



**F-Gas Regulation (Regulation (EU) No 517/2014):  
Technical Advice to Member States on implementing  
Article 7(2)**

-

**Discussion Paper  
(Oktober 2015)**

***This document is without prejudice to the obligations in the Regulation and shall not be understood to have any legal status***

**Acknowledgement**

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## 1. General Information

### 1.1. What is the aim of this document?

Regulation (EU) No 517/2014 on fluorinated greenhouse gases (“the Regulation”) includes a number of requirements for producers and importers of fluorinated greenhouse gases (including some for producers of fluorinated compounds at large).

**The aim of this document is to provide some advice to Member States on how these producers and importers may provide proof of compliance with obligations under Article 7(2) of the Regulation in particular. This document is without prejudice to the obligations contained in the Regulation and shall not be understood to have any legal status.**

Article 7 requires:

7(1) *Producers of fluorinated compounds shall take all necessary precautions to limit emissions of fluorinated greenhouse gases to the greatest extent possible during:*

*(a) production;*

*(b) transport; and*

*(c) storage.*

*This Article also applies where fluorinated greenhouse gases are produced as by-products.*

7(2) *Without prejudice to Article 11(1), the placing on the market of fluorinated greenhouse gases and gases listed in Annex II shall be prohibited unless, where relevant, producers or importers provide evidence, at the time of such placing, that trifluoromethane, produced as a by-product during the manufacturing process, including during the manufacturing of feedstocks for their production, has been destroyed or recovered for subsequent use, in line with best available techniques.*

**Please note: Article 7 only applies to producers and importers of bulk F-gases and not to importers of equipment pre-charged with F-gas.**

Article 7(1) applies to EU producers only and demands that emissions of fluorinated greenhouse gases (**F-gases**) should be avoided by producers to the greatest extent possible.

Article 7(2) applies to both EU producers and importers of gas and focuses specifically on the by-production of HFC-23 during the manufacture of F-gases and Annex II gases, regardless if this manufacture takes places in the EU or outside. **For any fluorinated greenhouse gas or Annex II gas that is to be placed on the EU market**, HFC-23 (trifluoromethane) produced as a by-product must be destroyed or recovered for use, using best available techniques (BAT).

**Please note:** Importers and producers are generally obliged to avoid fugitive emissions of fluorinated greenhouse gases (Article 3). Furthermore, to place hydrofluorocarbons (HFCs) on the market the company must have sufficient quota to do so. Under the HFC phase-down, the quantities of HFCs (expressed in CO<sub>2</sub> equivalents) placed on the EU market are incrementally reduced by 79% in 3-year steps during the period from 2015 to 2030. The phase-down is implemented via a quota allocation system where companies acquire individual rights to place a certain quantity of HFCs on the EU market (Articles 15-18). Companies having imported or produced fluorinated greenhouse gases must also report these quantities to the European Commission (Article 19).

## 1.2. What are fluorinated greenhouse gases and fluorinated compounds?

**Annex I** of the Regulation lists **Fluorinated greenhouse gases (F-gases)**. These are defined as Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF<sub>6</sub>).

**Annex II** of the Regulation lists '**Other fluorinated greenhouse gases (Annex II gases)**'. These include unsaturated hydro(chloro)fluorocarbons, fluorinated ethers and alcohols as well as some other perfluorinated compounds.

This document distinguishes between 'F-gases' and 'Annex II gases'. While some obligations apply to gases listed in both Annex I and Annex II of the Regulation, most obligations concern fluorinated gases in Annex I only. Consequently, the term 'F-gases' is normally understood to mean gases listed in Annex I only.

**Fluorinated compounds**, while not defined in the Regulation, include F-gases and Annex II gases as well as any other substance containing fluorine, such as e.g. hydrochlorofluorocarbons (HCFCs).

## 1.3. What does placing on the market mean?

Placing on the market (see Article 2(10)) takes place when for example:

- producers supply or make available gases to third parties in the EU for the first time,
- producers use the gas internally for their own account, and
- imported gases are released by customs for free circulation.

