



TECHNICAL DATA SHEET

R-454B

Features

R-454B refrigerant gas is a zeotropic, slightly flammable HFC+HFO blend, an alternative to R-410A in new positive displacement equipment, direct expansion (DX) air conditioners, heat pumps and chillers. Like all HFC+HFO refrigerants it is ozone friendly. Its safety classification is A2L group L2. i.e. it has low toxicity and is slightly flammable.

Some of its main features are:

- The global warming potential (GWP) is approx. 78% lower than R-410A.
- Higher cooling capacity and energy efficiency (COP) compared to R-410A.
- **Safety classification: A2L / Slightly flammable.**
- Excellent performance at medium and high temperatures.
- Very low temperature drift. In case of leakage the equipment can be recharged.
- Allows a minimum fill load greater than 1.7 kg in accordance with ISO 5149 or EN 378 codes and standards.
- It is a blend compatible with POE synthetic oils.

Applications

- Positive displacement, A/C DX, heat pump and chiller applications in the residential and commercial sectors.
- Alternative to R-410A in new equipment:
 - Window units
 - Ducted splits
 - Multi splits
 - Mini splits
 - PTACs
 - DX chillers

Working and service conditions

- **R-454B is a mixture**, always transfer in liquid phase, or in full loads if in gas phase.
- Due to its low temperature glide, it is suitable for partial recharging. Such partial recharges must be carried out in the liquid phase.

Lubricants

R-454B is compatible with synthetic polyolester based oils (POE). Please refer to the manufacturer's recommended viscosities for the working range of the equipment. Remember that the THUNDER® POE TL range is available from 22 to 220 ISO viscosity grades.

Environmental data

None of the components of R-454B contain chlorine, so the product has ODP = 0 (ozone depleting capacity).

R-454B has a **low** global warming potential (GWP), presenting a reduction of about 78% compared to R-410A, thus reducing CO emissions₂ in case of direct leakage.

Toxicity, safety, and storage

R-454B does not exhibit any acute oral, inhalation or eye contact toxicity. It is not considered to be irritating or corrosive to the skin, nor a respiratory sensitizer. As usual, as it has a higher density than air, it can be deposited in low areas of confined spaces and can cause asphyxiation by displacement of oxygen.

Animal studies of its components have shown that repeated exposures do not produce teratogenic (reproductive) effects. Moreover, it is unlikely to present a carcinogenic risk to man.

R-454B does not contain components that have endocrine disrupting properties according to Article 57(f) of REACH or Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

R-454B is slightly flammable according to ASHRAE Standard 34.

Therefore, the safety classification of R-454B is **A2L**.

R-454B containers should be stored in cool, ventilated places below 50°C, away from open flames, sparks and heat sources. Avoid storage near the intake of air conditioning units, boilers or open drains.

Components

Chemical name	% by weight	CAS NO	EC NO
Difluoromethane (R-32)	68.9	75-10-5	200-839-4
2,3,3,3-Tetrafluoroprop-1-ene (R-1234yf)	31.1	754-12-1	468-710-7

Physical properties

Property	Units	R-454B	R-410A
Molecular weight	g/mol	62.6	72.60
Liquid density (at 25°C)	Kg/l	0.985	1.059
Saturated vapour density (at 25 °C)	Kg/l	0.05072	0.06487
Boiling point (at 1 atm)	°C	-50.9	-51.4
Absolute vapour pressure (liquid at 25 °C)	bar	15.71	16.57
Critical pressure	bar	52.67	49.0
Critical temperature	°C	78.1	71.3
Critical density	Kg/l	0.443	--
Glide	°C	1.5	0.7
LFL (Low Flammable Limit)	Kg/m ³	0,303	Non-flammable
Flame speed (23 °C)	cm/s	~1.5	--
ODP		0	0
GWP		466 ⁽¹⁾	2088 ⁽¹⁾
Toxicity		No	No

(1) According to IPCC-AR4/ICES (Fourth Assessment Report of the Intergovernmental Panel on Climate Change)-2007.

