



CHEM-X

External Consultation DMP 0.9

From 2026-10-13 to 2026-10-28

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1. Foreword

The chemical industry worldwide has a future-defining opportunity. As the foundational backbone of modern manufacturing, the chemical industry has a unique role to play in leading the transition toward a sustainable, circular economy while pioneering a new era of industrial resilience. Achieving this vision requires a collective shift in how we manage industrial data. Data transparency must be embraced as a shared, collaborative foundation for market leadership and sustainable growth.

This imperative is the driving force behind Chem-X.

As a pioneering cornerstone of Germany's broader Manufacturing-X initiative—generously funded by the Federal Ministry for Economic Affairs and Energy (BMWE)—Chem-X represents a major, multi-million-euro collaborative effort. Brought to life by a visionary consortium of industrial leaders and technology innovators under the coordination of BASF, the project is building a secure, open-source data ecosystem that will help define the digital future of the chemical sector.

At the heart of Chem-X is the groundbreaking development of the Digital Material Passport (DMP). By establishing standardized data models tailored to the chemical industry, we are enabling the seamless and secure exchange of vital sustainability metrics—such as Product Carbon Footprints (PCFs) and recycled content—across the entire value chain. Crucially, our architecture provides a harmonized approach to material declaration. It structures chemical substance and material data from general specifications down to individual production batches, significantly simplifying cross-supply-chain compliance with evolving regulatory requirements such as EU REACH, CLP, and the Ecodesign for Sustainable Products Regulation (ESPR).

This digital backbone does not merely serve chemical producers; it empowers downstream industries such as automotive, textiles, and construction to manage their own environmental goals and meet compliance requirements with unprecedented precision.

This summary document outlines the strategic framework, technical milestones, and cross-industry guidelines established by our consortium. As an open-source initiative, our goal is to provide a public blueprint for a digitized, resilient, and climate-neutral raw materials sector. We invite our partners, global stakeholders, and the wider public to explore these foundations and join us in shaping a transparent, sustainable, and prosperous industrial future.

The Chem-X Project Team
On behalf of the Chem-X Consortium

Acknowledgment

This project is proudly supported by the German Federal Ministry for Economic Affairs and Energy (BMWE) as part of the Manufacturing-X initiative. We express our sincere gratitude to the BMWE for its visionary funding, guidance, and enduring commitment to driving digital transformation, economic resilience, and open data ecosystems across the German and European industrial landscape.

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3. Management Summary

Chem-X is a research project funded by the German Federal Ministry for Economic Affairs and Energy (BMWE) as part of the Manufacturing-X initiative. Coordinated by BASF and a consortium of leading industrial and technology partners, the project aims to establish a secure, open-source data ecosystem for the chemical industry to support the transition toward a sustainable, circular economy.

The central output of the project is the Digital Material Passport (DMP), a structured and machine-readable data object designed for the seamless exchange of material identity and component-level information across the value chain. Digital contracts ensure data sovereignty as well as verification mechanisms establish trust. The DMP simplifies compliance with evolving regulatory standards while providing downstream industries with the precision needed to meet their own environmental mandates.

The Chem-X Information Model utilizes a hierarchical structure where the DMP serves as the root object, containing a Nameplate for core identity and an array of Material Components. Each component can be associated with three primary content modules:

Material Declaration: Provides structured material and safety information based on chemical regulations

Sustainability: Currently focused as a Minimum Viable Product (MVP) on the Product Carbon Footprint (PCF) according to Together for Sustainability (TfS) guidelines. Other indicators may follow in due time.

Circularity: Implements core circularity metrics and Chain-of-Custody characterization

To ensure flexibility, the model employs specific granularity levels (model, batch and item) allowing data to be shared at the most appropriate level of detail depending on the product and business situation. Currently in the external consultation phase (DMP 0.9), the project is operating at Technical Readiness Level (TRL) 6, with the goal of providing here a public preview of a blueprint for a digitized, resilient, and climate-neutral raw materials sector in view of the end of the project's public funded period.

Eventually, the DMP will unlock its full economic value if it would become widely adopted. Let's join forces and shape our future together!



Dr. Nicole Borho (DAW; right) and Dr. Andreas Wollny (BASF; left) presenting the Chem-X project at the Hannover Fair 2026.

4. Introduction

Within the chemical industry, we want to help companies creating a Digital Material Passport (DMP). A Digital Material Passport (DMP) captures information on chemicals and materials which constitute a final product that is regulatory required to have a Digital Product Passport (DPP).

4.1. How to Read this Document

This document outlines the key information elements and architectural concepts of the Digital Material Passport for consultation purposes. It also provides information on how to participate in the consultation process.

4.1.1. Feedback and Consultation Process

Chem-X invites public feedback to ensure the inclusion of a wide range of perspectives. The broad consent collected will support future adaptations, maximizing value for all stakeholders.

Consultation period: From October 13 to October 28, 2026.

How to participate:

- Review this document and the provided material.
You can **download** the material here: <https://www.chem-x.de/publication/>
- Please use the provided Excel file as a template for your feedback.
You can **download** the template here: <https://www.chem-x.de/publication/>
- Once you have completed the Excel feedback template,
please **send your feedback file** to the e-mail address: consultation@chem-x.de

The feedback table is organised into three sheets to guide your input:

- Feedback – PDF:** For feedback on this document
- Feedback – JSON:** For feedback on the physical metadata model, the designed JSON Schema or the example JSON payload.

What you should also know:

- The consultation period will remain open until October 28, 2026. Late feedback will not be considered.
- In case we are not sure how to interpret your feedback, we will reach out to you via your provided e-mail sender address.
- We appreciate your feedback and your contribution to a pre-competitive, publicly funded project. To avoid misunderstandings, we would like to point out that your feedback is voluntary, and you cannot make any copyright claims from these contributions and/or register intellectual property.

Setting the right expectation:

The information provided in this document and the supplementary material offers a snapshot of ongoing development. Chem-X shows here the foundational data model. Individual data points may have allowed values from predesigned lists (enumerations), which are still under

development and merely few illustrating examples are shown here. Regarding the scope of the project, about 90% of the work has been completed. Moreover, we are carrying out ongoing fine-tuning and consistency checks to advance from version 0.9 to version 1.0 of the DMP by the end of the project. We will use your feedback and different perspectives to develop version 1.0 into a solution that can be used as widely as possible within the given timeframe of the Chem-X public funded project ending on November 30th, 2026. However, consortium members already explore pathways for broad industrial application of Chem-X's results in view of significant commercial value the transition would generate.

The DMP 1.0 is expected to reach technology readiness level 7 (TRL 7) by the end of the Chem-X project. This means that the enabling technology has been successfully demonstrated in an industrially relevant environment. Further development and practical testing are required to turn the solution into a robust and valuable business instrument that has been proven and acknowledged in an operational environment. This will bring it to its final maturity level of TRL 9. Over time, the successor organisation(s), which have been identified, will further develop this maturity.

4.1.2. Target Audience

This document provides a comprehensive, centralized blueprint of our organization's logical and physical data architecture. Because a data model serves as the bridge between business strategy and technical execution, this guide is intended for various stakeholder groups:

- **Technical Subject Matter Experts:** The technical expert looking for details on the DMP JSON schema design, data types, indexing strategy, and technical information to validate against the JSON schema and structure the payload.
- **Domain Subject Matter Expert:** The domain expert for circularity, sustainability and material declaration interested into details covered by the Digital Material Passport.
- **General Readership:** The curious reader who would like to get an overview and general information about the Digital Material Passport.

