

Maintenance and Flammable Refrigerants

FACT FILE



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

When we work on systems that use flammable refrigerant, the risk of fire or explosions is higher than during normal operation. This is because the possibility of released refrigerant mixing with air and the presence of potential sources of ignition is greater during service and repair. This fact file covers the practices to undertake maintenance work safely.

Because of the increased flammability risk, significant consequences can arise if appropriate servicing and maintenance or repair practices are not followed. For repairs and maintenance, remove all refrigerant and lubricant from the circuit and flush with oxygen-free nitrogen (OFN) before undertaking any brazing, welding or other hot work.

Temporary flammable zone

Temporary flammable zones are areas where at least some emission of refrigerant is anticipated to occur during working procedures such as refrigerant charging and recovery or when accessing a system.

From the refrigerant discharge point, the temporary flammable zone extends a minimum of 2m in all directions (refer to AS/NZS 60079.10.1) for small systems. The size of the temporary flammable zone should be determined from the refrigerant charge in the system being serviced, the refrigerant discharge rate, and whether the system is indoors or in a well-ventilated area (e.g. outdoors). For example, for a domestic fridge it could be 2m, for a small air conditioner or heat pump it could be 3m, for a larger system with a larger refrigerant charge, greater distances could be required.

Maintenance standard

Systems using flammable refrigerants require regular service and maintenance. This is covered in AS/NZS 5149.4.

The standard requires preventive maintenance to be carried out in accordance with the system maintenance manual. This includes regular leak tests, inspections and checking of the safety equipment. Tools and equipment used during service and maintenance (including, but not limited to, portable detectors, vacuum pumps, tools, cylinders and gauges) must be rated for use with the appropriate refrigerant flammability Class (2, 2L or 3) and be in serviceable condition.

Maintenance manuals

The system instruction manual, provided by the installer as required by AS/NZS 5149.2, must include the maintenance instructions for the entire system with a time schedule for preventive maintenance with respect to refrigerant leakage.

Under AS/NZS 60335.2.40, a service, maintenance and repair manual must be available for appliances using flammable refrigerants. Annex DD outlines the safety-critical information that must be included in manuals for servicing, maintenance, and decommissioning technicians.

The manual must specify the parts of the refrigeration system to be checked – including checks to the refrigerating equipment, refrigerant charge, ventilation arrangements, marking and corrosion, electrical devices and cabling. Manuals must also provide clear instructions for safely removing refrigerant, purging systems with inert gas, and recharging them without contamination.

During servicing and maintenance, technicians must minimise the risk of ignition. This includes using appropriate leak detection methods and ensuring that electrical components are handled safely. Annex DD stresses the need for proper ventilation during any work on the refrigerant circuit and training and competence in handling flammable refrigerants.

When decommissioning an appliance, technicians must follow procedures that ensure all refrigerant is safely removed and the system is properly labelled. They must comply with local disposal regulations, and handle any components that could pose a hazard with care.

In-service leakage inspection

In-service leak inspections allows the technician to find and fix small leaks before they lead to complete loss of refrigerant charge.

The technician should complete a visual inspection of the system, a diagnostic analysis of the system operating parameters, and a leak inspection of the system using a leak detector. In the absence of instructions in the operating manual, follow the recommended frequency of in-service leakage inspections of AS/NZS 5149.4.

SYSTEM TYPE /REFRIGERANT CHARGE	INSPECTION FREQUENCY
Self-contained systems, unitary systems	After repair or when leakage is suspected
Hermetic systems ≤ 6kg refrigerant charge	Every 12 months
All other systems ≤ 3kg refrigerant charge	After repair or when leakage is suspected
All other systems > 3kg ≤ 30kg refrigerant charge	Every 12 months
All other systems > 30kg ≤ 300kg refrigerant charge	Every 6 months
All other systems > 300kg refrigerant charge	Every 3 months
Stored refrigerant in cylinders	Every 3 months

AS/NZS 5149.4 Recommended in-service leakage inspection frequency

Pre-service safety

Before any maintenance, ensure that the immediate area is suitable for working safely and the appropriate precautions are in place for a temporary flammable zone. Be aware that the system might have been incorrectly charged or incorrectly labelled – complete an assessment to confirm the type and classification of the installed refrigerant.

Gaining access to a system

Under no circumstances should a system be broken into by cutting or breaking pipework if it contains any flammable refrigerant or any other gas under pressure. Consider the following:

- ✦ In the absence of servicing ports, tube piercing valves can be used to gain access. This should be followed by leak detection to ensure refrigerant does not leak around the pierced tubing. Tube-piercing valves should be removed before finishing service. It is generally preferable to remove the entire refrigerant charge in case of unexpected failures.