Placing on the market does not necessarily involve a payment of some sort.

Placing on the market does not take place when for example:

- producers supply gases directly to third parties outside the EU.

## 1.4. Who is the importer of the F-gas?

The importer is the legal person importing the gas when it clears EU customs. For complying with the F-gas Regulation, the paper documentation at customs is relevant as it provides proof of the importing entity. **The importer is identified in this documentation as the 'consignee'** (Field 8 of the customs declaration document or Single Administrative Document (SAD)).

Importers are usually EU-based companies, but non-EU companies can also import bulk gases. The non-EU company should be listed as the "Consignee" in this case. Non-EU companies however need an "only representative" established in the EU and subject to the obligations of the Regulation on behalf of the non-EU company, e.g. reporting obligations (Art. 19) and quota compliance.

Companies are only considered to be importers if they import from countries outside the EU. Companies are not considered to be importers if they only buy or sell gases from or to companies in other Member States. Shipments between Member States are not considered to be imports/exports.

### 1.5. Why is HFC-23 by-production problematic?

Trifluoromethane (HFC-23, CHF<sub>3</sub> or fluoroform) is a greenhouse gas with a very high potential to warm the climate. One ton of HFC-23 has a global warming potential 14,800 times that of CO<sub>2</sub>.<sup>1</sup> By-production of HFC-23, if unabated, is immediately emitted into the atmosphere.

### 1.6. Where is HFC-23 by-production likely to occur?

HFC-23 is primarily generated during the fluorination of chloroform (Trichloromethane, CHCl<sub>3</sub> or R20). Since chloroform is a feedstock for chlorodifluoromethane (HCFC-22 or **R22**), HFC-23 is a by-product during the manufacture of this widely used substance. The HFC-23 yield amounts to 2-3% of the amount of R22 produced. In addition, where R22 is used as an intermediate product or feedstock this may also lead to HFC-23 by-production. This is the case e.g. for some production pathways of difluoromethane (HFC-32 or **R32**). It is often produced in upgraded R22 production facilities and R22 is then the main feedstock and also produced as an intermediate product.<sup>2,3</sup> HFC-32 is included in a number of frequently used blends such as the **R407** series (10-30% R32) and **R410A** (50% R32). Production of these blends may therefore also involve HFC-23 by-production.

There is also evidence that R22 can be used as a feedstock for the production pathway of unsaturated HFCs such as tetrafluoropropene (HFC-1234yf or **R1234yf**).<sup>4</sup> This in turn means that the production of HFC-1234yf can lead to HFC-23 by-production. Blends of HFC-1234yf and other HFCs are currently being developed by refrigerant producers and it is therefore necessary to ensure that HFC-23 by-production either does not take place or is abated.

There are also production pathways for other F-gases that only indirectly lead to HFC-23 by-production. HFC-227ea, for example, is produced from hexafluoropropene (R1216) which is a by-product during the production of tetrafluoroethylene (TFE or CAS 79-01-6) which in turn requires R22 as a feedstock. **HFC-227ea** therefore indirectly leads to HFC-23 by-production and producers and importers need to establish the production facility of origin for the R22 and ensure that the by-production was destroyed or captured for use according to best available techniques (see also section 6 for an example).

Similarly, the production of **HFC-125** (pentafluoroethane or R125) can include significant amounts of TFE as feedstock.<sup>5</sup> HFC-125 is a common component of HFC-blends such as **R404A**, **R422D**, **R507A** as well as the HFC-32 blends R407C and R410A mentioned above.

**Any other F-gas that may have TFE or R1216 in its production pathway should consequently also be investigated for HFC-23 by-production.**

A non-exhaustive list of F-gases that could lead to HFC-23 by-production in their production pathway is provided in Table 1. In many production processes HFC-23 can also occur in only trace quantities. Article 7 is understood not to cover production processes for which this is exclusively the case.