4.1.3. Reading Guide

To optimize your time, it is recommended to navigate this document based on your current role and immediate operational goals. Use the table below to map your objectives to the relevant sections of this guide:

Objective	Target Section	Description
General introduction	Chapter 1 to 6	Non-technical introduction to the Digital Material Passport, its application and design.
High-level business logic	Chapter 7 to 9	Focuses on model design, core business domains, and standardised definitions, without technical complexities.
Technical specification	Chapter 10 to 13	Definition of terms by domain, entities, attributes, and externalised taxonomies.

5. The Core Use Cases – Information Provision and Interoperable Data Exchange

Use Case 01

“DPP Information Provision”

System-supported provision of human-readable Information for humans, such as consumers.

- Comprehensive
- Concise information
- Unique identifiers for trace back
- Defined information pieces

Use Case 02

“Interoperable DMP Data Exchange”

System-supported provision of system-readable data for systems of companies.

- Self-descriptive and system agnostic
- Complete set of object data
- Unambiguous unique identifiers for all objects
- Defined data structure

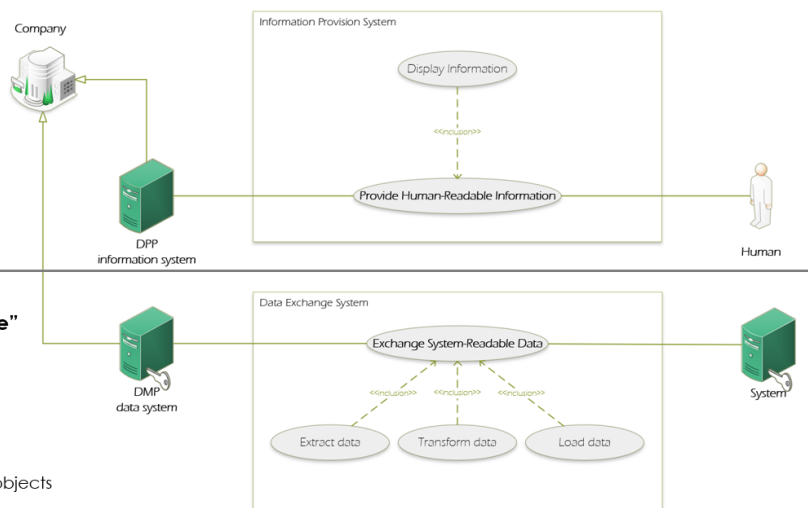


Figure 1. Core use cases “Information Provision” and “Interoperable Data Exchange” as Human–System and System–System interaction.

This chapter describes the core use cases depicted by digital information architecture:

01 INFORMATION PROVISION – the provision of information in a format that can be understood and used by people.

02 INTEROPERABLE DATA EXCHANGE – the structured exchange of data between different digital systems.

Together, these functions support the availability, accessibility, and reuse of company-related information across both human and system interfaces.

5.1. Use Case Information Provision

The **INFORMATION PROVISION** use case enables information maintained by a company to be made available to human users in a comprehensible format.

The diagram represents an **information system (DPP)** that acts as the technical interface between the company's information and the human user. Its primary purpose is to provide **human-readable information** and make this information available for presentation.

The information provision process can be described as follows:

- The **company** is the source or owner of the relevant information.
- The information is made available through the company's **information system (DPP)**.
- The information system processes or makes the relevant information available for presentation.
- The **“Display Information”** function enables the information to be presented to the user.
- The resulting information is provided as **human-readable information**.

- A **human user** can access, read, and interpret the information.

The focus of this process is therefore on **making information understandable and accessible to people**.

The objective of **INFORMATION PROVISION** is to ensure that relevant information can be communicated to human users in an appropriate and understandable form.

This function is particularly concerned with:

- accessibility of information
- human-readable presentation
- clear communication of relevant information
- enabling users to access and understand information provided by the company.

5.2. Use Case Interoperable Data Exchange

The **INTEROPERABLE DATA EXCHANGE** function addresses the exchange of data between different digital systems.

In contrast to Information Provision, which is primarily intended for human users, Interoperable Data Exchange provides **system-readable data** that can be processed by other systems.

The diagram represents a **data system (DMP)** that exchanges data with an external **system**. This enables information to be transferred between different technical environments in a structured and reusable manner.

The exchange process comprises three principal activities:

- **Extract Data:** Relevant data is **extracted** from the available data source. This step identifies and retrieves the data required for further processing or transfer.
- **Transform Data:** The extracted data is **transformed** as necessary to meet the structural or format requirements of the receiving system. Transformation may, for example, involve adapting the structure, representation, or format of the data so that it can be processed by the target system.
- **Load Data:** The transformed data is **loaded into the receiving system**. This makes the exchanged information available for further processing or use within the target environment.

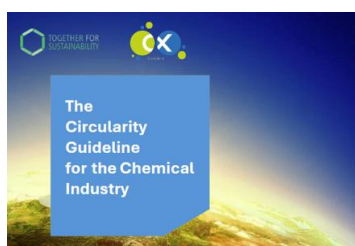
The objective of **INTEROPERABLE DATA EXCHANGE** is to enable **structured and system-readable information to be exchanged between different digital systems**.

The process supports:

- automated data transfer
- structured data processing
- compatibility between different systems
- reuse of information across system boundaries
- reduction of the need for manual data transfer

5.3. Real-World Applications & Daily Value

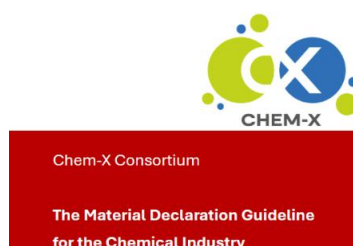
Chem-X is transforming the chemical industry with cutting-edge digital standards and solutions. Conceived by 16 chemical, digital and data-space organisations, the consortium is setting a new benchmark for methodology and process descriptions, providing transparency of data and increasing efficiency. By addressing gaps in current methodologies, reporting and data exchange, Chem-X aims to harmonise how sustainability, circularity and other chemical material data are precisely defined, assessed and digitally exchanged.



[Circularity Guideline v2.0 \(pdf\)](#)

Defines harmonized metrics for measuring circularity in chemical products. The guideline covers:

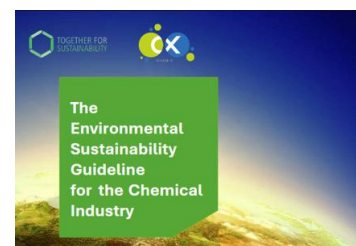
- Bio/ Renewable/ Recycled/ Reuse content metrics definitions and formulas
- Chain of custody definitions and indicators
- CO₂-based content (CCU)
- Waste disposal metrics
- Material accounting



[Material Declaration Guideline v1.0 \(pdf\)](#)

Provides clear information, showing how to structure chemical material and substance information:

- Substance declarations at different levels – from general product specifications to specific production batches and individual items
- Framework to share chemical information electronically throughout their supply chains while maintaining appropriate confidentiality
- Incorporate Safety Data Sheet information when needed as an additional set of information between supply chain partners



[Sustainability Guideline v2.0 \(pdf\)](#)

Provides a framework for assessing the environmental impacts of chemical products:

- Product carbon footprint (TfS PCF Guideline 3.0)
- Resource use fossil
- Resource use minerals & metals
- Acidification potential
- Water use (water scarcity)
- Ozone depletion potential
- Photochemical ozone creation potential
- Eutrophication (terrestrial, freshwater, marine)
- Particulate matter
- Ionising radiation
- Land use
- Ecotoxicity (freshwater)
- Human toxicity (cancer, non-cancer)

6. The Big Picture – Our Data Landscape

6.1. High-Level Data Flow

The Digital Material Passport is designed to support interoperable data exchange between companies, facilitating seamless communication and collaboration across different systems. Such data exchange can be facilitated by modern dataspace technology, which allows for the secure and efficient exchange of data between different systems. The following scheme illustrates how data transfer can be set up between two business partners using a dataspace service:

