

R454A



REFRIGERANTS

R454A

Product information

## Product description

R454A has been developed for low temperature applications typically covered by R404 or R507. It has a significantly lower GWP and outstanding performance characteristics.

## Applications

- Low temperature refrigeration systems designed for R454A (A2L –Safety class), typically used in commercial, industrial but also transport refrigeration systems
- Condensing units for medium and low temperature applications

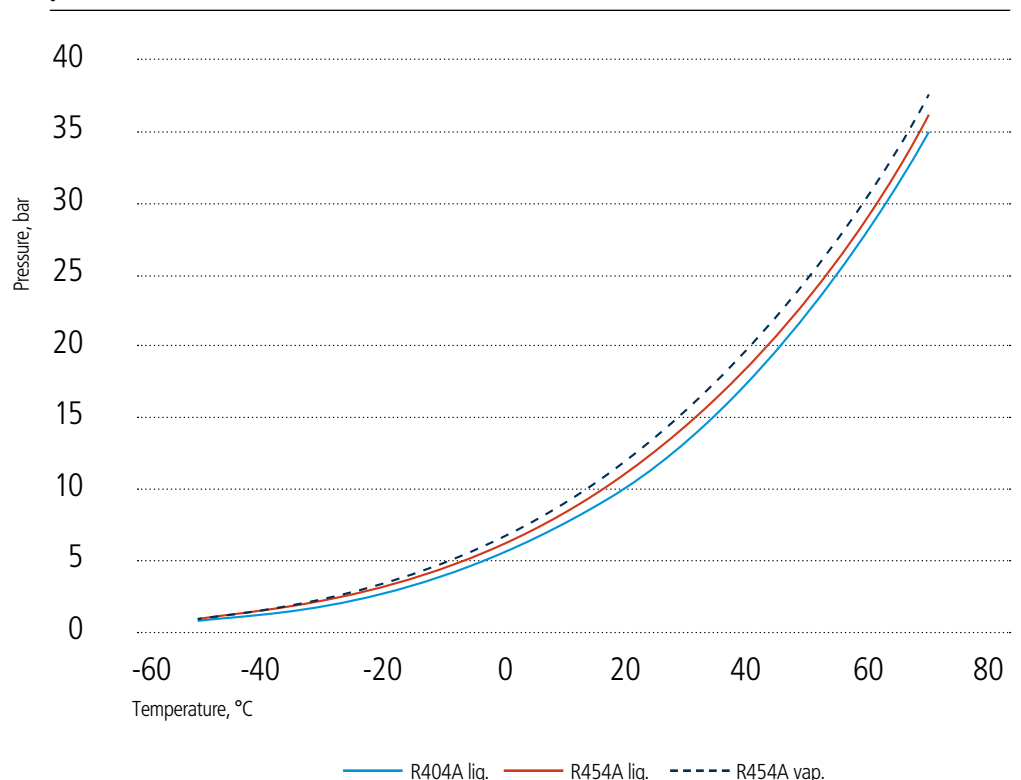
## Environmental aspects

R454A is a refrigerant that addresses a range of environmental and safety considerations:

- Zero Ozone Depletion Potential (ODP)
- Lower Global Warming Potential (GWP) – less than 10% compared to R404A
- R454A has comparable performance characteristics to R404A with slight advantages at high condensing temperatures
- Compatible to all standard materials used in R404A systems
- Safe to use in many applications because it is an A2L classified refrigerant (low toxicity and lower flammability)

