



# R-424A (RS-24)

## Features and uses of R-424A (RS-24)

R-424A (RS-44) is a non-flammable blend of HFC 134a, HFC 125, iso-pentane, n-butane with ODP = 0, **compatible** with traditional mineral lubricants, alkyl benzene and also with synthetic POE, thus there is no need to make changes in the installation.

- "Drop-in" direct **replacement for R-12**, providing a long term easy solution.
- There is no need for expensive and hygroscopic synthetic lubricants, so the risk of humidity in the refrigerating equipment is completely avoided.
- Discharge temperature is lower than R-12, which eliminates the problem of oil decomposition.
- Cannot be mixed it with R-12 or other blends (R-409A, R401A, etc...) which contain R-22 because it could cause extremely high pressures.

### Applications

R-426A (RS-24) is suitable as a direct replacement for R-12 in most R-12 systems with the exception of centrifugal compressors.

- Automobile air conditioners
- Hermetic and semi-hermetic compressors
- Refrigerated warehouses
- Refrigerated transport
- Milk cooler
- Vending machines
- Refrigerated cellars

See the application guide for RS more information.

### Service and work terms

Due to the fact that it is a blend, it must always be transferred in liquid phase or full loads if transferred in gas phase.

Since in most cases there is no need to change the existing lubricant, RS-24 can be used directly as indicated in the conversion guidelines.

## Lubricants

RS-24 is compatible with mineral oils and alkyl benzene which are in R-12 systems, also with polyester lubricants (POE) and (PAG).

While in most cases there is no need to change lubricant, it is recommended to follow directions in relation to lubricity and viscosity of compressor manufacturers. However, in systems with extensive and complex piping configuration, or in large volume of liquid containers or with very low work temperatures, it may be necessary to add a part of POE.



## Environmental Data

None of RS-24 components contains chlorine, so the product has ODP = 0 (ability to deplete the ozone layer). As with all hydro fluorocarbons (HFCs), RS-44 has a direct potential atmospheric warming (GWP), but this is compensated by its low TEWI-Total Equivalent Warming Impact (greenhouse effect). RS-24 has an atmospheric lifetime up to 15 years compared to R-12 which is up to 100 years, below of the majority of HFCs available at present.

## Security

R-426A (RS-24) is not toxic, not flammable, high security. It is classified as **A1 / group L1**.

## Material compatibility

R-426A (RS-24) is compatible with all materials commonly used in refrigeration systems which have previously worked with R-12. In general, compatible materials with R-12 can be used with RS-24. It is recommended to check with the manufacturer the particularities of the equipment for its adaptation with regard to materials' compatibility. In R-12 existing installations, it may be necessary to replace some joints due to the different composition of RS-24, which contains HFCs.

## Pressure and Temperature Tables

The tables of refrigerant pressure temperature and graphs indicate both bubble liquid point and pressure dew point.

**Bubble Temperature:** The temperature at which liquid refrigerant begins to vaporize at the given pressure. Below this temperature refrigerant liquid is sub cooled.

**Pressure dew point:** The temperature at which refrigerant vapor begins to condense at given pressure. Above this temperature, refrigerant vapor is considered in superheated state.

**Superheated steam:** To determine the superheat of evaporator, measure temperature and pressure line suction in evaporator outlet piping. Using P/T tables you can determine pressure dew point, with pressure measured in suction. Subtract to the dew point current temperature and this difference is the evaporator superheat.

**Sub cooling the refrigerant liquid:** To determine sub-cooling in condenser, measure temperature condenser outlet pipe and measure pressure condenser outlet of the same pipe. Using table Pressure / Temperature to determine bubble point of fluid from condenser. Subtract measured temperature from boiling point determined and this difference is sub cooling of condenser refrigerant liquid.

Note: The range of refrigerants RS, the average of evaporating and condensing temperatures will be the midpoint between bubble and dew temperature.

## Components:

Chemical Name	% By weight	N °. EC
1,1,1,2- Tetrafluoroethane (R-134a)	93	212-377-0
Pentafluoroethane (R-125)	5,1	206-557-8
N-butane (R-600)	1,3	203-448-7
Iso-pentane (R-601a)	0,6	201-142-8