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<sup>1</sup> IPCC 4<sup>th</sup> Assessment Report

<sup>2</sup> Frischknecht, R. 1999, Umweltrelevanz natürlicher Kältemittel, Anhang zum Schlussbericht, Bundesamt für Energie, Bern

<sup>3</sup><http://www.arkema.com/export/sites/global/.content/medias/downloads/investorrelations/en/finance/fluorochemicals.pdf>

<sup>4</sup> For example a Japanese patent on the distillation of pure HFC-1234yf (Patent WO2014080916 A1) as well as Honeywell US patent applications for the production of HFC-1234yf via HFC-244bb (US patent application No. 20100119460 and 20150007592).

<sup>5</sup> See for example patent number US7067707 B2 held by Solvay

**Table 1: List of F-gases whose production could involve HFC-23 by-production (non-exhaustive)**

<b>HFC-32</b>	
<b>R32-blends</b>	R407A
	R407B
	R407C
	R407D
	R407E
	R407F
	R410A
	R410B
	R425A
	R427A
	R438A
	R439A
	R442A
	R444A
	R504
<b>R1234yf</b>	
<b>R1234yf-blends<sup>6</sup></b>	R445A
	R448A
	R449A
	R513A
	R454B
<b>HFC-227ea</b>	
<b>HFC-125</b>	
<b>HFC-125-blends</b>	R402A
	R402B
	R404A
	R407A
	R407B
	R407C
	R407D
	R407F
	R408A
	R410A
	R410B
	R417A
	R421A
	R421B
	R422A
	R422B
	R422C
	R422D
	R424A
	R426A
	R427A
	R428A
	R434A
R438A	
R442A	
R442A	
R507A	

<sup>6</sup> This list is incomplete as many of these blends are currently under development and do not as of yet have an associated ASHRAE number.

### **1.7. What are best available techniques for HFC-23 emission abatement?**

Article 7(2) calls for the destruction or capture for subsequent use of HFC-23 by-production according to best available techniques (BATs). The Regulation itself does not provide a definition of BATs for destruction or capture of HFC-23 by-production. Best practice has however been the subject of extensive discussions under the UNFCCC's Clean Development Mechanism (CDM) where further technical guidance and specifications are available.<sup>7</sup> It is therefore suggested that the monitoring and methodology should be of a standard equivalent to that established by the UNFCCC approved baseline methodology AM0001 "Incineration of HFC 23 waste streams".<sup>8</sup>

As regards destruction, BATs constitute any chemical conversion including thermal oxidation (incineration) and plasma pyrolysis, among others. During operation they generally achieve efficiencies of more than 99.99%.<sup>9</sup>

BATs for capture and use of HFC-23 by-production should on the other hand achieve efficiencies of greater than 99%.

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<sup>7</sup> See Volume 3 pp. 3.100 of the 2006 International Panel on Climate Change Guidelines for National Greenhouse Gas Inventories (available at [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3\\_Volume3/V3\\_3\\_Ch3\\_Chemical\\_Industry.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_3_Ch3_Chemical_Industry.pdf)).

<sup>8</sup> <https://cdm.unfccc.int/methodologies/DB/GAOZAY2DWIQHK71LJS027N6N4AV6SC>

<sup>9</sup> UNFCCC 2011 report on "Implications of the establishment of new hydrochlorofluorocarbon-22 (HCFC-22) facilities seeking to obtain certified emission reductions for the destruction of hydrofluorocarbon-23 (HFC-23)"

## 2. How could evidence for HFC-23 abatement under Article 7(2) be provided?

It is the responsibility of the (EU) producer and importer to ensure that F-gases and Annex II gases they place on the market either did not entail any HFC-23 by-production or that such by-production was destroyed or captured according to best available techniques.

Both producers and importers of F-gases and Annex II gases are required to provide evidence **at the time of placing on the market** to that effect.

