



# Information Guide

## The European F-Gas Regulation

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# Information Guide

This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today. The guide accompanies a series of seminars, all of which are CPD accredited. The changing face of construction in the 21st Century demands that designers, specifiers and suppliers work as teams to create better buildings - for occupants and the environment. Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.

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# Cut or contain - the F-Gas dilemma

The European F-Gas Regulation is unquestionably the most politicised issue in the world of air conditioning and refrigeration.

Ever since the Kyoto Protocol of 1997, HFC refrigerants - such as R134a, 407c and 410A - and their supporters have been fighting a rearguard action. HFCs sit in a 'basket' of a number of fluorinated (hence 'F') greenhouse gases, whose emissions along with carbon dioxide, are controlled and monitored by the United Nations Framework Convention on Climate Change

This is not a great place to be and, when the UK Government published its Climate Change Programme in 2000, the position did not improve: "HFCs are not sustainable in the long term" the policy document stated, adding: "HFC emissions will not be allowed to rise unchecked".

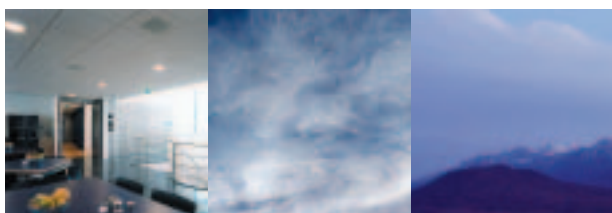
The Government did acknowledge that HFCs had played and would continue to play a crucial role in the transition of the industry from ozone depleting CFCs and HCFCs, but the fact that HFCs are potent global warming gases means they pose an environmental threat.

By volume, F-gases currently account for only 2% of total EU greenhouse gas emissions. However, their very high global warming potential and long atmospheric lifetimes means that, if no measures were taken, the Commission estimated that emissions of fluorinated gases would increase from 65.2 million tonnes of CO<sub>2</sub> equivalent in 1995 to 98 million tonnes in 2010.

The EU's F-Gas Regulation is an attempt to harmonise the response to this challenge across all the member states. We live in a two-stage community - many Northern European countries (especially the Scandinavians) wanted total blanket bans on HFCs, while more southerly member states sought a more considered, gradual phase out. The regulation is moving forward based on a 'common position' that could reduce emissions by 20 million tonnes of CO<sub>2</sub> equivalent per year until 2012, and when the legislation is fully implemented, by 40-50 million tonnes each year.

## The proposal

So, in August 2003, as part of the First Phase of the European Climate Change Programme, the European Commission adopted a draft regulation.





## The main elements of the proposal were:

- provisions to improve the containment of the gases contained in the Kyoto 'basket'
- provisions for reporting on production, importation, export, recycling and destruction of F-gases, aimed at improving their monitoring specific restrictions on marketing and use in a number of mainly emissive applications where containment is not feasible or the use of fluorinated gases is inappropriate (for ex non-refillable containers, fire protection systems fire extinguishers, windows insulation, one component foams, non-medical aerosols)
- phase-out of HFC-134a in air conditioning in new vehicles between 2009-2013 (now set at 2011 for new models and 2017 for all cars under the terms of a separate EU Directive)

A frantic lobbying effort then swung into action and late last year the EU's Environment Committee came out with a radical proposal to ban HFCs in all air conditioning and refrigeration from 2010. This threw the industry into a flat panic, but was rejected in a full vote of the European Parliament in October 2005, and the common position was retained.

## Legal position

The legal situation is very confusing as the Regulation is being established as both an environmental and an 'internal market' measure. This means, in essence, that all countries must do the same thing when it comes to controlling how the F-gases are used, but individual members are allowed to go further than the common position when it comes to setting containment standards. This is to allow them to meet their own individual greenhouse gas emissions targets under the Kyoto Protocol. This does rule out a total ban (for air conditioning at least) any time soon, but accepts that eventually HFCs will be phased out.

The regulation will be formally adopted at the end of 2006 and from that point EU member states will have 18 months to put its measures into force. These include setting minimum standards for inspection of systems and recovery of refrigerant gases; strengthening monitoring and reporting of f-gas emissions, introducing labelling of products and equipment so that consumers can make informed choices, and setting up minimum standards for training and certification of personnel.

"Some fluorine gases have a greenhouse effect thousands of times greater than that of CO<sub>2</sub>," a statement from the EU Environment Commission said. "The new legislation will also outlaw greenhouse gas leakage from cooling equipment, air conditioning systems, fire extinguishing equipment and heat pumps. In the future, air conditioning units in cars will not be allowed to contain fluorine gases that have too great a greenhouse effect. Until that time, leakage of these gases from such units will be subject to strict legal limits."

