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ANNEXES 1 to 10

## **ANNEXES**

*to the*

**Proposal for a Regulation of the European Parliament and of the Council  
on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing  
Regulation (EU) No 517/2014**

{SEC(2022) 156 final} - {SWD(2022) 95 final} - {SWD(2022) 96 final} -  
{SWD(2022) 97 final}

## ANNEX I

### *Fluorinated greenhouse gases referred to in Article 2(1)<sup>1</sup>*

Substance			GWP <sup>(2)</sup>	20 years-GWP <sup>(3)</sup> for information purposes only
Industrial designation	Chemical name (Common name)	Chemical formula		
<i>Section 1: Hydrofluorocarbons (HFCs)</i>				
HFC-23	trifluoromethane (fluoroform)	CHF <sub>3</sub>	14 800	12 400
HFC-32	difluoromethane	CH <sub>2</sub> F <sub>2</sub>	675	2 690
HFC-41	Fluoromethane (methyl fluoride)	CH <sub>3</sub> F	92	485
HFC-125	pentafluoroethane	CHF <sub>2</sub> CF <sub>3</sub>	3 500	6 740
HFC-134	1,1,2,2-tetrafluoroethane	CHF <sub>2</sub> CHF <sub>2</sub>	1 100	3 900
HFC-134a	1,1,1,2-tetrafluoroethane	CH <sub>2</sub> FCF <sub>3</sub>	1 430	4 140
HFC-143	1,1,2-trifluoroethane	CH <sub>2</sub> FCHF <sub>2</sub>	353	1 300
HFC-143a	1,1,1 –trifluoroethane	CH <sub>3</sub> CF <sub>3</sub>	4 470	7 840
HFC-152	1,2-difluoroethane	CH <sub>2</sub> FCH <sub>2</sub> F	53	77,6
HFC-152a	1,1 –difluoroethane	CH <sub>3</sub> CHF <sub>2</sub>	124	591
HFC-161	Fluoroethane (ethyl fluoride)	CH <sub>3</sub> CH <sub>2</sub> F	12	17,4
HFC-227ea	1,1,1,2,3,3,3-heptafluoropropane	CF <sub>3</sub> CHFCF <sub>3</sub>	3 220	5 850
HFC-236cb	1,1,1,2,2,3-hexafluoropropane	CH <sub>2</sub> FCF <sub>2</sub> CF <sub>3</sub>	1 340	3 750

<sup>1</sup> This Annex contains the gases listed therein, whether alone or in a mixture.

<sup>2</sup> Based on the Fourth Assessment Report adopted by the Intergovernmental Panel on Climate Change, unless otherwise indicated.

<sup>3</sup> Based on the Sixth Assessment Report adopted by the Intergovernmental Panel on Climate Change, unless otherwise indicated.

HFC-236ea	1,1,1,2,3,3-hexafluoropropane	CHF <sub>2</sub> CHF <sub>2</sub> CF <sub>3</sub>	1 370	4 420
HFC-236fa	1,1,1,3,3,3-hexafluoropropane	CF <sub>3</sub> CH <sub>2</sub> CF <sub>3</sub>	9 810	7 450
HFC-245ca	1,1,2,2,3-pentafluoropropane	CH <sub>2</sub> FCF <sub>2</sub> CHF <sub>2</sub>	693	2 680
HFC-245fa	1,1,1,3,3-pentafluoropropane	CHF <sub>2</sub> CH <sub>2</sub> CF <sub>3</sub>	1 030	3 170
HFC-365mfc	1,1,1,3,3-pentafluorobutane	CF <sub>3</sub> CH <sub>2</sub> CF <sub>2</sub> CH <sub>3</sub>	794	2 920
HFC-43-10mee	1,1,1,2,2,3,4,5,5,5 - decafluoropentane	CF <sub>3</sub> CHFCH <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub>	1 640	3 960

Substance			GWP 100 <sup>(3)</sup>	GWP 20 <sup>(3)</sup>
Industrial designation	Chemical name (Common name)	Chemical formula		
<i>Section 2: Perfluorocarbons (PFCs)</i>				
PFC-14	tetrafluoromethane (perfluoromethane, carbon tetrafluoride)	CF <sub>4</sub>	7 380	5 300
PFC-116	Hexafluoroethane (perfluoroethane)	C <sub>2</sub> F <sub>6</sub>	12 400	8 940
PFC-218	octafluoropropane (perfluoropropane)	C <sub>3</sub> F <sub>8</sub>	9 290	6 770
PFC-3-1-10 (R-31-10)	decafluorobutane (perfluorobutane)	C <sub>4</sub> F <sub>10</sub>	10 000	7 300
PFC-4-1-12 (R-41-12)	dodecafluoropentane (perfluoropentane)	C <sub>5</sub> F <sub>12</sub>	9 220	6 680
PFC-5-1-14 (R-51-14)	tetradecafluorohexane (perfluorohexane)	CF <sub>3</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub>	8 620	6 260
PFC-c-318	octafluorocyclobutane (perfluoro cyclobutane)	C-C <sub>4</sub> F <sub>8</sub>	10 200	7 400
PFC-9-1-18 (R-91-18)	Perfluorodecalin	C <sub>10</sub> F <sub>18</sub>	7 480	5 480

