

Flammable Refrigerants — an overview

FACT FILE



This FACT FILE is based
on AIRAH's Flammable
Refrigerants Safety
Guide 2026

As Australia transitions to refrigerants with lower environmental impact, we are increasingly moving from non-flammable to flammable refrigerants. To enable this transition, we also need to change our safety practices for designing, installing, servicing, repairing and decommissioning systems. The **Flammable Refrigerant Safety Guide** is an industry developed guide that highlights the key issues to address when safely applying flammable refrigerants.

Safety objectives

- ✦ Minimise the possibility of refrigerant leaks
- ✦ Minimise the possibility of air entering the refrigerant circuit
- ✦ Minimise the possibility of ignition of any refrigerant leaks
- ✦ Minimise the severity of the consequences of any ignition
- ✦ Integrate mitigation measures to minimise the formation of flammable mixtures
- ✦ Provide marking and information to warn of flammability hazards.

One of the main ways of reducing risk is by controlling the amount of flammable refrigerant (charge) allowed in any given system, or the amount of refrigerant that can be released from a system.

Refrigerant classification and labelling

Flammable refrigerants are classified differently for system design, storage and handling, and transport.

Design classification – AS/NZS ISO 817 has four classes of refrigerant flammability: Class 1 (No Flame Propagation), Class 2L (Lower Flammability), Class 2 (Flammable) or Class 3 (Higher Flammability). These are based on the flammability potential, the probability of ignition and the potential impact of ignition. The design classifications are used in safety standards (AS/NZS 5149 series and AS/NZS 60335 series) to determine the stringency required for the application. The **ISO 7010 W021 Flammable Material Warning Symbol** is used on appliances and systems.

Storage classification – Flammable refrigerants are classified according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) for hazard classification, information labelling and Safety Data Sheets (SDS). There are two categories of Class 2 Flammable Gases; Category 1A or Category 1B. The **GHS Flammable Gas GHS02 Pictogram** is used in the SDS and for product storage, placarding and manifest purposes at workplaces. An equivalent ADG label is an acceptable alternative to a GHS pictogram (see below).

Transport classification – The Australian Dangerous Goods (ADG) code classifies flammable refrigerants as Class 2 Flammable Gas Division 2.1 dangerous goods and includes requirements for transport and placarding. The **ADG Flammable Gas Class 2 Division 2.1 Label** is used for packaging and placarding for transport.



Figure 6.1.3 Flammable refrigerant labels

Most flammable refrigerants are classed as Division 2.1 Flammable gases under ADG, and as Flammable Gases Category 1A H220 under the GHS. The exception is refrigerant R1234ze(E), which is classified as Lower Flammability A2L by AS/NZS ISO 817 but non-flammable under ADG and GHS.

Refrigerant hazards

All refrigerants can be hazardous if applied or handled inappropriately. Specific hazards from flammable refrigerant and refrigerant handling fall into the following categories:

1. **Flammability hazard** – Flammable refrigerants can present an immediate hazard when released into the air, by forming an explosive atmosphere.
2. **Combustion hazard** – Mixtures of refrigerant, lubricant and air/oxygen, under pressure in systems or when filling cylinders, can also create an explosion hazard due to a variety of mechanisms such as adiabatic heating (diesel type compression ignition) or mechanical heat.
3. **Toxicity hazard** – Toxic refrigerants can present an immediate acute or chronic toxicity hazard when released into the air.
4. **Decomposition hazards** – All flammable refrigerants that contain carbon can decompose to carbon dioxide and carbon monoxide. Decomposition of A1, A2L and A2 fluorinated refrigerants can produce highly toxic substances such as hydrogen fluoride (hydrofluoric acid) and carbonyl halides.
5. **Asphyxiation hazard** – Refrigerants that are heavier or lighter than air can cause suffocation by oxygen displacement, if the concentration is high enough or if released in a confined space.
6. **Pressure hazard** – Sudden unexpected release of pressurised refrigerant can result in personal injury.
7. **Temperature hazard** – When released from high to low pressure, liquid refrigerant will flash and boil to vapour, leading to very low temperatures. This can cause cold burns or frostbite if it contacts skin.

Refrigerant regulations

There are a wide range of laws and other instruments that regulate flammable refrigerants in Australia. Refrigerants Australia has information on the regulatory landscape for flammable refrigerants at its [website](#).

Conversion to flammable refrigerant

A system should not be changed to a replacement refrigerant with a more hazardous AS/NZS 817 Safety Group Classification unless:

- ✚ The system has been re-engineered by a competent refrigeration or air conditioning engineer
- ✚ The required changes to the system have been designed and installed in accordance with AS/NZS 5149 parts 1, 2 and 3 and documented, in accordance with AS/NZS 5149.4
- ✚ Any introduced flammability concerns have been addressed in accordance with AS/NZS 5149 and AS/NZS 3000
- ✚ The system complies with other relevant standards, such as those relating to electrical and gas safety.

