

# REGULATION ON FLUORINATED GREENHOUSE GASES

## CHAPTER 1

### Aim, Scope, Basis, Definitions and Abbreviations

#### Aim

**ARTICLE 1** – (1) The aim of this Regulation is to restrain emissions of fluorinated greenhouse gases and to set procedures and principles regarding fluorinated greenhouse gases listed under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, to which Turkey is a party, and regarding the use of products or equipment that contain fluorinated greenhouse gases.

#### Scope

**ARTICLE 2** – (1) Regulations on the training and certification of real and legal persons that interfere with the essential principles regarding fluorinated greenhouse gases listed under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, electronic registry of fluorinated greenhouse gases and products and equipment containing fluorinated greenhouse gases, labeling, leak checks, reporting, placing on the market and use restrictions of fluorinated greenhouse gases and products or equipment containing fluorinated greenhouse gases,

(2) And stationary equipment and applications that contain or function with 3 (three) kilograms of or more fluorinated greenhouse gases,  
are within the scope of this Regulation.

#### Basis

**ARTICLE 3** – (1) This Regulation has been drawn up in accordance with;

- a) The Environmental Law published in the Official Gazette No. 2872 of 9/8/1983,
- b) The Decree on the Organization and Duties of the Ministry of Environment and Urbanization published in the Official Gazette No. 644 of 29/6/2011,
- c) The United Nations Framework Convention on Climate Change, consistent with the Law, published in the Official Gazette No. 4990 of 16/10/2003,
- ç) The Kyoto Protocol to the United Nations Framework Convention on Climate Change, consistent with the Law, published in the Official Gazette No. 5836 of 5/2/2009.

#### Alignment with the European Union Acquis

**ARTICLE 4** – (1) This Regulation has been drawn up within the framework of alignment with the European Union Acquis by taking into consideration the Regulation (EC) No. 842/2006 of the European Parliament and of the Council of 17/5/2006 on Certain Fluorinated Greenhouse Gases.

#### Definitions and Abbreviations

**ARTICLE 5** – (1) For the purposes of this Regulation the following definitions shall apply;

- a) 'Military Institutions' mean the central and provincial organization of the Ministry of Defense, institutions, detachments, headquarters or facilities of Land, Naval and Air Forces and the General Staff,
- b) The 'Ministry' means the Ministry of Environment and Urbanization,
- c) 'Maintenance or Technical Service' means all activities including detaching circuits that transfer fluorinated greenhouse gases to the system, disassembling or re-assembling circuit of equipment pieces and repairing any leakage; except for recovery and leak checks,
- ç) 'Pressurized Container' means a container which is designed primarily for transporting or storing fluorinated greenhouse gases,
- d) 'Certificate' means the certificate obtained by real and legal persons to interfere with the product or equipment,
- e) '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,

- f) 'CO<sub>2</sub>' means carbon dioxide,
- g) 'CO<sub>2</sub> Equivalent' means a quantity received as the product of the weight of the greenhouse gases in metric tons and their global warming potential,
- ğ) 'Distributor' means real or legal persons that are registered under the Ministry and locally or internationally sell fluorinated gases,
- h) 'Other Fluorinated Substances' mean substances listed under Annex 2 or mixtures that contain at least one of these substances, but not fluorinated greenhouse gases,
- ı) 'Electrical Switchgear' means the switching equipment and their combination with associated control, measuring, protecting and regulating equipment, and assemblies of such devices and equipment with associated interconnections, hardware and supporting structures; for use in connection with the generation, transmission, distribution and conversion of electric energy,
- ı) 'Fluorinated Greenhouse Gases' means the hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and other greenhouse gases that contain fluorine, listed in Annex I, or mixtures containing any of those substances,
- ı) 'Emissions of Fluorinated Greenhouse Gases' mean fluorinated greenhouse gases and other fluorinated substances that absorb and re-emit infrared radiation,
- k) 'Recycling' means the reuse of a recovered fluorinated greenhouse gas following a basic cleaning process
- l) 'Recovery' means the collection and storage of fluorinated greenhouse gases from products and equipment,
- m) 'Hermetically-Sealed Product or Equipment' means any 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,
- n) 'Hydrofluorocarbon' means the substances listed in section 1 of Annex I, or mixtures containing any of those substances,
- o) 'Reclamation' means the reprocessing of a recovered fluorinated greenhouse gases for reuse,
- ö) 'Heat Pump' means any hardware or equipment that extracts heat from a low temperature air to high temperature environment by receiving energy from the outside and contains fluorinated greenhouse gases,
- p) 'Operator' means the real or legal person that exercises actual power over the technical functioning of products and equipment and uses them through lawful methods such as possession, renting or other legal procedures,
- r) 'Import' means the entry into free movement of fluorinated greenhouse gases, product or equipment and pressurized container stipulated under this Regulation,
- s) 'Importer' means real or legal person that places into free movement fluorinated greenhouse gases, product or equipment and pressurized container stipulated under this Regulation,
- ş) 'Export' means extracting fluorinated greenhouse gases, product or equipment and pressurized container under this Regulation that are in free movement outside Turkish Customs Territory or to free zones, and extracting fluorinated greenhouse gases, product or equipment and pressurized container under this Regulation outside the country's customs area,
- t) 'Exporter' means real or legal person that extracts fluorinated greenhouse gases, product or equipment and pressurized container under the Regulation that are in free movement outside Turkish Customs Territory or to free zones, real or legal person that takes out fluorinated greenhouse gases, product or equipment and pressurized container under this Regulation outside the country's customs area,
- u) 'Mixture' means a fluid composed of two or more substances, at least one of which is a fluorinated greenhouse gas or another fluorinated substance,
- ü) 'User' means real or certified legal persons that prepare any product by using fluorinated greenhouse gases or other fluorinated substances in pure form or as a mixture, or handle refilling,

