

This fact sheet explores the rules for the installation of A2 and A3 flammable refrigerants in stationary air conditioning and refrigeration systems. The content is based on the *Flammable Refrigerants Safety Guide* (the guide) as published in July 2013. Separate fact sheets cover system design and system operation and maintenance.

# Installing systems with flammable refrigerants

## System conversions

Flammable A2 or A3 refrigerants are not a suitable “drop-in” replacement for non-flammable A1 refrigerants, system conversion is usually required. When converting an existing A1-refrigerant-based system to use an A2 or A3 refrigerant:

- the converted system must comply with all applicable standards and regulations
- the technician must be trained to safely handle the refrigerant
- and both the equipment manufacturer and flammable refrigerant manufacturer should be contacted for their advice on the application, including on warranties

Any conversion that is not implemented in the correct way is unsafe.

## Installation checklists

Installers should use the checklists in Appendix A of the guide, which outline the steps and issues that need to be addressed by installers for conversion or new installation of high-wall split systems, cool room systems and plantroom-based systems. Installation work should always be in compliance with AS/NZS 1677.2.

## Temporary flammable zones

Can arise during system installation and maintenance activities. A “temporary flammable zone” is an area where at least some emission of refrigerant is anticipated to occur during the normal working procedures, e.g. refrigerant charging and recovery, typically where hoses may be connected or disconnected. The requirements for Zone 2 in AS/NZS 60079.14 apply. Prevention of ignition sources and provision of adequate ventilation to disperse any gas leaks are critical safety factors.

## Ventilation

Ventilation is a key consideration in the assessment of risk posed by a flammable refrigerant application. Ventilation should safely disperse any released refrigerant, preferably to the outside. Note that where there is a “jet” release, the use of ventilation will not eliminate a hazardous area close to the source of the jet.

## Sources of ignition

There must be no potential sources of ignition associated with, or in the vicinity of, the equipment. Systems should not be installed or located in areas that have naked flames present, e.g. areas with gas cook-tops and ranges, gas water heaters and gas or wood-fired room or space heaters.

## Pooling risk

The pooling risk from leaked refrigerant in refrigerated coolrooms is lessened by the usual practice of running the evaporator fans continuously, even on the refrigeration system off-cycle. The risk can be further reduced by the system automatically doing a “pump-down cycle” whenever the refrigeration system is off, or, in the case of freezer rooms, when the evaporator is in defrost mode. The liquid line solenoid valve that controls the pump-down cycle should not be located at the evaporator inlet. To further minimise risk it should be outside the coolroom to minimise the risk further.

## Labelling

The installing contractor who charges the system must ensure that all units containing flammable refrigerant are marked with a visible and clearly identifiable red diamond class label. Where units must also carry the international symbol ISO 7010 W021, both labels need to be applied. Interconnecting refrigerant pipework should be marked with the red diamond class label every 2m where the pipework is visible or in a ceiling space or void which a person may access for maintenance or repair work.



Australian class label



ISO 7010 W021 symbol

## Pipe work

Joints should be minimised where possible and installers should use brazed or permanent mechanical joints. Serviceable-type joints such as flare nuts must not be used in the occupied space or in any area where leaked refrigerant could pool. Piping should be enclosed or protected to avoid mechanical damage.

**Significant consequences may arise if you, as an installer, fail to properly address safety considerations. Further information can be found on all of these topics in the *Flammable Refrigerants Safety Guide*, available for free download from [www.airah.org.au](http://www.airah.org.au)**

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## Detector locations

Ideal gas detector locations are influenced by the physical and chemical properties of the refrigerant. The installer should consider:

- Density, is the refrigerant heavier than air?
- Ventilation, and its effect on gas movement,
- Safety characteristics, is the refrigerant flammable; toxic; or an asphyxiant?
- The likely release temperature of any leaked refrigerant.

## Cylinders

Cylinders for storage and transport should be suitable for use with flammable refrigerants and have collars to protect valving and relief devices. Storage of A2 and A3 cylinders in quantities not exceeding 500 litres (empty, full or combined) is classed as minor storage and can be in accordance with Section 2 of AS 4332; for larger quantities the full requirements of the standard will apply (see Table 11.2 of the guide).

The maximum quantity of gas cylinders stored at residential premises must not exceed 50 litres and the storage area should be:

- Well ventilated and free of combustible or waste materials.
- Free of sources of ignition such as electrical power points, lights and switches, electric motors and like equipment.
- Out of the sun and away from sources of heat.

Protect all gas cylinders from falling over and secure them to prevent theft or tampering. Storage areas should be provided with safety signs and appropriate fire protection. See Section 11 of the guide.



## Transporting refrigerants

Cylinders containing flammable refrigerants must be labelled and transported in accordance with the Australian Code for the Transport of Dangerous Goods by road or rail (ADG Code). Gas cylinders must be marked with:

- The proper shipping name for the dangerous goods
- The United Nations number, preceded by the letters "UN"
- a class label (red diamond).

The following minimum ADG Code requirements apply for transport of up to 250 litres of flammable gas cylinders:

- Gas cylinders must not be stored on the transport vehicle near a source of heat.
- The cylinder must be stored upright so 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 which has a preferable rating of at least 30B.

For larger quantities additional requirements apply, see ADG 7. Unodourised flammable refrigerant, including recovered refrigerant that has suffered from odourant fade, should not be transported in an enclosed vehicle or stored in an enclosed space, regardless of the quantity.

Use the Appendix B self-audit tool of the guide for assessing your particular arrangements for transport of refrigerant cylinders.

## Training

Installers should be competent in all safety aspects of flammable refrigerants and meet local jurisdiction requirements for restricted electrical licensing. See Section 10 of the guide.

## Licensing

**An ARCTick licence is required for any person to work with HCFC or HFC refrigerants.** Specific licencing requirements for A3 refrigerants apply in Queensland. See Section 2 of the guide.

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