When isolating an affected section without removing all refrigerant, such as in the case of a pump down, take care to ensure that air does not leak into the system (via leakage points), creating a mixture of refrigerant, oil and air, and an explosion or flammability hazard.

- ✦ If refrigerant has been removed, the system should be flushed with OFN. Although there will always be some residual refrigerant left within the system, flushing can eliminate the risk of flash fire by diluting residual refrigerant below the LFL. Depending on the circumstances such as charge size and specific purging method, this process might need to be repeated several times.
- ✦ If brazing or de-brazing operations are to take place on the pipework, OFN should be flushed through the system both before and during the process.
- ✦ Due to the possible explosion hazard, compressed air or oxygen must not, under any circumstances, be used for flushing, pressure testing or filling the system.

Where possible, use cold connection technologies instead of brazing if there is a likelihood that residual flammable refrigerant is present.

Refrigerant recovery

Recovery and disposal of scheduled refrigerant by a licensed technician at the end of its useful life is mandatory. With the right equipment, non-scheduled A2L and A3 refrigerants are also readily recovered.

A2L, A2 and A3 refrigerant must be recovered into refrigerant-specific cylinders with the correct design pressure ratings and with valves and seals that are compatible with flammable gas. Flammable refrigerant recovery cylinders are fitted with left-hand valves (tighten anticlockwise) and a red ring around the collar. Non-flammable A1 refrigerant cylinders are fitted with right hand valves (tighten clockwise). All tools and equipment used for recovery must be suitable for flammable refrigerants and not have any potential sources of ignition.

A ventilation fan should be used when working inside if there is insufficient natural ventilation, or when working in a confined space. A dry powder or CO₂ fire extinguisher should be available at the location.

An electronic refrigerant gas detector suitable for detecting the type of flammable refrigerant should be used to monitor the air in the work area.

Hoses, fittings and procedures used during recovery should minimise the loss of refrigerant.

Cylinders used for recovery must conform with AS 4484, AS 2030.5 and AS/NZS 1200. The recovery cylinder must be appropriate for the refrigerant being recovered and be clearly labelled to identify the type and quantity of refrigerant. Refrigerants of different safety groups (e.g. A1, A2L, A2, and A3) must not be mixed in recovery cylinders.

Before permanently opening the valves to recover refrigerant, leak test all hose connections. Take care to ensure that air does not get into the cylinder (via leakage points), creating a potential explosion or flammability hazard. Weigh cylinders carefully during the transfer of the refrigerant. Do not exceed the safe fill capacity of the refrigerant at a reference temperature of 65°C.

Scheduled refrigerants in mixtures must be recovered by a licensed technician, and it is an offence to knowingly vent them to atmosphere. There are four pathways for recovered refrigerant as detailed in AS/NZS 5149.4: reuse, recycling, reclamation or disposal.

Refrigerant venting

AS/NZS 5149.4 requires that venting any refrigerant to atmosphere must be avoided, except for R744 (CO₂). Venting of scheduled refrigerants (including R22, R410A, R134a, R404A and R32) is prohibited in Australia.

Controlled venting of non-scheduled refrigerants may be permitted when complying with applicable environmental and WHS/OHS legislation. Adopt a risk assessment process with control measures before controlled venting.

Venting non-scheduled A2L refrigerants

Non-scheduled A2L refrigerants such as R1234yf and R1234ze are readily recoverable. Some A2L refrigerants are being investigated in relation to their links to environmental pollutants such as trifluoroacetic acid (TFA) and per- and polyfluoroalkyl substances (PFAS). Venting of any refrigerant that degrades to TFA should be avoided.

Indoor venting of A2L refrigerant is not recommended, as the formation of a large hazardous area can occur, in which there might be ignition sources. If outdoor venting of A2L refrigerant is unavoidable, the controlled venting procedures for A3 refrigerants should be followed.

