March, 2024

F-gas Regulation Overview

A revision of the EU F-gas regulation has passed the EU parliament. Many environmental simulation systems are affected by a new limit for refrigerants. Where technical safety allows, there is a ban on refrigerants with a GWP >150 from January 2025. That includes several weisstechnik products. Weiss Technik is redesigning them. New refrigeration systems will become available in 2024, some current systems will be phased out.

This document has not been legally checked and only contains the assessment of Weiss Technik GmbH.

Weiss Technik FAQ: Refrigerants

General Questions

Q: What happened? Why this FAQ document?

A: The EU has adopted a change proposal of the so-called F-gas regulation. It affects some of weisstechnik's products. See here for details: EU legislation to control F-gases - European Commission (europa.eu)

Q: When will this regulation become valid? Where do I find the original text?

A: The new version of the regulation text currently is on the EUR-lex page since February, 20th 2024. The regulation is valid 20 days after publishing, so from March 11th 2024 on: Regulation - EU - 2024/573 - EN - EUR-Lex (europa.eu)

Q: How does this regulation affect testing equipment?

A: Some additional refrigerants have been banned by the EU, so some refrigeration systems will have to be modified. For temperature and climatic chambers, mainly devices of the -40°C class are affected. Without technical modifications and refrigerant replacements, these products cannot be sold anymore from January 2025 in the EU. This also includes imports. For the export market, EU manufacturers will not be able to ship those temperature and climatic chambers from March 2025.

Q: What will Weiss Technik do now?

A: The threshold for banned refrigerants is 150. The GWP of all synthetic refrigerants used by Weiss Technik is higher. Weiss Technik will continue to use compliant, but safe refrigerants in the future, where this is possible. Weiss Technik will stop offering, stop selling, stop shipping most current products with a temperature range from -40 °C. They will be redesigned to meet the EU regulation. The latest order, sell and ship dates will be calculated backwards based on the "place on the market" limit of January 1st, 2025.

Shipping & Timelines

Q: What does "placing on the market prohibition date" actually mean? Can I order up to Dec 31st, 2024?

A: The regulation defines a date when the end customer needs to be in possession of their equipment. This is described as "place on the market". As production and shipping dates need to be taken into consideration, the last purchase date is much earlier than 2025. Weiss Technik will only accept orders from EU customers with an agreed ship date before 2025 for new equipment.

Q: Why all the time pressure? What changed so suddenly?

A: The EU parliament voted on the revision on January 16th, 2024. A new product category has been introduced in the regulation. It is called “self-contained refrigeration equipment”. All chambers with integrated refrigeration (no gas-containing parts are connected at customer site) fall in this category. In general, any one-piece-chamber produced in one of Weiss Technik’s factories in the EU belong to this category. As the required GWP level cannot be reached with the current refrigeration systems, other safe refrigerants have to be used. The timeline is a challenge as the ban starts on January 1st, **2025**.

(ANNEX IV, page 54)

(4)	Any self-contained refrigeration equipment, except chillers, that contains fluorinated greenhouse gases with a GWP of 150 or more, except if required to meet safety requirements at the site of operation.	1 January 2025

Q: Does Weiss Technik have reference customers for new refrigeration already?

A: Yes, Weiss Technik does produce refrigeration systems with natural refrigerants for walk-in and drive-in chambers since 2019. The have been installed at sites of well-known customers like Mercedes Benz, the University of Bremen and others. The refrigeration systems for reach-in cabinets have been newly developed. Beta tests are running.

Q: What will be the impact on lead time and price of these new refrigeration systems?

A: Products with new cooling will be produced in a very similar way to today. All manufacturing and quality procedures stay valid. Lead and delivery times will therefore be similar to today.

It is expected that suppliers of components for refrigeration systems will react to the EU regulation. Weiss Technik hopes for constant or falling component prices.

Q: Why did Weiss Technik not act earlier?

A: Weiss Technik did change our refrigeration systems to new refrigerants R449A in 2016 and R469A in 2019 according to the regulation. We also started offering refrigeration systems based on natural refrigerants wherever components were available, technically safe and affordable. For weisstechnik cabinets and chambers, R449A and R449A/R469A were the best solution. CO_2 was used in bigger chambers as only there sufficiently tested components were available.

Safety of refrigerants

Q: What are the mentioned „safety requirements" in the EU regulation?

A: The safety requirements are the exception to the GWP 150 requirement. If it is not technically save to use a refrigerant, the ban does not apply. The regulation includes a definition of "safety requirements". For environmental simulation, mainly ultra-low temperature tests cause an exemption. Temperatures below -50 °C can only be reached with flammable refrigerants or refrigerants with a much higher GWP than 150. For safety reasons (e.g. ignition sources like heaters), flammable refrigerants in weisstechnik chambers represent a risk.

