

**Explanations
regarding the new
F-gas Regulation (EU)
517/2014 relating to
the use of SF₆ in energy
transmission and
distribution**

January 2017

Power Engineering Division

Following lengthy discussions and negotiations at the European level, the new Regulation (EU) No. 517/2014 of the European Parliament and of the Council dated 16 April 2014 on fluorinated greenhouse gases was published in the Official Journal of the European Union on 20 May 2014¹ repealing Regulation (EC) No. 842/2006.

This document is an in-depth analysis of the new F-gas Regulation (EU) No. 517/2014 by the „SF₆ Working Group“, a joint committee of the associations BDEW - German Association of Energy and Water Industries, VIK - German Federation of Industrial Energy Consumers and ZVEI - German Electrical and Electronic Manufacturers' Association. The focus is on the application of the insulating and extinguishing gas sulphur hexafluoride (SF₆) in operating equipment for energy transmission and distribution.

With the regulations regarding the use of sulphur hexafluoride (SF₆) in energy transmission and distribution, the new F-gas Regulation (EU) No. 517/2014 sets the course for the continued responsible use of SF₆ to achieve the European goals regarding climate protection and energy efficiency.

Important issues in the new F-gas Regulation (EU) No. 517/2014

The proposal initially put forward by the Environment Committee of the European Parliament to ban the use of SF₆ in certain medium voltage switchgear is not contained in the new F-gas Regulation. Security of supply is rightly given greater significance by the EU institutions involved than the restriction of use of a greenhouse gas, which due to the poorer material and energy efficiency of the alternatives would actually lead to higher CO₂ emissions during the course of use. Nevertheless, the industry sees this as a signal to further intensify efforts to research and develop alternatives. The new F-gas Regulation schedules a review for a specified application in the year

2020 when, based on eco-balance criteria, the application of alternatives to SF₆ in medium voltage switchgear of the secondary distribution level shall be examined.

Primary goal: Avoidance of emissions

To avoid emission of fluorinated greenhouse gases, Art. 3 of the new F-gas Regulation (EU) No. 517/2014 obligates operators to repair any leak detected without delay. In the area of energy transmission and distribution, this requirement is in line with current practice. For its safe operation, SF₆-insulated high voltage switchgear requires SF₆ as an insulating medium. If such switchgear has a leak, it is in the operator's own best interest to repair the defective gear as soon as possible to protect the operating equipment and to ensure security of supply. For reasons of personnel safety and trouble-free or uninterrupted supply of the consumers, such work can be carried out only on isolated and earthed equipment, so that repair work needs to be planned and prepared carefully. With this requirement, the new F-gas Regulation documents a procedure which has been established practice for years.

¹ See <http://eur-lex.europa.eu/legal-content/DE/TXT/?qid=1410362243522&uri=CELEX:32014R0517>

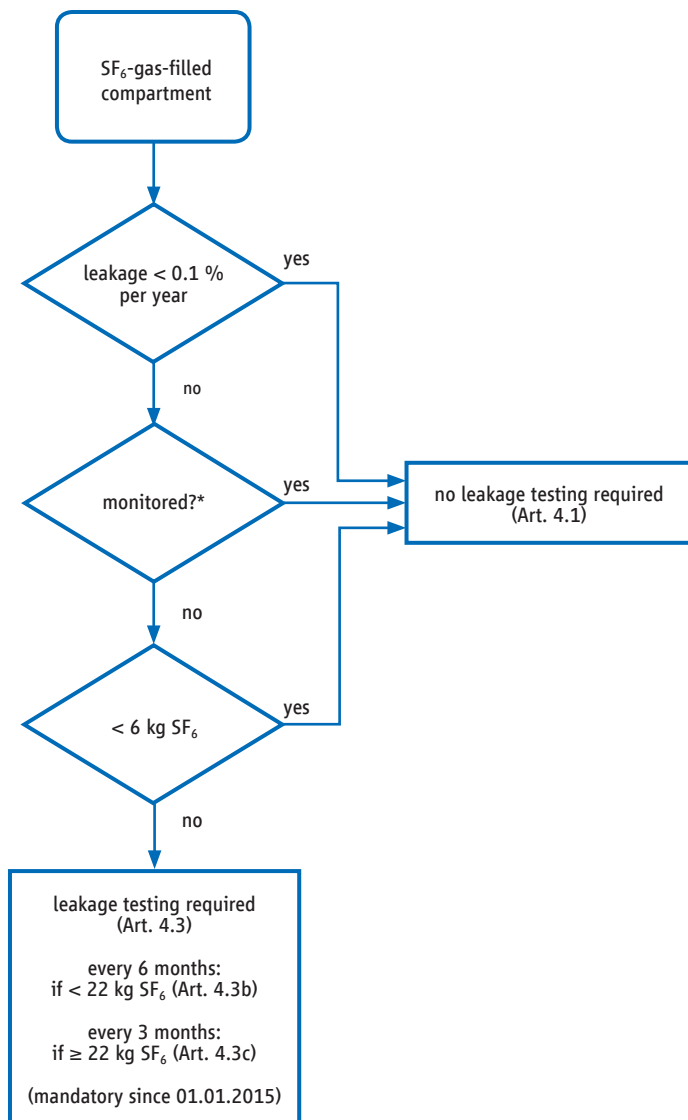
No leak testing required

Under Art. 4 of the new F-gas Regulation (EU) No. 517/2014, electrical switchgear is exempted from leakage tests if it