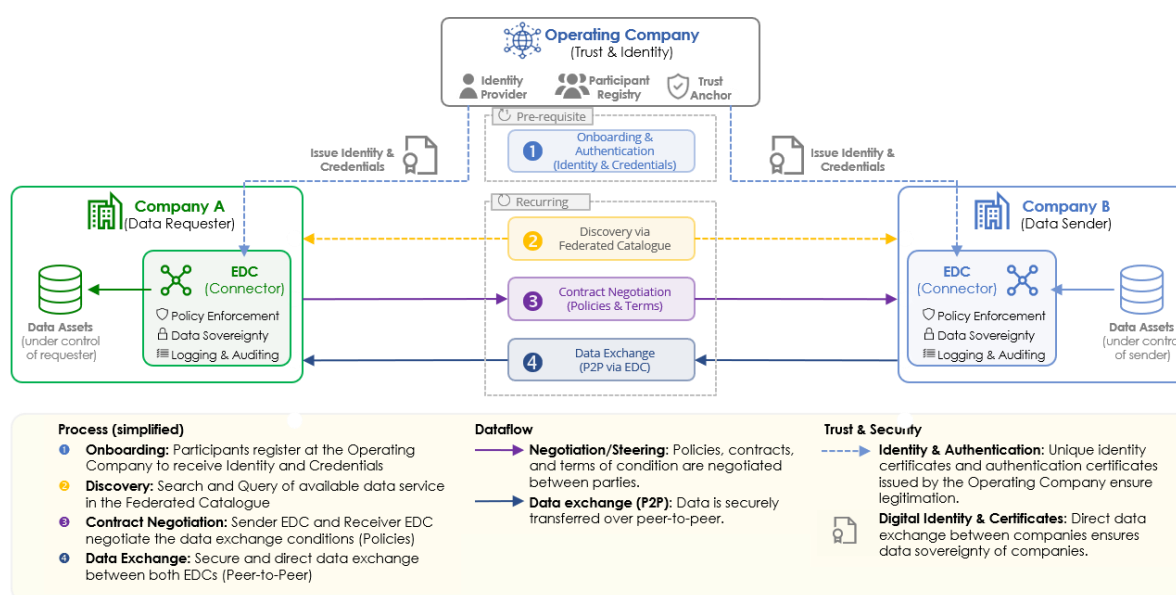


Figure 2. Schematic Illustration of the Digital Material Passport Dataflow and Components.

- 1 Onboarding & Authentication (Identity & Credentials):** Participants register at the Operating Company to receive Identity and Credentials. This is required once.
- 2 Discovery via Federated Catalogue:** Search and Query of available data service in the Federated Catalogue.
- 3 Contract Negotiation (Policies & Terms):** Sender EDC and Receiver EDC negotiate the data exchange conditions (Policies).
- 4 Data Exchange (Peer-to-Peer via Eclipse Dataspace Components connector):** Secure and direct data exchange between both EDCs (Peer-to-Peer).

7. How to use the Digital Material Passport

The *Digital Material Passport* (DMP) is a standardised digital record of material information (*DMP payload*) that can be shared and exchanged between parties. Such an exchange can optionally happen through a decentralised, secure data network governed by strict rules called a '*Dataspace*'. The digital record holds individual material data in a standardised format, compiled by a company according to the *DMP framework* policies to ensure consistency, as well as the company's own business rules to ensure confidentiality and maintain data sovereignty.

7.1. Guidance on Using the DMP Framework

The Digital Material Passport (DMP) Framework provides a common foundation for structuring, managing, and exchanging material-related information across the chemical value chain. Its purpose is to ensure that relevant information can be understood, validated, and reused consistently by different companies, systems, and applications throughout the material lifecycle.

At the core of the framework are standardized data models that define how information about substances, materials, articles, and production batches is represented. This common structure enables companies to provide data in a consistent and machine-readable form, while allowing the level of detail to evolve from general material specifications to product- or batch-specific information. Standardisation therefore reduces ambiguity and facilitates the reliable exchange of information between organizations and across supply-chain boundaries.

The framework also establishes policies governing how data is provided, maintained, and shared. These policies support clear responsibilities for data ownership, quality, and sovereignty, define expectations for the provenance and validity of information, and help ensure that data remains consistent as it moves between different participants and systems. Rather than requiring every organization to use the same internal systems, the DMP Framework provides common rules and structures that enable interoperability while preserving the autonomy of individual organizations.

Consistency is further supported through defined semantics, data requirements, and validation mechanisms. Information such as sustainability indicators, recycled content, material composition, and regulatory attributes can therefore be communicated using a common understanding and with appropriate context. This creates a trusted digital foundation for downstream applications, regulatory reporting, and sustainability assessments.

In this way, the DMP Framework turns material information into a structured, interoperable, and reusable digital asset—supporting transparency and enabling more efficient collaboration across the entire value chain.

7.2. Guidance on Applying the Dataspace Technology

Dataspace technology lets organizations share data directly with each other while each party keeps full control of its own data. Rather than moving data into a central repository, every participant (such as Company A as data requester and Company B as data sender) connects through its own Eclipse Dataspace Connector (EDC). The connector enforces usage policies,

protects data sovereignty, and logs and audits all activity, so data assets always stay under the control of their owner.

Applying the technology follows a clear sequence. As a one-time prerequisite, each company is onboarded and authenticated by the Operating Company of the data space, which issues identities and credentials. After that, a recurring cycle runs for each sharing need: participants discover available data through a federated catalogue, negotiate a contract that sets the policies and terms of use, and then exchange data peer-to-peer between their EDCs. Organizations applying this approach should set up their connector, define their data usage policies in advance, and publish their data offerings to the catalogue so partners can find them.

The Operating Company acts as the trusted neutral party, acting as the identity provider, the participant registry, and the trust anchor. Its role is to establish trust: it verifies who participants are and issues their credentials, but it does not hold or route the actual business data.

Participating companies take on either a data requester or data sender role, and a company can play both depending on the exchange. Using the model well means completing onboarding before any data sharing begins, relying on the federated catalogue rather than direct ad-hoc requests to find data, and treating every exchange as governed by an agreed contract. Because data moves directly between connectors, each participant stays accountable for its own data, policy enforcement, and audit trail, while the Operating Company maintains trust across the whole ecosystem.

7.3. Guidance on Populating the DMP Payload

The Digital Material Passport (DMP) relies on a structured, modular data model. To properly compose a DMP JSON payload, data creators must follow the specific logical structure outlined in the Chem-X DMP schema (v0.9).

The DMP serves as the root object (dmp.schema.json), establishing the administrative frame of the passport. When generating a DMP, the payload must be built by strictly mapping data into three core tiers:

- **DMP Root and Metadata:** Every payload must start with the core administrative fields, including a globally unique dmpld, the version (e.g., "0.9"), and the createdAt timestamp following the ISO 8601 standard.
- **Nameplate:** A single nameplate object must be defined at the root level. This object acts as the core identity of the material or product. It must specify the explicit granularity (model, batch, or item) and provide the corresponding material and company identifiers (e.g., materialId, companyName, productName, tradeProductIdentifier).
- **Material Components:** The core material data is stored within a mandatory array named components. A DMP must have at least one component (e.g., the "Unpacked" material) but can accommodate multiple components (e.g., "Packaging", "Packaged material") within the same passport. Each object inside the components array must specify its own unique id, type, and explicit granularity.