(Article 3, page 15):

> (42) 'safety requirements' means requirements on the safety of using fluorinated greenhouse gases and natural refrigerants or products and equipment containing or relying on them, prohibiting the use of certain fluorinated greenhouse gases or their alternatives, including when contained in a product or in equipment at a specific place of intended utilisation due to site and application specificities that are set out in:
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> (a) Union or national law; or
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> (b) a non-legally binding act containing technical documentation or standards that have to be applied to ensure safety at the specific location, provided that they are in accordance with relevant Union or national law;

Q: Is CO_2 safe?

A: Yes. CO_2 has been used as a refrigerant for decades. It's somewhat unique physical character requires components which can withstand higher pressure than conventional systems. Higher ambient temperatures lead to a fast increase in pressure levels in CO_2 refrigeration cycles.

Weiss Technik's systems do not require separate safety measures. When used as described in the instructions for use, they are always safe.

CO_2 is not toxic. Under its R-number, R-744, it is classified in safety group A1 which means "not toxic" and "not flammable".

Handling CO_2 requires sensitivity as it has asphyxiating effect. It is odorless, colorless and tasteless, so does not trigger a sensual warning effect in humans. The workplace limit value for CO_2 is 5000 ppm (0.5 percent in volume). For refrigeration systems the limit is 0.07 kg/m3 according to DIN EN 378.

Dry-ice on skin can cause serious burns.

Q: Do we need a CO_2 sensor in the lab?

A: Not in most cases. The amount of CO_2 in most refrigeration cycles is usually not a risk. Example:

The filling quantity of the refrigeration systems in a room of 10x10x2.5m must not exceed 17.5 kg: 0.07 kg/m3 x 250 m3 = 17.5 kg based on the limit value specified in DIN EN 378.

Q: Will the new refrigeration system be compliant with the Pressure Equipment Directive?

A: Yes. Weiss Technik will ensure that the EU regulation 2014/68/EU (pressure equipment directive) is followed. Weiss Technik will have a notified body certify all equipment.

Requirements at operator's site

Q: Are there any other requirements on the installation site?

A: No. The requirements for an environmental simulation or test system will stay the same. Weiss Technik will make sure ambient temperature and cooling water temperature will stay the same as today.

Q: What about cooling water and energy consumption?

A: The required cooling water temperature will stay the same. Energy consumption of CO_2 refrigeration systems can be lower than for comparable systems with synthetic refrigerants.

Technical reliability & compatibility

Q: What are the long term experiences with CO_2?

A: CO_2 has been used as a refrigerant for decades in many applications without issues. It can now be used in environmental simulation chambers as suitable components become available. Weiss Technik will test and stress all components for several thousand hours before they are used in climatic chambers.

Q: Can we still run all test programs? Do the new CO_2 units run the same standards?

A: CO_2 refrigeration does not affect test standards. The lower temperature limit of CO_2 cooling is about -50°C. All tests above that temperature can be run. The cooling power at -40°C is better than with R404A or R449A. It might be possible to replace cascade systems with single-stage CO_2 systems for some test procedures.

Q: Did Weiss Technik run reference tests?

A: Yes. Several chambers with different sizes and performance levels have been setup and are running since more than one year now without issues. Cooling rates and heat compensation have been measured. The performance of the new CO_2-cooled cabinets is – as expected - better than for comparable -40°C devices, but not as good as for cascade systems.

Customer and operator responsibilities

Q: Who is responsible for complying to the regulation when exemptions apply?

A: The “operator” is supposed to provide required documentation. Weiss Technik will provide compliance documentation with all products. (Article 13, page 31)

> 19. The putting into operation of any equipment or utilisation of any product listed in points 2(b), 4, 5(c), 7(b), (c) and (d), 8(b) to (e), 9(b) to (f), 11(c), 17(c) and 19(b) of Annex IV after the respective prohibition date specified in those points shall be prohibited unless the operator can provide evidence that:
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> (a) the relevant safety requirements at the particular location do not permit the installation of equipment using fluorinated greenhouse gases below the global warming potential value specified in the respective prohibitions; or
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> (b) the equipment was placed on the market before the relevant prohibition date set out in Annex IV.

Q: Who is the “operator” mentioned in the regulation?

A: Definition of operator, (Article 3 page 49):

> (5) ‘operator’ means the undertaking exercising actual power over the technical functioning of products, equipment or facilities covered by this Regulation, or the owner designated by a Member State as being responsible for the operator's obligations in specific cases;

The “operator” is subject to competent authority verification for the next 5 years:

(Article 13, page 31)

> 20. The operator shall keep documentation establishing the evidence referred to in paragraph 19 for at least 5 years and shall make it available, upon request, to the competent authority of the Member State concerned or to the Commission.

Exemptions

Q: What will happen to the -70°C chambers?

A: The lower temperature limit of -70°C cannot be reached with CO_2 due to its physical characteristics. Therefore, Weiss Technik will continue selling and shipping these products with refrigeration cascades with R449A and R469A/R23. The GWP 150 threshold would only allow flammable refrigerants as an alternative. Flammable gases cannot be used in products with an ignition source, e.g. a heater.

