



# R-470B (RS-51)

## Characteristics and applications of RS-51

RS-51 is a blend of HFC+HFO refrigerant gases. It is non-azeotropic, **non-flammable** with a **zero ODP** and a **low global warming potential (GWP)** and was developed to comply with the requirements of the European F-Gas Regulation for reducing CO<sub>2</sub> emissions.

Some of its main properties are:

- It is a good alternative to R-404A, R-507, R-448A, R-449A for new medium and low temperature systems.
- It is a **direct drop-in** replacement for R-404A, R-507 and their replacements (R-407A/F/H, R-448A, R-449A) in existing systems.
- Its global warming potential (GWP) is:
  - ≈ 81% less than R-404A.
  - ≈ 46% less than R-448A and R-449A.
- It has a refrigeration capacity and energy efficiency (COP) similar to that of R-404A and R-507.
- It is an **indirect retrofit** replacement for R-22 (change the kind of lubricant) and its replacements (R-434A, R-438A, R-453A) in refrigeration.
- It is a blend that is compatible with POE synthetic oils.

## Applications

With a GWP less than a quarter of that of R-404A and R-507, the R-51 refrigerant gas is an excellent replacement for R-404A and R-507, resulting in a reduced carbon footprint. RS-51 also has a GWP just slightly over half of that of R-448A and R-449A.

As the properties of RS-51 are similar to those of R-404A and R-507, it is suitable for any systems that use these particular refrigerants.

RS-51 could also be used as an alternative for many of these applications where R-22 has been used.

## Working and service conditions

Since RS-51 is a blend, it should always be transferred in liquid phase or, if transferred in gas phase, in full loads.

As it is not necessary to change the existing lubricant, RS-51 is easy to use, just as described in the procedure.

There is no need to make any major changes in the R-404A or R-507 system to change to RS-51. It may be necessary to change the thermostatic expansion valve (TXV) to one for R-134a.



## Lubricants

RS-51 is compatible with the same polyolester oils that are used with R-404A, R-507 and their replacements (R-407A/F/H, R-448A, R-449A), so there is no need to change the oil type when converting systems from R-404A, R-507, R-407A/F/H, R-448A, R-449A to RS-51. When replacing R-22 with RS-51, you will need to change the existing oil to a polyol-based oil.

## Environmental data

None of the components of RS-51 contain chlorine, so the product has an ODP of zero (ozone depletion potential).

RS-51 has a **low** global warming potential (GWP), thus reducing CO<sub>2</sub> emissions if there is a direct leak.

RS-51 is a non-flammable direct replacement for R-404A and R-507, with the lowest GWP on the market.

## Safety

RS-51 is not flammable under any blend fractionation situation, in accordance with the ASHRAE Standard 34.

The components of RS-51 have been subjected to toxicity testing by the Alternative Fluorocarbons Environmental Acceptability Study (AFEAS), and was declared as having low toxicity.

The safety classification of RS-51 is **A1/group L1**.

## Compatibility with materials

RS-51 is compatible with all materials commonly used in refrigeration systems that have previously worked with R-404A, R-507 and their replacements (R-407A/F/H, R-448A, R-449A).

Materials compatible with R-404A and R-507, and their replacements (R-407A/F/H, R-448A, R-449A), can generally be used with RS-51. It is recommended that you contact the equipment manufacturer to obtain precise information regarding the adaptation of said equipment in relation to the compatibility of the materials.

For old systems that have been using R-22, it may be necessary to replace some joints due to the different composition of RS-51.

## Pressure / temperature tables

The pressure / temperature tables and graphics for the refrigerant indicate both the bubble point of the liquid and the dew point of the vapour.

**Bubble point temperature:** This is the temperature at which the liquid refrigerant begins to vaporise at the given pressure. When below this temperature, the liquid refrigerant will be subcooled.

**Dew point of vapour:** This is the temperature at which the refrigerant vapour begins to condense at the given pressure. When above this temperature, the refrigerant vapour is considered to be in a superheated state.

