



Complying with Regulations Controlling Fluorinated Greenhouse Gases and Ozone Depleting Substances

A Guidance Note for Contractors of Equipment Containing F-gas and ODS

July 2015

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1. Introduction

This Guidance Note is published by the Environmental Protection Agency (EPA) and is aimed at assisting contractors and in-house technical personnel working on equipment containing Fluorinated Greenhouse Gas (F-gas) and Ozone Depleting Substances (ODS) to comply with the relevant European Regulations in the Republic of Ireland.

This Guidance Note introduces [Regulation \(EU\) No. 517/2014](#) (hereinafter referred to as the F-gas Regulation) which came into force on 1st January 2015 and repealed F-gas Regulation EC No. 842/2006 (hereinafter referred to as the [repealed F-gas Regulation](#)). The existing ten Commission (Implementing) Regulations, associated with the repealed F-gas Regulation are still applicable and are listed in Appendix 1. The ODS Regulation ([Regulation \(EC\) No. 1005/2009](#)) remains unchanged and sets out the obligations relating to ODS and equipment containing ODS.

The F-gas and ODS Regulations are European Regulations that are directly in force in all EU Member States. The purpose of these Regulations is to reduce the impact of F-gases on climate change and of ODS on the further depletion of the ozone layer, by reducing emissions of F-gases and ODS respectively through HFC Phase Downs and Service Bans

This guidance is primarily aimed at contractors and in-house technical personnel dealing with equipment containing ODS and/or F-gas, and to a smaller degree at the operators of such equipment. Operators may require and request guidance from contractors regarding their obligations under the ODS and F-gas Regulations. Therefore, operator obligations are also included in this Guidance Note.

Key changes introduced in the F-gas Regulation include:

- (i) Extended containment provisions to include refrigerated units of trucks and trailers, switchgear with some derogations, organic Rankine cycles.
- (ii) Leak checking frequency based on the **Global Warming Potential**¹ (GWP) of the F-gas (this was previously based on the charge (in kg) of an F-gas),
- (iii) Service and maintenance ban using high GWP refrigerants in 2020, but the use of recycled and reclaimed gases will be allowed until 2030.
- (iv) Some equipment which did not previously require leak checking may now need to be checked, and
- (v) Some equipment which did not previously require automatic leak detection equipment may now need such equipment to be installed.

In this Guidance Note new requirements of the F-gas Regulation are flagged for ease of reference using the word '**New!**'.

Guidance documents relating to the obligations of operators of electrical switchgear² (containing SF₆), refrigerated trucks and trailers³ and Air Conditioning (AC) equipment in road vehicles is available at www.fgases.ie.

¹ Global warming potential is the climatic warming potential of a greenhouse gas relative to that of carbon dioxide.

² Electrical switchgear' means switching devices and their combination with associated control, measuring, protective and regulating equipment, and assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting structures, intended for usage in connection with the generation, transmission, distribution and conversion of electric energy.

³ A motor vehicle with a mass of more than 3.5 tonnes that is designed and constructed primarily to carry goods and that is equipped with a refrigeration unit.

2. Purpose of the F-gas and ODS Regulations

2.1 F-gas Regulation

F-gases are very powerful greenhouse gases that contribute to climate change if emitted to the atmosphere. F-gases include hydrofluorocarbons (HFCs) which are commonly used as refrigerants and Sulphur hexafluoride (SF₆) and Perfluorocarbons (PFCs).

Most F-gases have a relatively high GWP, and thus contribute to global climate change if released to the atmosphere. The objective of the F-gas Regulation is to protect the environment and combat climate change by reducing and preventing emissions to atmosphere and encouraging the use of low GWP F-gases.

The F-gas Regulation presents the following strategies to reduce F-gas emissions to atmosphere:

- Prevent leakage and emissions through leak checks, control of production, training, information for users and end of life treatment, and
- Avoid the use of high GWP F-gases via phase down and bans (service and maintenance and placing on the market bans).

The publication of Irish Regulations⁴ to give further effect in Ireland to specific elements of the F-gas Regulation will follow. Significant changes compared to the current content of the F-gas Regulation are not anticipated.

For help with abbreviations and definitions of terms see Appendix 2 and for other sources of information see Appendix 3.

2.2 ODS Regulation

ODS are chemicals that can damage the earth's ozone layer if they escape into the upper atmosphere. ODS include chlorofluorocarbons (CFCs) such as R12 and R502, hydrochlorofluorocarbons (HCFCs) such as R22 and drop in blends such as R408A, R123 and R142b. HCFCs are still in use as refrigerants in many buildings in Refrigeration and Air Conditioning (RAC) equipment.

The ODS Regulation replaces an earlier Regulation ([Regulation \(EC\) No. 2037/2000](#)). The key requirement of the ODS Regulation is the phasing-out of the use of ODS. Virgin⁵ ODS refrigerant (R12, R502, R11) for maintenance and servicing of RAC equipment has been banned since the end of 2009. A ban on the use of **all** (i.e. virgin, recycled and reclaimed) ODS for the maintenance or servicing of existing RAC and heat pump equipment is in place since 1st January 2015. This ban is discussed in detail in [Section 5.6](#) of this document.

The ODS Regulation was given further effect in Ireland by the Control of Substances that Deplete the Ozone Layer Regulations 2011 ([S.I. No. 465 of 2011](#)).

⁴ F-gas Regulation, as any other EC Regulation, is directly binding in all EU Member States. It is the obligation of the reader to ensure to refer to the most current legislation. The associated Irish Regulations, when published, will be available on the website of the Department of Environment, Heritage and Local Government www.environ.ie.

⁵ A substance that has not previously been used.

3. Equipment Containing F-gas and ODS

The following stationary equipment types containing ODS and F-gas are within the scope of the F-gas Regulation.

- Refrigeration systems,
- AC systems,
- Heat pumps, and
- Fire protection equipment.

New! The F-gas Regulation introduces obligations for the following equipment:

- Refrigeration units of refrigerated trucks and trailers,
- Electrical switchgear,
- Organic Rankine cycles (ORCs)⁶, and
- AC units in motor vehicles.

3.1 Out of Scope Equipment

While a large number of modern RAC equipment contains F-gas, there are number of systems which utilise alternatives such as low and very low GWP F-gases and natural refrigerants that fall outside the scope of the F-gas Regulation. These include carbon dioxide (CO₂), ammonia (R717) and Halocarbon (HC) refrigerants (such as R290 (Propane) and R600a (Butane)).

Appendix 4 contains a list of refrigerants, which fall within the scope of, and are controlled by, the F-gas and ODS Regulations.

3.2 Common F-gases and ODS in Use

Table 1 lists some of the most common ODS, F-gases and blends (gases that contain a mixture of different F-gases, ODS and potentially other refrigerants) and shows which Regulation is relevant to each. See Appendix 4 for a more extensive listing.

Table 1: Common ODS and F-gases

Refrigerant	Type	EU F-Gas Regulation	EC ODS Regulation
R22*	HCFC	✗	✓
R408A*	HCFC + HFC Blend	✓	✓
R134a	HFC	✓	✗
R404A	HFC Blend	✓	✗
R407C	HFC Blend	✓	✗
R410A	HFC Blend	✓	✗
Ammonia	Natural	✗	✗
CO ₂	Natural	✗	✗

*The use ODS is now banned under the [ODS Regulation \(EU\) 842/2006](#).

⁶ Heating recovery devices which utilise waste heat to provide electrical power.

4. Definition of an Operator

The operator is defined in the F-gas Regulation as “*the natural or legal person exercising actual power over the technical functioning of products and equipment covered by this Regulation*”. It is the operator of equipment containing F-gas and/or ODS that must ensure they comply with the specific obligations under the Regulations.

The operator may be a person or a company and may be, but is not necessarily, the owner of the equipment containing ODS and/or F-gas. As a starting point the owner should assume responsibility for operator obligations, unless it is confirmed that operator obligations belong, or have been transferred to, a 3rd party.

The European Commission (EC) issued [guidance](#) in 2009 which states that the “actual power over the technical functioning” of a piece of equipment or system must include each of the following elements:

- Free access to the system, which entails the possibility to supervise its components and their functioning, and the possibility to grant access to third parties,
- The control over the day-to-day functioning/ running (e.g. take the decision to switch it on or off), and,
- The powers (including financial power) to decide on technical modifications (e.g. replacement of a component), modification of the quantities of F-gases in the system, and to have checks or repairs carried out.

If all of these elements are transferred to a third party (e.g. a contractor) through contractual arrangements then the responsibility for compliance with operator requirements will likely rest with the third party, depending on how the contract is set up. For example, a supermarket retail chain will be the operator, unless the supermarket chain has formally and contractually transferred all responsibility to another party, such as a contractor. For most organisations, the end-user is both the owner and the operator.

The following sections outline the specific obligations for both operators and contractors. The extent to which obligations apply is dependent on the type of equipment, the type of gas and the gas charge.

