HARP INTERNATIONAL

Harp® 410A

Harp® 410A is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant blend. Harp® 410A is a binary blend of R32 and R125 (50%/50%) developed as a replacement refrigerant for air conditioning applications previously designed for HCFC R22. Due to both its higher refrigerating capacity and pressure, Harp® 410A should not be used as a retrofit refrigerant in existing R22 equipment.

APPLICATION

Harp® 410A is used in new residential and commercial air conditioning systems, heat pumps, dehumidifiers and small chillers. Harp® 410A can also be used in some medium temperature refrigeration applications.

PROPERTIES AND PERFORMANCE

Harp® 410A is a near-azeotropic HFC refrigerant blend that meets the industry's needs for many new air conditioning systems. Harp® 410A has an A1 safety rating from ASHRAE (lowest levels of toxicity and flammability), zero ozone depletion potential and a Global Warming Potential (GWP) of 2088.

Harp® 410A has both higher pressures and capacity than R22, requiring equipment and components specifically designed to accommodate the resulting higher system pressures and the lower mass flow rates. Typical operating pressures of a Harp® 410A system will be 50% to 60% higher than those in an R22 system at comparable operating conditions. Harp® 410A also has significantly higher volumetric refrigerating capacity than R22 under most operating conditions. This allows OEMs to manufacture equipment of similar capacity and efficiency to R22 in a smaller package.

LUBRICATION

Polyolester (POE) lubricants must be used with Harp® 410A since it is not miscible with mineral or alkyl benzene lubricants. New R410A equipment will be charged with the OEM recommended lubricant, ready to use with Harp® 410A.

CHARGING

Due to the zeotropic nature of the Harp® 410A blend, it should only be charged as liquid to prevent fractionation (changes in refrigerant composition due to vapour charging). Harp® 410A requires the use of manifold gauge sets, recovery machines, and cylinders specifically designed and rated for its higher pressures.

RETROFITTING

Due to the significantly higher operating pressures and capacities of Harp® 410A, it must never be used as a retrofit in existing R22 systems.

MATERIAL COMPATIBILITY

Whenever retrofitting air-conditioning or refrigeration systems, compatibility of system materials is always a concern. Items such as elastomers, hoses, and filter-driers respond differently to different refrigerants and oils. For these reasons, before performing any system repairs, Harp International recommends contacting the OEM for specific recommendations.

Harp International The Complete Worldwide Refrigerant Service
email harp@harpintl.com Web www.harpintl.com

HARP INTERNATIONAL

Harp® 410A

Technical Data

Harp® 410A BASIC PROPERTIES

Chemical formula	R125: CHF_2CF_3 (50% by weight) R32: CH_2F_2 (50% by weight)	Boiling point at 1 atmosphere	-51.5°C
		Critical temperature	71.4°C
Molecular weight	72.6	Critical pressure	48.9 bar absolute
		Temperature glide	0.1K

