



R-442A (RS-50)

Features and uses of the R-442A (RS-50)

R-442A (RS-50) is a non-flammable HFC blend with an **ODP = 0** and **low global warming potential (GWP)**, developed to comply with the new dictates laid out in Europe's F-Gas Regulation for the reduction of CO₂ emissions, and also to offer a significant economical saving to the end user client due to its high level of energy efficiency.

Some of its main characteristics are:

- Good alternative to R-404A and R-507 in new medium and low temperature installations.
- **Direct substitute (drop-in)** for R-404A and R-507 in existing installations.
- Its global warming potential (GWP) is less than half of R-404 and R-507.
- High energy efficiency (COP) compared with R-404A and R-507.
- Better cooling capacity compared with R-404A and R-507.
- **Indirect substitute (retrofit)** for R-22 in refrigeration.
- Its molecular structure is equivalent to that of R-22, and smaller than that of R-404A and R-507 which means that it is not necessary to adjust the expansion valve for installations containing R-22 while it might be necessary to slightly close the expansion valve in the case of R-404A and R-507.
- Because it is a mixture of HFC, it is compatible with POE synthetic oils. Thanks to its composition, the oil return to the compressor will be better compared with R-404A and R-507.

RS-50 (R-442A) is ideal as an alternative to R-404A and R-507 both in new and existing installations, contributing a major improvement to energy saving and significantly reducing the TEWI, in terms of direct and indirect CO₂ emissions, thereby being a product for the future within the new European framework.

Applications

Because the properties of R-442A (RS-50) are similar to those of R-404A and R-507, it is suitable for installations where these refrigerants were being used such as supermarkets, freezers, refrigerated warehouses, cold chambers, refrigerated cellars, refrigerated transport, ice rinks, ice-making machines, cold drink vending machines, cooling processes, etc.

R-22 was also used in many of these applications for which RS-50 could also be an alternative.

Conditions for service and work

As RS-50 is a blend, it must always be transferred in its liquid phase or else in complete loads if transferred in its gas phase.

There is no need for major changes to an R-404A or R-507 installation in order to change to RS-50 other than reducing the rate of the expansion system.

Due to its glide, it is advisable, should there be a leak, to recover the refrigerant, create a vacuum and replace with virgin refrigerant.



Lubricants

RS-50 is compatible with the same polyol ester oils used with R-404A and R-507 so that it is not necessary to change the oil type when converting R-404A or R-507 installations to RS-50. If substituting R-22 with RS-50 it will be necessary to change the existing oil for one with a polyol base.

Environmental Information

No RS-50 components contain chlorine meaning that the product has an ODP (capacity to deplete the ozone layer) = 0.

RS-50 has a **low** potential for directly affecting global warming, thereby reducing CO₂ emissions in the event of direct leakage.

Safety

RS-50 is not flammable in any situation where the mixture is fractionated in line with Standard 34 of ASHRAE.

RS-50's components have been subjected to toxicity tests by the Alternative Fluorocarbons Environmental Acceptability Study (AFEAS) and been declared as having a low toxicity.

RS-50 has been assigned an ASHRAE refrigerant number of R-442A with a safety **classification of A1/group L1**.

Compatibility with materials

R-442A (RS-50) is compatible with all the materials commonly used in refrigeration systems that previously had worked with R-404A and R-507.

In general, materials compatible with R-404A and R-507 can be used with RS-50. It is advisable to check with the equipment manufacturer on its specific peculiarities in order to adapt the equipment with respect to the compatibility of materials.

In old installations that have been working with R-22, it might be necessary to replace some gaskets due to the different composition of RS-50, which contains HFCs.

Pressure and Temperature Tables

RS Series Pressure/Temperature charts indicate both liquid bubble point and vapour dew point of the RS Series Refrigerant.

Bubble point temperature: This is the temperature which the liquid refrigerant will begin to vaporize at the given pressure. Below this temperature the liquid refrigerant will be sub-cooled.

Vapour dew point: This is the temperature at which refrigerant vapour will begin to condense at the given pressure. Above this temperature the refrigerant vapour will be superheated.

Evaporator vapour Superheat:

To determine evaporator superheat, measure the suction line temperature at the outlet pipe of the evaporator and measure the suction pressure at the outlet pipe of the evaporator. Using the Pressure/Temperature chart, determine the vapour dew point for the measured suction pressure. Subtract the determined dew point from the actual temperature and this difference is the evaporator superheat.

Condenser Liquid Sub-Cooling:

To determine condenser sub-cooling, measure the temperature of the outlet pipe of the condenser and measure the condenser pressure at the outlet pipe of the condenser. Using the Pressure/Temperature chart, determine the liquid bubble point for the measured condenser pressure. Subtract the measured temperature from the determined bubble point and this difference is the condenser liquid sub-cooling.



Note: with the RS range of refrigerants, the average of the evaporation and condensation temperatures is the half way point between the temperatures of the bubble point and the dew point.