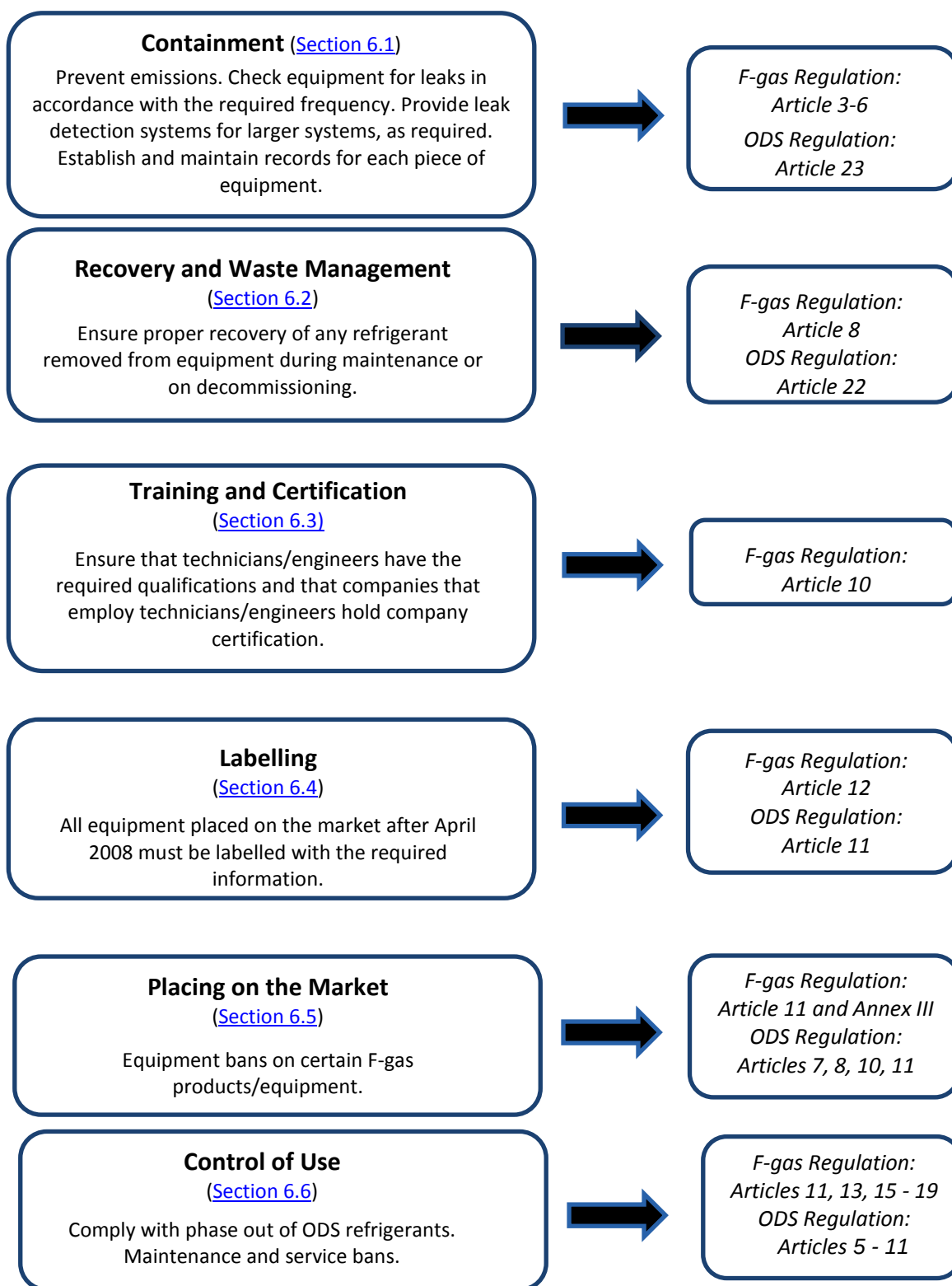
Although qualified contractors carry out maintenance and servicing activities on behalf of the operator, the operator has responsibility for:

- Compliance with the Regulations, and
- Providing documentation proving compliance during an inspection by the EPA.

It is therefore important that both contractors and operators are aware of, and understand, the requirements of the Regulations.

5. Summary of Obligations

This section provides a summary* of each of the key obligations under the F-gas and ODS Regulations followed by a more detailed introduction to each obligation.



* Commission (Implementing) Regulations should also be referred to in addition to the relevant sections of the ODS and F-Gas Regulations outlined above. A list of the Daughter Regulations is provided in Appendix 1.

Figure 1: Summary of Key Obligations under the F-gas and ODS Regulations

6. Key Obligations Explained

6.1 Containment

6.1.1 Leak Prevention

The repealed F-gas Regulation and the ODS Regulation place an emphasis on the “prevention” of leaks.

New! The F-gas Regulation explicitly **prohibits** the intentional release (e.g. deliberate venting) of F-gases to atmosphere in addition to taking precautions to prevent unintentional release.

New! Where leaks of F-gas are detected the F-gas Regulation obligates operators to ensure that the associated equipment is repaired without undue delay.

Where leaks of ODS are detected, the ODS Regulation obligates operators to complete a repair as soon as possible and in any event within 14 days.

The ODS and F-gas Regulations require that a repaired leak is checked by a certified person within one month after the repair to ensure that the repair has been effective. However, this recheck can take place on the same day that the leak is fixed once the system has been repaired and is in operation.

New! Both operators and contractors must take precautionary measures to prevent F-gas leakages.

6.1.2 Leak Checks

Equipment containing ODS or F-gas refrigerant must be checked periodically for leakage. Leak checking must be carried out by qualified personnel⁷. [Commission Regulation \(EC\) No. 1516/2007](#) (on standard leak checking requirements) requires that all newly installed equipment containing F-gases should be checked for leakage immediately after installation. This should be completed prior to commissioning and addition of refrigerant.

Appropriately qualified personnel working on equipment containing ODS or F-gas refrigerant should have a good working knowledge of the equipment, e.g.:

- Have an awareness and understanding of the equipment design, operation and performance criteria,
- Understand the operating pressures of the equipment and have the knowledge to confirm they are as per equipment operating design,
- Have sufficient knowledge of which areas on the equipment are more prone to failure/cause of leakage if left unchecked,
- Inspect and interpret equipment records to identify historical leakage points and conduct forensic checks to ensure gas tightness, and
- Inspect and identify any potential areas of the equipment where future loss may occur.

⁷ Personnel include in house personnel or external contractors.

a. F-gas

New! The F-gas Regulations require that in addition to stationary⁸ equipment (i.e. refrigeration, AC, heat pumps and fire protection equipment) the following equipment containing F-gas requires periodic leak checking **if** the equipment contains F-gases in quantities of **5 tonnes of CO₂ equivalent (t CO₂ eq) or more**:

- Refrigeration units of trucks and trailers,
- Electrical switchgear using SF₆, and
- Organic Rankine cycles.

New! The F-gas Regulation replaces thresholds expressed as weight (charge in kg) of F-gas by thresholds expressed in tonnes of CO₂ eq quantities. This means that the frequency of leak checking on F-gas equipment will depend on the **Global Warming Potential (GWP)** of the refrigerant, expressed as tonnes of CO₂ eq, contained in the equipment in addition to the quantity of the gas. This requirement applies from 1st January 2015. ODS leak checking thresholds remain expressed as weight (charge in kg).

Exemptions

- I. **New!** Hermetically sealed equipment containing F-gas which contains F-gases in quantities less than **10 t CO₂ eq** is not subject to leak checks provided that the equipment is labelled as hermetically sealed.
- II. **New!** Electrical switchgear is not subject to leak checking provided the equipment complies with the following:
 - a. It has a tested leakage rate of 0.1% per year as set out in technical specifications and is labelled accordingly,
 - b. It is equipped with a pressure or density monitoring device, or
 - c. It contains less than 6 kg of F-gas.
- III. **New!** Fire protection equipment is not subject to leak checking providing the following two conditions are met:
 - a. The inspection regime meets ISO 14520 or EN 15004 (related to design and properties of fire extinguishing systems), and
 - b. The fire protection equipment is inspected in accordance with the frequencies outlined in Table 2 of this document.
- IV. **New!** The leak checking regime for **small charge equipment** set out in the repealed F-gas Regulation continues until 31st December 2016, i.e. leak checking **is not** required for non-hermetically sealed⁹ equipment containing less than 3 kg and hermetically sealed equipment containing less than 6 kg - regardless of the GWP (see Figure 2). From 1st January 2017 relevant small charge equipment must be leak checked in accordance with Table 2.

⁸ Stationary means not normally in transit during operations.

⁹ Equipment with an airtight seal.

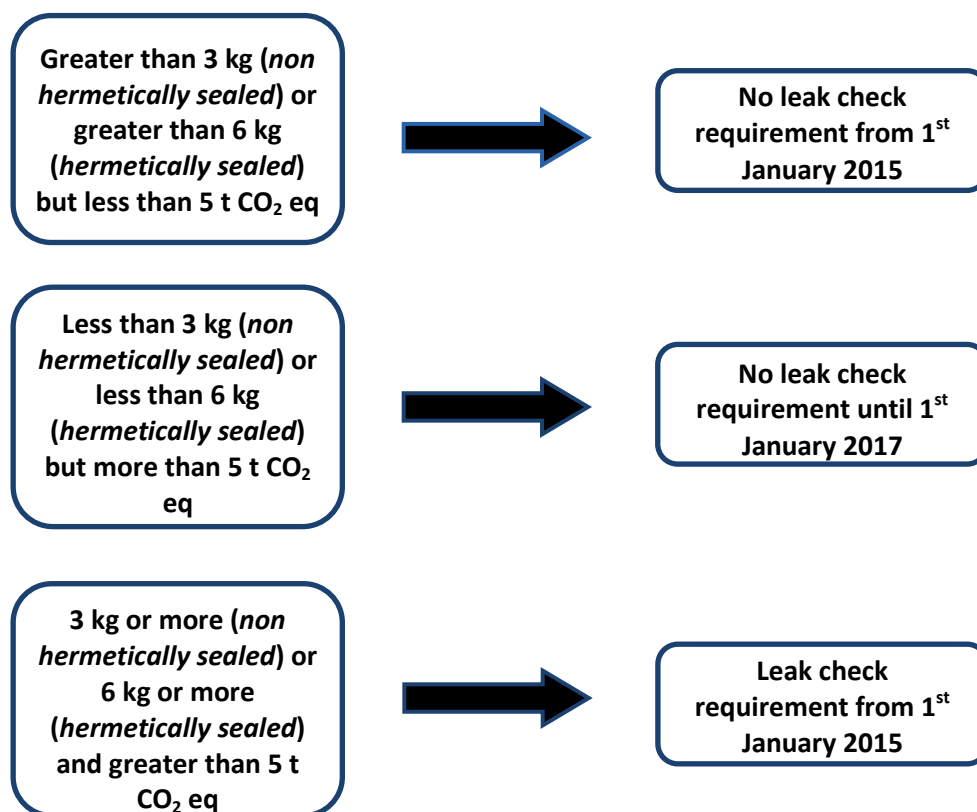


Figure 2: Small Charge Equipment Exemption

The leak checking frequency for equipment containing F-gas is included in Table 2. A table listing common F-gases (both pure and blends), the associated GWP and the 5, 50 and 500 t CO₂ eq is included in Appendix 5. This table, in conjunction with Table 2, should be used to determine the leak checking frequency of equipment containing F-gas. The method for calculating the CO₂ eq is included in the guidance document titled "[Summary Guide to the New Leak Checking Requirements](#)".

