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► F gases regulation (EU) 517/2014

White Paper IE 9

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“Are cooling units and chillers from Rittal no longer deployable post 2020?” This or similar questions are repeatedly asked by panel, switchgear or machine builders. As background information, the inception of the regulation (EU) No. 517/2014 concerning fluorinated greenhouse gases (F gases regulation) since January 1, 2015, results in banned use for cooling and air-conditioning plants as well as new regulations for their maintenance and servicing.

This white paper explains which areas are affected by the new regulation, which use bans apply and how it affects the use of Rittal climate-control solutions.

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1 Introduction



“Are cooling units and chillers from Rittal no longer deployable post 2020?” This or similar questions are repeatedly asked by customers of worldwide panel, switchgear and machine building sector. As background information, the inception of the regulation (EU) No. 517/2014 concerning fluorinated greenhouse gases (F gases regulation) since January 1, 2015, includes banned uses for cooling and air-conditioning plants as well as new regulations for their maintenance and servicing.

The F gases regulation is fundamentally a contribution to reducing industrial emissions to 70 percent by 2030 compared with 1990. Specifically, the emissions of fluorinated greenhouse gases (F gases) in the EU should be reduced by 70 million tons of CO₂ equivalent to 35 million tons of CO₂ equivalent by year 2030. Whereby, three regulation principles should contribute to the emission reduction [UBA]:

- Introduction of a successive restriction (phase-down) of the quantities of partially-fluorinated hydrocarbons (HFC) available on the market by 2030 to a fifth of today’s sales quantities
- Issue use and marketing bans, provided technically feasible, climate-friendly alternatives are available
- Retention and augmentation of the regulations for leakage inspections, certification, disposal and marking

Important in this regard is the statement made by the EU Commission concerning alternatives to F gases [EUC]. Because of the different thermodynamic and safety properties of the alternatives, there is no “one size fits all” solution. Whether a specific alternative is suitable must be considered individually for each category of products and equipment.

Consequently, in some cases, the ambient temperature at the deployment location of the product and of the equipment must be considered.

In the search for alternatives to HFCs (partially-fluorinated hydrocarbons) and HCFCs (hydro-chlorofluorocarbons) for specific applications, the total greenhouse emissions associated with the use are of concern. Consequently, suitable climate-friendly alternatives must exhibit a high energy efficiency so that the reduction of the direct emissions from the alternatives HFCs and HCFCs is not offset by higher indirect emissions caused by the energy consumption.

This white paper explains which areas are affected by the new regulation, which use bans apply and how it affects the use of Rittal climate control solutions.

2 Content of the F gases regulation

The F gases regulation (EU) 517/2014 in force since January 1, 2015 replaced regulation (EC) 842/2006. Its objective is to reduce the emissions of F gases and so their effect on global warming.

The new F gases regulation includes additional action compared with the regulation from 2006. It strengthens the action of the earlier regulation, and introduces a number of new wider activities for reducing F gases and their emissions.

The new regulation affects the following areas:

- **Leakages:** new interval for the inspection, requirement for detection systems and recording
- **Recovery:** increased attention of the member states for ensuring disposal
- **Use bans:** restrictions for various applications that use F gases
- **Maintenance and servicing:** new rules post 2020 for products with GWP (Global Warming Potential) > 2500
- **Certification:** delivery of refrigerants to certified customers
- **Marking:** further additional details for marking plant and pressure vessels
- **Phase-down period:** reduction linked with production and import quotas
- **Reporting:** revised process for reporting to the EU

3 Limitation of the total quantity

The actual core concept behind the new F gases regulation is not the bans, but rather the on-going limitation and so reduction of the F gas quantities (phase-down) by issuing quotas to manufacturers and importers. Whereby, this is a drastic, previously never experienced, step meaning that industry and users must convert to refrigerants with a lower GWP value.

To implement the phase-down, the European Commission limits the HFC (= F gases) quantities that may be marketed in the EU. This means that the European Commission specifies for all enterprises that manufacture or import HFCs how much they may market in the EU.

These quantities, also called quotas, are expressed as a CO₂ equivalent and do not apply to specific refrigerant types; enterprises are not permitted to exceed their granted quotas.

The (relative) global warming potential (GWP) specifies the extent to which a specified quantity of a greenhouse gas contributes to the greenhouse effect. Carbon dioxide serves as comparison value. The value describes the average warming effect over a specific interval. 100 years are often considered. The CO₂ equivalent quantity is the product formed from the absolute quantity of the HFC and the associated GWP of the HFC.