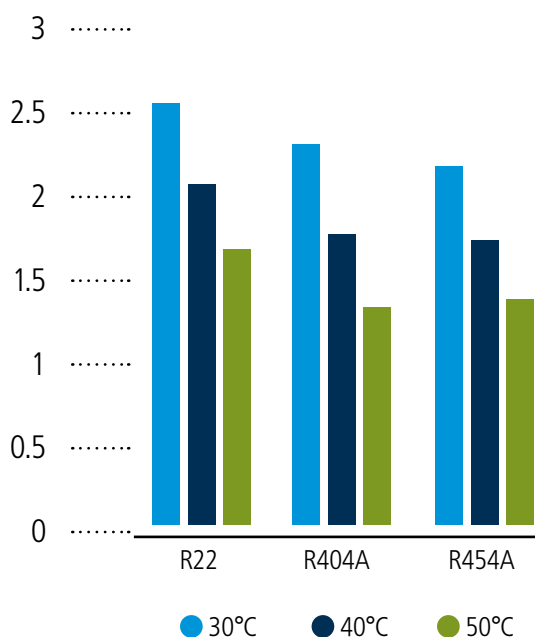
## Range of Applications

### p/t Curve

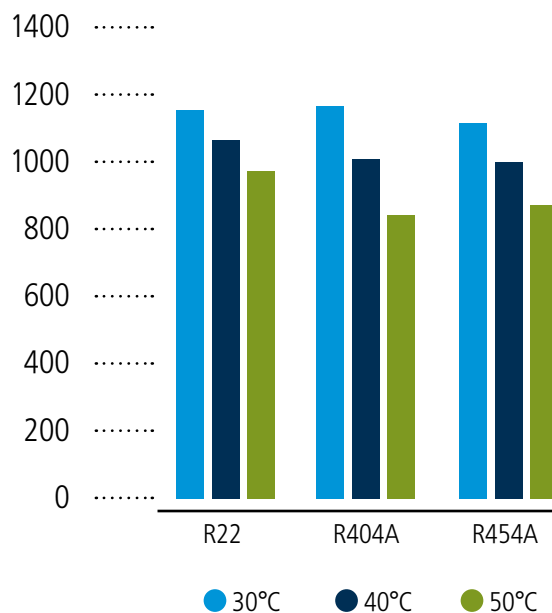


## Theoretical Performance<sup>1</sup>

### COP



### Capacity, kJ/m<sup>3</sup>



<sup>1</sup>Conditions Cycle Simulation:  
 $t_o = -30^\circ\text{C}$ ,  $t_c = \text{variable}$ ,  $T_{\text{superheat}} = 10\text{K}$ ,  $T_{\text{subc}} = 2\text{K}$ ,  $\text{isent. eff.} = f(p_o/p_c)$

## Physical Properties<sup>2</sup>

Chemical Name		Difluoromethane / 2,3,3,3-Tetrafluoropropene
Chemical Formula		$\text{CH}_2\text{F}_2$ / $\text{CH}_2=\text{CF}_3$
Molecular Weight	kg/kmol	80.47
GWP <sub>100</sub>	IPCC 4 <sup>th</sup> AR / 5 <sup>th</sup> AR	239 / 237
Boiling Point @ 1.013 bar	°C	-48.4
Critical Temperature	°C	86.2
Critical Pressure	bar	49.5
Critical Density	kg/m <sup>3</sup>	469
Critical Volume	dm <sup>3</sup> /kg	2.13
Liquid Density <sup>3</sup>	kg/m <sup>3</sup>	1022
Sat. Vapour Density <sup>3</sup>	kg/m <sup>3</sup>	46.39
Heat of Vaporization <sup>3</sup>	kJ/kg	180.86
$c_{p, \text{liq.}}$ <sup>3</sup>	kJ/(kg K)	1.604
$c_{p, \text{vap.}}$ <sup>3</sup>	kJ/(kg K)	1.189
Temp. Glide @ NBP	K	6.8
ASHRAE 34 safety class		A2L

## Packaging

Type	Loan Steel Container	Iso Tank Containers
Size	859 x 2230 (D x L)	6096 x 2438 x 2591 (L x W x H)
Volume	900 l	18000 l
Tara	~ 500 kg	7300 – 9000 kg
Net Content	760 kg	15300 kg
Connections	Valve DIN4676, W 1-1/4	Flange DIN2635, DN40 / PN40 (liq.), DN40 / PN40 (gas)
Other packaging on request		