- has a tested leakage rate of less than 0.1 per cent per year; or
- is equipped with a sensor that monitors pressure or density; or
- contains less than 6 kg SF₆.

Figure 1: Decision tree for leakage testing:

Medium and high voltage switchgear meet at least one of the three criteria. Therefore, they are exempted from the leakage testing requirement.



* monitored = sensor (or manometer) that monitors pressure or density (Art. 4.1b)

Modern medium voltage switchgear in accordance with IEC 62271-1 usually meets the first and the second criterion, and a major part of the stations installed for medium voltage secondary distribution meet the second criterion. They are, therefore, exempted from the leakage testing requirement.

Since separate gas-filled compartments of switchgear are not connected to each other and hence any leakage usually will be restricted to one gas-filled compartment, the minimum threshold of 6 kg applies to individual gas-filled compartments.

For operational reasons, high voltage switchgear has always been equipped with measuring systems for pressure/density monitoring. Accordingly, this requirement of the new F-gas Regulation does not entail any need for additional, periodic leakage testing, nor for existing high voltage switchgear.

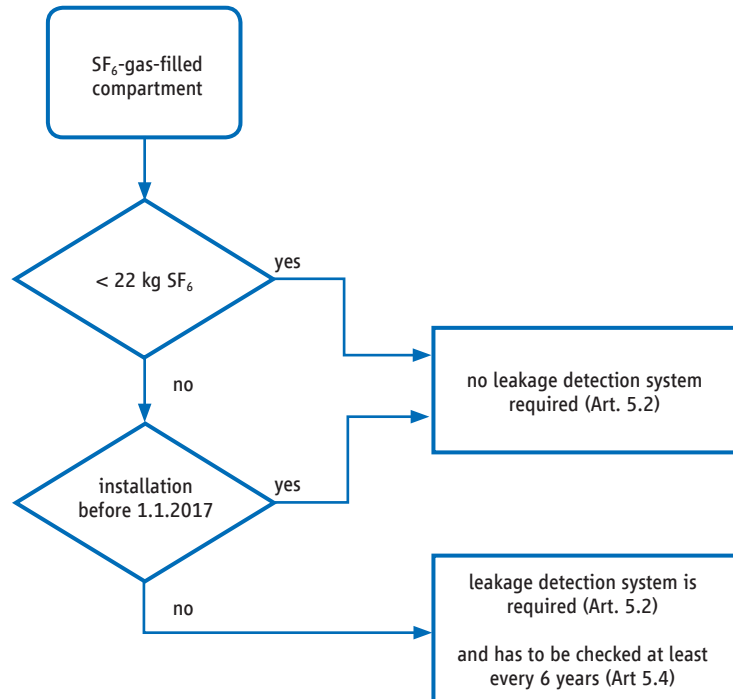
Leakage detection systems mandatory only for high voltage switchgear

From 1 January 2017, new electrical switchgear put into operation that contains an F-gas quantity corresponding to more than 500 tons of CO₂ equivalents (about 22 kg SF₆) must, according to Art. 5 of the new F-gas Regulation (EU) No. 517/2014, be equipped with a leakage detection system. Medium voltage switchgear usually contains significantly less SF₆ and, therefore does not fall within the scope of this requirement.

For reasons of operational safety, high voltage switchgear is commonly equipped with pressure/density monitoring sensors that signal the current operational status to a control room.

Figure 2: Decision tree leakage detection system:

Electrical switchgear with a gas-filled compartment containing more than 22 kg SF₆ gas needs to be monitored by a leakage detection system only if installed after 1 January 2017.



If electrical switchgear is equipped with a leakage detection system, the correct function of the leak detection must be checked at intervals of no longer than six years. Operators may carry out the required check of the pressure/density sensor system in the course of a routine check of the switchgear, as is the current practice. This obligation to check does not apply to electrical switchgear put into operation before 1 January 2017.

The SF₆ Working Group rates the sensor systems for gas-filled compartment monitoring of electrical switchgear as follows:

- Pressure and density sensors alone do not meet the requirements that apply to a leakage detection system.
- Pressure and density sensors with remote signalling function, such as the often used density monitors with control circuit (limit-value switch) meet the requirements that apply to a leakage detection system.