**Failure to provide evidence, where relevant, upon placing on the market of F-gases and Annex II gases means the producer or importer is violating Article 7(2).**

It is proposed that this compliance is demonstrated by way of a **declaration of conformity by the producer or importer, which would need to accompany any shipment of gas**, similar to how it is standard practice for other legislation such as RoHS<sup>10</sup> or Ecodesign<sup>11</sup>. Section 4 contains a template for a declaration of conformity with Article 7(2) to be filled out and signed by the producer/importer.

Besides this self-declaration by an importer or producer, it should be considered what additional proof is requested of companies as proof of compliance. In case R22 is not used in the manufacturing process it may be assumed that the risk of HFC-23 by-production is lower, so a self-declaration of the producer/importer may be considered as sufficient.

For all cases where the production of the gas placed on the EU market involves R22 (i.e. the major source of HFC-23 by-production) somewhere in the manufacturing chain<sup>12</sup>, the following information should also be provided:

- (i) The production facility of origin of the R22 used in the manufacturing process;
- (ii) proof of abatement technology at the latter facility; as well as
- (iii) documentation (i.e. template in section 5) that links production of the imported/produced gas to the R22 used.

The declaration of conformity may be checked by the relevant national authorities upon placing on the market. Hence, for gases not produced in the EU, this will affect first and foremost the importer of the gas, and not the non-EU producer. To be able to comply, the importer should ask the non-EU producer to supply it with all the necessary information so it can make the declaration (see also section 2.2 and template in section 5). The importer does not have to inspect the supplier to verify it. It is advisable for producers and importers to keep a record of each declaration of conformity with Art 7 (2) for inspection by national enforcement authorities after placing on the market.

Documents should be in the language of the country where the gases are to be placed on the market or a language which is generally known by the relevant national administration and customs.

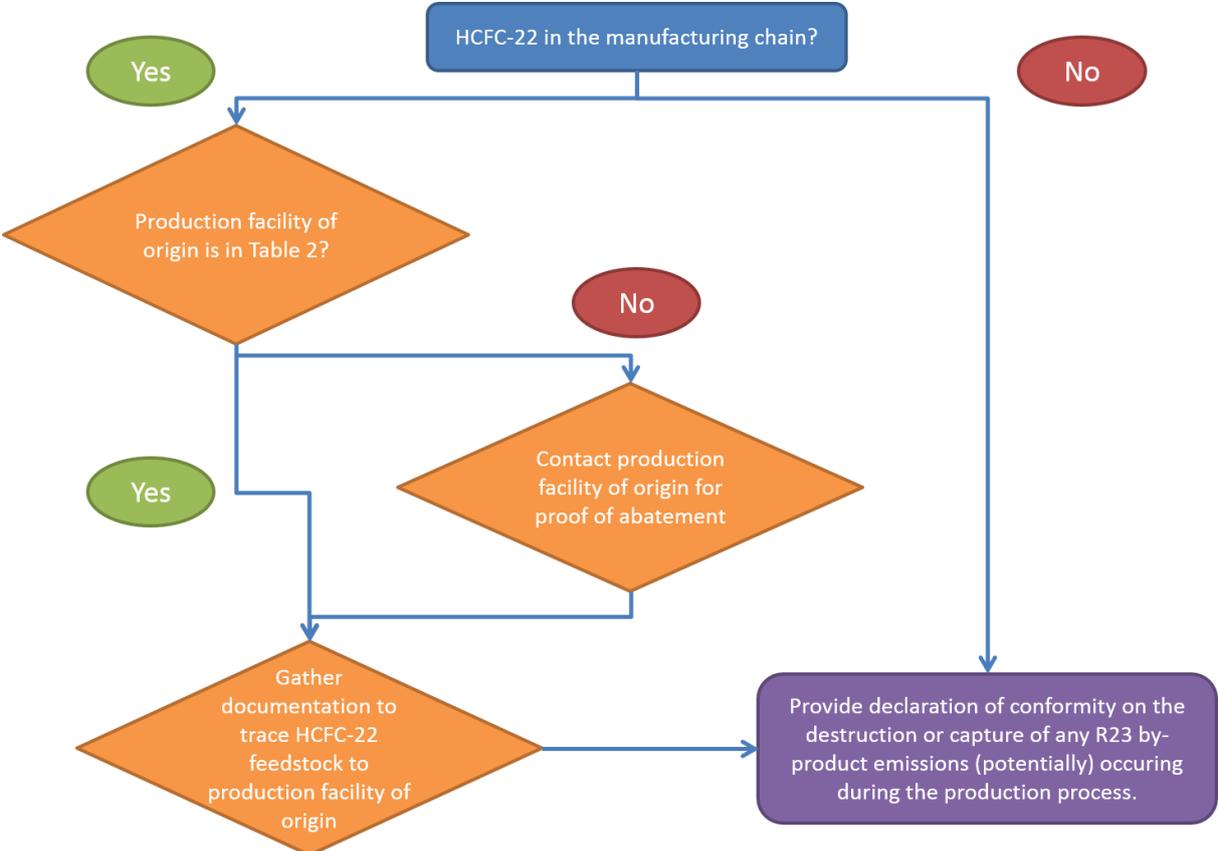
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<sup>10</sup> Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

