THE LINDE GROUP

Linde

EU f-gas regulation EN 517/2014.

Helping you meet your environmental obligations.

EU f-gas regulation. Reducing your environmental impact.

The updated f-gas regulation will impact the use of HFCs in many applications.

The European Union (EU) aims to restrict the use of fluorinated gases in order to contain the environmental impact of these substances. It recently published an updated f-gas regulation 517/2014, effective from 1.1.2015 across all EU member states.

Fluorinated gases (f-gases) include Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulfur Hexafluoride (SF_6). These gases are used in a number of applications including refrigeration and air conditioning, foam blowing, propellants, semiconductor manufacture and electrical switchgear.

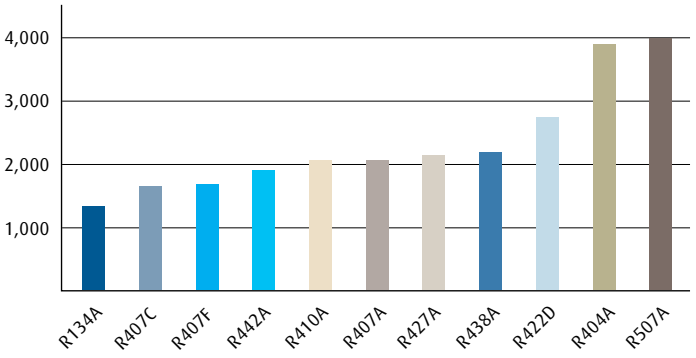
- The introduction of a cap and phase down of the the supply of HFC refrigerants
- New product and equipment bans
- Existing refrigeration equipment service and maintenance bans
- The responsible supply of f-gases
- Leakage control and end-of-life gas recovery.

Why target f-gases?

The United Nations has stated that countries need to substantially reduce their greenhouse gas emissions by 2050 to limit global climate change. In response, the European Commission has adopted a roadmap to reduce total greenhouse gas emissions across all member states.

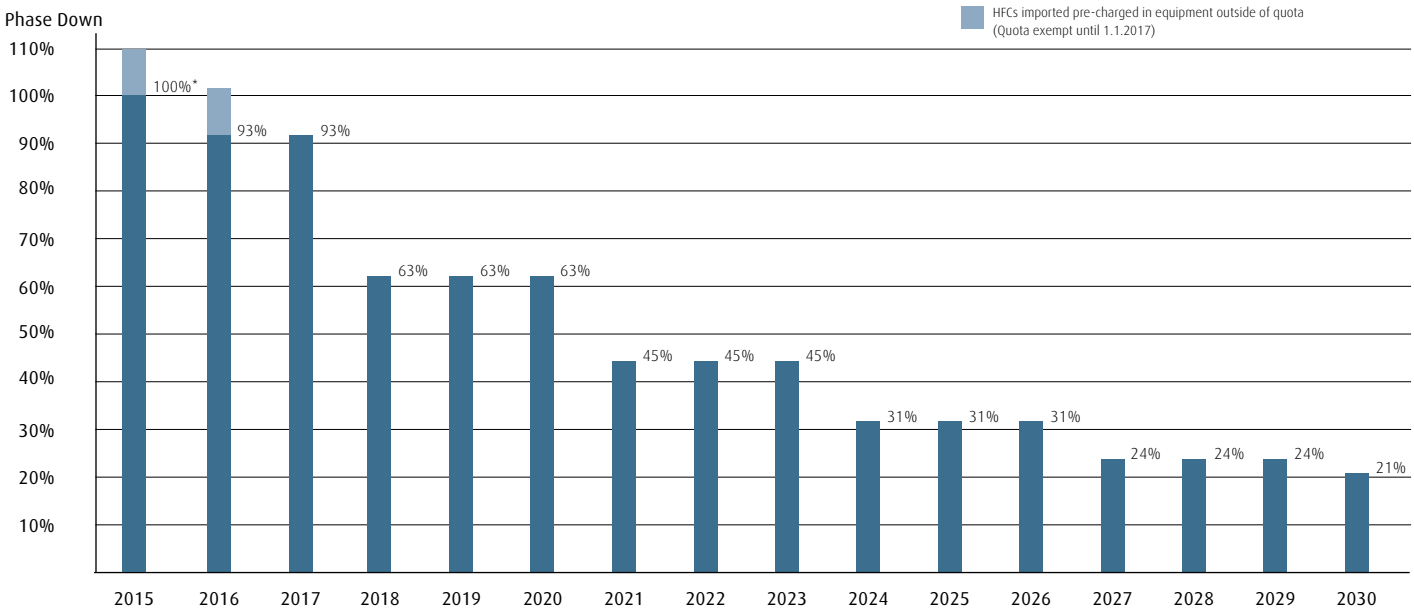
Many f-gases have a high global warming potential (GWP). When released to the atmosphere, they have been identified as one of the contributors to climate change. The EU aims to reduce emissions of these fluorinated gases through stricter regulation. The first EU f-gas regulation was issued in 2006. The revised regulation will become law on 1.1.2015 and includes a number of changes that will require further action across a number of industries.