Harp® 410A THERMODYNAMIC PROPERTIES

Pressure (bar)	Liquid Temperature (°C)	Vapour Temperature (°C)	Liquid Density (kg/m³)	Vapour Density (kg/m³)	Liquid Enthalpy (kJ/kg)	Vapour Density (kJ/kg)	Liquid Entropy (kJ/kg.K)	Vapour Entropy (kJ/kg.K)
0.5	-64.4	-64.3	1389.7	2.2	109.9	393.6	0.693	2.051
0.6	-61.2	-61.1	1380.0	2.6	114.2	395.3	0.713	2.039
0.7	-58.5	-58.4	1371.5	3.0	118.0	396.8	0.731	2.029
0.8	-56.0	-55.9	1363.9	3.3	121.4	398.1	0.747	2.021
0.9	-53.7	-53.7	1356.9	3.7	124.4	399.3	0.761	2.013
1.0	-51.7	-51.6	1350.5	4.1	127.2	400.4	0.773	2.007
1.013	**-51.5**	**-51.4**	**1349.7**	**4.2**	**127.6**	**400.5**	**0.775**	**2.006**
1.5	-43.4	-43.3	1324.1	6.0	138.6	404.6	0.824	1.981
2.0	-37.1	-37.0	1303.4	7.9	147.4	407.7	0.861	1.964
2.5	-31.9	-31.8	1286.1	9.8	154.7	410.2	0.892	1.950
3.0	-27.4	-27.4	1271.1	11.7	161.0	412.2	0.917	1.939
3.5	-23.5	-23.5	1257.6	13.6	166.6	413.9	0.940	1.930
4.0	-20.0	-20.0	1245.3	15.4	171.6	415.3	0.959	1.922
4.5	-16.9	-16.8	1233.9	17.3	176.2	416.6	0.977	1.915
5.0	-14.0	-13.9	1223.3	19.2	180.4	417.7	0.994	1.909
5.5	-11.3	-11.2	1213.4	21.1	184.4	418.8	1.009	1.903
6.0	-8.7	-8.6	1203.9	23.0	188.1	419.7	1.023	1.898
6.5	-6.4	-6.3	1194.9	24.9	191.6	420.5	1.036	1.893
7.0	-4.2	-4.1	1186.3	26.8	195.0	421.2	1.048	1.889
7.5	-2.0	-1.9	1178.1	28.7	198.1	421.9	1.060	1.885
8.0	0.0	0.1	1170.1	30.7	201.2	422.5	1.071	1.881
8.5	1.9	2.0	1162.4	32.6	204.1	423.1	1.081	1.877
9.0	3.7	3.8	1154.9	34.6	206.9	423.6	1.091	1.874
9.5	5.5	5.6	1147.6	36.5	209.6	424.1	1.101	1.870
10.0	7.2	7.3	1140.5	38.5	212.2	424.5	1.110	1.867
11.0	10.4	10.5	1126.8	42.5	217.3	425.3	1.127	1.861
12.0	13.3	13.5	1113.7	46.6	222.0	425.9	1.144	1.855
13.0	16.2	16.3	1101.1	50.8	226.5	426.4	1.159	1.850
14.0	18.8	18.9	1088.8	55.0	230.8	426.8	1.174	1.845
15.0	21.3	21.4	1076.9	59.3	234.9	427.1	1.187	1.840
16.0	23.7	23.8	1065.2	63.7	238.9	427.3	1.200	1.835
17.0	26.0	26.1	1053.8	68.1	242.7	427.5	1.213	1.831
18.0	28.1	28.3	1042.6	72.7	246.4	427.5	1.225	1.826
19.0	30.2	30.3	1031.6	77.3	250.0	427.5	1.237	1.822
20.0	32.2	32.3	1020.7	82.1	253.5	427.5	1.248	1.817
21.0	34.2	34.3	1009.9	87.0	256.9	427.3	1.259	1.813
22.0	36.0	36.1	999.2	91.9	260.3	427.1	1.269	1.809
23.0	37.8	37.9	988.6	97.0	263.5	426.9	1.279	1.804
24.0	39.6	39.7	978.0	102.3	266.7	426.5	1.289	1.800
25.0	41.3	41.4	967.5	107.7	269.9	426.2	1.299	1.796
26.0	42.9	43.0	957.0	113.2	273.0	425.7	1.308	1.792
27.0	44.5	44.6	946.4	118.9	276.0	425.2	1.318	1.787
28.0	46.0	46.1	935.8	124.8	279.1	424.7	1.327	1.783
29.0	47.5	47.6	925.2	130.8	282.0	424.1	1.336	1.779
30.0	49.0	49.1	914.5	137.1	285.0	423.4	1.345	1.774

Harp International Limited
Gellihirion Industrial Estate, Pontypridd, Rhondda
Cynon Taff, CF37 5SX United Kingdom

Telephone +44 (0) 1443 842255 **Freephone** 0800 134 404 (UK only)
Facsimile +44 (0) 1443 841805
email harp@harpintl.com **Web** www.harpintl.com

HARP INTERNATIONAL

Harp® 407C

Harp® 407C is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant blend. Harp® 407C is a ternary blend of R32, R125 and R134a (23%/25%/52%). It has been formulated to closely match the properties of HCFC R22. It is widely used in new equipment that would have previously used R22 and can with specific modifications be retrofitted into exiting R22 equipment.

APPLICATION

Harp® 407C applications include residential and commercial air conditioning systems, direct expansion fluid chillers and some commercial refrigeration systems. Since Harp® 407C has similar properties to R22, it is possible (with modifications) to use it in existing R22 systems. It should not be used in systems with a flooded evaporator.