Components

Chemical name	% by weight	CAS N°	EC No.
Pentafluoroethane (R-125)	31,0	354-33-6	206-557-8
1,1,1,2- Tetrafluoroethane (R-134a)	30,0	811-97-2	212-377-0
Difluoromethane (R-32)	31,0	75-10-5	200-839-4
1,1,1,2,3,3,3- Heptafluoropropane (R-227ea)	5,0	431-89-0	207-079-2
1,1- Difluoroethane (R-152A)	3,0	75-37-6	200-866-1

Physical properties

PHYSICAL PROPERTIES	UNITS	R-442A (RS-50)	R-404A	R-22
Molecular weight	(kg/kmol)	81.8	97.6	86.5
Boiling point (1 atm.)	(°C)	-46.5 ⁽¹⁾	-46.2 ⁽¹⁾	-40.8 ⁽¹⁾
Critical temperature	(°C)	84.4	72.1	96.1
Critical pressure	(bara)	48.6	37.3	49.9
Liquid density at 25°C	(kg/m ³)	1108	1044	1191
Saturated vapour density at 25°C	(kg/m ³)	47.7	65.3	44.2
Cv (25°C and 1 bar) Specific heat at const. V.	(kJ/kg.K)	0.727	0.784	0.559
Cp (25°C and 1 bar) Specific heat at const. P.	(kJ/kg.K)	0.838	0.877	0.662
Cp/Cv (25°C and 1 bar)		1.152	1.118	1.185
Vapour pressure 25°C	(bara)	13.3 ⁽¹⁾	12.6 ⁽¹⁾	10.4
Latent vaporization heat at boiling point	(kJ/kg)	266 ⁽¹⁾	200 ⁽¹⁾	234 ⁽¹⁾
Temperature glide	(K)	4.6	0.5	0
Flammability in air at 1 atm	% vol.	No	No	No
ODP		0	0	0.055
GWP		1888*	3922*	1810*
Exposure to inhalation (8h/day and 40 h/week)	(ppm)	1000	1000	1000

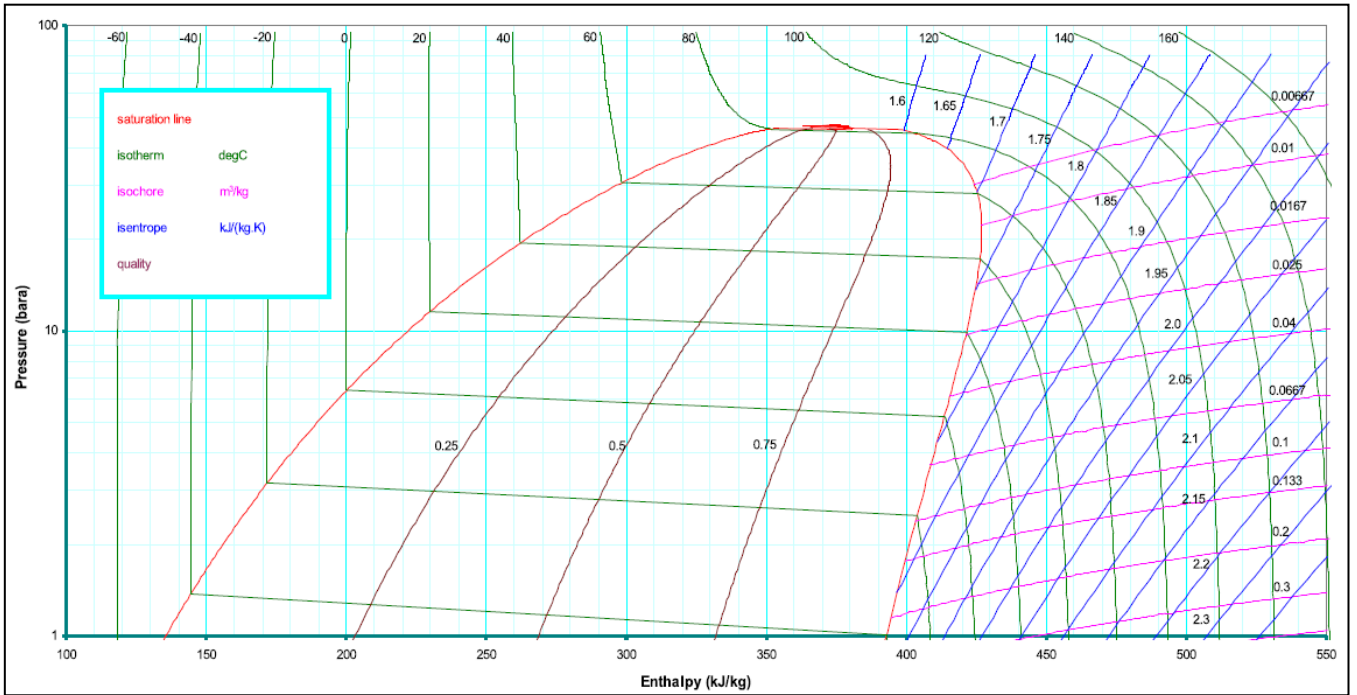
(1) Bubble point

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

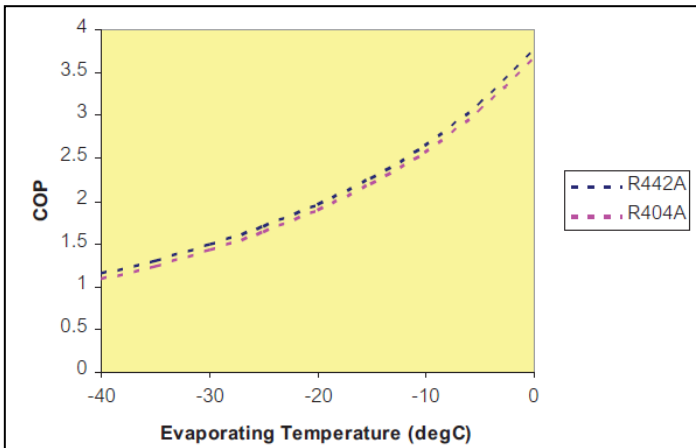
Remember to consult the guidelines for the reconversion of R442A (RS-50)