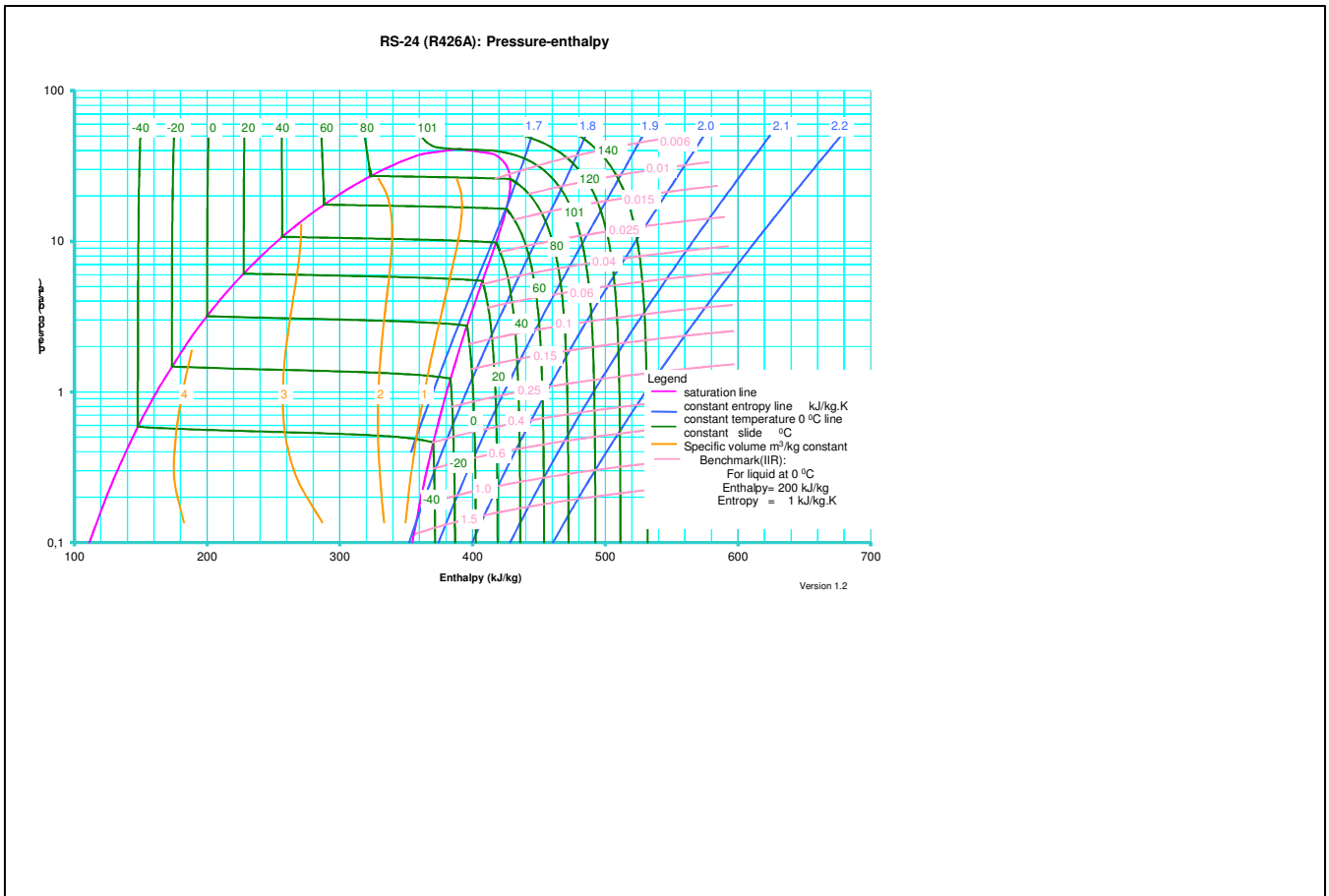
Physical properties:

PHYSICAL PROPERTIES:		R-426A (RS-24)	R-12
Molecular weight	(Kg/kmol)	102,6	120,9
Boiling point (1 atm.)	(°C)	-28,6 (1)	-29,8
Critical temperature	(°C)	101,0	112,0
Critical pressure	(Bar a)	40,97	41,16
Liquid Density at 25 ° C	(Kg/m3)	1184	1311
Saturated vapor density at 25 ° C	(Kg/m3)	30,9	37,3
Specific heat of liquid at 25 ° C	(KJ/kg°C)	1,45	1,00
Specific heat of vapor at 25°C and 1 atm	(KJ/kg°C)	0,863	0,606
Steam Pressure 25 ° C	(Bar a)	7,07 (1)	6,43
Latent heat of vaporization	(KJ/kg°C)	218 (1)	165
Slip temp.	(°C)	Approx. 0,5	0
Flammability in air at 1 atm	%vol	No	No
ODP		0	1
GWP		1508	8500
Inhalation exposure (8h/day and 40 h / week	(Ppm)	1000	1000

(1) Bubble Point

Remember to consult guidelines for conversion of R- 426A (RS-24)

Mollier Diagram :



**R426A (RS-24) PRESSURE TABLE (Absolute) TEMPERATURE (°C)**

TEMPERATURE	Pressure BUBBLE P. (Liquid)	Pressure DEW P. (Vapor)	Pressure BUBBLE P. (Liquid)	Pressure DEW P. (Vapor)	Pressure BUBBLE P. (Liquid)	Pressure DEW P. (Vapor)