<sup>2</sup>Data calculated with Refprop 9.0 using own mixing parameter. Data might differ from other R454A calculations done by Refprop 9.0

<sup>3</sup>sat. @ 25°C

## Wet-Vapor Table of R454A\*

Temp.	p	p''	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	bar	dm <sup>3</sup> /kg	dm <sup>3</sup> /kg	kg/m <sup>3</sup>	kg/m <sup>3</sup>	kJ/kg	kJ/kg	kJ/kg	kJ/kg K	kJ/kg K
-50	0.936	0.662	0.786	337.587	1.273	2.96	129.300	378.990	249.69	0.716	1.856
-49	0.983	0.698	0.787	321.388	1.270	3.11	130.670	379.620	248.95	0.723	1.854
-48	1.032	0.735	0.789	306.129	1.267	3.27	132.040	380.250	248.21	0.729	1.851
-47	1.083	0.774	0.791	291.732	1.264	3.43	133.410	380.880	247.47	0.735	1.849
-46	1.135	0.814	0.793	278.149	1.261	3.60	134.780	381.500	246.72	0.741	1.847
-45	1.190	0.856	0.795	265.329	1.258	3.77	136.150	382.130	245.98	0.747	1.845
-44	1.247	0.900	0.796	253.216	1.256	3.95	137.530	382.750	245.22	0.753	1.842
-43	1.306	0.945	0.798	241.774	1.253	4.14	138.900	383.370	244.47	0.759	1.840
-42	1.367	0.992	0.800	230.947	1.250	4.33	140.280	383.990	243.71	0.765	1.838
-41	1.430	1.041	0.802	220.707	1.247	4.53	141.660	384.610	242.95	0.771	1.836
-40	1.495	1.092	0.804	211.015	1.244	4.74	143.040	385.230	242.19	0.776	1.834
-39	1.563	1.145	0.806	201.837	1.241	4.95	144.420	385.850	241.43	0.782	1.832
-38	1.633	1.200	0.808	193.136	1.238	5.18	145.800	386.460	240.66	0.788	1.830
-37	1.706	1.257	0.810	184.891	1.235	5.41	147.190	387.080	239.89	0.794	1.828
-36	1.781	1.316	0.812	177.066	1.232	5.65	148.580	387.690	239.11	0.800	1.826
-35	1.858	1.378	0.814	169.644	1.229	5.89	149.970	388.300	238.33	0.806	1.824
-34	1.938	1.441	0.816	162.596	1.226	6.15	151.360	388.910	237.55	0.812	1.822
-33	2.021	1.507	0.818	155.899	1.223	6.41	152.750	389.510	236.76	0.817	1.820
-32	2.107	1.575	0.820	149.537	1.220	6.69	154.140	390.120	235.98	0.823	1.818
-31	2.195	1.645	0.822	143.488	1.217	6.97	155.540	390.720	235.18	0.829	1.817
-30	2.286	1.718	0.824	137.733	1.214	7.26	156.940	391.320	234.38	0.835	1.815
-29	2.380	1.793	0.826	132.256	1.210	7.56	158.340	391.920	233.58	0.840	1.813
-28	2.476	1.871	0.828	127.042	1.207	7.87	159.740	392.520	232.78	0.846	1.812
-27	2.576	1.951	0.830	122.075	1.204	8.19	161.140	393.110	231.97	0.852	1.810
-26	2.679	2.034	0.833	117.343	1.201	8.52	162.550	393.700	231.15	0.857	1.808
-25	2.785	2.120	0.835	112.831	1.198	8.86	163.960	394.290	230.33	0.863	1.807
-24	2.894	2.208	0.837	108.528	1.195	9.21	165.370	394.880	229.51	0.869	1.805
-23	3.007	2.300	0.839	104.423	1.192	9.58	166.780	395.470	228.69	0.874	1.804
-22	3.122	2.394	0.841	100.505	1.189	9.95	168.200	396.050	227.85	0.880	1.802
-21	3.241	2.491	0.844	96.759	1.186	10.34	169.610	396.630	227.02	0.885	1.800

