

## 01 GAS REFRIGERANTE

# R-410A

**R-410A**  
El sustituto  
del R22 y  
del R13B1  
sin más...

- ✓ Refrigerante zeotrópico que contiene R-32 y R-125.
- ✓ Bastante mayor eficacia que el R22.
- ✓ No inflamable.
- ✓ El R-410A está considerado en todo el mundo como la alternativa definitiva del R-22.
- ✓ Disponible comercialmente.
- ✓ Los compresores deben ser cargados con aceites poliolester.

### Aplicaciones:

- Unidades de aire acondicionado y bombas de calor.
- Almacenamiento, refrigeración comercial e industrial.
- En relación con los componentes del sistema (compresor, etc.), el mayor nivel de presiones del R-410A debe ser tenido en cuenta.
- La sustitución del R13B1 por el R-410A en aplicaciones de baja temperatura.

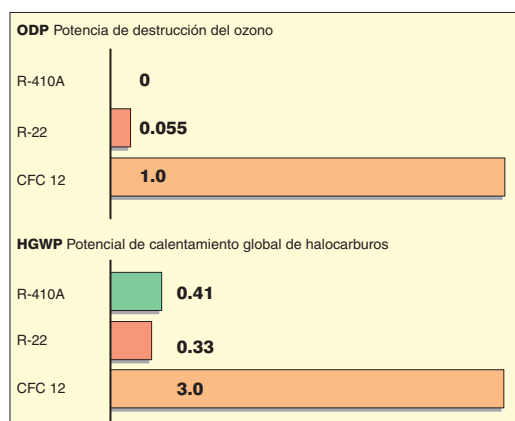
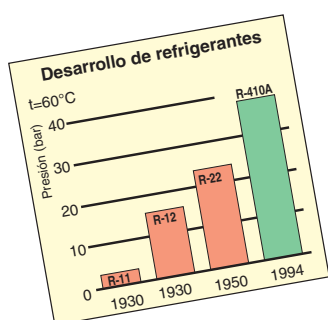
### Nivel de presiones:

- Presión significativamente mayor que el R-22.
- Presión: 38,5 bar a la temperatura de condensación de 60°C.
- Tener en cuenta las recomendaciones de los fabricantes de compresores.
- Si se quieren mantener las juntas, deberán revisarse previamente.



Especificaciones técnicas		R-410A
Descripción química		Difluorometano / Pentafluoroetano
Fórmula química		$\text{CH}_2\text{F}_2 / \text{CHF}_2\text{-CF}_3$
Peso molecular	Kg/kmol	72,6
Punto de ebullición a 1.013 bar	°C	-51,5
Temperatura crítica	°C	71,8
Presión crítica	bar	48,9
Densidad crítica	Kg/m <sup>3</sup>	487
Volumen crítico	m <sup>3</sup> /Kg	2,05 x 10 <sup>-3</sup>
Densidad del líquido a 25°C	Kg/m <sup>3</sup>	1.068
Densidad del vapor saturado a 25°C	Kg/m <sup>3</sup>	65,183
Calor de vaporización a 25°C	kJ/kg	190,3
Calor específico a 25°C (líquido)	kJ/kgK	1,690
Calor específico a 25°C y 1.013 bar (vapor)	kJ/kgK	0,827