Table 2: **New!** Leak Checking Frequencies: F-gas

Leak Checking Frequency*	2006 Regulation	2014 Regulation
	kg threshold for all HFC refrigerants	t CO ₂ eq threshold for all HFC refrigerants
None	≤ 3 kg	≤ 5 t CO ₂ eq
Annual	3 kg	5 t CO ₂ eq**
Every 6 months	30 kg	50 t CO ₂ eq
Every 3 months	300 kg	500 t CO ₂ eq

* Leak check frequency is halved if automatic leak detection system is installed

** The threshold for annual leak checks of hermetically sealed equipment is 10 t CO₂ eq

The change from leak checking based on charge (in kg) to leak checking based on CO₂ equivalent is to encourage the use of lower GWP alternatives.

Hermetically sealed equipment containing less than 10 t CO₂ eq is not subject to leak checking provided the equipment is labelled as being hermetically sealed.

Automatic leak detection equipment¹⁰ is required for equipment covered under the F-gas Regulation (with the exception of refrigerated trucks and trailers) which contains F-gas in quantities of 500 t CO₂ eq, or more.

Important: This change also brings some equipment containing F-gas, which would previously have been exempt, into the leak checking regime. For example, from the 1st January 2017, equipment containing just 1.27 kg of R404A will now be required to be leak checked (1.27 kg of R404A is equal to 5 t of CO₂ eq). On the other hand, equipment previously liable to regular leak checks may fall below the minimum threshold. For example, the minimum R32 charge increases from 3 kg to 7.41 kg.

b. ODS

Equipment containing ODS is required to be leak checked based on the charge of ODS (in kg). This requirement remains unchanged.

Note: hermetically sealed equipment containing less than 6 kg of ODS is not subject to leak checking provided that the equipment is labelled as hermetically sealed.

Table 3: Leak Checking Frequencies: ODS

Leak Checking Frequency	ODS	
	System charge - non hermetically sealed (kg)	System charge - Hermetically sealed (kg)
None	< 3 kg	< 6 kg
Annual	3 kg to 30 kg	6 kg to 30 kg
6 monthly	30 kg to 300 kg	30 kg to 300 kg
Quarterly	> 300 kg	> 300 kg

6.1.3 Automatic Leak Detection Systems for Equipment Containing F-gas

New! Operators must provide leak detection systems for the following equipment:

- Stationary equipment (i.e. refrigeration, air conditioning, heat pumps and fire protection equipment) containing F-gas in quantities greater than **500 t CO₂ eq**, (applicable from 1st January 2015), and
- Electrical switchgear and organic Rankine cycles containing F-gas in quantities greater than **500 t CO₂ eq** and installed from 1st January 2017.

New! Equipment fitted with leak detection systems must be checked at least once every 12 months to ensure the proper functioning of the leak detection system. Switchgear leak detection systems require checking every 6 years to ensure proper functioning.

There are two types of automatic leak detection systems:

- **A direct system** uses electronic sensors to detect the presence of leaked refrigerant in areas adjacent to the refrigeration plant, and

¹⁰ An automatic leakage detection system is a calibrated mechanical, electrical or electronic device for detecting leakage of F-gases which, on detection, alerts the operator.

- **An indirect system** interprets appropriate measurements within the refrigeration plant to predict a leak.

Both systems have advantages and disadvantages and it depends on the location and operation of equipment containing F-gas as to which leak detection system is most appropriate.

The new leak checking frequencies based on CO₂ eq means that some larger systems, previously not required to have leak detection, may now have to install automatic leak detection. For example, for equipment containing R404A, the size threshold drops from 300 kg to 127 kg.

There is no mandatory requirement to fit leak detection on equipment containing ODS.

6.1.4 Records

Operators are required to maintain records for:

- Each piece of equipment containing F-gas which requires periodic leak checking, and
- Equipment containing 3 kg or more of ODS.

The requirement to keep records is to improve containment of F-gases and ODS and to demonstrate compliance with relevant obligations. Using the information that has been collected in your equipment records can allow you to monitor and reduce losses of F-gases and ODS and so maintain equipment and optimise energy efficiency, minimise downtime and identify poorly operating equipment.

Before carrying out leak checks, certified personnel should check the equipment records to determine any previous issues and consult previous reports.

The records must include the following information:

- The name, postal address and telephone number of the operator,
- The **quantity** and **type** of F-gas refrigerants installed in each system¹¹,
- Any quantities of refrigerant added (**New!** during installation, maintenance or servicing or due to leakage),
- **New!** Whether the quantities of installed F-gases have been recycled or reclaimed¹², the name and address of the recycling or reclamation facility, and if applicable, the certificate number of the recycling/reclamation facility,
- The quantity of refrigerant recovered during servicing, maintenance and final disposal,
- The identity of the company who installed, serviced, maintained and where applicable repaired or decommissioned the equipment, including, where applicable, the certificate number of the company,
- Dates and results of leak checks,
- **New!** If the equipment is decommissioned, the measures taken to recover and dispose of the F-gas refrigerant¹³, and

^{11,13,14} For equipment containing F-gases these are regulatory requirements, and for equipment containing ODS these are best practices.

- Details of automatic leak detection systems, including results of annual checks for effectiveness.

Other record keeping requirements:

- For equipment containing F-gas, **operators** must retain the applicable records **for at least five years (New!)**,
- **The company or personnel**, who installed, serviced, maintained, repaired or decommissioned the F-gas equipment, must also retain the applicable records (see above) **for at least five years (New!)**,
- Records may be kept centrally or with the equipment, the main requirement is that they are accessible and **can be made available** on request to the competent authority (the EPA) and to the European Commission, and
- The operator should be prepared for inspections by the competent authority and ideally should nominate a person who is responsible for producing records during inspection.

See Appendix 7 for an example of a recommended record sheet.

6.2 Recovery and Waste Management

6.2.1 Recovery of Refrigerant during Maintenance or Decommissioning

If ODS/F-gas refrigerant needs to be removed from equipment it must be properly recovered by suitably qualified personnel and all due care must be taken to minimise any emissions.

In practice, this can be done using a refrigerant recovery unit, which is comprised of a small compressor, filters and controls. One side is connected to the refrigeration system via service valves and the other side to a purpose built designated recovery cylinder, shown in Figure 3. Some recovery units have the capability to extract most of the refrigerant in liquid form, before switching to extract any remaining vapour.



Figure 3: F-gas Recovery Cylinder

Great care should be taken to label the recovery cylinder in order to identify its contents and not to mix different refrigerants.

After recovery the F-gas refrigerant can be reused or sent for reclamation or destruction.

The company/personnel that use an F-gas container immediately prior to its disposal must arrange for the recovery of any residual gas in the container and ensure that it is recycled, reclaimed or destroyed.

Options for dealing with recovered F-gas refrigerant include reuse, recycling, reclamation or destruction, as detailed in Figure 4.

Important: all recovered ODS **must be discarded and managed as a hazardous waste**, as there is no longer any legitimate use for it.

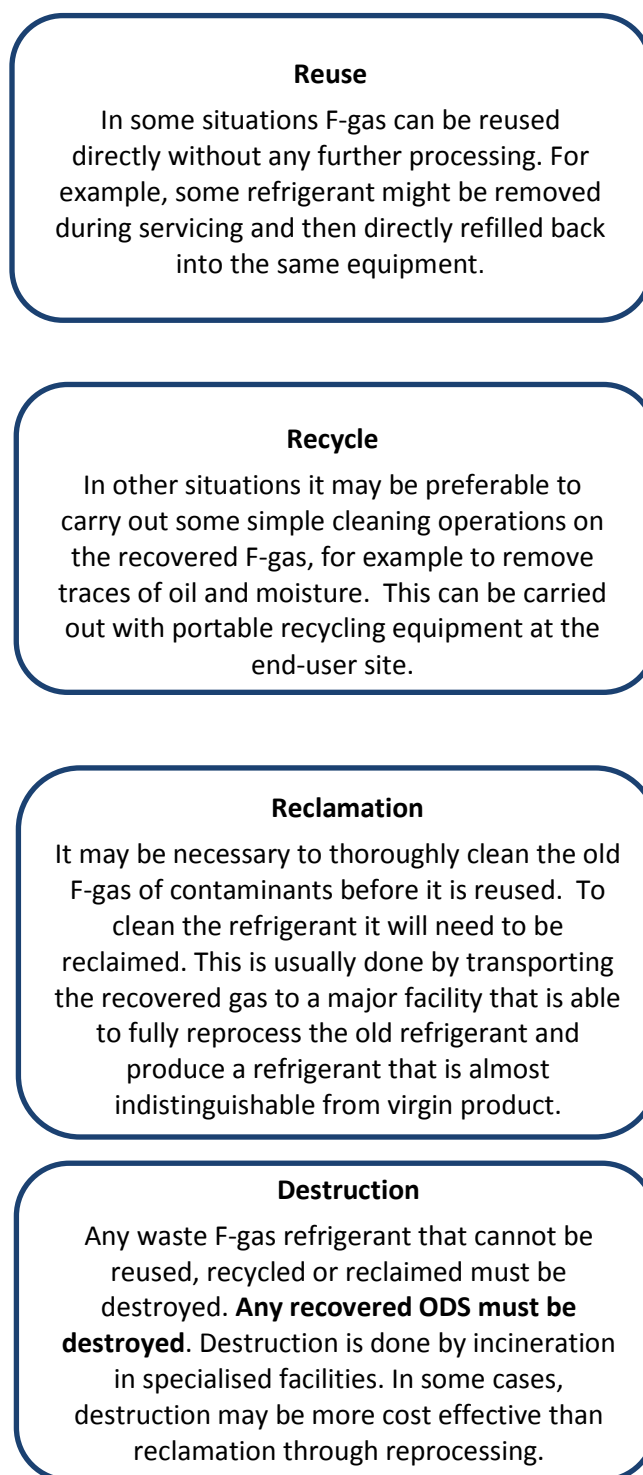


Figure 4: Options for Dealing with Recovered ODS/F-gas Refrigerant

6.2.2 Waste Refrigerant Handling

ODS/F-gas refrigerant for disposal is classified as **hazardous** waste.

Waste producers have a “**duty of care**” for the waste they handle and must ensure they use the right documentation and move waste appropriately.

The EPA has developed a position paper on the handling of waste F-gas and ODS refrigerants entitled “[Management of waste refrigerant gases](#)” and it is important to be aware of its requirements.