**Superheated vapour:** To determine the evaporator superheat, measure the temperature and pressure from the suction line in the evaporator outlet pipe. Use the P/T tables to determine the vapour dew point, with the pressure measured in the suction line. Subtract the current temperature from the dew point and the difference will be the evaporator superheat.

**Subcooling in refrigeration liquid:** To determine subcooling, measure the temperature and pressure from the suction line in the condenser outlet pipe. Use the P/T tables to determine the bubble point, with the pressure measured in the condenser.



Subtract the current temperature from the bubble point and the difference will be the condenser subcooling.

Note: with the RS range of refrigerants, the average evaporation and condensation temperatures will be the midpoint between the bubble point temperature and the dew point temperature.

## Components

Chemical Name	% By weight	CAS No.	EC No.
trans-1,3,3,3- Tetrafluoroprop-1-ene (R-1234ze)	56	29118-24-9	471-480-0
Difluoromethane (R-32)	11	75-10-5	200-839-4
1,1,1,2,2- Pentafluoroethane (R-125)	11	354-33-6	206-557-8
Carbon Dioxide (R-744)	11	124-38-9	204-696-9
1,1,1,2,3,3,3-Heptafluoropropane (R-227ea)	7	431-89-0	207-079-2
1,1,1,2- Tetrafluoroethane (R-134a)	4	811-97-2	212-377-0

## Physical properties

PHYSICAL PROPERTIES	UNITS	R-470B (RS-51) <sup>(2)</sup>	R404A <sup>(2)</sup>
Peso molecular	(kg/kmol)	89.73	97.6
Boiling point (at 1,013 bar) <sup>(1)</sup>	(°C)	-61.45	-46.23
Critical temperature	(°C)	94.29	72.12
Critical pressure	(bara)	54.66	37.35
Liquid density at 25°C <sup>(1)</sup>	(kg/m <sup>3</sup> )	1107	1044
Saturated vapour density at 25°C <sup>(1)</sup>	(kg/m <sup>3</sup> )	56.74	66.41
Cv (25°C y 1 bara) Specific heat a V const.	(kJ/kg.K)	0.762	0.784
Cp (25°C y 1 bara) Specific heat a P const.	(kJ/kg.K)	0.862	0.877
Cp/Cv (25°C y 1bara)		1.131	1.118
Vapour pressure 25°C <sup>(1)</sup>	(bara)	17.07	12.55
Latent heat of vaporization at boiling point. <sup>(3)</sup>	(kJ/kg)	259.9	200.9
Vapour viscosity (25°C y 1 bara) <sup>(1)</sup>	cP	0.0129	0.0121
Liquid viscosity (25°C) <sup>(1)</sup>	cP	0.143	0.128
Thermal conductivity of liquid (25°C)	W/m.K	0.0812	0.0627
Surface tension (25°C) <sup>(1)</sup>	N/m	0.00642	0.00446
Specific heat of liquid at (25°C) <sup>(1)</sup>	kJ/kg.K	1.54	1.54
Flammability in air at 1 atm	%vol.	No	No
ODP		0	0
GWP*		746	3922
Exposición por inhalación (8h/día y 40 h/semana)	(ppm)	1000	1000

(1) Bubble point

(2) Properties of the RS-51 refrigerant obtained from the REFPROP v10 program from NIST.

(3) Difference between the enthalpy of the liquid bubble point and the enthalpy of the vapour dew point at 1 atm.

\* According to IPPCC-AR4/CIE (Fourth Assessment Report of the Intergovernmental Panel of Experts on Climate Change)-2007.