Pressure/Temperature tables(*)

Temperature °C	Absolute pressure		Density		Enthalpy		Entropy	
	Bubble bar	Dew bar	Liquid Kg/m ³	Vapour Kg/m ³	Liquid kJ/Kg	Vapour bar	Liquid bar	Vapour Kg/m ³
-60	0.613	0.582	1,264.8	2.120	108.55	432.90	0.6252	2.1512
-59	0.648	0.615	1,262.1	2.233	110.01	433.47	0.6320	2.1468
-58	0.685	0.650	1,259.4	2.351	111.47	434.04	0.6388	2.1423
-57	0.723	0.686	1,256.6	2.474	112.93	434.61	0.6456	2.1380
-56	0.762	0.724	1,253.9	2.601	114.40	435.17	0.6523	2.1337
-55	0.804	0.805	1,251.2	2.734	115.86	435.73	0.6591	2.1295
-54	0.847	0.848	1,248.4	2.873	117.33	436.28	0.6657	2.1253
-53	0.892	0.893	1,245.6	3.106	118.80	436.84	0.6724	2.1212

Temperature °C	Absolute pressure		Density		Enthalpy		Entrop	
	Bubble bar	Dew bar	Liquid Kg/m ³	Vapour Kg/m ³	Liquid kJ/Kg	Vapour bar	Liquid bar	Vapour Kg/m ³
-52	0.939	0.893	1,242.8	3.166	120.27	437.39	0.6791	2.1171
-51	0.988	0.939	1,240.1	3.321	121.74	437.94	0.6857	2.1131
-50	1.039	0.988	1,237.3	3.482	123.21	438.49	0.6923	2.1091
-49	1.092	1.038	1,234.5	3.649	124.68	439.03	0.6988	2.1052
-48	1.147	1.091	1,231.6	3.822	126.16	439.57	0.7054	2.1013
-47	1.204	1.146	1,228.8	4.002	127.63	440.11	0.7119	2.0975
-46	1.263	1.203	1,226.0	4.189	129.11	440.64	0.7184	2.0938
-45	1.325	1.262	1,223.1	4.382	130.59	441.17	0.7249	2.0900
-44	1.389	1.323	1,220.3	4.583	132.07	441.70	0.7313	2.0864
-43	1.456	1.386	1,217.4	4.790	133.56	442.23	0.7378	2.0827
-42	1.525	1.452	1,214.5	5.005	135.04	442.75	0.7442	2.0792
-41	1.596	1.521	1,211.6	5.227	136.53	443.27	0.7506	2.0756
-40	1.670	1.592	1,208.7	5.457	138.02	443.79	0.7570	2.0721
-39	1.747	1.665	1,205.8	5.695	139.52	444.30	0.7633	2.0687
-38	1.827	1.742	1,202.9	5.941	141.01	444.81	0.7697	2.0619
-37	1.909	1.820	1,200.0	6.196	142.51	445.31	0.7760	2.0619
-36	1.994	1.902	1,197.0	6.459	144.01	445.81	0.7823	2.0586
-35	2.083	1.987	1,194.1	6.730	145.51	446.31	0.7886	2.0553
-34	2.174	2.074	1,191.1	7.011	147.01	446.81	0.7949	2.0520
-33	2.268	2.164	1,188.1	7.300	148.52	447.30	0.8011	2.0488
-32	2.365	2.258	1,185.1	7.600	150.03	447.79	0.8074	2.0456
-31	2.466	2.354	1,182.1	7.908	151.54	448.27	0.8136	2.0425
-30	2.570	2.454	1,179.1	8.227	153.05	448.75	0.8198	2.0394
-29	2.677	2.557	1,176.1	8.556	154.57	449.22	0.8260	2.0363
-28	2.788	2.663	1,173.0	8.895	156.09	449.70	0.8321	2.0332
-27	2.902	2.773	1,170.0	9.244	157.61	450.16	0.8383	2.0302
-26	3.020	2.886	1,166.9	9.604	159.14	450.63	0.8444	2.0272
-25	3.142	3.002	1,163.8	9.976	160.66	451.09	0.8506	2.0243
-24	3.267	3.122	1,160.7	10.36	162.20	451.54	0.8567	2.0213
-23	3.396	3.246	1,157.6	10.75	163.73	451.99	0.8628	2.0184
-22	3.529	3.374	1,154.5	11.16	165.27	452.44	0.8689	2.0156
-21	3.666	3.505	1,151.3	11.58	166.81	452.88	0.8749	2.0127
-20	3.807	3.641	1,148.2	12.01	168.35	453.31	0.8810	2.0099
-19	3.952	3.780	1,145.0	12.45	169.90	453.75	0.8871	2.0071
-18	4.101	3.924	1,141.8	12.91	171.45	454.17	0.8931	2.0043
-17	4.255	4.071	1,138.6	13.38	173.00	454.59	0.8991	2.0016
-16	4.413	4.223	1,135.4	13.86	174.56	455.01	0.9051	1.9989