maintenance or technical servicing and repair by using these substances or use this substance during production activities,

v) 'Use' means the utilization of fluorinated greenhouse gases in the production, refilling, technical servicing or maintenance of products and equipment and the areas of use of fluorinated greenhouse gases,

y) 'Decommissioning' means the final shut-down and removal from operation of a product or piece of equipment,

z) '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,

aa) 'Sulphur Hexafluoride' means the substance listed in section 3 of Annex I, or mixtures containing that substance,

bb) 'Global Warming Potential' or GWP, means the climatic warming potential of a greenhouse gas relative to that of carbon dioxide ('CO<sub>2</sub>'), calculated in terms of the 100-year warming potential of one kilogram of a greenhouse gas relative to one kilogram of CO<sub>2</sub> and, in the case of mixtures, calculated in accordance with Annex IV,

cc) 'Central Database' means the electronic system to be set up by the Ministry, or any institution or organization appointed by the Ministry in which information will be entered regarding fluorinated greenhouse gases or any product or equipment containing fluorinated greenhouse gases,

çç) 'Repair' means the restoration of damaged or leaking products or equipment,

dd) '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,

ee) 'Perfluorocarbons' means the substances listed in section 2 of Annex I, or mixtures containing any of those substances

ff) 'Placing on the Market' means supplying or making available to another party the fluorinated greenhouse gases, product or equipment and pressurized container within the state,

gg) 'Stationary Equipment and Applications' mean refrigeration and heat pumps, fire protection systems and electrical switchgear and application for air conditioning that cannot be transferred/relocated during normal operation period,

ğğ) 'Stationary Refrigeration and Air Conditioning Equipment' means stationary refrigeration and air conditioning equipment functioning with at least one circuit that contains fluorinated greenhouse gases,

hh) 'Stationary Fire Protection Equipment and Fire Extinguisher' means stationary functioning equipment that is used for the purposes of fire protection and includes pressurized containers with fluorinated greenhouse gases in their system, or that consists of many interconnected pressurized containers,

ıı) 'Free Zone' means an area which is within the political borders of a country but outside its customs frontier, which is not subject to or partially subject to commercial, financial and economic laws and regulations executed in the country, where more extensive incentives are implemented for industrial and commercial activities and which is physically separated from the rest of the country,

ii) 'Leakage Detection System' means a calibrated mechanical, electrical or electronic device for detecting leakage of fluorinated greenhouse gases which, upon detection, alerts the operator,

jj) 'Solvent' means fluorinated greenhouse gas-based substances that can solve solid or fluid substances,

kk) 'Responsible Real Person' means the real person who works in the business and whom the Operator appoints in order to fulfill the obligations stated under paragraph one of Article 14,

ll) 'A Non-Refillable Pressurized Container' means a container which cannot be refilled and designed for transporting or storing fluorinated greenhouse gases,

mm) 'Product or Equipment' means stationary equipment and applications that contain or function with 3 (three) kilograms of or more fluorinated greenhouse gases,

nn) 'Mandatory Field of Use' refers to the fields of use with no alternatives for fluorinated greenhouse gases, which are used by human health and Turkish Armed Forces institutions and in the field of national security.

