

What are the different types of refrigerants?

Family name	Examples	Comments
Chlorofluorocarbon (CFC)	CFC-11 CFC-12	Ozone Depleting Substances (ODSs) that have been phased out under the Montreal Protocol since 2010
Hydrochlorofluorocarbon (HCFC)	HCFC-22 HCFC-123	Another group of ODSs group that are in the process of being phased out under the Montreal Protocol by 2030
Hydrofluorocarbon (HFC)	HFC-134a HFC-32	HFCs were introduced in the 1990s as alternatives to CFCs and HCFCs. Most HFCs have higher global warming potential (GWP) values and are now controlled by Montreal Protocol to be phased down to different levels by middle of the century
Hydrocarbon (HC)	HC-290 (propane) HC-600a (isobutane)	HCs are being used as alternatives in various applications. They have very low GWP values
Hydrofluoroolefin (HFO)	HFO-1234yf, HFO-1234ze	HFOs are recently developed chemicals being used as alternatives in various applications. HFOs are also referred to as unsaturated HFCs. They have short atmospheric lifetime and very low GWP values
Blends (HFCs or HFOs/HFOs or others)	R-404A R-410A R-454A R-444B	Blends are widely used nowadays, some are with high/higher GWP values while most recent ones have lower GWP values
Non-organic fluids	R-744 (Carbon Dioxide, CO2) R-717 (Ammonia)	Alternatives that can be used in several applications. They are very low GWP values

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#Refrigerants4Life



World Refrigeration Day

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Refrigerants for Life



What are refrigerants?

Refrigerants are substances used in refrigeration, freezing, cryogenics, and air-conditioning. They absorb heat from one area (i.e. an air-conditioned space) and expel it into another (i.e. outdoors), usually through a phase change process.

Refrigerants should have specific thermodynamic properties to offer the required cooling effect, be easy to manufacture, affordable and compatible with systems' components.

**5.6 billion
air-
conditioning
units in use
by 2050**

Where are refrigerants used?

Refrigerants are used in types of refrigeration, freezing, and air-conditioning applications, for example:

- They are found in domestic appliances, such as air-conditioning units, refrigerators, freezers, and dehumidifiers.
- In the food cold chain, they are used in flash freezers, cold storage facilities, and refrigerated vehicles and containers.
- In medical applications, refrigerators and refrigerated vehicles transport and maintain the potency and integrity of vaccines, blood, samples, and other medical supplies.
- Refrigeration and air-conditioning are vital to research laboratories and for keeping data centres cool enough to function.
- Air-conditioning contributes to thermal comfort on transport and in public and private spaces.

Why are refrigerants so critical?

Refrigeration and air-conditioning are crucial to maintaining our modern way of life. Without them:

**3 billion
refrigeration,
air-conditioning
and heat pump
systems are in
operation
worldwide**

- Food would not be able to be stored for long periods or transported for long distances, causing food insecurity in some urban and remote areas.
 - Blood banks, hospitals, and medical facilities would be unable to perform sufficiently and safely to save lives.
 - Modern telephone and internet services would be unable to function.
- The lack of thermal comfort would make some places uninhabitable or uncomfortable.

Responsible use of refrigerants

Correct management of refrigerants is the responsibility of all including governments, system designers, suppliers, sellers, installers, technicians and owners. Managing refrigerants responsibly means:

- Selecting lower global warming potential refrigerants for new systems and promoting relevant research.
- Using certified companies and individuals who ensure proper training, good practice, and safe use of flammable substances.
- Promoting recovery, reuse, and reclamation of refrigerants, and prohibiting release into the atmosphere.
- Careful refrigerant selection, system design, and management of operation can reduce refrigerant emissions and save energy costs.

**700 million
air-
conditioned
cars in use
globally
today**

Environmental and safety considerations

Most commercially available refrigerants are safe for humans and working spaces. However, they have an impact on the environment by contributing global warming and/or ozone depletion. Alternative refrigerants are available but some have flammability, high-pressure, or toxicity that require proper management.

Newer energy efficient equipment can save owners money and reduce greenhouse gas emissions.

**4m refrigerated
trucks and 600m
m³ of
refrigerated
warehouse
preserves 400m
tonnes of food
per year**

What is an 'R' number?

Refrigerants are numbered with and assigned an R-XXX number in accordance to ASHRAE Standards-34.

The numbers following the letter "R" represent the number of fluorine, hydrogen, and carbon atoms counted through specific formula.

In some cases, the numbers are followed by a small letter like R-134a which represents the molecules' arrangement in a refrigerant. In other cases it is followed by a capital letter which corresponds to the composition and percentage of different refrigerants that make up a blend refrigerant like R-410A.