

EU F-Gas Regulation Guidance

Information Sheet 11: High Voltage Switchgear

Target audience for this Information Sheet

This Information Sheet is aimed at organisations that are operators (usually the owner) of high voltage switchgear using SF₆. It is also useful for those organisations that manufacture, sell, maintain and dispose of SF₆ insulated switchgear.

1. Background

This guidance is for organisations affected by the 2014 EU F-Gas Regulation (517/2014). The F-Gas Regulation creates controls on the use and emissions of fluorinated greenhouse gases (F-Gases) including HFCs, PFCs and SF₆.

In the switchgear sector, the F-Gas Regulation affects the use of SF₆ as an insulating gas in various types of high voltage equipment. The 2014 EU F-Gas Regulation replaces the 2006 Regulation, strengthening all of the 2006 requirements and introducing a number of important new measures.

The F-Gas Regulation is an important piece of legislation that will result in significant reductions in the emissions of F-Gases. These are very powerful greenhouse gases, with global warming impacts that are several thousand times higher than CO₂ (per kg of gas emitted). All EU Member States agree that it is important to reduce emissions of these gases.

This Information Sheet describes the requirements that apply to high voltage switchgear. Further guidance is available – see Information Sheet 30 for a full list and a glossary of terms.

High Voltage Switchgear: Compliance Checklist for EU F-Gas Regulation

Purchase of new equipment

- ✓ Switchgear products containing SF₆ must be labelled

Operation of existing equipment

- ✓ Mandatory leak checks and repairs (although most switchgear likely to be exempted via 3 special derogations for switchgear)
- ✓ **NEW:** Requirement for automatic leak detection on larger equipment (from 1st Jan 2017)
- ✓ **NEW:** Keep records about switchgear containing SF₆ (only if mandatory leak checks required)
- ✓ Use certificated technicians for certain SF₆ handling operations
- ✓ During servicing, mandatory recovery of SF₆ by a certificated technician

End-of-life requirements

- ✓ Mandatory recovery of SF₆ by a certificated technician

Import reporting requirements

- ✓ **NEW:** Mandatory annual reporting of HFCs and HFOs in imported products

2. Sector description

The electricity industry makes use of equipment insulated with SF₆. Most SF₆ is used in circuit breakers, although it can also be used in related equipment such as switches, disconnectors, current transformers and voltage transformers. There are 2 main categories of high voltage switchgear used in the electricity transmission and distribution system:

- a) **Transmission switchgear**, is typically used in systems at voltages between 66 kV and 400 kV. Equipment filled with SF₆ falls in two broad categories i.e. gas insulated switchgear (GIS) and air insulated switchgear (AIS). GIS equipment is significantly smaller than equivalent AIS and makes possible compact substations in urban and other areas, where its compactness gives the only practical solution for the electricity network. GIS can contain many tens or hundreds of kg of SF₆. GIS usually has a number of segregated metal enclosures with jointed components that enable engineers to get access to the systems for maintenance purposes. AIS are also large sized equipment, typically containing tens of kg of SF₆. AIS also has jointed SF₆ containing components.
- b) **Medium voltage switchgear**, is typically used in the range of 3.3 to 33 kV. These are much smaller pieces of equipment and are usually hermetically sealed and can operate without maintenance of the SF₆ circuit for the life of the switchgear. They typically contain less than 5 kg of SF₆. Some medium voltage units can be of GIS construction (i.e. with jointed compartments containing SF₆).

3. Purchase of new equipment

Bans and HFC Phase Down

There are no bans related to the use of SF₆ in high voltage switchgear.

Other F-Gas end use sectors are affected by a phase down in the quantity of HFCs to be placed on the EU market. This only applies to HFCs – it will have no impact on the SF₆ switchgear market.

Product Labelling

All switchgear containing SF₆ shall not be placed on the market unless the SF₆ is identified with a label. The label shall indicate the following information:

- 1) A reference that the switchgear contains F-Gases
- 2) The accepted industry designation for the F-Gas concerned or, if no such designation is available, the chemical name
- 3) **NEW:** From 1 January 2017, the quantity expressed in weight and in CO₂ equivalent of F-Gas contained in the switchgear, and the global warming potential of the F-Gas used.

4. Operation of existing equipment

The 2014 F-Gas Regulation includes a number of requirements that affect the use and maintenance of existing switchgear containing SF₆. The rules depend on the type and size of switchgear being used. The regulations affecting existing equipment relate to (a) leak prevention, (b) record keeping and (c) the use of certificated technicians. These requirements are described below.

Leak prevention and mandatory leak checks

The intentional release of F-Gases into the atmosphere is prohibited and operators of all switchgear systems using SF₆ must take all measures that are technically and economically feasible to minimise leakage. Where leaks are detected operators must carry out repairs without undue delay.

NEW: Under the 2006 Regulation, the legal responsibility for preventing F-Gas releases was only given to the operator (usually the owner) of the equipment. In the 2014 Regulation there is a similar legal responsibility given to third party contractors carrying out installation, maintenance, leak checking or SF₆ recovery on behalf of operators.

