SMC GUIDE TO EU F-GAS REGULATION

Don’t get left out in the cold

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This guide focuses on our thermo-chiller products, which are classified as stationary chillers, in accordance with the requirements of EU Regulation 2024/573 on fluorinated greenhouse gases. Under this regulation, stationary chillers are subject to strict controls on the use of fluorinated refrigerants, particularly those with a Global Warming Potential (GWP) exceeding 150.

Our refrigerant air dryer product also complies with the requirements of EU regulation 2024/573; however, it is not covered in detail within this guide.

Importers of **fluorinated (HFC's) refrigerants** must register in the EU F-Gas portal and report F-Gas imports.

Import-export: CO_2 (R744) is not an F-Gas; R454C and R32 must be reported for the EU F-Gas portal.

F-Gas portal - Fluorinated greenhouse gases – Climate action

Overview of the new EU F-Gas regulation

The 2024 revision of the F-Gas regulation builds upon the original 2014 framework, introducing stricter quotas and broader bans on high-GWP refrigerants. The regulation's primary objectives are:

- **Phasing down HFCs**: the EU aims to reduce the supply of hydrofluorocarbons (HFCs) by 95 % by 2030, measured in CO_2-equivalent tonnes
- **Application-specific bans**: certain equipment types will no longer be allowed to use refrigerants above defined GWP thresholds
- **Leakage control**: operators must implement leak detection systems and maintain detailed service records
- **Quota system**: importers and manufacturers must hold quota authorisations for placing HFCs on the EU market.

Key milestones

- **2025**: ban on servicing equipment with refrigerants ≥ GWP 2500. This will apply only for "virgin refrigerants", reclaimed/recycled refrigerants can be used until 2030.
- **2027**: ban on stationary chillers:

  >12 kW using F-Gases with **GWP ≥750**

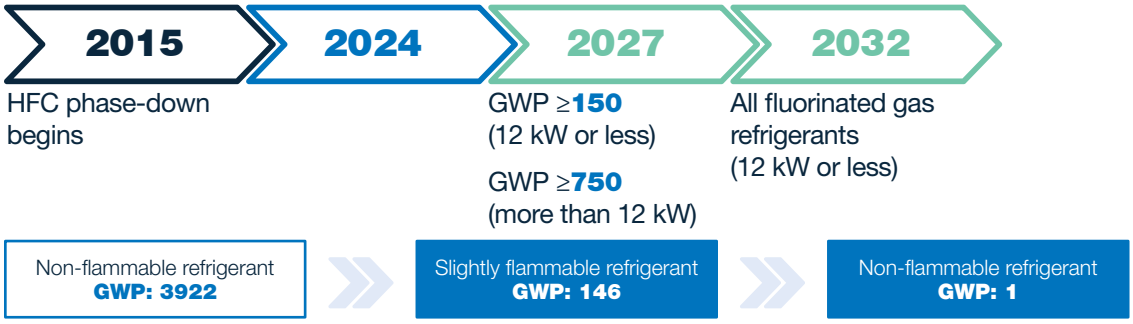
  ≤12 kW using F-Gases with **GWP ≥150**, unless required for safety.
- **2032**: ban on any F-Gases in chillers ≤12 kW, unless required for safety.

These measures are designed to accelerate the transition to low-GWP and natural refrigerants, aligning with the EU's climate neutrality goals.

Refrigerant regulations for chillers

Below, you'll find the European & UK legislation as it's the most restrictive one (compared to the California and US regulation) and it's the one that SMC decided to follow.

EU and UK



Refrigerant safety classes: A1, A2L, A3

Refrigerants are categorised based on their flammability and toxicity, which directly impacts their handling, storage, and application.