## **CHAPTER 2**

### **Basic Principles and Central Database**

#### **Basic Principles**

**ARTICLE 6 – (1)** It is forbidden to use fluorinated greenhouse gases for the following purposes:

- a) Releasing to atmosphere,
- b) Selling to real or legal persons not registered to the Ministry under this Regulation,
- c) Accepting into destruction facilities without conducting the recovery process on products or equipment, except for use in foam products or use as bloating agent in the foam insulation of the equipment.

(2) Products or equipment shall be reused, recovered, recycled and destroyed in accordance with the Regulation on Waste Management that entered into force upon publication in the Official Gazette No. 29314 of 2/4/2015.

#### **Central Database**

**ARTICLE 7 - (1)** Central database shall include electronic data which will be entered into the electronic system set up by the Ministry or any institution or organization appointed by the Ministry, by real or legal persons, whose obligations are listed under Article 10.

(2) The military content of the data to be put into the central database shall be determined with the consensus of the Ministry, the Ministry of National Defense, the Ministry of the Interior and the General Staff. The data of military institutions prepared within the framework of the determined content shall be put into the central database by the end of March of the following year.

(3) Procedures and principles regarding the central database shall be set by the Ministry.

## **CHAPTER 3**

### **Principles and Procedures Regarding the Use and Reporting of the Product or Equipment**

#### **Labeling the Product or Equipment and Pressurized Container**

**ARTICLE 8 – (1)** Product or equipment and pressurized containers shall be labeled in accordance with the principles and procedures set under the Regulation on Classification, Labeling and Packaging of Substances and Mixtures entered into force upon publication in the Official Gazette No. 28848 of 11/12/2013.

(2) In addition to the procedures and principles set under the first paragraph, the label of product or equipment and pressurized container shall include;

- a) The statement "Contains fluorinated greenhouse gases,"
- b) Industrial or chemical name and amount in kilogram, as stated under Annex 1 of the Regulation on Fluorinated Greenhouse Gases,
- c) Amount of CO<sub>2</sub> equivalent of the fluorinated greenhouse gases starting from January 1, 2019,
- ç) The statement "Hermetically sealed," if the product or equipment is hermetically sealed,
- d) The statement "Leakage rate of less than 0.1% per year," if the warranty of the electrical switchgear containing fluorinated greenhouse gases states that the tested leakage rate is less than 0.1% per year,

e) The statement "Foam bloated with fluorinated greenhouse gases," if fluorinated greenhouse gases were used as a bloating agent to insulate the stationary refrigeration and air conditioning equipment and heat pump prior to placing them in the market.

(3) In the event that the information on the label is contradicting with the substance inside the product or equipment and pressurized container, technical survey shall be conducted on the imported product or equipment and pressurized container prior to the actual import at customs laboratory. If such laboratories are not available, surveys shall be conducted at university laboratories or public institutions specified by the Ministry of Customs and Trade, provided that all fees are covered by the importer. In the event of contradiction, the subject shall be assessed by the Ministry by considering the opinions of the related institutions.

### **Leak Checks of the Product or Equipment**

**ARTICLE 9** – (1) Product or equipment shall be checked for leakage;

a) At least once every 12 (twelve) months if they contain 3 (three) to 30 (thirty) kilograms of fluorinated greenhouse gases,

b) At least once every 6 (six) months if they contain 30 (thirty) to 300 (three hundred) kilograms of fluorinated greenhouse gases,

c) At least once every 3 (three) months if they contain 300 (three hundred) kilograms of or more fluorinated greenhouse gases.

2) If the product or equipment containing 300 (three hundred) kilograms or more fluorinated greenhouse gases has a leakage detection system, it shall be checked at least once every 6 (six) months.

3) If the product or equipment containing 6 (six) kilograms or less fluorinated greenhouse gases is hermetically sealed and labeled with "Hermetically sealed" statement, it shall not be checked for leakage.

4) If there is not a leakage detection system in electrical switchgear containing 300 (three hundred) kilograms or more fluorinated greenhouse gases, the leakage detection system shall be installed by 1 January, 2019 and the system shall be checked at least once every 6 (six) months. If the electric switchgear's tested leakage rate is less than 0.1% per year, it is labeled as "Leakage rate of less than 0.1% per year", is equipped with a pressure and density monitoring device and contains less than 6 (six) kilograms of fluorinated greenhouse gases; it shall not be checked for leakage.

5) In the event that the stationary refrigerator and air conditioning equipment, the heat pump, the stationary fire protection equipment and the fire extinguisher containing 300 (three hundred) kilograms or more fluorinated greenhouse gases do not have leakage detection system; the leakage detection system shall be installed starting from 1 January, 2019 and the system shall be checked at least every 12 (twelve) months.

6) Leak checks shall be conducted in accordance with the principles and procedures stated under Annex 5.