7.3.1. Modularity and Content Sub-Models

Within each Material Component, the data is not provided as a flat list but is strictly categorized into thematic content modules. Based on the material's nature and the available data, the component can embed one or more of the following sub-models:

- **Material Declaration (materialDeclaration):** This section must be populated following the conditional structure based on the compositionType. If the component is a pure substance, the substance object must be used. If it is a mixture, the mixture object must be populated, embedding the array of mixtureSubstances. Identifiers, classification (including H-codes and ATEs), and regulatory information are strictly categorized within these structures.
- **Sustainability (sustainability):** This module captures environmental impact data. The payload must define the sustainabilityGeneral properties (such as the declared unit and product mass) and encapsulate specific metrics within the impactCategories object (e.g., productCarbonFootprint).
- **Circularity (circularity):** This module manages circular material data. The payload must provide the general properties and can include distinct objects for recycledContent, biogenicContent, renewableContent, and co2basedContent. Whenever a circularity metric is claimed, it must be substantiated by providing the relevant chainOfCustody properties.

By adhering to this strict hierarchical and modular composition, the DMP payload guarantees interoperability and ensures that downstream systems can predictably parse and process the material data.

8. Metamodel Concept Architecture

8.1. High-Level Data Map

The Digital Material Passport (DMP) is a machine-readable digital record describing a specific material, batch or item, including its material declaration, chemical composition, and corresponding sustainability and circularity data.

8.1.1. DMP structural view

The following diagram illustrates all the modules and sub-modules present in DMP version 0.9, along with their relationships.

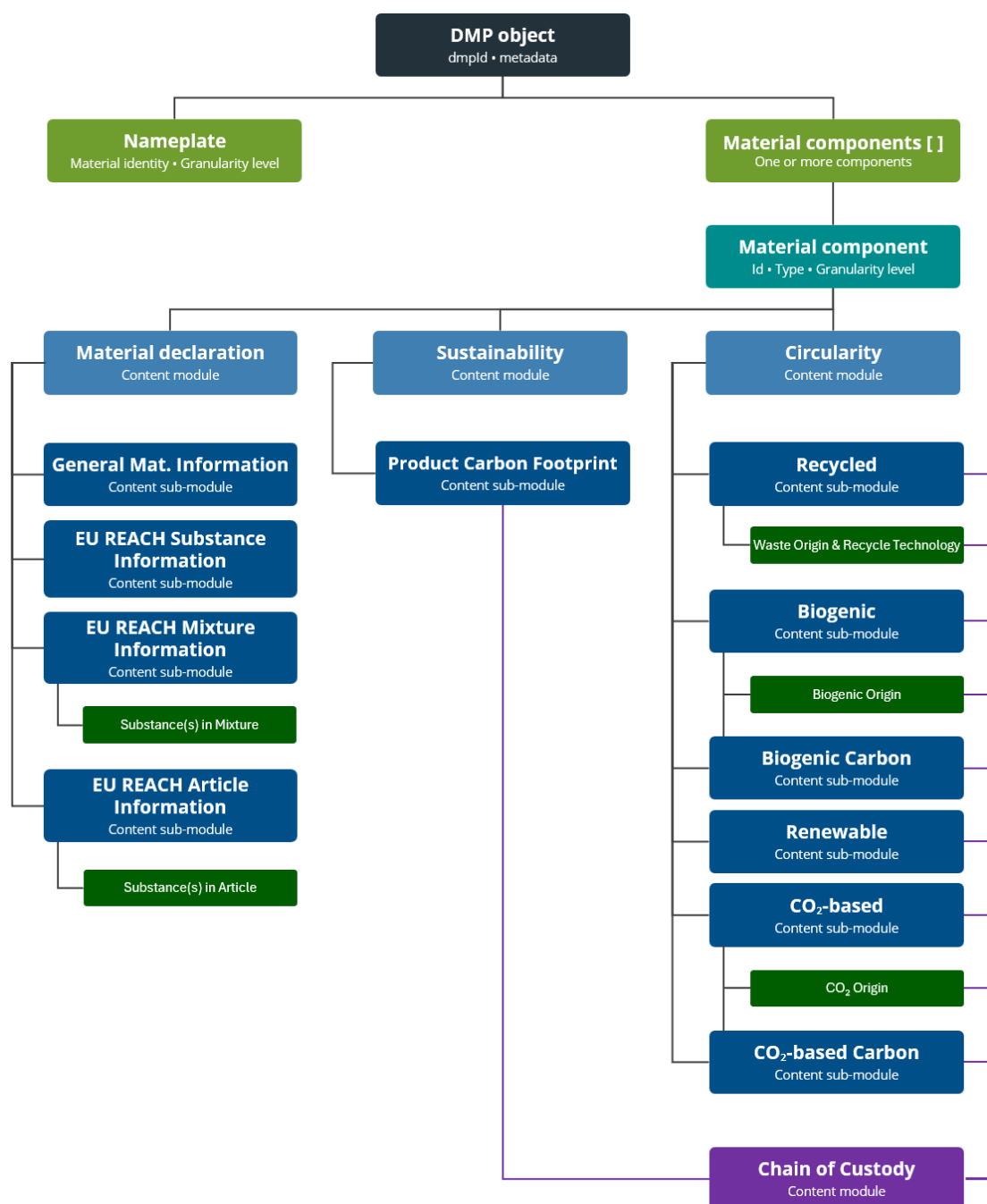


Figure 3. Schematic Structure of the Digital Material Passport.

- The DMP object is the root. Nameplate and Material Components are both direct children of the DMP object.
- The Material Components array contains one or more Material Component objects. Each component can represent a different material role and can use its own explicit granularity.
- The three content modules Material Declaration, Sustainability and Circularity belong to each Material Component. Their applicable granularity is defined through data policy and is therefore implicit in the module data.

8.1.2. Reading the diagram

- **DMP object:** Provides a list of administrative information about the digital record, including a unique DMP identifier and further metadata on the record.
- **Nameplate:** Provides a list of material identifiers and the granularity level assigned to the material or product included in the record.
- **Material Components:** Lists the material components of a material or product specified by the DMP, including the component identifier and type, and, optionally, the individual granularity level.
- **Material Component:** An individual component of a Material or Product specified by the DMP. Materials can comprise multiple components (the unpackaged material, packaging material, packaged material, etc.), each managed separately for comprehensive sustainability data, circularity data and material declaration.
- **Material Declaration:** A standardized, digital description of a chemical material's composition and relevant substance information. It forms a core building block for Digital Material Passports (DMP) and Digital Product Passports (DPP), enabling regulatory compliance, transparency, and interoperability while protecting confidential business information (CBI).
 - **General Material Information:** A good (mixture, substance or reach article) ready to be packed for further value chain steps. Other Material information for "packaging component" and "Packaged Component" could use the same attributes like "unpackaged component" (currently not required by regulation).
 - **EU REACH Substance:** Substance is defined in Regulation (EC) No. 1907/2006 REACH. Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.
 - **EU REACH Mixture:** Solid mixture or solution composed of two or more substances.

- **Substance(s) in Mixture:** cf. EU REACH **Substance** including substance main function and substance category information with their concentration and additional substance information.
- **EU REACH Article:** An object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition.
- **Substance(s) in Article:** cf. EU REACH **Substance** including substance main function and substance category information with their concentration and additional substance information.
- **Sustainability:** General sub-model for attributes which refer to all sustainability metrics (e.g., PCF and other Lifecycle Assessment (LCA) impact categories).
- **Product Carbon Footprint:** The Product Carbon Footprint is the most established method for determining the climate impact of a product, considering the total greenhouse gas (GHG) emissions caused to produce a product, expressed as carbon dioxide equivalent. The PCF can be assessed from cradle-to-gate (partial PCF) or from cradle-to-grave (total PCF). In Chem-X DMP, the chosen system boundary is cradle-to-gate.
- **Circularity:** General sub-model for attributes which refer to all circularity metrics (e.g., Recycled Content, Biogenic Content, etc.).
- **Recycled:** Sub-model for attributes which refer to the circularity metric Recycled Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **Biogenic:** Sub-model for attributes which refer to the circularity metric Biogenic Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **Biogenic Carbon:** Sub-model for attributes which refer to the circularity metric Biogenic Carbon Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **Renewable:** Sub-model for attributes which refer to the circularity metric Renewable Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **CO₂-based:** Sub-model for attributes which refer to the circularity metric CO₂-based Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **CO₂-based Carbon:** Sub-model for attributes which refer to the circularity metric CO₂-based Carbon Content. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.
- **Chain of Custody:** Sub-model for attributes which refer to the Chain of Custody model characterization. Refer to the latest version of the Chem-X Circularity Guideline (<https://www.chem-x.de/publication/>) for further details.