***Remember to consult the guidelines for conversion from RS-51.***

## R-470B (RS-51) Absolute Saturation Properties

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m <sup>3</sup> ]	Density Vapour [kg/m <sup>3</sup> ]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
-60	1.0977	0.20337	1406.6	1.0403	118.69	358.67	0.66705	1.8574
-59	1.1502	0.21704	1403.6	1.1056	120	359.35	0.67314	1.8546
-58	1.2047	0.23146	1400.7	1.1742	121.3	360.02	0.67921	1.8518
-57	1.2611	0.24666	1397.8	1.2462	122.61	360.69	0.68525	1.8491
-56	1.3195	0.26267	1394.9	1.3217	123.92	361.37	0.69126	1.8465
-55	1.3799	0.27952	1391.9	1.4008	125.23	362.04	0.69726	1.8439
-54	1.4425	0.29724	1389	1.4838	126.54	362.71	0.70323	1.8413
-53	1.5071	0.31587	1386.1	1.5706	127.85	363.39	0.70918	1.8388
-52	1.574	0.33545	1383.1	1.6615	129.16	364.06	0.71511	1.8364
-51	1.6431	0.35601	1380.1	1.7565	130.48	364.73	0.72102	1.834
-50	1.7145	0.37758	1377.2	1.8559	131.79	365.41	0.7269	1.8317
-49	1.7882	0.40021	1374.2	1.9597	133.11	366.08	0.73277	1.8294
-48	1.8643	0.42392	1371.2	2.0681	134.43	366.75	0.73861	1.8271
-47	1.9427	0.44877	1368.2	2.1812	135.75	367.42	0.74444	1.8249
-46	2.0237	0.47478	1365.2	2.2992	137.07	368.09	0.75024	1.8228
-45	2.1072	0.502	1362.2	2.4223	138.39	368.77	0.75603	1.8206
-44	2.1932	0.53047	1359.2	2.5506	139.72	369.44	0.76179	1.8186
-43	2.2819	0.56023	1356.2	2.6842	141.04	370.11	0.76754	1.8165
-42	2.3732	0.59132	1353.2	2.8234	142.37	370.78	0.77326	1.8145
-41	2.4672	0.62379	1350.1	2.9682	143.7	371.45	0.77897	1.8126
-40	2.564	0.65768	1347.1	3.1188	145.03	372.12	0.78466	1.8107
-39	2.6636	0.69303	1344	3.2755	146.36	372.78	0.79033	1.8088
-38	2.766	0.7299	1341	3.4384	147.7	373.45	0.79599	1.807
-37	2.8713	0.76832	1337.9	3.6076	149.04	374.12	0.80162	1.8052
-36	2.9796	0.80834	1334.8	3.7833	150.37	374.78	0.80724	1.8034
-35	3.0909	0.85002	1331.7	3.9658	151.71	375.45	0.81284	1.8017
-34	3.2053	0.8934	1328.6	4.1552	153.05	376.11	0.81843	1.8