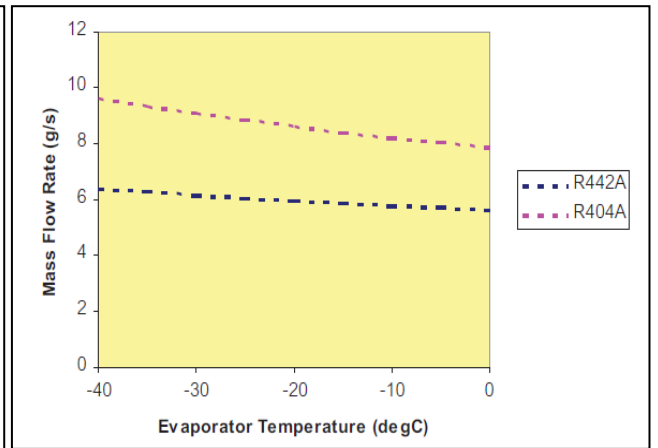
Mollier Diagram



COP



MASS FLOW



R-442A (RS-50) Saturation Properties Absolute

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m ³]	Density Vapour [kg/m ³]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
-50	0.8493	0.5954	1374.8	2.7017	131.14	387.10	0.7237	1.8913
-49	0.8933	0.6291	1371.8	2.8450	132.47	387.68	0.7296	1.8885
-48	0.9390	0.6643	1368.7	2.9944	133.79	388.27	0.7355	1.8857
-47	0.9865	0.7011	1365.7	3.1499	135.12	388.85	0.7414	1.8830
-46	1.0360	0.7395	1362.6	3.3117	136.45	389.44	0.7472	1.8803
-45	1.0874	0.7795	1359.5	3.4800	137.79	390.02	0.7531	1.8777
-44	1.1408	0.8213	1356.5	3.6550	139.12	390.59	0.7589	1.8751
-43	1.1962	0.8648	1353.4	3.8370	140.46	391.17	0.7647	1.8725
-42	1.2537	0.9101	1350.3	4.0260	141.79	391.75	0.7705	1.8700
-41	1.3134	0.9573	1347.2	4.2223	143.13	392.32	0.7762	1.8676
-40	1.3753	1.0064	1344.0	4.4261	144.47	392.89	0.7820	1.8652
-39	1.4395	1.0575	1340.9	4.6376	145.82	393.46	0.7877	1.8628
-38	1.5060	1.1106	1337.8	4.8570	147.16	394.03	0.7934	1.8604
-37	1.5749	1.1658	1334.6	5.0844	148.51	394.60	0.7991	1.8581
-36	1.6462	1.2232	1331.5	5.3203	149.85	395.16	0.8048	1.8558
-35	1.7201	1.2828	1328.3	5.5646	151.20	395.72	0.8104	1.8536
-34	1.7965	1.3446	1325.1	5.8178	152.56	396.28	0.8161	1.8514
-33	1.8755	1.4087	1321.9	6.0799	153.91	396.84	0.8217	1.8492
-32	1.9572	1.4752	1318.7	6.3513	155.27	397.39	0.8273	1.8471
-31	2.0416	1.5442	1315.5	6.6321	156.62	397.95	0.8329	1.8449
-30	2.1288	1.6157	1312.3	6.9226	157.98	398.50	0.8385	1.8429
-29	2.2189	1.6897	1309.1	7.2231	159.35	399.04	0.8440	1.8408
-28	2.3120	1.7664	1305.8	7.5338	160.71	399.59	0.8496	1.8388
-27	2.4080	1.8457	1302.6	7.8549	162.08	400.13	0.8551	1.8368
-26	2.5070	1.9278	1299.3	8.1868	163.45	400.67	0.8606	1.8349
-25	2.6092	2.0128	1296.0	8.5296	164.82	401.21	0.8661	1.8329
-24	2.7146	2.1006	1292.7	8.8837	166.19	401.74	0.8716	1.8310
-23	2.8233	2.1913	1289.4	9.2492	167.57	402.28	0.8771	1.8291
-22	2.9352	2.2851	1286.1	9.6266	168.95	402.81	0.8826	1.8273
-21	3.0505	2.3820	1282.7	10.0160	170.33	403.33	0.8880	1.8255
-20	3.1693	2.4821	1279.4	10.4180	171.71	403.85	0.8935	1.8236
-19	3.2916	2.5853	1276.0	10.8320	173.10	404.38	0.8989	1.8219
-18	3.4175	2.6919	1272.6	11.2600	174.49	404.89	0.9043	1.8201
-17	3.5470	2.8018	1269.3	11.7010	175.88	405.41	0.9097	1.8184
-16	3.6803	2.9152	1265.8	12.1550	177.27	405.92	0.9151	1.8167
-15	3.8173	3.0321	1262.4	12.6230	178.67	406.43	0.9205	1.8150
-14	3.9583	3.1525	1259.0	13.1060	180.07	406.93	0.9258	1.8133
-13	4.1031	3.2767	1255.5	13.6030	181.47	407.43	0.9312	1.8117
-12	4.2520	3.4045	1252.1	14.1150	182.88	407.93	0.9366	1.8100
-11	4.4049	3.5362	1248.6	14.6420	184.29	408.42	0.9419	1.8084
-10	4.5619	3.6717	1245.1	15.1850	185.70	408.91	0.9472	1.8068
-9	4.7232	3.8112	1241.5	15.7440	187.11	409.40	0.9525	1.8052
-8	4.8888	3.9548	1238.0	16.3190	188.53	409.89	0.9578	1.8037
-7	5.0588	4.1024	1234.4	16.9110	189.95	410.36	0.9631	1.8021
-6	5.2331	4.2542	1230.9	17.5200	191.38	410.84	0.9684	1.8006
-5	5.4120	4.4103	1227.3	18.1470	192.81	411.31	0.9737	1.7991
-4	5.5955	4.5708	1223.6	18.7920	194.24	411.78	0.9790	1.7976
-3	5.7836	4.7357	1220.0	19.4550	195.67	412.24	0.9843	1.7961
-2	5.9765	4.9051	1216.3	20.1370	197.11	412.70	0.9895	1.7947
-1	6.1742	5.0790	1212.7	20.8380	198.55	413.16	0.9948	1.7932
0	6.3767	5.2577	1209.0	21.5600	200.00	413.61	1.0000	1.7918