Refrigerant	GWP100 [1]	Structure formula / Composition	PFAS [2]	Safety classification [3]	Airfreight [4]
R32	675	CH2F2	No	A2L	No
R125	3500	CHF2-CF3	Yes	A1	Yes
R134a	1430	CF3CH2F			
R143a	4470	CF3-CH3		A2L	No
R290	3	CH3-CH2-CH3	No	A3	
R404A	3922	R125 (44 %)	Yes	A1	Yes
		R134a (4 %)			
		R143a (52 %)			
R407C	1774	R32 (23 %)			
		R125 (25 %)			
		R134a (52 %)			
R410A	2088	R32 (50 %)			
		R125 (50 %)			
R448A	1386	R32 (26 %)			
		R125 (26 %)			
		R134a (21 %)			
		R1234yf (20 %)			
		R1234ze(E) (7 %)			
R449A	1396	R32 (24.3 %)			
		R125 (24.7 %)			
		R134a (25.7 %)			
		R1234yf (25.3 %)			
R452A	2140	R32 (11 %)			
		R125 (59 %)			
		R1234yf (30 %)			

SMC blue: Fully compliant.
Light blue: Attention, limited lifespan.
White: Not compliant.

Refrigerant	GWP100 [1]	Structure formula / Composition	PFAS [2]	Safety classification [3]	Airfreight [4]
R454C	146	R32 (21.5 %)	Yes	A2L	No
		R1234yf (78.5 %)			
R455A		R32 (21.5 %)			
		R744 (3 %)			
		R1234yf (75.5 %)			
R513A	630	R134a (44 %)		A1	Yes
		R1234yf (56 %)			
R600a	3	CH(CH3)2	No	A3	No
R744	1	CO2		A1	Yes
R1234yf	0.501	CH2 = CF-CF3	Yes	A2L	No
R1234ze(E)	1.37	CHF = CH-CF3			

1) According to AR6 IPCC (refrigerant R1234yf / R1234ze(E)), AR4 IPCC (all other refrigerants).
2) Refrigerant is categorised as Poly- and perfluoroalkyl substances (PFAS) by the presence of at least one fully fluorinated methyl group "-CF3" (typically at the beginning or end of the chain) or fully fluorinated methylene group "-CF2-" (typically within the chain). Refrigerant composition (R4□□□/R5□□□) is categorised as PFAS if at least one of the refrigerants in the composition is a PFAS.
3) According to ISO 817:2024 / ANSI/ASHRAE Standard 34.
4) According to IATA Dangerous Goods Regulation (DGR), Refrigerating machines (UN3358) containing flammable, non-toxic, liquefied gas are forbidden to transport by passenger and cargo aircraft.

Implications for use

- **A1 refrigerants** are widely used but face regulatory pressure due to their environmental impact
- **A2L refrigerants** offer a balance between safety and sustainability but require updated infrastructure
- **A3 refrigerants** are ideal for low-GWP goals but are limited to applications where flammability risks can be mitigated.

Regulatory impacts on stocking, transportation, and cost

The EU F-Gas regulation introduces a complex set of challenges for manufacturers, distributors, and end-users of refrigeration and air conditioning systems. These challenges are not only technical but also logistical and financial. Understanding the full scope of these impacts is essential for strategic planning and operational continuity.

Stocking and inventory management

Regulatory constraints

The regulation imposes strict deadlines after which certain refrigerants can no longer be imported or sold. For example:

- **From 2025**: Refrigerants with a GWP ≥2500 (e.g., R404A) are banned for servicing. This will apply only for "virgin refrigerants", reclaimed/recycled refrigerants can be used until 2030.
- **From 2027**: Equipment using refrigerants with GWP ≥ 50 (over 12 kW) or ≥150 (under 12 kW) cannot be placed on the market.
- **From 2032**: Ban on any F-Gases in chillers ≤12 kW, unless required for safety.

These deadlines create a "stock obsolescence risk" for distributors and OEMs. Products that are not sold or installed before the cut-off dates may become unsellable within the EU, leading to financial losses.

Inventory planning

Companies must now:

- Forecast demand more accurately to avoid overstocking banned refrigerants
- Phase out high-GWP inventory in favour of compliant alternatives
- Coordinate with suppliers to ensure timely delivery of low-GWP systems.

Labelling and traceability

The regulation also mandates clear labelling of refrigerant type and GWP on all equipment. This requires updates to packaging, documentation, and ERP systems to ensure traceability and compliance during audits.

Transportation and logistics

Hazard classification

Refrigerants are classified under ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road) and IATA (International Air Transport Association) regulations. A2L and A3 refrigerants, due to their flammability, are subject to stricter transport rules:

- **A2L refrigerants** (e.g., R32, R1234yf, R454C) are considered “dangerous goods” and require:
  · Special packaging and labelling
  · Trained personnel for handling
  · Limited air transport options (typically banned if charge >100 g) – Refrigeration equipment cannot be transported by air when filled with flammable gases.
- **A3 refrigerants** (e.g., R290, R600a) are even more restricted and often require ground or sea transport with explosion-proof containment.