	IPCC 4th AR	Refrigerant quantity [kg] corresponds to tons of CO ₂	
		5	10
F gas	GWP ₁₀₀	kg	kg
R 134a	1,430	3.5	7
R 404A	3,922	1.3	2.6
R 407C	1,774	2.8	5.6
R 410A	2,088	2.4	4.8
R 422D	2,730	1.8	3.6
R 507A	3,985	1.3	2.6

Table 1: GWP / refrigerant quantity overview

Calculation:

The refrigerant R134a used by Rittal has a GWP of 1,430. The refrigerant filling quantity of an enclosure cooling unit with 500 g then corresponds to a CO₂ equivalent of 0.72 t (500 g filling quantity x 1430 GWP = 0.72 t CO₂e).

The objective is to reduce the consumption of F gases. As of 2015, the production quantities, expressed as CO₂ equivalent, should be reduced by 79% by 2030.

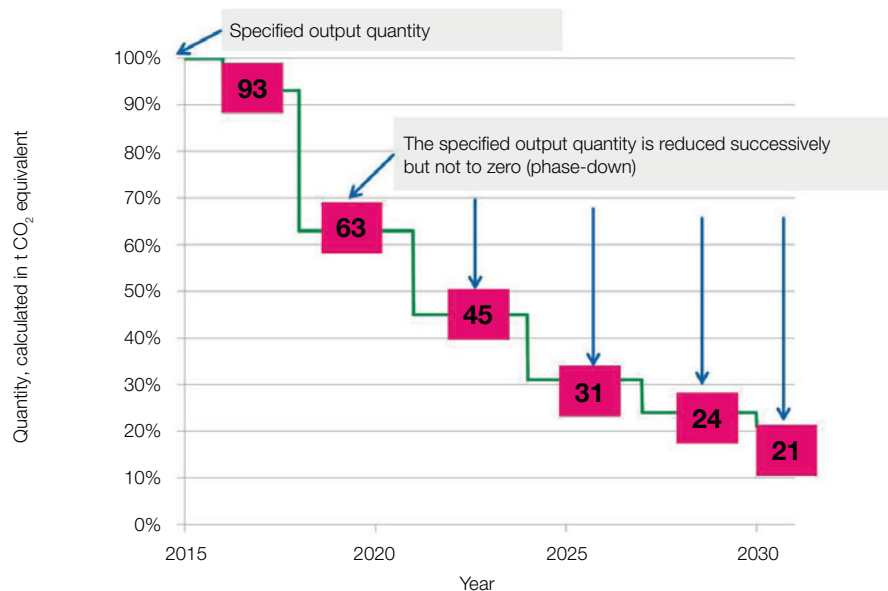


Figure 1: Phase-down graphic (source: German Environment Agency [UBA])

F-gas calculator provides clarity

Operators can easily determine the extent to which an existing system is affected by the consequences of the F gases regulation by using the Rittal F-gas calculator: This online tool calculates the corresponding carbon dioxide equivalent based on the GWP value and the amount of refrigerant being used. The carbon dioxide equivalent determines the action the operator will have to take in order to comply with the regulation. Here's how the Rittal F-gas calculator works: All system parameters (as shown on the rating plate), as well as the type of refrigerant and the filling quantity per circuit are entered at <http://www.rittal.com/f-gas>. The result is the carbon dioxide equivalent of the system. The admissibility of refrigerant replenishment, as well as practical advice for the operation of the current system are also shown.

4 Use bans for F gases

Use bans have been issued for many refrigeration and air-conditioning applications for which more environment-friendly alternatives exist, such as refrigerators in households or in commercial properties (supermarkets), air-conditioners as well as foams and aerosols:

Use bans in new plants [in addition to the existing restrictions from the F gases regulation 842/2006]	Valid as of
Household refrigerators and deep-freezers that contain HFCs with a GWP of at least 150	01/01/2015
Fire extinguishers that contain R 23 (exception: critical applications)	01/01/2016
Refrigerated counters and freezer cabinets in the commercial area (hermetically sealed) that contain HFCs with a GWP of at least 2500	01/01/2020
Stationary cooling plants with F gases with a GWP > 2500, except for plants with temperatures below -50°C.	01/01/2020
Portable room air-conditioners (hermetically sealed) that contain HFCs with a GWP of at least 150	01/01/2020
XPS foams that contain HFCs with a GWP of at least 150	01/01/2020
Technical aerosols that contain HFCs with a GWP of at least 150, except for medical applications or requirements that affect national safety	01/01/2020
Refrigerated counters and freezer cabinets in the commercial area (hermetically sealed) that contain HFCs with a GWP of 150	01/01/2022
New refrigeration centres for commercial purposes with a capacity above 40 kW, except for the main cycle of cascade systems whose refrigerant must have a GWP value below 1500	01/01/2022
Other foams that contain HFCs with a GWP of at least 150	01/01/2023
Split systems with less than 3 kg refrigerant filling and HFCs with a GWP of at least 750	01/01/2025

Table 2: Use bans



Rittal enclosure cooling units and chillers are not affected by these use bans because they have a hermetically sealed refrigerant cycle (no split climate-control systems).

