

Installation with Flammable Refrigerants

FACT FILE



This FACT FILE is an
excerpt taken from
AIRAH's Flammable
Refrigerants Safety
Guide 2026

This fact file explores the installation rules for air conditioning and refrigeration systems that use flammable refrigerants. Installing contractors and technicians must ensure, so far as is reasonably practicable, that the equipment they install and commission is safe and that work onsite is carried out in a safe manner.

Electrical installation safety

The person in control of the installation must ensure that any hazardous areas are assessed and classified in accordance with Clause 7.7 of AS/NZS 3000. This refers to the hazardous area classification standard AS/NZS 60079.10.1.

As a guide, most large stationary systems using flammable refrigerants need to comply with AS/NZS 60079.10.1 and AS/NZS 60079.14. The AS/NZS 60079 standards are not applied to domestic premises or small refrigerant systems.

Standards

Standards play an important role in helping installers of plant to discharge their safety duties under environmental, electrical safety and WHS/OHS legislation. Detailed installation guidance can be found in referred Australian Standards such as AS/NZS 5149.

Electrical safety standards, such as AS/NZS 60335.2.40 on air conditioners and heat pumps, and AS/NZS 60335.2.89 on commercial refrigerating appliances and cool rooms, instruct manufacturers on what must be addressed and included in the appliance installation instructions.

Temporary flammable zone

A temporary flammable zone is an area where emission of refrigerant is anticipated to occur during common working procedures, such as installing a system or refrigerant charging. They occur when hoses are connected or disconnected or when cutting into a system that has been emptied of flammable refrigerant.

Key control measures for managing the risks within temporary flammable zones include:

1. Use safe work procedures to minimise emissions of flammable refrigerants.
2. Use flammable refrigerant detection systems, before, during and after the maintenance work.
3. Control access to and around the system – restrict access to the area, cordon off the system, and inform other people in the area.
4. Use natural and mechanical ventilation systems to dilute any flammable refrigerant atmosphere before, during and after the work.
5. Temporarily eliminate ignition sources from the hazardous area – de-energise the area.
6. Use intrinsically safe (or flameproof) refrigerant handling equipment.
7. Relocate flammable and combustible materials that could contribute to a fire load.
8. Ensure all equipment used is calibrated and maintained in accordance with the manufacturer's instructions.

Technicians and contractors need to action this during installation, including the creation of a temporary flammable zone and refrigerant detection before, during and after work.

Installation of systems

For AS/NZS 5149 systems, installation procedures must comply with AS/NZS 5149.2 and AS/NZS 5149.3.

AS/NZS 5149.2 covers system installation including construction requirements, testing and marking. It applies to new systems and modifications of existing systems (including the conversion of a system to another refrigerant type), but not to systems that are relocated. Class A3 and B3 flammable refrigerants attract the highest stringency requirements. Class 2L refrigerants must comply with the same requirements as Class 2 refrigerants unless specifically excluded or varied and relaxed in the standard. There are several areas in AS/NZS 5149.2 where these stringency reductions have been amended (removed) for Australian/New Zealand use.

Tools and equipment used during the installation process (including, but not limited to, portable detectors, vacuum pumps, tools, cylinders and gauges) must be suitable for use with the appropriate refrigerant flammability Class (2L, 2 or 3) and be in serviceable condition.

Construction

AS/NZS 5149.2 contains technical detail about system construction. Installation work must only be undertaken by competent personnel, or trainee personnel working under appropriate supervision.

The installer should ensure that all piping used is selected and applied in accordance with AS/NZS 1571 and AS 4041 as applicable and is delivered clean and sealed from the ingress of foreign matter. Refrigerant pipe must not be installed where it can be walked on or mechanically damaged, unless protected. Pipe should be cut with a pipe cutter with the opening facing down and be de-burred. Oxygen-free nitrogen should be passed through the system to remove any oxygen before and during brazing or silver soldering joints.

