November 2026

Fluoropolymer Manufacturing Programme 2.0 for European Manufacturing Sites

General Legal Statement regarding Manufacturing Programme 2.0

This Programme is a voluntary, industry-led initiative. It does not create legally binding obligations and does not replace, modify or override any applicable laws, regulations, permits, authorisations or regulatory requirements. Each participating company remains solely responsible for determining how it will seek to implement the Programme and for its own compliance with applicable legal obligations.

All involved exchanges between participating companies for this Programme shall be conducted in a manner consistent with applicable competition law and shall not extend to the exchange of competitively sensitive operational or commercial information.

Only aggregated, anonymised, or high-level information may be shared - details such as pricing, costs, margins, production volumes, capacity, customers, market allocation, future business plans, or other strategic commercial information are not permitted.

Participants are not required to share confidential information, trade secrets or intellectual property, and nothing illegal or commercially inappropriate will be shared. Technology sharing decisions, including licensing, are entirely voluntary and independent for each participant**.**

Any external communication of data generated under this Programme should be considered in light of site-specific permits, legal obligations, confidentiality constraints and applicable regulatory engagement requirements.

Introduction

In September 2023, Members of Plastics Europe's Fluoropolymer Product Group (FPG) with manufacturing sites in the European Economic Area (EEA) and UK committed to a Manufacturing Programme [FPG Manufacturing Programme for European Manufacturing sites - September 2023 - Final].

This Manufacturing Programme 2.0 (MP 2.0) builds on the first Manufacturing Programme (MP 1.0), clarifying several items based on feedback received, and also expands the Programme with new elements, including:

1. Emission factors for the overall Fluoropolymer/Fluoroelastomer/Perfluoropolyether manufacturing process
2. An expanded Technology Exchange Platform for Emission Control Technologies
3. Technology Exchange Platform for Analytical Techniques
4. Reduction of solid waste
5. An expanded update of the Safe Handling Guide for downstream users of Fluoropolymers/Fluoroelastomers
6. Engagement with local authorities

As referenced in the EU Restriction Proposal Background Document (updated August 2025), the final RAC opinion adopted on 2 March 2026 and the draft SEAC opinion agreed on 10 March 2026 and published for consultation later that month, as well as proposed by the Industry, the development of a Fluoropolymer/Elastomer BREF (Best Available Technique Reference Document) under the EU Industrial Emissions Directive (IED) 2010/75/EU would provide an effective risk management solution. Recognising this will likely take years to implement, this Comprehensive Manufacturing Programme 2.0 can serve as a bridge to the IED Fluoropolymer/Fluoroelastomer BREF and it can also provide required input for the development of the IED Fluoropolymer/Elastomer BREF. All manufacturers of fluoropolymers with at least one site in the EEA/UK are eligible to join the initiative.

1. Emission factors from Fluoropolymer (including Fluoroelastomer) and PerFluoroPolyEther manufacturing

The manufacturing of Fluoropolymers (including Fluoroelastomers) and PerFluoroPolyEthers includes all steps from the production of the monomer to the finished polymer products.

The production of Fluoropolymer (including Fluoroelastomers) and PerFluoroPolyEthers requires the supply of fluorinated monomers. A typical manufacturing process is represented as a block diagram in Figure 1. These monomers can be produced locally by the member companies, and can also be purchased from the supplier or imported from manufacturing locations outside the EEA/UK.

PFAS and non-PFAS chemicals that are starting points for the manufacturing process of fluorinated monomers are in scope, since they can generate non-polymeric PFAS residues. R22, for example, is the building block for the production of TFE, which is the basis for a manufacture of a wide variety of Fluoropolymers and Fluoroelastomers. There are other monomers that can be used to produce Fluoropolymers (including Fluoroelastomers) and PerFluoroPolyEthers, with their own specific manufacturing process.

Non-polymeric PFAS substances, that are used on site to aid the manufacturing of Fluoropolymers (including Fluoroelastomers) and PerFluoroPolyEthers, like surfactants, solvents or initiators are also in scope.

Figure 2 provides a general schematic overview for a typical Fluoropolymers (including Fluoroelastomers) and PerFluoroPolyEthers manufacturing production steps.

In the reactor, polymerization takes place through the combination of monomers and other ingredients specific to the Fluoropolymer (including FluoroElastomers) and PerFluoroPolyEther being produced. This reaction can be described as the “polymerization process”. There are different types of polymerization processes and reaction media. The polymerization process can include the use of solvents, it can occur in an aqueous medium with the use of “polymerisation aids”, or it can also include technology that is called photopolymerization. In MP 1.0, polymerization in an aqueous medium with a use of polymerisation aids is referred to as “polymerisation aid technology”.