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(oC)	(kPa)	(kPa)	(bare)	(bare)	(psia)	(psia)
-50	34,30	25,90	0,34	0,26	4,97	3,76
-48	38,30	29,20	0,38	0,29	5,55	4,23
-46	42,70	32,80	0,43	0,33	6,19	4,76
-44	47,50	36,80	0,48	0,37	6,89	5,34
-42	52,80	41,20	0,53	0,41	7,66	5,97
-40	58,50	46,00	0,59	0,46	8,48	6,67
-38	64,70	51,20	0,65	0,51	9,38	7,42
-36	71,30	56,80	0,71	0,57	10,34	8,24
-34	78,60	63,00	0,79	0,63	11,40	9,14
-32	86,40	69,70	0,86	0,70	12,53	10,11
-30	94,80	76,90	0,95	0,77	13,75	11,15
-28	103,90	84,70	1,04	0,85	15,07	12,28
-26	113,60	93,20	1,14	0,93	16,47	13,51
-24	124,00	102,30	1,24	1,02	17,98	14,83
-22	135,20	112,00	1,35	1,12	19,60	16,24
-20	147,20	122,50	1,47	1,23	21,34	17,76
-18	159,90	133,80	1,60	1,34	23,19	19,40
-16	173,50	145,80	1,74	1,46	25,16	21,14
-14	188,00	158,70	1,88	1,59	27,26	23,01
-12	203,50	172,40	2,04	1,72	29,51	25,00
-10	219,80	187,10	2,20	1,87	31,87	27,13
-8	237,20	202,70	2,37	2,03	34,39	29,39
-6	255,70	219,30	2,56	2,19	37,08	31,80
-4	275,20	236,90	2,75	2,37	39,90	34,35
-2	295,80	255,60	2,96	2,56	42,89	37,06
0	317,60	275,40	3,18	2,75	46,05	39,93
2	340,70	296,40	3,41	2,96	49,40	42,98
4	364,90	318,60	3,65	3,19	52,91	46,20
6	390,50	342,10	3,91	3,42	56,62	49,60
8	417,50	366,80	4,18	3,67	60,54	53,19
10	445,80	392,90	4,46	3,93	64,64	56,97
12	475,50	420,40	4,76	4,20	68,95	60,96
14	506,80	449,40	5,07	4,49	73,49	65,16
16	539,50	479,80	5,40	4,80	78,23	69,57
18	573,90	511,80	5,74	5,12	83,22	74,21
20	609,80	545,40	6,10	5,45	88,42	79,08
22	647,50	580,70	6,48	5,81	93,89	84,20
24	686,80	617,60	6,87	6,18	99,59	89,55
26	728,00	656,30	7,28	6,56	105,56	95,16
28	770,90	696,80	7,71	6,97	111,78	101,04
30	815,80	739,20	8,16	7,39	118,29	107,18
32	862,50	783,50	8,63	7,84	125,06	113,61
34	911,30	829,70	9,11	8,30	132,14	120,31
36	962,00	878,10	9,62	8,78	139,49	127,32
38	1014,90	928,50	10,15	9,29	147,16	134,63
40	1069,90	981,00	10,70	9,81	155,14	142,25
42	1127,10	1035,80	11,27	10,36	163,43	150,19
44	1186,50	1092,80	11,87	10,93	172,04	158,46
46	1248,30	1152,20	12,48	11,52	181,00	167,07
48	1312,40	1214,00	13,12	12,14	190,30	176,03
50	1379,00	1278,30	13,79	12,78	199,96	185,35
52	1448,00	1345,20	14,48	13,45	209,96	195,05
54	1519,60	1414,60	15,20	14,15	220,34	205,12
56	1593,80	1486,70	15,94	14,87	231,10	215,57
58	1670,60	1561,70	16,71	15,62	242,24	226,45
60	1750,20	1639,40	17,50	16,39	253,78	237,71
62	1832,60	1720,10	18,33	17,20	265,73	249,41

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64	1917,90	1803,80	19,18	18,04	278,10	261,55
66	2006,20	1890,60	20,06	18,91	290,90	274,14
68	2097,40	1980,60	20,97	19,81	304,12	287,19
70	2191,80	2073,80	21,92	20,74	317,81	300,70
72	2289,30	2170,50	22,89	21,71	331,95	314,72
74	2390,00	2270,70	23,90	22,71	346,55	329,25
76	2494,10	2374,50	24,94	23,75	361,64	344,30
78	2601,70	2482,00	26,02	24,82	377,25	359,89
80	2712,70	2593,50	27,13	25,94	393,34	376,06
82	2827,40	2709,00	28,27	27,09	409,97	392,81
84	2945,80	2828,80	29,46	28,29	427,14	410,18
86	3067,90	2952,90	30,68	29,53	444,85	428,17
88	3194,00	3081,80	31,94	30,82	463,13	446,86
90	3324,20	3215,60	33,24	32,16	482,01	466,26