Q: What will happen to the equipment assembled on site?

A: “Stationary refrigeration equipment” and is now part of Annex 4, (5). There will be no changes until January 1st, **2030** for these installations (ANNEX IV, page 54):

(5) Refrigeration equipment, except chillers and equipment covered in points (4) and (6), that contains, or whose functioning relies upon:	(a) HFCs with GWP of 2 500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C;	1 January 2020
	(b) fluorinated greenhouse gases with a GWP of 2 500 or more, except equipment intended for application designed to cool products to temperatures below – 50 °C;	1 January 2025
	(c) fluorinated greenhouse gases with a GWP of 150 or more, except if required to meet safety requirements at the site of operation.	1 January 2030

Q: Why are environmental simulation chambers not “stationary refrigeration equipment” anymore?

A: The definition of “self-contained” includes Weiss Technik’s one-piece chambers and cabinets.

(Article 3, page 14):

(38) ‘self-contained’ means a complete factory-made system which is in a suitable frame or casing, is fabricated and transported complete or in two or more sections, can contain isolation valves and in which no gas-containing parts are connected on site;

Q: Will Weiss Technik still export R449A or R513A devices to countries outside the EU?

A: Except for military equipment, we will have to follow the same restrictions we would face in Europe from March, 12th 2025 (one year after the regulation was entered into force). Devices with R153A can be exportet.

(Article 22, page 38)

3. From 12 March 2025 the export of foams, technical aerosols, stationary refrigeration and stationary air-conditioning equipment and stationary heat pumps as referred to in Annex IV that contain, or whose functioning relies upon, fluorinated greenhouse gases with a GWP of 1 000 or more shall be prohibited.

Q: Will there be any other exemptions to equipment?

A: Maybe. The regulation contains a clause allowing temporary exemptions for up to 4 years. Weiss Technik does not expect many exemptions and will not apply for one. The request must come from the “competent

authority" of an EU member state. https://climate.ec.europa.eu/system/files/2023-11/f-gas_contact_list_en_1.pdf

(Article 11, page 25)

> 5. Following a substantiated request by a competent authority of a Member State and taking into account the objectives of this Regulation, the Commission may, exceptionally, by means of implementing acts, authorise an exemption for up to 4 years to allow the placing on the market of products and equipment listed in Annex IV, or, by way of derogation from Article 13(9), the putting into operation of new or extended electrical switchgear, including parts thereof, containing fluorinated greenhouse gases or whose functioning relies upon those gases, where it is demonstrated that:
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> (a) for a specific product or a piece of equipment, or for a specific category of products or equipment, alternatives are not available, or cannot be used for technical or safety reasons; or
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> (b) the use of technically feasible and safe alternatives would entail disproportionate costs.

Service

Q: Did the service regulation change too?

A: Service is allowed for all chambers for a long time. There is a ban for refrigerants above GWP 750 starting on January 1st, **2032** but equipment below -50°C is exempt. Reclaimed refrigerants can be used without an end date

(Article 13, (5) page 29):

> 5. From 1 January 2032, the use of fluorinated greenhouse gases listed in Annex I, with a global warming potential of 750 or more, for the maintenance or servicing of stationary refrigeration equipment, with the exclusion of chillers, shall be prohibited.
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> The prohibition referred to in the first subparagraph shall not apply to military equipment or equipment intended for applications designed to cool products to temperatures below – 50 °C or equipment intended for applications designed to cool nuclear power stations.
>
> The prohibition referred to in the first subparagraph shall not apply to the following categories of fluorinated greenhouse gases:
>
> (a) reclaimed fluorinated greenhouse gases listed in Annex I with a global warming potential of 750 or more used for the maintenance or servicing of existing stationary refrigeration equipment, with the exclusion of chillers, provided that containers containing those gases have been labelled in accordance with Article 12(7);
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> (b) recycled fluorinated greenhouse gases listed in Annex I with a global warming potential of 750 or more used for the maintenance or servicing of existing stationary refrigeration equipment, with the exclusion of chillers, provided such gases have been recovered from such equipment; such recycled gases shall only be used by the undertaking which carried out their recovery as part of maintenance or servicing or by the undertaking for which the recovery was carried out as part of maintenance or servicing.

Q: Is my current equipment affected?

A: No. All existing equipment can be used without a time limit. In case of repairs, some service rules apply. weisstechnik products can be serviced without a limit. In some cases, recycled refrigerants have to be used.

Q: What about service and replacement parts of CO_2?

A: All parts used in weisstechnik products will be available as spare parts from the service department. Only qualified and tested parts can be used.

CO_2 for refrigeration needs to be free of contamination and moisture. Moisture can lead to hydrate and acids. Not all CO_2 gas can be used. Only R-744 with a certain quality standard can be used, due to the defined level of contamination.