PROPERTIES AND PERFORMANCE

Harp® 407C is designed to meet the needs of many new and existing air conditioning and refrigeration systems. Harp® 407C is a zeotropic HFC refrigerant blend rated A1 by ASHRAE (lowest levels of toxicity and flammability), having zero ozone depletion potential and a Global Warming Potential of 1774.

LUBRICATION

POE lubricants must be used with Harp® 407C since it is not miscible with mineral or alkyl benzene lubricants found in most R22 systems. When retrofitting, a lubricant flushing procedure is necessary to reduce the original oil content below 5%. New R407C equipment will be charged with the OEM recommended lubricant, ready to use with Harp® 407C.

CHARGING

Due to the zeotropic nature of Harp® 407C, it should be charged as a liquid to prevent fractionation (changes in refrigerant composition due to vapour charging). In situations where vapour is normally charged into a system, a valve should be installed in the charging line to flash the liquid to vapour while charging.

RETROFITTING

Harp® 407C can be used to retrofit existing R22 systems in positive displacement, direct expansion refrigeration, and air conditioning equipment. R407C should not be used in centrifugal chillers or other equipment that uses a flooded evaporator, due to its high temperature glide.

MATERIAL COMPATIBILITY

Whenever retrofitting air-conditioning or refrigeration systems, compatibility of system materials must always be taken into consideration. Items such as elastomers, hoses, and filter-driers respond differently to different refrigerants and oils. For these reasons, before performing any refrigerant retrofit, Harp International recommends contacting the OEM for specific recommendations.

Harp International The Complete Worldwide Refrigerant Service
email harp@harpintl.com Web www.harpintl.com

HARP INTERNATIONAL

Harp® 407C

Technical Data

HARP® 407C BASIC PROPERTIES

Chemical formula	R32: CH_2F_2 (23% by weight)	Boiling point at 1 atm.	-43.6°C
	R125: CHF_2CF_3 (25% by weight)	Temperature glide at 1 atm.	7.0 K
	R134a: CH_2FCF_3 (52% by weight)	Critical temperature	86.0°C
Molecular weight	86.2	Critical pressure	46.3 bar absolute