Temp.	p	p''	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	bar	dm <sup>3</sup> /kg	dm <sup>3</sup> /kg	kg/m <sup>3</sup>	kg/m <sup>3</sup>	kJ/kg	kJ/kg	kJ/kg	kJ/kg K	kJ/kg K
-20	3.364	2.592	0.846	93.188	1.182	10.73	171.030	397.200	226.17	0.891	1.799
-19	3.490	2.695	0.848	89.775	1.179	11.14	172.450	397.780	225.33	0.897	1.798
-18	3.619	2.801	0.850	86.505	1.176	11.56	173.880	398.350	224.47	0.902	1.796
-17	3.752	2.911	0.853	83.382	1.173	11.99	175.310	398.920	223.61	0.908	1.795
-16	3.889	3.024	0.855	80.399	1.170	12.44	176.740	399.490	222.75	0.913	1.793
-15	4.029	3.140	0.857	77.537	1.166	12.90	178.170	400.050	221.88	0.919	1.792
-14	4.173	3.260	0.860	74.800	1.163	13.37	179.600	400.610	221.01	0.924	1.791
-13	4.322	3.383	0.862	72.181	1.160	13.85	181.040	401.170	220.13	0.930	1.789
-12	4.474	3.510	0.865	69.667	1.157	14.35	182.480	401.720	219.24	0.935	1.788
-11	4.630	3.640	0.867	67.259	1.153	14.87	183.920	402.270	218.35	0.941	1.787
-10	4.790	3.774	0.870	64.952	1.150	15.40	185.370	402.820	217.45	0.946	1.785
-9	4.954	3.911	0.872	62.739	1.147	15.94	186.820	403.360	216.54	0.951	1.784
-8	5.122	4.053	0.875	60.613	1.143	16.50	188.270	403.910	215.64	0.957	1.783
-7	5.295	4.198	0.877	58.575	1.140	17.07	189.730	404.440	214.71	0.962	1.782
-6	5.472	4.348	0.880	56.619	1.137	17.66	191.180	404.980	213.80	0.968	1.780
-5	5.653	4.501	0.882	54.738	1.133	18.27	192.650	405.510	212.86	0.973	1.779
-4	5.839	4.658	0.885	52.932	1.130	18.89	194.110	406.030	211.92	0.979	1.778
-3	6.029	4.820	0.888	51.198	1.127	19.53	195.580	406.550	210.97	0.984	1.777
-2	6.224	4.986	0.890	49.529	1.123	20.19	197.050	407.070	210.02	0.989	1.776
-1	6.424	5.156	0.893	47.927	1.120	20.87	198.520	407.590	209.07	0.995	1.774
0	6.628	5.330	0.896	46.384	1.116	21.56	200.000	408.100	208.10	1.000	1.773
1	6.837	5.509	0.899	44.899	1.113	22.27	201.480	408.600	207.12	1.005	1.772
2	7.051	5.693	0.902	43.471	1.109	23.00	202.970	409.100	206.13	1.011	1.771
3	7.270	5.881	0.904	42.095	1.106	23.76	204.450	409.600	205.15	1.016	1.770
4	7.494	6.074	0.907	40.771	1.102	24.53	205.950	410.090	204.14	1.021	1.769
5	7.723	6.271	0.910	39.496	1.099	25.32	207.440	410.580	203.14	1.027	1.768
6	7.957	6.474	0.913	38.266	1.095	26.13	208.940	411.060	202.12	1.032	1.767
7	8.197	6.681	0.916	37.081	1.091	26.97	210.450	411.540	201.09	1.037	1.766
8	8.441	6.893	0.919	35.939	1.088	27.83	211.950	412.010	200.06	1.043	1.764
9	8.691	7.111	0.922	34.837	1.084	28.71	213.470	412.480	199.01	1.048	1.763

\*based on Refprop 9.0 using own mixing parameter. Data might differ from other calculations done by Refprop 9.0. Mixing parameters available on request.