The following sections provide further details on the data model structure and the core data domains.

506 The DMP version 0.9 includes a subset of metrics – the so called “minimum viable passport”
507 (MVP) - related to material declaration, environmental sustainability and circularity, which have
508 been selected taking into consideration methodological maturity, data availability, forecasted
509 relevance in regulatory requirements, etc. As outlined in the following chapters, additional
510 metrics are supposed to be added to the DMP core at a later date as optional or mandatory DMP
511 sub-modules, reflecting the evolution of global market requirements and regulations.

512

9. Core Domains

9.1. DMP structure and main components

Business overview of the architecture implemented in Chem-X Data Model v0.9.

MODEL SCOPE. The Digital Material Passport (DMP) is the root object. Its two direct children are a single Nameplate and the Material Components array. The array contains one or more Material Component objects. The DMP also carries its own identifier and optional metadata.

9.1.1. Purpose and structural logic

The model is a structured, machine-readable contract for exchanging material identity and component-level information. The Nameplate and Material Components are peers under the DMP object: the Nameplate describes the identity represented by the passport, while each Material Component describes a constituent material entity and anchors the applicable content modules.

9.1.2. Main components and content modules

Component	Role in the DMP
Nameplate	Direct child of the DMP. Holds core material identity and its explicit granularity, with identifiers applicable at model, batch or item level.
Material Components	Direct child of the DMP. Repeatably array of constituent material entities. Examples include an unpackaged material, a packaging material or packaging component, a transport container, and the packaged material (comprising the unpackaged material and all packaging components).
Content modules	Each Material Component may contain Material Declaration, Sustainability, Circularity and Certificates of Analysis. Their granularity is governed by policy rather than repeated as a field in each module.

1 DMP / Nameplate

The Nameplate states the explicit granularity of the DMP identity and carries the corresponding identifiers.

2 Material Component

Every Material Component states its own explicit granularity. Components inside one DMP do not have to use the same level.

3 Content Module

Module granularity is implicit: data policy fixes the level for each metric category, so the exchanged module does not repeat it.

9.1.3. Granularity: explicit scope and policy-controlled module scope

Granularity defines the level at which a record is valid. The controlled values are **model**, **batch** and **item**. Model applies to information shared by all equivalent material instances; batch applies to a defined production lot; item applies to one individually identifiable material instance.

9.1.3.1. How granularity works in practice (fictitious illustrative examples)

- A batch-level DMP can contain an unpackaged material at batch level and a packaging component available only at model level. Component granularity therefore refines scope instead of merely copying the DMP level.
- For a batch-level unpackaged material, policy may make Material Declaration and Circularity batch-level while Sustainability, including PCF, remains model-level.
- A model-level packaging component can carry model-level Material Declaration data, even when another component in the same DMP is batch-level.

9.1.4. How the schemas work together

dmp.schema.json defines the root and references nameplate.schema.json and material-component.schema.json. Both use granularity.schema.json. Each Material Component may then reference material-declaration.schema.json, sustainability.schema.json, and circularity-content.schema.json. This keeps identity, component scope and content categories modular while preserving one coherent DMP.

9.2. Material Declaration sub-model

Business overview of the scope implemented in Chem-X Data Model v0.9

MVP SCOPE. The Material Declaration Sub-Model in Data Model v0.9 provides all necessary attributes derived from chemicals regulations and the additional Battery, ESPR, CPR, and Detergents Regulations. In addition, the DPP-specific data attributes derived from the ESPR — such as the SoC type information and material compositions — were integrated into the MVP in accordance with the current Safety Data Sheet (SDS) information adhering to the general CLP cut-off limits.

9.2.1. Purpose and position in the DMP

The material declaration sub-model within the Chem-X Digital Material Passport (DMP) provides structured, machine-readable material and safety information for materials and material components therein. Examples for material components are unpackaged material, packaging material or a packaged material. The Material Declaration forms one of the three main content information cluster of the Chem-X DMP, alongside Circularity and Sustainability, and supports transparent exchange of material information across chemical value chains while having important safety data sheet information integrated into the DMP.

9.2.2. Scope of Data Model v0.9

The Material Declaration sub-model of the Data Model v0.9 is based on chemical regulations (with focus on EU REACH and CLP) with REACH Article and mixture and substance information including selected Safety Information currently only exchanged via Safety Data Sheets (SDS). Additionally, mixture and substance main function information allow to cover product-specific regulations such as Detergent or Biocide Product Regulation. Document attachments such as Certificates of Analysis (CoA), Safety Data Sheets (SDS), and Declarations of Conformity (DoC) are supported.

9.2.3. What is not part of the MVP

During the project, available models for Safety Data Sheet developed in the frame of other projects (e.g., Catena-X) have been assessed. For the moment only selected SDS attributes which are exchanged and maintained anyhow in the chemical industry and expected to be relevant in regulations requiring DPPs have been included. A full modelling on SDS information has the potential to reduce the manual work of supply chain partners upon integrating such safety information in their own ERP/PDM systems and could be considered in future versions of Chem-X DMP but is not part of the Data Model v0.9.

9.2.4. How the documents work together

The JSON schema defines the technical structure, attributes, value lists (enumerations), multiplicities and relationships which are essential for interoperable data exchange. The documents will not provide business policies and most of the material declaration data points besides certain substance and mixture information are optional.

9.2.5. Data policies

Data policies complement the JSON schema by defining default attribute granularity and business rules defining conditional obligations.

To protect intellectual property, substance data (e.g., SoC types) and material composition data are provided on REACH compliance level for Safety Data Sheet only, so no full material or substance disclosure, adhering to the general CLP cut-off limits, below which no health or environmental hazard classification is triggered for the relevant hazard classes.

The current data policy draft set “model-level” granularity while specific batch and item attributes have been modelled to integrate e.g., a Certificate of Analysis into the DMP.

9.3. Sustainability sub-model

Business overview of the scope implemented in Chem-X Data Model v0.9.

MVP SCOPE. The Sustainability sub-model in Data Model v0.9 contains Product Carbon Footprint (PCF) only. Other environmental impact categories described in the “Environmental Sustainability Guideline for the Chemical Industry” of project Chem-X (e.g., Water Scarcity, Acidification Potential, etc.) are not part of the Minimum Viable Product (MVP). They will be included in a broader data-model scope to be published at a later date.

9.3.1. Purpose and position in the DMP

The Sustainability sub-model provides structured, machine-readable environmental sustainability information for a material component (e.g., an unpackaged material, a component of a packaging or a packaged material) within the Chem-X Digital Material Passport (DMP). It forms one of the three main content buckets of the Chem-X DMP, alongside Circularity and Material Declaration, and supports transparent exchange of lifecycle impact assessment (LCIA) information across chemical value chains.

9.3.2. Scope of Data Model v0.9

The MVP covers general sustainability information and the PCF in accordance with the latest version of the Environmental Sustainability Guideline of project Chem-X and of the PCF

Guideline of Together for Sustainability (TfS). The PCF attribute structure includes the information needed to exchange a cradle-to-gate Product Carbon Footprint, together with relevant methodological and data-quality information. The data attribute selection is based on the TfS PCF Data Model v3.1, except for an adaptation of the section related to Mass-Balance, demanded by the requirement of consistency with the Circularity sub-model and recent ISO standards.

