

Guidance for Departments on the Regulation of Fluorinated Greenhouse Gases (F-gas) and University Equipment

Introduction

In May 2006 the EC introduced legislation to regulate certain fluorinated greenhouse gases. The Regulations (known as the F-gas Regulations) deal with the containment and recovery of these gases and also with training and certification of personnel who carry out leak testing, gas recovery, maintenance etc of equipment that contains this type of gas. The most commonly used F-gases are hydrofluorocarbons (HFCs), these are widely used in refrigeration applications. Other fluorinated gases include perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

This guidance focuses on installations and equipment that use refrigeration, air conditioning and heat pump technology. However, certain fire protection equipment that contains F-gases may also be subject to the legislation.

The Regulations come into force on 4 July 2007 and introduce a number of general obligations that apply to **all** equipment, irrespective of size, that contains fluorinated greenhouse gases:

- Use all measures that are technically feasible and do not entail disproportionate cost to prevent leakage of HFC refrigerants
- Repair any detected leak as soon as possible
- Recover refrigerant
- Use appropriately trained and qualified contractors to service, maintain and dispose of equipment and refrigerant

The remainder of the provisions apply only to larger installations such as:

- **Commercial scale refrigeration machinery** – equipment to cool processes or storage spaces below ambient temperature, e.g. cold rooms, large scale water chillers
- **Air-conditioning equipment**
- **Heat pumps** – heating devices that use a refrigeration machine to extract energy from a waste heat source and deliver useful heat. This may include hot rooms.

For this type of equipment the Regulations will potentially have an impact on servicing, maintenance and disposal. Within the University Estates & Buildings manage the servicing and maintenance of much of the equipment to which the Regulations apply. However individual departments must ensure that the requirements are met for any installations or equipment within their control to which the Regulations apply.

Note: This legislation should not be confused with the EC Regulation on substances that deplete the ozone layer that became effective from October 2001 and that currently controls the use of chlorofluorocarbons (CFCs) and

hydrochlorofluorocarbons (HCFCs) and the disposal of equipment that contains them including disposal of small scale refrigeration equipment. Information on disposal of equipment that is regulated by this legislation is available at <http://www.gla.ac.uk/services/purchasing/supplier/fridges.doc> and guidance on the legislation is available at <http://www.defra.gov.uk/environment/waste/topics/fridges/faq.htm#Q3>

A. Identifying equipment or installations within the University that may be affected

All equipment or installations that contain an F-gas are subject to the general requirements of the Regulations.

Step 1. Identify fluorinated gases contained within refrigeration installations

All refrigeration systems should be labeled with the refrigerant type, usually on a name plate mounted on the equipment. Occasionally this information will be contained in the documentation provided when the system was purchased.

Refrigerants are generally identified by an “R” number or by a trade name. Table 1 shows information that can help you identify refrigerants to which the Regulations apply.

Table 1

Type	Commonly used	Less commonly used
HFCs (pure fluids)	R134a	R23, R32, R125, R143a
HFCs (blends)	R403A, R403B, R404A, R407C, R408A, R410A, R413A, R417A, R507	R401(A,B,C), R402(A,B) R407 (A,B,D), R411B, R416A, R422A, R423A, R508
Trade names for refrigerants	Trade names are sometimes used with the relevant R number (e.g. Harp 134a) or with another number (e.g. R 401A is also Suva MP39) The following trade names are for refrigerants that contain F gases: AZ-20, AZ-50, Forane (FX56, FX80, FX100), Greencool 411B, Harp, Isceon (MO29, 39TC, MO49, 59, MO79, MO89), Klea, RS-24, RS-44 Suva (MP39, MP66, HP80, HP81)	

Additional points to note when identifying refrigerants

a) Some HFC refrigerant blends contain both HFCs and HCFCs (e.g. R401A and R408A). These “HCFC blends” **do** falls under the EU Ozone Regulations. However, whether they are subject to the requirements of the F-gas Regulations will depend on the precise nature of the blend and the combined global warming potential of the mixture. The equipment manufacturer or a contractor that is appropriately qualified should be able to clarify the status of such mixtures.

b) R22 is a very common HCFC refrigerant used in air-conditioning and industrial plant. As an HCFC it is **not covered** by the F-gas Regulation, but **does** fall under the EU Ozone Regulations.

Step 2. Identify the equipment and installations that are subject to the more stringent requirements by determining if the volume of refrigerant exceeds the thresholds

If the equipment **does** use an HFC refrigerant it is then necessary to determine the volume of refrigerant within the equipment. It should be noted that if there are two or more interconnected systems then the **total** volume of refrigerant is the relevant measure.

In some cases the name plate on the equipment will, in addition to giving details of the refrigerant it contains, give the weight in kilograms of the refrigerant. For example the name plate may say:

R134a 0.05Kg

This means that the equipment contains 0.05Kg of the HFC refrigerant R134a.