-33	3.3227	0.93853	1325.5	4.3516	154.4	376.78	0.824	1.7983
-32	3.4433	0.98545	1322.4	4.5553	155.74	377.44	0.82955	1.7967
-31	3.5671	1.0342	1319.3	4.7665	157.09	378.1	0.83509	3.5671
-30	3.6941	1.0849	1316.1	4.9854	158.44	378.76	0.84061	3.6941
-29	3.8244	1.1375	1313	5.2121	159.79	379.42	0.84611	3.8244
-28	3.9581	1.1922	1309.8	5.4468	161.14	380.08	0.8516	3.9581
-27	4.0952	1.2489	1306.6	5.6899	162.5	380.74	0.85707	4.0952
-26	4.2357	1.3077	1303.5	5.9414	163.86	381.39	0.86253	4.2357
-25	4.3797	1.3687	1300.3	6.2017	165.21	382.05	0.86798	4.3797
-24	4.5273	1.432	1297.1	6.4708	166.58	382.7	0.87341	4.5273
-23	4.6784	1.4975	1293.8	6.7491	167.94	383.35	0.87882	4.6784
-22	4.8332	1.5653	1290.6	7.0367	169.31	384	0.88423	4.8332
-21	4.9916	1.6356	1287.4	7.334	170.67	384.65	0.88961	4.9916
-20	5.1539	1.7083	1284.1	7.641	172.05	385.3	0.89499	5.1539
-19	5.3198	1.7835	1280.8	7.9581	173.42	385.94	0.90035	5.3198
-18	5.4897	1.8614	1277.6	8.2855	174.79	386.58	0.9057	5.4897
-17	5.6634	1.9418	1274.3	8.6235	176.17	387.23	0.91104	5.6634
-16	5.841	2.025	1271	8.9722	177.55	387.87	0.91636	5.841
-15	6.0227	2.1109	1267.7	9.332	178.93	388.51	0.92167	6.0227
-14	6.2083	2.1997	1264.3	9.7031	180.32	389.14	0.92697	6.2083
-13	6.3981	2.2914	1261	10.086	181.71	389.78	0.93225	6.3981
-12	6.5919	2.386	1257.6	10.48	183.1	390.41	0.93753	6.5919
-11	6.79	2.4837	1254.2	10.887	184.49	391.04	0.94279	6.79
-10	6.9922	2.5845	1250.8	11.306	185.89	391.67	0.94804	6.9922
-9	7.1987	2.6884	1247.4	11.738	187.28	392.3	0.95329	7.1987
-8	7.4096	2.7955	1244	12.183	188.68	392.92	0.95852	7.4096
-7	7.6248	2.906	1240.6	12.641	190.09	393.54	0.96374	7.6248
-6	7.8444	3.0198	1237.1	13.112	191.5	394.16	0.96895	7.8444
-5	8.0685	3.1371	1233.6	13.598	192.91	394.78	0.97415	8.0685
-4	8.2971	3.2579	1230.2	14.097	194.32	395.4	0.97933	8.2971
-3	8.5302	3.3822	1226.6	14.612	195.73	396.01	0.98451	8.5302
-2	8.7679	3.5102	1223.1	15.141	197.15	396.62	0.98969	8.7679
-1	9.0103	3.642	1219.6	15.685	198.57	397.23	0.99485	9.0103