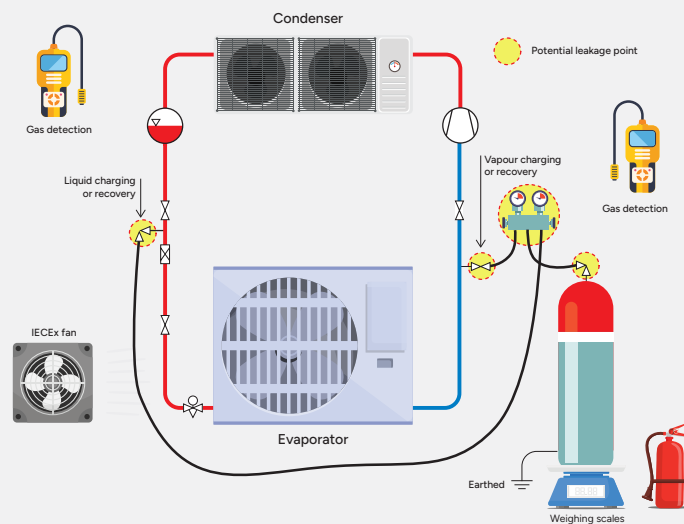
Venting A3 hydrocarbon refrigerants

Indoor venting of A3 refrigerants is extremely hazardous and should be avoided. It is unlikely that indoor venting can be carried out without creating a hazardous explosive atmosphere.

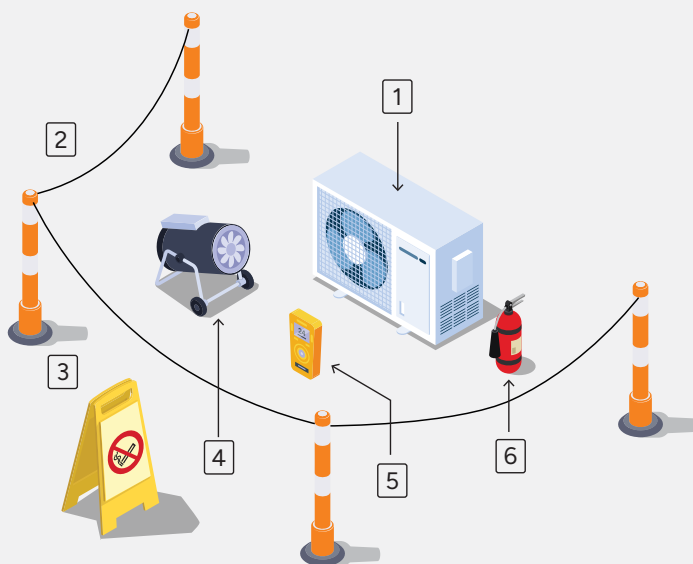
Venting flammable refrigerants outdoors can create an explosive atmosphere in the immediate vicinity of the discharge point. The extent of the danger area depends on the amount of refrigerant released and the effect of air movement around the release.

The following procedures for controlled venting should be applied:

- ✦ Venting must only be done outdoors, above ground level, in a well-ventilated location with a discharge point that is at least 3m away from buildings and other obstructions.
- ✦ Venting should be carried out at a refrigerant discharge rate that ensures a hazardous explosive atmosphere will not be generated within 3m of the discharge point.
- ✦ Make sure no ignition sources are present or in electrical equipment used during venting operations.
- ✦ Use a hose compatible with the refrigerant and oil to vent the refrigerant at least 1m above ground level to help it disperse and dilute in the air.
- ✦ Beware of hazardous areas near hose connections and make sure all connections are tight before starting work.
- ✦ Ensure that the refrigerant will not be blown into any adjacent buildings, and that it has no way of sinking below ground level (such as into drains and basements) or migrating into confined spaces.
- ✦ Do not vent to a public area or an area where people are not aware of what you are doing – appropriate signage must be positioned close to the hose discharge.

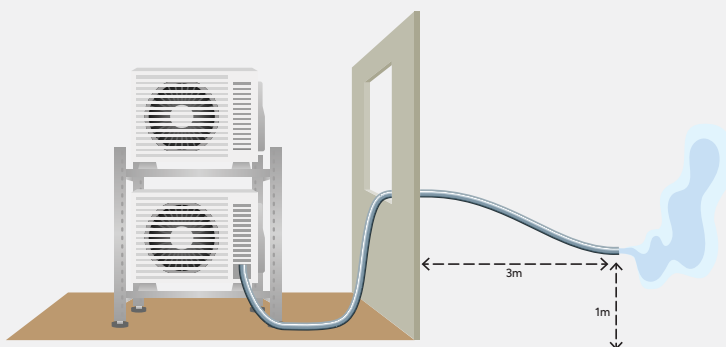


Potential leakage points



Pre-service safety

1. Unit being worked on – containing flammable refrigerant
2. Temporary flammable zone – safety exclusion zone
3. Safety warning signs – Warning, Danger, Restricted Access, No Smoking, No Mobile Phones
4. Ventilation fan – IECEx Certified fan or equivalent
5. Refrigerant gas detector – suitable for use with flammable refrigerants
6. Fire extinguisher – CO₂ or powdered dry type



Venting flammable refrigerant

Flammable Refrigerants

SAFETY GUIDE 2026

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SCAN TO VIEW



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