Temperature	Absolute pressure		Density		Enthalpy		Entropy	
	°C	Bubble bar	Dew bar	Liquid Kg/m ³	Vapour Kg/m ³	Liquid kJ/Kg	Vapour bar	Liquid bar
-15	4.575	4.379	1,132.2	14.36	176.12	455.42	0.9111	1.9962
-14	4.742	4.540	1,128.9	14.87	177.68	455.83	0.9171	1.9935
-13	4.913	4.705	1,125.6	15.40	179.25	456.23	0.9231	1.9909
-12	5.089	4.874	1,122.4	15.94	180.82	456.63	0.9291	1.9882
-11	5.270	5.048	1,119.1	16.49	182.40	457.02	0.9350	1.9856
-10	5.456	5.227	1,115.7	17.07	183.98	457.40	0.9410	1.9830
-9	5.647	5.411	1,112.4	17.65	185.56	457.78	0.9469	1.9804
-8	5.842	5.600	1,109.0	18.26	187.15	458.15	0.9528	1.9779
-7	6.043	5.793	1,105.7	18.88	188.74	458.52	0.9588	1.9753
-6	6.249	5.992	1,102.3	19.52	190.33	458.88	0.9647	1.9728
-5	6.461	6.195	1,089.9	20.17	191.93	459.24	0.9706	1.9703
-4	6.677	6.404	1,095.4	20.85	193.54	459.59	0.9765	1.9678
-3	6.899	6.619	1,092.0	21.54	195.15	459.93	0.9824	1.9653
-2	7.127	6.838	1,088.5	22.25	196.76	460.27	0.9883	1.9629
-1	7.360	7.063	1,085.0	22.98	198.38	460.59	0.9941	1.9604
0	7.599	7.294	1,081.5	23.73	200.00	460.92	1.0000	1.9580
1	7.844	7.531	1,077.9	24.50	201.63	461.23	1.0059	1.9555
2	8.095	7.773	1,074.4	25.29	203.26	461.54	1.0117	1.9531
3	8.352	8.021	1,070.8	26.11	204.90	461.84	1.0176	1.9507
4	8.614	8.275	1,067.2	26.94	206.54	462.13	1.0234	1.9483
5	8.883	8.535	1,063.5	27.80	208.19	462.42	1.0293	1.9459
6	9.159	8.801	1,059.9	28.68	209.84	462.70	1.0351	1.9411
7	9.440	9.074	1,056.2	29.58	211.50	462.97	1.0409	1.9411
8	9.728	9.352	1,052.5	30.51	213.16	463.23	1.0468	1.9388
9	10.02	9.638	1,048.7	31.47	214.83	463.48	1.0526	1.9364
10	10.32	9.929	1,045.0	32.44	216.50	463.73	1.0584	1.9340
11	10.63	10.23	1,041.2	33.45	218.18	463.96	1.0642	1.9317
12	10.95	10.53	1,037.3	34.48	219.87	464.19	1.0700	1.9293
13	11.27	10.85	1,033.5	35.54	221.56	464.41	1.0759	1.9270
14	11.60	11.16	1,029.6	36.63	223.26	464.61	1.0817	1.9246
15	11.93	11.49	1,025.7	37.75	224.97	464.81	1.0875	1.9222
16	12.28	11.82	1,021.7	38.89	226.68	465.00	1.0933	1.9199
17	12.63	12.16	1,017.8	40.07	228.39	465.18	1.0991	1.9175
18	12.99	15.51	1,013.7	41.28	230.12	465.35	1.1049	1.9152

