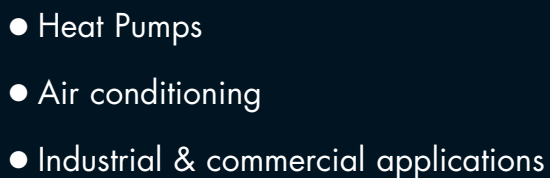


Refrigerant R410A



Product Description

Substitute for R 22 and R 13B1

- Near azeotropic refrigerant containing R 32 and R 125
- Distinct higher efficiency in comparison with R 22
- Non-flammable
- R 410 is being favoured worldwide as long-term alternative for R 22
- Commercially available
- Compressors must be charged with polyolester oils

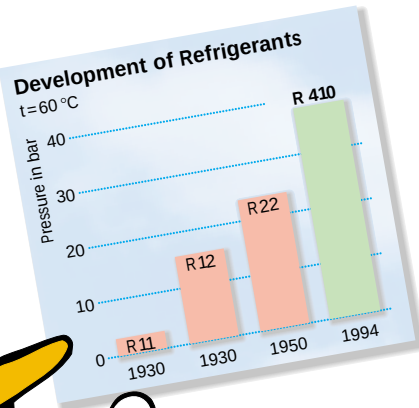
Applications

- Air-Conditioning units
- Heat pumps
- Cold storage
- Industrial and commercial refrigeration
- Regarding the system components (compressor etc.), the higher pressure level of R 410 has to be considered
- Substitution of R 13B1 by R 410 in low temperature application is possible

Pressure Level

- Significant higher pressure than Solkane 22
- Pressure: 38.5 bar at a condensing temperature of 60 °C
- Refer to the recommendation of compressor manufactures
- Common joint fittings can be maintained as usual after revision