9.3.3. What is not part of the MVP

The other 15 impact categories (e.g., water scarcity, acidification potential, etc.) addressed in the Environmental Sustainability Guideline of project Chem-X are outside Data Model v0.9. Furthermore, data attributes dedicated to PCF certification or verification are omitted in this MVP version.

9.3.4. How the documents work together

The JSON schema defines the technical structure, attributes, value lists (enumerations), multiplicities, and relationships used for interoperable data exchange. The Environmental Sustainability Guideline explains the calculation methods, terminology, system boundaries and methodological requirements.

9.3.5. Data policies

Data policies complement the JSON schema by defining default attribute granularity, and business rules defining conditional obligations. The current data policy draft sets “model-level” granularity for PCF and other Environmental Sustainability impacts. Selected PCF attributes are currently optional and are intended to become mandatory after the End of 2027.

9.4. Circularity sub-model

Business overview of the scope implemented in Chem-X Data Model v0.9.

MVP SCOPE. The Circularity sub-model in Data Model v0.9 implements a selected set of the metrics described in the “Circularity Guideline for the Chemical Industry” of project Chem-X. The current release focuses on core circular content metrics and their Chain-of-Custody characterization. A more extensive model, covering the additional Guideline metrics, will be published at a later date.

9.4.1. Purpose and position in the DMP

The Circularity sub-model provides structured, machine-readable information on share and origin of circular material content for a material component (e.g., an unpackaged material, a component of a packaging) within the Chem-X Digital Material Passport (DMP). It sits alongside Sustainability and Material Declaration in the Chem-X DMP and supports transparent exchange of information on alternative feedstocks and circularity claims across chemical value chains.

9.4.2. Scope of Data Model v0.9

The MVP covers biogenic content and biogenic carbon content, renewable content, recycled content, CO₂-based content and CO₂-based carbon content. These metrics describe different circularity contents and must be interpreted according to the definitions and calculation rules in the latest version of the Circularity Guideline of project Chem-X. The model also contains general Circularity information and the attributes necessary to characterize, wherever applicable, the Chain-of-Custody model adopted.

9.4.2.1. Chain of Custody and combined claims

The model can characterize identity preserved, segregated, controlled blending, mass balance using either the rolling-average or credit method, and book & claim approaches. Relevant information may include the existence of a physical link, proportional or non-proportional attribution to inputs and outputs, multi-site credit transfer, the certification system, and the conformity-assessment party. A circularity metric may be linked to more than one certified share, supporting also combined claims, whereby a total circular content value is substantiated through different Chain-of-Custody approaches and certificates.

9.4.3. What is not part of the MVP

Additional metrics (e.g., re-used content or renewable energy-derived content) described in the Circularity Guideline remain outside the Chem-X Data Model v0.9.

9.4.4. How the documents work together

The JSON schema defines the technical structure, attributes, value lists (enumerations), multiplicities, and relationships used for interoperable data exchange. The Circularity Guideline provides the terminology, calculation principles, and methodological context for the metrics and Chain-of-Custody models.

9.4.5. Data policies

Data policies complement the JSON schema by defining default attribute granularity, the selected MVP sub-models and business rules defining conditional obligations. The current data policy draft sets “model-level” granularity for Circularity. Conditional rules connect declared Chain-of-Custody choices (e.g. mass-balance) to required data attributes pertaining to PCF calculation.

10. Glossaries and Catalogues

10.1. Business Glossaries

The Business Glossaries define the terms used for the domains Circularity, Material Declaration and Sustainability and are listed by domain in separate sections.

10.1.1. Business Glossary – Circularity

Table 1. Business Glossary of the Domain Circularity.

Term	Definition	Source
Digital Material Passport	A structured digital record for a material that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates, and additional material information. It focuses on intermediate materials in the value chain which may not be subject to regulation, but whose data is required to enable the issue of regulated Digital Product Passports (DPPs). DPPs are designed to interoperate with one or more DPPs.	Chem-X Definition
Digital Product Passport	A structured digital record for a product that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates and additional product information. It focuses on a regulated end product in the value chain. Both its information content and technical requirements follow regulatory requirements and/or standards delegated by the legislator to designated standardization bodies.	Chem-X Definition <i>Note 1: based on DPP definition in ESPR.</i>
Backfilling	Any recovery operation where suitable non-hazardous waste is used for purposes of reclamation in excavated areas or for engineering purposes in landscaping. Waste used for backfilling must <i>substitute</i> non-waste materials, be suitable for the aforementioned purposes, and be limited to the amount strictly necessary to achieve those purposes.	EU Waste Framework Directive (2008/98/EC)
Bio-based	Derived from biomass. <i>See “Biogenic”, which will be used as a leading term.</i>	EN 16575:2014
Biogenic	Derived from biomass.	ISO 14067:2018

Term	Definition	Source
		<i>Note A: extracted from definition of biogenic carbon</i>
Biogenic carbon content	Fraction of carbon mass (out of total material mass) classified as biogenic. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Note 2: If analytically measurable via ^{14}C-analysis, it can be classified as “bio-based carbon content”. Note 3: If not analytically measurable via ^{14}C-analysis (e.g., by applying mass balance chain-of-custody model), it can be classified as “bio-attributed carbon content”. <i>“Biogenic carbon content” will be used as a leading term in this document.</i>	Derived from ISO 59020:2024 <i>Note 1: based on ISO 59020:2024 section A.2.1 “Introduction to resource inflow circularity indicators”, in analogy with “renewable content”</i>
Biogenic content	Fraction of material mass content classified as biogenic. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Note 2: This includes all molecules/atoms (carbon and non-carbon like nitrogen) derived from biomass and excluding added water.	Derived from ISO 59020:2024 <i>Note 1: based on ISO 59020:2024 section A.2.1 “Introduction to resource inflow circularity indicators”. in analogy with “renewable content”</i>
Biomass	Material of biological origin, excluding material embedded in geological formations, and material transformed into fossilized material. Note 1: Biomass includes organic material (both living and dead), e.g., trees, crops, grasses, tree litter, algae, animals, manure and waste of biological origin. Note 2: Excludes peat.	ISO 14067:2018

Term	Definition	Source
CO ₂ Capture and Utilization	Process involving the separation and extraction of CO₂ from a CO₂-containing medium and using this CO₂ in a production process for the manufacture of a carbonaceous product or other use of the CO₂. Note 1: CCU is limited to CO₂ which would have otherwise been emitted. The CO₂ cannot be produced exclusively for the capturing process.	Derived from DIN SPEC 91508:2025-04
CO ₂ -based content	Fraction of material mass originating from CO₂ capture and utilization Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules.	Chem-X definition
CO ₂ -based carbon content	Fraction of carbon mass (out of total material mass) originating from CO₂ capture and utilization. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules.	Chem-X definition
Certified share	Fraction of material mass which has been certified by an accepted conformity assessment party regarding the traceable sustainable sourcing of the raw materials and/or manufacturing of the product, and the related determination of the share.	Chem-X definition
Circular Inflow	A resource inflow that is defined as circular, meaning it belongs to one or more of the following categories: • reused content • recycled content • virgin renewable content • virgin renewable energy-based content. Note 1: CO₂-based content for captured CO₂ is classified as recycled content.	Derived from ISO 59020:2024
Direct Air Capture	Technological process extracting CO ₂ directly from the atmosphere, for CO ₂ storage or utilization.	International Energy Agency (IEA), iea.org

