



COMMONLY USED NON-ODS SUBSTITUTE REFRIGERANTS



ASHRAE Designation	Refrigerant Type	Chemical name	Chemical formula	GWP (100y) ¹	ASHRAE Safety Group Classification ²	HS code (2012)
<i>Single component refrigerants</i>						
R-23	HFC	trifluoromethane	CHF ₃	12 500	A1	2903.39
R-30	chlorocarbon	dichloromethane (methylene chloride)	CH ₂ Cl ₂	9	B1	2903.39
R-32	HFC	difluoromethane (methylene fluoride)	CH ₂ F ₂	704	A2L	2903.39
R-125	HFC	pentafluoroethane	CHF ₂ CF ₃	3450	A1	2903.39
R-1234yf	Unsaturated HFC (HFO)	2,3,3,3-tetrafluoro-1-propene	CF ₃ CF=CH ₂	<1	A2L	2903.39
R-1234ze(E)	Unsaturated HFC (HFO)	trans-1,3,3,3-tetrafluoro-1-propene	CF ₃ CH=CHF	<1	A2L	2903.39
R-134a	HFC	1,1,1,2-tetrafluoroethane	CH ₂ FCF ₃	1360	A1	2903.39
R-143a	HFC	1,1,1-trifluoroethane	CH ₃ CF ₃	5080	A2L	2903.39
R-152a	HFC	1,1-difluoroethane	CH ₃ CHF ₂	148	A2	2903.39
R-600	Hydrocarbon	butane	CH ₃ CH ₂ CH ₂ CH ₃	4	A3	2901.10 ³
R-600a	Hydrocarbon	2-methylpropane (isobutane)	CH(CH ₃) ₂ CH ₃	~20	A3	2901.10 ³
R-290	Hydrocarbon	propane	CH ₃ CH ₂ CH ₃	5	A3	2711.12
R-717	Inorganic compound	ammonia	NH ₃	0	B2L	2814.10
R-744	Inorganic compound	carbon dioxide	CO ₂	1	A1	2811.21

1. Global Warming Potential, WMO Scientific Assessment Report 2014; Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee 2014 Assessment

2. A1 = Lower toxicity, no flame propagation (non-flammable); B1 = Higher toxicity, no flame propagation (non-flammable); A2 = Lower toxicity, flammable; A2L = Lower toxicity, lower flammability; B2L = Higher toxicity, lower flammability.

3. 2901.10 applies only if the concentration of is higher than 95%, otherwise 2711.13 ("Butanes") applies.

ASHRAE Designation	Refrigerant Type	Composition (Composition by %)	GWP (100y) ¹	ASHRAE Safety Group Classification ²	HS code (2012)
<i>Refrigerant blends/mixtures</i>					
R-404A	HFC-containing mixture (non-ODS)	HFC-125/HFC-143a/HFC-134a (44/52/4)	4200	A1	3824.78
R-407A	HFC-containing mixture (non-ODS)	HFC-32/HFC-125/HFC-134a (20/40/40)	2100	A1	3824.78
R-407B	HFC-containing mixture (non-ODS)	HFC-32/HFC-125/HFC-134a (10/70/20)	2800	A1	3824.78
R-407C	HFC-containing mixture (non-ODS)	HFC-32/HFC-125/HFC-134a (23/25/52)	1700	A1	3824.78
R-410A	HFC-containing mixture (non-ODS)	HFC-32/HFC-125 (50/50)	2100	A1	3824.78
R-417A	HFC-containing mixture (non-ODS)	HFC-125/HFC-134a/R-600 (46.6/50/3.4)	2300	A1	3824.78
R-421A	HFC-containing mixture (non-ODS)	HFC-125/HFC-134a (58/42)	2600	A1	3824.78
R-422A	HFC-containing mixture (non-ODS)	HFC-134a/HFC-125/R600a (11.5/85.1/3.4)	3100	A1	3824.78
R-422D	HFC-containing mixture (non-ODS)	HFC-134a/HFC-125/R600a (31.5/65.1/3.4)	2700	A1	3824.78
R-507A	HFC-containing mixture (non-ODS)	HFC-125/HFC-143a (50/50)	4300	A1	3824.78
R-508A	HFC-containing mixture (non-ODS)	HFC-23/HFC-116 (39/61)	12000	A1	3824.78

Prepared by: Ezra Clark/OzonAction

1. Global Warming Potential, Report of the Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee 2014 Assessment; WMO Scientific Assessment Report 2014; 2010

3. A1 = Lower toxicity, no flame propagation (non-flammable)

OzonAction
 United Nations Environment Programme
 (UNEP)
 Division of Technology, Industry and
 Economics
 1 rue Miollis, Building VII
 Paris 75015, France
www.unep.org/ozonaction
ozonaction@unep.org