After the “polymerisation process”, additional steps are carried out that vary depending on the type of Fluoropolymer (including Fluoroelastomers) or PerFluoroPolyEther produced. These may include coagulation, washing, drying, extrusion and other steps. Collectively, the steps involved in converting monomers into a finishing Fluoropolymer (including Fluoroelastomers) or PerFluoroPolyEthers are called collectively in this Manufacturing Programme 2.0, “polymer manufacturing process”.

Emissions to air and water from this “polymer manufacturing process”, as defined above, can happen throughout the different steps of the process, and depend on a wide variety of variables. For the purposes of this MP 2.0, these emissions are considered in aggregate for calculating the emission factors to air and to water. The Emission factors are relevant to the total manufacturing site of each company.

The existing Emissions Factors from MP 1.0 for 2024 and 2030 remain valid.

In this MP 2.0, a new overall Emission Factor, with a target for 2030, is defined, which will also include emissions related to non-polymeric PFAS residues from polymerisation aid technology. The participating companies intend to pursue further reductions beyond 2030, subject to technical feasibility, proportionality, evolving scientific understanding, internal approvals and applicable legal and regulatory requirements.

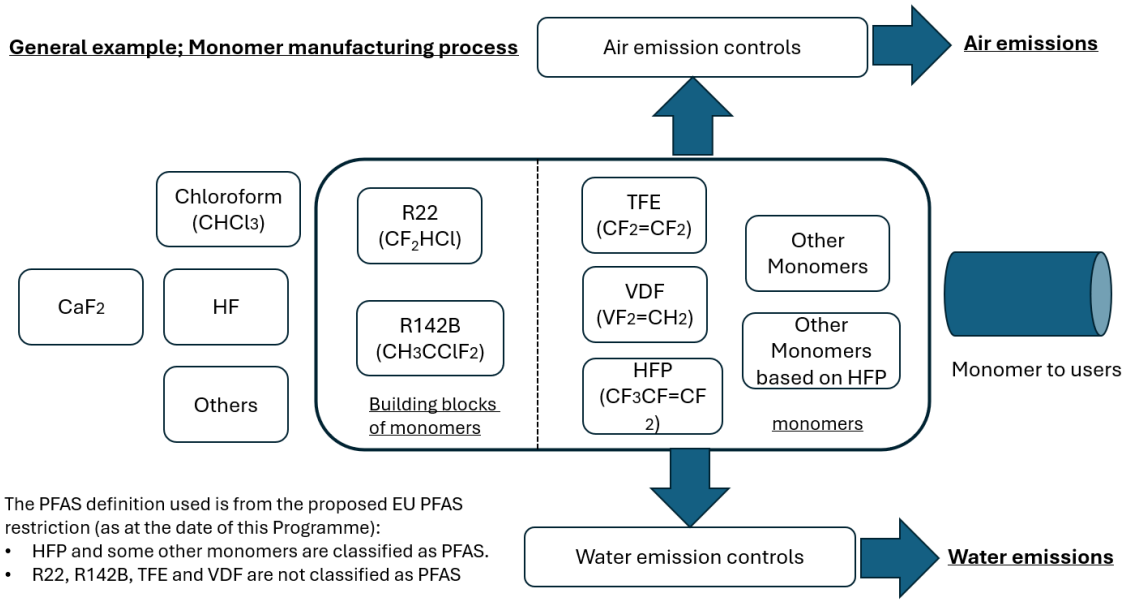


Figure 1: Example of a typical Fluoromonomer manufacturing process, there are other processes possible for other monomers