Temperature	Absolute pressure		Density		Enthalpy		Entropy	
	°C	Bubble bar	Dew bar	Liquid Kg/m ³	Vapour Kg/m ³	Liquid kJ/Kg	Vapour bar	Liquid bar
19	13.35	12.87	1,009.7	42.52	231.85	465.51	1.1107	1.9128
20	13.72	13.23	1,005.6	43.80	233.59	465.65	1.1166	1.9104
21	14.11	13.60	1,001.5	45.11	235.34	465.79	1.1224	1.9081
22	14.49	13.98	997.33	46.46	237.09	465.92	1.1282	1.9057
23	14.89	14.36	993.14	47.84	238.85	466.03	1.1340	1.9033
24	15.30	14.76	988.90	49.26	240.62	466.13	1.1399	1.9009
25	15.71	15.16	984.63	50.72	242.40	466.22	1.1457	1.8985
26	16.13	15.57	980.31	52.23	244.19	466.29	1.1515	1.8961
27	16.56	15.99	975.94	53.77	245.98	466.36	1.1574	1.8936
28	17.00	16.42	971.53	55.36	247.79	466.40	1.1632	1.8912
29	17.44	16.85	967.08	56.99	249.60	466.44	1.1691	1.8887
30	17.90	17.30	962.58	58.67	251.42	466.46	1.1749	1.8863
31	18.36	17.75	958.02	60.39	253.25	466.47	1.1808	1.8838
32	18.84	18.21	953.42	62.17	255.10	466.46	1.1867	1.8813
33	19.32	18.68	948.76	63.99	256.95	466.43	1.1926	1.8787
34	19.81	19.17	944.04	65.87	258.81	466.39	1.1985	1.8762
35	20.31	19.66	939.27	67.81	260.69	466.33	1.2044	1.8736
36	20.82	20.16	934.44	69.80	262.57	466.26	1.2104	1.8710
37	21.34	20.67	929.54	71.86	264.47	466.16	1.2163	1.8684
38	21.87	21.18	924.58	73.97	266.38	466.05	1.2223	1.8657
39	22.41	21.71	919.55	76.15	268.30	465.92	1.2282	1.8631
40	22.96	22.25	914.45	78.40	270.24	465.77	1.2342	1.8603
41	23.52	22.80	909.28	80.72	272.19	465.60	1.2403	1.8576
42	24.09	23.36	904.02	83.12	274.15	465.40	1.2463	1.8548
43	24.67	23.93	898.69	85.59	276.13	465.8	1.2524	1.8520
44	25.26	24.51	893.27	88.14	278.12	464.94	1.2585	1.8491
45	25.86	25.10	887.76	90.78	280.13	464.68	1.2646	1.8462
46	26.47	25.71	882.16	93.50	282.16	464.39	1.2707	1.8432
47	27.09	26.32	876.45	96.32	284.20	464.07	1.2769	1.8402
48	27.72	26.95	870.64	99.24	286.27	463.73	1.2831	1.8371
49	28.37	27.58	864.73	102.3	288.35	463.35	1.2894	1.8340
50	29.02	28.23	858.69	105.4	290.46	462.94	1.2956	1.8308
51	29.69	28.89	852.53	108.7	292.58	462.51	1.3020	1.8275
52	30.37	29.57	846.23	112.0	294.73	462.03	1.3083	1.8242

Temperature	Absolute pressure		Density		Enthalpy		Entropy	
	°C	Bubble bar	Dew bar	Liquid Kg/m ³	Vapour Kg/m ³	Liquid kJ/Kg	Vapour bar	Liquid bar
53	31.06	30.25	839.80	115.5	296.91	461.52	1.3148	1.8208
54	31.76	30.95	833.21	119.2	299.11	460.97	1.3212	1.8173
55	32.47	31.66	826.47	123.0	301.33	460.38	1.3278	1.8137
56	33.20	32.38	819.55	126.9	303.59	459.75	1.3344	1.8100
57	33.94	33.12	812.45	131.1	305.88	459.07	1.3411	1.8062
58	34.69	33.87	805.15	135.4	308.20	458.34	1.3478	1.8023
59	35.45	34.63	797.64	139.9	310.56	457.55	1.3546	1.7983
60	36.23	35.41	789.89	144.6	312.96	456.71	1.3615	1.7941

* Data calculated with Refprop v.10.0

The pressure-temperature tables for the refrigerant indicate liquid to bubble point and vapour to dew point.

Bubble temperature: Temperature at which the liquid refrigerant starts to evaporate (appearance of the first bubble) at a given pressure. Below this temperature the refrigerant liquid is considered to be sub-cooled.

Vapour dew point: Temperature at which the refrigerant in gaseous state (vapour) starts to condense (appearance of the first drop or dew) at the given pressure. Above this temperature, the refrigerant vapour is considered to be superheated.

