

F-GAS

SUPPORT

Promoting Compliance with F Gas and Ozone Regulations

General Guidance

This Information Sheet provides background information about the fluids/gases affected by the EC F gas and Ozone Regulations.

What are F Gases?

Fluorinated gases (F gases) are a family of man-made chemicals that are very powerful greenhouse gases; emission of even a small quantity of an F gas to the atmosphere is harmful to the environment. Most F gases are between 1,000 and 20,000 more powerful than CO₂ in terms of "Global Warming Potential". The F gases are part of the "Kyoto Protocol Basket" of greenhouse gases. In the EU the use and emissions of F gases is now Regulated by EC Regulation 842/2006. The following 3 types of F gases are in use:

HFCs	Hydrofluorocarbons	Common uses: refrigerants in refrigeration, air-conditioning and heat pumps used in many applications such as industry, offices, retail, hospitality and cars. Other uses: aerosols, insulating foam, solvent cleaning and fire protection
PFCs	Perfluorocarbons	Used in semi-conductor manufacture and a few other specialised applications.
SF₆	Sulphur hexafluoride	Used in high voltage switch gear, for magnesium smelting processes and a few other specialised applications.

What are ODS?

Ozone Depleting Substances (ODS) are a family of man-made chemicals that can cause damage to the earth's stratospheric ozone layer. ODS are being phased out under the Montreal Protocol. In the EU the use and emissions of ODS is regulated by EC Regulation 2037/2000. Most ODS are already completely phased out in the EU, however the HCFCs that remain in use are due to be phased out soon. Key types of ODS include:

CFCs	Chlorofluorocarbons	Already completely phased out. CFCs were widely used as refrigerants, aerosol propellants, solvents, foam blowing agents.
Halons	Bromofluorocarbons	Already completely phased out. Halons were widely used in fire protection applications.
HCFCs	Hydro-chlorofluorocarbons	Many HCFC applications are already phased out (e.g. for foam blowing and in new refrigeration systems). The main on-going market for HCFCs is for maintenance of existing refrigeration and air-conditioning equipment. HCFC use in this market will be phased out between 2010 and 2015. There is also some use as a solvent in aerospace applications, but this will be phased out at the end of 2008.

Fluids Affected by the EC F Gas and Ozone Regulations

The following two tables list the F gas and ODS fluids by type, which regulation will govern its use; the first table is for pure fluids and indicates the main markets where they tend to be used, the second table is for blends used for Refrigeration and Air-conditioning (RAC) purposes.

Table 1 Pure Fluids

Fluids	Formula	EC F Gas Regulation?	EC Ozone Regulation?	Main Markets
HCFC 22	CHClF ₂	✗	✓	RAC
HCFC 123	CHCl ₂ CF ₃	✗	✓	RAC
HCFC 124	C ₂ HClF ₄	✗	✓	Blend component
HCFC 142b	C ₂ H ₃ ClF ₂	✗	✓	Solvent
HFC 23	CHF ₃	✓	✗	Fire protection, electronics manufacture
HFC 32	CH ₂ F ₂	✓	✗	Blend component
HFC 41	CH ₃ F	✓	✗	
HFC 43-10mee	C ₅ H ₂ F ₁₀	✓	✗	Solvent
HFC 125	C ₂ HF ₅	✓	✗	Blend component. Fire protection
HFC 134	C ₂ H ₂ F ₄	✓	✗	
HFC 134a	CH ₂ FCF ₃	✓	✗	RAC, aerosols, foam
HFC 143	C ₂ H ₃ F ₃	✓	✗	
HFC 143a	C ₂ H ₃ F ₃	✓	✗	Blend component
HFC 152a	C ₂ H ₄ F ₂	✓	✗	Blend component
HFC 227ea	C ₃ HF ₇	✓	✗	Fire protection, aerosols
HFC 236cb	CH ₂ FCF ₂ CF ₃	✓	✗	
HFC 236ea	CHF ₂ CHFCF ₃	✓	✗	
HFC 236fa	C ₃ H ₂ F ₆	✓	✗	Some use in Portable Fire Extinguishers
HFC 245ca	C ₃ H ₃ F ₅	✓	✗	
HFC 245fa	CHF ₂ CH ₂ CF ₃	✓	✗	Foam blowing
HFC 365mfc	CF ₃ CH ₂ CF ₂ CH ₃	✓	✗	Foam blowing, solvent
PFC 14 - Perfluoromethane	CF ₄	✓	✗	Aluminium, electronics
PFC 116 - Perfluoroethane	C ₂ F ₆	✓	✗	Aluminium, electronics
PFC 218 - Perfluoropropane	C ₃ F ₈	✓	✗	Blend component, electronics
PFC 3110 - Perfluorobutane	C ₄ F ₁₀	✓	✗	Electronics
PFC 4112 - Perfluoropentane	C ₅ F ₁₂	✓	✗	
PFC 5114 - Perfluorohexane	C ₆ F ₁₄	✓	✗	
PFC 318 - Perfluorocyclobutane	c-C ₄ F ₈	✓	✗	
SF ₆ - Sulphur Hexafluoride	SF ₆	✓	✗	Magnesium, HV switchgear
HC 290 - Propane	C ₃ H ₈	✗	✗	RAC
HC 600a - Iso-butane	C ₄ H ₁₀	✗	✗	RAC
R 717 - Ammonia	NH ₃	✗	✗	RAC