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m <sup>3</sup> ]	Density Vapour [kg/m <sup>3</sup> ]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
0	9.2574	3.7776	1216	16.245	200	397.83	1	9.2574
1	9.5091	3.917	1212.4	16.821	201.43	398.43	1.0051	9.5091
2	9.7657	4.0604	1208.8	17.413	202.86	399.03	1.0103	9.7657
3	10.027	4.2078	1205.2	18.021	204.3	399.63	1.0154	10.027
4	10.293	4.3594	1201.6	18.647	205.73	400.22	1.0205	10.293
5	10.565	4.5151	1197.9	19.29	207.18	400.81	1.0256	10.565
6	10.841	4.6752	1194.3	19.951	208.62	401.4	1.0307	10.841
7	11.122	4.8395	1190.6	20.63	210.07	401.98	1.0358	11.122
8	11.408	5.0083	1186.8	21.328	211.52	402.57	1.0409	11.408
9	11.699	5.1817	1183.1	22.045	212.98	403.14	1.046	11.699
10	11.996	5.3596	1179.3	22.781	214.44	403.72	1.0511	11.996
11	12.297	5.5422	1175.5	23.538	215.9	404.29	1.0562	12.297
12	12.604	5.7296	1171.7	24.314	217.37	404.85	1.0612	12.604
13	12.916	5.9218	1167.9	25.112	218.84	405.42	1.0663	12.916
14	13.233	6.119	1164	25.931	220.32	405.98	1.0713	13.233
15	13.556	6.3212	1160.1	26.772	221.8	406.53	1.0764	13.556
16	13.884	6.5286	1156.2	27.635	223.28	407.09	1.0814	13.884
17	14.217	6.7412	1152.3	28.522	224.77	407.63	1.0865	14.217
18	14.556	6.959	1148.3	29.432	226.26	408.18	1.0915	14.556
19	14.901	7.1823	1144.3	30.366	227.76	408.72	1.0965	14.901
20	15.251	7.4111	1140.3	31.324	229.26	409.25	1.1016	15.251
21	15.606	7.6454	1136.2	32.308	230.77	409.78	1.1066	15.606
22	15.967	7.8854	1132.1	33.318	232.28	410.31	1.1116	15.967
23	16.334	8.1313	1128	34.355	233.8	410.83	1.1166	16.334
24	16.707	8.383	1123.8	35.419	235.32	411.35	1.1216	16.707
25	17.085	8.6407	1119.6	36.51	236.84	411.86	1.1267	17.085
26	17.469	8.9044	1115.4	37.63	238.37	412.36	1.1317	17.469
27	17.858	9.1744	1111.2	38.78	239.91	412.87	1.1367	17.858
28	18.254	9.4507	1106.9	39.96	241.45	413.36	1.1417	18.254
29	18.655	9.7334	1102.6	41.171	243	413.85	1.1467	18.655
30	19.063	10.023	1098.2	42.413	244.55	414.34	1.1517	19.063
31	19.476	10.318	1093.8	43.688	246.11	414.82	1.1567	19.476
32	19.895	10.621	1089.3	44.997	247.67	415.29	1.1617	19.895
33	20.32	10.93	1084.8	46.34	249.24	415.76	1.1667	20.32
34	20.751	11.247	1080.3	47.718	250.81	416.22	1.1717	20.751
35	21.188	11.57	1075.7	49.133	252.4	416.67	1.1767	21.188
36	21.632	11.901	1071.1	50.585	253.98	417.12	1.1817	21.632
37	22.081	12.239	1066.5	52.076	255.58	417.56	1.1867	22.081
38	22.536	12.584	1061.8	53.606	257.18	417.99	1.1918	22.536
39	22.998	12.937	1057	55.177	258.79	418.42	1.1968	22.998
40	23.466	13.298	1052.2	56.791	260.4	418.84	1.2018	23.466
41	23.939	13.666	1047.3	58.447	262.02	419.25	1.2068	23.939
42	24.419	14.043	1042.4	60.148	263.65	419.65	1.2119	24.419
43	24.906	14.427	1037.4	61.896	265.29	420.05	1.2169	24.906
44	25.398	14.82	1032.4	63.69	266.93	420.44	1.2219	25.398
45	25.897	15.221	1027.3	65.534	268.58	420.82	1.227	25.897
46	26.402	15.631	1022.2	67.429	270.24	421.18	1.232	26.402
47	26.913	16.049	1016.9	69.376	271.91	421.55	1.2371	26.913
48	27.431	16.477	1011.7	71.378	273.59	421.9	1.2422	27.431
49	27.955	16.913	1006.3	73.436	275.27	422.24	1.2472	27.955
50	28.485	17.358	1000.9	75.551	276.97	422.57	1.2523	28.485
51	29.021	17.813	995.38	77.728	278.67	422.89	1.2574	29.021
52	29.564	18.277	989.8	79.967	280.39	423.2	1.2625	29.564
53	30.113	18.751	984.15	82.27	282.11	423.5	1.2677	30.113
54	30.668	19.235	978.41	84.642	283.85	423.78	1.2728	30.668
55	31.229	19.729	972.58	87.083	285.59	424.06	1.278	31.229
56	31.797	20.233	966.67	89.598	287.35	424.32	1.2831	31.797
57	32.37	20.748	960.66	92.189	289.12	424.57	1.2883	32.37
58	32.95	21.273	954.55	94.86	290.9	424.8	1.2935	32.95
59	33.536	21.81	948.33	97.613	292.7	425.02	1.2988	33.536
60	34.128	22.357	942.01	100.45	294.5	425.23	1.304	34.128