Storing flammable refrigerant

Cylinders must conform with AS 4484, AS 2030.1 and AS/NZS 1200, with design pressure ratings, valves and seals that are compatible with a flammable gas. The cylinders should have collars to protect valving and relief devices, and appropriate marking and labelling.

Flammable refrigerant cylinders should be stored outdoors, preferably in a secure cage protected them from sunlight. Storage indoors is not recommended.

AS 4332 sets out the requirements for the storage of gases. Section 2 deals with the storage of gases in minor storage, including flammable refrigerants of Safety Group A2L, A2 or A3, in quantities not exceeding 200L maximum aggregate cylinder water capacity.

The maximum quantity of gas cylinders stored at residential premises must not exceed 50L (water capacity of cylinders) and the storage area should be well-ventilated and free of combustible or waste materials, free of sources of ignition (e.g. electrical power points, lights and switches), out of the sun and away from heat sources.

All gas cylinders should be protected from falling over and secured to prevent theft or tampering. Storage areas should be provided with safety signs and appropriate fire protection.

Transporting flammable refrigerant

Cylinders containing flammable refrigerants must be labelled and transported in accordance with the ADG code (and its amendments). They must be marked with:

- ✚ The proper shipping name for the dangerous goods
- ✚ The United Nations number, preceded by the letters "UN"
- ✚ a GHS flammable gas symbol or ADG red diamond class label.

The ADG code also covers when and how placards—the large hazard signs displayed on trucks, containers, and bulk tanks—must be used during dangerous goods transport. Placards are required on vehicles or containers when the load meets certain thresholds.

Transport in trade vehicles

For transport of up to 250L (water capacity of cylinders) of flammable gas cylinders in tool of trade vehicles:

- ✚ Gas cylinders must not be stored on the transport vehicle near a source of heat
- ✚ The cylinder must be restrained and stowed upright, to ensure the pressure release device communicates with the vapour space

- ✚ The main cylinder valve must be shut, and any regulator removed prior to loading
- ✚ Ventilation is required to prevent the build-up of flammable gas in the event of a leak
- ✚ For enclosed vehicles like vans, station wagons, and utilities with a canopy/cover, one means of providing ventilation is to stow the gas cylinders in a cabinet that is vented externally only, i.e. not into the vehicle
- ✚ In the case of an open tray truck or utility vehicle, gas cylinders need to be in a locked cage for security
- ✚ The vehicle should be fitted with a fire extinguisher, preferably with a rating of at least 30B.

The 250L limit is based on the water capacity of the cylinder, not the quantity of gas held in the cylinder. Empty or partially filled cylinders are considered full for the purpose of calculating the total storage quantity limit. For quantities in excess of 250L (water capacity of cylinders) additional requirements apply – refer to the ADG code.

Use the [Appendix B self-audit tool of the Flammable Refrigerant Safety Guide](#) to assess arrangements for transporting refrigerant cylinders.

Competency and training

Persons working on flammable refrigerant systems must be competent. WHS regulations and AS/NZS 5149 define a competent person as someone who has acquired, through training, qualifications, or experience, the knowledge and skills necessary to perform the task safely.

If you are working on HVAC&R systems using flammable refrigerants, you should undertake training to achieve competence in the safety aspects of flammable refrigerants. This includes site supervisors and managers, maintenance personnel, refrigeration and air conditioning technicians, appliance service mechanics, contractors and engineers.

Training should include:

- ✚ Knowledge of legislation, regulation and standards relating to flammable refrigerants
- ✚ Detailed knowledge of and skill in handling flammable refrigerants, PPE, refrigerant leakage prevention, handling of cylinders, charging, leak detection, recovery and disposal
- ✚ Knowledge of the properties and hazards of flammable refrigerants.

You should continuously maintain your skills and competence by studying relevant updated literature, taking short courses and practical work experience, as appropriate. For technicians and contractors, specific flammable refrigerant units of competency are available through registered training organisations – refer to the Flammable Refrigerants Safety Guide for more information.

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SAFETY GUIDE 2026

This is an extract from the *Flammable Refrigerants Safety Guide*, 2026 edition. Developed by AIRAH, Refrigerants Australia and Refrigerant Reclaim Australia.

The *Flammable Refrigerants Safety Guide* update project is supported by the ARBS Foundation, an ARBS organisation dedicated to funding research and education initiatives that

advance learning and understanding across Australia's HVAC&R and building services industries.



SCAN TO VIEW



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