Where containment is not feasible or the use of certain fluorinated gases is inappropriate, their use will be banned. At the moment, this only applies to things like vehicle tyres, non-refillable containers, windows, footwear, self-chilling drinking cans, novelty aerosols, new fire protection systems and fire extinguishers, but this will be reviewed again in four years time to see if the ban should be extended to other uses including 'fixed' air conditioning systems.

The key issue is that the regulation will put the onus on member states to improve containment, monitoring and control of HFCs. Reducing refrigerant leakage, improving system design and efficiency as well as making clear arrangements for recovery of refrigerant during service work and recycling it at the end of the equipment's life must now be priorities for the UK air conditioning and refrigeration sector.

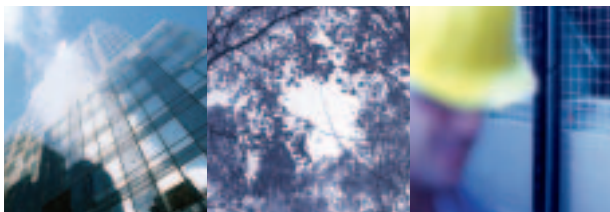
# Handling the F-Gas issue

As with most pieces of legislation, the weight of responsibility for the F-Gas Regulation will fall on the end user. They will have the legal liability to ensure that refrigerant does not leak and is recovered properly during servicing and replacement of cooling systems.

They will also have a clear duty of care to closely monitor all equipment on their premises that uses more than 3kg of refrigerant. In practice, this will mean ensuring all refrigeration and air conditioning plant is properly monitored and maintained by fully qualified contractors.

Users will have to set and adhere to minimum standards for inspection of systems and recovery of refrigerant gases; they will be subject to stronger monitoring and reporting of f-gas emissions, but they will also have the benefit of product labels to help them make informed choices about the environmental impact and running cost of equipment.

The regulation will force the industry to impose minimum standards for training and certification of personnel as part of a mandatory registration scheme. And, as it is the user feeling the pressure, you can be sure they will insist on these standards.



## Checks and balances

Equipment containing 3kg and above of refrigerant will have to be checked every six months - although hermetically sealed systems are exempt - and systems where the charge is 300kg and above must be checked for leakage every three months under the terms of the proposed regulation. If leaks are detected repairs must be carried out as soon as possible and a further check carried out one month later.

The servicing technician will have to be identified in the records of the building operator and the quantity and type of refrigerant involved must be logged. All servicing personnel will be required to hold proper certification that meets detailed criteria laid down by the EU.

The Air Conditioning and Refrigeration European Association (AREA) recommends that the owner/operator of a system should provide an adequately protected machine card at an easily accessible location near the system with information complying with the requirements of the current European harmonised standards.

For new systems with a total refrigerant charge of 3kg or more, the installer should provide a logbook at an easily accessible location. Existing systems should have a logbook issued at the first performance test following the entry into force of the regulation.

Refrigerant leaks will have to be identified and repaired as soon as possible, by a competent person and the system would only be put into service again when all leaks have been repaired and a competent person has inspected the installation.



All measures, in accordance with the best available techniques, have to be taken in order to reduce the relative loss of refrigerant below a maximum of 5%. Used refrigerant, which is not intended for re-use, should be dealt with as waste for safe disposal and only a person deemed as 'competent' under the terms of the regulation will be able to carry out disassembly of any refrigeration and air conditioning system.

## Who's competent?

Member countries will appoint one or more industry bodies to monitor and control professional standards. In the UK, the sector has been calling for the Government to provide statutory backing for a mandatory registration scheme for well over a decade - the F-Gas Regulation will finally bring this about in 2008.

In the meantime, this year the UK is introducing a half-way house statutory scheme for CFC and HCFC refrigerants. By December 2006, anyone involved in servicing and dismantling fixed refrigeration, air conditioning and heat pump equipment containing CFC or HCFC refrigerants will be required to hold a statutory minimum qualification. This means one of the two existing voluntary qualifications: The City & Guilds 2078 Certificate in Safe Handling of Refrigerants, and the CITB Safe Handling of Refrigerants Certificate.

Employers using personnel without the relevant qualifications will be liable to an as yet unspecified fine. The Government estimates that 60-70% of existing technicians handling CFC's and HCFC's already have the appropriate qualifications, leaving between 5,500 and 8,000 who must take action to either get more training or be assessed.

However, there has been a voluntary scheme controlling the use of ALL refrigerants including HFCs for over 11 years. The REFCOM scheme run by the HVCA is also the model likely to be adopted for the eventual mandatory scheme in the UK.

It has a current membership of 124 firms, all of whom claim business benefits from being "ahead of the game". One obvious benefit of being part of a nationally accredited professional scheme is that it makes it very difficult for the 'cowboys' to get a look in, as they cannot offer the same level of service to customers. Making the scheme mandatory under the F-Gas Regulation will be an important step in eradicating the 'rogue trader' from the industry once and for all.