PFC-4-1-14 (R-41-14)	perfluoro-2- methylpentane	CF <sub>3</sub> CF <sub>2</sub> CF <sub>3</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub> (I-C <sub>6</sub> F <sub>14</sub> )	7 370 <sup>(4)</sup>	(*)
<i>Section 3: Other perfluorinated compounds</i>				
	sulphur hexafluoride	SF <sub>6</sub>	25 200	18 300

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<sup>4</sup> Droste et al. (2019). Trends and Emissions of Six Perfluorocarbons in the Northern and Southern Hemisphere. Atmospheric Chemistry and Physics. <https://acp.copernicus.org/preprints/acp-2019-873/acp-2019-873.pdf>

\* Global warming potential not yet available.

## ANNEX II

### *Other fluorinated greenhouse substances referred to in Article 2(1)<sup>(5)</sup>*

Substance		GWP <sup>(6)</sup>	20 years-GWP <sup>(2)</sup> for information purposes only
Common name/industrial designation	Chemical formula		
<i>Section 1: Unsaturated hydro(chloro)fluorocarbons</i>			
HCFC-1224yd(Z)	CF <sub>3</sub> CF=CHCl	0,06 <sup>(7)</sup>	(*)
Cis/Trans-1,2-difluoroethylene (HFC-1132)	CHF=CF <sub>2</sub>	0,005	0,017
1,1-difluoroethylene (HFC-1132a)	CH <sub>2</sub> =CF <sub>2</sub>	0,052	0,189
1,1,1,2,3,4,5,5,5(or1,1,1,3,4,4,5,5,5)-nonafluoro-4(or2)-(trifluoromethyl)pent-2-ene	CF <sub>3</sub> CF=CFCFCF <sub>3</sub> CF <sub>3</sub> or CF <sub>3</sub> CF <sub>3</sub> C=CFCF <sub>2</sub> CF <sub>3</sub>	1 <sup>Fn</sup> (8)	(*)
HFC-1234yf	CF <sub>3</sub> CF = CH <sub>2</sub>	0,501	1,81
HFC-1234ze	trans — CHF = CHCF <sub>3</sub>	1,37	4,94
HFC-1336mzz	CF <sub>3</sub> CH = CHCF <sub>3</sub>	17,9	64,3
HCFC-1233zd	CF <sub>3</sub> CH = CHCl	3,88	14
HCFC-1233xf	CF <sub>3</sub> CCl = CH <sub>2</sub>	1 <sup>Fn</sup> (4)	(*)
<i>Section 2: fluorinated substances used as inhalation anaesthetics</i>			
HFE-347mmz1 (sevoflurane) and isomers	(CF <sub>3</sub> ) <sub>2</sub> CHOCH <sub>2</sub> F	195	702
HCFE-235ca2 (enflurane) and isomers	CHF <sub>2</sub> OCF <sub>2</sub> CHFCl	654	2 320

<sup>5</sup> This Annex contains the gases listed therein, whether alone or in a mixture.

<sup>6</sup> Based on the Sixth Assessment Report adopted by the Intergovernmental Panel on Climate Change, unless otherwise indicated.

<sup>7</sup> Tokuhashi, K., T. Uchimar, K. Takizawa, & S. Kondo (2018): Rate Constants for the Reactions of OH Radical with the (E)/(Z) Isomers of CF<sub>3</sub>CF=CHCl and CHF<sub>2</sub>CF=CHCl. The Journal of Physical Chemistry A 122:3120–3127.

\* Global warming potential not yet available.

<sup>8</sup> Default value, global warming potential not yet available.

HCFE-235da2 (isoflurane) and isomers	$\text{CHF}_2\text{OCHClCF}_3$	539	1 930
HFE-236ea2 (desflurane) and isomers	$\text{CHF}_2\text{OCHF}_3$	2 590	7 020
<i>Section 3: other fluorinated substances</i>			
nitrogen trifluoride	$\text{NF}_3$	17 400	13 400
sulfurylfluoride	$\text{SO}_2\text{F}_2$	4 630	7 510