Environmental Aspects

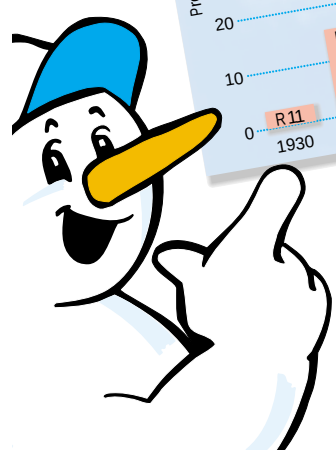


ODP Ozone Depletion Potential

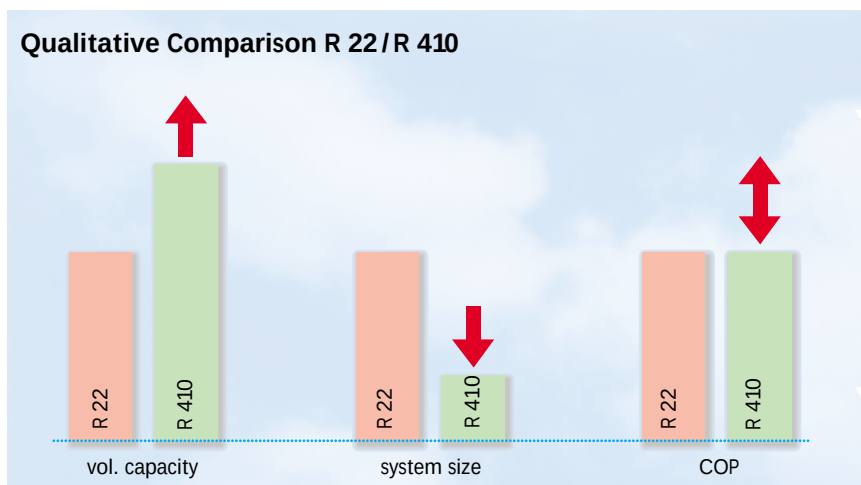
R410	0
R22	0.055
CFC 12	1.0

HGWP Halocarbon Global Warming Potential

R410	0.44
R22	0.36
CFC 12	3.0



Performance



Physical Properties

Chemical Name		Difluoromethane/ Pentafluoroethane
Chemical Formula		CH ₂ F ₂ /CHF ₂ -CF ₃
Molecular Weight	kg/kmol	72.6
Boiling Point at 1.013 bar	°C	-51.5
Critical Temperature	°C	71.8
Critical Pressure	bar	48.9
Critical Density	kg/m ³	487
Critical Volume	m ³ /kg	2.05 x 10 ⁻³
Density Liquid ¹⁾	kg/m ³	1068
Density Saturated Vapour ¹⁾	kg/m ³	65.183
Heat of Vaporization ¹⁾	kJ/kg	190.3
Specific Heat Capacity ¹⁾ (Liquid)	kJ/kgK	1.690
Specific Heat Capacity ²⁾ (Vapour)	kJ/kgK	0.827
¹⁾ at 25 °C		
²⁾ at 25 °C and 1.013 bar		

Technical Service

For further information please contact our technical specialists:

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Comments:

The recommendations for the use of A-Gas refrigerants are given to the best of our knowledge and information and are not binding.

All users are themselves responsible for the observance of the relevant legal regulations and existing copyright.

Under no circumstances do we accept liability for damages which arise from the use of A-Gas-refrigerants and such products, which are manufactured with A-Gas refrigerants.

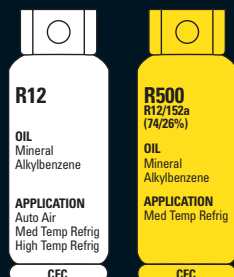
Thermodynamic properties of saturated R 410