### Aspectos medioambientales:



### Propiedades termodinámicas del R-410A:

t	p	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	dm³/kg	dm³/kg	kg/dm³	kg/m³	kJ/kg	kJ/kg	kg/kg	kJ/kgK	kJ/kgK
-70	0.36	0.695	640.51	1.440	1.56	100.55	390.15	289.60	0.5828	2.0083
-69	0.38	0.696	604.08	1.436	1.66	101.97	390.72	288.74	0.5898	2.0041
-68	0.40	0.698	570.34	1.433	1.75	103.30	391.29	287.99	0.5962	2.0000
-67	0.43	0.700	538.83	1.429	1.86	104.62	391.86	287.24	0.6026	1.9960
-66	0.46	0.701	509.17	1.426	1.96	106.05	392.42	286.37	0.6096	1.9920
-65	0.48	0.703	481.65	1.422	2.08	107.38	392.99	285.61	0.6159	1.9881
-64	0.51	0.705	455.89	1.419	2.19	108.71	393.56	284.85	0.6223	1.9842
-63	0.54	0.707	431.78	1.415	2.32	110.04	394.12	284.09	0.6286	1.9805
-62	0.57	0.708	409.01	1.412	2.45	111.48	394.68	283.20	0.6355	1.9767
-61	0.61	0.710	387.84	1.408	2.58	112.81	395.24	282.43	0.6417	1.9730
-60	0.64	0.712	367.96	1.405	2.72	114.15	395.80	281.65	0.6480	1.9694
-59	0.68	0.714	349.17	1.401	2.86	115.59	396.34	280.75	0.6548	1.9658
-58	0.72	0.715	331.65	1.398	3.02	116.93	396.89	279.96	0.6610	1.9622
-57	0.76	0.717	315.11	1.394	3.17	118.33	397.44	279.12	0.6674	1.9587
-56	0.80	0.719	299.63	1.391	3.34	119.67	397.99	278.32	0.6736	1.9553
-55	0.84	0.721	284.97	1.387	3.51	121.08	398.53	277.45	0.6801	1.9519
-54	0.89	0.723	271.22	1.384	3.69	122.46	399.07	276.61	0.6864	1.9486
-53	0.94	0.725	258.23	1.380	3.87	123.86	399.61	275.74	0.6928	1.9453
-52	0.99	0.727	246.05	1.376	4.06	125.21	400.14	274.93	0.6989	1.9421
-51	1.04	0.728	234.50	1.373	4.26	126.61	400.68	274.06	0.7052	1.9389
-50	1.09	0.730	223.62	1.369	4.47	128.00	401.21	273.21	0.7114	1.9357
-49	1.15	0.732	213.32	1.366	4.69	129.42	401.73	272.31	0.7177	1.9326
-48	1.21	0.734	203.62	1.362	4.91	130.81	402.25	271.45	0.7239	1.9295
-47	1.27	0.736	194.44	1.358	5.14	132.20	402.78	270.58	0.7300	1.9265
-46	1.33	0.738	185.76	1.355	5.38	133.59	403.30	269.71	0.7361	1.9235
-45	1.40	0.740	177.54	1.351	5.63	135.00	403.81	268.81	0.7423	1.9205
-44	1.46	0.742	169.75	1.348	5.89	136.41	404.32	267.91	0.7484	1.9176
-43	1.54	0.744	162.39	1.344	6.16	137.80	404.83	267.03	0.7545	1.9147
-42	1.61	0.746	155.39	1.340	6.44	139.23	405.34	266.11	0.7607	1.9119
-41	1.68	0.748	148.76	1.337	6.72	140.64	405.84	265.20	0.7667	1.9091
-40	1.76	0.750	142.48	1.333	7.02	142.04	406.34	264.30	0.7727	1.9063
-39	1.84	0.752	136.52	1.329	7.33	143.45	406.84	263.39	0.7787	1.9036
-38	1.93	0.754	130.85	1.326	7.64	144.87	407.33	262.46	0.7847	1.9009
-37	2.02	0.756	125.47	1.322	7.97	146.28	407.82	261.54	0.7907	1.8982
-36	2.11	0.759	120.35	1.318	8.31	147.70	408.31	260.61	0.7967	1.8956
-35	2.20	0.761	115.48	1.314	8.66	149.12	408.79	259.67	0.8026	1.8930
-34	2.30	0.763	110.85	1.311	9.02	150.54	409.27	258.73	0.8085	1.8904
-33	2.40	0.765	106.45	1.307	9.39	151.97	409.75	257.78	0.8145	1.8879
-32	2.50	0.767	102.25	1.303	9.78	153.40	410.22	256.82	0.8204	1.8854
-31	2.61	0.770	98.25	1.300	10.18	154.82	410.69	255.87	0.8262	1.8829
-30	2.72	0.772	94.45	1.296	10.59	156.24	411.16	254.92	0.8321	1.8804
-29	2.83	0.774	90.82	1.292	11.01	157.67	411.62	253.96	0.8379	1.8780
-28	2.95	0.776	87.35	1.288	11.45	159.11	412.08	252.97	0.8437	1.8756
-27	3.07	0.778	84.05	1.284	11.90	160.54	412.54	252.00	0.8495	1.8733
-26	3.19	0.781	80.90	1.281	12.36	161.96	412.99	251.03	0.8552	1.8709
-25	3.32	0.783	77.88	1.277	12.84	163.40	413.44	250.04	0.8610	1.8686
-24	3.45	0.786	75.01	1.273	13.33	164.84	413.89	249.05	0.8667	1.8663
-23	3.59	0.788	72.25	1.269	13.84	166.28	414.33	248.04	0.8725	1.8641
-22	3.73	0.790	69.63	1.265	14.36	167.72	414.77	247.05	0.8782	1.8618
-21	3.88	0.793	67.11	1.261	14.90	169.17	415.20	246.03	0.8839	1.8596
-20	4.03	0.795	64.70	1.258	15.46	170.61	415.63	245.02	0.8896	1.8574
-19	4.18	0.798	62.40	1.254	16.03	172.06	416.06	244.00	0.8952	1.8553
-18	4.34	0.800	60.20	1.250	16.61	173.51	416.48	242.97	0.9009	1.8531
-17	4.50	0.803	58.09	1.246	17.22	174.95	416.90	241.95	0.9064	1.8510
-16	4.67	0.805	56.06	1.242	17.84	176.41	417.31	240.91	0.9121	1.8489
-15	4.84	0.808	54.12	1.238	18.48	177.87	417.72	239.86	0.9177	1.8468
-14	5.02	0.810	52.27	1.234	19.13	179.32	418.13	238.81	0.9232	1.8447
-13	5.20	0.813	50.48	1.230	19.81	180.78	418.53	237.75	0.9288	1.8427
-12	5.38	0.815	48.77	1.226	20.50	182.24	418.93	236.68	0.9344	1.8407
-11	5.58	0.818	47.13	1.222	21.22	183.71	419.32	235.61	0.9399	1.8387
-10	5.77	0.821	45.55	1.218	21.95	185.17	419.71	234.54	0.9454	1.8367
-9	5.97	0.823	44.04	1.214	22.71	186.64	420.10	233.46	0.9509	1.8347
-8	6.18	0.826	42.58	1.210	23.48	188.11	420.47	232.36	0.9564	1.8328
-7	6.39	0.829	41.19	1.206	24.28	189.59	420.85	231.26	0.9619	1.8308
-6	6.61	0.832	39.84	1.202	25.10	191.06	421.22	230.16	0.9674	1.8289
-5	6.84	0.835	38.55	1.198	25.94	192.54	421.59	229.05	0.9728	1.8270
-4	7.07	0.837	37.31	1.194	26.81	194.03	421.95	227.92	0.9783	1.8251
-3	7.30	0.840	36.11	1.190	27.69	195.52	422.30	226.79	0.9837	1.8232
-2	7.54	0.843	34.96	1.186	28.61	197.01	422.65	225.65	0.9892	1.8213
-1	7.79	0.846	33.85	1.182	29.54	198.50	423.00	224.50	0.9946	1.8195