HARP® 407C THERMODYNAMIC PROPERTIES

Absolute Pressure (bar)	Bubble Temperature (°C)	Dew Temperature (°C)	Liquid Density (kg/m³)	Vapour Density (kg/m³)	Liquid Enthalpy (kJ/kg)	Vapour Density (kJ/kg)	Liquid Entropy (kJ/kg.K)	Vapour Entropy (kJ/kg.K)
0.5	-57.3	-50.1	1422.0	2.4	123.7	382.6	0.786	1.966
0.6	-54.0	-46.8	1412.0	2.8	128.0	384.6	0.806	1.958
0.7	-51.0	-43.9	1403.2	3.3	131.8	386.3	0.823	1.951
0.8	-48.4	-41.3	1395.3	3.7	135.2	387.8	0.838	1.945
0.9	-46.1	-39.0	1388.2	4.1	138.3	389.2	0.852	1.940
1.0	-43.9	-36.9	1381.6	4.6	141.2	390.4	0.864	1.936
1.013	**-43.6**	**-36.6**	**1380.7**	**4.6**	**141.5**	**390.6**	**0.866**	**1.935**
1.5	-35.1	-28.3	1354.3	6.7	152.8	395.4	0.914	1.919
2.0	-28.4	-21.7	1333.0	8.8	161.7	399.1	0.951	1.908
2.5	-22.9	-16.3	1315.1	10.9	169.1	402.0	0.980	1.899
3.0	-18.2	-11.7	1299.5	13.0	175.6	404.5	1.006	1.892
3.5	-14.0	-7.6	1285.5	15.1	181.2	406.6	1.028	1.887
4.0	-10.3	-4.0	1272.8	17.2	186.4	408.4	1.047	1.882
4.5	-7.0	-0.7	1261.1	19.2	191.1	410.0	1.065	1.878
5.0	-3.9	2.4	1250.1	21.3	195.4	411.5	1.081	1.874
5.5	-1.0	5.2	1239.8	23.4	199.5	412.8	1.096	1.871
6.0	1.7	7.8	1230.0	25.5	203.3	414.0	1.109	1.868
6.5	4.2	10.2	1220.7	27.7	206.9	415.1	1.122	1.865
7.0	6.6	12.6	1211.7	29.8	210.3	416.1	1.134	1.863
7.5	8.9	14.8	1203.1	31.9	213.6	417.0	1.146	1.860
8.0	11.0	16.9	1194.9	34.1	216.7	417.9	1.157	1.858
8.5	13.0	18.8	1186.8	36.3	219.7	418.7	1.167	1.856
9.0	15.0	20.7	1179.1	38.5	222.6	419.4	1.177	1.854
9.5	16.9	22.6	1171.5	40.7	225.3	420.1	1.187	1.852
10.0	18.7	24.3	1164.1	42.9	228.0	420.7	1.196	1.850
11.0	22.1	27.6	1149.9	47.4	233.2	421.9	1.213	1.846
12.0	25.3	30.7	1136.2	51.9	238.0	422.9	1.229	1.843
13.0	28.3	33.6	1123.0	56.6	242.7	423.7	1.244	1.840
14.0	31.1	36.4	1110.2	61.3	247.1	424.5	1.258	1.836
15.0	33.8	39.0	1097.7	66.1	251.3	425.1	1.272	1.833
16.0	36.4	41.4	1085.5	71.1	255.4	425.6	1.285	1.831
17.0	38.8	43.8	1073.5	76.1	259.4	426.1	1.297	1.828
18.0	41.2	46.0	1061.7	81.2	263.2	426.5	1.309	1.825
19.0	43.4	48.2	1050.0	86.5	266.9	426.7	1.321	1.822
20.0	45.6	50.3	1038.5	91.8	270.5	426.9	1.332	1.819
21.0	47.7	52.2	1027.1	97.3	274.0	427.1	1.343	1.816
22.0	49.7	54.2	1015.7	103.0	277.5	427.1	1.353	1.813
23.0	51.6	56.0	1004.4	108.8	280.9	427.1	1.363	1.810
24.0	53.5	57.8	993.1	114.8	284.2	427.1	1.373	1.808
25.0	55.3	59.5	981.8	120.9	287.4	426.9	1.383	1.805
26.0	57.1	61.2	970.5	127.3	290.7	426.7	1.392	1.801
27.0	58.8	62.8	959.0	133.8	293.8	426.4	1.401	1.798
28.0	60.5	64.4	947.5	140.6	297.0	426.1	1.410	1.795
29.0	62.1	65.9	935.9	147.6	300.1	425.6	1.419	1.792
30.0	63.7	67.4	924.1	154.9	303.2	425.1	1.428	1.788
31.0	65.3	68.8	912.1	162.5	306.2	424.6	1.437	1.785
32.0	66.8	70.3	899.9	170.5	309.3	423.9	1.446	1.781
33.0	68.3	71.6	887.4	178.8	312.3	423.2	1.454	1.777
34.0	69.7	72.9	874.6	187.5	315.4	422.3	1.463	1.773
35.0	71.2	74.2	861.3	196.7	318.5	421.4	1.472	1.769

Harp International Limited
Gellihirion Industrial Estate, Pontypridd, Rhondda
Cynon Taff, CF37 5SX United Kingdom

Telephone +44 (0) 1443 842255 **Freephone** 0800 134 404 (UK only)
Facsimile +44 (0) 1443 841805
email harp@harpintl.com **Web** www.harpintl.com

HARP INTERNATIONAL

Harp® 404A

Harp® 404A is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant blend. Harp® 404A is a ternary blend of R125, R143a and R134a (44%/52%/4%). It has been formulated to closely match the properties of CFC R502. It is widely used in new equipment that would have previously used R502 and can with specific modifications be retrofitted into exiting R502 equipment.

APPLICATION

Harp® 404A applications include medium and low temperature refrigeration systems such as food display and storage cabinets, cold storage rooms, ice machines, refrigerated transportation and process refrigeration. Since Harp® 404A has similar properties to R502, it is possible (with modifications) to use it in existing R502 systems.

PROPERTIES AND PERFORMANCE

Harp® 404A is designed to meet the needs of many new and existing refrigeration systems. Harp® 404A is a zeotropic HFC refrigerant blend rated A1 by ASHRAE (lowest levels of toxicity and flammability), having zero ozone depletion potential and a Global Warming Potential of 3922.