Cost and complexity

These restrictions increase:

- **Shipping costs** due to specialised containers and documentation
- **Lead times** due to limited transport options
- **Risk of delays** from customs inspections or non-compliance.

CO_2 as a transport-friendly alternative

CO_2 (R744) is non-flammable and non-toxic, making it exempt from many transport restrictions. This makes it an attractive option for global logistics, especially for OEMs exporting to multiple regions.

Cost implications

Refrigerant price volatility

The EU’s quota system limits the total CO_2-equivalent tonnes of HFCs that can be placed on the market. As the quota tightens:

- **High-GWP refrigerants** become scarcer and more expensive
- **Black market activity** may increase, leading to enforcement challenges
- **Reclaimed refrigerants** may become a temporary solution but are also limited in supply.

For example:

- R404A (GWP 3922) has seen price increases of over 500 % in some markets since the initial phase-down began
- R134a (GWP: 1430) and R410A (GWP: 2088) are also experiencing upward price pressure.

System upgrade costs

Switching to low-GWP refrigerants often requires:

- **New equipment** (due to incompatibility with existing compressors, seals, and oils)
- **Training for technicians** (especially for flammable refrigerants)
- **Infrastructure upgrades** (ventilation, leak detection, fire suppression).

Total cost of ownership (TCO)

While upfront costs may rise, compliant systems often offer:

- **Higher energy efficiency**
- **Lower maintenance costs**
- **Longer regulatory lifespan**

This makes the **TCO more favourable** over a 10–15 year horizon, especially when factoring in carbon taxes or penalties for non-compliance.

Strategic implications for businesses

Risk mitigation

- **Diversify refrigerant portfolio** to avoid over-reliance on any single gas
- **Invest in training and certification** for handling A2L and A3 refrigerants
- **Engage with suppliers** to ensure long-term availability of compliant systems.

Opportunities

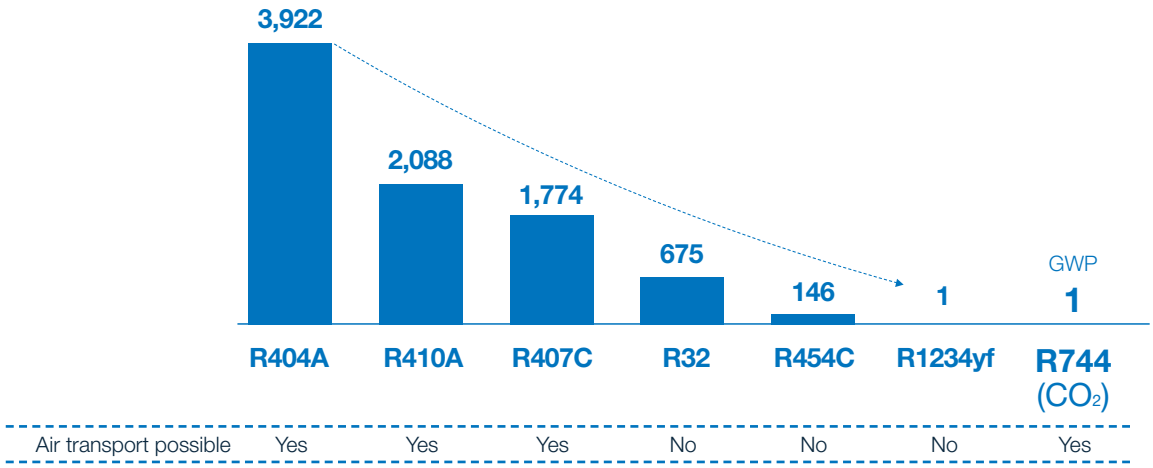
- **Early adopters** of low-GWP technologies can gain a competitive edge
- **Green branding** and sustainability reporting can be enhanced
- **Access to subsidies** or tax incentives in some EU countries for switching to natural refrigerants.

SMC's solutions and product compliance

SMC has proactively adapted its product portfolio to meet and exceed the requirements of the F-Gas regulation.