GLIDE: ABOUT 3 ° C

**R426A (RS-24) PRESSURE TABLE (Gauge) TEMPERATURE (°C)**

TEMPERATURE (°C)	Pressure BUBBLE P. (Liquid) (kPa)	Pressure DEW P. (Vapor) (kPa)	Pressure BUBBLE P. (Liquid) (bare)	Pressure DEW P. (Vapor) (bare)	Pressure BUBBLE P. (Liquid) (psia)	Pressure DEW P. (Vapor) (psia)
-50	-65,70	-74,10	-0,66	-0,74	-9,73	-10,94
-48	-61,70	-70,80	-0,62	-0,71	-9,15	-10,47
-46	-57,30	-67,20	-0,57	-0,67	-8,51	-9,94
-44	-52,50	-63,20	-0,53	-0,63	-7,81	-9,36
-42	-47,20	-58,80	-0,47	-0,59	-7,04	-8,73
-40	-41,50	-54,00	-0,42	-0,54	-6,22	-8,03
-38	-35,30	-48,80	-0,35	-0,49	-5,32	-7,28
-36	-28,70	-43,20	-0,29	-0,43	-4,36	-6,46
-34	-21,40	-37,00	-0,21	-0,37	-3,30	-5,57
-32	-13,60	-30,30	-0,14	-0,30	-2,17	-4,59
-30	-5,20	-23,10	-0,05	-0,23	-0,95	-3,55
-28	3,90	-15,30	0,04	-0,15	0,37	-2,42
-26	13,60	-6,80	0,14	-0,07	1,77	-1,19
-24	24,00	2,30	0,24	0,02	3,28	0,13
-22	35,20	12,00	0,35	0,12	4,90	1,54
-20	47,20	22,50	0,47	0,23	6,64	3,06
-18	59,90	33,80	0,60	0,34	8,49	4,70
-16	73,50	45,80	0,74	0,46	10,46	6,44
-14	88,00	58,70	0,88	0,59	12,56	8,31
-12	103,50	72,40	1,04	0,72	14,81	10,30
-10	119,80	87,10	1,20	0,87	17,17	12,43
-8	137,20	102,70	1,37	1,03	19,69	14,69
-6	155,70	119,30	1,56	1,19	22,38	17,10
-4	175,20	136,90	1,75	1,37	25,20	19,65
-2	195,80	155,60	1,96	1,56	28,19	22,36
0	217,60	175,40	2,18	1,75	31,35	25,23
2	240,70	196,40	2,41	1,96	34,70	28,28
4	264,90	218,60	2,65	2,19	38,21	31,50
6	290,50	242,10	2,91	2,42	41,92	34,90
8	317,50	266,80	3,18	2,67	45,84	38,49
10	345,80	292,90	3,46	2,93	49,94	42,27
12	375,50	320,40	3,76	3,20	54,25	46,26
14	406,80	349,40	4,07	3,49	58,79	50,46
16	439,50	379,80	4,40	3,80	63,53	54,87
18	473,90	411,80	4,74	4,12	68,52	59,51
20	509,80	445,40	5,10	4,45	73,72	64,38
22	547,50	480,70	5,48	4,81	79,19	69,50



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24	586,80	517,60	5,87	5,18	84,89	74,85
26	628,00	556,30	6,28	5,56	90,86	80,46
28	670,90	596,80	6,71	5,97	97,08	86,34
30	715,80	639,20	7,16	6,39	103,59	92,48
32	762,50	683,50	7,63	6,84	110,36	98,91
34	811,30	729,70	8,11	7,30	117,44	105,61
36	862,00	778,10	8,62	7,78	124,79	112,62
38	914,90	828,50	9,15	8,29	132,46	119,93
40	969,90	881,00	9,70	8,81	140,44	127,55
42	1027,10	935,80	10,27	9,36	148,73	135,49
44	1086,50	992,80	10,87	9,93	157,34	143,76
46	1148,30	1052,20	11,48	10,52	166,30	152,37
48	1212,40	1114,00	12,12	11,14	175,60	161,33
50	1279,00	1178,30	12,79	11,78	185,26	170,65
52	1348,00	1245,20	13,48	12,45	195,26	180,35
54	1419,60	1314,60	14,20	13,15	205,64	190,42
56	1493,80	1386,70	14,94	13,87	216,40	200,87
58	1570,60	1461,70	15,71	14,62	227,54	211,75
60	1650,20	1539,40	16,50	15,39	239,08	223,01
62	1732,60	1620,10	17,33	16,20	251,03	234,71
64	1817,90	1703,80	18,18	17,04	263,40	246,85
66	1906,20	1790,60	19,06	17,91	276,20	259,44
68	1997,40	1880,60	19,97	18,81	289,42	272,49
70	2091,80	1973,80	20,92	19,74	303,11	286,00
72	2189,30	2070,50	21,89	20,71	317,25	300,02
74	2290,00	2170,70	22,90	21,71	331,85	314,55
76	2394,10	2274,50	23,94	22,75	346,94	329,60
78	2501,70	2382,00	25,02	23,82	362,55	345,19
80	2612,70	2493,50	26,13	24,94	378,64	361,36
82	2727,40	2609,00	27,27	26,09	395,27	378,11
84	2845,80	2728,80	28,46	27,29	412,44	395,48
86	2967,90	2852,90	29,68	28,53	430,15	413,47
88	3094,00	2981,80	30,94	29,82	448,43	432,16
90	3224,20	3115,60	32,24	31,16	467,31	451,56

