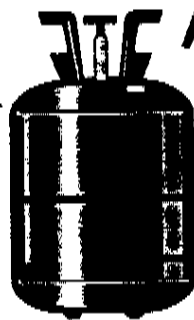


Elf Atochem
ATO



TECH DIGEST

Published by Elf Atochem North America, Inc., Fluorochemicals, 2000 Market Street, Philadelphia, PA 19103

Forane® 408A

Forane® 408A (FX-10) is a low ozone depletion potential (ODP), near-azeotropic blend of HCFC 22 and HFC refrigerants R-125 and R-143a. Forane 408A has been added to the Forane family of refrigerants to provide a convenient and reliable retrofit solution for medium and low temperature refrigeration systems which are currently using R-502.

Use Forane 408A to Retrofit R-502 Systems

Forane 408A can be used to retrofit many existing R-502 systems. R-408A has been blended to closely match the physical and refrigeration properties of R-502 because the equipment being retrofitted was designed for R-502. R-408A should not be mixed with R-502 or used to top off existing systems. (See the *RETROFIT* section for review of additional considerations.)

Use Forane 404A for New Low and Medium Temperature Systems

Forane 408A is not intended for use in new equipment. Refrigeration appli-

cations which were previously designed to use R-502 can now be specified to use a long term alternative HFC blend, Forane 404A. Manufacturers are making compressors and refrigeration systems available for use in food display and storage cases, cold storage rooms, ice

machines, transportation, and process refrigeration.

This brochure has been designed to give a broad background of properties and technical considerations to help you apply Forane 408A to your refrigeration needs.

Forane 408A: Basic Property Data

		R-408A	R-502
Chemical Formula:	R-125 (CF ₃ CHF ₂)	7 wt %	--
	R-143a (CF ₃ CH ₃)	46 wt %	--
	R-22 (CHClF ₂)	47 wt %	48.8 wt %
	R-115 (CClF ₂ CF ₃)	--	51.2 wt %
Average Molecular Weight:		87	111.6
Boiling Point @ 1 atm (°F):		- 46.3	- 50.1
Density of Saturated Vapor @ b.p.(lb./cu. ft.):		0.296	0.388
Density of Saturated Liquid @ 77°F(lb./cu. ft.):		66.17	75.91
Critical Temperature(°F):		182.3	180.0
Critical Pressure (psia):		629.5	591.0
Latent Heat of Vaporization @ b.p.(BTU/lb.):		100.7	74.21
Specific Heat of Liquid @ 77°F (BTU/lb. °F):		0.151	0.298
Specific Heat of Vapor @ 1 atm (BTU/lb. °F):		0.180	0.200
Maximum Temperature Glide (°F):		1.0	0
Flammable Limits in Air:		non-flammable*	
Ozone Depletion Potential (ODP, CFC 11 = 1.0):		0.026	0.3
Halocarbon Greenhouse Warming Potential (HGWP, CFC 11 = 1.0):		0.75	4.1

* Forane 408A does not propagate flame in ASTM E-681-85 at test temperatures up to 100°C

Pressure - Temperature Chart

Temp (°F)	Sat Vapor R-408A (psig)	R-502 (psig)
-45	0.7	1.9
-40	2.8	4.1
-35	5.1	6.5
-30	7.6	9.2
-25	10.4	12.1
-20	13.5	15.3
-15	16.8	18.8
-10	20.4	22.6
-5	24.4	26.7
0	28.7	31.1
5	33.3	35.9
10	38.3	41.0
15	43.7	46.5
20	49.5	52.4
25	55.8	58.8
30	62.5	65.6
35	69.7	72.8
40	77.4	80.5
45	85.6	88.7
50	94.3	97.4
55	103.6	106.6
60	113.5	116.4
65	124.0	126.7
70	135.1	137.6
75	146.9	149.1
80	159.4	161.2
85	172.5	174.0
90	186.4	187.4
95	201.1	201.4
100	216.6	216.2
105	232.8	231.7
110	250.0	247.9
115	267.9	264.9
120	286.8	282.7
125	306.6	301.4
130	327.4	320.8
135	349.2	341.2
140	371.9	362.6

a. The pressure of Saturated Vapor (Dew Point pressure) has been provided for R-408A for this P-T chart. This pressure is from 1 to 2 psi lower than, for example, the pressure generated by a cylinder of liquid refrigerant at the same temperature. The Dew Point pressure is more meaningful when using a Pressure - Temperature chart for purposes such as checking system operation during charging.