Term	Definition	Source
End-of-Life	The end-of-life stage begins when the used product under study is ready for disposal, recycling, reuse for different purposes, or energy recovery. Note 1: End-of-life processes may include: a) collection, packaging and transport of end-of-life products; b) preparation for recycling and reuse; c) dismantling of components from end-of-life products; d) shredding and sorting; e) material recycling; f) organic recovery (e.g., composting and anaerobic digestion); g) energy recovery or other recovery processes; h) incineration and sorting of bottom ash; i) landfilling, landfill maintenance and promoting emissions from decomposition, such as methane.	Derived from ISO 14067:2018
End-of-Waste	Waste which has undergone a recycling or other recovery operation is considered to have ceased to be waste if it complies with the following conditions: (a) the substance or object is to be used for specific purposes; (b) a market or demand exists for such a substance or object; (c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and (d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.	EU Waste Framework Directive (2008/98/EC) Article 6
Fossil carbon	Carbon that is contained in fossilized material. Note1: Examples of fossilized material are coal, oil, natural gas, and peat.	ISO 14067:2018
Pre-consumer waste	Material or product which the holder discards or intends or is required to discard before it has been put in use. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it. Pre-consumer waste = post-industrial waste	Derived from FprEN 18065 and ISO 14021

Term	Definition	Source
	Note 1: Unsold goods shall not be classified as pre-consumer waste.	
Primary material	See “ <i>Virgin material</i> ” (synonym), which will be used as a leading term.	
Post-consumer waste	Material generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.	Derived from FprEN 18065 and ISO 14021
Post-industrial waste	See “ <i>Pre-consumer waste</i> ” (synonym), “ <i>Post-industrial waste</i> ” will be used as a leading term in this document.	
Recovery	Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.	EU Waste Framework Directive (2008/98/EC) Note 1: Annex 2 in EU Waste Framework Directive (2008/98/EC) provides a non-exhaustive list of recovery operations, which includes for example recycling
Recovered material	Secondary resource that is obtained from one that has already been processed or used. Note 1: Other terminology used, depending on the context, includes “secondary material”.	Derived from ISO 59004:2024
Recycled content	Fraction of material mass content classified as recycled. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095.	Derived from ISO 59020:2024 Note 1: based on ISO 59020:2024 section A.2.1 “Introduction to resource inflow circularity indicators”.

Term	Definition	Source
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances, whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.	EU Waste Framework Directive (2008/98/EC)
recycling, closed-loop	A recycling process in which the output (e.g., recycle) is used as content in a product or application of the same broad product category that it originated from. (e.g., Recycled packaging being used to make new packaging. EOL car component being used to make another car part. Polymer fabric being made into another polymer fabric).	Derived from Circular Transition Indicators, WBCSD (CTI)
recycling, open-loop	All other cases, which do not fall under the closed-loop definition can be seen as open-loop recycling (e.g., Recycled PET bottle being made into car seat fabric. PU foam from waste mattresses made into carpet underlay).	Derived from Circular Transition Indicators, WBCSD (CTI) Note A: Not defined itself in CTI, complementary definition to closed-loop recycling.
Renewable energy	Energy from a renewable resource. Note 1: From energy sources that replenish (or renew) themselves naturally (e.g., solar energy, wind energy, biomass).	ISO 59004:2024
Renewable material	Material from a renewable resource. Note 1: Material that is composed of biomass (i.e., biogenic) and that can be continuously replenished or cleansed on a human timescale. Note 2: Material that is not composed of biomass but is also replenished within a human timescale by processes found in nature (e.g., oxygen from air).	Derived from ISO 59004:2024, ISO 14021:2016 and ISO 6707-3:2022
Renewable energy-derived material	A material derived in the Technosphere from renewable energy and material resources that can be replenished on a human timescale (e.g., hydrogen from water electrolysis using renewable energy).	Chem-X definition
Renewable material content	Fraction of material mass content classified as renewable.	Derived from ISO 59020:2024

Term	Definition	Source
	Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules.	<i>Note 1: Based on ISO 59020:2024 section A.2.1 “Introduction to resource inflow circularity indicators”.</i>
Renewable resource	Resource that can be naturally or artificially grown or replenished within a foreseeable time frame by processes found in nature. Note 1: It refers to both renewable materials and renewable energy. Note 2: Some renewable resources are inexhaustible (e.g., the sun) while others are capable of being exhausted but can be regrown or replenished indefinitely with proper stewardship in line with sustainable development.	ISO 59004:2024
Reuse	Use of a product or its component parts after their initial use, for the same purpose for which they were originally designed. Note 1: Minor treatment (e.g., cleaning, removal of connection, trimming, stripping of coatings) of the product can be needed by the user to prepare and allow for reuse without any other reprocessing. Note 2: In some cases, resources such as water are considered as a product, in which case the purpose of “original design” is not applicable. Note 3: Including the reutilization of rework, regrind or scrap materials generated within the process and capable of being fed back into the same process generating them or in other integrated productions where reuse is also certain, allowing waste to be reduced and materials to be kept in a loop.	Derived from ISO 59004:2024 and EN 15643:2021, and EUR-Lex 52007DC0059 ¹
Reused content	Fraction of material mass content classified as reused. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules.	Derived from ISO 59020:2024 <i>Note A: based on ISO 59020:2024 description of “resource inflow circularity indicators”</i>

Term	Definition	Source
Secondary material Secondary raw material Secondary resource material	Material that has previously been processed or used (e.g., end-of-life material arrived as waste), has been captured by a recovery system and has completed all recovery process steps, and can be used as an input to produce new materials and products Note 1: Other terminology used, depending on the context, includes “recovered material”. Note 2: Secondary material encompasses post- and pre-consumer recycled material, as well as reused material.	Derived from ISO 59014 and prEN 15897
System boundary	Boundary based on a set of criteria specifying which unit processes are part of the system under study.	ISO 14050:2020
Technosphere	Sphere or realm of human technological activity which results in a technologically modified environment.	ISO 59004:2024
Unit process	The smallest element considered in the life cycle inventory analysis for which input and output data are quantified.	ISO 14040:2006
Virgin material	Material that has not been subjected to use or processing other than that required for its manufacture and to which no reused or recycled material has been added.	Derived from ISO 21003-1:2008
Waste	Any substance or object which the holder discards or intends or is required to discard Note 1: A substance or object resulting from a production process the primary aim of which is not the production of that substance or object is considered not to be waste, but to be a by-product if the following conditions are met: (a) further use of the substance or object is certain; (b) the substance or object can be used directly without any further processing other than normal industrial practice; (c) the substance or object is produced as an integral part of a production process; and (d) further use is lawful (i.e., the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts).	EU Waste Framework Directive (2008/98/EC)
Attribution	Assignment of specified characteristics to <i>outputs</i> or part of the outputs.	ISO 22095-2:2026

Term	Definition	Source
Balancing period	Time frame when the <i>inputs</i> and <i>outputs</i> with specified characteristics are balanced in the temporal boundaries of the system.	ISO 22095-2:2026
Chain of custody	Process by which inputs and outputs and associated information are transferred, monitored and controlled as they move through each step in the relevant supply chain.	ISO 22095:2020
Claim	Declared information regarding the specified characteristics of a material or product. Note 1: Information can be any message or representation, including text, pictorial, graphic or symbolic representation in any form in the context of a commercial communication. Note 2: A claim can be made using various means or channels, for example on the product or physically attached to the product or physical or virtual information about the product.	ISO 22095-2:2026
Claim period	Time frame when <i>claims</i> can be made on products.	ISO 22095-2:2026
Conformity assessment	Demonstration that specified requirements are fulfilled. Note 1: Conformity assessment can be performed as • first-party activity, if performed by the person or organization that provides or that is the object of conformity assessment; • second-party activity, if performed by a person or organization that has a user interest in the object of conformity assessment, or • third-party activity, if performed by a person or organization that is independent of the provider of the object and has no user interest in the object of conformity assessment.	ISO 22095:2020
Credit	Representation of the quantity of attributable <i>units</i> with entitlement to claim the ownership of specified characteristics.	ISO 22095-2:2026
Conversion factor	Ratio, which is used to determine the quantity of output or part of the output with specified characteristics that can be obtained from the quantity of the input with specified characteristics, taking into account any losses.	ISO 22095-2:2026

