichloroethene	$C_2H_2Cl_2$	156–60–5	–49.8	48.7	243.3	200
1132a	1,1-Difluoroethene	$C_2H_2F_2$	75–38–7	–144	–85.7	29.7	500
1140	Chloroethene	C_2H_3Cl	75–01–4	–153.84	–13.8	159	
1141	Fluoroethene	C_2H_3F	75–02–5	–160.5	–72	54.7	1
1150	Ethylene	C_2H_4	74–85–1	–169.15	–103.77	9.19	
1270	Propene	C_3H_6	115–07–1	–185.24	–47.69	91.7	