<sup>11</sup> Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

<sup>12</sup> See table 1 for gases or blends that may involve R22 in the manufacturing chain

**Figure 1: Decision tree for evidence to be provided by producers and importers of F-gases and Annex II gases to achieve compliance with Article 7(2)**



**2.1. How to identify the production facility of origin?**

Documentation proving the identity of the production facility of origin of any R22 used in the manufacturing process can take the form of contractual agreements, bills of sale or a certificate of origin.

Proof of the identity of the production facility of origin can be integrated with establishing the traceability of the R22 used (see 2.2. below).

**2.2. How to establish traceability of the R22 used in the manufacturing process?**

Tracing any R22 used in the supply chain back to its production facility of origin is an important part of complying with Article 7(2). In order to do so, a documented link has to be established between the original site of manufacture of the R22 and the amount of F-gas or Annex II gas produced or imported.

This link can take the form of contractual agreements between the producer/importer and the facility providing the F-gas or Annex II gas or other intermediates that in turn had R22 in their supply chain.

It is possible for the producer or importer placing the F-gas or Annex II gas on the market to submit a sheet listing the companies involved in the transaction if confirmation by each company representative that the information provided is correct, are included. Alternatively, appropriate invoices should be provided.

Documentation has to be provided for each link in the supply chain back to the R22 production indicating

- (i) the substances involved and their quantities;
- (ii) the name and address of the supplier and the recipient;
- (iii) the date and time of transaction or delivery; and
- (iv) the container reference number (for customs to be able to match things up).

A template for establishing the traceability of origin is provided in section 6. It is recommended that such a document includes all companies going to the R22 production facility of origin. Each company representative should confirm, in writing or electronically, that the information provided is correct. An importer of gas should ask its suppliers to provide all the necessary documents and information. The evidence should be kept by a company including e-mail records confirming declarations and purchases.

### **2.3. How to prove installation of abatement technology at the production facility of origin?**

A number of R22 production facilities worldwide have been approved to receive carbon credits under the Clean Development Mechanism for installing HFC-23 by-production destruction technology. A list of these plants is presented in Table 2. The HFC-23 emission abatement technology utilized in these projects may be regarded as best available technologies (exclusively thermal oxidation and plasma pyrolysis). R22 produced at the facilities contained in this list may therefore be assumed to comply with the conditions of Art. 7(2).

Similarly, R22 production facilities in the EU also apply similar technologies and the R22 produced there may also be considered to fulfill the requirements set out in Article 7(2). No additional proof of the installation of abatement technology needs to be provided in case the R22 was produced at these facilities.

**Note that a declaration of conformity and a document establishing traceability still need to be provided for these cases.**

Producers of any R22 originating from **other production facilities need to provide further evidence** of the installation of best available technology.

Documentation proving the operation of abatement technology at the production facility of origin could be contractual agreements. A declaration on behalf of the R22 production facility of origin is another option. Any other type of proof the production facility of origin might wish to submit might also be valid and would be at the discretion of the responsible national authority to accept as sufficient.