NEW: Switchgear is now included in a list of F-Gas applications requiring mandatory leak tests. The Regulation specifies leak tests are required for switchgear containing more than 6 kg of SF₆. However, the Regulation includes 2 special derogations for switchgear. The leak checking rules do not apply if a piece of switchgear containing more than 6 kg of SF₆ complies with one of the following conditions:

- a) It has a tested leakage rate of less than 0.1 % per year as set out in the technical specification of the manufacturer and is labelled accordingly
- b) It is equipped with a pressure or density monitoring device

The first derogation could apply to new hermetically sealed equipment, but not many existing systems have the appropriate labelling. However, the size threshold excludes virtually all hermetically sealed systems used for medium voltage switchgear as most contain less than 6 kg of SF₆.

The second derogation excludes the majority of larger GIS as they are usually fitted with a pressure monitoring device and / or a density monitoring device.

If none of the above derogations apply then the SF₆ insulated switchgear must be regularly checked for leakage. All switchgear falling outside the above derogations would require leak testing at the frequency shown in Table 1.

Table 1: Leak Testing Frequency (if switchgear derogations do not apply)

SF ₆ quantity	No automatic leak detection	Automatic leak detection fitted
6 to 22 kg	Every 6 months	Every 12 months
Above 22 kg	Every 3 months	Every 6 months

If a leak is found during a mandatory leak check it must be repaired without undue delay and the leak test repeated within one month to ensure the repair was effective.

Mandatory automatic leak detection

NEW: For new switchgear systems installed after 1st January 2017, containing 500 tonnes CO₂e or more there is a mandatory requirement for an automatic leak detection system to be fitted. For systems with SF₆, this means switchgear containing more than 22 kg.

An automatic leak detection system is defined as a “*calibrated mechanical, electrical or electronic device for detecting leakage of F-Gases which, on detection, alerts the operator or a service company of any leakage*”.

Automatic leak detection systems used for SF₆ switchgear must be checked at least once every 6 years to ensure their proper functioning.

Record keeping

NEW: Operators of SF₆ switchgear must keep records for each piece of equipment that is subject to a mandatory leak check (i.e. not exempted via the derogations listed above). The records that must be kept include:

- a) quantity and type of F-Gas installed
- b) quantities of F-Gas added during installation, maintenance or when repairing a leak
- c) whether the F-Gases used have been recycled or reclaimed (including the name and address of the recycling or reclamation facility and, where applicable, the certificate number).
- d) quantity of any F-Gases recovered
- e) the identity of the undertaking that installed, serviced or decommissioned the equipment, including, where applicable, their certificate number
- f) dates and results of all mandatory leak checks
- g) for equipment decommissioned, the measures taken to recover and dispose of the F-Gases.

Records must be kept by the plant operator for at least 5 years. Records collected by a contractor on behalf of an operator must be kept for at least 5 years. The records shall be made available on request to the UK Government's competent authority (i.e. the Environment Agency) or to the Commission.

5. Use of certificated technicians

Certain SF₆ handling operations on switchgear must be carried out by suitably trained technicians holding an F-Gas handling certificate. This specifically includes installation, servicing, maintenance, repair or decommissioning, and generally for the recovery of SF₆. See Information Sheet 24 for details of all training and certification requirements.

6. End-of-life requirements

Any switchgear containing SF₆ that is being disposed of at end-of-life must undergo an SF₆ recovery process. Recovery must be carried out by a certificated technician.

All recovered F-Gases can either be:

- a) sent for destruction by incineration at a licenced waste facility
- b) sent to a specialist plant that can re-process the old SF₆ into a fluid with properties identical to virgin SF₆, to create "reclaimed SF₆"
- c) given a basic cleaning process, to create "recycled SF₆".

7. Purchase and Supply of Bulk SF₆

NEW: The 2014 F-Gas Regulation places a new obligation on companies selling bulk F-Gases (e.g. cylinders of SF₆) to:

- a) Ensure that they only sell F-Gases to companies that hold the correct F-Gas certification
- b) For each customer, to keep records of the relevant certificate numbers and of quantities of F-Gases sold.

Details of how bulk gas wholesalers should address this requirement are given in Information Sheet 19 “Customer Screening”.

Companies purchasing F-Gases for installation, servicing and maintenance should be aware of this requirement. Suppliers are likely to request a “Letter of Assurance” that includes:

- Statements that confirm the purchasers understanding of the F-Gas Regulation and the importance of minimising emissions
- An assurance that the purchaser will only use trained and certified persons to carry out ‘gas handling’ activities where required by the Regulation
- Certification details for the employees who hold appropriate training and certification under the F-Gas Regulation.
- If appropriate, expiry dates for personnel certificates.

8. Reporting of imports

NEW: Any high voltage switchgear containing SF₆ that is imported from outside the EU needs to be reported to the Commission on an annual basis. The first report covers the calendar year 2014 and must be submitted to the Commission by March 31st 2015. Reports for future calendar years must be made by March 31st of the following year.

Details of import reporting requirements are given in Information Sheet 20.

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This Information Sheet has been prepared by Gluckman Consulting

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