## Questions and answers regarding RS-51

### 1 Q: What is RS-51?

A: RS-51 is an HFC+HFO blend that is a direct replacement for R-404A and R-507, and their replacements (R-407A/F/H, R-448A, R-449A). It is non-flammable, has a low global warming potential (GWP) and a zero ozone depletion potential (ODP). It is also an indirect replacement for R-22 and its replacements (R-434A, R-438A, R-453A) in refrigeration.

### 2 Q: OK, but what does RS-51 contain?

A: RS-51 is a blend of R-1234ze, R-32, R-125, R-744, R-227ea and R-134a.

### 3 Q: Is RS-51 in the process of being phased out, in accordance with regulations, as is the case with CFCs and HCFCs?

A: No, none of the components of RS-51 are subject to a phase-out calendar within the framework of the Montreal Protocol or other European regulations.

### 4 Q: Can RS-51 be used with the same oil when used as a replacement for R-404A or R-507?

A: Yes. RS-51 is fully compatible with synthetic oils such as polyolester oils (POE), which are commonly used with R-404A, R-507 and their replacements (R-407A/F/H, R-448A, R-449A).

### 5 Q: Can RS-51 be used with the same oil when used as a replacement for R-22?

A: No. RS-51 is not compatible with mineral or alkylbenzene oils, which are normally used with R-22. It would be best to replace all the existing oil with a POE.

### 6 Q: Is RS-51 non-flammable and non-toxic?

A: RS-51 is non-flammable and has a low toxicity. It is non-flammable under all fractionation conditions. It is classified as group L1.

### 7 Q: Is RS-51 approved by compressor manufacturers?

A: The components that make up RS-51 are widely used for compressors produced by the main manufacturers.

### 8 Q: Can RS-51 be used in new systems?

A: RS-51 has also been developed as an alternative to R-404A and R-507 in new systems, due to its low global warming potential (GWP).

### 9 Q: Is RS-51 as efficient as R-404A and R-507?

A: The tests demonstrate that RS-51 has a similar COP to R-404A and R-507.

### 10 Q: What are the pressures of RS-51 compared with R-404A, R-507 and R-22?

A: The discharge pressure of RS-51 is less than that of R-404A and R-507.

### 11 Q: What is the capacity of RS-51 compared with R-404A and R-507?

A: The capacity of RS-51 is similar to that of R-404A and R-507.

### 12 Q: What are the working temperatures of RS-51 compared with R-404A and R-507?

A: The discharge temperature of RS-51 is slightly more than that of R-404A and R-507, as with R-448A and R-449A.

### 13 Q: What tests have been carried out on RS-51, and what were the results?

A: The refrigerant in a chest freezer was changed from R-404A to RS-51 and the resulting performance and operating parameters were both satisfactory.

### 14 Q: Should RS-51 be charged in liquid or gas phase?

A: Since RS-51 is a blend, it is recommended that it be charged in liquid phase. However, if the entire content of the cylinder is being charged into a system, it can be done in gas phase.



**15 Q: Do RS-51 cylinders have probe tubes?**

A: It depends on the type of cylinder. All the blue cylinders from Gas Servei S.A. have them. If there isn't one, it is recommended that you turn the cylinder upside down.

**16 Q: Does RS-51 have an ASHRAE number, and what is its classification?**

A: Yes, RS-51 has been assigned the ASHRAE number R-470B with an A1 classification, which indicates low toxicity and non-flammability in all fractionation conditions.

**17 Q: What are the flammability properties of RS-51?**

A: RS-51 is non-flammable at room temperature and atmospheric pressure, and has the same classification as R-410A, R-134a, R-404A, R-507, R-448A, R-449A, etc.

**18 Q: What are the decomposition products resulting from the combustion of RS-51?**

A: The decomposition products resulting from the exposure of RS-51 to a high temperature source are similar to those produced by R-404A, R-507, R-448A and R-449A when they are exposed to fire. The decomposition products in any case are irritants and toxic, and in the case of exposure, a self-contained breathing apparatus should be used.