Diagram 1: GWP of some common HFC refrigerants



HFC cap and phase down. Risk of product shortages and price rises.

Diagram 2: HFC phase down schedule (CO_2e basis, in %)



* 100% = Average of 2009–2012

Starting in 2015, the cap and phase down provisions will limit the total supply of HFCs across the EU, measured in total tonnes of CO_2 equivalent (CO_2e). CO_2e is the total weight of each gas multiplied by its respective GWP.

It will initially target the supply of bulk HFCs, also focusing on the supply of equipment containing HFCs from 2017. By 2030, the supply of HFCs will have reduced to 21% of the 2009-2012 baseline.

Some of this reduction in supply will be met by reduced demand driven by other aspects of the regulation including leak reduction, service and maintenance bans, and product and equipment bans. However, it is likely that this alone will not be enough to reduce demand. So there is a real risk of potential refrigerant supply shortages and associated cost increases unless industry acts to lower its HFC CO_2e demand.

Your options

Users can lower their HFC CO_2e by using less virgin gas, or gases with a lower GWP.

- → Use less gas: The most common ways to use less gas include lowering consumption via leak reduction or using reclaimed or recycled refrigerant.
- → Use lower GWP gas: To switch to lower-GWP alternatives, users can convert existing equipment to run on retrofit refrigerants or install new equipment based on lower-GWP HFCs, HFOs or natural refrigerants.

Linde support

Linde can support you through this transition. We offer a wide range of refrigerants including many lower-GWP gases, extensive technical and legislative support as well as complementary services including refrigerant recovery, reclamation and banking.

Service and maintenance bans. Limiting high-GWP gases in existing equipment.

Table 1: Common refrigerant gases impacted by the service and maintenance bans

Refrigerant	GWP	Charge size threshold (40t CO_2e)	Potential retrofit replacements
R23	14800	2.7 kg	None available (however often temperature exempt)
R404A	3922	10.2 kg	R407A, R407F (Performax™ LT), R442A (RS-50), R449A (Opteon® XP-40)
R422A	3143	12.7 kg	Consult your supplier
R422D	2729	14.7 kg	R438A, R427A, R424A
R428A	3607	11.1 kg	Consult your supplier
R434A	3245	12.3 kg	Under development
R507	3985	10.0 kg	R407A, R407F (Performax™ LT), R442A (RS-50), R449A (Opteon® XP-40)
R508B	13396	3.0 kg	None available (however often temperature exempt)
MO89	3805	10.5 kg	None available (however often temperature exempt)

From 1.1.2020, the use of f-gases with a GWP of 2500 or more to service refrigeration equipment with a gas charge size exceeding 40T CO_2e will be banned. Equipment using gases such as R404A, R507 and R422D (ISCEON® MO29) will be impacted. (Non-refrigeration applications, such as air conditioning or heat pumps, low-temperature systems and military systems are exempt.)

In these cases, there are a number of options to consider:

- → Continue: Use the existing equipment and gas until 2020, and then use reclaimed or recycled gas, if available, until 2030.
- → Convert: Modify the equipment to run on a retrofit refrigerant gas with a GWP of less than 2500.
- → Replace: Install new equipment that uses lower-GWP gases.

Linde support

We can support you in understanding the implications of the service and maintenance bans, guiding you towards the solution that best meets your requirements.

We offer a wide range of refrigerant gases including many lower-GWP refrigerant gases suitable for retrofitting existing installations such as R404A, R507 and R422D systems. Our portfolio of gases is continually growing, and we plan to add new HFO blends offering even greater environmental benefit in the near future.

Product and equipment bans.
Restricting the use of f-gases.

The f-gas revisions include further bans that impact the sale of certain refrigeration and air conditioning equipment, foams and propellants using f-gases. It also prohibits the use of sulfur hexafluoride (SF_6) in small magnesium foundries from 1.1.2018.

The restriction and bans on the use of certain f-gases in new products and equipment mean that OEMS and equipment installers will need to use alternative gases. This will entail equipment and process modifications.

Linde support

We can support you in understanding the implications of the equipment and product bans, helping you identify the solution that best meets your specific requirements.

This includes detailed information on refrigerant gas properties to help you understand their operating capabilities.

In addition, we offer a wide range of gases suitable for refrigeration, air conditioning, foam blowing and aerosol applications including lower-GWP HFCs and next-generation gases including HFOs, ammonia, CO_2 and hydrocarbons.

The physical properties (flammability, toxicity, operating pressures, etc.) of these next-generation gases often differ from those of traditional f-gases. We can advise you on the safe handling and use of these products.