### ANNEX III

#### *Other fluorinated greenhouse gases referred to in Article 2(1)<sup>9</sup>*

Substance		GWP <sup>(10)</sup>	20 years–GWP <sup>(2)</sup> for information purposes only
Common name/industrial designation	Chemical formula		
<i>Section 1: Fluorinated ethers, ketones and alcohols</i>			
HFE-125	CHF <sub>2</sub> OCF <sub>3</sub>	14 300	13 500
HFE-134 (HG-00)	CHF <sub>2</sub> OCHF <sub>2</sub>	6 630	12 700
HFE-143a	CH <sub>3</sub> OCF <sub>3</sub>	2 170	616
HFE-245cb2	CH <sub>3</sub> OCF <sub>2</sub> CF <sub>3</sub>	747	2 630
HFE-245fa2	CHF <sub>2</sub> OCH <sub>2</sub> CF <sub>3</sub>	3 060	878
HFE-254cb2	CH <sub>3</sub> OCF <sub>2</sub> CHF <sub>2</sub>	328	1 180
HFE-347 mcc3 (HFE-7000)	CH <sub>3</sub> OCF <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub>	576	2 020
HFE-347pcf2	CHF <sub>2</sub> CF <sub>2</sub> OCH <sub>2</sub> CF <sub>3</sub>	980	3 370
HFE-356pcc3	CH <sub>3</sub> OCF <sub>2</sub> CF <sub>2</sub> CHF <sub>2</sub>	277	995
HFE-449s1 (HFE-7100)	C <sub>4</sub> F <sub>9</sub> OCH <sub>3</sub>	460	1 620
HFE-569sf2 (HFE-7200)	C <sub>4</sub> F <sub>9</sub> OC <sub>2</sub> H <sub>5</sub>	60,7	219
HFE-7300	(CF <sub>3</sub> ) <sub>2</sub> CFCFOC <sub>2</sub> H <sub>5</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>3</sub>	405	1 420
n-HFE-7100	CF <sub>3</sub> CF <sub>2</sub> CF <sub>2</sub> CF <sub>2</sub> OCH <sub>3</sub>	544	1 920
i-HFE-7100	(CF <sub>3</sub> ) <sub>2</sub> CFCF <sub>2</sub> OCH <sub>3</sub>	437	1 540
i-HFE-7200	(CF <sub>3</sub> ) <sub>2</sub> CFCF <sub>2</sub> OCH <sub>2</sub> CH <sub>3</sub>	34,3	124

<sup>9</sup> This Annex contains the gases listed therein, whether alone or in a mixture.

<sup>10</sup> Based on the Sixth Assessment Report adopted by the Intergovernmental Panel on Climate Change, unless otherwise indicated.

HFE-43-10pcccl24 (H-Galden 1040x) HG-11	<chem>CHF2OCF2OC2F4OCHF2</chem>	3 220	8 720
HFE-236cal2 (HG-10)	<chem>CHF2OCF2OCHF2</chem>	6 060	11 700
HFE-338pccl3 (HG-01)	<chem>CHF2OCF2CF2OCHF2</chem>	3 320	9 180
HFE-347mmyl	<chem>(CF3)2CFOCH3</chem>	392	1 400
2,2,3,3,3-pentafluoropropan-1-ol	<chem>CF3CF2CH2OH</chem>	34,3	123
1,1,1,3,3,3-Hexafluoropropan-2-ol	<chem>(CF3)2CHOH</chem>	206	742
HFE-227ea	<chem>CF3CHFOCF3</chem>	7 520	9 800
HFE-236fa	<chem>CF3CH2OCF3</chem>	1 100	3 670
HFE-245fal	<chem>CHF2CH2OCF3</chem>	934	3 170
HFE 263fb2	<chem>CF3CH2OCH3</chem>	2,06	7,43
HFE-329 mcc2	<chem>CHF2CF2OCF2CF3</chem>	3 770	7 550
HFE-338 mcf2	<chem>CF3CH2OCF2CF3</chem>	1 040	3 460
HFE-338mmzl	<chem>(CF3)2CHOCHF2</chem>	3 040	6 500
HFE-347 mcf2	<chem>CHF2CH2OCF2CF3</chem>	963	3 270
HFE-356 mec3	<chem>CH3OCF2CHFCF3</chem>	264	949
HFE-356mm1	<chem>(CF3)2CHOCH3</chem>	8,13	29,3
HFE-356pcf2	<chem>CHF2CH2OCF2CHF2</chem>	831	2 870
HFE-356pcf3	<chem>CHF2OCH2CF2CHF2</chem>	484	1 730
HFE 365 mcf3	<chem>CF3CF2CH2OCH3</chem>	1,6	5,77
HFE-374pc2	<chem>CHF2CF2OCH2CH3</chem>	12,5	45
2,2,3,3,4,4,5,5- octafluorocyclopentan- 1-ol	<chem>(CF2)4CH(OH)-</chem>	13,6	49,1



