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Quick Start Guide – A2L Refrigerant Systems – Retail Cabinets

This short document provides an example of the application of an A2L refrigerant in compliance with EN 378¹. You must read this in conjunction with the Quick Start Guide – Design of A2L Refrigerant Systems and EN 378. There are documents with other examples, including large and small cold rooms.

Retail Specification

The example system will run on R454A. It is cooled by a remote pack located outside the building with a charge of 35 kg R454A.

- Access category is a (general access)
- Equipment location is II (compressors and receivers outside or in a machinery room) and that there are no below ground areas;
- System is not a sealed system;
- The pipe work passes through the warehouse;
- Shop floor size is 275 m² x 2.8 m high.
- Warehouse size is 52 m² x 2.8 m high (volume = 145.6 m³).

Maximum Charge

In accordance with EN 378-1 Table C.2, the maximum charge for access category a, other applications and plant location II is:

20% x LFL x room volume, and not more than m₂ x 1.5

or

According to C.3 (risk management) and not more than m₃ x 1.5.

C.3 includes construction requirements and possible other measures dependent on the concentration in the room in the event of a leak of the whole charge into that room (Conc).

For R454A:

$$\text{LFL} = 0.278 \text{ kg/m}^3$$

$$m_2 \times 1.5 = 26 \times 0.278 \times 1.5 = 10.8 \text{ kg}$$

$$m_3 \times 1.5 = 130 \times 0.278 \times 1.5 = 54.2 \text{ kg}$$

The charge for this system exceeds 10.8 kg but not 54.2 kg, so the requirements in C.3 are followed. This means there are construction requirements.

To determine if additional measures are required Conc needs to be calculated for both the shop floor and the warehouse.

Warehouse:

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

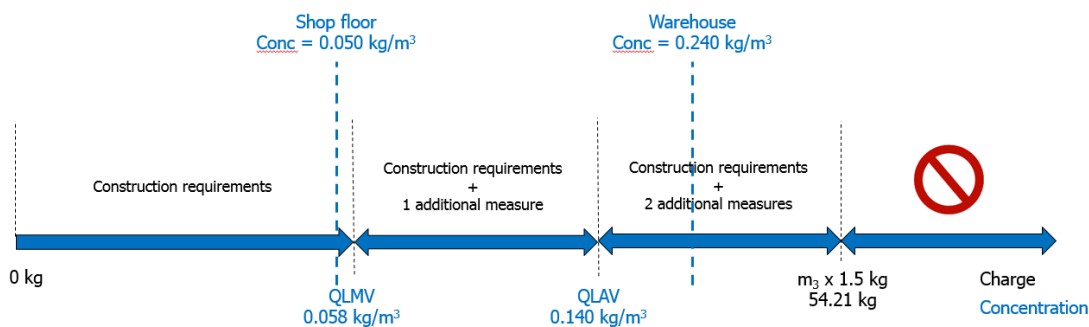


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$$\text{Conc} = \frac{\text{charge}}{\text{volume}} = \frac{35}{145.6} = 0.240 \text{ kg/m}^3$$

Shop floor, the floor area is greater than 250 m² so the volume is calculated assuming the area is 250 m²:

$$\text{Conc} = \frac{\text{charge}}{\text{volume}} = \frac{35}{250 \times 2.8} = 0.05 \text{ kg/m}^3$$



As shown in the diagram above Conc is above QLAV (quantity limit with additional ventiation) so two additional measures are required in the warehouse. The simplest measures would be a detector and alarm plus mechanical ventilation. The alarm must provide a warning (audible and visible) at least inside the warehouse.

Conc is below QLMV (quantity limit with minimum ventiation) on the shop floor so no additional measures are required (construction requirements must be followed). However, the diagram shows that a small increase in charge will increase Conc to above QLMV and at least one additional measure would be needed on the shop floor.

Note – this example does not include cold rooms on the pack. See Quick Start Guide – A2L Refrigerant Systems – Examples 1 and 2 for the maximum charge sizes of cold room.

Further Information

This document provides one example of an A2L system. The relevant BRA Guide **xxxx** will provide more detailed information and you should also read the appropriate standard.

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