GLIDE: ABOUT 3 ° C

R426A (RS-24) Saturation Properties



Temp	Pressure (L)	Pressure (V)	Density (L)	Density (V)	Volume (L)	Volume (V)	Enthalpy (L)	Enthalpy (V)	Entropy (L)	Entropy (V)
[C]	[bare] bubble	[bare] dew	[kg/m^3] bubble	[kg/m^3] dew	[litre/kg] bubble	[litre/kg] dew	[kJ/kg] bubble	[kJ/kg] dew	[kJ/K-kg] bubble	[kJ/K-kg] dew
-50	0.343	0.259	1420.8	1.5	0.781	686.33	135.43	364.01	0.7401	1.7783
-48	0.383	0.292	1415.2	1.6	0.780	613.43	137.91	365.31	0.7512	1.7745
-46	0.427	0.328	1409.6	1.8	0.780	549.66	140.41	366.62	0.7622	1.7710
-44	0.475	0.368	1404.0	2.0	0.781	493.70	142.91	367.92	0.7731	1.7676
-42	0.528	0.412	1398.3	2.3	0.781	444.47	145.42	369.22	0.7840	1.7644
-40	0.585	0.460	1392.6	2.5	0.782	401.04	147.93	370.53	0.7948	1.7613
-38	0.647	0.512	1386.9	2.8	0.783	362.64	150.45	371.83	0.8056	1.7584
-36	0.713	0.568	1381.2	3.0	0.784	328.59	152.98	373.13	0.8163	1.7556
-34	0.786	0.630	1375.4	3.4	0.785	298.33	155.52	374.43	0.8269	1.7530
-32	0.864	0.697	1369.6	3.7	0.786	271.38	158.07	375.73	0.8375	1.7505
-30	0.948	0.769	1363.7	4.0	0.787	247.31	160.62	377.02	0.8480	1.7481
-28	1.039	0.847	1357.8	4.4	0.789	225.79	163.18	378.31	0.8585	1.7458



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-26	1.136	0.932	1351.9	4.8	0.791	206.49	165.75	379.60	0.8689	1.7437
-24	1.240	1.023	1346.0	5.3	0.792	189.16	168.33	380.89	0.8793	1.7416
-22	1.352	1.120	1340.0	5.8	0.794	173.56	170.92	382.17	0.8896	1.7397
-20	1.472	1.225	1334.0	6.3	0.796	159.49	173.51	383.45	0.8998	1.7378
-18	1.599	1.338	1327.9	6.8	0.798	146.78	176.12	384.72	0.9100	1.7361
-16	1.735	1.458	1321.8	7.4	0.801	135.27	178.73	385.99	0.9202	1.7344
-14	1.880	1.587	1315.6	8.0	0.803	124.85	181.35	387.25	0.9303	1.7328
-12	2.035	1.724	1309.4	8.7	0.805	115.37	183.99	388.51	0.9404	1.7313
-10	2.198	1.871	1303.2	9.4	0.808	106.76	186.63	389.76	0.9504	1.7299
-8	2.372	2.027	1296.9	10.1	0.810	98.91	189.28	391.01	0.9604	1.7285
-6	2.557	2.193	1290.5	10.9	0.813	91.75	191.95	392.25	0.9704	1.7272
-4	2.752	2.369	1284.1	11.7	0.816	85.21	194.62	393.48	0.9803	1.7260
-2	2.958	2.556	1277.7	12.6	0.819	79.22	197.30	394.70	0.9902	1.7249
0	3.176	2.754	1271.2	13.6	0.822	73.73	200.00	395.92	1.0000	1.7238
2	3.407	2.964	1264.6	14.6	0.825	68.69	202.71	397.13	1.0098	1.7227
4	3.649	3.186	1258.0	15.6	0.828	64.06	205.43	398.33	1.0196	1.7217
6	3.905	3.421	1251.3	16.7	0.831	59.80	208.16	399.52	1.0293	1.7208
8	4.175	3.668	1244.5	17.9	0.835	55.88	210.90	400.70	1.0390	1.7199
10	4.458	3.929	1237.7	19.1	0.838	52.26	213.65	401.87	1.0487	1.7191
12	4.755	4.204	1230.8	20.4	0.842	48.91	216.42	403.03	1.0584	1.7182
14	5.068	4.494	1223.8	21.8	0.845	45.82	219.20	404.18	1.0680	1.7175
16	5.395	4.798	1216.8	23.3	0.849	42.96	222.00	405.31	1.0776	1.7167
18	5.739	5.118	1209.6	24.8	0.853	40.30	224.81	406.43	1.0872	1.7160
20	6.098	5.454	1202.4	26.4	0.857	37.84	227.63	407.55	1.0968	1.7153
22	6.475	5.807	1195.1	28.1	0.862	35.55	230.47	408.64	1.1063	1.7146
24	6.868	6.176	1187.7	29.9	0.866	33.42	233.32	409.72	1.1158	1.7140