**Table 2: R22 production facilities with approved emission abatement for HFC-23 by-production<sup>13, 14</sup>**

Country	Province/ District/ State	City	Name of production facility
<b>CDM approved HFC-23 by-production destruction projects<sup>15</sup></b>			
Argentina	San Louis	Villa Mercedes	Frio Industrias Argentinas S.A
China	Zhejiang	Dongyang	Zhejiang Dongyang Chemical Co., Ltd.
China	Zhejiang	Linhai	Limin Chemical Co., Ltd.
China	SiChuan	Zigong	Zhonghao Chenguang Research Institute of Chemical Industry
China	Zhejiang	Quzhou	Zhejiang Juha Co., Ltd.
China	Changshu	Jiangsu	Changshu Haike Chemical Co.Ltd.
China	Shandong	Jinan	China Fluoro Technology Co.Ltd.
China	Zhejiang	-	China Yingpeng Chemical Co., Ltd.
China	Shandong	Zibo City	Shandong Dongyue Chemical Co., Ltd-
China	Jiangsu	Taizhou	Jiangsu Meilan Chemical Co. Ltd.
China	Jiangsu	Changshu	Changshu 3F Zhonghao New Chemical Materials Co. Ltd
China	Zhejiang	Yongkang	Yingpeng Chemical Co., Ltd.
India	Tamil Nadu	Chennai	Chemplast Sanmar Ltd.
India	Gujarat	Surat	Navin Fluorine International Ltd.
India	Gujarat	Ranjitnagar	Gujarat Fluorochemicals Limited
India	Medak	-	Hindustan Fluorocarbons Ltd.
India	Rajasthan	Jhiwana Tehsil Tijara	SRF Ltd.
Mexico	Province of Nuevo León	Monterrey	Quimobásicos S.A. de C.V.
South Korea	Ulsan	-	Foosung Co. Ltd
<b>R22 production facilities of origin in the EU</b>			
France	-	Colombes	Arkema France S.A.
Germany	Hessen	Frankfurt am Main	CF Carbons GmbH
Netherlands	-	Dordrecht	Chemours Netherlands B.V.
United Kingdom	Cheshire	Runcorn	Fenix Fluor Limited
Germany	Hessen	Frankfurt am Main	Fluorchemie GmbH Frankfurt
Italy	-	Milan	Solvay Specialty Polymers Italy S.p.A.

<sup>13</sup> Source: <https://cdm.unfccc.int/Projects/projsearch.html>

<sup>14</sup> Further plants that have received funding for installing abatement technology are listed here: <http://www.multilateralfund.org/sites/57th/Document%20Library2/1/5762.pdf>

<sup>15</sup> Additional CDM approved projects may come online. This list may therefore be expanded to include all relevant projects listed at <https://cdm.unfccc.int/>

### 3. Example: Import of HFC-227ea

By way of example, take the case where an importer wishes to import HFC-227ea.

HFC-227ea is produced from hexafluoropropene (R1216).<sup>16</sup> R1216 on the other hand is a by-product during the production of tetrafluoroethylene (TFE or CAS 79-01-6), the most common feedstock use of R22 and therefore presents a risk of HFC-23 by-production.

According to Article 7(2), importers of HFC-227ea (and potential blends containing this F-gas) have to prove that HFC-23 by-production was destroyed or captured for subsequent use, in line with BAT, before being allowed to place the gas on the market.

In order to do so the importer could go through the following procedure:

1. The importer should demand from its suppliers the relevant information in order to produce a document to establish traceability (see template in section 5) all the way up the manufacturing chain until it reaches the R22 production facility of origin. The document should be filled out and signed at each step by the relevant companies. Alternatively, the importer can provide invoices documenting the sales further up the supply chain.
2. If the R22 production facility of origin is contained in the list of companies with approved abatement technology installed (Table 2), it can be assumed that HFC-23 by-production is destroyed or captured in accordance with Article 7(2). Otherwise the importer should request further documentation that proves the installation of appropriate abatement technology from their supplier. This request should be made to the production facility of origin which in turn has to provide evidence of the installation of abatement technology.
3. The importer is then in a position to complete a declaration of conformity and an accompanying technical file that contains the trace to the production facility of origin and proof of HFC-23 by-production abatement.