t °C	p bar	v' dm ³ /kg	v'' dm ³ /kg	rho' kg/dm ³	rho'' kg/m ³	h' kJ/kg	h'' kJ/kg	r kJ/kg	s' kJ/kgK	s'' kJ/kgK	t °C	p bar	v' dm ³ /kg	v'' dm ³ /kg	rho' kg/dm ³	rho'' kg/m ³	h' kJ/kg	h'' kJ/kg	r kJ/kg	s' kJ/kgK	s'' kJ/kgK
-70	0.36	0.695	640.51	1.440	1.56	100.55	390.15	289.60	0.5828	2.0083	0	8.04	0.849	32.78	1.178	30.51	200.00	423.34	223.34	1.0000	1.8177
-69	0.38	0.696	604.08	1.436	1.66	101.97	390.72	288.74	0.5898	2.0041	1	8.30	0.852	31.75	1.174	31.49	201.50	423.68	222.18	1.0054	1.8158
-68	0.40	0.698	570.34	1.433	1.75	103.30	391.29	287.99	0.5962	2.0000	2	8.57	0.855	30.76	1.169	32.51	203.01	424.01	221.00	1.0108	1.8140
-67	0.43	0.700	538.83	1.429	1.86	104.62	391.86	287.24	0.6026	1.9960	3	8.84	0.858	29.81	1.165	33.55	204.52	424.33	219.81	1.0162	1.8122
-66	0.46	0.701	509.17	1.426	1.96	106.05	392.42	286.37	0.6096	1.9920	4	9.12	0.861	28.88	1.161	34.62	206.04	424.65	218.61	1.0216	1.8104
-65	0.48	0.703	481.65	1.422	2.08	107.38	392.99	285.61	0.6159	1.9881	5	9.40	0.864	28.00	1.157	35.72	207.56	424.96	217.41	1.0270	1.8086
-64	0.51	0.705	455.89	1.419	2.19	108.71	393.56	284.85	0.6223	1.9842	6	9.69	0.868	27.14	1.153	36.85	209.08	425.27	216.19	1.0324	1.8068
-63	0.54	0.707	431.78	1.415	2.32	110.04	394.12	284.09	0.6286	1.9805	7	9.99	0.871	26.31	1.148	38.01	210.62	425.57	214.95	1.0378	1.8050
-62	0.57	0.708	409.01	1.412	2.45	111.48	394.68	283.20	0.6355	1.9767	8	10.30	0.874	25.51	1.144	39.20	212.15	425.86	213.71	1.0431	1.8033
-61	0.61	0.710	387.84	1.408	2.58	112.81	395.24	282.43	0.6417	1.9730	9	10.61	0.877	24.74	1.140	40.42	213.70	426.15	212.46	1.0485	1.8015
-60	0.64	0.712	367.96	1.405	2.72	114.15	395.80	281.65	0.6480	1.9694	10	10.93	0.881	24.00	1.135	41.67	015.24	426.44	211.19	1.0539	1.7998
-59	0.68	0.714	349.17	1.401	2.86	115.59	396.34	280.75	0.6548	1.9658	11	11.25	0.884	23.28	1.131	42.96	216.80	426.71	209.91	1.0593	1.7980
-58	0.72	0.715	331.65	1.398	3.02	116.93	396.89	279.96	0.6610	1.9622	12	11.59	0.888	22.58	1.127	44.29	218.36	426.98	208.62	1.0647	1.7963
-57	0.76	0.717	315.11	1.394	3.17	118.33	397.44	279.12	0.6674	1.9587	13	11.93	0.891	21.91	1.122	45.65	219.93	427.24	207.31	1.0701	1.7945
-56	0.80	0.719	299.63	1.391	3.34	119.67	397.99	278.32	0.6730	1.9553	14	12.28	0.895	21.26	1.118	47.04	221.51	427.49	205.99	1.0754	1.7928
-55	0.84	0.721	284.97	1.387	3.51	121.08	398.53	277.45	0.6801	1.9519	15	12.63	0.898	20.63	1.113	48.48	223.09	427.74	204.65	1.0808	1.7911
-54	0.89	0.723	271.22	1.384	3.69	122.46	399.07	276.61	0.6864	1.9486	16	13.00	0.902	20.02	1.109	49.95	224.68	427.98	203.29	1.0862	1.7893
-53	0.94	0.725	258.23	1.380	3.87	123.86	399.61	275.74	0.6928	1.9453	17	13.37	0.905	19.43	1.105	51.46	226.28	428.21	201.92	1.0917	1.7876
-52	0.99	0.727	246.05	1.376	4.06	125.21	400.14	274.93	0.6989	1.9421	18	13.75	0.909	18.86	1.100	53.02	227.89	428.43	200.54	1.0971	1.7858
-51	1.04	0.728	234.50	1.373	4.26	126.61	400.68	274.06	0.7052	1.9389	19	14.13	0.913	18.31	1.095	54.61	229.51	428.64	199.13	1.1025	1.7841
-50	1.09	0.730	223.62	1.369	4.47	128.00	401.21	273.21	0.7114	1.9357	20	14.53	0.917	17.78	1.091	56.26	231.14	428.85	197.71	1.1079	1.7824
-49	1.15	0.732	213.32	1.366	4.69	129.42	401.73	272.31	0.7177	1.9326	21	14.93	0.921	17.26	1.086	57.94	232.78	429.04	196.27	1.1134	1.7806
-48	1.21	0.734	203.62	1.362	4.91	130.81	402.25	271.45	0.7239	1.9295	22	15.35	0.924	16.76	1.082	59.68	234.42	429.23	194.80	1.1189	1.7789
-47	1.27	0.736	194.44	1.358	5.14	132.20	402.78	270.58	0.7300	1.9265	23	15.77	0.928	16.27	1.077	61.46	236.08	429.40	193.32	1.1243	1.7771
-46	1.33	0.738	185.76	1.355	5.38	133.59	403.30	269.71	0.7361	1.9235	24	16.20	0.933	15.80	1.072	63.30	237.76	429.57	191.81	1.1298	1.7754
-45	1.40	0.740	177.54	1.351	5.63	135.00	403.81	268.81	0.7423	1.9205	25	16.64	0.937	15.34	1.068	65.18	239.44	429.73	190.29	1.1354	1.7736