Temp.	p	p''	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	bar	dm³/kg	dm³/kg	kg/m³	kg/m³	kJ/kg	kJ/kg	kJ/kg	kJ/kg K	kJ/kg K
10	8.947	7.333	0.925	33.775	1.081	29.61	214.980	412.940	197.96	1.053	1.762
11	9.208	7.561	0.929	32.749	1.077	30.54	216.500	413.400	196.90	1.058	1.761
12	9.474	7.795	0.932	31.760	1.073	31.49	218.030	413.850	195.82	1.064	1.760
13	9.746	8.033	0.935	30.805	1.069	32.46	219.560	414.300	194.74	1.069	1.759
14	10.024	8.277	0.938	29.883	1.066	33.46	221.090	414.740	193.65	1.074	1.758
15	10.308	8.527	0.942	28.991	1.062	34.49	222.630	415.170	192.54	1.079	1.757
16	10.597	8.782	0.945	28.131	1.058	35.55	224.170	415.600	191.43	1.085	1.756
17	10.893	9.043	0.949	27.299	1.054	36.63	225.720	416.020	190.30	1.090	1.755
18	11.194	9.310	0.952	26.495	1.050	37.74	227.280	416.440	189.16	1.095	1.754
19	11.502	9.583	0.956	25.718	1.046	38.88	228.830	416.850	188.02	1.100	1.753
20	11.816	9.862	0.959	24.966	1.042	40.06	230.400	417.250	186.85	1.106	1.752
21	12.136	10.148	0.963	24.238	1.038	41.26	231.970	417.650	185.68	1.111	1.751
22	12.462	10.439	0.967	23.534	1.034	42.49	233.540	418.040	184.50	1.116	1.750
23	12.794	10.737	0.970	22.853	1.030	43.76	235.120	418.420	183.30	1.121	1.749
24	13.133	11.041	0.974	22.194	1.026	45.06	236.710	418.790	182.08	1.127	1.748
25	13.479	11.351	0.978	21.556	1.022	46.39	238.300	419.160	180.86	1.132	1.747
26	13.831	11.668	0.982	20.938	1.018	47.76	239.900	419.520	179.62	1.137	1.746
27	14.190	11.992	0.986	20.338	1.014	49.17	241.500	419.870	178.37	1.142	1.744
28	14.556	12.323	0.990	19.758	1.010	50.61	243.110	420.210	177.10	1.148	1.743
29	14.928	12.661	0.995	19.195	1.005	52.10	244.730	420.540	175.81	1.153	1.742
30	15.308	13.005	0.999	18.650	1.001	53.62	246.350	420.870	174.52	1.158	1.741
31	15.694	13.357	1.003	18.121	0.997	55.18	247.980	421.180	173.20	1.163	1.740
32	16.087	13.716	1.008	17.608	0.992	56.79	249.620	421.490	171.87	1.169	1.739
33	16.488	14.083	1.012	17.111	0.988	58.44	251.260	421.790	170.53	1.174	1.738
34	16.896	14.457	1.017	16.628	0.984	60.14	252.910	422.080	169.17	1.179	1.737
35	17.311	14.838	1.021	16.160	0.979	61.88	254.570	422.350	167.78	1.184	1.736
36	17.733	15.227	1.026	15.705	0.975	63.68	256.240	422.620	166.38	1.190	1.735
37	18.163	15.624	1.031	15.263	0.970	65.52	257.910	422.880	164.97	1.195	1.733
38	18.601	16.029	1.036	14.834	0.965	67.41	259.590	423.120	163.53	1.200	1.732
39	19.046	16.442	1.041	14.418	0.961	69.36	261.290	423.360	162.07	1.205	1.731