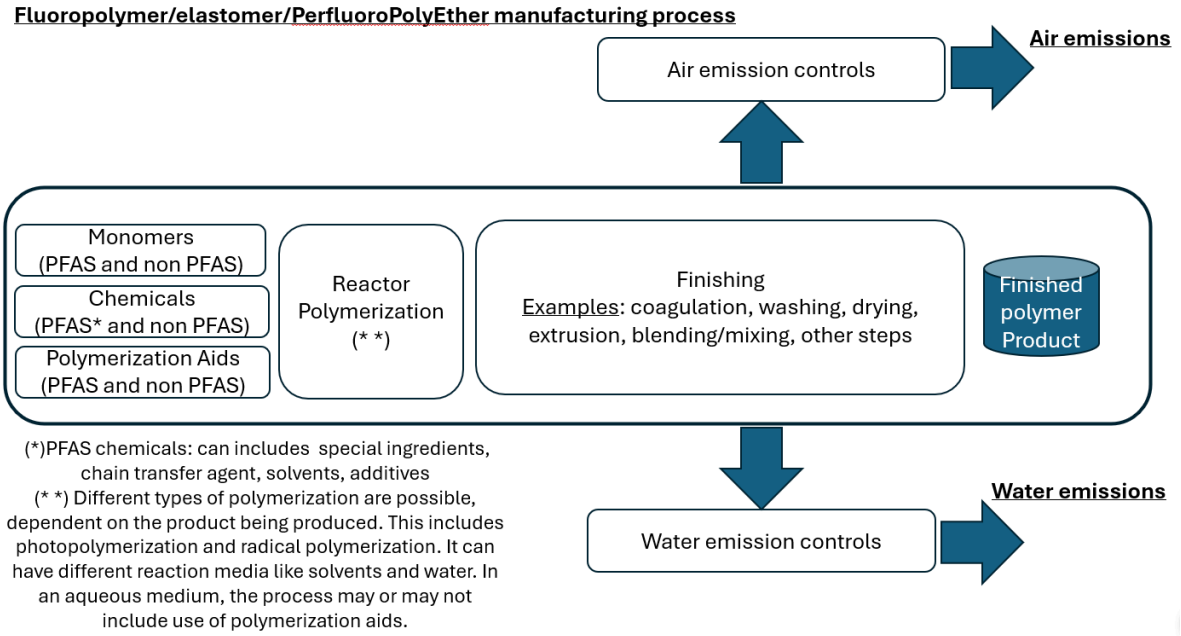


Figure 2: General overview of Fluoropolymer (including FluoroElastomer), PerFluoroPolyEther manufacturing process

As detailed below, Manufacturing Programme 1.0 described Emission factors related to polymerization aid technologies.

- *Emission factors of **non-polymeric PFAS residues from polymerisation aid technology** that is used in the fluoropolymer manufacturing process:*

  - *By end 2024: 0.009% to air; 0.001% to water*
  - *By end 2030: 0.003% to air; 0.0006% to water*

  Emission factors are calculated as follows (in percentage): Annual emission of non-polymeric PFAS residue from non-polymeric polymerization aid technology [added and/ or generated] divided by total annual amount of fluoropolymers produced on site[1].

  These Emission factors are independent of whether fluorinated, non-fluorinated or no polymerization aids[2] are being used in the production of fluoropolymers, at each of our sites.

These compounds can be detected by the use of a combination of targeted and non-targeted analysis.

Each company calculates its emissions based on the most accurate data they have available from their different analysis that is tailored to their manufacturing process. The results of identified PFAS substances and associated Emission factors may change when new analytical methods become available to the companies that can quantify the identified substances.

[1] Method of calculation of emission factors based on the Equation 1. Calculation of emission factors from Annex B of PFAS restriction proposal p. 227 (Submitted restrictions under consideration - ECHA (europa.eu))
[2] Polymerisation aid is as defined in ECHA's PFAS restriction proposal Annex A "Polymerisation aid is the term used to describe a surfactant or emulsifier, fluorinated or non-fluorinated"

The types of non-polymeric PFAS emissions from polymerisation aid technology can include the fluorinated polymerisation aid and its decomposition products, or non-polymeric PFAS substances from polymerisation aids technology.

All emission factors, data and calculations referred to in this Programme are based on the methodologies, assumptions, site configurations and analytical techniques available to each company at the relevant time. Because scientific understanding, analytical capability and regulatory expectations are evolving, such data may be revised from time to time and should not be interpreted as directly comparable between companies or sites.

In section 3 of this Manufacturing Programme 2.0 we cover the New Technology Exchange Platform for Analytical Techniques. In section 4, we describe efforts to reduce solid waste.

Emission factors of known non-polymeric PFAS residues from the overall manufacturing process

In this Manufacturing Programme 2.0 we also include an Emission Factor for all known non-polymer PFAS emissions from the overall Fluoropolymer (including Fluoroelastomers) and PerFluoroPolyEther manufacturing process. This includes known PFAS emissions from the monomer and polymer manufacturing process. We consider these emissions jointly in the calculation of the numerator of the Emission factors, since at some manufacturing sites, they are all combined in common treatment and emission points.

From the monomer process, the emissions can include the monomers themselves but also known unintended non-polymeric PFAS substances generated in the manufacturing of the monomers or its pre-cursors (PFAS and non-PFAS).

In the Fluoropolymer (including Fluoroelastomers) and PerFluoroPolyEther manufacturing process, besides the emissions related to polymerisation aid technology, there can also be other non-polymeric PFAS emissions. Examples for this are the C4-C21 type fluorinated substances and the C2, C3 short chains, residual unreacted monomers, generated oligomers, other non-polymeric PFAS raw materials that are used in polymerisation (e.g. solvents) or any known non polymeric PFAS substances from polymerisation aids technology.

The substances included in the scope of new overall emission factors for all non-polymeric PFAS, do not include emissions caused by legacy operations, background levels, different on-site remediation activities that are addressed separately.

The commitment of the Emission Factor target for the overall Monomer – Fluoropolymer, Fluoroelastomer, PerFluoroPolyEther manufacturing process is:

- By the end of 2030: 0.09% combined to air and water[3]

The Industry commits to further reduction beyond 2030.