F-Gas compliant product lines

- **HR□F Series**: Uses R454C (GWP 146), ideal for industrial cooling.
- **HR□C Series**: Uses CO_2 (GWP 1), a natural refrigerant with no phase-down risk.



GWP = 1 Compliant with each country's refrigerant regulations

As of the end of September 2024

EU refrigerant regulations	: GWP150 or more
US refrigerant regulations	: GWP700 or more
California, US refrigerant regulations	: GWP750 or more

* "GWP" indicates the global warming potential. The values are based on the IPCC AR4.

Regulatory readiness

F-Gas portal and export obligations:

Exporters of chillers from the EU must **register in the EU F-Gas** portal and report F-Gas exports. CO_2 (R744) is not considered an F-Gas and does not require reporting. However, refrigerants such as R454C and R32 must be reported.

- SMC holds EU quota authorisations and ensures all imports are compliant
- Products are clearly labelled with refrigerant type and GWP. Also the mass of the refrigerant has to be mentioned
- Maintenance support is available for legacy systems during the transition period.

When is F-Gas portal registration required?

Companies must register in the EU F-Gas portal if they:

- Import or export HFCs or other fluorinated greenhouse gases (F-Gases) in bulk
- Import or export products or equipment (e.g., chillers, heat pumps) containing F-Gases listed in Annex I, II, or III of Regulation (EU) 2024/573
- Manage quotas for placing HFCs on the EU market
- Authorise the use of quotas for pre-charged equipment
- Export F-Gas-containing equipment from the EU to non-EU countries.

What about non-EU European countries?

Non-EU countries (e.g., Switzerland, Norway, UK, Serbia) must register in the EU F-Gas portal if they:

- Export F-Gas-containing equipment to the EU
- Import such equipment from the EU
- Manage quota authorisations or use HFCs under EU regulation.

These companies must appoint an Only Representative (OR) established in the EU to act on their behalf.

Required documentation and reporting:

Registered companies must:

- Report imports/exports of F-Gas-containing equipment
- Include F-Gas portal registration numbers in customs declarations
- Submit quota authorisations and verification reports as applicable.

CO_2 (R744) is not considered an F-Gas under the regulation and does not require registration or reporting.

Summary table:

Scenario	F-Gas portal registration required?	Notes
Exporting F-Gas equipment from EU to Switzerland/ Norway/UK	No	
Importing F-Gas equipment into EU from non-EU country	Yes	Must appoint only representative Must report in F-Gas portal
Exporting CO2-only equipment (e.g., R744)	No	CO2 is not an F-Gas
Operating only within non-EU country		Unless exporting to EU

Customer support

- Import/export compliance guidance
- Documentation and certification assistance
- Training on refrigerant handling and system upgrades.

Recommendations for customers

Navigating the evolving landscape of the EU F-Gas regulation can be complex, but with the right strategy and support, it also presents an opportunity to modernise systems, reduce environmental impact, and improve operational efficiency. SMC offers a comprehensive approach to help customers transition smoothly and confidently

Strategic steps for compliance

1 **Conduct a refrigerant audit**

- Identify all systems using refrigerants with a GWP ≥750
- Prioritise equipment nearing end-of-life or with high leakage risk
- Document refrigerant types, charge volumes, and service history.

2 **Develop a transition plan**

- Create a phased roadmap to replace or retrofit non-compliant systems
- Evaluate the feasibility of switching to A2L or natural refrigerants (like CO_2)
- Consider energy efficiency improvements alongside refrigerant changes.

3 **Choose compliant equipment**

- Select systems that use refrigerants with GWP <150 or natural alternatives like CO_2
- Ensure new equipment is future-proof and meets upcoming regulatory thresholds
- Leverage SMC's portfolio of low-GWP chillers, dryers, and temperature control units.

4 **Train and certify your team**

- Ensure technicians are certified to handle A2L and A3 refrigerants
- Provide training on leak detection, safe handling, and emergency procedures
- SMC can support with technical documentation and training resources.

5 **Stay informed and proactive**

- Monitor updates from the European Commission and national authorities
- Subscribe to SMC's regulatory bulletins and technical newsletters
- Engage in industry forums and working groups to stay ahead of trends.