**19 Q: Should any special precautions be taken into account with RS-51?**

A: There are no particular precautions that need to be taken with RS-51. Common sense and good practices are always recommended, as with all refrigerants.

**20 Q: Is RS-51 compatible with refrigeration and air conditioning systems designed for R-404A, R-507 and R-22?**

A: Yes, RS-51 is compatible with all the materials commonly used in systems that were designed for and charged with R-404A, R-507 and their replacements (R-407A/F/H, R-448A, R-449A), as well as R-22.

**21 Q: What technical advice would we give when changing from R-404A or R-507 to RS-51?**

A: Use the same kind of oil that is already in use, which should be POE. After recovering the R-404A or R-507 and emptying the system, change the filter dehydrator and charge 10% less than the original charge of the R-404A or R-507. If the expansion system is a thermostatic valve (TXV), replace it with one for R-134a and fit it. Finish charging the equipment with small charges of RS-51 while controlling the superheating.

**22 Q: What technical advice would we give when changing from R-22 to RS-51?**

A: If your system uses mineral oil or alkylbenzene, which is usually the case, it should be entirely replaced with POE oil. It is a good idea to check the type of oil used and its viscosity with the manufacturer of the compressor. The amount of mineral oil or alkylbenzene leftover should be less than 5%. After recovering all the R-22 and emptying the system, change the filter dehydrator and charge 10% less than the original charge of R-22. The flow rate of the liquid is a bit less than R-22, so the expansion valve will need to be adjusted by being closed slightly. Finish charging the equipment with small charges of RS-51 while controlling the superheating.

As with any change from HCFC to HFC, it may be necessary to replace some of the joints due to the different composition.

**23 Q: How does the price of RS-51 compare to other alternatives?**

A: RS-51 is more cost-effective than R-404A and R-507, it is competitively priced compared to the replacements (R-407A/F/H, R-448A, R-449A) and the tax is approximately 81% lower than that of R-404A and 46% lower than that of R-448A and R-449A.

**24 Q: What is the main benefit of RS-51?**

A: The global warming potential (GWP) of RS-51 is 81% lower than that of R-404A and R-507, and 46% lower than that of R-448A and R-449A, thus reducing the carbon footprint.



**25 Q: Is RS-51 compatible with the joints, seals, hoses and toric joints that are used with R-404A and R-507?**

A: Yes. There is no need to change the joints when changing a system with these refrigerants to RS-51.

**26 Q: Is RS-51 compatible with the joints, seals, hoses and toric joints that are used with R-22?**

A: RS-51 is compatible with the materials that are normally used in refrigeration systems that previously used R-22. The materials used with R-22 are generally compatible with RS-51. To be properly advised on this, it is a good idea to check the equipment manufacturers' documentation when doing the retrofitting. For systems that have been using R-22 for many years, it may be necessary to change the seals and joints due to the different composition of RS-51, since it is an HFC+HFO. The same is also true when changing from R-22 to an HFC or an HFC+HFO, such as R-404A, R-422D, R-134a, R-434A, R-448A, R-449A, etc.

**27 Q: What are the effects of prolonged exposure to RS-51 by inhalation?**

A: As is the case with all CFC, HCFC, HFC and HFC+HFO refrigerants, prolonged exposure to RS-51 may cause anaesthetic effects. Very prolonged exposure may lead to heart arrhythmia and could be fatal, as is the case with all CFC, HCFC, HFC and HFC+HFO refrigerants.

**28 Q: What kinds of leak detectors should be used with RS-51?**

A: The same leak detectors used for other HFC and HFC+HFO refrigerants can also be used with RS-51.

**29 Q: What is the correct way to respond to a major leak of RS-51?**

A: As is the case with all other refrigerants of this type, the area should be immediately evacuated. The vapours may concentrate at ground level and in poorly ventilated areas they may disperse slowly. The area should be properly ventilated before entering.

**30 Q: Is RS-51 available in rechargeable and disposable cylinders?**

A: Yes, although disposable cylinders may only be used outside of the European Union.