



Quick Start Guide – Design of A2L Refrigerant Systems

This short guide aims to get you started on the design of an A2L refrigerant system. It enables you to follow a risk assessment-based approach by highlighting the standards which should be followed to design safe systems.

A2L Refrigerants

The table below shows how refrigerants are classified for safety:

	Lower toxicity	Higher toxicity
Higher flammability	A3	B3
Lower flammability	A2L	B2L
No flame propagation	A1	B1

Combustion can occur if a flammable refrigerant leaks into air and there is a source of ignition such as a naked flame. Compared to A3 refrigerants such as hydrocarbons, A2L refrigerants have a higher LFL (lower flammability level) and are more difficult to ignite. Charge limits are based on LFL, so a greater charge size is allowed for A2Ls compared to A3s.

A2Ls include single substances such as R32 and R1234ze and blends such as the R454 and R455 series of refrigerants.

Standards

There are standards which cover the design, application, installation, and operation of RACHP systems:

- Product or vertical standards apply to a specific product type (e.g., appliances or split AC systems).
- System or horizontal standards are general and can apply to a range of system types.

Where there is a product standard for the system then this is the standard which must be followed. The scope of all standards should be studied carefully to ensure the correct standard is applied.

Standards are written and revised by a European or international panel of industry experts. The revision cycle is typically 5 years, so not all the refrigeration standards cover A2Ls to the same extent. BRA members participate represent the UK industry on standards committees.



Standards for the Design of A2L Systems

Standards underpin a risk assessment-based approach to system design. They specify how to reduce risk as much as possible, then how to deal with residual risk by protection and warning. For example, for A2L refrigerants the standards specify:

- System design and construction to minimise leak potential.
- Charge limits, where necessary, to avoid the risk of reaching a flammable concentration in the event of a leak.
- How to avoid ignition of flammable refrigerant by electrical devices on the system.
- When to fit a refrigerant detection system and what it should activate.
- How to warn users.

The table below shows the standards which are applicable to A2L refrigerant systems:

System type	Applicable standard
Cold room + condensing unit	EN 378 ¹
Central plant	EN 378
Chiller	EN 378
Split / multi split / VRV / VRF type systems	IEC 60335-2-40 ² which will be transposed into an EN standard (EN 60335-2-40)
Appliance	IEC 60335-2-89 ³ . EN 378 for larger charge sizes.

You must ensure you have the latest version of the standard.

Pressure Equipment (Safety) Regulations, PE(S)R

Under the PE(S)R, A2L refrigerants are classified as group 1 fluids (“dangerous”) whereas A1 refrigerants are group 2 (“other”). A2L systems which are the same size and have the same PS as an A1 system are likely to be in a higher PED hazard category. The effect of this is that smaller systems which might have been exempt from the PED when on A1 refrigerants are now in hazard category 2 or higher when on A2Ls. The installer (manufacturer) will need to demonstrate compliance with PE(S)R and have the system assessed by an Approved Body.

Further Information

This document should get you started on the design of your A2L system. The relevant FETA Guide will provide more detailed information and you should also read the appropriate standard.

Note – this should be the process you adopt whatever the refrigerant!!!

¹ EN 378 Refrigerating systems and heat pumps. Safety and environmental requirements.

² IEC 60335-2-40 Household and similar electrical appliances. Safety. Particular requirements for electrical heat pumps, air-conditioners, and dehumidifiers

³ EN 60335-2-89 Household and similar electrical appliances. Safety. Particular requirements for commercial refrigerating appliances with an incorporated or remote refrigerant condensing unit or compressor