REFCOM offers greater customer confidence in the standard of system design, installation and commissioning and helps to ease the burden on them of meeting ever more onerous legislation. Working to high agreed standards improves profitability for the contractor, as there are fewer system breakdowns, fewer callouts for unscheduled repairs/maintenance, fewer warranty claims and reduced time is needed on-site for planned maintenance programmes. This also means less money spent on replacement components and additional supplies of refrigerant. So, there are plenty of firms ready to welcome the day when the refrigerant handling scheme becomes mandatory.

### In force from 2008

- End user responsible
- Regular inspections
- Logbooks
- Product labels
- Competent people - part of mandatory handling scheme
- Leak detection and repair
- Leaks kept below 5% of total charge
- Fewer breakdowns
- Reduced servicing costs
- Better profitability

# Continuing to adapt

The UK's annual consumption of refrigerant gases is about 9,000 tonnes and rising. The key statistic is that as much as 60% of refrigerants sold are used to top up leaking systems - this is both wasteful and expensive for end users. It also explains why the F-Gas Regulation has made containment, through better installation and servicing standards, a key focus.

Poorly maintained air conditioning systems also waste energy. A 10% loss of gas charge can push energy consumption up by 20% and nearly a third of all systems are operating with a depleted refrigerant charge. This means that not only are we directly warming the planet through leaking global warming substances, but adding to the power generation problem, which is responsible for 75% of all CO<sub>2</sub> emissions.

It could be said that few professions have wrestled more dramatically with ozone depletion and global warming than building services, and air conditioning in particular. The industry has had to invest time and money in developing new refrigerants, as general understanding of greenhouse gases has increased over the past decades. The CFC issue struck right at the heart of air conditioning and refrigeration technologies because manufacturers and engineers had embraced them wholeheartedly as highly effective refrigerants that were also relatively safe and easy to work with. When scientists revealed the damage CFCs were doing to our environment, the industry searched for alternatives.

Instead, HCFCs were adopted, R22 in particular. These were also highly effective refrigerants and contained less of the ozone damaging chlorine that condemned CFCs. However, these could only ever be a stopgap because even reduced amounts of chlorine pose a serious threat to the ozone layer and it is now illegal to sell many types of new equipment containing HCFCs. It is still legal to operate systems containing CFCs, but prohibited to top-up or refill them now and the same will apply to HCFCs by 2015.

Many air conditioning manufacturers and installers moved onto the 'new generation' of refrigerants described as HFCs (hydrofluorocarbons): No chlorine and good performance characteristics for many types of equipment.



However, yet again, it was discovered that while HFCs are relatively ozone friendly, they are also thousands of times more effective at trapping heat in our atmosphere than CO<sub>2</sub>.

So in the next decade, the air conditioning industry faces yet another challenge: to find new forms of refrigerant. There are a number of alternatives being tried already. One of the big problems however, is finding an alternative to HFCs that is also energy efficient. The danger is that in avoiding global warming by one method, we increase energy use in our buildings with inefficient cooling systems. It will be a difficult balance to find.

Engineers and refrigerant users have been studying the potential of alternative 'natural' refrigerants such as hydrocarbons (HCs), CO<sub>2</sub>, Stirling, thermoacoustic and solar cooling. While these do work, they also pose challenges for design and installation.

HC gases are derived from LPG (liquefied petroleum gas) and as such are 'naturally occurring'. They are also environmentally benign, as they have no impact on the ozone layer and only a minuscule global warming effect. The downside is their flammability, a major safety issue. Ammonia has also been suggested as an alternative, and it has been used in large plant. However it is highly toxic, and must be kept away from occupied areas.

There can be little doubt that the F-Gas Regulation will have a big effect on the air conditioning market. It may well drive up the cost of HFC equipment. Other factors are pushing clients to select non-HFC refrigerants, even though they are less efficient and require more maintenance. For example, the BREEAM 2003 assessment procedure gives buildings a better rating if natural refrigerants are used. The CIBSE Guide B4 on Refrigeration and Heat Rejection states that engineers should only use refrigerants with zero or low global warming potential, which rules out HFCs in most instances.

It seems that legislation is asking the impossible – an energy efficient, safe and cost-effective refrigerant that has no environmental impact at all! But while the industry is exploring the alternatives, the emphasis will remain on high standards of installation and regular maintenance. These are key messages that clients need to hear, and one that qualified air conditioning professionals will be happy to deliver:

### No refrigerant is perfect

- CFCs/HCFCs – great refrigerants, but ozone depleting
- HFCs – effective replacements, but global warming
- Hydrocarbons – energy efficient, but flammable
- Ammonia – highly effective, but toxic
- Carbon dioxide – effective, but expensive to bring to market
- Water – problems with energy



# Further information

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