Pipework must be fixed and supported at regular intervals according to the outside diameter. The maximum spacing for supports should not exceed the recommendations of AS/NZS 5149.2 Table 5 and 6. The clearance around the piping must allow routine maintenance of insulation, vapour barrier, and components, the checking of pipe joints and repairing of leaks. No valves or detachable joints can be located in areas accessible to the general public.

Copper pipe supports

Outside diameter (mm)	Support spacing (m)
15–22	2
>22–<54	3
>54–67	4

Steel pipe supports

Nominal bore (DN)	Support spacing (m)
15–25	2
32–50	3
65–80	4.5
100–175	5
200–350	6
400–450	7

These are recommended maximum spacings. Additional support might be needed to account for components, vibration and thermal expansion, as specified by the designer or manufacturer.

ISO 14903 specifies type test requirements to prove the tightness level of jointing systems. Flare connections must be kept to the practical minimum. For single-flare connections of copper tubes, apply the torque and conditions outlined in AS/NZS 5149.2 Table 4 or the manufacturer's instructions. Install compression/crimped fittings following the manufacturer's instructions.

Pressure relief devices

Pressure relief devices must be mounted on, or in proximity to, a pressure vessel or other parts of the system that require protection. They must be easily accessible and be connected above the level of liquid refrigerant. Discharges must be directed into a safe place which is well ventilated and clearly identifiable from a safe distance, alerting people to the potential release of flammable gases.

System tightness testing

Before the plant is charged with refrigerant, the system must be leak tested using the tightness test. Refrigerant must not be put into a system for the purposes of on-site tightness testing. Major components and sub-assemblies that have already been factory tested for tightness in accordance with the applicable standard do not need to be re-tested on site. The test pressure must be at the system maximum allowable pressure (PS) for that section. All leaks found must be repaired and the system re-tested.

Machinery rooms

Under AS/NZS 5149.3, machinery rooms or special enclosures have requirements for flammable refrigerants. This includes the number and opening of doors, fire resistance of walls, tightness, refrigerant detection and alarm, and minimum airflow or ventilation rates.

Ventilation must be provided, both for normal operation and for emergency. An independent emergency mechanical ventilation system must operate in the event of a refrigerant leak, initiated via the refrigerant detector if one is required in the room. An emergency ventilation start switch must be provided inside and outside the room.

Appropriate refrigerant detectors must be provided when the allowable charge specified in AS/NZS 5149.1 can be exceeded for the installation. This can occur in plantrooms designated as special machinery rooms if the charge of refrigerant is above the practical limits. Where the refrigerant concentration can exceed the practical limit or RCL (20% of LFL), or a flammable atmosphere can exist at any location, the requirements for hazardous areas apply.

Detectors must at least actuate an alarm and start the emergency mechanical ventilation.

Fixed detection systems

Fixed detection systems should be installed at suitable locations that take into account the types of activities and points of the system where leaks might be expected to occur, such as around the installation or loading areas and public spaces. The ideal detector locations are also influenced by the physical and chemical properties of the airborne contaminant (the refrigerant) and the application, for example:

- ✦ The density – is the refrigerant heavier than air?
- ✦ Any effect of ventilation on gas movement?
- ✦ The safety characteristics – is the flammable refrigerant toxic or an asphyxiant?
- ✦ The likely operating and release temperature of any leaked refrigerant.

AS/NZS 60335.2.40 installation

AS/NZS 60335.2.40 mandates that the manufacturer performs the refrigerant charge calculations and that the installation instructions clearly show the resulting minimum floor area into which the air conditioner can be installed. AS/NZS 60335.2.40 Annex DD outlines the safety-critical information that must be included in manuals for installation.

The annex emphasises the importance of understanding the refrigerant charge and how it relates to the room size and ventilation requirements. Technicians must ensure that pipework is installed securely and with minimal length, avoiding unventilated spaces unless specific conditions are met. If additional refrigerant charge is required during installation, the manual must clearly explain how to calculate and label the total charge, including any field-installed components.