The declaration and technical file needs to be attached to every shipment of HFC-227ea (or blends containing HFC-227ea) that clear customs for free circulation on the European market.

Note that a declaration of conformity needs to be provided in all cases regardless of whether R22 is involved in the manufacturing process or not.

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<sup>16</sup> IPCC/TEAP Special Report on Safeguarding the Ozone Layer and the Global Climate System 2005 Chapter 11 available at [https://www.ipcc.ch/pdf/special-reports/sroc/sroc\\_full.pdf](https://www.ipcc.ch/pdf/special-reports/sroc/sroc_full.pdf)

## 4. Template Declaration of Conformity

**EU Declaration of Conformity** *(in all relevant languages where the gas is to be placed on the market)*

**We**

*(Company name)*

*Postal address*

*Postcode and city*

*Telephone number*

*Email address)*

**hereby declare under our sole responsibility for the quantities of substances to which this declaration relates:**

*(Specify industry nomination of gases, e.g. R32, R404A, R407C etc, or chemical name/CAS number.)*

**placed on the market in container No.:**

*(Specify container number.)*

**that, to the best of our knowledge,**

*(Check applicable boxes.)*

- [for EU producers of fluorinated compounds only: all necessary precautions have been taken to limit emissions of fluorinated greenhouse gases to the greatest extent possible during production, transport and storage as well as by-production of the above substances.]**
- No trifluoromethane (HFC-23) was produced as by-product during the manufacturing process, including during the manufacturing of feedstocks, for the production of the above quantities of substances. Accompanying documentation is not provided but is available upon request.**
- Trifluoromethane (HFC-23) produced as by-product during the manufacturing process, including during the manufacturing of feedstocks, for the production of the above quantities of substances, have been destroyed or recovered for subsequent use, in line with best available techniques. The following accompanying documentation is provided: a trace to the HCFC-22 production facility of origin and proof of abatement (where applicable).**

**This quantity of substances is therefore in conformity with Article 7 of Regulation (EU) No 517/2014 on fluorinated greenhouse gases.**

*(Place and time)*

*(Producer/importer/authorized representative)*

*(Company name)*

*(Name and position of the signatory)*

*(Signature)*

## 5. Template for establishing Traceability of Origin

**We declare that by signing for our company in column F of the following table that the substance named in column A was supplied by us to the customer in column C as detailed in columns D & E.**

*(Sample substances, company names, values and dates have been added for better understanding.)*

<b>Gas</b>	HFC-227ea
<b>Quantity</b>	20 tonnes
<b>Container Number</b>	ISO 123456789
<b>Importer (name and address)</b>	EU Importer, Brussels, Belgium
<b>Supplier (name and address)</b>	Distributor 1, Shanghai, China

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
<b>Substance</b> (industry nomination or chemical name/CAS number)	<b>Supplier</b> (including address)	<b>Customer</b> (including address)	<b>Tonnes supplied</b>	<b>Date of delivery</b>	<b>Signed by the supplier</b>
R22	Company A	Company B	20	1 <sup>st</sup> June 2015	
CAS 79-01-6	Company B	Company C	60	10 <sup>th</sup> June 2015	
R1216	Company C	Company D	40	20 <sup>th</sup> June 2015	
HFC-227ea	Company D	Distributor 1	20	30 <sup>th</sup> June 2015	
HFC-227ea	Distributor 1	EU Importer	1	5 <sup>th</sup> July 2015	

**Accompanying documentation includes a declaration of conformity by the entity placing the above mentioned amount on the EU market as well as proof of abatement by the HCFC-22 production facility of origin.**