Under [Section 32](#) of the [Waste Management Act 1996](#), as amended, a holder of waste, “shall not hold, transport, recover or dispose of waste in a manner that causes or is likely to cause environmental pollution”. The Waste Management Act 1996, as amended, and the EC (Waste Directive) Regulation, S.I. No 126 of 2011 provide the basis for the management of hazardous waste in Ireland.

a. Transport of Waste Refrigerant Gases

The collection and transport of waste refrigerant gases can only be carried out by a person that either holds an appropriate waste collection permit or by the contractor that generated the waste while working on the equipment containing ODS or F-gas and who has submitted a Prior Annual Notification (PAN) to the EPA. Waste refrigerant gases must be brought to an appropriately authorised waste facility when taken from an end-user site. The following options apply for the movement and management of waste refrigerant gases:

1. A contractor who has submitted a PAN to the EPA can transport the waste refrigerant gas from the end-user site to an authorised waste management facility, as outlined in their PAN and in accordance with Article 30 of the Waste Management (Collection Permit) Regulations 2007 ([S.I. No. 820 of 2007](#)). In this instance, the contractor becomes the holder of the waste and must fulfil the general duty on the holder of waste set out in Section 32 of the Waste Management Act, as amended. A list of PANs received and accepted by the EPA is available on www.ozone.ie. Waste Transfer Forms (WTFs) are not required for the movement of waste refrigerant gases within Ireland, under a PAN. However, any transfer of hazardous waste outside the State must be in accordance with the requirements of [Transfrontier Shipment of Waste \(TFS\)](#).
2. The operator can make its own arrangements for the proper management of the waste refrigerant. In this instance, the operator remains the holder of the waste and must fulfil the general duty on the holder of waste set out in Section 32 of the Waste Management Act, as amended.

b. Storage of Waste Refrigerant Gases

The storage of waste refrigerant gases is not permitted on any site (other than temporary storage i.e. no greater than 6 months at the site of generation), unless that site is specifically authorised to do so.

Appropriate authorisation will be one of the following:

1. Waste Licence issued by the EPA,
2. Waste Facility Permit issued by the relevant local authority, or,
3. Certificate of Registration issued by the relevant local authority.

Under no circumstances can a contractor store waste refrigerant gas on their own site without having an appropriate authorisation for the storage of such waste.

6.2.3 Waste Electrical and Electronic Equipment (WEEE) Waste Management Issues

When equipment containing F-gas/ODS reaches the end of its life, it must be disposed of in an environmentally sound manner through a facility authorised to accept and/or treat Waste Electrical and Electronic Equipment (WEEE). This is particularly relevant considering the ban on the use of ODS in servicing and maintenance and the likely increased generation of WEEE due to replacement of equipment containing ODS.

The route by which the waste equipment (WEEE) can be managed will vary, depending on when the unit was placed on the market, and whether or not it is being replaced. The following points should be noted:

- For equipment placed on the market prior to 13th August 2005 that is now waste, the Electrical and Electronic Equipment (EEE) producer¹⁴ (in practice, usually the supplier of the equipment) is obliged to take back WEEE of a similar type and function (irrespective of brand) when a business end-user is purchasing new equipment from him/her. The EEE producer is then responsible for the environmentally sound management of the WEEE, and
- If the business end user is simply discarding the WEEE (where the unit was placed on the market originally prior to 13th August 2005) and not replacing it, the responsibility for ensuring the environmentally sound management of the WEEE remains with the business end user.

An appropriately authorised waste management operator must be used to transport and manage the waste in both scenarios identified above.

- For equipment placed on the market after August 2005 that will become waste, the EEE producer must take back and manage WEEE from the business end-user or make alternative financing arrangements with the business user. Alternative arrangement means that there must be a formal agreement between both parties on how and who will finance the management of the WEEE. The WEEE must be transported and managed by appropriately authorised waste management operators. This requirement applies whether or not the equipment is being replaced.

If your company has purchased equipment outside Ireland or sourced it from an unregistered EEE producer, your company will be required to register¹⁵ as an EEE producer. To find out more about the requirements of the EU (Waste Electrical and Electronic Equipment) Regulations 2014 - [S.I. No. 149 of 2014](#) including any producer obligations that may apply visit www.weee-enforcement.ie.

In addition, if the equipment contains batteries you will need to consider your obligations under the European Union (Batteries and Accumulators) Regulations 2014 – [S.I. No. 283 of 2014](#). More information is available at www.batteries-enforcement.ie.

¹⁴ The producer is normally the person who placed the equipment on the market in Ireland for the first time.

¹⁵ All details on the registration process and a list of registered producers are presented on the website of the WEEE Register Society Ltd. www.weee-register.ie.

6.3 Training and Certification

6.3.1 Company Certification

Companies (including sole traders) undertaking the tasks outlined below on stationary equipment, refrigerated units of truck and trailers (i.e. refrigeration, AC, heat pumps and fire protection equipment) **must** hold a company certificate.

The relevant tasks include:

- Installation, servicing, maintenance,
- Repair, and
- **New!** Decommissioning

Operators must take reasonable steps to determine whether the company performing relevant tasks holds the necessary certificate. F-Gas Registration Limited is the certification company established in Ireland to issue company certificates¹⁶.

Further detail on company certification requirements is set out in the supporting Commission Regulation (EC) [No. 303/2008](#) (on minimum certification requirements - stationary equipment) and [304/2008](#) (on minimum certification requirements - fire protection).

If a company directly employs personnel to undertake such activities then the company must hold a company certificate and the personnel will be required to hold appropriate qualifications. If a company sub-contracts all of this type of work and only acts in a project management capacity (i.e. it does not directly employ any qualified staff to work on RAC equipment containing or designed to contain F-gases) then the company does not require a company certificate.

Table 4 summarises the certification requirements for specific tasks and items of equipment - for both companies and personnel.

6.3.2 Personnel Qualifications

Personnel carrying out certain tasks on relevant equipment **must** be appropriately qualified. Operators must only use personnel with appropriate qualifications.

The relevant equipment includes:

- Stationary refrigeration, AC, heat pump and fire protection systems,
- **New!** Refrigerated trucks (above 3.5 t) and trailers,
- AC equipment in cars and light vans¹⁷ (**recovery operations only**),

¹⁶ Contractor company certificates can also be issued by a certification body in another Member State of the European Union and are mutually recognised in Ireland.

¹⁷ Category M1 and N1 class 1 road vehicles within the scope of [Directive 2006/40/EC](#) on Mobile Air Conditioning (MAC) :

- *M1: designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat, and*
- *N1 class 1: vehicles designed and constructed for the carriage of goods and having a maximum mass not exceeding 3.5 tonnes.*

- **New!** AC equipment in other commercial and passenger road vehicles¹⁸ (**recovery operations only**) - covers all other categories of road vehicle, and
- Any other equipment (including mobile equipment¹⁹) containing F-gases (**recovery operations only**, where recovery is technically feasible and does not entail disproportionate costs).

The relevant tasks include:

- Installation, servicing, maintenance,
- Repair,
- **New!** Decommissioning,
- Leakage checking, and
- Recovery.

New! For the recovery of F-gases from AC equipment in cars and light vans, personnel holding at least an appropriate training certification (see Tables 5 and 6) are considered qualified. For other commercial and passenger road vehicles and other equipment containing F-gases, personnel must hold an “appropriate” qualification - this may be considered to be the relevant appropriate industry standard.

Table 4: Certification Requirements for Tasks and Equipment

	Installation, Servicing, Maintenance	Repair	Decommissioning	Leak Checking	Recovery
Stationary Equipment ²¹	 	 	 	 	 
Refrigerated Trucks & Trailers	 	 	 	 	 
Electrical Switchgear					
AC in Road Vehicles					



Company Certification Required



Personnel Qualifications Required

¹⁸ Vehicles outside the scope of Directive 2006/40/EC on MAC.

¹⁹ Equipment that is normally in transit during operation – this could be interpreted as applying to, for example, passenger transport such as trains, metros, trams, buses, boats etc.

²¹ Stationary includes refrigeration, air conditioning, heat pumps and fire protection equipment.

6.3.3 Stationary Refrigeration and Air Conditioning Equipment

Commission Regulation (EC) No. 303/2008, sets out minimum qualifications for personnel on stationary Refrigeration and Air Conditioning (RAC) systems that contain or are designed to contain F-gases. This Regulation sets out four different levels of certification for stationary systems, which allow contractors or personnel to carry out different activities. For example, Category I allows personnel to work on any systems containing 3 kg or more of an F-gas whereas Category IV only allows personnel to undertake leak checking.

Table 5: Levels of Certification

Category	Activity
Category I	Certificate holders may carry out <u>all</u> of the following activities for any size of RAC systems containing F-gas refrigerants - installation, maintenance and servicing, repair, decommissioning (New!), leak checking and refrigerant recovery.
Category II	Certificate holders may carry out refrigerant recovery, installation, maintenance and servicing in relation to RAC systems containing less than 3kg of fluorinated greenhouse gases (or less than 6kg for systems that are hermetically sealed). Category II certificate holders may also carry out leak checks on sized RAC system provided that it does not entail breaking into the refrigeration circuit containing F-gases.
Category III	Certificate holders may carry out refrigerant recovery in relation to RAC systems containing less than 3 kg of F-gases (or less than 6kg for systems that are hermetically sealed).
Category IV	Certificate holders may carry out leak checks on any plant provided that it does not entail breaking into the refrigeration circuit containing F-gases.

There are two types of training courses widely available and accepted in Ireland. These are outlined in Table 6.

The Further Education and Training Awards Council (FETAC) developed a national specification for F-gas and ODS certification for stationary RAC qualifications that meets the minimum requirements of F-gas Regulation - FETAC Level 5 (Special Purpose Certificate in Handling F-gas Refrigerants 5S0108). The functions of FETAC have been taken over by Quality and Qualifications Ireland (QQI). The City and Guilds (Level 2 Award in F-gas Regulation, No. 2079) will be accepted in Ireland and by other Member States under mutual recognition obligations.

