

**Further uptake of flammable refrigerants, especially
those of safety class A3, for various applications**

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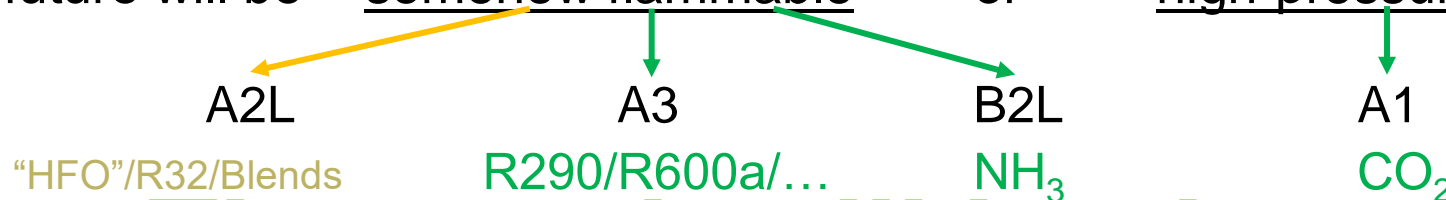
Consequences resulting from EU regulatory requirements

Major obligations from existing EU F-Gas Regulation No. 517/2014:

- Phase down of HFC refrigerants until 2030
- Prohibition for placing certain products (using HFC refrigerants) on the market
- Regular leak checks by certified persons for equipment using HFC refrigerants, + provision of leakage detection systems (for systems with higher charges)
- Reporting for manufacturers and importers

Result:

- The use of HFC refrigerants of safety class A1 (“non-flammable”) is dramatically limited.
- The future will be “somehow flammable” or “high-pressurized”



The result will be the same

EU Standardization Request on Flammable Refrigerants

Standardization Request M/555 - Outcome

- Technical Specifications for the safe installation of equipment using flammable refrigerants (in particular of safety class A3)
 - in view of ensuring safety during installation and operation (operation includes servicing and decommissioning)
 - extending charge size limits and describing associated risk mitigation measures (considering the “whole lifetime”)
 - specifications for rooms/places in which equipment is installed

Results:

- CEN/TS 17606:2021 - Installation of refrigeration, air conditioning and heat pump equipment containing flammable refrigerants, complementing existing standards
- CEN/TS 17607:2021 - Operation, servicing, maintenance, repair and decommissioning of refrigeration, air conditioning and heat pump equipment containing flammable refrigerants, complementing existing standards

EU Standardization Request on Flammable Refrigerants

Standardization Request M/555 – Outcome: CEN/TS 17606 & CEN/TS 17607

→ Does this outcome satisfy the needs of the evolving market?

- No – the Technical Specifications are only one step.
- The “major part” of the needed changes in standards is part of the work program of several TC’s:
 - CEN/TC 182: EN 378 series of standards – Full Revision
Updates of EN 378 are to be started this year (formal start of work item)
 - CEN/TC 413: Development of a new standard EN 17893 for
Thermal Road Vehicles - Safety Standard for temperature-controlled systems using
flammable refrigerants for the transport of goods - Requirements and risk analysis process
 - CENELEC/TC 61: New editions / amendments of the EN IEC 60335-2-40 & -2-89 standards on
“air-conditioners & heat pumps” and “commercial refrigeration appliances”

Current activities – Refrigerating systems using flammable refrigerants

Focus on EN 378 series of standards – discussion on the following topics

- EN 378-1: new structure and remarkable changes concerning
 - refrigerant charge limits
 - additional options to qualify refrigerating systems using class A3 refrigerant for several applications / location classifications
- EN 378-2: consideration of the following new aspects
 - evaluation of vibration load, especially for refrigerant piping
 - requirements for integral ventilation for specific systems / appliances
 - requirements for leak detection initiating specific safety measures
- EN 378-3: reconsidering aspects for installation sites, mainly in the occupied space and synchronization between EN 378 series & EN 14624 on requirements for leak detectors

Current activities – Refrigerating systems using flammable refrigerants

Focus on EN 378 series of standards – the most challenging details

- EN 378-1: refrigerant charge limits
 - additional options to qualify refrigerating systems using class A3 refrigerant for several applications / location classifications with the aim of allowing higher charge limits – which additional measures shall be taken?
 - strictly related to individual types of appliances / refrigerating systems
- EN 378-2: consideration of vibration load and similar operational loads
 - enhanced tightness / improved tightness
 - “durably technically tight” systems

Summary:

the manufacturer shall draw up a risk assessment and consider all relevant aspects.

Current activities – Refrigerating systems using flammable refrigerants

The manufacturer shall draw up a risk assessment and consider all relevant aspects details

→ this is needed anyway for most types of refrigerating systems

- This is required by most of the for refrigerating systems relevant legislations in the EU, e. g. according to following directives:
Machinery Directive 2006/42/EC
Pressure Equipment Directive 2014/68/EU
- Safety standards can support the manufacturers in this task, but they cannot replace the Risk assessment process to be executed by the manufacturer

Current activities – Refrigerating systems using flammable refrigerants

Focus on EN 60335-2-40 – the most challenging details

- New Version of IEC 60335-2-40 (ed. 7) published in May 2022
 - additional options to qualify refrigerating systems using class A3 refrigerant implemented
 - related to clauses 22.112 / .115 / .116 / .118 / .121 / .122 / .125 / .132
in conjunction with Annexes BB / DD / EE / FF / GG / HH / LL / MM / PP / QQ
- especially Annex GG in focus → new version amounts to 33 pages
→ not easy to be understood in overall context.
- The topic “enhanced tightness” is partly covered, but only suitable for split units.

Summary:

the manufacturer shall evaluate the new standard requirements, if they are helpful or not for the specific product in question.

Current activities – Refrigerating systems using flammable refrigerants

Examples for standards described the risk assessment for specific types of refrigerating systems

- ISO 20854:2019 Thermal containers — Safety standard for refrigerating systems using flammable refrigerants — Requirements for design and operation
 - was the first new standard developed for a specific type of refrigerating systems
 - and to include a chapter for description of the risk assessment approach
- FprEN 17893:2023 Thermal Road Vehicles - Safety Standard for temperature-controlled systems using flammable refrigerants for the transport of goods - Requirements and risk analysis process
 - under development (final steps) in CEN/TC413 WG1
 - mentioned in the Final Report of CEN/TC182 WG12
- ...and more standards expected to be developed / published

Future activities – Refrigerating systems using flammable refrigerants

Remarks from a technical point of view

- The key aspect for a successful application of flammable refrigerants are **the tightness & durability of refrigerant circuits**
- Corresponding requirements are only partly incorporated in EN 378-2 / IEC 60335-2-40
- One possible approach is:
”durably technically tight” as described in EN 1127-1 Annex B
- Advantages: a release of refrigerant is not to be expected, or the effects of a release are "very small" to "negligible".
- Today’s status: not yet “State of the Art”, but an option for the future!
- One core topic: **Competence of personnel for safe use of flammable refrigerants**

Thank you for your attention!

Questions?

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euramm^on

refrigerants delivered by mother nature

eurammon e. V. is always available as a sparring partner for questions on refrigeration with natural refrigerants.

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