No documentation obligation for electrical switchgear

Under the new F-gas Regulation (EU) No. 517/2014, only those operators operating switchgear which must be checked for leaks on a regular basis pursuant to Art. 3 are obligated to keep certain records in accordance with Art. 6. Neither medium nor high voltage switchgear insulated with SF₆ fall within the scope of the leakage testing requirement, so that their operators can continue their established internal documentation processes without change or adaptation.

Training and certification only for persons handling SF₆

Art. 10 of the new F-gas Regulation (EU) No. 517/2014 makes reference to the hitherto existing requirements and states that older certificates issued in accordance with the old EU F-gas Regulation 842/2006 continue to be valid. Only those persons who handle the SF₆

gas need to be trained and certified. Workers and employees of the manufacturers of SF₆-insulated electrical switchgear need to be certified only if they handle SF₆ gas during installation of switchgear on site. For all activities at the manufacturing plant of SF₆-insulated electrical switchgear, the new F-gas Regulation does not demand additional certification of personnel.

Already in 2005, the manufacturers committed themselves under the voluntary commitment of the SF₆ producers and the manufacturers and operators of electrical equipment > 1 kV for the transmission and distribution of electric energy in the Federal Republic of Germany regarding SF₆ as an insulating and extinguishing gas to regularly inform and train all employees who handle SF₆. Moreover, in Germany, employees and companies are obligated to comply with the regulations of the employers' liability insurance association when they handle SF₆ gas.

New labelling of switchgear

From 1 January 2017, the manufacturers of SF₆-insulated switchgear (medium and high voltage) are obligated under Art. 12 of the new F-gas Regulation (EU) No. 517/2014 to state the quantity of SF₆ contained in a switchgear in kg and in CO₂ equivalents and the global warming potential of SF₆. The label has to be affixed permanently to the SF₆-insulated electrical switchgear either to each separate gas-filled compartment or in the immediate vicinity of the valves for filling and recovery of the SF₆. The new F-gas Regulation requires the information to be given in the official language of the member state in which the electrical switchgear is put into the market.

Where SF₆-insulated electrical switchgear is designed with an emission rate of less than 0.1 % per year and where it is the sole criterion for not performing regular leakage checks (see Figure 1 in this document), the manufacturer must state this and label this permanently on the equipment.

The SF₆ Working Group will campaign for a uniform, intelligible and easy-to-read marking by means of pictograms.

Reporting to the European Commission according to the new F-gas Regulation (EU) No. 517/2014

The new F-gas Regulation (EU) No. 517/2014 states in Article no. 19, that manufacturers, importers and exporters of SF₆ gas have to report the amount and use of SF₆ gas to the European Commission on 31 March of each year, as it was already practiced before.

Manufacturers of SF₆-insulated electrical switchgear must not report the amount of SF₆ gas if they have purchased it from a European SF₆ gas manufacturer, who is obliged to report the amount in the first place. However, if a larger amount of bulk SF₆ gas accompanying electrical switchgear will be exported outside the EU, this amount must be reported to the European Commission via an electronic reporting tool.

Also, operators of SF₆-insulated electrical switchgear must not report the amount of all SF₆ gas in their possession, but only the amount of SF₆ gas they are importing directly into the EU. This applies to SF₆ gas contained in imported switchgear exceeding the limit of 22 kg per year as well as to bulk SF₆ gas in bottles and containers.

The established practice of reporting according to the voluntary commitment on SF₆ in Germany remains unaffected by these new regulations and will be continued by manufacturers and operators in coordination with the Federal Environmental Agency and the Federal Environment Ministry.

Chart 1: Important deadlines and facts relating to the new F-gas Regulation (EU) No. 517/2014

The table summarizes the main activities related to the use of SF₆ gas in medium and high voltage electrical switchgear.

It provides information as to when the respective regulation applies, to whom it is relevant and what passage of the Regulation No. 517/2014 applies.