Emission factors are calculated as follows (in percentage): Annual emission of known non-polymeric PFAS [added and generated] divided by total annual amount of precursors, monomers, Fluoropolymers (including Fluoroelastomers) and PerFluoroPolyEthers produced on site.

In case where non-polymeric PFAS substances are produced on site, that are used in the polymer manufacturing process (other non-polymeric PFAS raw materials e.g. solvents), these substances will also be part of the equations (their emissions will be included in the numerator and volume manufactured on site will be included in the denominator).

These compounds can be detected by the use of a combination of targeted and non-targeted analysis.

Appendix A1, has a list of all non-polymeric PFAS substances that are measured by at least one of the member companies at their EU/UK manufacturing site. The specific substances measured by each company are directly related to the company's unique manufacturing process for the specific products.

Each company will calculate its emissions based on the best data they have available from their different analysis.

There are several reasons why the actual Emission Factors may change from year to year. One example is the availability of new analytical methods to the companies, and identifying previous unidentified substances. Another example, is related to the utilization of the manufacturing units or the change in manufacturing operations. Emissions of non-polymeric PFAS are not linear to production volumes, this can result in a situation where the production volumes are reduced giving a lower net emission, but it can result in higher Emission factors.

Even where companies use their best efforts and apply the best available data, methodologies and operational practices, exceptional circumstances arising at any given time and beyond their reasonable control may affect actual emissions, resulting in emission factors that differ from those initially estimated or targeted.

The member companies will report their Emission Factors every year to an independent third party, and only combined results will be published by Plastics Europe Fluoropolymers Product Group.

[3] *AGC Chemicals Europe, Ltd. abstains from the 2030 Emission Factor targets because it will no longer have fluoropolymer manufacturing operations in the EEA/EU/the UK in 2030. AGC Chemicals Europe remains committed to the other objectives of the Manufacturing Programme, and to continued emissions reduction efforts.*

In section 3 of this Manufacturing Programme 2.0 programme we will cover the New Technology Exchange Platform for Analytical Techniques.

2. Technology Exchange Platform for Emission Control Technologies

In MP 1.0 we started the Technology Exchange Platform to enable FPG members to share and promote state-of-the-art, commercially available abatement technologies that reduce non-polymeric PFAS emissions, while safeguarding confidential business information and intellectual property. The MP 2.0 builds on this foundation and expands its scope to share outcomes more broadly with stakeholders.

3. Technology Exchange Platform for Analytical Techniques

To understand the emissions from the Fluoromonomer, Fluoropolymer (including Fluoroelastomers) and PerFluoroPolyEther manufacturing process, it is important to apply state of the art analytical techniques.

Currently, no standardized analytical methods exist for determining all non-polymeric PFAS in air and water. This gap extends across sampling approaches, extraction approaches, and the analytical methods used to detect the different types of PFAS.

For the non-targeted analysis, there is likewise no standard protocol for detecting and identifying the substances or for determining when targeted standards should be developed.

Building on the success of Technology Exchange Platform for Emission Control Technologies, the companies also agree to establish a Technology Exchange Platform for Analytical Techniques. This platform will support comparison of best practices, sharing of new analytical techniques and methods, and, where possible, drive standardisation.

4. Reduction of solid waste

Besides the emissions of non-polymeric PFAS to air and water, concerns have also been raised about PFAS solid waste generated during the manufacturing process and its fate.

State of the art technologies for non-polymeric PFAS emissions to air and water include advanced filtration technologies. These advanced filtration technologies minimise solid PFAS waste to air and water.

The preferred disposition for out of specification product grade materials, is recycling and sale into the market, whenever feasible. If not possible, the materials may be disposed of, in accordance with local regulations through the available local waste handling infrastructure.

The companies also commit that non-polymeric PFAS that have been collected at each site through means of different collection and absorption technologies, like Activated Carbon and Ion Exchange Resin, will be sent to approved contractors for efficient destruction or regeneration.

Under Manufacturing Programme 2.0 the companies agree to exchange best practices regarding the external destruction of PFAS solid waste.

5. Update the Safe Handling Guide with Fluoroelastomers and missing specialty Fluoropolymers

Manufacturing Programme 1.0 launched an updated Safety Handling Guide for PTFE, melt processible fluoropolymers, and included environmental controls. MP 2.0 will expand the safe handling guide with Fluoroelastomers (FKM, FFKM) and speciality polymers, like ionomers and FEVE. This guidance is intended to support good practice and does not replace site-specific legal, regulatory, permit or product stewardship requirements.

6. **Engagement with local authorities**

Manufacturing Programme 1.0 recognised the unique characteristics of each manufacturing site. To address site specific questions regarding non-polymeric PFAS emissions to air and water, the signatories of the document committed to individually cooperate with their National Competent Authorities regarding non-polymeric PFAS emissions to air and water.

