

# 152a Physical Properties

## HFA 152 a

**IUPAC Name:**

1,1-Difluoroethane

**Other Names:**

DFE  
HFA 152a  
P 152a

**Structure:**

$\text{CH}_3\text{CHF}_2$

**Solubility:**

Most organic solvents

**Appearance:**

Colourless liquefied gas, slight ethereal odour  
Global warming potential about 124, integrated  
time of 100 years based on IPCC 4<sup>th</sup> Report, 2007

# Property

PROPERTY		UNITS	VALUE
Molecular Weight		g mol <sup>-1</sup>	66.05
Boiling Point	1atm	°C	-24.0
Melting Point		°C	-117.0
Critical Temperature		°C	113.3
Critical Pressure		bar	45.168
Critical Density		kg m <sup>-3</sup>	368.0
Saturated Liquid Density	25°C	kg m <sup>-3</sup>	899.47
Saturated Vapour Density	25°C	kg m <sup>-3</sup>	18.47
Surface Tension	25°C	mN m <sup>-1</sup>	9.71
Liquid Dielectric Constant	25°C		12.5185
Liquid Dielectric Strength	5atm	kV/0.1 inch gap	5.9
Vapour Dipole Moment		Debye	2.26
Liquid Dipole Moment		Debye	3.69
Solubility of water in HFA 152a	25°C	% w/w	0.22
Solubility of HFA 152a in water	25°C	g L <sup>-1</sup>	2.8
Flammability in Air	1atm	% vol	3.7 to 18.0
Refractive Index of Liquid HFA 152a			1.2434
Closed Cup Flash Point		°C	<-50.0
Saturated Vapour Pressure	25°C	Barg	4.95
Specific Gravity	4°C		0.95
Liquid Viscosity	25°C	cP	0.16

Saturated Liquid Density		
$\rho_{liq} = a + bx + cx^2 + dx^3 + ex^4$ where $x = (1-(T/T_c))^{1/3}$		
a=	414.1928238	T = Temperature K
b=	281.4728594	Tc = Critical Temperature K
c=	1505.138602	$\rho_{liq} = \text{kg m}^{-3}$
d=	-1626.937411	
e=	876.6550301	

Applicable range -30°C to +100°C

Liquid Viscosity		
$\ln(\mu_{liq}) = a + b/T + cT + dT^2$		
a=	-27.20191766	T = Temperature K
b=	2832.620826	$\mu_{liq} = \text{cP}$
c=	0.085985169	
d=	-10.9617 x 10 <sup>-5</sup>	

Applicable range -30°C to +100°C

Saturated Vapour Density		
$\rho_{vap} = a + bx + cx^2 + dx^3 + ex^4$ where $x = (1-(T/T_c))^{1/3}$		
a=	310.3284679	T = Temperature K
b=	-204.8290781	Tc = Critical Temperature K
c=	-1690.899743	$\rho_{vap} = \text{kg m}^{-3}$
d=	2698.276097	
e=	-1082.259217	

Applicable range -30°C to +100°C

### Saturated Vapour Pressure

$$\ln(P) = a + b/(c+T) + dT + e \ln(T) \quad (c=0)$$

a=	97.93293392	T = Temperature K
b=	-5073.366874	P = vapour pressure bara
c=	0	
d=	0.023188367	
e=	0.023188367	

Applicable range -30°C to +100°C

### Surface Tension

$$\sigma = a + bT + cT^2$$

a=	66.23145527	T = Temperature K
b=	66.23145527	$\sigma = \text{mN m}^{-1}$
c=	66.23145527	