### **Reporting on Fluorinated Greenhouse Gases**

**ARTICLE 10** – (1) Within the scope of this Regulation;

- a) The producer, the importer and the exporter of more than yearly 1 (one) metric ton of fluorinated greenhouse gases,
- b) Real or legal persons and distributors that conduct recovery, recycle, reclamation or destruction and use of fluorinated greenhouse gases,
- c) The producer of product or equipment and
- ç) The operator

must be registered in the system following the set-up of central database. Until the central database is set up, real or legal persons stated under paragraphs (a), (b), (c) and (d) must fill out the forms that will be published by the Ministry and submit them to the Ministry by the end of March of the following year.

### **Placement on the Market and Use Restrictions**

**ARTICLE 11** – (1) The import and placement on the market of product or equipment and pressurized container containing pure or mixture of fluorinated greenhouse gases shall be prohibited, unless they are labeled in line with Article 8.

(2) Placement on the market of products or equipment listed under Annex 3 shall be prohibited starting from 1 January, 2019.

(3) Starting from 1 (one) year following the date stated by this Regulation, import of non-refillable containers containing fluorinated greenhouse gases shall be prohibited.

(4) Placement on the market of non-refillable containers containing fluorinated greenhouse gases shall be prohibited starting from 1 January, 2020.

(5) In the event that the amount of sulphur hexafluoride is less than 850 (eight hundred and fifty) kilograms per year, the use of sulphur hexafluoride in magnesium die-casting and the recycling of magnesium die-casting alloys shall be prohibited starting from January 1, 2019.

(6) The use of sulphur hexafluoride or preparations thereof for the filling of vehicle tires shall be prohibited from 1 January 2019.

## **CHAPTER 4**

### **Regarding Real or Legal Person or Operator Interfering With The Product or Equipment Procedures and Principles**

#### **Certification of Real Person**

**ARTICLE 12** – (1) Real persons;

a) Who handle the installation, maintenance or technical servicing, repair or decommissioning of stationary refrigerator and air conditioning equipment, heat pumps, stationary fire protection systems and fire extinguishers and electrical switchgears; check them for leakage or recover fluorinated greenhouse gases from this equipment containing fluorinated greenhouse gases or functioning based on fluorinated greenhouse gases,

b) Who recover fluorinated greenhouse gases from equipment or organic Rankine cycle containing solvents that contain fluorinated greenhouse gases or function based on fluorinated greenhouse gases,

must be certified.

(2) Military institutions that provide training with curriculum containing requirements regarding the training and certification of real persons who interfere with equipment containing fluorinated greenhouse gas-based solvents shall exempt from sub-paragraph (b) of paragraph (1) of this Article.

(3) Procedures and principles regarding the training and certification, cancellation of the certificate, tests and other related procedures for real persons who interfere with equipment that contains or is dependent on fluorinated greenhouse gases shall be regulated with communiqués published by the Ministry.

### **Certification of Legal Persons**

**ARTICLE 13** – (1) Legal persons that conduct installation, maintenance or technical servicing, repair or decommissioning of stationary refrigerator and air conditioning equipment, heat pump, stationary fire protection system and fire extinguisher and electrical switchgear that contain, is dependent on fluorinated greenhouse gases shall be required to have certification.

(2) Procedures and principles regarding the certification, audit, cancellation of certificate and other related procedures for legal persons that interfere with equipment that contain, or is dependent on fluorinated greenhouse gases shall be regulated with communiqués published by the Ministry.

### **Liabilities of the Operator**

**Article 14** – (1) The operator shall

a) Ensure that the installation, maintenance or technical servicing, repair, decommissioning and recovery of fluorinated greenhouse gases are conducted by real or legal persons who are certified in accordance with the provisions of Article 12 and 13.

b) Take all necessary measures in order to prevent emission of fluorinated gases, including leak checks and employing certified real persons.

c) Ensure that the leak checks for product or equipment are conducted by real or certified legal persons, pursuant to the time schedule set under paragraph 1 of Article 9.

ç) Ensure the repair of product or equipment without delay, by certified real persons, if any leak is detected concerning fluorinated greenhouse gases.

d) Ensure the control conducted by real person with the certification within 30 (thirty) business days following the repair of the leak, in order to detect the pertinence of the repair.

e) Make available each copy of the input that are fed to the central data base for any and all product or equipment containing fluorinated greenhouse gases.

f) Be obliged to process activities regarding the product or equipment to be entered into the central data base, within 10 (ten) business days at the latest following the completion of the activities.

g) Be obliged to submit product or equipment information to the Ministry within 30 (thirty) business days after the product or equipment obtained upon the Regulation's entry into force are submitted to the operator or installations and refill of the product or equipment with fluorinated greenhouse gases are completed.