While in this Manufacturing Programme 2.0, the signatories provide additional elements regarding the various emissions, ongoing cooperation with local authorities remains important, and the signatories commit to the ongoing dialogue to address specific questions and needs. The companies will work with their local authorities to update their site-specific management plans. Where appropriate, this will include the sharing of PFAS substances used and emitted, plans to minimise emissions, sharing the various emission factors, and how they can be incorporated in the site-specific management plan.

Implementation

This version of the Manufacturing Programme was approved by the members in November 2026. The members will continue implementing existing activities under Manufacturing Programme 1.0, and will start the new activities listed in this Manufacturing Programme 2.0 as of the date of approval.

To ensure compliance with competition law, each member of the programme shall remain independent in the way in which they implement the voluntary commitment and state-of-the-art technologies in their own manufacturing process. The information gathered from its members will be aggregated and anonymised in respect of competition law. Each participant shall remain solely and independently responsible for its own business decisions, regulatory strategy, investment choices and operational measures.

Participating Companies

- AGC Chemicals Europe, Ltd.
- Arkema
- Chemours Netherlands B.V.
- Daikin Chemical Europe
- Syensqo
- W. L. Gore & Associates

APPENDIX A – GUIDANCE DOCUMENT EMISSION FACTORS

A.1: PFAS Substances measured by EU/UK Manufacturers

The table below shows a list of non-polymeric PFAS substances that are measured by at least one member company at their EU/UK manufacturing site. The specific substances measured by each company are directly related to the company's unique manufacturing process for the specific products in EU/UK.

Each company includes in their emission factors the non-polymeric PFAS substances that are relevant for their process in EU/UK and the data they have available for these substances per the analytical method they use themselves or receive from the external test laboratories that are being used.

In case a non-polymeric PFAS substance is not used or generated in a specific company process in EU/UK, or previous investigation did not detect the substance, they may not be measured and will not be considered in emission factors.

From the list below, not all substances are measured by each company. For the substances listed, that are currently not measured by a member company, the company will make an assessment if they are relevant to their manufacturing process. If the substance is not relevant, the company has no obligation to measure that substance.

The list below is therefore non-exhaustive. It reflects substances measured by at least one participating company based on its site-specific process, operational context and analytical approach. Inclusion of a substance in this Appendix does not imply that it is present, used, generated, emitted or monitored in air and/or water at all sites, and does not create any obligation for any participant to monitor substances that are not relevant to its own manufacturing process or risk assessment.

CAS NR	IUPAC Name
111173-24-1	1,1,2,2-tetrafluoro-2-(1,2,2-trifluoroethenoxy)ethanesulfonic acid
113507-82-7	1,1,2,2-tetrafluoro-2-(1,1,2,2,2-pentafluoroethoxy)ethanesulfonic acid
115-25-3	1,1,2,2,3,3,4,4-octafluorocyclobutane
116-15-4	1,1,2,3,3,3-hexafluoroprop-1-ene
1187-93-5	1,1,2-trifluoro-2-(trifluoromethoxy)ethene
1190931-27-1	azanium 2,2-difluoro-2-[[2,2,4,5-tetrafluoro-5-(trifluoromethoxy)-1,3-dioxolan-4-yl]oxy]acetate
120226-60-0	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-henicosafluorododecane-1-sulfonic acid
13252-13-6	2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanoic acid
13252-14-7	2,3,3,3-tetrafluoro-2-[1,1,2,3,3,3-hexafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propoxy]propanoic acid
138495-42-8	1,1,1,2,2,3,4,5,5,5-decafluoropentane
1411713-91-1	bis(3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl) phosphate
144728-60-9	2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]propanoic acid
1493-13-6	trifluoromethanesulfonic acid
1514-85-8	2,2-difluoropropanedioic acid
151772-58-6	2,2-difluoro-2-[1,1,2,2-tetrafluoro-2-(trifluoromethoxy)ethoxy]acetic acid
1623-05-8	1,1,1,2,2,3,3-heptafluoro-3-(1,2,2-trifluoroethenoxy)propane
16517-11-6	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,17,17,18,18,18-pentatriacontafluorooctadecanoic acid
1691-99-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-(2-hydroxyethyl)octane-1-sulfonamide
1763-23-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonic acid
19430-93-4	3,3,4,4,5,5,6,6,6-nonafluorohex-1-ene
2058-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecanoic acid
2355-31-9	2-[1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl(methyl)amino]acetic acid
2356-62-9	1,1,1,2-tetrafluoro-2-(trifluoromethoxy)ethane
24448-09-7	2-(N-methylheptadecafluorooctanesulfonamido)ethanol
2706-90-3	2,2,3,3,4,4,5,5,5-nonafluoropentanoic acid
2706-91-4	1,1,2,2,3,3,4,4,5,5,5-undecafluoropentane-1-sulfonic acid
27619-97-2	3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctane-1-sulfonic acid
27854-31-5	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecanoic acid
2804-50-4	2-chloro-1,1,3,3,3-pentafluoroprop-1-ene
2837-89-0	2-chloro-1,1,1,2-tetrafluoroethane
29514-94-1	1,1,2,2-tetrafluoro-2-(1,2,2-trifluoroethenoxy)ethanesulfonyl fluoride
2991-50-6	2-[ethyl(1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctylsulfonyl)amino]acetic acid
30334-69-1	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonamide
306-83-2	2,2-dichloro-1,1,1-trifluoroethane
307-24-4	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanoic acid
307-55-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-tricosafluorododecanoic acid
31506-32-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-N-methyloctane-1-sulfonamide
329238-24-6	Perfluoro acetic acid, α-substituted with the copolymer of perfluoro-1,2-propylene glycol and perfluoro-1,1-ethylene glycol, terminated with chlorohexafluoropropyloxy groups