Table 6: City and Guilds and FETAC Qualifications for each Category - RAC systems

Level	City and Guilds 2079	QQI/FETAC 5S0108
Category I	2079-11 City and Guilds NDAQ Ref No 500/5730/3 NFQ Level 4 Award in F-gas and ODS Regulations: Category I	F-gas Handling in Large RAC Systems plus Category II, III and IV awards* Award Code 5N0104
Category II	2079-12 City and Guilds NDAQ Ref No, 500/5731/3 NFQ Level 4 Award in F-gas and ODS Regulations: Category II	F-gas Handling in Small RAC Systems plus Category III and IV awards* Award Code 5N0103
Category III	2079-13 City and Guilds NDAF Ref No. 500/5732/7 NFQ Level 4 Award in F-gas and ODS Regulations: Category III	F-gas Recovery in Small RAC Systems plus Category IV award* Award Code 5N0105
Category IV	2079-14 City and Guilds NDAF Ref No. 500/5729/7 NFQ Level 4 Award in F-gas and ODS Regulations: Category IV	F-gas Refrigerant Leak Detection Award Code 5N0102
*Completion of all four minor awards leads to a Special Purpose Award in Handling F-gas Refrigerants		

6.3.4 Fire Protection and Mobile Air Conditioning Equipment

Minimum requirements for the qualifications for personnel working on fire protection systems and mobile air conditioning systems that contain, or are designed to contain, F-gases are set out in Commission Regulation (EC) No 304/2008 and [Commission Regulation \(EC\) No 307/2008](#), respectively. Tables 7 below shows the FETAC courses and equivalent City and Guild Awards that meet these minimum requirements.

Table 7: Qualifications for Fire Protection Systems and Mobile Air Conditioning Equipment

Equipment	Qualification
Mobile Air Conditioning Systems (in road vehicles)	City & Guilds Certificate 5101-01 in Safe Handling of Refrigerants for Mobile Air Conditioning Systems (MAC) or FETAC Special Purpose Certificate in Handling F-gas Mobile Aircon Systems Award Code 5S0109 or equivalent.
Fire Protection Systems	FETAC Special Purpose Certificate in Handling F-gas Fire Extinguishants Award Code 5S0110 or equivalent

Further details on the FETAC courses are available at www.qqi.ie.

Certifications issued before 1st January 2015 (i.e. issued in accordance with the repealed F-gas Regulation) remain valid under the original conditions of issue.

Employers of personnel working on systems using the alternative gases butane or propane have an obligation to ensure that personnel have flammable refrigerant training.

The requirement for those contractors/personnel working with ODS is to hold either a *City and Guilds Certificate in Handling Refrigerants Scheme 2078* or the appropriate category of F-gas qualification for the work to be undertaken.

6.3.5 Exemptions

Under Commission Regulation (EC) No. 303/2008 there are exemptions for three categories of personnel - for stationary equipment:

1. Trainees are exempt for up to 2 years, but they must work under the supervision of a person with an appropriate personnel certificate (including an interim certificate) and must be enrolled on a relevant training course,
2. Personnel only undertaking brazing, soldering or welding on a piece of RAC equipment are exempt if they hold a nationally recognised qualification to undertake such activities and if they are supervised by a person holding an appropriate personnel certificate (including an interim certificate) to undertake installation of equipment containing F-gas, and
3. Personnel undertaking recovery of F-gases from “waste equipment” under the WEEE Directive (Waste Electrical and Electronic Equipment) EC 96/2002 with an F-gas charge less than 3 kg, in premises covered by an appropriate permit, are exempt provided that they are employed by the company holding the permit and have completed a training course on the minimum skills and knowledge corresponding to Category III that is verified.

See Commission Regulation (EC) No. 303/2008 for more details on these exemptions.

6.4 Labelling

The current [Commission Regulation \(EC\) No. 1494/2007](#) (on labelling requirements) sets out the labelling requirements for products and equipment containing F-gases.

The following equipment containing F-gas is required to be labelled before being placed on the market:

- Stationary equipment (i.e. refrigeration, air conditioning, heat pumps and fire protection equipment),
- Electrical switchgear,
- All F-gas containers,
- **New!** Aerosol dispensers that contain F-gases (with the exception of metered dose inhalers),
- **New!** F-gas based solvents, and
- **New!** Organic Rankine cycles.

The labelling requirements listed below for equipment containing F-gas remain unchanged. These requirements apply to equipment containing F-gas placed on the market after 1st April 2008.

- The text ‘*Contains fluorinated greenhouse gases covered by the Kyoto Protocol*’,
- For equipment containing F-gas blown foam, the text ‘*Foam blown with fluorinated greenhouse gases*’,

- The abbreviated chemical names for the F-gases contained or designed to be contained in the equipment using accepted industry nomenclature standard to the equipment or substance,
- The quantity of the F-gases, expressed in kilograms, and
- A reference that the F-gas is contained in hermetically sealed equipment, where applicable.

New! The following requirements are now applicable:

- A reference that electrical switchgear has a tested leakage rate of 0.1 % per year as set out in the technical specification of the manufacturer, where applicable,
- From **1st January 2017**, the quantity expressed in weight and in CO₂ eq of F-gases contained in the product or equipment, or the quantity of F-gases for which the equipment is designed, and the GWP of those gases,
- Reclaimed or recycled F-gases must be labelled with an indication that the substance has been reclaimed or recycled, information on the batch number and the name and address of the reclamation or recycling facility, and
- F-gases placed on the market for destruction must be labelled with an indication that the contents of the container must be destroyed.

The label may be placed in any of the following positions:

- Adjacent to the service points for charging or recovering the F-gas, or
- On that part of the product or equipment which contains the F-gas.
- If applicable a reference that the F-gas is contained in hermetically sealed equipment should also be included on the label.

Example of a label is provided in Figure 5.

Contains Fluorinated Greenhouse Gases covered by the Kyoto Protocol	
Refrigerant Type:	<i>R404A</i>
Charge in kg:	<i>12.7kg</i>
Charge in CO ₂ :	<i>50 tonnes CO₂ eq</i>

Figure 5: Label Required for Equipment Containing F-gas

All ODS systems irrespective of age are required to be labelled with the type and quantity (in kg) of ODS gas in the systems.

6.5 Placing on the Market Prohibitions

New! Additional restrictions on the placing on the market of F-gas containing products and equipment are now in force. There are now 17 types of F-gas containing products/equipment with prohibition dates ranging from **July 2007** to **January 2025**. The placing on the market of

the equipment/products listed is **prohibited** after the date of prohibition. These bans must be considered before making any new purchasing decisions. Appendix 6 contains the full list of products/equipment and the relevant prohibition dates.

6.6 Control of Use

6.6.1 **New! Service and Maintenance Ban**

From **January 1st 2020** the use of **virgin** F-gases with a GWP of 2,500 or more, to service or maintain refrigeration equipment with a charge size of 40 t CO₂ eq or more, is **prohibited** (with the exception of military equipment and equipment designed to cool products to below minus 50°C).

Reclaimed and recycled refrigerant $\geq 2,500$ GWP may be used until **1st January 2030** under the following conditions:

- Reclaimed and recycled refrigerant is used for servicing and maintenance of existing refrigeration equipment'
- Reclaimed refrigerant is labelled with an indication that the substance has been reclaimed, information on the batch number and the name and address of the reclamation or recycling facility, and
- Recycled refrigerant may only be used by:
 - The contractor which carried out the recovery of the F-Gas as part of maintenance or servicing, **or**
 - The company for which the recovery was carried out as part of maintenance or servicing.

Table 8 shows the minimum charge size corresponding to 40 t CO₂ eq for F-gases greater or equal to 2,500 GWP commonly used in refrigeration systems.

Table 8: Minimum Charge Size of Common F-gases Corresponding to 40 tonnes CO₂ eq

Refrigerant Name	Minimum Charge (kg)	GWP
R404A	10.20	3922
R422D	14.66	2729
R507	10.04	3985

6.6.2 **ODS (including R22) Ban**

Since 1st January 2015 it is **illegal** to any ODS to service ODS containing equipment.

It should be noted that an ODS system can continue to be used after the 1st January 2015, however, should the system leak it **cannot** be topped up with ODS refrigerant gas or an ODS refrigerant blend in order to repair the system. At this point, the refrigerant gas in the system would either have to be replaced with an alternative gas or the whole system has to be replaced with an alternative system.

The operator is responsible for compliance with the ODS ban. However, operators will likely require technical assistance from contractors on issues such as unit replacement or use of alternative gases. It is recommended that operators, who continue to use an ODS system after 1st January 2015, have a plan in place in the event that the equipment breaks down or leaks, as it will be illegal to top up ODS gas such as R22.

6.6.3 Phase Down of F-gases

New! The F-gas Regulation includes as one of its most important elements, the provision for the phase down of the quantities of F-gases (and blends) placed on the EU market by producers and importers. This means that each year the quantity placed on the market and therefore available to contractors will decrease in accordance with set targets set out in Annex III of the F-gas Regulation.

The phase-down applies to all producers or importers of **≥100 t CO₂ eq of F-gases**. It does not apply to F-gases imported for destruction, used as feedstock, supplied for export outside the EU, for use in military equipment, for use in etching of semiconductor material or cleaning of chemicals within the semiconductor manufacturing sector and from 1st January 2018 for use in metered dose inhalers.

The European Commission will specify maximum quotas (quantities) for each producer or importer for each year beginning with the year 2015. A reference value will be calculated based on the annual average volume placed on the market by each undertaking from **2009 to 2012**.

Based on the reference value, annual maximum quantities will be calculated by using the percentages listed in Table 9. Please refer to Articles 15 - 18 and Annex V of the F-gas Regulation for details.

Table 9: F-gas Phase Down Percentages per Year

Years	Percentage (%)
2015	100 %
2016 - 17	93 %
2018 - 20	63 %
2021 - 23	45 %
2024 - 26	31 %
2027 - 29	24 %
2030	21 %

The phase down means that by 2030 the annual quantity of F-gases placed on the market and available will be reduced by 79 % when compared to 2015.

The phase down will push the use of alternative lower GWP gases and will result in reduced availability of common F-gases, especially those with a higher GWP.

Further information is provided in the Guidance Document titled "[Summary Guide to the HFC \(F-gas\) Phase Down](#)".

7. Good Practice

7.1 Consider Alternatives Now

The phase down of F-gases and the equipment bans will mean that the availability of the current commonly used F-gases will decline over time. Therefore the use of alternatives or F-gases with lower GWP instead of F-gases with high GWP at an early stage will help with a smoother transition into the new regime. It is also prudent to keep the 2020 service and maintenance ban in mind. Before you invest into new equipment you should take care that the alternative design is cost effective and has the lowest “overall carbon footprint”²³. For most refrigeration plants it is the energy related CO₂ emission that is the dominant part of the overall carbon footprint. Hence, it is essential that a system with an alternative refrigerant is equal to or better than an ODS/F-gas system in terms of energy efficiency.