ğ) Be obliged to enter the data into central database the information regarding products or equipment obtained prior to the Regulation's entry into force,

1) within 3 (three) years for product or equipment containing 3 (three) to 30 (thirty) kilograms of fluorinated greenhouse gases,

2) within 2 (two) years for product or equipment containing 30 (thirty) to 300 (three hundred) kilograms of fluorinated greenhouse gases,

3) within 1 (one) year for product or equipment containing 300 (three hundred) kilograms of or more fluorinated greenhouse gases, following the entry into force of the Regulation.

## **CHAPTER 5**

### **Miscellaneous and Final Provisions**

#### **Miscellaneous Provisions**

**ARTICLE 15** - (1) The Ministry shall evaluate the subject in the event that fluorinated greenhouse gases, prohibited product or equipment and pressurized container, prohibited, are needed for mandatory fields of use.

(2) Procedures and principles regarding the import and export of fluorinated greenhouse gases, product or equipment shall be mutually determined with the Ministry of Economy.

#### **Principles Regarding Companies that Operate in Free Zones**

**ARTICLE 16** - (1) Companies that operate in Free Zones, while subject to Article 11 of this Regulation, may bring product or equipment and pressurized container stated under paragraph 2 and 3 of the Article into the Free Zones, provided that they do not bring them into Turkey.

(2) Companies that bring fluorinated greenhouse gases, product or equipment and pressurized container into free zones and produce them shall be obliged to register to the Ministry and central database.

(3) Companies that operate in free zones by using fluorinated greenhouse gases, product or equipment, except for the import and export thereof, shall be required to have certification in accordance with Articles 12 and 13 of this Regulation.

#### **Administrative Sanctions**

**ARTICLE 17** - (1) Administrative sanctions assumed in Article 20 of the Environmental Law No. 2872 shall be imposed on those who act contrary to the provisions of this Regulation and who do not fulfill their obligations within the context of the provisions of this Regulation.

#### **Exemption of Training and Certification**

**PROVISIONAL ARTICLE 1** - (1) Technical personnel identified in the Regulation on the Control of Ozone-Depleting Substances No. 27052 of 12/11/2008 may interfere with the product or equipment for 2 (two) years following the Regulation's entry into force.

(2) Certification is not required for real persons registered to or proceeds with the training program in order to receive certification, provided that they work and continue to work for at least 2 (two) years under the supervision of the technical personnel identified in the Regulation on Control of Ozone-Depleting Substances No. 27052 of 12/11/2008.

(3) Real persons not registered to the training program in order to obtain certification is required to take the test and receive certificate within 1 (one) year at most, following the establishment of national testing system.

#### **Entry Into Force**

**ARTICLE 17** -(1) This regulation shall enter into force on the date of its publication.



**Enforcement**

**ARTICLE 18** - (1) The provisions of this Regulation shall be enforced by the Minister of Environment and Urbanization.

**Annex 1**  
**FLUORINATED GREENHOUSE GASES**

<b>Industrial Designation of the Substance</b>	<b>Chemical Name of the Substance</b>	<b>Chemical Formula of the Substance</b>	<b>Global Warming Potential (GWP) of the Substance<sup>1</sup></b>
<b>Section 1: Hydrofluorocarbons (HFCs)</b>			
HFC-23	Trifluoromethane	CHF <sub>3</sub>	12400
HFC-32	Difluoromethane	CH <sub>2</sub> F <sub>2</sub>	677
HFC-41	Fluoromethane	CH <sub>3</sub> F	116
HFC-125	Pentafluoroethane	CHF <sub>2</sub> CF <sub>3</sub>	3170
HFC-134	1,1,2,2-tetrafluoroethane	CHF <sub>2</sub> CHF <sub>2</sub>	1120
HFC-134a	1,1,1,2-tetrafluoroethane	CH <sub>2</sub> FCF <sub>3</sub>	1300
HFC-143	1,1,2-trifluoroethane	CH <sub>2</sub> FCHF <sub>2</sub>	328
HFC-143a	1,1,1-trifluoroethane	CH <sub>3</sub> CF <sub>3</sub>	4800
HFC-152	1,2-difluoroethane	CH <sub>2</sub> FCH <sub>2</sub> F	16
HFC-152a	1,1-difluoroethane	CH <sub>3</sub> CHF <sub>2</sub>	138
HFC-161	Fluoroethane	CH <sub>3</sub> CH <sub>2</sub> F	4
HFC-227ea	1,1,1,2,3,3,3-heptafluoropropane	CF <sub>3</sub> CHFCF <sub>3</sub>	3350
HFC-236cb	1,1,1,2,2,3-hexafluoropropane	CH <sub>2</sub> FCF <sub>2</sub> CF <sub>3</sub>	1210
HFC-236ea	1,1,1,2,3,3-hexafluoropropane	CHF <sub>2</sub> CHFCF <sub>3</sub>	1330
HFC-236fa	1,1,1,3,3,3-hexafluoropropane	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	8060

<sup>1</sup> Based on the Fifth Evaluation Report adopted by Intergovernmental Panel on Climate Change.