1,1,1,3,4,4,4-Heptafluoro-3-(trifluoromethyl)butan-2-one	$\text{CF}_3\text{C}(\text{O})\text{CF}(\text{CF}_3)_2$	0,29 <sup>(11)</sup>	(*)
<i>Section 2: Other fluorinated compounds</i>			
perfluoropolymethylisopropyl-ether (PFPME)	$\text{CF}_3\text{OCF}(\text{CF}_3)\text{CF}_2\text{OCF}_2\text{OCF}_3$	10 300	7 750
trifluoromethylsulphurpentafluoride	$\text{SF}_5\text{CF}_3$	18 500	13 900
Perfluorocyclopropane	c-C <sub>3</sub> F <sub>6</sub>	9 200 <sup>(12)</sup>	6 850 <sup>(3)</sup>
Heptafluoroisobutyronitrile (2,3,3,3-tetrafluoro-2-(trifluoromethyl)propanenitrile)	Iso-C <sub>3</sub> F <sub>7</sub> CN	2 750	4 580
perfluorotributylamine (PFTBA, FC43)	C <sub>12</sub> F <sub>27</sub> N	8 490	6 340
perfluoro-N-methylmorpholine	C <sub>5</sub> F <sub>11</sub> NO	8 800 <sup>(13)</sup>	(*)
Perfluorotripropylamine	C <sub>9</sub> F <sub>21</sub> N	9 030	6 750

<sup>11</sup> Ren et al. (2019). Atmospheric Fate and Impact of Perfluorinated Butanone and Pentanone. *Environ. Sci. Technol.* 2019, 53, 15, 8862–8871

<sup>12</sup> WMO et al. (2018). Scientific Assessment of Ozone Depletion.

<sup>13</sup> REACH registration dossier. <https://echa.europa.eu/registration-dossier/-/registered-dossier/10075/5/1>

\* Not yet available.

## ANNEX IV

### *Placing on the market prohibitions referred to in Article 11(1)*

<b>Products and equipment</b>		<b>Date of prohibition</b>
<b>Where relevant, the GWP of mixtures containing fluorinated greenhouse gases shall be calculated in accordance with Annex VI, as provided for in Article 3, point (1)</b>		
1)	Non-refillable containers for fluorinated greenhouse gases listed in Annex I, empty, partially or fully filled, used to service, maintain or fill refrigeration, air-conditioning or heat-pump equipment, fire protection systems or switchgear, or for use as solvents.	4 July 2007
(2)	Non-confined direct evaporation systems that contain HFCs and PFCs as refrigerants.	4 July 2007
(3)	Fire protection equipment that contain PFCs	4 July 2007
	that contain HFC-23	1 January 2016
	that contain or rely on other fluorinated greenhouse gases listed in Annex I, except when required to meet safety standards	1 January 2024
(4)	Windows for domestic use that contain fluorinated greenhouse gases listed in Annex I.	4 July 2007
(5)	Other windows that contain fluorinated greenhouse gases listed in Annex I.	4 July 2008
(6)	Footwear that contains fluorinated greenhouse gases listed in Annex I.	4 July 2006
(7)	Tyres that contain fluorinated greenhouse gases listed in Annex I.	4 July 2007
(8)	One-component foams, except when required to meet national safety standards, that contain fluorinated greenhouse gases listed in Annex I with GWP of 150 or more.	4 July 2008
(9)	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 July 2009
(10)	Domestic refrigerators and freezers that contain HFCs with GWP of 150 or more.	1 January 2015

(11)	Refrigerators and freezers for commercial use (self-contained equipment)	-that contain HFCs with GWP of 2 500 or more.	1 January 2020
		-that contain HFCs with GWP of 150 or more.	1 January 2022
		-that contain other fluorinated greenhouse gases with GWP of 150 or more.	1 January 2024
(12)	Any self-contained refrigeration equipment that contains fluorinated greenhouse gases with GWP of 150 or more.		1 January 2025
(13)	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 January 2020
(14)	Stationary refrigeration equipment, that contains, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 2 500 or more except equipment intended for application designed to cool products to temperatures below – 50 °C.		1 January 2024
(15)	Multipack centralized refrigeration systems for commercial use with a rated capacity of 40 kW or more that contain, or whose functioning relies upon, fluorinated greenhouse gases listed in Annex I 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 January 2022
(16)	Plug-in room air-conditioning equipment (self-contained equipment) which is movable between rooms by the end user that contain HFCs with GWP of 150 or more.		1 January 2020
(17)	Plug-in room and other self-contained air-conditioning and heat pump equipment that contain fluorinated greenhouse gases with GWP of 150 or more.		1 January 2025
(18)	Stationary split air-conditioning and split heat pump equipment :		1 January 2025
	(a)	Single split systems containing less than 3 kg of fluorinated greenhouse gases listed in Annex I, that contain, or whose functioning relies upon, fluorinated greenhouse gases listed in Annex I with GWP of 750 or more;	
	(b)	Split systems of a rated capacity of up to and including 12 kW containing, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 150 or more, except when required to meet safety standards;	
	(c)	Split systems of a rated capacity of more than 12 kW containing,	