7.2 Develop an Inventory of Equipment containing ODS or F-gas

All operators should create an inventory of the equipment containing F-gas and ODS at their premises (see Appendix 8 for an example of an inventory). The inventory should give each piece of equipment a unique identification and record the location and other relevant details (e.g. cross reference with their asset register). In addition, the inventory should record the type of refrigerants within its systems and the quantity of refrigerant in each piece of equipment.

7.3 Energy Efficiency

The operation of equipment containing ODS or F-gas accounts for a significant percentage of total energy costs. The steps necessary for compliance with the F-gas and ODS Regulations provide an opportunity to assess the energy efficiency of your RAC equipment. If systems have to be replaced or retrofitted, this is particularly important.

Typical issues to consider are:

- Load reduction (e.g. better time and temperature controls),
- Plant operating conditions (e.g. reduce head pressures),
- Secondary loads (e.g. chilled water pumps), and
- Part-load operation (e.g. compressor controls and variable speed drives).

It is important that contractors consider the optimum charge for a system to minimise the overall carbon footprint of the piece of equipment. Systems with low levels of refrigerant may continue to operate but will use more energy to achieve their function than equipment that has an appropriate level of refrigerant charge.

²³ A measure of the impact our activities have on the environment, especially climate change, often reported as the units of tonnes (or kg) of carbon dioxide each of us produces over a given period of time.

Appendix 1: Commission (Implementing) Regulations

1. Commission Regulation (EC) No 1493/2007 - producer, importer, exporter reporting,
2. Commission Regulation (EC) No 1494/2007 - form of labels and additional labelling requirements,
3. Commission Regulation (EC) No 1497/2007 - leak checking requirements for stationary fire protection systems,
4. Commission Regulation (EC) No 1516/2007 - leak checking requirements for stationary refrigeration, air conditioning and heat pump equipment,
5. Commission Regulation (EC) No 303/2008 - requirements and conditions for recognition for certification of companies and personnel regarding RAC and heat pump equipment,
6. Commission Regulation (EC) No 304/2008: requirements and conditions for recognition for certification of companies and personnel regarding stationary fire protection systems and fire extinguishers,
7. Commission Regulation (EC) No 305/2008: requirements and conditions for recognition for certification of recovering F-gases from high voltage switchgear,
8. Commission Regulation (EC) No 306/2008: requirements and conditions for recognition for certification of recovering F-gases based solvents from equipment,
9. Commission Regulation (EC) No 307/2008: minimum requirements for training programmes and conditions for recognition of training attestations for personnel regarding air conditioning in certain motor vehicles, and
10. Commission Regulation (EC) No 308/2008: notification of training and certification programmes.

Appendix 2: Abbreviations and Definitions

Term	Abbreviation	Definition
Fluorinated greenhouse gases	F-gas	Means hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF ₆) and other greenhouse gases that contain fluorine, listed in Annex I, or mixtures containing any of those substances. <i>From EU F-gas Regulation 517/2014</i>
Ozone depleting substance	ODS	Various chemicals, including CFCs and HCFCs that damage the ozone layer. Many are already completely phased out.
Chlorofluorocarbon	CFC	Family of chemicals that was historically used in various applications such as refrigeration, foam blowing and aerosols. Now completely banned under ODS Regulation.
Hydrochlorofluorocarbon	HCFC	Family of chemicals used in various applications such as refrigeration, foam blowing and aerosols. The use of ODS is already phased out under the ODS Regulations.
Hydrofluorocarbon	HFC	Means the substances listed in Section 2 of Annex I, or mixtures containing any of those substances <i>From EU F-gas Regulation 517/2014</i>
Perfluorocarbon	PFC	Means the substances listed in Section 2 of Annex I, or mixtures containing any of those substances. <i>From EU F-gas Regulation 517/2014</i>
Hydrocarbon	HC	Family of chemicals including propane and butane. These have been adopted as alternatives to ODS and F-gases in some applications.
Global warming potential	GWP	Means the climatic warming potential of a greenhouse gas relative to that of carbon dioxide ('CO ₂ '), calculated in terms of the 100-year warming potential of one kilogram of a greenhouse gas relative to one kilogram of CO ₂ , as set out in Annexes I, II and IV or in the case of mixtures, calculated in accordance with Annex IV <i>From EU F-gas Regulation 517/2014</i>
Carbon footprint		A measure of the impact our activities have on the environment, especially climate change, often reported as the units of tonnes (or kg) of carbon dioxide each of us produces over a given period of time.
Container		Means a product which is designed primarily for transporting or storing fluorinated greenhouse gases. <i>From EU F-gas Regulation 517/2014</i>
Electrical Switchgear		Means switching devices and their combination with associated control, measuring, protective and regulating equipment, and assemblies of such devices and equipment with associated interconnections, accessories, enclosures and supporting

Term	Abbreviation	Definition
		structures, intended for usage in connection with the generation, transmission, distribution and conversion of electric energy. <i>From EU F-gas Regulation 517/2014</i>
Feedstock		Means any fluorinated greenhouse gas, or substance listed in Annex II, that undergoes chemical transformation in a process in which it is entirely converted from its original composition and its emissions are insignificant. <i>From EU F-gas Regulation 517/2014</i>
Heat pump		Means a device or installation that extracts heat at low temperature from air, water or earth and supplies heat. <i>From EC ODS Regulation 1005/2009</i>
Hermetically sealed system		Means equipment in which all fluorinated greenhouse gas containing parts are made tight by welding, brazing or a similar permanent connection, which may include capped valves or capped service ports that allow proper repair or disposal, and which have a tested leakage rate of less than 3 grams per year under a pressure of at least a quarter of the maximum allowable pressure. <i>From EU F-gas Regulation 517/2014</i>
Operator		Means the natural or legal person exercising actual power over the technical functioning of the equipment and systems covered by this Regulation, a Member State may, in defined, specific situations, designate the owner as being responsible for the operator's obligations. <i>From EU F-gas Regulation 517/2014</i>
Placing on the Market		Means supplying or making available to another party in the Union for the first time, for payment or free of charge, or using for its own account in the case of a producer, and includes customs release for free circulation in the Union. <i>From EU F-gas Regulation 517/2014</i>
Leak detection system		Means a calibrated mechanical, electrical or electronic device for detecting leakage of fluorinated greenhouse gases which, on detection, alerts the operator. <i>From EU F-gas Regulation 517/2014</i>
Organic Rankine Cycle		Means a cycle containing condensable fluorinated greenhouse gas converting heat from a heat source into power for the generation of electric or mechanical energy. <i>From EU F-gas Regulation 517/2014</i>
Recovery		Means the collection and storage of fluorinated greenhouse gases/ozone depleting substances from products, including containers and equipment during maintenance or servicing or before disposal. <i>From EU F-gas Regulation 517/2014 and EC Ozone Regulation 1005/2009</i>
Recycling		Means the reuse of a recovered fluorinated greenhouse gas/ozone depleting substances following a basic cleaning process. <i>From EU F-gas Regulation 517/2014 and EC ODS Regulation 1005/2009</i>

Term	Abbreviation	Definition
Reclamation		Means the reprocessing of a recovered controlled substance/F-Gas in order to meet the equivalent performance of a virgin substance, taking into account its intended use. <i>From EU F-gas Regulation 517/2014 and EC ODS Regulation 1005/2009</i>
Refrigerated Truck		Means a motor vehicle with a mass of more than 3.5 tonnes that is designed and constructed primarily to carry goods and that is equipped with a refrigeration unit. <i>From EU F-gas Regulation 517/2014</i>
Refrigerated Trailer		Means a vehicle that is designed and constructed to be towed by a truck or a tractor, primarily to carry goods and that is equipped with a refrigeration unit. <i>From EU F-gas Regulation 517/2014</i>
Repair		Means the restoration of damaged or leaking products or equipment that contain, or whose functioning relies upon, fluorinated greenhouse gases, involving a part containing or designed to contain such gases. <i>From EU F-gas Regulation 517/2014</i>
Destruction		Means the process of permanently transforming or decomposing all or most of a fluorinated greenhouse gas into one or more stable substances that are not fluorinated greenhouse gases. <i>From EU F-gas Regulation 517/2014</i>
Non-refillable container		Means a container which cannot be refilled without being adapted for that purpose or is placed on the market without provision having been made for its return for refilling. <i>From EU F-gas Regulation 517/2014</i>
Installation		Means joining two or more pieces of equipment or circuits containing or designed to contain fluorinated greenhouse gases, with a view to assembling a system in the location where it will be operated, that entails joining together gas carrying conductors of a system to complete a circuit irrespective of the need to charge the system after assembly. <i>From EU F-gas Regulation 517/2014</i>
Maintenance or servicing		Means all activities, excluding recovery in accordance with Article 8 and leak checks in accordance with Article 4 and point (b) of Article 10(1) of the F-Gas Regulation, that entail breaking into the circuits containing or designed to contain fluorinated greenhouse gases, in particular supplying the system with fluorinated greenhouse gases, removing one or more pieces of circuit or equipment, reassembling two or more pieces of circuit or equipment, as well as repairing leaks. <i>From EU F-gas Regulation 517/2014</i>
Mixture		Means a fluid composed of two or more substances, at least one of which is a substance listed in Annex I or in Annex II. <i>From EU F-gas Regulation 517/2014</i>
Tonne(s) of CO₂ equivalent	t CO₂ eq	Means a quantity of greenhouse gases,, expressed as the product of the weight of the greenhouse gases in metric tonnes and of their global warming potential. <i>From EU F-gas Regulation 517/2014</i>

Term	Abbreviation	Definition
Undertaking		Means any natural or legal person who: (a) produces, uses, recovers, collects, recycles, reclaims, or destroys fluorinated greenhouse gases, (b) imports or exports fluorinated greenhouse gases or products and equipment that contain such gases, (c) places on the market fluorinated greenhouse gases or products and equipment that contain, or whose functioning relies upon, such gases, (d) installs, services, maintains, repairs, checks for leaks or decommissions equipment that contains, or whose functioning relies upon, fluorinated greenhouse gases, (e) is the operator of equipment that contains, or whose functioning relies upon, fluorinated greenhouse gases, (f) produces, imports, exports, places on the market or destroys gases listed in Annex II, (g) places on the market products or equipment containing gases listed in Annex II. <i>From EU F-gas Regulation 517/2014</i>
Use		Means the utilisation of fluorinated greenhouse gases in the production, maintenance or servicing, including the refilling, of products and equipment, or in other processes referred to in this Regulation. <i>From EU F-gas Regulation 517/2014</i>
Virgin		A substance that has not previously been used. <i>From EU F-gas Regulation 517/2014</i>

Appendix 3: Sources of Further Information

There are a number of sources of additional information on the F-gas and ODS Regulations that is most easily accessed from the internet.