t	p	v'	v''	rho'	rho''	h'	h''	r	s'	s''
°C	bar	dm³/kg	dm³/kg	kg/dm³	kg/m³	kJ/kg	kJ/kg	kg/kg	kJ/kgK	kJ/kgK
0	8.04	0.849	32.78	1.178	30.51	200.00	423.34	223.34	1.0000	1.8177
1	8.30	0.852	31.75	1.174	31.49	201.50	423.68	222.18	1.0054	1.8158
2	8.57	0.855	30.76	1.169	32.51	203.01	424.01	221.00	1.0108	1.8140
3	8.84	0.858	29.81	1.165	33.55	204.52	424.33	219.81	1.0162	1.8122
4	9.12	0.861	28.88	1.161	34.62	206.04	424.65	218.61	1.0216	1.8104
5	9.40	0.864	28.00	1.157	35.72	207.56	424.96	217.41	1.0270	1.8086
6	9.69	0.868	27.14	1.153	36.85	209.08	425.27	216.19	1.0324	1.8068
7	9.99	0.871	26.31	1.148	38.01	210.62	425.57	214.95	1.0378	1.8050
8	10.30	0.874	25.51	1.144	39.20	212.15	425.86	213.71	1.0431	1.8033
9	10.61	0.877	24.74	1.140	40.42	213.70	426.15	212.46	1.0485	1.8015
10	10.93	0.881	24.00	1.135	41.67	215.24	426.44	211.19	1.0539	1.7998
11	11.25	0.884	23.28	1.131	42.96	216.80	426.71	209.91	1.0593	1.7980
12	11.59	0.888	22.58	1.127	44.29	218.36	426.98	208.62	1.0647	1.7963
13	11.93	0.891	21.91	1.122	45.65	219.93	427.24	207.31	1.0701	1.7945
14	12.28	0.895	21.26	1.118	47.04	221.51	427.49	205.99	1.0754	1.7928
15	12.63	0.898	20.63	1.113	48.48	223.09	427.74	204.65	1.0808	1.7911
16	13.00	0.902	20.02	1.109	49.95	224.68	427.98	203.29	1.0862	1.7893
17	13.37	0.905	19.43	1.105	51.46	226.28	428.21	201.92	1.0917	1.7876
18	13.75	0.909	18.86	1.100	53.02	227.89	428.43	200.54	1.0971	1.7858
19	14.13	0.913	18.31	1.095	54.61	229.51	428.64	199.13	1.1025	1.7841
20	14.53	0.917	17.78	1.091	56.26	231.14	428.85	197.71	1.1079	1.7824
21	14.93	0.921	17.26	1.086	57.94	232.78	429.04	196.27	1.1134	1.7806
22	15.35	0.924	16.76	1.082	59.68	234.42	429.23	194.80	1.1189	1.7789
23	15.77	0.928	16.27	1.077	61.46	236.08	429.40	193.32	1.1243	1.7771
24	16.20	0.933	15.80	1.072	63.30	237.76	429.57	191.81	1.1298	1.7754
25	16.64	0.937	15.34	1.068	65.18	239.44	429.73	190.29	1.1354	1.7736
26	17.08	0.941	14.90	1.063	67.12	241.14	429.87	188.74	1.1409	1.7718
27	17.54	0.945	14.47	1.058	69.12	242.85	430.00	187.16	1.1465	1.7700
28	18.01	0.949	14.05	1.053	71.18	244.57	430.13	185.56	1.1520	1.7682
29	18.48	0.954	13.64	1.048	73.29	246.31	430.24	183.93	1.1577	1.7664
30	18.97	0.958	13.25	1.043	75.47	248.06	430.			