| Activity | Remark | Mandatory as of | Who is affected? | Applies to existing installations | Applies to new installations | F-gas Regulation requires use of certified personnel | | EU F-gas Regulation 517/2014 |
|---|---|-----------------|--|-----------------------------------|------------------------------|--|--|---|
| Immediate repair of leakage after detection | | 2006 | operator | X | X | yes | Article 10 training and certification, paragraph 1, a | Article 3 Prevention of emissions of fluorinated greenhouse gases paragraph 3, sentence 1 f |
| Leakage test (not mandatory if: leakage rate < 0.1 %/a or < 6 kg SF ₆ or gas-filled compartment is monitored by a sensor) | Pressure- and density monitors can be considered as sensors | 01.01.2015 | operator | X | X | no | Certification for leakage tests only on products acc. to Article 4, paragraph 2 a-e (not f) (switchgear) | Article 4 Leak checks, paragraph 1, sentence 3 a – c |
| Installation of a leakage detection system (if it contains > 22 kg SF ₆ gas) | e.g. pressure- and density sensors with a remote signaling function are considered as leakage detection system. | 01.01.2017 | manufacturer | | X | no | | Article 5 leakage detection systems, paragraph 2 |
| Check of the leakage detection system at least every 6 years (if it contains more than 22 kg SF ₆ gas and has been installed after 1.1.2017) | Assuming that SF ₆ is being handled during the check | 01.01.2017 | operator | | X | yes | Article 10 training and certification, paragraph 1, a | Article 5 leakage detection systems, paragraph 4 |
| Installation, service, maintenance, recovery (applies to works on the SF ₆ gas system only) | | 2006 | manufacturer: installation of new switchgear operator: during use | X | X | yes | Article 10 training and certification, paragraph 1, a and c | Article 3 Prevention of emissions of fluorinated greenhouse gases, paragraph 4; Article 10 training and certification, paragraph 1, a and c |
| Filling and handling of switchgear at the factory | | 2005 | manufacturer | X | X | no *) | *) Voluntary commitment to SF ₆ requires the use of trained personnel | |
| Labeling: contains F-gases, SF ₆ gas | | 2006 | manufacturer | X | X | no | | Article 12 Labelling and product and equipment information, paragraph 1, e and paragraph 3, a and b |

| Activity | Remark | Mandatory as of | Who is affected? | Applies to existing installations | Applies to new installations | F-gas Regulation requires use of certified personnel | | EU F-gas Regulation 517/2014 |
|---|--|--|---|-----------------------------------|------------------------------|--|---|--|
| Extended labelling: Mass SF ₆ gas in kg, CO ₂ -equivalent and GWP | | 01.01.2017 | manufacturer | | X | no | | Article 12 Labelling and product and equipment information, paragraph 1, e and paragraph 3, a to c |
| Extended labelling: indicating a leakage rate < 0.1 %/a | Only applicable if < 0.1 %/a justifies the omission of the leakage test | 01.01.2015 | operator and manufacturer | X | X | no | | Article 12 Labelling and product and equipment information, paragraph 1, e and paragraph 3, sentence 2 b |
| Reporting of SF ₆ -quantities, emissions, etc. (if a leakage test is mandatory) | Since 2005, the voluntary commitment to SF ₆ also includes reporting of the amount of SF ₆ gas applied and emitted | 01.01.2015 | operator | X | X | no | | Article 6 Record keeping, paragraph 1 |
| Reporting of SF ₆ gas in products or as bulk commodities to the EU commission (if > 22 kg SF ₆ per year are being dispatched) | Not mandatory for SF ₆ gas contained in switchgear but for imported or exported SF ₆ gas in bulk commodities | 01.01.2015 (reporting period 01.01.2014 - 31.12.2014) | manufacturer | | X | no | Submitting report by 31.03.2015 and annually thereafter | Article 19 Reporting on production, import, export, feedstock use and destruction of the substances listed in Annexes I or II, paragraph 4 See also executive order (EU) 1191/2014, paragraph 2, 3 and 11 |
| Reporting of SF ₆ gas in products or bulk commodities to the EU commission (if imported amount > 22 kg SF ₆ per year) | Not mandatory for products purchased in the EU but for all imported SF ₆ gas contained in switchgear or as bulk commodities | 01.01.2015 (reporting period 01.01.2014 - 31.12.2014) | operator (company) | | X | no | Submitting report by 31.3.2015 and annually thereafter | Article 19 Reporting on production, import, export, feedstock use and destruction of the substances listed in Annexes I or II, paragraph 4 See also executive order (EU) 1191/2014, paragraph 2 and 11 |
| Reporting of SF ₆ -quantities, certificates of receipt etc. | The record keeping requirement does not apply to electrical switchgear (Article 11, paragraph 4) | 01.01.2015 | SF ₆ gas supplier, operator, manufacturer | | | no | For electrical switchgear, a certification of the company (manufacturers, operators) is not required (Article 10, paragraph 6). | Article 6 Record keeping, paragraph 3; Article 11 Restrictions on the placing on the market, paragraph 4; Article 10 Training and certification |
| Transport of SF ₆ gas in bottles or products | | 2006 | operator, manufacturer, SF ₆ gas supplier, logistics companies | | | no | | Article 11 Restrictions on the placing on the market, paragraph 4 |

Remarks

500 tons of CO₂ equivalent stated in the F-gas Regulation corresponds to about 22 kg of SF₆ gas. All quantities refer to a gas-filled compartment.

The term referred to in the F-gas Regulation as "electrical switchgear" applies analogously also to all devices and components used for the generation, transmission, distribution and conversion of electrical energy.



Imprint

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