-44	1.46	0.742	169.75	1.348	5.89	136.41	404.32	267.91	0.7484	1.9176	26	17.08	0.941	14.90	1.063	67.12	241.14	429.87	188.74	1.1409	1.7718
-43	1.54	0.744	162.39	1.344	6.16	137.80	404.83	267.03	0.7545	1.9147	27	17.54	0.945	14.47	1.058	69.12	242.85	430.00	187.16	1.1465	1.7700
-42	1.61	0.746	155.39	1.340	6.44	139.23	405.34	266.11	0.7607	1.9119	28	18.01	0.949	14.05	1.053	71.18	244.57	430.13	185.56	1.1520	1.7682
-41	1.68	0.748	148.76	1.337	6.72	140.64	405.84	265.20	0.7667	1.9091	29	18.48	0.954	13.64	1.048	73.29	246.31	430.24	183.93	1.1577	1.7664
-40	1.76	0.750	142.48	1.333	7.02	142.04	406.34	264.30	0.7727	1.9063	30	18.97	0.958	13.25	1.043	75.47	248.06	430.33	182.27	1.1633	1.7646
-39	1.84	0.752	136.52	1.329	7.33	143.45	406.84	263.39	0.7787	1.9036	31	19.46	0.963	12.87	1.039	77.72	249.83	430.42	180.59	1.1690	1.7627
-38	1.93	0.754	130.85	1.326	7.64	144.87	407.33	262.46	0.7847	1.9009	32	19.96	0.968	12.50	1.034	80.03	251.61	430.49	178.88	1.1747	1.7609
-37	2.02	0.756	125.47	1.322	7.97	146.28	407.82	261.54	0.7907	1.8982	33	20.48	0.972	12.13	1.028	82.41	253.41	430.54	177.13	1.1804	1.7590
-36	2.11	0.759	120.35	1.318	8.31	147.70	408.31	260.61	0.7967	1.8956	34	21.00	0.977	11.78	1.023	84.87	255.24	430.58	175.35	1.1862	1.7571
-35	2.20	0.761	115.48	1.314	8.66	149.12	408.79	259.67	0.8026	1.8930	35	21.53	0.982	11.44	1.018	87.40	257.07	430.61	173.54	1.1920	1.7551
-34	2.30	0.763	110.85	1.311	9.02	150.54	409.27	258.73	0.8085	1.8904	36	22.08	0.987	11.11	1.013	90.02	258.94	430.62	171.68	1.1978	1.7532
-33	2.40	0.765	106.45	1.307	9.39	151.97	409.75	257.78	0.8145	1.8879	37	22.63	0.992	10.79	1.008	92.72	260.82	430.61	169.79	1.2037	1.7512
-32	2.50	0.767	102.25	1.303	9.78	153.40	410.22	256.82	0.8204	1.8854	38	23.20	0.998	10.47	1.002	95.51	262.72	430.58	167.86	1.2097	1.7492
-31	2.61	0.770	98.25	1.300	10.18	154.82	410.69	255.87	0.8262	1.8829	39	23.77	1.003	10.16	0.997	98.40	264.64	430.54	165.89	1.2157	1.7471
-30	2.72	0.772	94.45	1.296	10.59	156.24	411.16	254.92	0.8321	1.8804	40	24.36	1.008	9.86	0.992	101.38	266.60	430.47	163.87	1.2217	1.7450
-29	2.83	0.774	90.82	1.292	11.01	157.67	411.62	253.96	0.8379	1.8780	41	24.95	1.014	9.57	0.986	104.46	268.57	430.38	161.81	1.2278	1.7429
-28	2.95	0.776	87.35	1.288	11.45	159.11	412.08	252.97	0.8437	1.8756	42	25.56	1.020	9.29	0.981	107.66	270.57	430.27	159.70	1.2340	1.7407
-27	3.07	0.779	84.05	1.284	11.90	160.54	412.54	252.00	0.8495	1.8733	43	26.18	1.026	9.01	0.975	110.97	272.60	430.14	157.54	1.2402	1.7385
-26	3.19	0.781	80.90	1.281	12.36	161.96	412.99	251.03	0.8552	1.8709	44	26.81	1.032	8.74	0.969	114.40	274.66	429.98	155.32	1.2465	1.7362
-25	3.32	0.783	77.88	1.277	12.84	163.40	413.44	250.04	0.8610	1.8686	45	27.45	1.038	8.48	0.963	117.96	276.75	429.79	153.04	1.2529	1.7339
-24	3.45	0.786	75.01	1.273	13.33	164.84	413.89	249.05	0.8667	1.8663	46	28.10	1.045	8.22	0.957	121.66	278.88	429.58	150.70	1.2593	1.7315
-23	3.59	0.788	72.25	1.269	13.84	166.28	414.33	248.04	0.8725	1.8641	47	28.76	1.051	7.97	0.951	125.50	281.04	429.34	148.30	1.2659	1.7291
-22	3.73	0.790	69.63	1.265	14.36	167.72	414.77	247.05	0.8782	1.8618	48	29.44	1.058	7.72	0.945	129.51	283.23	429.06	145.83	1.2725	1.7266
-21	3.88	0.793	67.11	1.261	14.90	169.17	415.20	246.03	0.8839	1.8596	49	30.13	1.065	7.48	0.939	133.68	285.46	428.75	143.28	1.2792	1.7240
-20	4.03	0.795	64.70	1.258	15.46	170.61	415.63	245.02	0.8896	1.8574	50	30.83	1.072	7.24	0.932	138.03	287.74	428.40	140.66	1.2860	1.7213
-19	4.18	0.798	62.40	1.254	16.03	172.06	416.06	244.00	0.8952	1.8553	51	31.54	1.080	7.01	0.926	142.58	290.06	428.01	137.95	1.2930	1.7185
-18	4.34	0.800	60.20	1.250	16.61	173.51	416.48	242.97	0.9009	1.8531											