	or whose functioning relies upon, fluorinated greenhouse gases with GWP of 750 or more, except when required to meet safety standards.		
(19)	Foams that contain HFCs with GWP of 150 or more, except when required to meet national safety standards.	-Extruded polystyrene (XPS)	1 January 2020
		-Other foams	1 January 2023
(20)	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 January 2018
(21)	Personal care products (i.e. mousse, creams, foams) containing fluorinated greenhouse gases.		1 January 2024
(22)	Equipment used for cooling the skin that contain, or whose functioning relies upon, fluorinated greenhouse gases with GWP of 150 or more except when used for medical applications.		1 January 2024
(23)	Installation and replacement of the following electrical switchgear:	(a) medium voltage switchgear for primary and secondary distribution up to 24 kV, with insulating or breaking medium using, or whose functioning relies upon, gases with GWP of 10 or more, or with GWP of 2000 or more, unless evidence is provided that no suitable alternative is available based on technical grounds within the lower GWP ranges referred to above;	1 January 2026
		(b) medium voltage switchgear for primary and secondary distribution from more than 24 kV and up to 52 kV, with insulating or breaking medium using, or whose functioning relies upon gases with GWP of 10 or more, or with GWP of more than 2000, unless evidence is provided that no suitable alternative is available based on technical grounds within the lower GWP ranges referred to above;	1 January 2030
		(c) high voltage switchgear from 52 and up to 145 kV and up to 50 kA short circuit current with insulating or breaking medium using, or whose functioning relies upon gases with GWP of 10 or more, or with GWP of more than 2000, unless evidence is provided that no suitable alternative is available based on	1 January 2028

	technical grounds within the lower GWP ranges referred to above;	
	(d) high voltage switchgear of more than 145 kV or more than 50 kA short circuit current with insulating or breaking medium using, or whose functioning relies upon gases with GWP of 10 or more, or with GWP of more than 2000 unless evidence is provided that no suitable alternative is available based on technical grounds within the lower GWP ranges referred to above.	1 January 2031

1. Point 1 applies to:

- (a) containers which cannot be refilled without being adapted for that purpose (non-refillable);
- (b) containers that could be refilled but are imported or placed on the market without provision having been made for their return for refilling.

2. The evidence referred to in point 23, shall include documentation establishing that following an open call for tender no suitable alternative on technical grounds, given the demonstrated specificities of the application, was available that could meet the conditions set out in point 23. The documentation shall be kept by the operator for at least five years and shall be made available to the competent authority of the Member State and to the Commission, upon request.

## ANNEX V

### *Production rights for placing hydrofluorocarbons on the market*

The calculated levels of production of hydrofluorocarbons, expressed in tonnes of CO<sub>2</sub> equivalents, referred to in Article 14 for each producer is:

- (a) for the period 1 January 2024 to 31 December 2028, 60 % of the annual average of its production in 2011-2013;
- (b) from the period 1 January 2029 to 31 December 2033, 30% of the annual average of its production in 2011-2013;
- (c) for the period 1 January 2034 to 31 December 2035, 20% of the annual average of its production in 2011-2013;
- (d) for the period 1 January 2036 and thereafter, 15% % of the annual average of its production in 2011-2013.

For the purpose of this Annex, production means the amount of hydrofluorocarbons produced minus the amount destroyed by technologies approved by the Parties to the Protocol, and minus the amount entirely used as feedstock in the manufacture of other chemicals, but including hydrofluorocarbons generated as a by-product, unless not captured or unless that by-product is destroyed as part of or after the manufacturing process by the producer or handed over to another undertaking for destruction. No amount reclaimed shall be considered as production.

## ANNEX VI

### *Method of calculating the total GWP of a mixture referred to in Article 3(1)*

The 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, unless otherwise specified, including substances that are not fluorinated greenhouse gases.

$\Sigma$  (Substance X %<sub>x</sub> GWP) + (Substance Y %<sub>x</sub> GWP) + ... (Substance N %<sub>x</sub> GWP), where % is the contribution by weight with a weight tolerance of +/-1 %.

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

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

$$\text{Total GWP} = 13,9$$

The GWP of the following non-fluorinated substances are used to calculate the GWP of mixtures. For other substances not listed in this annex a default value of 0 applies.

Substance			GWP 100 <sup>(14)</sup>
Common name	Industrial designation	Chemical Formula	
methane		CH <sub>4</sub>	27,9
nitrous oxide		N <sub>2</sub> O	273
dimethyl ether		CH <sub>3</sub> OCH <sub>3</sub>	1 <sup>(15)</sup>
methylene chloride		CH <sub>2</sub> Cl <sub>2</sub>	11,2
methyl chloride		CH <sub>3</sub> Cl	5,54
chloroform		CHCl <sub>3</sub>	20,6
ethane	R-170	CH <sub>3</sub> CH <sub>3</sub>	0,437
propane	R-290	CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>	0,02
butane	R-600	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	0,006
isobutane	R-600a	CH(CH <sub>3</sub> ) <sub>2</sub> CH <sub>3</sub>	0 <sup>(16)</sup>
pentane	R-601	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> CH <sub>3</sub>	0 <sup>(16)</sup>
isopentane	R-601a	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> CH <sub>3</sub>	0 <sup>(16)</sup>
ethoxyethane (diethyl ether)	R-610	CH <sub>3</sub> CH <sub>2</sub> OCH <sub>2</sub> CH <sub>3</sub>	4 <sup>(15)</sup>
methyl formate	R-611	HCOOCH <sub>3</sub>	11 <sup>(17)</sup>
hydrogen	R-702	H <sub>2</sub>	6 <sup>(15)</sup>
ammonia	R-717	NH <sub>3</sub>	0
ethylene	R-1150	C <sub>2</sub> H <sub>4</sub>	4 <sup>(15)</sup>
propene	R-1270	C <sub>3</sub> H <sub>6</sub>	0 <sup>(16)</sup>
cyclopentane		C <sub>5</sub> H <sub>10</sub>	0 <sup>(16)</sup>