R-442A (RS-50) Saturation Properties Absolute

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m ³]	Density Vapour [kg/m ³]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
1	6.5843	5.4411	1205.2	22.3010	201.45	414.05	1.0052	1.7904
2	6.7968	5.6293	1201.5	23.0630	202.90	414.49	1.0105	1.7889
3	7.0145	5.8225	1197.7	23.8460	204.36	414.93	1.0157	1.7875
4	7.2374	6.0207	1193.9	24.6510	205.82	415.36	1.0209	1.7861
5	7.4656	6.2240	1190.1	25.4790	207.29	415.79	1.0261	1.7848
6	7.6991	6.4324	1186.3	26.3290	208.76	416.21	1.0313	1.7834
7	7.9380	6.6461	1182.4	27.2020	210.23	416.63	1.0365	1.7820
8	8.1824	6.8652	1178.5	28.1000	211.71	417.04	1.0417	1.7807
9	8.4325	7.0898	1174.6	29.0220	213.19	417.44	1.0469	1.7793
10	8.6882	7.3198	1170.7	29.9690	214.68	417.84	1.0521	1.7780
11	8.9496	7.5555	1166.7	30.9430	216.17	418.24	1.0573	1.7766
12	9.2169	7.7969	1162.7	31.9420	217.67	418.63	1.0624	1.7753
13	9.4901	8.0441	1158.6	32.9690	219.17	419.01	1.0676	1.7740
14	9.7693	8.2973	1154.6	34.0240	220.68	419.39	1.0728	1.7726
15	10.0550	8.5564	1150.5	35.1080	222.19	419.76	1.0780	1.7713
16	10.3460	8.8216	1146.4	36.2210	223.71	420.12	1.0831	1.7700
17	10.6440	9.0930	1142.2	37.3640	225.23	420.48	1.0883	1.7687
18	10.9480	9.3707	1138.0	38.5380	226.76	420.83	1.0935	1.7674
19	11.2580	9.6548	1133.8	39.7440	228.29	421.17	1.0986	1.7661
20	11.5750	9.9454	1129.5	40.9830	229.83	421.51	1.1038	1.7648
21	11.8980	10.2430	1125.2	42.2560	231.37	421.84	1.1089	1.7635
22	12.2280	10.5460	1120.9	43.5630	232.92	422.16	1.1141	1.7621
23	12.5650	10.8570	1116.5	44.9060	234.48	422.47	1.1193	1.7608
24	12.9090	11.1750	1112.1	46.2850	236.04	422.78	1.1244	1.7595
25	13.2600	11.4990	1107.6	47.7030	237.61	423.08	1.1296	1.7582
26	13.6170	11.8310	1103.1	49.1590	239.19	423.36	1.1348	1.7569
27	13.9820	12.1690	1098.6	50.6550	240.77	423.65	1.1399	1.7555
28	14.3540	12.5160	1094.0	52.1930	242.35	423.92	1.1451	1.7542
29	14.7330	12.8690	1089.4	53.7730	243.95	424.18	1.1503	1.7529
30	15.1200	13.2300	1084.7	55.3970	245.55	424.43	1.1554	1.7515
31	15.5140	13.5990	1080.0	57.0670	247.16	424.68	1.1606	1.7501
32	15.9150	13.9760	1075.2	58.7830	248.78	424.91	1.1658	1.7488
33	16.3240	14.3600	1070.4	60.5480	250.40	425.13	1.1710	1.7474
34	16.7410	14.7530	1065.5	62.3630	252.04	425.34	1.1762	1.7460
35	17.1660	15.1530	1060.5	64.2300	253.68	425.54	1.1814	1.7446
36	17.5980	15.5620	1055.5	66.1500	255.33	425.73	1.1866	1.7432
37	18.0390	15.9790	1050.5	68.1260	256.98	425.91	1.1918	1.7418
38	18.4880	16.4050	1045.4	70.1600	258.65	426.08	1.1971	1.7403
39	18.9450	16.8390	1040.2	72.2530	260.33	426.23	1.2023	1.7388
40	19.4100	17.2820	1034.9	74.4080	262.01	426.37	1.2075	1.7374
41	19.8830	17.7340	1029.6	76.6280	263.71	426.50	1.2128	1.7359
42	20.3660	18.1950	1024.2	78.9150	265.41	426.61	1.2181	1.7343
43	20.8560	18.6650	1018.8	81.2710	267.13	426.71	1.2234	1.7328
44	21.3550	19.1450	1013.2	83.7000	268.85	426.79	1.2286	1.7312
45	21.8640	19.6340	1007.6	86.2050	270.59	426.86	1.2340	1.7296
46	22.3810	20.1320	1001.9	88.7890	272.34	426.91	1.2393	1.7280
47	22.9060	20.6410	996.1	91.4550	274.10	426.95	1.2446	1.7263
48	23.4410	21.1590	990.2	94.2080	275.87	426.97	1.2500	1.7246
49	23.9860	21.6870	984.2	97.0510	277.66	426.97	1.2554	1.7229
50	24.5390	22.2260	978.2	99.9890	279.46	426.95	1.2608	1.7212