In addition, the R134a, R410a and R407c refrigerants used in Rittal products have a GWP less than 2500.

5 Regular inspections and leakage checks



Figure 2: Everything in sight: An employee from the Rittal Manufacturer's Service checks the current efficiency values of the Rittal Blue e+ cooling units at Voith Turbo in Heidenheim.

Operators of enclosure cooling devices must make regular professional maintenance a high priority. This is because only reliable enclosure climate control protects the investment in the system and ensures that electronic components are protected from overheating while processes can run smoothly and safely. Emissions are prevented through the routine inspection and maintenance of existing systems with F gases, as well as the recovery of the gases at the end of the system's service life.

Any accidental release of fluorinated gases (leakage) must be prevented and kept to a minimum by the operator of the F gases systems by taking precautions and performing every technically and economically feasible measure. Should a leak be detected, the operator must ensure that it is repaired promptly.

As also in the regulation from 2006, the number of leakage inspections depends on the refrigerant filling of the equipment (per refrigerant cycle). However, the new regulation in effect since 01/01/2017 uses the CO₂ equivalent as basis rather than the weight in kilogram as previously.

CO ₂ equivalent per refrigerant cycle	Number of leakage inspections	
	Without leakage detection system	With leakage detection system
From 5 to 50 tons	Every 12 months	Every 24 months
From 50 to 500 tons	Every 6 months	Every 12 months
Above 500 tons	Every 3 months	Every 6 months

Table 3: Leakage inspections

Equipment classified as hermetically sealed with a quantity less than 10 tons CO₂ equivalent is not subject to a leakage inspection. This is the case for all Rittal enclosure cooling units. Filling quantities, GWP values and CO₂ equivalent details are shown on the associated rating plates and can also be obtained from the product descriptions on the Rittal website.

Rittal provides appropriate services for plants with a CO₂ equivalent filling quantity > 10 tons. Leakage inspections may be performed only by certified, qualified personnel. The Rittal service personnel is certified in accordance with the F gas regulation no. 267/2014 and so authorised to perform the required inspections.

The regular leak tests can also be combined with inspections and maintenance work. Maintenance of this nature is carried out according to product-specific checklists. It includes, among other things, the visual inspection and assessment of the general condition of the system, basic cleaning, the measurement and documentation of the system parameters, inspecting the fans, air routing and setting parameters, as well as logging any maintenance work and evaluating the state of the installation.

Besides this, Rittal also offers every service in the context of a service contract. Recurring maintenance operations help uphold the value of the equipment installed and make costs plannable. The customer benefits from cost transparency, the availability of spare parts, 24/7 accessibility, warranty extensions and qualified service technicians who can arrive on site very quickly indeed.



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Further information can be found at:

<http://www.rittal.com/service-maintenance>

6 Service and efficiency checks

The condition of cooling devices without regular maintenance varies from factory to factory and depends greatly on the environmental conditions. Where high levels of pollution are present, machine availability declines due to the significantly reduced useful cooling capacity of the enclosure cooling units and the increased amount of energy being consumed. The Rittal After Sales Service provides plant operators with practical and reliable on-site support in regularly inspecting equipment and in order to comply with statutory regulations. Besides the evaluation of the actual state of the system and the acquisition of all the operating parameters, the customer also receives an efficiency analysis with a concrete calculation of the energy consumption and potential savings to serve as a basis for decision-making. In many cases, it is worth replacing old devices with the latest technologies that will ensure compliance with regulatory and efficiency requirements in every case.

Besides all this, plant operators can benefit from applying for subsidies when replacing old equipment with more efficient technologies. Germany's Federal Ministry for the Environment is promoting and initiating climate protection projects throughout Germany via its National Climate Initiative (NKI). One contribution to help achieve the climate protection goals is to increase the energy efficiency, reduce the need for refrigeration and to cut fluorinated greenhouse gas emissions in the refrigeration and climate control technology sector. When it comes to efficiency and greenhouse gas reduction, funding is being provided to support system operators. Just which devices and which activities are being specifically funded will be determined and checked individually; the amount of funding per appliance is calculated based on the cooling output, the type of refrigeration system, how it is used, the reduction in energy consumption and the savings in carbon dioxide output. A company that specialises in making applications for funding supports plant operators at all the necessary stages and checks whether the same investment measure can be cumulated with other funding programmes.