Environmental Protection Agency

Guidance on the F-gas Regulation, including key changes and seminar presentations are available from the EPA website (www.epa.ie) at the following link:

<http://www.epa.ie/air/airenforcement/ozone/reviewofthef-gasregulation/>

Guidance on the ODS Regulation, the ODS ban, EC Regulation 1005/2009 and the ODS Statutory Instrument (S.I. No. 465 of 2011) is provided on the EPA website (www.epa.ie) at the following link:

<http://www.epa.ie/air/airenforcement/ozone/>

Other F-Gas/ODS Guidance Documents include:

- Summary Guidance for Compliance with ODS and F-gas Regulations
- Guidance Note for Contractors of Equipment containing F-gases and ODS
- Guidance Note for Operators of Equipment containing F-gases and ODS
- Guidance Note for Contractors working with Fire Protection Equipment Containing F-gases
- Summary Guide to the new Leak Checking Requirements
- Summary Guide to the HFC Phase-down
- Summary Guidance for Garages for Mobile Air Conditioning (MACs)
- Summary Guidance for operators of Refrigerated Trucks and Trailers,
- Summary Guidance for operators of Electrical Switchgear containing SF₆ and Equipment containing PFCs.

These documents are available on the [EPA website](http://www.epa.ie).

QQI/FETAC

The Further Education and Training Awards Council in Ireland (FETAC) developed national standards equivalent to the City and Guilds F-gas qualifications that have been developed in the UK. These courses have been assessed as Level 5 FETAC Award courses and the FETAC course developed for the refrigeration and air conditioning sector is the Special Purpose Certificate in Handling F-gas Refrigerants 5S0108. The functions of FETAC were taken over by Quality and Qualifications Ireland (QQI). For more information on FETAC courses see: www.qqi.ie

European Commission: [Information for technicians](#) and users of refrigeration, air conditioning and heat pump equipment containing fluorinated greenhouse gases.

Appendix 4: Refrigerants Affected by these Regulations

The following tables list the F-gas and ODS refrigerants by type, which Regulation will govern its use, the first table is for pure refrigerants and indicates the main markets where they tend to be used, the second table is for blends used for RAC purposes. For F-Gases please refer to Annex I, Section 1 in the F-Gas Regulation.

Pure Fluids

Refrigerants	Formula	EU F-gas Regulation?	EC ODS Regulation?	Main Markets
HCFC 22 (R22)	CHClF ₂	✗	✓	RAC
HCFC 123 (R123)	CHCl ₂ CF ₃	✗	✓	RAC
HCFC 124 (R124)	C ₂ HClF ₄	✗	✓	Blend component
HCFC 142b (R142b)	C ₂ H ₃ ClF ₂	✗	✓	Solvent
HFC 23 (R23)	CHF ₃	✓	✗	Fire protection, electronics manufacture
HFC 32 (R32)	CH ₂ F ₂	✓	✗	Blend component
HFC 41 (R41)	CH ₃ F	✓	✗	
HFC 43-10mee (R43-10mee)	C ₅ H ₂ F ₁₀	✓	✗	Solvent
HFC 125 (R125)	C ₂ HF ₅	✓	✗	Blend component.
HFC 134 (R134)	C ₂ H ₂ F ₄	✓	✗	
HFC 134a (R134a)	CH ₂ FCF ₃	✓	✗	RAC, aerosols, foam
HFC 143 (R143)	C ₂ H ₃ F ₃	✓	✗	
HFC 143a (R143a)	C ₂ H ₃ F ₃	✓	✗	Blend component
HFC 152 (R152)	CH ₂ FCH ₂ F	✓	✗	
HFC 152a (R152a)	C ₂ H ₄ F ₂	✓	✗	Blend component
HFC 161 (R161)	CH ₃ CH ₂ F	✓	✗	
HFC 227ea (R227ea)	C ₃ HF ₇	✓	✗	Fire protection, aerosols
HFC 236cb (R236cb)	CH ₂ FCF ₂ CF ₃	✓	✗	
HFC 236ea (R236ea)	CHF ₂ CHFCF ₃	✓	✗	
HFC 236fa (R236fa)	C ₃ H ₂ F ₆	✓	✗	Some use in Portable Fire Extinguishers
HFC 245ca (R245ca)	C ₃ H ₃ F ₅	✓	✗	
HFC 245fa (R245fa)	CHF ₂ CH ₂ CF ₃	✓	✗	Foam blowing
HFC 365mfc (R365 mfc)	CF ₃ CH ₂ CF ₂ CH ₃	✓	✗	Foam blowing, solvent
HC 290 - Propane	C ₃ H ₈	✗	✗	RAC
HC 600a - Iso-butane	C ₄ H ₁₀	✗	✗	RAC
R 717 - Ammonia	NH ₃	✗	✗	RAC

Common Blended Refrigerants Used in RAC Market

Refrigerant	Composition Variants	Composition Components	Type	EU F-gas Regulation ?	EC ODS Regulation ?
R401	A, B, C	R22/152a/124	HCFC + HFC	✓	✓
R402	A, B	R22/125/290	HCFC + HFC + HC	✓	✓
R403	A, B	R22/218/290	HCFC + PFC + HC	✓	✓
R404	A	R143a/125/134a	HFC	✓	✗
R406	A	R22/600a/142b	HCFC + HC	✗	✓
R407	A, B, C	R32/125/134a	HFC	✓	✗
R407	D, F	R32/R125/R134a	HFC	✓	✗
R408	A	R22/143a/125	HCFC + HFC	✓	✓
R409	A, B	R22/142b/124	HCFC	✗	✓
R410	A	R32/125	HFC	✓	✗
R411	B	R22/152a /1270	HCFC + HFC + HC	✓	✓
R413	A	R134a/218/600a	HFC + PFC + HC	✓	✗
R416	A		HFC	✓	✗
R417	A	R125/134a/600	HFC + HC	✓	✗
R422	A, D	R125/134a/600a	HFC + HC	✓	✗
R423	A	R134a/227	HFC	✓	✗
R424	A	R134a/125/600/600a/601a	HFC + HC	✓	✗
R426	A	R125/134a/601a/600	HFC	✓	✗
R427	A	R134a/125/32/143a	HFC	✓	✗
R428	A	R125/143a /600a /290	HFC + HC	✓	✗
R434	A	R125/143a/R134a/600a	HFC + HC	✓	✗
R437	A	R134a/125	HFC	✓	✗
R438	A	R32/125/134a/600/601a	HFC	✓	✗
R442	A	R125/134a/32/227ea/152a	HFC	✓	✗
R449	A	R134a/32/125	HFC	✓	✗
R507		R143a/125	HFC (azeotropic)	✓	✗
R508		R23/116	HFC + PFC (azeotropic)	✓	✗

Appendix 5: F-gas Conversion Table

F-gas	GWP	5 Tonnes CO ₂ eq (in kg)	50 Tonnes CO ₂ eq (in kg)	500 Tonnes CO ₂ eq (in kg)
23	14,800	0.34	3.37	33.78
32	675	7.41	74.07	740.74
41	92	54.35	543.47	5,434.78
125	3,500	1.42	14.28	142.86
134	1,100	4.55	45.45	454.54
134a	1,430	3.50	34.96	349.65
143	353	14.16	141.64	1,416.4
143a	4,470	1.12	11.2	111.8
152	53	94.34	943.4	9,434
152a	124	40.32	403.22	4,032.26
161	12	416.66	4,166.66	41,666.66
227ea	3,220	1.55	15.53	155.28
236cb	1,340	3.73	37.31	373.13
236ea	1,370	3.65	36.50	365
236fa	9,810	0.51	5.1	50.1
245ca	693	7.22	72.20	722.00
245fa	1,030	4.85	48.54	485.44
365mfc	794	6.30	63.00	630.00
43-10mee	1,640	3.05	30.50	305.00
404a	3,922	1.27	12.75	127.49
407a	2,107	2.37	23.73	237.30
407c	1,774	2.82	28.18	281.85
407d	1,627	3.07	30.73	307.31
407f	1,825	2.74	27.40	273.97
410a	2,088	2.39	23.95	239.46
417a	2,346	2.13	21.31	213.13
422a	3,143	1.59	15.91	159.08
422d	2,729	1.83	18.32	183.22
423a	2,280	2.19	21.93	219.30
424a	2,440	2.02	20.49	204.92
426a	1,508	3.32	33.16	331.56
427a	2,138	2.34	23.39	233.86
428a	3,607	1.39	13.86	138.62
434a	3,245	1.54	15.41	154.08
437a	1,805	2.77	27.70	277.01
438a	2,265	2.21	22.07	220.75
442a	1,888	2.65	26.48	264.83
449a	1,397	3.58	35.79	357.91
507	3,985	1.25	12.55	125.47

F-gas	GWP	5 Tonnes CO ₂ eq (in kg)	50 Tonnes CO ₂ - eq (in kg)	500 Tonnes CO ₂ - eq (in kg)
508a	12,214	0.38	3.78	37.83
508b (Suva 95)	13,396	0.37	3.73	37.32
508b ISCEON MO89	3,805	1.31	13.14	131.41



Pure F-gases



Blends

F-gases marked **Red** are subject to the leak checking derogation i.e. leak checking is not required for less than 3 kg non hermetically sealed F-gas equipment and less than 6 kg hermetically sealed F-gas equipment until 31st December 2016.

