

# Harp<sup>®</sup> 404A

Harp<sup>®</sup> 404A is a zero ozone depletion (ODP) hydrofluorocarbon (HFC) refrigerant blend. Harp<sup>®</sup> 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 existing R502 equipment.

## APPLICATION

Harp<sup>®</sup> 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<sup>®</sup> 404A has similar properties to R502, it is possible (with modifications) to use it in existing R502 systems.

## PROPERTIES AND PERFORMANCE

Harp<sup>®</sup> 404A is designed to meet the needs of many new and existing refrigeration systems. Harp<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> 404A.

## CHARGING

Due to the zeotropic nature of Harp<sup>®</sup> 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<sup>®</sup> 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® 404A

## Technical Data

### Harp® 404A BASIC PROPERTIES

Chemical formula	R125: CHF <sub>2</sub> CF <sub>3</sub> (44% by weight) R143a: CH <sub>3</sub> CF <sub>3</sub> (52% by weight) R134a: CH <sub>2</sub> FCF <sub>3</sub> (4% by weight)	Molecular weight	97.6
		Boiling point at 1 atmosphere	-46.2°C
		Temperature glide at 1 atm.	0.7 K
		Critical temperature	72.1°C
		Critical pressure	37.3 bar absolute

### Harp® 404A THERMODYNAMIC PROPERTIES

Absolute Pressure (bar)	Bubble Temperature (°C)	Dew Temperature (°C)	Liquid Density (kg/m <sup>3</sup> )	Vapour Density (kg/m <sup>3</sup> )	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
<b>1.013</b>	<b>-46.2</b>	<b>-45.5</b>	<b>1306.3</b>	<b>5.5</b>	<b>137.8</b>	<b>338.8</b>	<b>0.823</b>	<b>1.707</b>
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	1066.4	54.2	227.4	373.5	1.165	1.662
12.0	23.3	23.7	1051.1	56.8	232.3	374.6	1.181	1.661
13.0	26.4	26.8	1036.2	59.4	236.9	375.7	1.196	1.659
14.0	29.2	29.6	1021.8	62.0	241.3	376.5	1.210	1.657
15.0	31.9	32.3	1007.9	64.6	245.6	377.3	1.224	1.656
16.0	34.5	34.9	994.5	67.2	249.7	377.9	1.237	1.654
17.0	37.0	37.3	981.6	69.8	253.7	378.5	1.250	1.652
18.0	39.3	39.7	969.1	72.4	257.6	378.9	1.262	1.650
19.0	41.6	41.9	957.0	75.0	261.3	379.2	1.274	1.648
20.0	43.8	44.1	945.2	77.6	265.0	379.4	1.285	1.646
21.0	45.8	46.2	933.8	80.2	268.7	379.6	1.296	1.644
22.0	47.9	48.2	922.7	82.8	272.2	379.6	1.307	1.641
23.0	49.8	50.1	911.9	85.4	275.7	379.5	1.317	1.639
24.0	51.7	52.0	901.4	88.0	279.2	379.3	1.328	1.636
25.0	53.5	53.8	891.1	90.6	282.6	379.1	1.338	1.633
26.0	55.3	55.5	881.1	93.2	286.0	378.7	1.348	1.630
27.0	57.0	57.2	871.3	95.8	289.4	378.1	1.358	1.627
28.0	58.6	58.9	861.7	98.4	292.8	377.5	1.368	1.623
29.0	60.2	60.5	852.3	101.0	296.2	376.7	1.378	1.619
30.0	61.8	62.0	843.1	103.6	299.7	375.7	1.388	1.615
31.0	63.3	63.5	834.1	106.2	303.2	374.5	1.398	1.610
32.0	64.8	65.0	825.3	108.8	306.8	373.0	1.408	1.604
33.0	66.3	66.4	816.7	111.4	310.5	371.2	1.419	1.597
34.0	67.7	67.8	808.3	114.0	314.5	369.0	1.430	1.590
35.0	69.0	69.2	800.1	116.6	318.8	366.0	1.442	1.580