Forane 408A: Engineering Data

Temp (°F)	Pressure (psia)		Density (lb./cu. ft.)		Enthalpy (BTU/lb.°F)	
	Sat. Liq.	Sat. Vap.	Sat. Liq.	Sat. Vap.	Sat. Liq.	Sat. Vap.
-45	15.8	15.4	80.46	0.310	-1.400	95.70
-40	18.0	17.5	79.96	0.350	-0.000	96.50
-35	20.3	19.8	79.45	0.393	1.400	97.20
-30	22.9	22.3	78.93	0.440	2.700	97.90
-25	25.7	25.1	78.41	0.491	4.100	98.60
-20	28.8	28.1	77.89	0.547	5.500	99.30
-15	32.2	31.5	77.36	0.608	6.900	99.90
-10	35.9	35.1	76.83	0.674	8.400	100.6
-5	39.9	39.1	76.29	0.745	9.800	101.3
0	44.2	43.4	75.75	0.823	11.30	102.0
5	48.9	48.0	75.19	0.906	12.80	102.6
10	54.0	53.0	74.64	0.997	14.20	103.3
15	59.5	58.4	74.07	1.094	15.70	103.9
20	65.4	64.2	73.50	1.199	17.30	104.5
25	71.7	70.5	72.92	1.312	18.80	105.2
30	78.4	77.2	72.33	1.433	20.40	105.8
35	85.7	84.4	71.74	1.563	21.90	106.4
40	93.4	92.1	71.13	1.703	23.50	107.0
45	101.7	100.3	70.51	1.853	25.20	107.5
50	110.5	109.0	69.89	2.014	26.80	108.1
55	119.8	118.3	69.25	2.187	28.50	108.6
60	129.8	128.2	68.60	2.372	30.20	109.1
65	140.3	138.7	67.93	2.571	31.90	109.6
70	151.5	149.8	67.26	2.783	33.60	110.1
75	163.4	161.6	66.56	3.012	35.40	110.6
80	175.9	174.1	65.85	3.257	37.20	111.0
85	189.1	187.2	65.12	3.519	39.10	111.4
90	203.1	201.1	64.37	3.802	40.90	111.7
95	217.8	215.8	63.60	4.105	42.80	112.1
100	233.3	231.3	62.80	4.432	44.80	112.4
105	249.7	247.5	61.98	4.785	46.80	112.7
110	266.8	264.7	61.12	5.165	48.80	112.9
115	284.9	282.6	60.23	5.577	50.90	113.1
120	303.8	301.5	59.31	6.023	53.10	113.2
125	323.6	321.3	58.34	6.509	55.30	113.2
130	344.4	342.1	57.32	7.040	57.60	113.2
135	366.2	363.8	56.24	7.622	60.00	113.1
140	389.0	386.6	55.09	8.263	62.40	113.0

To calculate the Latent Heat of Vaporization, subtract the liquid enthalpy from the vapor enthalpy at the desired temperature.

Temperature Conversion: $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5/9$

Pressure Conversion: $\text{psig} = \text{psia} - 14.7$ { $P > 14.7$ }
 $\text{in. Hg Vacuum} = (14.7 - \text{psia}) \times 2.036$

Density Conversion: $\text{lb./cu. ft.} \quad \{\text{water} = 62.43 \text{ lb./cu. ft.}\}$
 $\text{lb./gal.} = \text{lb./cu. ft.} \div 7.48$
 $\quad \quad \quad \{\text{water} = 8.35 \text{ lb./gal.}\}$
 $\text{g/ml} = \text{lb./cu. ft.} \times 0.016$
 $\quad \quad \quad \{\text{water} = 1 \text{ g/ml}\}$

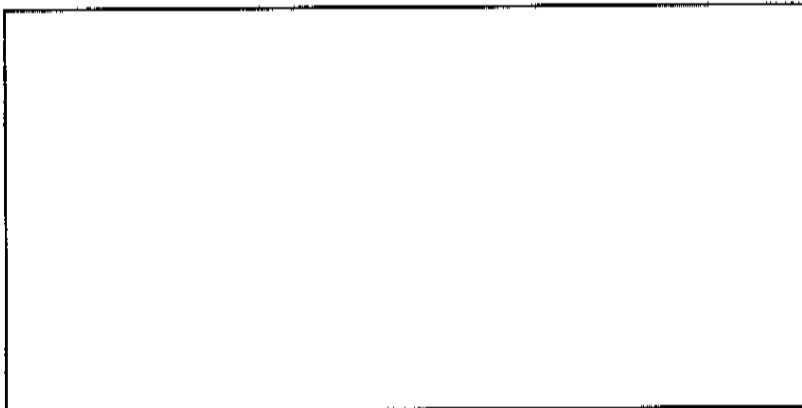
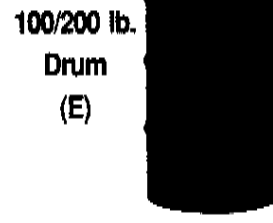
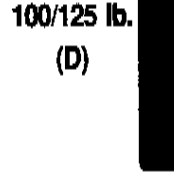
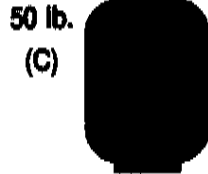
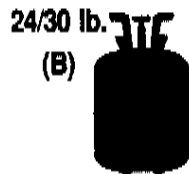
Elf Atochem Cylinder Identification

Refrigerant	Color	SIZES (WT/LBS)
R-408A	Medium Purple	24 (B), 100 (D)

Other Forane® Alternative Refrigerants

Refrigerant	Color	SIZES (WT/LBS)
R-22 (CHClF ₂)	Green	30 (B), 50 (C), 125 (D)
R-123 (CHCl ₂ CF ₃)	Lt. Blue Grey	100 (E), 200 (E)
R-134a (CF ₃ CH ₂ F)	Light Blue	30 (B), 125 (D)
R-409A	Tan	30 (B)
R-404A	Orange	24 (B), 100 (D)

Container Style



elf atochem
ATO