Applicable range -30°C to +100°C

Temperature °C	Saturated Vapour Pressure barg	Saturated Liquid Density kg m <sup>-3</sup>	Saturated Vapour Density kg m <sup>-3</sup>	Surface Tension mN m <sup>-1</sup>	Liquid Viscosity cP
-50	-0.74	1063.70	0.99	20.45	0.43
-49	-0.72	1061.70	1.05	20.30	0.42
-48	-0.71	1059.80	1.10	20.15	0.42
-47	-0.69	1057.80	1.16	20.00	0.41
-46	-0.67	1055.80	1.22	19.85	0.41
-45	-0.65	1053.80	1.29	19.70	0.40
-44	-0.63	1051.80	1.36	19.54	0.39
-43	-0.61	1049.80	1.43	19.39	0.39
-42	-0.59	1047.80	1.50	19.24	0.38
-41	-0.57	1045.80	1.57	19.09	0.38
-40	-0.54	1043.80	1.65	18.94	0.37
-39	-0.52	1041.80	1.73	18.79	0.37
-38	-0.49	1039.80	1.82	18.65	0.36
-37	-0.46	1037.80	1.90	18.50	0.36
-36	-0.44	1035.80	1.99	18.35	0.35
-35	-0.41	1033.70	2.09	18.20	0.35
-34	-0.38	1031.70	2.19	18.05	0.34
-33	-0.34	1029.70	2.29	17.90	0.34
-32	-0.31	1027.60	2.39	17.75	0.33
-31	-0.28	1025.60	2.50	17.61	0.33
-30	-0.24	1023.50	2.61	17.46	0.32
-29	-0.20	1021.50	2.73	17.31	0.32
-28	-0.17	1019.40	2.85	17.16	0.31
-27	-0.13	1017.40	2.98	17.02	0.31
-26	-0.09	1015.30	3.11	16.87	0.31
-25	-0.04	1013.20	3.24	16.72	0.30
-24	0.00	1011.10	3.38	16.58	0.30
-23	0.05	1009.00	3.52	16.43	0.29
-22	0.09	1006.90	3.67	16.28	0.29
-21	0.14	1004.80	3.82	16.14	0.29
-20	0.19	1002.70	3.98	15.99	0.28
-19	0.25	1000.60	4.14	15.85	0.28
-18	0.30	998.49	4.31	15.70	0.27
-17	0.36	996.36	4.48	15.56	0.27
-16	0.41	994.23	4.66	15.41	0.27
-15	0.47	992.09	4.84	15.27	0.26
-14	0.54	989.94	5.03	15.12	0.26
-13	0.60	987.79	5.23	14.98	0.26
-12	0.66	985.63	5.43	14.84	0.25
-11	0.73	983.46	5.64	14.69	0.25
-10	0.80	981.28	5.85	14.55	0.25
-9	0.87	979.10	6.07	14.41	0.24
-8	0.95	976.91	6.30	14.26	0.24
-7	1.02	974.72	6.53	14.12	0.24
-6	1.10	972.51	6.77	13.98	0.24
-5	1.18	970.30	7.02	13.84	0.23
-4	1.27	968.08	7.27	13.70	0.23
-3	1.35	965.85	7.53	13.56	0.23
-2	1.44	963.61	7.80	13.41	0.22
-1	1.53	961.37	8.08	13.27	0.22
0	1.63	959.11	8.36	13.13	0.22
1	1.72	956.85	8.65	12.99	0.22
2	1.82	954.58	8.95	12.85	0.21

Temperature °C	Saturated Vapour Pressure barg	Saturated Liquid Density kg m <sup>-3</sup>	Saturated Vapour Density kg m <sup>-3</sup>	Surface Tension mN m <sup>-1</sup>	Liquid Viscosity cP
3	1.92	952.30	9.26	12.71	0.21
4	2.03	950.01	9.57	12.57	0.21
5	2.13	947.71	9.90	12.43	0.21
6	2.24	945.40	10.23	12.29	0.20
7	2.36	943.08	10.57	12.16	0.20
8	2.47	940.76	10.92	12.02	0.20
9	2.59	938.42	11.28	11.88	0.20
10	2.71	936.07	11.65	11.74	0.19
11	2.84	933.71	12.03	11.60	0.19
12	2.97	931.34	12.42	11.47	0.19
13	3.10	928.96	12.82	11.33	0.19
14	3.23	926.57	13.23	11.19	0.19
15	3.37	924.16	13.65	11.06	0.18
16	3.51	921.75	14.08	10.92	0.18
17	3.66	919.32	14.52	10.78	0.18
18	3.81	916.89	14.97	10.65	0.18
19	3.96	914.44	15.43	10.51	0.17
20	4.12	911.97	15.91	10.38	0.17
21	4.28	909.50	16.40	10.24	0.17
22	4.44	907.01	16.90	10.11	0.17
23	4.61	904.51	17.41	9.97	0.17
24	4.78	901.99	17.93	9.84	0.16
25	4.95	899.47	18.47	9.71	0.16
26	5.13	896.92	19.02	9.57	0.16
27	5.31	894.37	19.58	9.44	0.16
28	5.50	891.79	20.16	9.31	0.16
29	5.69	889.21	20.75	9.18	0.16
30	5.88	886.61	21.36	9.05	0.15
31	6.08	883.99	21.98	8.91	0.15
32	6.29	881.36	22.61	8.78	0.15
33	6.50	878.71	23.26	8.65	0.15
34	6.71	876.04	23.93	8.52	0.15
35	6.93	873.36	24.61	8.39	0.15
36	7.15	870.66	25.31	8.26	0.14
37	7.37	867.94	26.03	8.13	0.14
38	7.60	865.20	26.76	8.00	0.14
39	7.84	862.45	27.51	7.87	0.14
40	8.08	859.67	28.28	7.75	0.14
41	8.32	856.88	29.07	7.62	0.14
42	8.57	854.07	29.87	7.49	0.13
43	8.83	851.23	30.70	7.36	0.13
44	9.09	848.38	31.54	7.24	0.13
45	9.35	845.50	32.41	7.11	0.13
46	9.63	842.60	33.29	6.98	0.13
47	9.90	839.68	34.20	6.86	0.13
48	10.18	836.74	35.13	6.73	0.13
49	10.47	833.77	36.08	6.61	0.12
50	10.76	830.78	37.06	6.48	0.12
51	11.06	827.76	38.06	6.36	0.12
52	11.36	824.72	39.08	6.24	0.12
53	11.67	821.65	40.13	6.11	0.12
54	11.98	818.56	41.20	5.99	0.12
55	12.30	815.43	42.30	5.87	0.12