LUBRICATION

POE lubricants must be used with Harp® 404A since it is not miscible with mineral or alkyl benzene lubricants found in most old R502 systems. When retrofitting, a lubricant flushing procedure is necessary to reduce the original oil content below 5%. For refrigeration systems using an oil separator, multiple oil flushes may not be required. New R404A equipment will be charged with the OEM recommended lubricant, ready to use with Harp® 404A.

CHARGING

Due to the zeotropic nature of Harp® 404A, it should be charged as a liquid to prevent fractionation (changes in refrigerant composition due to vapour charging). In situations where vapour is normally charged into a system, a valve should be installed in the charging line to flash the liquid to vapour while charging. Testing shows that fractionation due to system leaks is typically not so problematic for R404A. The leak should be repaired and the charge topped-off.

RETROFITTING

With the correct modifications Harp® 404A can be used to retrofit existing R502 systems. The physical and thermodynamic properties of the blend result in similar performance to R502 when used as a retrofit but it is not intended to be a direct "drop-in" for R502 systems due its higher operating pressures and material compatibility issues.

MATERIAL COMPATIBILITY

Whenever retrofitting air-conditioning or refrigeration systems, compatibility of system materials must always be taken into consideration. Items such as elastomers, hoses, and filter-driers respond differently to different refrigerants and oils. For these reasons, before performing any refrigerant retrofit, Harp International recommends contacting the OEM for specific recommendations.

Harp International The Complete Worldwide Refrigerant Service
email harp@harpintl.com Web www.harpintl.com

Harp® 404A

Technical Data

Harp® 404A BASIC PROPERTIES

Chemical formula	R125: CHF_2CF_3 (44% by weight R143a: CH_3CF_3 (52% by weight) R134a: CH_2FCF_3 (4% by weight)	Molecular weight Boiling point at 1 atmosphere Temperature glide at 1 atm. Critical temperature Critical pressure	97.6 -46.2°C 0.7 K 72.1°C 37.3 bar absolute