R-442A (RS-50) Saturation Properties Gauge

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m ³]	Density Vapour [kg/m ³]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
-50	-0.1639	-0.4178	1374.80	2.70	131.14	387.10	0.7237	1.8913
-49	-0.1200	-0.3841	1371.80	2.85	132.47	387.68	0.7296	1.8885
-48	-0.0743	-0.3489	1368.70	2.99	133.79	388.27	0.7355	1.8857
-47	-0.0267	-0.3121	1365.70	3.15	135.12	388.85	0.7414	1.8830
-46	0.0227	-0.2738	1362.60	3.31	136.45	389.44	0.7472	1.8803
-45	0.0741	-0.2337	1359.50	3.48	137.79	390.02	0.7531	1.8777
-44	0.1275	-0.1920	1356.50	3.66	139.12	390.59	0.7589	1.8751
-43	0.1830	-0.1485	1353.40	3.84	140.46	391.17	0.7647	1.8725
-42	0.2405	-0.1031	1350.30	4.03	141.79	391.75	0.7705	1.8700
-41	0.3002	-0.0559	1347.20	4.22	143.13	392.32	0.7762	1.8676
-40	0.3621	-0.0068	1344.00	4.43	144.47	392.89	0.7820	1.8652
-39	0.4263	0.0443	1340.90	4.64	145.82	393.46	0.7877	1.8628
-38	0.4928	0.0974	1337.80	4.86	147.16	394.03	0.7934	1.8604
-37	0.5617	0.1526	1334.60	5.08	148.51	394.60	0.7991	1.8581
-36	0.6330	0.2100	1331.50	5.32	149.85	395.16	0.8048	1.8558
-35	0.7068	0.2695	1328.30	5.56	151.20	395.72	0.8104	1.8536
-34	0.7832	0.3313	1325.10	5.82	152.56	396.28	0.8161	1.8514
-33	0.8622	0.3955	1321.90	6.08	153.91	396.84	0.8217	1.8492
-32	0.9439	0.4620	1318.70	6.35	155.27	397.39	0.8273	1.8471
-31	1.0283	0.5310	1315.50	6.63	156.62	397.95	0.8329	1.8449
-30	1.1156	0.6024	1312.30	6.92	157.98	398.50	0.8385	1.8429
-29	1.2057	0.6765	1309.10	7.22	159.35	399.04	0.8440	1.8408
-28	1.2987	0.7531	1305.80	7.53	160.71	399.59	0.8496	1.8388
-27	1.3947	0.8325	1302.60	7.85	162.08	400.13	0.8551	1.8368
-26	1.4938	0.9146	1299.30	8.19	163.45	400.67	0.8606	1.8349
-25	1.5960	0.9995	1296.00	8.53	164.82	401.21	0.8661	1.8329
-24	1.7014	1.0873	1292.70	8.88	166.19	401.74	0.8716	1.8310
-23	1.8100	1.1781	1289.40	9.25	167.57	402.28	0.8771	1.8291
-22	1.9220	1.2719	1286.10	9.63	168.95	402.81	0.8826	1.8273
-21	2.0373	1.3688	1282.70	10.02	170.33	403.33	0.8880	1.8255
-20	2.1561	1.4688	1279.40	10.42	171.71	403.85	0.8935	1.8236
-19	2.2784	1.5721	1276.00	10.83	173.10	404.38	0.8989	1.8219
-18	2.4042	1.6786	1272.60	11.26	174.49	404.89	0.9043	1.8201
-17	2.5338	1.7886	1269.30	11.70	175.88	405.41	0.9097	1.8184
-16	2.6670	1.9019	1265.80	12.16	177.27	405.92	0.9151	1.8167
-15	2.8041	2.0188	1262.40	12.62	178.67	406.43	0.9205	1.8150
-14	2.9450	2.1393	1259.00	13.11	180.07	406.93	0.9258	1.8133
-13	3.0899	2.2634	1255.50	13.60	181.47	407.43	0.9312	1.8117
-12	3.2387	2.3913	1252.10	14.12	182.88	407.93	0.9366	1.8100
-11	3.3916	2.5229	1248.60	14.64	184.29	408.42	0.9419	1.8084
-10	3.5487	2.6585	1245.10	15.19	185.70	408.91	0.9472	1.8068
-9	3.7100	2.7980	1241.50	15.74	187.11	409.40	0.9525	1.8052
-8	3.8756	2.9415	1238.00	16.32	188.53	409.89	0.9578	1.8037
-7	4.0455	3.0892	1234.40	16.91	189.95	410.36	0.9631	1.8021
-6	4.2199	3.2410	1230.90	17.52	191.38	410.84	0.9684	1.8006
-5	4.3988	3.3971	1227.30	18.15	192.81	411.31	0.9737	1.7991
-4	4.5822	3.5575	1223.60	18.79	194.24	411.78	0.9790	1.7976
-3	4.7704	3.7224	1220.00	19.46	195.67	412.24	0.9843	1.7961
-2	4.9632	3.8918	1216.30	20.14	197.11	412.70	0.9895	1.7947
-1	5.1609	4.0658	1212.70	20.84	198.55	413.16	0.9948	1.7932
0	5.3635	4.2444	1209.00	21.56	200.00	413.61	1.0000	1.7918