R426A (RS-24) Saturation Properties

Temp	Pressure (L)	Pressure (V)	Density (L)	Density (V)	Volume (L)	Volume (V)	Enthalpy (L)	Enthalpy (V)	Entropy (L)	Entropy (V)
[C]	[bare] bubble	[bare] dew	[kg/m <sup>3</sup> ] bubble	[kg/m <sup>3</sup> ] dew	[litre/kg] bubble	[litre/kg] dew	[kJ/kg] bubble	[kJ/kg] dew	[kJ/K-kg] bubble	[kJ/K-kg] dew
26	7.280	6.563	1180.1	31.8	0.870	31.44	236.19	410.79	1.1253	1.7134
28	7.709	6.968	1172.5	33.8	0.875	29.59	239.08	411.84	1.1348	1.7128
30	8.158	7.392	1164.8	35.9	0.880	27.87	241.98	412.87	1.1443	1.7122
32	8.625	7.835	1157.0	38.1	0.885	26.26	244.91	413.89	1.1538	1.7116
34	9.113	8.297	1149.0	40.4	0.890	24.76	247.85	414.89	1.1633	1.7110
36	9.620	8.781	1140.9	42.8	0.895	23.35	250.81	415.87	1.1727	1.7104
38	10.149	9.285	1132.7	45.4	0.901	22.04	253.78	416.82	1.1822	1.7098
40	10.699	9.810	1124.3	48.1	0.907	20.80	256.78	417.76	1.1916	1.7091
42	11.271	10.358	1115.8	50.9	0.912	19.64	259.81	418.67	1.2011	1.7085
44	11.865	10.928	1107.1	53.9	0.919	18.55	262.85	419.55	1.2105	1.7079
46	12.483	11.522	1098.3	57.0	0.925	17.53	265.92	420.41	1.2200	1.7072
48	13.124	12.140	1089.3	60.4	0.932	16.57	269.01	421.25	1.2295	1.7065
50	13.790	12.783	1080.1	63.9	0.939	15.66	272.13	422.05	1.2390	1.7058
52	14.480	13.452	1070.6	67.5	0.946	14.81	275.27	422.82	1.2485	1.7050

54	15.196	14.146	1061.0	71.4	0.953	14.00	278.45	423.56	1.2580	1.7042
56	15.938	14.867	1051.2	75.5	0.961	13.24	281.65	424.26	1.2676	1.7034
58	16.706	15.617	1041.1	79.9	0.969	12.52	284.89	424.92	1.2771	1.7025
60	17.502	16.394	1030.7	84.5	0.978	11.84	288.16	425.54	1.2867	1.7015
62	18.326	17.201	1020.0	89.4	0.987	11.19	291.46	426.11	1.2964	1.7004
64	19.179	18.038	1009.0	94.5	0.997	10.58	294.81	426.63	1.3061	1.6993
66	20.062	18.906	997.7	100.0	1.007	10.00	298.20	427.10	1.3159	1.6980
68	20.974	19.806	986.0	105.9	1.018	9.44	301.63	427.51	1.3257	1.6966
70	21.918	20.738	973.9	112.1	1.029	8.92	305.11	427.86	1.3356	1.6951
72	22.893	21.705	961.4	118.8	1.041	8.42	308.65	428.13	1.3456	1.6935
74	23.900	22.707	948.3	126.0	1.054	7.94	312.24	428.32	1.3556	1.6917
76	24.941	23.745	934.7	133.7	1.068	7.48	315.91	428.43	1.3658	1.6897
78	26.017	24.820	920.4	142.0	1.083	7.04	319.64	428.43	1.3762	1.6875
80	27.127	25.935	905.3	151.0	1.100	6.62	323.46	428.32	1.3867	1.6850
82	28.274	27.090	889.4	160.9	1.118	6.22	327.37	428.07	1.3974	1.6822
84	29.458	28.288	872.4	171.7	1.138	5.82	331.40	427.67	1.4083	1.6791
86	30.679	29.529	854.2	183.6	1.160	5.45	335.56	427.08	1.4195	1.6755
88	31.940	30.818	834.5	197.0	1.185	5.08	339.88	426.27	1.4311	1.6713
90	33.242	32.156	812.7	212.2	1.214	4.71	344.41	425.17	1.4432	1.6665

#### **QUESTIONS AND ANSWERS ABOUT R-426A (RS-24)**

**1 Q: What is R-426A (RS-24)?**

A: R-426A (RS-24) is a direct substitute (drop-in) of R-12 for all applications and also without effect on ozone layer (ODP = 0).

**2 Q: What does R-426 (RS-24) contain?**

A: R-426A (RS-24) is a mixture of HFC 134a, HFC 125, iso-pentane (R-601) and n-butane (R-600).

**3 Q: Has RS-24 an ASHRAE number and which is its classification?**

A: Yes, RS-24 has been assigned an ASHRAE number, R-426A and it is rated A1, which means low toxicity and non-flammability under all fractionation conditions.

**4 Q: Is R-426A (RS-24) subject to a phase-out according to regulations, such as CFC and HCFC?**

A: No, none of R-426A (RS-24) components are subject to a gradual elimination schedule under Montreal Protocol or European regulations.

**5 Q: Why is R-426A (RS-24) different to Isceon 49 / MO49?**

A: R-426A (RS-24) does not contain perfluorocarbon R-218, which has an atmospheric lifetime up to 2,500 years, and is a significant constituent of Isceon 49. RS-24 has an atmospheric lifetime lower than 20 years compared to Isceon 49 which is up to 250 years. RS-24 is non-flammable, ASHRAE classification A1, while Isceon 49 (MO49) is classified as A2, L2 group. RS-24 has also a lower discharge pressure to Isceon 49. RS-24 has also much lower glide temperature than MO49.