HFC-245ca	1,1,2,2,3-pentafluoropropane	$\text{CH}_2\text{FCF}_2\text{CHF}_2$	716
HFC-245fa	1,1,1,3,3-pentafluoropropane	$\text{CHF}_2\text{CH}_2\text{CF}_3$	858
HFC-365 mfc	1,1,1,3,3-pentafluorobutane	$\text{CF}_3\text{CH}_2\text{CF}_2\text{CH}_3$	804
HFC-43-10 mee	1,1,1,2,2,3,4,5,5,5-decafluoropentane	$\text{CF}_3\text{CHFCHF}_2\text{CF}_3$	1650
<b>Section 2: Perfluorocarbons (PFCs)</b>			
PFC-14	Tetrafluoromethane	$\text{CF}_4$	6630
PFC-116	Hexafluoroethane	$\text{C}_2\text{F}_6$	11100
PFC-218	Octafluoropropane	$\text{C}_3\text{F}_8$	8900
PFC-3-1-10 (R-31-10)	Decafluorobutane	$\text{C}_4\text{F}_{10}$	9200
PFC-4-1-12 (R-41-12)	Dodecafluoropentane	$\text{C}_5\text{F}_{12}$	8550
PFC-5-1-14 (R-51-14)	Tetradecafluorohexane	$\text{C}_6\text{F}_{14}$	7910
PFC-c-318	Octafluorocyclobutane	c- $\text{C}_4\text{F}_8$	9540
<b>Section 3: Sulphur Hexafluoride</b>			
	Sulphur hexafluoride	$\text{SF}_6$	23500

**Annex 2**  
**OTHER FLUORINATED SUBSTANCES**

Industrial Designation of the Substance	Chemical Formula of the Substance	Global Warming Potential of the Substance (GWP) <sup>1</sup>
<b>1. Unsaturated Hydrochlorofluorocarbons</b>		
HFC-1234yf	$\text{CF}_3\text{CF}=\text{CH}_2$	4
HFC-1234ze	Trans — $\text{CHF}=\text{CHCF}_3$	7
HFC-1336mzz	$\text{CF}_3\text{CH}=\text{CHCF}_3$	9
HCFC-1233zd	$\text{C}_3\text{H}_2\text{ClF}_3$	4.5
HCFC-1233xf	$\text{C}_3\text{H}_2\text{ClF}_3$	1
<b>2. Fluorinated Ethers and Alcohols</b>		
HFE-125	$\text{CHF}_2\text{OCF}_3$	12400
HFE-134 (HG-00)	$\text{CHF}_2\text{OCHF}_2$	5560
HFE-143a	$\text{CH}_3\text{OCF}_3$	523
HCFE-235da2 (isofluorane)	$\text{CHF}_2\text{OCHClCF}_3$	491
HFE-245cb2	$\text{CH}_3\text{OCF}_2\text{CF}_3$	654
HFE-245fa2	$\text{CHF}_2\text{OCH}_2\text{CF}_3$	812
HFE-254cb2	$\text{CH}_3\text{OCF}_2\text{CHF}_2$	359
HFE-347 mcc3 (HFE-7000)	$\text{CH}_3\text{OCF}_2\text{CF}_2\text{CF}_3$	530
HFE-347pcf2	$\text{CHF}_2\text{CF}_2\text{OCH}_2\text{CF}_3$	889
HFE-356pcc3	$\text{CH}_3\text{OCF}_2\text{CF}_2\text{CHF}_2$	413
HFE-449sl (HFE-7100)	$\text{C}_4\text{F}_9\text{OCH}_3$	297
HFE-569sf2 (HFE-7200)	$\text{C}_4\text{F}_9\text{OC}_2\text{H}_5$	57
HFE-43-10pccc124 (H-Galden 1040x) HG-11	$\text{CHF}_2\text{OCF}_2\text{OC}_2\text{F}_4\text{OCHF}_2$	2820
HFE-236ca12 (HG-10)	$\text{CHF}_2\text{OCF}_2\text{OCHF}_2$	5350

<sup>1</sup> Based on the Fifth Evaluation Report adopted by Intergovernmental Panel on Climate Change.