CAS NR	IUPAC Name
3330-15-2	1,1,1,2,2,3,3-heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)propane
335-67-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanoic acid
335-76-2	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecanoic acid
335-77-3	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-henicosafluorodecane-1-sulfonic acid
34455-29-3	2-[dimethyl-[3-(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctylsulfonylamino)propyl]azaniumyl]acetate
354-33-6	1,1,1,2,2-pentafluoroethane
354-88-1	1,1,2,2,2-pentafluoroethanesulfonic acid
355-37-3	1,1,1,2,2,3,3,4,4,5,5,6,6-tridecafluorohexane
355-46-4	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonic acid
355-49-7	1,1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-tetratriacontafluorohexadecane
356-02-5	4,4,5,5,6,6,6-Heptafluorohexanoic acid
359-49-9	2,3,3,3-tetrafluoropropanoic acid
360-53-2	1,3,3,3-tetrafluoro-1-methoxy-2-(trifluoromethyl)prop-1-ene
360-89-4	(E)-1,1,1,2,3,4,4,4-octafluorobut-2-ene
375-22-4	2,2,3,3,4,4,4-heptafluorobutanoic acid
375-50-8	1,1,2,2,3,3,4,4-octafluoro-1,4-diiodobutane
375-73-5	1,1,2,2,3,3,4,4,4-nonafluorobutane-1-sulfonic acid
375-85-9	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanoic acid
375-92-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,7-pentadecafluoroheptane-1-sulfonic acid
375-95-1	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononanoic acid
376-06-7	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,14-Heptacosafluorotetradecanoic acid
377-73-1	2,2,3,3-tetrafluoro-3-(trifluoromethoxy)propanoic acid
382-21-8	1,1,3,3,3-pentafluoro-2-(trifluoromethyl)prop-1-ene
382-26-3	2-[difluoro(methoxy)methyl]-1,1,1,3,3,3-hexafluoropropane
39108-34-4	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecane-1-sulfonic acid
406-58-6	1,1,1,3,3-pentafluorobutane
4151-50-2	N-ethyl-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide
41997-13-1	1,1,2,2,3,3,4,4,5,5,6,6,6-tridecafluorohexane-1-sulfonamide
420-46-2	1,1,1-trifluoroethane
422-55-9	1-chloro-1,1,2,2,3,3-hexafluoropropane
422-64-0	2,2,3,3,3-pentafluoropropanoic acid
423-31-4	1-chloro-1,1,2,2,3,3,4,4-octafluorobutane
423-41-6	1,1,2,2,3,3,3-heptafluoropropane-1-sulfonic acid
431-72-1	3,3,3-Trifluoro-2-oxopropanoic acid
431-89-0	1,1,1,2,3,3,3-heptafluoropropane
51798-33-5	Poly[oxy[trifluoro(trifluoromethyl)-1,2-ethanediyl]], α-(1-carboxy-1,2,2,2-tetrafluoroethyl)-ω-[tetrafluoro(trifluoromethyl)ethoxy]
5187-89-3	1,1,2,2,3,3,4-heptafluoro-4-(trifluoromethyl)cyclobutane
53826-12-3	3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctanoic acid
53826-13-4	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-henicosafluorododecanoic acid

