



Article | Commercial Refrigeration

FAQ - Your guide to choosing low-GWP refrigerants

Commercial refrigeration engineers, OEMs and cold room owners are faced with difficult decisions as they move to lower-GWP refrigerants. We can help you make the move with confidence by answering your most urgent refrigerant questions.

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Refrigeration engineers, installers, OEMs, and cold room owners must make the move to low-GWP refrigerants to comply with F-Gas regulations and other refrigerant regulations.

However, uncertainty over refrigerant selection and future supply, as well as misunderstandings about component suitability, could be preventing some designers, engineers and installers from making refrigerant decisions with confidence.

To help you select and install both new and retrofitted refrigerants, we've answered some of the most common low-GWP refrigerant questions.

- Is there a simple way to select the right refrigerant?
- What refrigerants should I consider, and why?
- Will a new refrigerant force me to use new components?
- Where can I learn more?

Is there a simple way to select the right refrigerant?

There is no one-size-fits-all solution available, as no single refrigerant can operate efficiently across all temperature ranges, applications and operating conditions.

To select the right refrigerants for your applications, you'll need to consider the properties of each – and how they match up to your environments and equipment. For new systems, the process is relatively straightforward; retrofitting is potentially a little more complex.

Things to consider:

| New systems | Retrofit |
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| Long and short-term refrigerant availability Component availability Cost Flammability Charge limitations and safety requirements Specific capacity Pipe sizing Overall system GWP (TEWI) How different components impact energy efficiency | Long and short-term refrigerant availability Capacity deviation to current refrigerant in typical temperature range Compressor, oil and component compatibility with alternative refrigerants Flammability (A2L class or higher) Discharge temperature Glide Superheat setting Safety device settings Pine sizing |

Which refrigerants should I consider, and why?

Based on regulations and system needs, lower GWP refrigerant alternatives are available. **R404A/R507 alternatives:** R448A, R449A, R407H, R452A (A1, non-flammable), R454A, R454C, R455A (A2L, mildly flammable, GWP < 150), 290 propane, R600a isobutane (A3, highly flammable).

R134a alternatives: R513A, R450A, R513B (A1, non-flammable), R516A, R445A (A2L, mildly flammable, GWP < 150), R290 propane, R600a isobutane (A3, highly flammable). Additionally, R744 (CO2) is an alternative for R404A/R507 and R134a, but it operates at considerably higher pressure, requiring a different system design. Retrofit existing R404A / R507 systems with A1 refrigerants only; A2L and A3 are for new installations.

When retrofitting old systems, there are some key things to consider when choosing a lower-GWP refrigerant:

- How close is the new refrigerant to your current refrigerant's pressure and capacity?
- Using new lower GWP A1 refrigerants to retrofit R404A, R507, and R134a systems avoids the need to check for flammable refrigerant requirements.
- In case the new refrigerant has a higher flammability class, check charge limits and safety requirements in standards and regulations.
- Refrigerant charge limits are defined in EN 378-1:2016 table C2 and in Application Specific standards IEC 60335-2-xx series.
- Be aware that auxiliary electrical equipment could become an ignition source when using a flammable refrigerant in a new system; for more information, refer to the Asercom guide about safety standards and components for flammable refrigerants
- If you're considering a new refrigerant with high glide, please read our technical paper on <u>Retrofit and high glide refrigerants</u>
- Recover the old refrigerant in the system, and don't mix it with other refrigerants.

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Legend > 2500 OR422B/D O R404A Flammability A1 – Non-flammable line O R438A R452A OR410A A2L – Mildly flammable < 2500 O R22 OR407A/F/H A3 – Highly flammable O R449A R134a O R449B < 1500 BI - Toxic - non-flammable O R448A B2L - Toxic - less flammable O R450A O R513A GWP <750 O R513B OR32/R452B O On the market R515A R515B O R454A OR454B O Not yet on the market O R516A O R123 OR444B O R454C No LGWP option Must move to R1336mzz(Z) R1270 O R455A < 150 low density R514A R600a O R744/CO2 OR1233zd(E) R1234ze/yf R290 R717/NH3 Vacuum Low Medium High Other GWP versus density Density (pressure) of the main refrigerant groups Figure 11: Carbon -chain-based Refrigerants (HCs, HFCs, HFOs, HCFCs), GWP versus density (pressure) of the main refrigerant groups

Main refrigerants at Play A complex picture in continuous evolution

Will a new refrigerant force me to use new components?

In some cases, you can continue to use the same compressors, heat exchangers, valves and controls you used before. It is always necessary to check if components may need to be modified before they are ready for a new refrigerant.

Check points may include:

- Oil and compressor approval for the new refrigerant. If not replace with a compatible compressor,
- Components with gaskets must be compatible with the new refrigerant and oils,
- Thermostatic expansion valves likely need to be adjusted or even become replaced with a new version as it might need a bulb charge that's compatible with the new refrigerant to allow good superheat control,
- Electronic expansion valve controllers may need new refrigerant specific parameters. Set the new refrigerant in the superheat controller for the electric expansion valve. If the refrigerant is not in the list, use user-defined and input parameters. Please note that Danfoss controllers already include many of the lower-GWP refrigerants,
- Control devices like pressure switches might need to be adjusted to the new refrigerant pressures.

Where can I learn more?

That said, if you have specific needs and requirements from your refrigerant, you may need to investigate other flammable refrigerant options.

Danfoss offers a range of content to help cold room operators, installers and OEMs select the right low-GWP refrigerant for their needs. Our engineers are committed to low-GWP refrigerants and solutions, and can help you keep up to date with the latest solutions and developments.

For more information, view our full low-GWP resources library at refrigerants.danfoss.com.



For the selection of components, turn to coolselector.danfoss.com

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