**6 Q: How is RS-24 compared to refrigerant such as R409A (FX56), R-401A (MP39) and others?**

A: First, R-426A (RS-24) has ODP = 0, so it is a long-term solution as a replacement for R-12, and not mentioned refrigerants. Moreover, RS-24 can be used in automobile air conditioning, not being possible with R-409A and R-401A, or other mixtures containing R-22.





**7 Q: Can R-426A (RS-24) be used with mineral and alkyl benzene lubricants?**

A: Yes, there is no need to change to synthetic polyolester oil (POE) or (PAG), since it operates satisfactorily with traditional lubricants.

Oil return depends on certain design and operating conditions. In some systems with extensive and complex piping configurations, in flooded evaporators or in systems in which the accumulator of the suction line acts as a low pressure receiver, it is recommended the replacement of all or part (approximately 25%) of oil load of POE compressor. See guidelines for conversion.

**8 Q: Is R-426A (RS-24) approved by manufacturers of compressors?**

A: The individual components that constitute RS-24 are widely used in compressors produced by the main manufacturers.

**9 Q: Can R-426A (RS-24) be used to recharge a system with R-134a and POE oil or PAG?**

A: Yes it can. RS-24 components are compatible with R-134a and synthetic oils.

**10 Q: What type of oil should be used in case RS-24 has been used to recharge a system with R-134a and synthetic oil?**

R: A synthetic oil with the same viscosity.

**11 Q: Can R-426A (RS-24) be used to recharge a system with R-12?**

A: No, it cannot be used to recharge a system with R-12. It is a mixture so it could cause extremely high pressures due to R12/R134a azeotrope formation.

**12 Q: Can R-426A (RS-24) be used to recharge a system with Isceon 49?**

A: There is not enough experience in this field to comment it. It is recommended to recover Isceon 49 from the system and replaced it with RS-24.

**13 Q: Can R-426A (RS-24) be used to recharge a system with R-409A or other direct replacement (DROP-IN) of R-12?**

A: No, it cannot. RS-24 is a very different refrigerant and cannot be mixed with R-409A or other direct substitutes for R-12.

**14 Q: Is R-426A (RS-24) as efficient as R-12 or R-134a?**

A: The energy efficiency of RS-24 is similar to R-12 or R-134a.

**15 Q: What tests have been carried out with R-426A (RS-24), and what are the results?**

A: There have been tests in commercial refrigeration, domestic and automotive applications. The results show a good oil return to the compressor in all cases and efficiency similar to R-12 and R-134a.

**16 P: Should R-426A (RS-24) be charged in liquid or gaseous form?**

A: Due to the fact that RS-24 is near an azeotropic mixture, the recommendation is to load the system in liquid phase. However, if the entire bottle contents must be introduced, it can be performed in gas phase.

**17 Q: Have containers of R-426A (RS-24) dip tube?**

A: It depends on the type of container. All blue containers of Servei Gas S.A. they do. In case of not having it, the recommendation is to invert the container.

**18 Q: Is R-426A (RS-24) included in the SNAP (Significant New Alternatives Project)?**

A: Yes, it is. R-426A (RS-24) is approved in the U.S. by the Environmental Protection Agency as a replacement for R-12 and is on the SNAP list.

**19 Q: How are the R-426A (RS-24) pressures compared to R-12 and R-134a?**

A: The discharge pressure of RS-24 is very similar to R-134a.



**20 Q: How is the R-426A (RS-24) ability compared to R-12?**

A. The ability of RS-24 is very similar to R-12.

**21 Q: What is the R-426A (RS-24) capacity compared to R-134a?**

A. The ability of RS-24 is slightly higher than R-134a.

**22 Q: How are the R-426A (RS-24) operating temperatures compared to R-12?**

A. The discharge temperatures for R-426A (RS-24) are lower than R-12.

**23 Q: How are the R-426A (RS-24) operating temperatures compared to R-134a?**

A. The discharge temperatures for R-426A (RS-24) are similar to R-134a.

**24 Q: What are the R-426A (RS-24) flammability characteristics?**

A: R-426A (RS-24) is not flammable at room temperature and atmospheric pressure, and has the same classification as R-410A, R-134a, R-404A, R-409A (FX56), R-507, etc.

**25 Q: What are the decomposition products resulting from the combustion of R-426A (RS-24)?**

A: The decomposition products resulting from exposure of R-426A (RS-24) to a high temperature source are similar to those formed by R-12 and R-134a when they are exposed to fire. The decomposition products are in each case irritating and toxic, and a self-contained breathing apparatus should be used if such possibility exists.

**26 Q: Must R-426A (RS-24) be taken into account any special precautions?**

A: No specific precautions to be taken with RS-24. As with all refrigerants, common sense and good practices are always recommended. The use of hygroscopic synthetic lubricants (POE) can be avoided with the use of RS-24, so there is no need to take special care with humidity. However, the humidity has always to be controlled.

**27 Q: Is R-426A (RS-24) compatible with refrigeration and air conditioning systems designed for R-12?**

A: Yes it is. R-426A (RS-24) is compatible with all materials commonly used in systems that were designed and loaded with R-12. As in the case of R-12, magnesium and zinc alloys should be avoided.