CAS NR	IUPAC Name
57677-95-9	bis(3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl) hydrogen phosphate
62037-80-3	Ammonium 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)propanooate
646-83-3	1,2,2,3,3,4,5,5,6,6-decafluoro-4-(1,1,2,2,2-pentafluoroethyl)cyclohexane-1-sulfonic acid
647-42-7	3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctan-1-ol
67584-42-3	potassium 2,2,3,3,4,4,5,5,6,6-decafluoro-1-(1,1,2,2,2-pentafluoroethyl)cyclohexane-1-sulfonate
678-39-7	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecan-1-ol
678-41-1	bis(3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl) hydrogen phosphate
67905-19-5	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,14,14,15,15,16,16,16-hentriacontafluorohexadecanoic acid
68259-12-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-nonadecafluorononane-1-sulfonic acid
68298-12-4	1,1,2,2,3,3,4,4,4-nonafluoro-N-methylbutane-1-sulfonamide
690-27-7	1,1,3,3,3-pentafluoroprop-1-ene
692-50-2	1,1,1,4,4,4-hexafluorobut-2-yne
700874-87-9	1-[difluoro(trifluoromethoxy)methoxy]-1,2,2-trifluoroethene
70887-84-2	3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-hexadecafluorodec-2-enoic acid
70887-88-6	3,4,4,5,5,6,6,7,7,8,8,8-dodecafluorooct-2-enoic acid
72629-94-8	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,13-pentacosafluorotridecanoic acid
749786-16-1	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-tricosafluoroundecane-1-sulfonic acid
754-91-6	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluorooctane-1-sulfonamide
756-09-2	2,2,3,3-Tetrafluoropropionic Acid
756426-58-1	2-(6-chloro-1,1,2,2,3,3,4,4,5,5,6,6-dodecafluorohexoxy)-1,1,2,2-tetrafluoroethanesulfonic acid
757124-72-4	3,3,4,4,5,5,6,6,6-nonafluorohexane-1-sulfonic acid
75-73-0	Tetrafluoromethane / Carbon Tetrafluoride
76-05-1	Trifluoroacetic Acid
76-16-4	1,1,1,2,2,2-hexafluoroethane
76-19-7	1,1,1,2,2,3,3,3-octafluoropropane
763051-92-9	2-(8-chloro-1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8-hexadecafluorooctoxy)-1,1,2,2-tetrafluoroethanesulfonic acid
791563-89-8	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,13,13,13-heptacosafluorotridecane-1-sulfonic acid
79780-39-5	1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-pentacosafluorododecane-1-sulfonic acid
801209-99-4	1,1,2,2-tetrafluoro-2-(1,2,2,2-tetrafluoroethoxy)ethanesulfonic acid
811-97-2	1,1,1,2-tetrafluoroethane
812-70-4	4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-pentadecafluorodecanoic acid
863090-89-5	2,2,3,3,4,4-hexafluoro-4-(trifluoromethoxy)butanoic acid
908020-52-0	azanium 2,2-difluoro-2-[1,1,2,2-tetrafluoro-2-(1,1,2,2,2-pentafluoroethoxy)ethoxy]acetate
914637-49-3	4,4,5,5,6,6,7,7,8,8,8-undecafluorooctanoic acid
919005-14-4	2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]propanoic acid
919005-14-4 (958445-44-8)	2,2,3-trifluoro-3-[1,1,2,2,3,3-hexafluoro-3-(trifluoromethoxy)propoxy]propanoic acid
943913-15-3	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecyl 3,3,4,4,5,5,6,6,7,7,8,8,8-tridecafluorooctyl hydrogen phosphate

A.2: Calculation Emission factors

The calculation of the Emission Factors is consistent with the dossier submitter calculation method Annex B 9.2, equation 1: Registry of restriction intentions until outcome - ECHA). Basically, the sum of the emitted PFAS per year divided by the relevant production volume per year.

This is being detailed out below.

The examples and methodologies set out below are illustrative only and are intended to support a common understanding of calculation approaches. They do not prescribe a legally binding methodology for any participant and may be refined over time in light of improved analytical techniques, scientific development, process changes and regulatory requirements.

A.2.1: Emission factors Polymerization Aids

$$\frac{Emission\ of\ relevant\ non-polymeric\ PFAS\ substances\ (ton/y) * 100\%}{Fluoropolymers + \ Elastomers + PolyFluoroEthers\ produced\ (\ ton/y)}$$

The emission factors are calculated separately for water and air.

Numerator:
The relevant non-polymeric PFAS substances are the emissions of known non-polymeric PFAS substances to either water or air, directly related to the polymerisation aid technology. This can be the fluorinated polymerisation aid itself, or it can be non-polymeric PFAS substances generated by the specific polymerisation aid technology.

Examples of this are:

- Fluorinated polymerisation aids and any decomposition products, when fluorinated polymerisation aid is being used
- Newly generated PFAS when non-fluorinated polymerisation aid or no polymerisation aid is being used

Non-polymeric PFAS Substances that are generated and are present in background levels independent of the type of polymerisation aid technology being used, are not considered relevant substances for polymerisation aid technology emission. Examples of this are short chain PFAS, long chain PFAS, Vinylidene Fluoride (VDF) oligomers.