How SMC supports you

SMC is more than a supplier—we are a strategic partner in your compliance journey. Here's how we help you succeed:

After-sales service excellence

- SMC offers robust after-sales support across Europe, including
  - On-site commissioning and troubleshooting
  - Preventive maintenance programs
  - Spare parts availability and rapid response
- Our service teams are trained in the latest refrigerant technologies and safety protocols.

Local manufacturing in the Czech Republic

- SMC's state-of-the-art production facility in the Czech Republic ensures:
  - Shorter lead times for European customers
  - Localised product customization
  - Reduced carbon footprint from regional logistics
- Our CZ factory is fully aligned with EU environmental and quality standards.

Regulatory expertise

- SMC holds EU F-Gas quota authorisations and ensures all products are compliant.
- We provide documentation support for customs (annex), audits, and certifications.
- Our experts can advise on refrigerant selection, system design, and lifecycle planning.

Future-proof product portfolio

- Our chillers and dryers are designed with long-term compliance in mind.
- We offer models using R32, R454C and CO_2 – covering a wide range of applications.
- Modular designs allow for easy upgrades and scalability.

Whether you're a system integrator, OEM, or end-user, **SMC is ready to guide you through the F-Gas transition with clarity, reliability, and innovation**.

The SMC advantage

By partnering with SMC, you gain:

- Confidence in regulatory compliance
- Access to cutting-edge, sustainable technologies
- A responsive support network across Europe
- A long-term partner committed to your success.

Conclusion

The EU F-Gas regulation is reshaping the refrigeration and cooling landscape. Companies must act now to remain compliant and competitive. SMC is not only ready but leading the way, offering:

- A full range of compliant, efficient, and future-proof products
- Expert guidance on regulatory and technical challenges
- A commitment to sustainability and customer success.

By partnering with SMC, customers can confidently navigate the regulatory transition and build a greener, more resilient future.

Annex (F-Gas portal registration)

F-Gas portal access

Register on F-Gas portal

Step-by-step registration process

Step 1: create an EU login

- Go to the EU Login page
- Create a personal account with your email and password.

Step 2: access the F-Gas portal

- Use your EU Login credentials to log in to the F-Gas Portal.

Step 3: complete the registration form

- Choose your role: **EU undertaking, non-EU undertaking, customs authority**, or **auditor**
- Fill in company details, VAT number, and business activities
- Upload required documents (e.g., financial identification form, proof of establishment).

Step 4: appoint an only representative (for non-EU companies)

- Must be **established in the EU**
- Takes full legal responsibility for compliance
- Both the non-EU company and the representative must sign the registration form.

Step 5: submit and await review

- The European Commission will review your application within 10 working days
- If accepted, you'll receive a confirmation email
- If corrections are needed, you'll be notified to revise and resubmit.

How to fill out Y-code documents in a customs declaration

1. Determine applicability:

- Check if your product contains or relies on F-Gases
- Identify the refrigerant type and its **GWP** (Global Warming Potential)
- Confirm if the product is subject to **import/export restrictions**.

Common Y-codes for F-Gas customs declarations

Here are the most relevant Y-Codes for F-Gas-related imports/exports:

Code	Purpose
Y121	Declare the **tonnes of CO2 equivalent** of F-Gases (bulk or in equipment)
Y123	Confirms the **exporter/importer is registered** in the EU F-Gas portal
Y154	Exemption for **laboratory or analytical use** of F-Gases
Y160	Declares that goods **do not fall under regulation (EU) 2024/573**
Y162	Exemption for **personal effects** (e.g., private use, not commercial)
Y163	Declare the **net mass of F-Gases** in the equipment
Y164	Confirms **labelling compliance** under article 12 of the regulation

2. Register in the F-Gas portal:

- If required, register your company in the EU F-Gas portal
- You'll receive a registration number needed for customs.

3. Include Y-codes in the customs declaration:

- Use the correct TARIC code for your product.
- Add the relevant Y-codes in the data elements (DE) of the customs declaration.
- For example:
  - Y123 to show you're registered in the F-Gas portal
  - Y121 to declare CO_2 equivalent
  - Y163 to declare net mass of F-Gas
  - Y164 to confirm proper labelling.

4. Provide supporting documents:

- Attach any required certificates, labels, or exemption justifications (e.g., for Y154 or Y162).

5. Ensure consistency:

- The information in your declaration must match the product labels and technical documentation.

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