The annex also requires technicians to be aware of the location and function of safety shut-off valves and leak detection systems. These components are critical for limiting the amount of refrigerant that could be released into a space in the event of a leak. Technicians must follow instructions for placing these devices correctly and verifying their operation. In cases where remote refrigerant sensors are used, the manual must specify their installation location and how to test them.

For matched units that have been factory tested, only the interconnecting pipework, joints and fittings installed onsite need to be leak tightness tested.

Refrigerant charging

Before charging a system with a flammable refrigerant, ensure that the immediate area (deemed a temporary flammable zone) is suitable for working safely and the appropriate precautions are in place. This should include an assessment of the area for ventilation, sources of ignition, fire hazards, fire safety equipment and include the use of refrigerant detection equipment and PPE.

Charging procedures

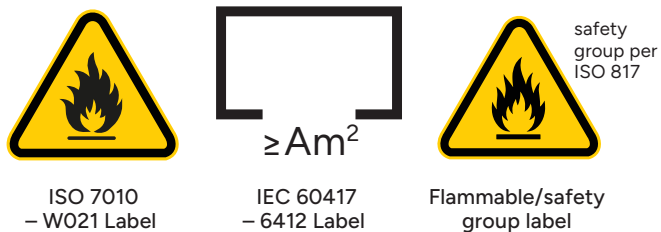
Refrigerant must be weighed in and out of the system using sufficiently accurate scales. System refrigerant charge limits must not be exceeded.

Earth the system and cylinder before charging. This is critical when the cylinder is electrically isolated by the scales or insulating materials. Refrigerant cylinders should not be connected to a system that is at a higher pressure or temperature, to prevent refrigerant backflow.

All charging must be carried out in accordance with AS/NZS 5149.4. Pure refrigerants can be charged as a vapour or liquid, but refrigerant blends can only be charged as a liquid. Hoses, fittings and procedures used during charging should be those which minimise the loss of refrigerant, i.e. hoses as short in length and small in diameter as possible with suitable fittings. Connections should be leak-tested before permanently opening the cylinder valve.

Marking, labelling and documentation

For appliances, marking must be in accordance with Section 7 of the applicable standard, AS/NZS 60335.2.24, AS/NZS 60335.2.40, AS/NZS 60335.2.89. The labels must be clearly identifiable when the equipment is installed and operating. AS/NZS 60355.2.40 also requires that the flammable material symbol (ISO 7010-W021 Label) with a minimum height of 30mm, also includes the AS/NZS ISO 817 safety group of the refrigerant (i.e.. A2L, A2 or A3). The class of the refrigerant (A2L, A2 or A3), must be placed within sight of where the refrigerant number is marked on the appliance.



For AS/NZS 5149.2 system compliance, a clearly readable identification plate must be located near or on the system. This indicates the installer or manufacturer name, model and serial number, year of manufacture, the installed refrigerant R number and charge, the maximum allowable pressure (high- and low-pressure sides) and the flammable material symbol (ISO 7010 W021). Interconnecting refrigerant pipework should be marked with a flammable material label every 2m where the pipework is visible. The installing contractor must ensure labelling requirements are satisfied.

The manufacturer or installer must supply an adequate number of instruction manuals and provide safety instructions in accordance with AS/NZS 5149.2. They must also supply a logbook for all systems with a refrigerant charge over 3kg.

System commissioning

AS/NZS 5149.2 requires a final inspection of the system and the verification of all safety devices. Piping and components must be verified to be installed as indicated on the design documentation. The completed system must be inspected in accordance with Annex A of AS/NZS 5149.2.

Installation checklists

Appendix A of the [Flammable Refrigerants Safety Guide](#) contains checklists that outline the issues to address when installing flammable refrigerant based systems. These include high wall split system air conditioners, ducted split systems, coolrooms and plantroom-based refrigeration systems.

Please note, installers need access to, and a thorough working knowledge of, the relevant standards to achieve full compliance.