Appendix 6: Placing on the Market Prohibitions

Products and Equipment		Date of Prohibition
Non-refillable containers for fluorinated greenhouse gases used to service, maintain or fill refrigeration, air-conditioning or heat-pump equipment, fire protection systems or switchgear, or for use as solvents.		4 th July 2007
Non-confined direct evaporation systems that contain HFCs and PFCs as refrigerants.		4 th July 2007
Fire protection equipment	that contain PFCs.	4 th July 2007
	that contain HFC-23.	1 st January 2016
Windows for domestic use that contain fluorinated greenhouse gases.		4 th July 2007
Other windows that contain fluorinated greenhouse gases.		4 th July 2008
Footwear that contains fluorinated greenhouse gases.		4 th July 2006
Tyres that contain fluorinated greenhouse gases.		4 th July 2007
One-component foams, except when required to meet national safety standards, that contain fluorinated greenhouse gases with GWP of 150 or more.		4 th July 2008
Aerosol generators marketed and intended for sale to the general public for entertainment and decorative purposes, as listed in point 40 of Annex XVII to Regulation (EC) No 1907/2006, and signal horns, that contain HFCs with GWP of 150 or more.		4 th July 2009
Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more.		1 st January 2015
Refrigerators and freezers for commercial use (hermetically sealed equipment)	that contain HFCs with GWP of 2,500 or more.	1 st January 2020
	that contain HFCs with GWP of 150 or more.	1 st January 2022
Stationary refrigeration equipment, that contains, or whose functioning relies upon, HFCs with GWP of 2,500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C.		1 st January 2020
Multipack centralised refrigeration systems for commercial use with a rated capacity of 40 kW or more that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 150 or more, except in the primary refrigerant circuit of cascade systems where fluorinated greenhouse gases with a GWP of less than 1,500 may be used.		1 st January 2022
Movable room air-conditioning equipment (hermetically sealed equipment which is movable between rooms by the end user) that contain HFCs with GWP of 150 or more.		1 st January 2020
Single split air-conditioning systems containing less than 3kg of fluorinated greenhouse gases, that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 750 or more.		1 st January 2025
Foams that contain HFCs with GWP of 150 or more except when required to meet national safety standards	Extruded polystyrene (XPS).	1 st January 2020
	Other foams.	1 st January 2023
Technical aerosols that contain HFCs with GWP of 150 or more, except when required to meet national safety standards or when used for medical applications.		1 st January 2018

Appendix 7: Sample Log Sheet for Record Keeping

The table below shows an example Equipment Record sheet for compliance with the F-gas Regulation.

Equipment Record					
Name of Equipment Operator:					
Postal Address:				Tel No.:	
Equipment Model:			Unique Identifier		
Description:			Hermetically Sealed		Yes / No
Location of plant:			Date of Installation:		
Refrigerant Type:			Refrigerant Quantity/Charge (kg):		
Refrigerant Additions During Installation, Maintenance, Servicing or Due to Leakage					
Date	Personnel/Company*	Type of Refrigerant	GWP of Refrigerant	Amount Added, kg	Reason for addition
Where installed refrigerant is recycled or reclaimed provide name/address of recycling/reclamation facility and the certificate number:					
Refrigerant Recovered - During Servicing, Maintenance and Final Disposal					
Date	Personnel/Company*	Type of Refrigerant	GWP of Refrigerant	Amount Removed (kg)	Reason for removal
Details of Refrigerant Disposal (if applicable):					
Leak Tests (including leak detection systems and follow-up tests)					
Date	Personnel /Company*	Areas Checked	Test Result (location and cause of any leaks identified)	Follow up actions and checks required	
Installation, Maintenance, Servicing and Decommissioning Activities					
Date	Personnel /Company*	Areas concerned	Maintenance/servicing work	Certificate No.	Comments
Details of refrigerant recovery (measures taken to recover and dispose) during system decommissioning:					
Leak Checking of Automatic Leak Detection System (if fitted)					
Date	Personnel /Company*	Test Result	Comments		
Other relevant information					

* include name of engineer and of company, postal address, telephone number and certificate number (if applicable)

Appendix 8: Example Inventory

The table below shows an example inventory and suggestions for other information that could be captured in the inventory. Keeping an inventory is not a mandatory requirement of the F-gas or ODS Regulations. However, an inventory is considered good practice as it can provide a summary of all the equipment on site and can be used as a means of tracking equipment and collating relevant information in relation to both these Regulations.

Equipment/ system unique identifier	Equipment Location	Type of Refrigerant	Quantity of Refrigerant (kg)	Leak Checking Requirement	Contractors Responsible	Next Service
RSZ60	Roof 1	R 410A	12kg	1 x year	Xx Freeze Ltd	Feb 2016
Other points to include:	Other points to include:	Other Points to include:	Other Points to include:	Other Points to include:	Other Points to include:	
Links to asset register	Reference to site plan	Which Regulation is applicable?	How has this been determined? From actual data from installation contractors, design documents or calculation.	Is the system hermetically sealed?	Where are the records kept Date of last service Relevant company certification reference and date of expiry Details of qualified employees	
Serial number of equipment	Unit description					

Appendix 9: Questions and Answers

Both the end-users and the RAC contractors may encounter a number of scenarios when equipment containing refrigerant gases is being serviced or decommissioned. These scenarios are addressed in the questions and answers presented below from an end-user's perspective.

Questions and answers for Contractors using Refrigerant Gases

1. **Question** - Can I service and maintain a system containing R22 after the 1st January 2015

Answer - Yes, as long as do you not use any ODS in the servicing and maintenance of the equipment containing ODS. If you are called to service a piece of equipment containing ODS which is not functioning properly due to a leak of the ODS gas, you are not allowed to repair the equipment by topping up the system with ODS gas. In this instance, the equipment containing ODS will either (i) have to be repaired with a non ODS gas alternative, or, (ii) where this is not possible the equipment will require to be retrofitted to accept a non ODS alternative gas or replaced with alternative piece of equipment. In all instances any ODS gas recovered during this repair process will have to be handled and disposed of as a hazardous waste.

2. **Question** – I have recovered R22 from a system on my client's site and I have no use for it. Can I leave it on my client's site for him to deal with?

Answer – Yes, but you should advise your client that they must ensure that the recovered gas is managed properly and that there must be a reasonable certainty that the quantities retained will be used. If, in the opinion of the EPA, a reasonable certainty of use cannot be demonstrated for the quantity of recovered R22 being retained, the EPA reserves the right to direct the end-user to discard such quantities of recovered refrigerant as hazardous waste. Purpose-built recovery designated cylinders should be used for the recovered gas.

3. **Question** - If I recover ODS from a piece of equipment containing ODS, am I responsible for ensuring its appropriate removal from site and final disposal/destruction?

Answer - The operator of the equipment containing the ODS gas has ultimate responsibility for ensuring the safe collection, transport and disposal of waste ODS gas generated on his/her site. The operator may request you to remove and dispose of the waste ODS gas on their behalf but you can only do this if you have submitted an approved Prior Annual Notification to the EPA and ensure that the waste gas is transported to appropriately authorised waste facility when taken from an end-user site.

4. **Question** – What qualifications should I have for handling refrigerants?

Answer – You should hold City and Guilds Certificate in Handling Refrigerants Scheme 2079 or FETAC 5S0108 - for RAC equipment. If you are dealing with fire protection equipment FETAC 5S0110 or equivalent is required. If you are dealing with Mobile Air Conditioning Systems then City & Guilds Certificate 5101-01 or FETAC 5S0109 is required.

5. **Question** – What is a purpose built designated recovery cylinder?

Answer – A purpose built designated recovery cylinder is one which can be obtained from a refrigerant gas wholesaler and should be approved for use with the type of refrigerant to be recovered. It should be checked to ensure its integrity and fitness to use prior to connection. It should have indelible marking to clearly differentiate it from stock refrigerant containers and should be labelled to indicate the refrigerant, the type of oil, any possible contamination, the weight of the cylinder and the quantity of refrigerant contained.

6. **Question** – What happens when I submit a Prior Annual Notification?

Answer – The EPA will assess the details provided in your Prior Annual Notification (PAN) and, where acceptable, will issue an acknowledgement, as provided for by the legislation. A list of those contractors who have made PAN for which an acknowledgement has been given, will be listed on the EPA website at www.ozone.ie.

7. **Question** - I leak check all repairs undertaken on equipment containing F-gas immediately after the repair is carried out. Does this fulfil the requirement to leak check all repairs within one month after the repair to ensure that the repair has been effective?

Answer - Yes, as long as the leak repair has been checked within 1 month of the repair being carried out (which includes undertaking the leak check immediately after undertaking the repair) then obligations under the Regulations are met. Details of this leak check should be recorded in the equipment record sheet for the particular piece of equipment upon which the repair has been carried out.

8. **Question** - A number of pieces of stationary equipment containing F-gas on my client's site have less than 3kg of refrigerant gas within the refrigerant circuit but have a CO₂ eq of greater than 5 tonnes and have not previously been subject to leak checking requirements. When is my client legally obliged to undertake leak checking of this equipment? -

Answer - Leak checking on all equipment containing less than 3 kg of F-gases but having a CO₂ eq of greater than 5 tonnes will be required from the 1st January 2017. Legally, it does not have to be leak checked prior to this date. It should also be noted that as of the 1st January 2015, equipment with greater than 3 kg of F-gas but having a CO₂ eq of less than 5 tonnes is legally no longer subject to leak checking requirements.

9. **Question** - My client has a piece of stationary equipment containing F-gas which, because of the amount of F-gas charged to the system, has a CO₂ eq greater than 500 t CO₂ eq and therefore requires an automatic leak detection. The equipment is located outside in a windy area and therefore it is not possible to install electronic sensors to detect the presence of leaked refrigerant in areas adjacent to the refrigeration plant. How can my client comply with the automatic leak checking requirements in this instance?

Answer - In this instance an indirect method of automatic leak checking should be used. Indirect methods may be the best approach if, because of the specifics associated with the piece of equipment, leaks are slow and difficult to detect, the system is in a well-ventilated area and/or the indirect method is suitable and accurate. This type of automatic leak checking relies on the interpretation of appropriate measurements within the refrigeration plant to predict a leak. For example, linking an alarm system to a temperature gauge, or to a drop on suction pressure, or to a liquid level in the receiver. Whichever method is used it is important to choose a method which minimises any possible losses of F-gas – i.e. the leak is detected and the operator is notified as soon as possible after the leak occurs.

10. **Question** - The ban on the use of virgin R404a for maintenance and servicing comes into effect in 2020. Can we continue to use recycled, recovered and reclaimed R404a?

Answer - Yes, until 2030.