Denominator:
The production volume per year of relevant polymers, this for example can be the fluoropolymers (including fluoroelastomers). This is the same for air and water emission factors.

Calculation Examples (which may be applicable for water or air and are purely illustrative / fictitious cases)
Example A: Fluorinated polymerisation aid: fluorinated substance A for PTFE, fluorinated substance B for FKM

Emission substance A: 0.002 ton/yr (2 kg/yr)
Emission substance B: 0.003 ton/yr (3 kg/yr)

No additional PFAS substance formed from this polymerisation aid technology (there are short chains and VDF oligomers being formed, but those are not associated with the polymerisation aid technology)
Production volume PTFE: 5000 ton/year
Production volume FKM: 2000 ton/year

Emission factor:
(0.002+0.003) *100% / (5000+2000) = 0.00007%

Example B: Non-Fluorinated polymerisation aid: non fluorinated substance C for PTFE

Generated PFAS substance: H-capped acids: sum 0.001 ton/year (1 kg/yr)
Generated PFAS substance: TFE adducts to substance C: total 0.002 ton/yr (2 kg/yr)

Production volume PTFE: 5000 ton/year

Emission factor:
(0.001+0.002) *100% / (5000) = 0.00006%

When during non-targeted analysis new substances are detected, and they are converted to a method that can quantify them, these substances are added to the emission factors calculation. Any such additions should be made using the methodology and data reasonably considered by the relevant company to be the most appropriate for its process and site circumstances at the relevant time

A.2.2: Overall Emission factor from manufacturing process

$$\frac{Emission\ of\ non-polymeric\ PFAS\ substances\ (ton/y) * 100\%}{Fluorinated\ products\ produced\ that\ generated\ PFAS\ emissions\ (\ ton/y)}$$

The emission factor is calculated combined for water and air.

Numerator:
The non-polymeric PFAS substances are the non-polymeric PFAS substances from the manufacturing process that are emitted to either water or air.

This can include the fluorinated raw materials used to produce the PFAS substances, like the monomers, polymerisation aid, solvents, and also include any non-polymeric PFAS substance formed. This formation can also be part of production of a non-PFAS substance, like TFE.

The emissions points include monitored stacks that emit to the air and any water discharge point.

It does not include any residues left in the product or during maintenance operations and during other than normal operating conditions.

Examples of the non-polymeric PFAS substances are:

- Formation of fluorinated chemicals meeting PFAS definition during production of monomers like TFE and HFP.
- Newly generated PFAS during the polymerization process, such as C2, C3 ultrashort chains, C4-C7 short chains, C8-C21 long chains PFCAs and potentially others.

Denominator:
The production volume per year of relevant products that generate PFAS emissions.

This includes Fluoropolymers (including Fluoroelastomers), PerFluoroPolyEthers produced, but also the monomers and associated precursors even if they are not a PFAS substance themselves like TFE.

In case non-polymeric PFAS substances are produced on site, that are used in the polymer manufacturing process, the production volume of these substances will also be part of the denominator.

Calculation Examples (which may be applicable for water or air and are purely illustrative/fictitious cases):

Example C: Plant producing TFE and PTFE

Emissions to air:
Non-polymeric PFAS substances formed in TFE process through one or more vent stacks: 30 kg (0.03 ton/year)
Non-polymeric PFAS substances from PTFE process through one or more vent stacks: 5 kg (0.005 ton/year) (includes formed short chains, polymerization aid)

Emission to water:
Non-polymeric PFAS substances formed in TFE process: 0.1 kg (0.0001 ton/year)
Non polymeric PFAS substances from PTFE process: 2 kg (0.002 ton/year) (includes short chains, polymerization aid, long chains)

Production volumes:
TFE; 5500 ton/year
PTFE: 5000 ton/ year

Combined Emission factor (air and water):
(0.03+0.005 + 0.002 + 0.0001) *100% /(5500+5000) = 0.00035%

Example D: Plant producing only FKM and not manufacturing any monomers

Emissions to air:
Non-polymeric PFAS substances from FKM process through one or more vent stacks: 5 kg (0.005 ton/year) (includes formed short chains, polymerization aid, remaining monomers)

Emission to water:
Non polymeric PFAS substances from FKM process: 1 kg (0.001 ton/year) (includes short chains, polymerization aid, long chains, oligomers)

Production volumes:
FKM: 3000 ton/year

Combined Emission factor (air and water):
(0.005 + 0.001) *100% / (3000)= 0.0002%

As with the examples in section A.2.1, these examples are illustrative only and should not be treated as establishing a mandatory or exclusive method for any participant or site. Site-specific methodologies may differ where appropriate to reflect process design, emission pathways, available analytical techniques, permit requirements and regulatory expectations.

****