Harp® 404A THERMODYNAMIC PROPERTIES

Absolute Pressure (bar)	Bubble Temperature (°C)	Dew Temperature (°C)	Liquid Density (kg/m³)	Vapour Density (kg/m³)	Liquid Enthalpy (kJ/kg)	Vapour Density (kJ/kg)	Liquid Entropy (kJ/kg.K)	Vapour Entropy (kJ/kg.K)
0.5	-59.9	-59.1	1347.7	2.8	120.8	330.5	0.746	1.728
0.6	-56.6	-55.8	1337.7	3.4	125.0	332.5	0.765	1.722
0.7	-53.6	-52.8	1328.9	3.9	128.6	334.3	0.782	1.717
0.8	-51.0	-50.3	1321.0	4.4	131.8	335.9	0.796	1.714
0.9	-48.7	-47.9	1313.8	4.9	134.8	337.3	0.809	1.710
1.0	-46.5	-45.7	1307.1	5.4	137.5	338.6	0.821	1.708
1.013	**-46.2**	**-45.5**	**1306.3**	**5.5**	**137.8**	**338.8**	**0.823**	**1.707**
1.5	-37.7	-37.0	1279.6	7.9	148.6	343.8	0.869	1.698
2.0	-30.9	-30.3	1258.0	10.4	157.2	347.8	0.905	1.691
2.5	-25.4	-24.8	1239.9	12.9	164.4	351.0	0.935	1.687
3.0	-20.6	-20.0	1223.9	15.4	170.7	353.7	0.959	1.683
3.5	-16.4	-15.9	1209.6	17.9	176.2	356.0	0.981	1.681
4.0	-12.7	-12.1	1196.5	20.4	181.2	358.0	1.000	1.678
4.5	-9.3	-8.7	1184.4	22.9	185.8	359.8	1.017	1.676
5.0	-6.2	-5.6	1173.0	25.4	190.0	361.5	1.033	1.675
5.5	-3.2	-2.7	1162.3	27.9	194.0	363.0	1.048	1.673
6.0	-0.5	0.0	1152.0	30.5	197.8	364.3	1.062	1.672
6.5	2.0	2.5	1142.3	33.0	201.3	365.6	1.074	1.671
7.0	4.4	4.9	1132.9	35.6	204.7	366.7	1.086	1.670
7.5	6.7	7.2	1123.8	38.2	207.9	367.8	1.098	1.669
8.0	8.9	9.3	1115.1	40.8	211.0	368.8	1.109	1.668
8.5	10.9	11.4	1106.5	43.5	214.0	369.7	1.119	1.667
9.0	12.9	13.4	1098.3	46.2	216.8	370.6	1.129	1.666
9.5	14.8	15.3	1090.2	48.9	219.6	371.4	1.138	1.665
10.0	16.6	17.1	1082.2	51.6	222.3	372.1	1.147	1.664
11.0	20.1	20.5	226.4	354.2	227.4	373.5	1.165	1.662
12.0	23.3	23.7	231.1	355.5	232.3	374.6	1.181	1.661
13.0	26.4	26.8	235.6	356.7	236.9	375.7	1.196	1.659
14.0	29.2	29.6	240.0	357.8	241.3	376.5	1.210	1.657
15.0	31.9	32.3	244.1	358.8	245.6	377.3	1.224	1.656
16.0	34.5	34.9	248.1	359.6	249.7	377.9	1.237	1.654
17.0	37.0	37.3	252.0	360.3	253.7	378.5	1.250	1.652
18.0	39.3	39.7	255.7	361.0	257.6	378.9	1.262	1.650
19.0	41.6	41.9	259.4	361.5	261.3	379.2	1.274	1.648
20.0	43.8	44.1	262.9	362.0	265.0	379.4	1.285	1.646
21.0	45.8	46.2	266.4	362.4	268.7	379.6	1.296	1.644
22.0	47.9	48.2	269.8	362.7	272.2	379.6	1.307	1.641
23.0	49.8	50.1	273.2	362.9	275.7	379.5	1.317	1.639
24.0	51.7	52.0	276.5	363.0	279.2	379.3	1.328	1.636
25.0	53.5	53.8	279.7	363.0	282.6	379.1	1.338	1.633
26.0	55.3	55.5	283.0	363.0	286.0	378.7	1.348	1.630
27.0	57.0	57.2	286.2	362.8	289.4	378.1	1.358	1.627
28.0	58.6	58.9	289.4	362.5	292.8	377.5	1.368	1.623
29.0	60.2	60.5	292.6	362.0	296.2	376.7	1.378	1.619
30.0	61.8	62.0	295.9	361.4	299.7	375.7	1.388	1.615
31.0	63.3	63.5	299.2	360.6	303.2	374.5	1.398	1.610
32.0	64.8	65.0	302.5	359.6	306.8	373.0	1.408	1.604
33.0	66.3	66.4	306.0	358.4	310.5	371.2	1.419	1.597
34.0	67.7	67.8	309.7	356.7	314.5	369.0	1.430	1.590
35.0	69.0	69.2	313.7	354.4	318.8	366.0	1.442	1.580

Harp International Limited
Gellihirion Industrial Estate, Pontypridd, Rhondda
Cynon Taff, CF37 5SX United Kingdom

Telephone +44 (0) 1443 842255 **Freephone** 0800 134 404 (UK only)
Facsimile +44 (0) 1443 841805
email harp@harpintl.com **Web** www.harpintl.com

HARP INTERNATIONAL

Harp® 134a

(1,1,1,2-tetrafluoroethane)

Harp® 134a is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant. It is used on its own as a pure refrigerant and as a component in a large number of refrigerant blends. It is widely used in new equipment that would have previously used CFC R12 and can with specific modifications be retrofitted into exiting R12 equipment.

APPLICATION

Harp® 134a applications include automotive air conditioning, chillers, medium temperature commercial refrigeration, domestic refrigeration appliances and transport refrigeration.

PROPERTIES AND PERFORMANCE

Harp® 134a is designed to meet the needs of many air conditioning and medium temperature refrigeration systems. Harp® 134a is a single component refrigerant, rated A1 by ASHRAE (lowest levels of toxicity and flammability), has zero ozone depletion potential and a Global Warming Potential of 1430.

LUBRICATION

Either Polyolester (POE) or Polyalkylene glycol (PAG) for auto Air conditioning lubricants must be used with HARP® 134a. It is not miscible with mineral oil or alkylbenzene lubricants found in many systems. When retrofitting, a lubricant flush procedure is necessary to reduce the original oil content below 5% of the total oil charge. New R134a equipment will be charged with the OEM recommended lubricant, ready to use with Harp® 134a.