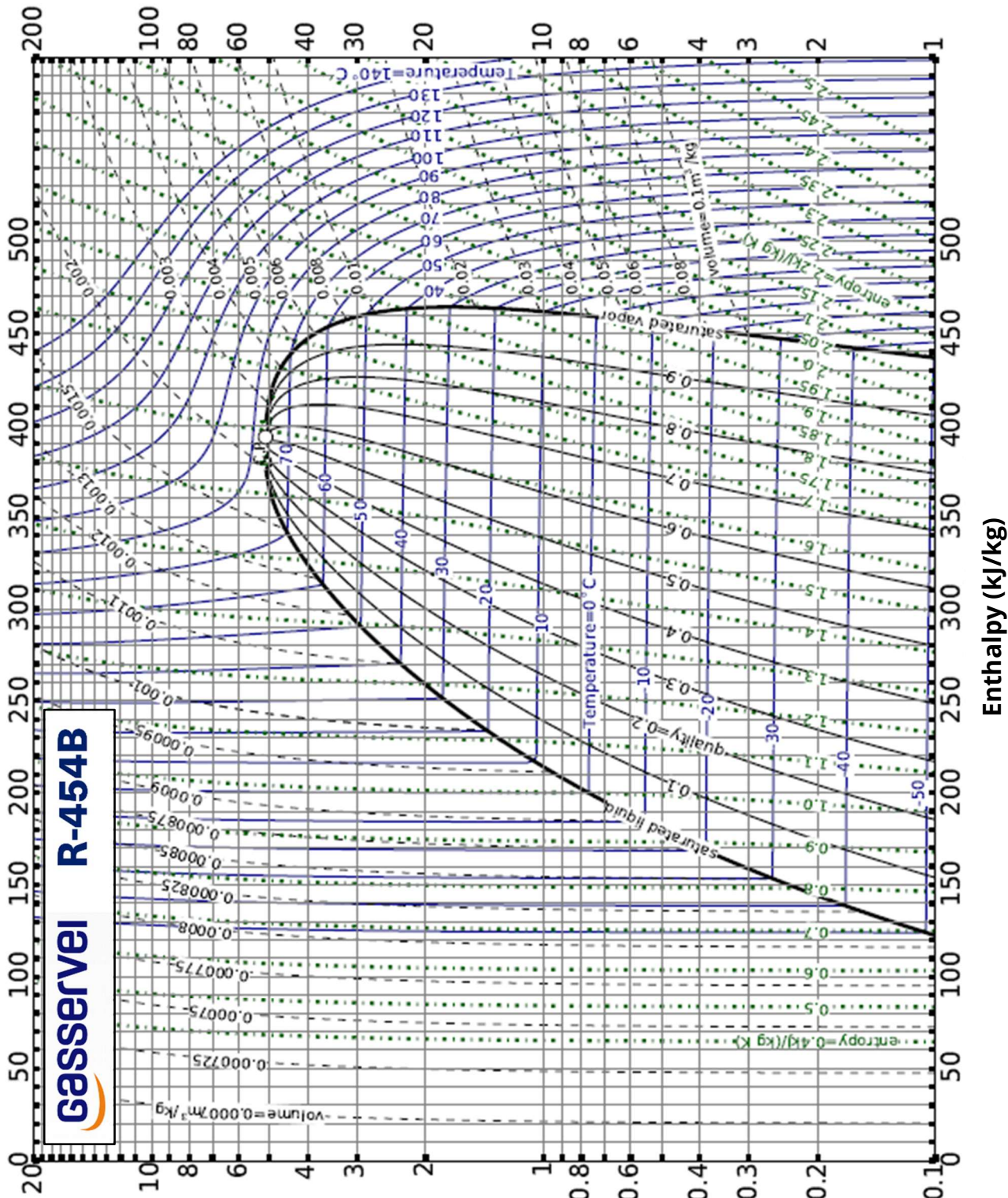
Superheated vapour: To determine evaporator superheat, measure the suction line temperature and pressure in the pipe at the outlet of the evaporator. Using the P/T tables determine the vapour dew point temperature, which corresponds to the measured suction pressure. Subtract the measured temperature from the temperature determined using the P/T tables, the difference found is the evaporator superheat.

Subcooling in the cooling liquid: To determine the subcooling, measure the temperature and pressure of the suction line in the condenser outlet pipe. Using the P/T tables determine the temperature at the bubble point, which corresponds to the pressure measured at the condenser outlet. Subtract the measured temperature from the temperature determined using the P/T tables, the difference found is the condenser subcooling.

Note: In order to more accurately adjust the calculations for all zeotropic gases, determine the evaporating and condensing temperatures by taking the midpoint between the bubble and dew temperatures.

Mollier diagram

Absolute pressure (bar)



GASSERVEI R-454B