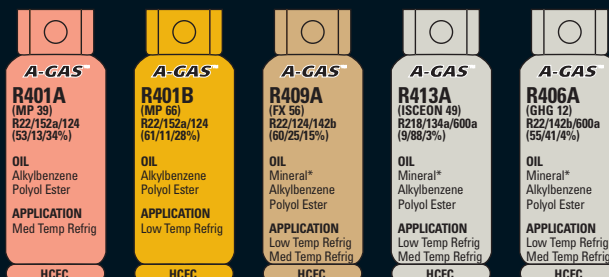
Refrigerant GUIDE

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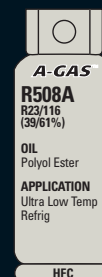
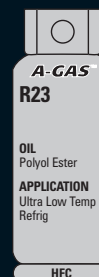
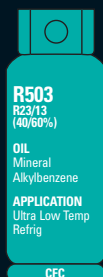
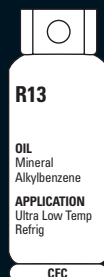
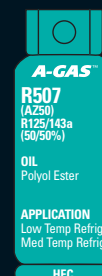
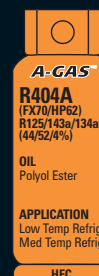
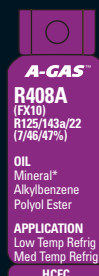
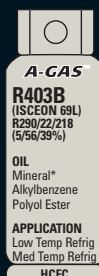
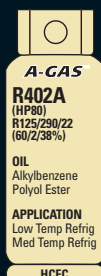
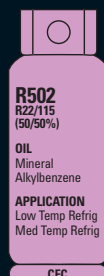
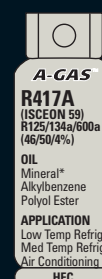
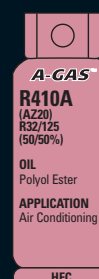
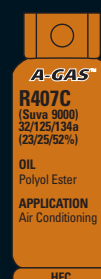
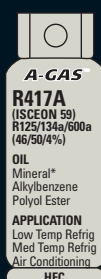
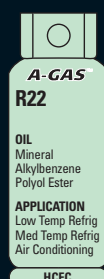
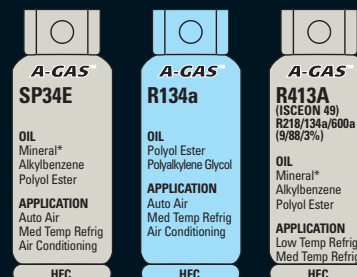
TRADITIONAL



INTERIM REPLACEMENT



LONG TERM REPLACEMENT



* 50/50 Mix of Mineral/Alkylbenzene preferred.
** Material for hoses & connections: check compatibility
Please Note: Not all products are available in all outlets

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