HFE-338pcc13 (HG-01)	$\text{CHF}_2\text{OCF}_2\text{CF}_2\text{OCHF}_2$	2910
HFE-347mmy1	$(\text{CF}_3)_2\text{CFOCH}_3$	343
2,2,3,3,3-pentafluoropropanol	$\text{CF}_3\text{CF}_2\text{CH}_2\text{OH}$	42
bis(trifluoromethyl)-methanol	$(\text{CF}_3)_2\text{CHOH}$	195
HFE-227ea	$\text{CF}_3\text{CHFOCF}_3$	6450
HFE-236ea2 (desfluoran)	$\text{CHF}_2\text{OCHF}_2\text{CF}_3$	1790
HFE-236fa	$\text{CF}_3\text{CH}_2\text{OCF}_3$	979
HFE-245fa1	$\text{CHF}_2\text{CH}_2\text{OCF}_3$	828
HFE 263fb2	$\text{CF}_3\text{CH}_2\text{OCH}_3$	1
HFE-329 mcc2	$\text{CHF}_2\text{CF}_2\text{OCF}_2\text{CF}_3$	3070
HFE-338 mcf2	$\text{CF}_3\text{CH}_2\text{OCF}_2\text{CF}_3$	929
HFE-338mmz1	$(\text{CF}_3)_2\text{CHOCHF}_2$	380
HFE-347 mcf2	$\text{CHF}_2\text{CH}_2\text{OCF}_2\text{CF}_3$	854
HFE-356 mec3	$\text{CH}_3\text{OCF}_2\text{CHF}_2\text{CF}_3$	387
HFE-356mm1	$(\text{CF}_3)_2\text{CHOCH}_3$	27
HFE-356pcf2	$\text{CHF}_2\text{CH}_2\text{OCF}_2\text{CHF}_2$	719
HFE-356pcf3	$\text{CHF}_2\text{OCH}_2\text{CF}_2\text{CHF}_2$	446
HFE 365 mcf3	$\text{CF}_3\text{CF}_2\text{CH}_2\text{OCH}_3$	<1
HFE-374pc2	$\text{CHF}_2\text{CF}_2\text{OCH}_2\text{CH}_3$	627
<b>3. Other Perfluorinated Compounds</b>		
Perfluoropolymethylisopropyl-ether (PFPMIE)	$\text{CF}_3\text{OCF}(\text{CF}_3)\text{CF}_2\text{OCF}_2\text{OCF}_3$	9710
Nitrogen trifluoride	$\text{NF}_3$	16100
Trifluoromethyl sulphur pentafluoride	$\text{SF}_5\text{CF}_3$	17400
Perfluorocyclopropane	c-C <sub>3</sub> F <sub>6</sub>	9200

### **Annex 3**

#### **List of Placement on The Market Prohibitions for Product and Equipment**

1. Direct evaporation systems that contain hydrofluorocarbons and perfluorocarbons as refrigerant.
2. Fire protection equipment that contains perfluorocarbons or HFC-23.
3. Windows for domestic use, footwear and tires that contain fluorinated greenhouse gases.
4. One-component foams, except for mandatory fields of use, that contain fluorinated greenhouse gases with Global Warming Potential (GWP) of 150 or more.
5. Aerosol generators and signal horns marketed and intended for sale to the general public for entertainment and decorative purposes that contain hydrofluorocarbons with Global Warming Potentials (GWP) of 150 or more.
6. Domestic refrigerators and freezers that contain foam-bloating agents or hydrofluorocarbons with Global Warming Potentials of 150 or more.

**Annex 4**  
**Calculation of Global Warming Potential (GWP)**

The total GWP of a mixture is calculated as a weighted average, derived from the sum of the weight fractions of the individual substances multiplied by their GWP including substances that are not fluorinated greenhouse gases.

$$\Sigma (\text{Substance X \%} \times \text{GWP}) + (\text{Substance Y \%} \times \text{GWP}) + \dots (\text{Substance N \%} \times \text{GWP}),$$

In this formula, in instances where % is used weight, there is a +/-1% with a weight tolerance.

For example: applying the formula to a blend of gases consisting of 60% dimethyl ether, 10% HFC-152a and 30% isobutane;

$$(60 \% \times 1) + (10\% \times 124) + (30\% \times 3)$$

$$\rightarrow \text{Total GWP} = 13.9$$

The GWPs of the substances showed in the table below but not listed in Annex 1 and Annex 2 are used to calculate the GWPs of mixtures.