R-442A (RS-50) Saturation Properties Gauge

T [°C]	Pressure Liquid [bar]	Pressure Vapour [bar]	Density Liquid [kg/m ³]	Density Vapour [kg/m ³]	Enthalpy Liquid [kJ/kg]	Enthalpy Vapour [kJ/kg]	Entropy Liquid [kJ/K·kg]	Entropy Vapour [kJ/K·kg]
1	5.5710	4.4278	1205.20	22.30	201.45	414.05	1.0052	1.7904
2	5.7836	4.6161	1201.50	23.06	202.90	414.49	1.0105	1.7889
3	6.0013	4.8093	1197.70	23.85	204.36	414.93	1.0157	1.7875
4	6.2242	5.0074	1193.90	24.65	205.82	415.36	1.0209	1.7861
5	6.4523	5.2107	1190.10	25.48	207.29	415.79	1.0261	1.7848
6	6.6858	5.4192	1186.30	26.33	208.76	416.21	1.0313	1.7834
7	6.9247	5.6329	1182.40	27.20	210.23	416.63	1.0365	1.7820
8	7.1692	5.8520	1178.50	28.10	211.71	417.04	1.0417	1.7807
9	7.4192	6.0765	1174.60	29.02	213.19	417.44	1.0469	1.7793
10	7.6749	6.3066	1170.70	29.97	214.68	417.84	1.0521	1.7780
11	7.9364	6.5423	1166.70	30.94	216.17	418.24	1.0573	1.7766
12	8.2036	6.7837	1162.70	31.94	217.67	418.63	1.0624	1.7753
13	8.4768	7.0309	1158.60	32.97	219.17	419.01	1.0676	1.7740
14	8.7560	7.2840	1154.60	34.02	220.68	419.39	1.0728	1.7726
15	9.0413	7.5431	1150.50	35.11	222.19	419.76	1.0780	1.7713
16	9.3327	7.8084	1146.40	36.22	223.71	420.12	1.0831	1.7700
17	9.6304	8.0798	1142.20	37.36	225.23	420.48	1.0883	1.7687
18	9.9343	8.3575	1138.00	38.54	226.76	420.83	1.0935	1.7674
19	10.2450	8.6416	1133.80	39.74	228.29	421.17	1.0986	1.7661
20	10.5620	8.9321	1129.50	40.98	229.83	421.51	1.1038	1.7648
21	10.8850	9.2293	1125.20	42.26	231.37	421.84	1.1089	1.7635
22	11.2150	9.5331	1120.90	43.56	232.92	422.16	1.1141	1.7621
23	11.5520	9.8437	1116.50	44.91	234.48	422.47	1.1193	1.7608
24	11.8960	10.1610	1112.10	46.29	236.04	422.78	1.1244	1.7595
25	12.2460	10.4860	1107.60	47.70	237.61	423.08	1.1296	1.7582
26	12.6040	10.8170	1103.10	49.16	239.19	423.36	1.1348	1.7569
27	12.9690	11.1560	1098.60	50.66	240.77	423.65	1.1399	1.7555
28	13.3410	11.5020	1094.00	52.19	242.35	423.92	1.1451	1.7542
29	13.7200	11.8560	1089.40	53.77	243.95	424.18	1.1503	1.7529
30	14.1060	12.2170	1084.70	55.40	245.55	424.43	1.1554	1.7515
31	14.5000	12.5860	1080.00	57.07	247.16	424.68	1.1606	1.7501
32	14.9020	12.9620	1075.20	58.78	248.78	424.91	1.1658	1.7488
33	15.3110	13.3470	1070.40	60.55	250.40	425.13	1.1710	1.7474
34	15.7280	13.7390	1065.50	62.36	252.04	425.34	1.1762	1.7460
35	16.1530	14.1400	1060.50	64.23	253.68	425.54	1.1814	1.7446
36	16.5850	14.5490	1055.50	66.15	255.33	425.73	1.1866	1.7432
37	17.0260	14.9660	1050.50	68.13	256.98	425.91	1.1918	1.7418
38	17.4750	15.3920	1045.40	70.16	258.65	426.08	1.1971	1.7403
39	17.9310	15.8260	1040.20	72.25	260.33	426.23	1.2023	1.7388
40	18.3970	16.2690	1034.90	74.41	262.01	426.37	1.2075	1.7374
41	18.8700	16.7210	1029.60	76.63	263.71	426.50	1.2128	1.7359
42	19.3520	17.1820	1024.20	78.92	265.41	426.61	1.2181	1.7343
43	19.8430	17.6520	1018.80	81.27	267.13	426.71	1.2234	1.7328
44	20.3420	18.1320	1013.20	83.70	268.85	426.79	1.2286	1.7312
45	20.8500	18.6210	1007.60	86.21	270.59	426.86	1.2340	1.7296
46	21.3670	19.1190	1001.90	88.79	272.34	426.91	1.2393	1.7280
47	21.8930	19.6270	996.11	91.46	274.10	426.95	1.2446	1.7263
48	22.4280	20.1460	990.22	94.21	275.87	426.97	1.2500	1.7246
49	22.9720	20.6740	984.24	97.05	277.66	426.97	1.2554	1.7229
50	23.5260	21.2130	978.16	99.99	279.46	426.95	1.2608	1.7212