Table 2 Blended Fluids Used in RAC Market

Refrigerant	Composition Variants*	Composition Components	Type	EC F Gas Regulation?	EC Ozone 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	✓	✗
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/601 a	HFC + HC	✓	✗
R427	A	R134a/125/32/143a	HFC	✓	✗
R428	A	R125/143a /600a /290	HFC + HC	✓	✗
R434	A	R125/143a/R134a/600a	HFC + HC	✓	✗
R507		R143a/125	HFC (azeotropic)	✓	✗
R508		R23/116	HFC + PFC (azeotropic)	✓	✗

* **Composition Variant:** Each blend in the table above contains 2 or 3 components. For example R401 contains a mixture of R22, R152a and R124. R401 is available in three different composition variants as follows:

R401A is 53% R22, 13% R152a and 34% R124

R401B is 61% R22, 11% R152a and 28% R124

R401C is 33% R22, 15% R152a and 52% R124

These different compositions are chosen by the fluid manufacturers to provide performance characteristics to suit different RAC applications.

¹ Symbols used in the tables

✗	Not relevant
✓	Relevant and must comply
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
PFC	Perfluorocarbon
HC	Hydrocarbon

Trade Names

The fluids listed in Tables 1 and 2 above may be referred to using the “R-number”. R-numbers are a standardised nomenclature developed and managed by ASHRAE (the American Society of Heating Refrigeration and Air-conditioning Engineers).

Refrigerants are often sold under trade names, sometimes in association with the relevant R-number and sometimes with a completely different numerical designation. Table 3 gives some examples of trade names for F gases commonly used as refrigerants and Table 4 provides some trade names for fluids commonly used in fire protections equipment.

Table 3 Trade names for HFC Refrigerants

Trade Names for HFC Refrigerants
Trade names are sometimes used with the relevant R number (e.g. Harp 134a) or with another number (e.g. R 401A is also Suva MP39)
The following trade names are for refrigerants that contain F gases: AZ-20, AZ-50, Forane (FX56, FX80, FX100), Greencool 411B, Harp, Isceon (MO29, 39TC, MO49, 59, MO79, MO89), Klea, RS-24, RS-44 Suva (MP39, MP66, HP80, HP81)

Table 4 Trade names for fire protection fluids

F Gas	Trade Names
HFC 23	FE-13
HFC 125	FE-25, ECARO, NAF-125
HFC 227ea	FM-200, FE-227, NAF-227
HFC 236fa	FE-36



How to Contact F-Gas Support:

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F-Gas Support is a Government funded team set up to help organisations understand their obligations under the EU Fluorinated Greenhouse Gases and Ozone Regulations. F-Gas Support is also working with Regulators to promote compliance. It is being run on behalf of Defra and the devolved administrations by the Local Authorities Coordinators of Regulatory Services (LACORS) and Enviros.