<sup>14</sup> Based on the Sixth Assessment Report adopted by the Intergovernmental Panel on Climate Change, unless otherwise indicated.

<sup>15</sup> Based on the Fourth Assessment Report adopted by the Intergovernmental Panel on Climate Change

<sup>16</sup> WMO et al. (2018). Scientific Assessment of Ozone Depletion, where value is given as <<1

<sup>17</sup> WMO et al. (2018). Scientific Assessment of Ozone Depletion.



## ANNEX VII

### **MAXIMUM QUANTITIES AND CALCULATION OF REFERENCE VALUES AND QUOTAS FOR PLACING HYDROFLUOROCARBONS ON THE MARKET REFERRED TO IN ARTICLE 17**

- (1) The maximum amount of HFCs allowed to be placed on the Union market in a given year is set to be the following:

<b>Years</b>	<b>Maximum Quantity in tonnes CO<sub>2</sub> equivalent</b>
2024 – 2026	41 701 077
2027 – 2029	17 688 360
2030 – 2032	9 132 097
2033 – 2035	8 445 713
2036 – 2038	6 782 265
2039 – 2041	6 136 732
2042 – 2044	5 491 199
2045 – 2047	4 845 666
2048 onwards	4 200 133

- (2) The 2015 base-value for the maximum quantity is set to be: 176 700 479 tonnes CO<sub>2</sub> equivalent
- (3) Reference values and quotas for placing hydrofluorocarbons on the market referred to in Articles 16 and 17 shall be calculated as the aggregated quantities of all hydrofluorocarbons, expressed in tonne(s) of CO<sub>2</sub> equivalent rounded to the nearest tonne.
- (4) Each importer and producer shall receive reference values referred to in Article 17(1), calculated as follows:
- i) a reference value for placing hydrofluorocarbons on the market based on the annual average of the quantities of hydrofluorocarbons lawfully placed on the market from 1 January 2015 as reported under Article 19 of Regulation (EU) No 517/2014 and under Article 26 of this Regulation for the years available, not including quantities of hydrofluorocarbons for the usages referred to in Article 26(5) during the same period, on the basis of available data.
  - ii) in addition, for importers and producers that have reported the placing on the market of hydrofluorocarbons for the usage referred to in Article 26(5), second subparagraph, a reference value based on the annual average of the quantities of

those hydrofluorocarbons for such usage lawfully placed on the market from 1 January 2020 as reported under Article 19 of Regulation (EU) No 517/2014 and of Article 26 of this Regulation for the years available, on the basis of available data.

## ANNEX VIII

### *Allocation mechanism referred to in Article 17*

- (1) Determination of the quantity to be allocated to undertakings for which reference values have been established under Article 17(1).

Each undertaking for which reference values have been established receives quota, which is calculated as follows:

- a quota corresponding to 89 % of the reference value referred to in Annex VII, point 4(i), multiplied by the maximum quantity for the year for which the quota is allocated divided by the base value of 176 700 479 tonnes CO<sub>2</sub> equivalent<sup>18</sup>.
- in addition, where relevant, a quota corresponding to the reference value referred to in Annex VII, point 4(ii), multiplied by the maximum quantity for the year for which the quota is allocated divided by the maximum quantity for the year 2024.

In case where after allocating the full amount of quotas as referred to in the second subparagraph, the maximum quantity is exceeded, all quotas will be reduced proportionally.

- (2) Determination of the quota to be allocated to undertakings that have submitted a declaration pursuant to Article 17(3).

The total sum of the quotas allocated under point 1 is subtracted from the maximum quantity for the given year set out in Annex VII to determine the reserve amount to be allocated to undertakings, which have submitted a declaration under Article 17(3).

Each undertaking receives an allocation corresponding to a pro-rata share of the reserve.

The pro-rata share is calculated by dividing 100 by the number of undertakings that have submitted a declaration.

- (3) Penalties established in accordance with Article 31 are taken into account in the calculations referred to above.

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<sup>18</sup> This number is the maximum quantity established for 2015 at the beginning of the phase-down, taking into account BREXIT.