Questions and answers about R-442A (RS-50)

1 Q: What is R-442A (RS-50)?

A: RS-50 is an HFC substitute for R-404A and R-507 that has low global warming potential (GWP) and no effect on the ozone layer (ODP=0). It also is a substitute for R-22 in refrigeration.

2 Q: OK, but what does R-442A (RS-50) contain?

A: R-442A (RS-50) is a blend of R-134a, R-125, R-32a, R-227ea and R-152a.

3 Q: Is R-442A (RS-50) going to be gradually phased out in line with the regulations as in the case of CFCs and HCFCs?

A: No, none of the components of R-442A (RS-50) is subject to a progressive schedule for elimination within the framework of the Montreal Protocol or other European regulations.

4 Q: Can R-442A (RS-50) be used with the same oil if it is being used as a substitute for R-404A or R-507?

A: Yes, R-442A (RS-50) is completely compatible with synthetic oils such as the polyesters (POE), commonly used with R-404A and R-507.

5 Q: Can R-442A (RS-50) be used with the same oil if it is used as a substitute for R-22?

A: No, R-442A (RS-50) is not compatible with the mineral and alkyl benzene oils normally used with R-22. It will be necessary to change all of the existing oil for POE.

6 Q: Is R-442A (RS-50) non-flammable and non-toxic?

A: R-442A (RS-50) is neither toxic nor flammable. By all of the fractionating conditions, it is not flammable according to regulation ASTM 681-09. It belongs to group L1.

7 Q: Is R-442A (RS-50) approved by compressor manufacturers?

A: The components that make up RS-50 are widely used in compressors produced by the leading manufacturers.

8 Q: Can R-442A (RS-50) be used in new installations?

A: RS-50 has also been developed as an alternative to R-404A and R-507 in new installations due to its higher energy efficiency and its low heating potential.

9 Q: Is R-442A (RS-50) as efficient as R-404A and R-507?

A: Tests show that RS-50 has a significantly better COP than R-404a and R-507 providing major energy savings to the owner of the installations.

10 Q: What are the pressure of R-442A (RS-50) like compared with R-404A, R-507 and R-22?

A: RS-50's discharge pressure is similar to that of R-404A and R-507, and higher than that of R-22.

11 Q: What is the capacity of R-442A (RS-50) compared with R-404A and R-507?

A: RS-50's capacity is greater, reducing the time to achieve low temperatures.

12 Q: What are the working temperatures of R-442A (RS-50) like compared with R-404A, R-507 and R-22?

A: The discharge temperature of R-442A (RS-50) is lower than that of R-22 and higher than that of R-404A and R-507.

13 Q: What tests have been done with R-442A (RS-50) and what have the results been?

A: Numerous independent tests have clearly demonstrated that the energy efficiency of RS-50 is much higher than that of R-404A, R-507, R-407A and R-407F at low temperatures.

14 Q: Should R-442A (RS-50) be loaded in its liquid or its gas phase?

A: Given that RS-50 is a blend, the recommendation is to load the system in liquid phase. Nevertheless, in the case of filling the entire content of the container, it can be loaded in its gas phase.