Table 2: Additional f-gas product and equipment bans – annex III

Ban type and number in text	Date
3. Fire protection equipment that contain HFC-23 (except critical use)	1.1.2016
10. Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more	1.1.2015
11. Refrigerators and freezers for commercial use (hermetically sealed) that contain:	
– HFCs with GWP of 2500 or more	1.1.2020
– HFCs with GWP of 150 or more	1.1.2022
12. Stationary refrigeration equipment containing f-gases with GWP 2500 or more except equipment intended for applications designed to cool products to temperatures below –50 °C	1.1.2020
13. Multipack centralised refrigeration systems for commercial use with a rated capacity of 40 kW or more that contain, or whose functioning relies upon, f-gases with GWP 150 or more, except in the primary circuit of cascade systems where f-gases with a GWP of less than 1500 may be used.	1.1.2022
14. Movable room air conditioning equipment (hermetically sealed equipment which is movable between rooms by the end user) that contain HFCs with GWP of 150 or more	1.1.2020
15. Single split air conditioning systems containing less than 3kg of f-gases, with GWP of 750 or more	1.1.2025
16. Foams that contain HFCs with GWP of 150 or more except when required to meet national safety standards:	
– Extruded polystyrene (XPS)	1.1.2020
– Other foams	1.1.2023
17. Technical aerosols that contain HFCs with GWP of 150 or more, except when required to meet national safety standards or when used for medical applications	1.1.2018
Article 13: Magnesium die-casting using SF_6 with demand <850kg (larger installations already banned)	1.1.2018

Containment. Leakage control and responsible supply.

Leakage control

Leakage control requirements have been widened to include new sectors such as transport refrigeration.

In addition, system f-gas CO_2e charge sizes will be used to determine leak check frequency and leak detection requirements. Charge size thresholds will thus depend on the refrigerant gas installed in the system.

Training, certification and responsible supply

The scope of training will be widened to include new sectors and/or training requirements. Most importantly, the new legislation will restrict the sale of f-gases to users who have the appropriate certification or have attended relevant training programmes. It is therefore important that your business has the knowledge, training and certification required under this new regulation. Otherwise you will not be entitled to purchase f-gases or service/maintain systems that use these gases.

Linde support

We can provide you with technical support in understanding the requirements for leak checks and leak detection systems. In addition, we offer a number of gases suitable for leak checks. These include pressure test gases and calibration gases for leak detection systems.

Regardless of your needs, our experts will work with you to ensure that you can meet your responsibilities under the new legislation without compromising on customer service.

Table 3: Leak detection systems

Equipment group	Leak detection system?	Leak detection system check frequency
a) Stationary refrigeration equipment	Yes when CO_2e > 500T	12 months
b) Stationary air-conditioning equipment		
c) Stationary heat pumps		
d) Stationary fire protection equipment		
e) Refrigeration units of refrigerated trucks and trailers	No	N/A
f) Electrical switchgear	Yes when CO_2e > 500T (from 1.1.2017)	6 years
g) Organic Rankine Cycles		12 months

Table 4: Leak check frequency

System f-gas contents	Leak check frequency (no leak detection system installed)	Leak check frequency (leak detection system installed)
500 tonnes CO_2e or more	At least once every 3 months	At least once every 6 months
50 to 499.99 tonnes CO_2e	At least once every 6 months	At least once every 12 months
5 to 49.99 tonnes CO_2e	At least once every 12 months	At least once every 24 months

Linde. Helping you meet your environmental obligations.

The revised f-gas regulation becomes law on 1.1.2015. It will drive substantial change in industries that use f-gases. Linde has taken a leading position in understanding the impact of the regulation and proactively helping customers to meet their obligations through a range of supporting products and services.

Wide product range

- Lower-GWP gases suitable for retrofitting existing equipment
- New low-GWP HFOs and natural refrigerants suitable for new equipment
- Reclaimed refrigerants
- SF_6 and alternatives
- Leak detection gases

Reliable supply

- Extensive sourcing expertise and supplier partnerships
- Pan-European supply chain
- Insight into HFC phase down and gas availability

Services

- Refrigerant recovery, destruction and reclamation
- Banking

Practical legislative support

- F-gas legislation advice
- Service and maintenance ban assessment
- Leakage criteria assessment

Technical support

- Retrofit gas technical advice
- Handling advice (e.g. for new flammable gases)
- Refrigerant gas technical, safety and environmental data

Getting ahead through innovation.

With its innovative concepts, Linde is playing a pioneering role in the global market. As a technology leader, it is our task to constantly raise the bar. Traditionally driven by entrepreneurship, we are working steadily on new high-quality products and innovative processes.

Linde offers more. We create added value, clearly discernible competitive advantages, and greater profitability.
Each concept is tailored specifically to meet our customers' requirements – offering standardised as well as customised solutions. This applies to all industries and all companies regardless of their size.

If you want to keep pace with tomorrow's competition, you need a partner by your side for whom top quality, process optimisation, and enhanced productivity are part of daily business. However, we define partnership not merely as being there for you but being with you. After all, joint activities form the core of commercial success.

Linde – Ideas become solutions.

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