**28 Q: Is R-426A (RS-24) recovered and recycled?**

A: Yes, R-426A (RS-24) can be recovered and reused after a cleaning process, and deliver it to a manager for further regeneration.

**29 Q: What is the technical guide for changing R-12 R-426A (RS-24)?**

A: The procedure for the conversion of R-12 to RS-24 is simple. After recovering R-22 and make empty, use the same type of lubricant, replace the filter / drier and enter about 10% less amount of RS-24 to the original charge of R-12. See guidelines for conversion.

**30 Q: What is the price of R-426A (RS-24) compared to other alternative?**

A: RS-24 is competitive in price with other alternative of R-12.

**31 Q: What is the main advantage of R-426A (RS-24)?**

A: R-426A (RS-24) is a long-term alternative to R-12, and its main advantage is that it can be used to replace R-12 without changing the original mineral oil in the system. Therefore, there is no need to adapt to a synthetic lubricant (POE or polyalkyleneglycol).

**32 Q: Why RS-24 can directly be used in automobile air conditioning, ant not R134a and synthetic oils, without removing the mineral oil?**

A: R-134a is not miscible with mineral oil, which must be reduced to a maximum of 5% prior to adding the synthetic oil. RS-24 can be used with both types of oil allowing the oil return to the compressor.

**33 Q: Can R-426A (RS-24) be used in flooded evaporators?**

A: R-426A (RS-24) can be used in flooded evaporators due to the fact that has low sliding, it is lower



than 1 °C.

**34 Q: Can R-426A (RS-24) be used successfully in evaporating temperatures lower than -20 ° C?**

A: In some circumstances, a low evaporating temperature may be little miscibility with oil and it can damage the compressor. At evaporation temperatures lower than -20 ° C, oil could reach the evaporator due to a lack of lubrication in the compressor. In these situations, it is advisable to change to a POE oil to facilitate oil return to the compressor. No need to remove all the oil from the system. Only you have to change the possible amount of mineral oil charge, and recharge with the appropriate level using POE oil

**35 Q: Is there any problem with oil using RS-24 in a launch of a flooded evaporator?**

A: It is known that the startup of flooded systems is detrimental to the compressor operation. Even with R-12 systems, designers anticipate to this problem by putting the resistors in the case. In many cases, a check valve is installed, controlling the pressure between the evaporator and the compressor to prevent backflow of condensate (liquid) refrigerant to the compressor. When resistors are installed in the case, prevent fluid buildup of RS-24. Moreover, they would be even more effective in this case, since it would require less heat to evaporate the liquid refrigerant than to distill a refrigerant of a solution.

If there is the possibility to realize a startup of a flooded system, it is recommended to change the existing oil by a synthetic POE oil, which will increase the miscibility of the refrigerant with the oil, and thus, to facilitate oil return to the compressor and prevent accumulation of oil in the evaporator.

**36 Q: Is R-426A (RS-24) compatible with hoses, seals, gaskets and sealing commonly used with R-12?**

A: Yes it is. The original mineral oil it is used and not a synthetic lubricant, elastomers and plastics used with R-12 are compatible with RS-24.

**37 Q: What is the R-426A (RS-24) coefficient of performance (COP) compared to R-12 and R-134a)?**

A: RS-24 COP is slightly lower than R-12 and R-134a and slightly higher than R-409A (FX-56).

**38 Q: What is the specification of R-426A (RS-24)?**

R: R-426A (RS-24) complies with the specification of refrigerants ARI-700-04 for fluorocarbon refrigerants.

**39 Q: What are the effects of high exposure by inhalation of R-426A (RS-24)?**

A: All CFC, HCFC and HFC that are base of refrigerants, the high exposure to RS-24 can produce anesthetic effects. Very high exposures may cause an abnormal heart rhythm and be fatal as happens with all CFC, HCFC and HFC.

**40 Q: What is the flash point, explosive and ignition temperature of R-426A (RS-24)?**

A: R-426A (RS-24) is listed as a non-flammable as defined in ASHRAE test EN 681-98, and therefore has no flash point or explosion limits. The ignition temperature of RS-24 has not been determined but is expected to exceed 750°C.

**41 Q: What types of leak detectors should be used with R-426A (RS-24)?**

R: You can use the same leak detectors used with HFC.

**42 Q: What would be the effect of a large release of R-426A (RS-24)?**

A: As with other refrigerants, the area should be immediately evacuated. Vapor can be concentrated at ground level and at low poorly ventilated areas so the dispersion can be slow. You must proceed to ventilate the area before entering.

**43 Q: Is R-426A (RS-24) available in disposable bottles?**

A: Not in Spain.

## TECHNICAL FILE

### RS-24



**44 Q: Can you use R-426A (RS-24) in systems designed and loaded with hydrocarbons, R-600a isobutene (HC)?**

A: Yes, we can.

**45 Q: Is R-426A (RS-24) appropriate to use with new equipment?**

R: R-426A (RS-24) has not (ODP), and avoids the use of synthetic oils POE cutting costs and reducing the risk of humidity into the system.