## ANNEX IX

### **DATA TO BE REPORTED PURSUANT TO ARTICLE 26**

- (1) Each producer referred to in Article 26(1), first subparagraph, shall report on:
- (a) the total quantity of each substance listed in Annexes I, II and III it has produced in the Union, including by-production, differentiating between amounts captured and not captured, and identifying quantities destroyed, from such production or by-production, of amounts not captured, or if captured, quantities destroyed prior to their placing on the market, either in the facilities of the producer or handed over to other undertakings for destruction, as well as the undertaking that carried out the destruction;
  - (b) the main categories of application in which the substance is used;
  - (c) the quantities of each substance listed in Annex I, II and III it has placed on the market in the Union, specifying separately:
    - quantities placed on the market for feedstock uses, including, for HFC-23 only, if after prior capture or without prior capture;
    - direct exports;
    - producing metered dose inhalers for the delivery of pharmaceutical ingredients;
    - use in military equipment;
    - use in the etching of semiconductor material or the cleaning of chemical vapour deposition chambers within the semiconductor manufacturing sector;
    - amounts of hydrofluorocarbons produced for uses within the Union exempted under the Montreal Protocol;
  - (d) any stocks held at the beginning and the end of the reporting period, specifying if placed on the market or not.
- (2) Each importer referred to in Article 26(1), first subparagraph, shall report on:
- (a) the total quantity of each substance listed in Annex I, II and III it has imported into the Union, identifying the main categories of application in which the substance is used, specifying separately:
    - amounts imported, not released for free circulation, and re-exported contained in products or equipment by the reporting undertaking;
    - quantities for destruction, identifying the undertaking carrying out the destruction;
    - feedstock uses, specifying separately amounts of hydrofluorocarbons imported for feedstock uses, and identifying the feedstock using undertaking;
    - direct exports, identifying the exporting undertaking;

- producing metered dose inhalers for the delivery of pharmaceutical ingredients identifying the producer;
  - use in military equipment; identifying the undertaking receiving the quantities for this use;
  - use in the etching of semiconductor material or the cleaning of chemical vapour deposition chambers within the semiconductor manufacturing sector, identifying the receiving semiconductor manufacturer;
  - amounts of hydrofluorocarbons contained in pre-blended polyols;
  - amounts of used, recycled or reclaimed hydrofluorocarbons;
  - amount of hydrofluorocarbons imported for uses exempted under the Montreal Protocol;
  - Quantities of hydrofluorocarbons shall be reported separately for each country of origin.
- (b) any stocks held at the beginning and the end of the reporting period, specifying if already placed on the market or not.
- (3) Each exporter referred to in Article 26(1), first subparagraph, shall report on the quantities of each substance listed in Annexes I, II and III that it has exported from the Union, specifying if from own production or import or if purchased from other undertakings within the Union.
- (4) Each undertaking referred to in Article 26(2) shall report on:
- (a) the quantities of each substance listed in Annexes I, II and III destroyed, including the quantities of those substances contained in products or equipment;
  - (b) any stocks of each substance listed in Annexes I, II and III waiting to be destroyed, including the quantities of those substances contained in products or equipment;
  - (c) the technology used for the destruction of the substances listed in Annexes I, II and III.
- (5) Each undertaking referred to in Article 26(3) shall report on the quantities of each substance listed in Annex I used as feedstock.
- (6) Each undertaking referred to in Article 26(4) shall report on:
- (a) the categories of the products or equipment containing substances listed in Annexes I, II and III;
  - (b) the number of units;
  - (c) any quantities of each substance listed in Annexes I, II and III contained in the products or equipment;

- (d) the amount of hydrofluorocarbons charged into the imported equipment, released for free circulation, for which the hydrofluorocarbons had previously been exported from the Union and which had been subject to quota limitations for placing on the Union market. In such case, the report shall also specify the exporting undertaking and the year of export as well as the undertaking having placed the hydrofluorocarbons on the Union market for the first time and the year of that placing on the market.
- (7) Each undertaking referred to in Article 26(5) shall report on the quantities of each substance received from importers and producers for destruction, feedstock uses, direct exports, metered dose inhalers for the delivery of pharmaceutical ingredients use in military equipment and use in the etching of semiconductor material or the cleaning of chemical vapour deposition chambers within the semiconductor manufacturing sector;

The manufacturer of metered dose inhalers for the delivery of pharmaceutical ingredients shall report on the type of hydrofluorocarbons and the quantities used.

- (8) Each undertaking referred to in Article 26(6) shall report on:
  - (a) the quantities of each substance listed in Annexes I, II and III that it has reclaimed;
  - (b) any stocks of each substance listed in Annexes I, II and III waiting to be reclaimed.

