


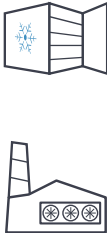
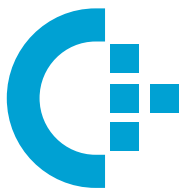


Refrigerant replacement solutions





		New equipment		
Application		Current Refrigerant	Low GWP (<750) Interim Solution	Very Low GWP (<150) Long Term Solution
 Air Conditioning	Packaged Chiller	R-134a (1430, A1) ◀	R-513A (631, A1) ◀ R-515B (293, A1) ◀	R-1234ze (7, A2L) ◀ R-1234yf (4, A2L) ◀
	Packaged Chiller Single split or VRF	R-410A (2088, A1) ◀	R-32 (675, A2L) ◀ R-452B (698, A2L) ◀ R-454B (466, A2L) ◀	R-1234ze (7, A2L) ◀
 Heat pumps	Monobloc (outdoors)	R-410A (2088, A1) ◀	R-32 (675, A2L) ◀ R-454B (466, A2L) ◀	Propane* (R-290) (3, A3) ◀ R-1234yf (4, A2L) ◀ R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
	Split systems	R-410A (2088, A1) ◀	R-32 (675, A2L) ◀ R-454B (466, A2L) ◀	R-1234yf (4, A2L) ◀ R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
 Commercial Refrigeration (Retail)	Multi-compressor >40kW	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀		CO ₂ (R-744) (1, A1) ◀ R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
	Single compressor or <40kW	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
 Commercial Refrigeration (Non-retail) & Light Industrial	MT Condensing Unit	R-134a (1430, A1) ◀	R-513A (631, A1) ◀ R-515B (293, A1) ◀	R-1234ze (7, A2L) ◀ R-1234yf (4, A2L) ◀
		R-448A (1387, A1) ◀ R-449A (1397, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
	LT Condensing Unit	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀ R-452A (2140, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
	Blast Chiller	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀
	Blast Freezer	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀ R-452A (2140, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀

* heat pump air/water

GWP: IPCC4 values / A1 = non flammable / A2L = mildly flammable / A3 = high flammable



Refrigerant replacement solutions

			New equipment		
Application		Current Refrigerant	Low GWP (<750) Interim Solution	Very Low GWP (<150) Long Term Solution	
 Industrial	Chiller / Condensing unit / DX System	R-448A (1387, A1) ◀ R-449A (1397, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀ CO ₂ (R-744) (1, A1) ◀	
		R-134a (1430, A1) ◀	R-513A (631, A1) ◀ R-515B (293, A1) ◀	R-1234ze (7, A2L) ◀ R-1234yf (4, A2L) ◀	
		R-410A (2088, A1) ◀		R-1234ze (7, A2L) ◀	
	Flooded system	R-134a (1430, A1) ◀ R-717 Ammonia (0, B2L) ◀ R-507A (3985, A1) ◀	R-513A (631, A1) ◀ R-515B (293, A1) ◀	R-1234ze (7, A2L) ◀ R-1234yf (4, A2L) ◀ R-717 Ammonia (0, B2L) ◀ R-1234ze (7, A2L) MT Only ◀	
 Automotive	Air Conditioning	R-134a (1430, A1) ◀ R-456A (687, A1) ◀		R-1234yf (4) (A2L) ◀	
 Transport	Small	R-134a (1430, A1) ◀	R-513A (631, A1) ◀	R-1234yf (4, A2L) ◀	
	Large	R-452A (2140, A1) ◀	R-454A (239, A2L) ◀	R-454C (148, A2L) ◀ R-455A (148, A2L) ◀	
			Existing and New equipment lowest GWP available		
 Very Low Temperature (<-50°C)	Medical Storage Freeze Dryers Test Chambers	R-23 (14800, A1) ◀ R-508B (13396, A1) ◀		R-473A (1831, A1) ◀	

GWP: IPCC4 values / A1 = non flammable / A2L = mildly flammable / A3 = high flammable

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