CHARGING

Charging with Harp® 134a can be done either as a vapour or a liquid. End-users should check with the equipment manufacturers guidelines for specific charging instructions.

RETROFITTING

When retrofitting R12 systems to Harp® 134a, it is necessary to replace the existing lubricant with POE oil, except in some automotive retrofit applications, which require PAG oil. In most cases, the mineral oil or alkylbenzene oil levels must be reduced below 5% of the new POE charge. Check with OEMs for any specific recommendations regarding viscosity grades or procedures. Remove as much of the existing lubricant as possible, add POE, and run the system on R12 for some time. When the residual oil concentration is appropriate, remove R12, replace the filter-drier, and charge Harp® 134a.

MATERIAL COMPATIBILITY

Whenever retrofitting air conditioning or refrigeration systems, compatibility of system materials must always be taken into consideration. Items such as elastomers, hoses, and filter-driers respond differently to different refrigerants and oils. For these reasons, before performing any refrigerant retrofit, Harp International recommends contacting the OEM for specific recommendations.

Harp International The Complete Worldwide Refrigerant Service
email harp@harpintl.com Web www.harpintl.com

HARP INTERNATIONAL

Harp® 134a

Technical Data

Harp® 134a BASIC PROPERTIES

Chemical formula	CH_2FCF_3
Molecular weight	102.0
Boiling point at 1 atmosphere	-26.08°C
Critical temperature	101°C
Critical pressure	40.7 bar absolute

Harp® 134a THERMODYNAMIC PROPERTIES

Temperature (°C)	Pressure (bar)	Liquid Density (kg/m^3)	Vapour Density (kg/m^3)	Liquid Enthalpy (kJ/kg)	Liquid Enthalpy (kJ/kg)	Vapour Entropy (kJ/kg.K)	Vapour Entropy (kJ/kg.K)
-40	0.51	1417.7	2.77	148.1	374.0	0.796	1.764
-35	0.66	1403.2	3.52	154.4	377.2	0.822	1.758
-30	0.84	1388.4	4.43	160.8	380.3	0.849	1.752
-26.08	**1.013**	**1376.7**	**5.26**	**165.8**	**382.8**	**0.869**	**1.747**
-25	1.06	1373.5	5.51	167.2	383.5	0.875	1.746
-20	1.33	1358.3	6.78	173.6	386.6	0.900	1.741
-15	1.64	1342.8	8.29	180.1	389.6	0.926	1.737
-10	2.01	1327.1	10.04	186.7	392.7	0.951	1.733
-5	2.43	1311.1	12.08	193.3	395.7	0.975	1.730
0	2.93	1294.8	14.43	200.0	398.6	1.000	1.727
5	3.50	1278.1	17.13	206.8	401.5	1.024	1.725
10	4.15	1261.0	20.23	213.6	404.3	1.049	1.722
15	4.88	1243.4	23.76	220.5	407.1	1.072	1.720
20	5.72	1225.3	27.78	227.5	409.8	1.096	1.718
25	6.65	1206.7	32.35	234.6	412.3	1.120	1.716
30	7.70	1187.5	37.54	241.7	414.8	1.144	1.715
35	8.87	1167.5	43.42	249.0	417.2	1.167	1.713
40	10.17	1146.7	50.09	256.4	419.4	1.191	1.711
45	11.60	1125.1	57.66	263.9	421.5	1.214	1.709
50	13.18	1102.3	66.27	271.6	423.4	1.238	1.707
55	14.92	1078.3	76.10	279.5	425.2	1.261	1.705
60	16.82	1052.9	87.38	287.5	426.6	1.285	1.702
65	18.90	1025.6	100.40	295.8	427.8	1.309	1.699
70	21.17	996.3	115.57	304.3	428.7	1.333	1.696
75	23.64	964.1	133.49	313.1	429.0	1.358	1.691
80	26.33	928.2	155.08	322.4	428.8	1.384	1.685
85	29.26	887.2	181.85	332.2	427.8	1.410	1.677

Harp International Limited
Gellihirion Industrial Estate, Pontypridd, Rhondda
Cynon Taff, CF37 5SX United Kingdom

Telephone +44 (0) 1443 842255 **Freephone** 0800 134 404 (UK only)
Facsimile +44 (0) 1443 841805
email harp@harpintl.com **Web** www.harpintl.com