Temperature °C	Saturated Vapour Pressure barg	Saturated Liquid Density kg m <sup>-3</sup>	Saturated Vapour Density kg m <sup>-3</sup>	Surface Tension mN m <sup>-1</sup>	Liquid Viscosity cP
56	12.63	812.28	43.43	5.75	0.11
57	12.96	809.10	44.58	5.63	0.11
58	13.30	805.89	45.77	5.51	0.11
59	13.64	802.65	46.98	5.38	0.11
60	13.99	799.37	48.22	5.26	0.11
61	14.35	796.06	49.50	5.15	0.11
62	14.71	792.72	50.81	5.03	0.11
63	15.08	789.34	52.15	4.91	0.10
64	15.46	785.93	53.52	4.79	0.10
65	15.84	782.48	54.93	4.67	0.10
66	16.23	778.99	56.38	4.55	0.10
67	16.62	775.46	57.87	4.44	0.10
68	17.03	771.89	59.39	4.32	0.10
69	17.43	768.27	60.96	4.21	0.10
70	17.85	764.61	62.57	4.09	0.10
71	18.27	760.91	64.22	3.98	0.09
72	18.70	757.15	65.92	3.86	0.09
73	19.14	753.35	67.67	3.75	0.09
74	19.59	749.50	69.46	3.64	0.09
75	20.04	745.59	71.31	3.53	0.09
76	20.50	741.62	73.21	3.42	0.09
77	20.96	737.60	75.17	3.30	0.09
78	21.44	733.52	77.19	3.19	0.09
79	21.92	729.37	79.26	3.08	0.09
80	22.41	725.15	81.40	2.98	0.08
81	22.91	720.87	83.61	2.87	0.08
82	23.41	716.51	85.89	2.76	0.08
83	23.93	712.07	88.24	2.65	0.08
84	24.45	707.56	90.67	2.55	0.08
85	24.98	702.96	93.19	2.44	0.08
86	25.52	698.26	95.79	2.34	0.08
87	26.07	693.47	98.48	2.24	0.08
88	26.63	688.58	101.27	2.13	0.07
89	27.19	683.59	104.17	2.03	0.07
90	27.77	678.47	107.17	1.93	0.07
91	28.35	673.23	110.30	1.83	0.07
92	28.94	667.86	113.55	1.73	0.07
93	29.54	662.35	116.95	1.63	0.07
94	30.16	656.69	120.49	1.54	0.07
95	30.78	650.85	124.19	1.44	0.07
96	31.41	644.83	128.07	1.34	0.07
97	32.05	638.62	132.15	1.25	0.06
98	32.70	632.18	136.44	1.16	0.06
99	33.36	625.50	140.96	1.07	0.06
100	34.04	618.54	145.75	0.98	0.06

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