- 15 Q: Do all of the containers for R-442A (RS-50) have a probe tube?**
A: It depends on the type of container. All Gas Servei S.A.'s blue containers do have them. If there isn't one, it is advisable to reverse the container.
- 16 Q: Is R-442A (RS-50) included in SNAP (the USA's Significant New Alternatives Policy)?**
A: Yes, the use of RS-50 is approved by the U.S. Environmental Protection Agency.
- 17 Q: Does RS-50 have an ASHRAE number and what is its classification?**
A: Yes, RS-50 has been assigned the ASHRAE number R-442A with an A1 classification, which indicates low toxicity and non-flammability in all fractionation conditions.
- 18 Q: What are the flammability characteristics of R-442A (RS-50)?**
A: R-442A (RS-50) is not flammable at room temperature and normal atmospheric pressure, and it has the same classification as R-410A, R-134a, R-404A, R-409A, R-507, etc.
- 19 Q: What decomposition products result from the combustion of R-442A (RS-50)?**
A: Decomposition products resulting from the exposure of RS-50 to a source of extreme heat are similar to those formed by R-404A and R-507 when exposed to fire. In any circumstances, decomposition products are irritants and toxic and self-contained breathing apparatus should be used if such a possibility exists.
- 20 Q: Is there any special precautions to be taken with R-442A (RS-50)?**
A: There are no specific precautions that need to be taken with RS-50. As with all refrigerants, the use of common sense and best practice is always recommended.
- 21 Q: Is R-442A (RS-50) compatible with refrigeration and air-conditioning systems designed for R-404A, R-507 and R-22?**
A: Yes, R-442A (RS-50) is compatible with all materials commonly used in the systems that were designed and loaded with R-404A, R-507 and R-22. Magnesium alloys and zinc alloys should be avoided.
- 22 Q: Can R-442A (RS-50) be recovered and recycled?**
A: Yes, R-442A (RS-50) can be recovered and reused after a cleaning process such as regeneration, performed by an authorized waste manager.
- 23 Q: What technical advice should be given for a change from R-404A or R-507 to R-442A (RS-50)?**
A: Use the same type of oil, which should be POE: after recovering the R-404A or R-507 and evacuating the system, change the filter-drier and load about 10% less than the original amount of R-404A or R-507. The flow rate of liquid is less than that of R-404A and R-507, so it may be necessary to change the expansion system for a valve about 40% smaller.
- 24 Q: What technical advice should be given for changing R-22 to R-442A (RS-50)?**
A: Should the system have mineral or alkyl benzene oil, which is the norm, this should be completely changed for POE oil. It is advisable to check the type and viscosity of the oil used with the compressor manufacturer. The residual quantity of mineral or alkyl benzene oil should be less than 5%. After recovering all of the R-22 and evacuating the system, change the filter-drier and load about 10% less than the original amount of R-22. The flow rate of liquid is similar to that of R-22, so that it is not necessary to change the expansion system although superheating must be controlled and the expansion valve adjusted as necessary.
As it would happen with any change from HCFC to HFC, some gaskets may need to be replaced due to its different composition.
- 25 Q: How much does R-442A (RS-50) cost compared to other alternatives?**
A: The price of RS-50 is competitive with other R-404A and R-507 alternatives and less expensive than direct R-22 substitutes.

26 Q: What is the main advantage of R-442A (RS-50)?

A: RS-50 has a much better COP than R-404A and R-507 at low temperatures meaning that the owner of the installation will notice an important energy saving. Additionally, RS-50 has less than 50% of the potential to cause global warming (GWP) compared with R-404A and R-507 thereby reducing its carbon footprint.

27 Q: Is R-442A (RS-50) compatible with the gaskets, seals, hoses, and O-rings used with R-404A and R-507?

A: Yes, it is not necessary to change gaskets when changing an installation with these refrigerants over to RS-50.

28 Q: Is R-442A (RS-50) compatible with the gaskets, seals, hoses and O-rings used with R-22?

A: RS-50 is compatible with the materials normally used in the refrigeration systems that had previously worked with R-22. In general, materials used with R-22 are compatible with RS-50. For better advice, it is advisable to check with the equipment manufacturers about the documentation necessary to perform a retrofit. In systems that have been using R-22 for many years, it may be necessary to change seals and gaskets due to the different composition of RS-50 being an HFC. The same happens with other changes from R-22 to HFC such as, for example, R-404A, R-422D, R-134a, R-434A, etc.

29 Q: What is the specification of R-442A (RS-50)?

A: R-442A (RS-50) complies with ARI-700 specifications for refrigerants based on fluorocarbons.

30 Q: What are the effects of a high inhalation exposure to R-442A (RS-50)?

A: As in the case of all refrigerants based on CFCs, HCFCs and HFCs a high level of exposure to RS-50 can produce anaesthetic effects. Very high levels of exposure can cause an abnormal heart rate that can be fatal, as it occurs with all CFCs, HCFCs and HFCs.

31 Q: What is the flash point, explosion point and ignition temperature of R-442A (RS-50)?

A: R-442A (RS-50) is listed as non-flammable as defined by the ASHRAE EN 681-09 test, so there is no flash point or explosion limits. The ignition temperature of RS-50 has not been determined but is expected to be higher than 750°C.

32 Q: What type of leak detectors should be used with R-442A (RS-50)?

A: The same leak detectors can be used as for all HFCs.

33 Q: What procedure should be followed in the case of a large scale leak of R-442A (RS-50)?

A: The area should be evacuated immediately, just as it would with any refrigerants of this type. Vapours may become concentrated at ground level and its dispersion may be slow in poorly ventilated areas. The area should be ventilated before entering.

34 Q: Is R-442A (RS-50) available in refillable and disposable containers?

A: Yes, although the disposable containers are only approved for use outside the E.U