Temp.	p	p''	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	bar	dm³/kg	dm³/kg	kg/m³	kg/m³	kJ/kg	kJ/kg	kJ/kg	kJ/kg K	kJ/kg K
40	19.499	16.863	1.046	14.012	0.956	71.37	262.990	423.580	160.59	1.211	1.730
41	19.959	17.292	1.052	13.619	0.951	73.43	264.700	423.790	159.09	1.216	1.729
42	20.428	17.730	1.057	13.236	0.946	75.55	266.410	423.990	157.58	1.221	1.727
43	20.904	18.176	1.063	12.864	0.941	77.73	268.140	424.170	156.03	1.227	1.726
44	21.388	18.631	1.068	12.503	0.936	79.98	269.880	424.340	154.46	1.232	1.725
45	21.881	19.095	1.074	12.151	0.931	82.30	271.630	424.500	152.87	1.237	1.724
46	22.382	19.568	1.080	11.808	0.926	84.69	273.390	424.640	151.25	1.243	1.722
47	22.890	20.050	1.086	11.475	0.921	87.15	275.160	424.770	149.61	1.248	1.721
48	23.408	20.541	1.092	11.150	0.915	89.69	276.940	424.880	147.94	1.253	1.719
49	23.933	21.042	1.099	10.834	0.910	92.30	278.740	424.980	146.24	1.259	1.718
50	24.468	21.552	1.106	10.526	0.905	95.00	280.540	425.050	144.51	1.264	1.717
51	25.010	22.072	1.112	10.226	0.899	97.79	282.360	425.120	142.76	1.270	1.715
52	25.562	22.602	1.119	9.933	0.893	100.67	284.200	425.160	140.96	1.275	1.714
53	26.122	23.142	1.127	9.648	0.888	103.65	286.040	425.180	139.14	1.281	1.712
54	26.691	23.692	1.134	9.370	0.882	106.72	287.910	425.180	137.27	1.286	1.710
55	27.269	24.253	1.142	9.099	0.876	109.90	289.780	425.170	135.39	1.292	1.709
56	27.856	24.824	1.150	8.834	0.870	113.20	291.680	425.130	133.45	1.297	1.707
57	28.452	25.406	1.158	8.576	0.864	116.61	293.590	425.060	131.47	1.303	1.705
58	29.057	25.999	1.166	8.324	0.857	120.14	295.510	424.980	129.47	1.308	1.704
59	29.671	26.604	1.175	8.077	0.851	123.81	297.460	424.860	127.40	1.314	1.702
60	30.295	27.219	1.184	7.836	0.844	127.62	299.430	424.720	125.29	1.320	1.700
61	30.928	27.847	1.194	7.601	0.838	131.57	301.410	424.550	123.14	1.325	1.698
62	31.571	28.487	1.203	7.370	0.831	135.69	303.420	424.350	120.93	1.331	1.696
63	32.223	29.139	1.214	7.144	0.824	139.97	305.460	424.120	118.66	1.337	1.694
64	32.884	29.803	1.224	6.923	0.817	144.44	307.510	423.860	116.35	1.343	1.692
65	33.555	30.480	1.235	6.707	0.809	149.10	309.600	423.550	113.95	1.349	1.689
66	34.236	31.170	1.247	6.495	0.802	153.97	311.710	423.210	111.50	1.355	1.687
67	34.927	31.874	1.259	6.287	0.794	159.07	313.850	422.830	108.98	1.361	1.685
68	35.628	32.592	1.272	6.082	0.786	164.41	316.030	422.400	106.37	1.367	1.682
69	36.338	33.324	1.286	5.882	0.778	170.02	318.240	421.920	103.68	1.373	1.679
70	37.058	34.070	1.300	5.684	0.769	175.93	320.490	421.390	100.90	1.379	1.677

The information contained herein is subject to change without notice, due to the refrigerants being under development. The information contained herein represents examples of actual measurement data, and examples of use herein do not guarantee that the products can be practically applicable for the example of use.

# R454A

Product information

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