**GWPs of Substances Not Listed in Annex 2 and Annex 3**

Commercial Name of the Substance	Industrial Designation of the Substance	Chemical Formula of the Substance	Global Warming Potential (GWP) of the Substance
Methane		CH <sub>4</sub>	25
Nitrous oxide		N <sub>2</sub> O	298
Dimethyl ether		CH <sub>3</sub> OCH <sub>3</sub>	1
Methylene chloride		CH <sub>2</sub> Cl <sub>2</sub>	9
Methyl chloride		CH <sub>3</sub> Cl	13
Chloroform		CHCl <sub>3</sub>	31
Ethane	R-170	CH <sub>3</sub> CH <sub>3</sub>	6
Propane	R-290	CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>	3
Butane	R-600	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	4
Isobutane	R-600a	CH(CH <sub>3</sub> ) <sub>2</sub> CH <sub>3</sub>	3
Pentane	R-601	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	5
Isopentane	R-601a	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CH <sub>3</sub>	5
Ethoxyethane (diethyl ether)	R-610	CH <sub>3</sub> CH <sub>2</sub> OCH <sub>2</sub> CH <sub>3</sub>	4
Methyl formate	R-611	HCOOCH <sub>3</sub>	25
Hydrogen	R-702	H <sub>2</sub>	6
Ethylene	R-1150	C <sub>2</sub> H <sub>4</sub>	4
Propylene	R-1270	C <sub>3</sub> H <sub>6</sub>	2
Cyclopentane		C <sub>5</sub> H <sub>10</sub>	5

**Annex 5**  
**Leak Checks and Repair of the Product or Equipment**

**1) Leak Checks of Stationary Refrigeration and Air Conditioning Equipment**

a) Connections, valves including the body, joints including the ones on changeable dryers and filter, vibrating parts of the system and connections to security or operation equipment of stationary refrigeration and air conditioning equipment and heat pump shall be regularly checked for leaks.

b) In leak checks of stationary refrigeration and air conditioning and heat pump, certified real persons shall implement at least one of the methods among controlling the circuits and compounds in risk of leakage with gas detection systems that adapts to the refrigerant within the system; applying ultraviolet detection fluid or appropriate dye; certified foam solutions or using lather. Said gas detection systems shall be checked at least every 12 (twelve) months.

c) Ultraviolet solution or dye shall be applied to refrigerant circuits with the approval of equipment producer. Certified real persons shall inspect the remaining parts of the equipment following the above-mentioned methods and recover fluorinated greenhouse gases from the equipment prior to conducting pressure test with oxygen-free nitrogen.

ç) In leak indirect checks of stationary refrigeration and air conditioning and heat pump, certified real persons shall examine pressure, heat and compressor flow, refrigerant levels and parameters of charge rate.

d) Leak check shall be done on stationary refrigeration and air conditioning and heat pump in the event that leak detection system warns about a leak in the system, the equipment gets frosted or provides insufficient refrigerant, that oil stains or equipment damage is detected where there is leakage, there is damage to safety switches, pressure switches, manometer and sensor connections and there is refrigerant loss.

**2) Leak Checks of Stationary Fire Protection System and Fire Extinguisher**

a) Leak check requirements shall be met provided that the stationary fire protection system and fire extinguisher are in line with the standards of TS ISO 14520 or EN 15004 and leak checks are conducted according to the time schedule above.

b) Leak checks on stationary fire protection system and fire extinguisher shall be performed by certified real persons in order to control pressurized containers, components and connections.

c) Leak check shall be performed on stationary fire protection system and fire extinguisher when the leak detection system warns about a leak in the system, there is a 10% or more loss of pressure in the pressurized container with adjusted temperature and of fire extinguisher substance therein and when there is a refrigerant loss.

d) Pressure scales and weight monitoring equipment of stationary fire protection system and fire extinguisher shall be checked at least once every 12 (twelve) months.



### **3) Repairing Leakage**

#### 3) Repairing Leakage

a) Certified real persons who check leakages shall control data previously entered into the central database regarding stationary refrigeration and air conditioning equipment, heat pump, stationary fire protection system and fire extinguisher and electrical switchgear that contain 3 (three) kilograms or more fluorinated greenhouse gases. If there has been detected leak, the real person shall take this information into consideration.

b) The Operator shall be responsible for ensuring the repair of the leakage and leak check of product or equipment prior to the refilling of fluorinated greenhouse gases by certified real persons, for recovery of fluorinated greenhouse gases from the equipment prior to conducting pressure test with oxygen-free nitrogen and conducting leak check with oxygen-free nitrogen on stationary refrigeration and air conditioning equipment and heat pump and follow-up of the recovery, refill and leak checks.