## ANNEX X

### *Correlation Table*

<b>Regulation (EU) No 517/2014</b>	<b>This Regulation</b>
Article 1	Article 1
Article 2(1)	Article 2(1), point (a)
Article 2(2)	Article 3(4)
Article 2(3)-(4)	-
Article 2(5)	Article 3(2)
Article 2(6)	Article 3(1)
Article 2(7)	Article 3(3)
Article 2(8)	Article 3(5)
Article 2(9)	Article 3(36)
Article 2(10)	Article 3(6)
Article 2(11)	Article 3(9)
Article 2(12)	Article 3(10)
Article 2(13)	Article 11(3) and Annex IV, point 1
Article 2(14)	Article 3(11)
Article 2(15)	Article 3(12)
Article 2(16)	Article 3(13)
Article 2(17)	Article 3(14)
Article 2(18)	Article 3(15)
Article 2(19)	Article 3(16)
Article 2(20)	Article 3(17)
Article 2(21)	Article 3(18)
Article 2(22)	Article 3(19)
Article 2(23)	Article 3(20)
Article 2(24)	Article 3(21)

Article 2(25)	Article 3(22)
Article 2(26)	Article 3(23)
Article 2(27)	Article 3(24)
Article 2(28)	-
Article 2(29)	Article 3(25)
Article 2(30)	Article 3(26)
Article 2(31)	Article 3(27)
Article 2(32)	Article 3(28)
Article 2(33)	Article 3(29)
Article 2(34)	Article 3(30)
Article 2(35)	Article 3(31)
Article 2(36)	Article 3(32)
Article 2(37)	Article 3(33)
Article 2(38)	Article 3(34)
Article 2(39)	-
Article 3(1)-(2)	Article 4(1)-(2)
Article 3(3)	Article 4(4)
Article 3(4)	Article 4(6)
Article 4	Article 5
Article 5	Article 6
Article 6	Article 7
Article 7(1)	Article 4(3)
Article 7(2)	Article 4(5)
Article 8(1)	Article 8(1)
Article 8(2)	Article 8(3)
Article 8(3)	Article 8(4)
Article 9	Article 9



Article 10(1)-(4)	Article 10(1)-(4)
Article 10(5)	-
Article 10(6)	Article 10(6)
Article 10(7)	Article 10(7)
Article 10(8)	-
Article 10(9)	-
Article 10(10)	Article 10(8)
Article 10(11)	Article 10(10)
Article 10(12)	Article 10(5)
Article 10(13)	Article 10(9)
Article 10(14)	Article 10(11)
Article 10(15)	Article 10(12)
Article 11(1)	Article 11(1), first subparagraph
Article 11(2)	Article 11(2)
Article 11(3)	Article 11(4)
Article 11(4)	Article 11(5)
Article 11(5)	Article 11(6)
Article 11(6)	-
Article 12(1)-(12)	Article 12(1)-(12)
Article 12(13)	Article 12(15)
Article 12(14)	Article 12(16)
Article 12(15)	Article 12(17)
Article 13(1) first subparagraph	Article 13(1)
Article 13(1) second subparagraph	-
Article 13(2)	Article 13(2)
Article 13(3)	-
Article 14(1)	Article 19(1)

Article 14(2) , first subparagraph	Article 19(2), first subparagraph
Article 14(2), second subparagraph	Article 19(3)
Article 14(2) , third subparagraph	Article 19(2), third subparagraph
Article 14(3)	Article 19(2), second subparagraph
Article 14(4)	Article 19(4)
Article 15(1), first subparagraph	-
Article 15(1), second subparagraph	Article 16(1), first subparagraph
Article 15(2)	Article 16(2)
Article 15(3)	Article 16(6)
Article 15(4)	Article 16(4)
Article 16(1)	-
Article 16(2)	Article 17(3)
Article 16(3)	Article 17(1)
Article 16(4)	Article 17(3)
Article 16(5)	Article 17(4)
Article 17(1), first subparagraph	Article 20(1)
Article 17(1), second subparagraph	Article 20(4)
Article 17(1), third subparagraph	-
Article 17(2)	Article 20(6)
Article 17(3)	-
Article 17(4)	Article 20(7)
Article 18(1)	Article 21(1), first subparagraph
Article 18(2), first subparagraph	Article 21(2)
Article 18(2), second subparagraph	-
Article 18(2), third subparagraph	Article 21(3)
Article 19(1), first subparagraph	Article 26(1), first subparagraph
Article 19(2)	Article 26(2)

Article 19(3)	Article 26(3)
Article 19(4)	Article 26(4)
Article 19(5)	Article 26(7)
Article 19(6)	Article 26(8)
Article 19(7)	Article 26(9), second subparagraph
Article 19(8)	Article 20(7), second subparagraph
Article 20	Article 27
Article 21(1)	Article 35, first subparagraph
Article 21(2)-(6)	-
Article 22	Article 32
Article 23	Article 33
Article 24	Article 34
Article 25	Article 31
Article 26	Article 36
Article 27	Article 38
Annex I	Annex I
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Annex III	Annex IV
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Annex V	Annex VII
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Annex VII	Annex IX