There are some ‘rules of thumb’ that may be useful in estimating how much refrigerant the equipment contains:

- **Small hermetically sealed systems fitted with a “domestic” 240 Volt 13 Amp plug will contain less than 6 kg.** All domestic fridges and freezers fall into this category and the majority of domestic refrigerators contain less than 3 kg.
- **Most “split systems” will contain more than 3 kg.** A split system is one with at least 2 major components located in different locations, connected by refrigerant pipework. For example, an air-conditioning system or cold room with a cooling unit inside a room and a condensing unit that is located remotely, usually outside the building.
- **Most air-conditioning water chillers will contain more than 3 kg.**

If information on the refrigerant type and quantity is not readily available you should consult the manufacturer/supplier. If the equipment is subject to a routine servicing schedule, the contractor may be able to provide information, otherwise it may be necessary to engage a contractor to determine the information. In addition, SEPS can provide further information about determining refrigerant quantities.

B. Complying with the requirements of the Regulations

a) General obligation to prevent leakage. Using all measures which are technically feasible and do not entail disproportionate cost operators must:

- Prevent leakage of HFC refrigerants and
- As soon as possible repair any detected leakage.

b) Regular leak testing. Equipment containing 3kg or more of F-gas refrigerant must be checked for leakage by certified personnel on a regular basis. The frequency of testing depends on refrigerant charge and system type.

Table 2 summarises the leakage checking frequencies.

Table 2

Frequency	Normal systems	Hermetically sealed systems
None	< 3kg	< 6 kg
Annual	3 – 30 kg	6 – 30 kg
6 monthly (annually*)	30 – 300kg	30 – 300 kg
Quarterly (6 monthly*)	> 300kg	> 300 kg

*The longer intervals in parenthesis can be applied if leak detection is fitted

c) Automatic leak detection systems. Installations with more than 300 kg must be fitted with a leak detection system that alerts the operator. The detection system must be checked at least once a year to ensure it functions properly.

If a leak detection system is fitted to any plant below the mandatory 300 kg threshold the frequency of leak testing can be halved, although an annual check remains the minimum frequency.

d) Maintaining records. Records must be kept about each system that has more than 3 kg of HFC refrigerant. The records must include:

- The quantity and type of F-gas refrigerant in each system
- Any quantities of refrigerant added
- The quantity of refrigerant recovered during servicing, maintenance and final disposal.
- Other relevant information including
 - the identification of the company or technician who performed the servicing or maintenance
 - The dates and results of leak checks and leak detection system checks.
- Information that specifically identifies stationary equipment containing 30kg or more of refrigerant

These records must be made available on request to the competent authority (SEPA).

Appendix 1 shows an example log sheet.

e) Gas recovery. If refrigerant needs to be removed from a system (e.g. during maintenance or decommissioning) it must be properly recovered by certified personnel. After recovery the refrigerant can be reused or sent for reclamation or destruction.

f) Use of adequately trained and certified staff. Personnel involved in refrigerant handling (e.g. leak checking, gas recovery, installation or maintenance) must have a suitable refrigerant handling qualification.

Summary of requirements

A summary of the steps to compliance is shown in Figure 1.

- Stationary HFC refrigeration systems with less than 3 kg of HFC refrigerant are not covered by the obligation to carry out regular leakage checks and to keep records **but are subject to the general obligations described in the introductory section above.**
- Hermetically sealed systems with between 3 kg and 6 kg of HFC refrigerant are exempt from the obligation to carry out regular leakage checks. Any system requiring on-site fabrication of refrigerant pipework is unlikely to fall in this category.
- There are further thresholds at 30 kg and 300 kg which are used to define the frequency of leak testing required and the requirements for automatic leak detection.

Further Information

Further information can be obtained by contacting SEPS or by visiting <http://www.defra.gov.uk/environment/climatechange/uk/fgas/index.htm> where you will find a link to the Regulations and to government guidance documents.

Appendix 1

Example record sheet for compliance with the F gas Regulations. Records of this type must be kept for **each** refrigerant plant that contains more than 3 kg of HFC refrigerant.

UNIVERSITY OF GLASGOW			
<i>Record of work undertaken on equipment containing F-gas</i>			
General Information			
Plant Name		Ref No.	
Location of Plant			
Plant Operator ¹			
Operator Contact ²			
Area Served			
Refrigerant Type		Refrigerant Quantity (kg)	
Plant manufacturer		Date of Installation	
Refrigerant Additions			
<i>Date</i>	<i>Engineer³</i>	<i>Amount added (kg)</i>	<i>Reason for addition</i>
Refrigerant Removals			
<i>Date</i>	<i>Engineer³</i>	<i>Amount removed (kg)</i>	<i>Reason for removal. What was done with refrigerant?</i>
Follow-up Actions			
<i>Date</i>	<i>Engineer³</i>	<i>Related to test on</i>	<i>Actions taken</i>
Testing of Automatic Leak Detection System (if fitted)			
<i>Date</i>	<i>Engineer³</i>	<i>Test result</i>	<i>Comments</i>

- 1 - Name and address of department that operates plant
- 2 - Name of nominated person responsible for compliance
- 3 - Identify both the Company and the actual technician carrying out the work, with contact details – to provide evidence of competence.

Figure 1 - Steps to compliance with F-gas Regulations