Best practice Voith

The Voith technology group in Heidenheim, Germany took advantage of the Rittal service and efficiency check and has discovered a remarkable savings potential: At the Voith plant, staff of the Rittal Manufacturer's Service looked at every machine tool and its enclosure climate control system; a total of 50 different machines had enclosure climate control features. The result of the Rittal service was a large-scale documentation of the condition of the enclosure climate control for each machine examined and to make a recommendation as to whether it would be rational to replace the cooling unit and which unit was suitable and how much energy could be saved if it were replaced. In this specific case, it was recommended to replace the cooling units on a total of 21 machine tools with units from the new "Blue e" or "Blue e+" series; at least 70 percent of the energy consumed to date can now be saved. The changeover to more energy-efficient cooling appliances paid off after just over two years.



Figure 3: Retrofitted with savings: After the conversion to the new Blue e+ chiller generation, more than 70 percent or 25,000 euros per year in energy costs were saved.

Best practice Ford

Service partner Rittal has also been able to demonstrate considerable efficiency improvements at the Ford automotive works in Cologne: More than €552,000 in energy costs and 276 tonnes of carbon dioxide is now being saved over a service life of ten years after replacing 150 cooling units with Rittal Blue e and Blue e+ units. After deducting the investment sum, the payback period was a mere 2.42 years. This provided decisive arguments for Ford to let Rittal carry out analyses at its plants in both the UK and the USA. Ford then installed the more energy-efficient Rittal Blue e+ chillers there as well, not least as a means of countering the cost pressure in the automotive industry.



Link to technical articles about Voith and Ford:

<https://betop.friedhelm-loh-group.com/>

7 FAQs

1.) Are cooling units with compressors no longer permitted post 2020?

No. Rittal enclosure cooling units and chillers are not affected by these use bans because they have a hermetically sealed refrigerant cycle and the deployed refrigerants have a GWP value less than 2500.

2.) Are cooling units with a GWP = / > 150 no longer permitted post 2022?

No. The regulation affects only commercial refrigerated counters and freezer cabinets (hermetically sealed). Enclosure cooling units are not affected.

3.) What is banned?

Refer to the table in Chapter 4, "Use bans for F gases".

4.) From when (date) what applies and how?

Refer to the table in Chapter 4, "Use bans for F gases".

5.) Which cooling units are affected? Filling quantity in kg?

See Question 1. Equipment classified as hermetically sealed with a quantity more than 10 tons CO₂ equivalent is subject to a leakage inspection. Only Rittal chillers with power rating above 30 kW must be inspected. Rittal offers appropriate services for this purpose (see item 4).

6.) Does Rittal have a detailed "roadmap" for what needs to be adapted to conform to the EU regulation post 2022?

Rittal products are not affected by the use ban. Notwithstanding this, Rittal remains in contact with the component and refrigerant manufacturers. The mid-term objective is to provide feasible alternatives for energy-efficient and environment-friendly cooling solutions.

7.) Are the refrigerants R134 and R410a still permitted post 2020 or 2022?

Yes. Refer to the table in Chapter 4, "Use bans for F gases".

8.) How does the quota system function?

Quotas are expressed as CO₂ equivalent. This means, the larger the global warming potential (GWP) of a refrigerant, the greater the quantity of CO₂ equivalent and so the larger the required quota. The quotas are calculated once a year. The European Commission has also created a special reserve for enterprises that in the past did not market any HFC quantities in the EU. This should ensure that such enterprises can also apply for quotas. The European Commission then deploys an assignment mechanism as basis for calculating the quota for each enterprise.

9.) Do the refrigerants used in Rittal products originate from a quota?

Yes. All refrigerants used in Rittal enclosure cooling units and chillers are obtained from manufacturers with an appropriate quota. This is the case for all Rittal factories worldwide.

10.) Has Rittal issued a declaration of conformity required for the introduction of cooling units with HFCs in the EU?

Yes. The declaration of conformity can be downloaded from the Rittal homepage for the associated products.

Download: <http://www.rittal.de/eu-conformity>

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[EUC]	EU Commission objective: http://ec.europa.eu/clima/policies/f-gas/alternatives/index_en.htm	3
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