Term	Definition	Source
Evaluation period	Time frame when the performance of the chain of custody system is monitored, measured, analysed and evaluated, by conducting audits to assess the performance of the chain of custody system procedures and the conformance with all applicable requirements.	ISO 22095-2:2026
Requirement setter	Person or organization that specifies the requirements for a particular chain of custody.	ISO 22095:2020
Similar in nature	Materials, products, or concepts that share, e.g., common characteristics, functionalities, qualities, compositions or attributes, making them alike in fundamental aspects.	ISO 22095-2:2026
Specified characteristics	Set of product characteristics and/or production characteristics that the chain of custody is designed to maintain.	ISO 22095:2020
System boundary of chain of custody (CoC)	Boundary based on a set of criteria specifying which processes or sites are part of the system under study.	ISO 22095-2:2026
Technically feasible	Following an existing and operable route to obtain the <i>output</i> or parts of the output from the <i>input(s)</i> with specified characteristics within the <i>system boundary of CoC</i> .	ISO 22095-2:2026

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679 **10.1.2. Business Glossary – Material Declaration**680 *Table 2. Business Glossary of the Domain Material Declaration.*

Term	Term Definition	Source
Bill of Materials	Bill of Materials (BoM) is a presentation of the constituents in a product structure with the possibility to adopt the level of decomposition to actual need.	ISO 29845:2011(en) Technical product documentation — Document types
Biocidal Active Substance (EU)	If a substance is an active biocidal substance according to Regulation (EU) No 528/2012, an indication on DPP substance level is mandatory.	Regulation (EU) No 528/2012
CAS Name	Standardized chemical name assigned to a substance by the Chemical Abstracts Service (CAS). Note to entry: The CAS name is systematically constructed to ensure every known chemical gets one name.	CAS REGISTRY
CAS Registry Number	Identifier for a chemical substance, assigned by the Chemical Abstract Service in the USA (CAS Registry Number - CAS RN®).	CAS REGISTRY
Certified share	Fraction of material mass which has been certified by an accepted conformity assessment party regarding the traceable sustainable	Chem-X Definition

	sourcing of the raw materials and/or manufacturing of the product, and the related determination of the share.	
Chemical Abstracts Service number	The Chemical Abstracts Service number (CAS number) is an identifier for a chemical substance, assigned by the Chemical Abstract Service in the USA (CAS Registry Number - CAS RN®).	CAS REGISTRY
Chemical products	A chemical product is a manufactured good whose principal functional or structural components are one or more chemical substances, mixtures, or REACH articles produced, transformed, or combined through chemical processes. Note to entry: Synonyms are chemicals, materials, (un)packaged goods	Chem-X Material Declaration Guideline
CLP Annex VI	European Chemical Agency Table of harmonised entries.	Table of harmonised entries in Annex VI to EU CLP - ECHA
Composition / Constituent Substance	In our Material Declaration Model, we defined three substance categories: 1. Main Constituent 2. Additive 3. Impurity	
Concentration	Is a proportion of a substance [e.g.: %, ppb, ppm, mass or volume percentage]	
Constituent	Any single species present in a substance can be characterised by its unique chemical identity. Note to entry: Constituents of substances are atoms and molecules.	See ECHA Q&A
Constituent Substance	Parts list entry for a substance in a combination of substances accord to the EU REACH.	
Cosmetic Products Regulation	Legal framework for cosmetic products on the EU market, establishing rules for product safety and free movement (Regulation (EC) No 1223/2009)	Regulation (EC) No 1223/2009
Create, Read, Update, Delete	Create, Read, Update, Delete (CRUD) action done on dedicated	
CRMA material-type substance	Critical Raw Material (CRM) and Strategic Raw Material (SRM) substance names in accordance with the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020 Annex I and Annex II. Code Structure:	Regulation (EU) 2024/1252

	AIS1: Annex I Section 1 - List of strategic raw materials (from (a) to (p)) AIS1: Annex II Section 1 - List of critical raw materials (from (a) to (hh)) Abbreviations: SRM: Strategic Raw Materials CRM: Critical Raw Materials	
CRM & SRM Substance type	Critical Raw Material (CRM) and Strategic Raw Material (SRM) substance names in accordance with the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020 Annex I and Annex II. Code Structure: AIS1: Annex I Section 1 - List of strategic raw materials (from (a) to (p)) AIS1: Annex II Section 1 - List of critical raw materials (from (a) to (hh)) Abbreviations: SRM: Strategic Raw Materials CRM: Critical Raw Materials	Regulation (EU) 2024/1252
Customer Relationship Management system	A Customer Relationship Management (CRM) system, is an ICT system to manage and structure the business relationship and interaction with the customers of an economic operator.	
Data Universal Numbering System	Data Universal Numbering System (DUNS) by Dun & Bradstreet to identify global business entity or organization	
Detergents Regulation	EU framework for detergents and cleaning products, designed to protect human health and the environment by harmonising rules on biodegradability, ingredient disclosure, and labelling to ensure free movement of these products within EU's internal market.	Regulation (EC) No 648/2004
Digital Material Passport	The Digital Material Passport (DMP) is a structured digital record for a material that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates, and additional material information. It focuses on intermediate materials in the value chain which may not be subject to regulation, but whose data are required to enable the issue of regulated Digital Product Passports (DPPs). DMPs are designed to interoperate with one or more DPPs.	Chem-X Definition

Digital Product Passport	The Digital Product Passport (DPP) is a structured digital record for a product that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates, and additional product information. It focuses on a regulated end product in the value chain. Both its information content and technical requirements follow regulatory requirements and/or standards delegated by the legislator to designated standardization bodies.	Chem-X Definition Note 1: based on DPP definition in ESPR
Eclipse Dataspace Connector	An EC-number can be obtained from the official publications of EINECS, ELINCS and NLP and of the European Chemicals Agency (list number)	
EC Number	An EC-number, i.e. the EINECS, ELINCS or NLP number, is the official number of a substance within the European Union.	Official Publications of EINECS, ELINCS and NLP and ECHA publications
Economic Actors	An economic actor is any organization or individual that performs a commercial, regulatory, or operational function within the lifecycle of a physical product.	
Electronic Data Interchange protocol	Electronic Data Interchange (EDI) protocol is a set of standards to enable automated machine to machine information exchange between legal entities, e.g. purchase orders, invoices, shipping notices, etc.	
Enterprise Resource Planning	Enterprise Resource Planning (ERP) is an Integrated Transaction Control System (ICT System) helping organizations streamline their core business processes such as order to cash (OTC) or purchase to pay (PTP)	
EU CLP Regulation	Regulation (EC) No 1272/2008 on the Classification, Labelling and Packaging of substances and mixtures.	Regulation (EC) No 1272/2008
EU REACH	EU REACH Regulation ("Registration, Evaluation, Authorization and Restriction of Chemicals") is the main EU law governing chemicals, requiring companies to register and identify and manage the risks of chemicals to protect human health and the environment. Note to entry: Different nations publish specific REACH regulations.	Regulation (EC) No 1907/2006
EU REACH Article	Name of an article or product or object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition.	

EU REACH Registration number	An EU REACH Registration Number is a unique, 18-digit identifier assigned by the European Chemicals Agency (ECHA) after a company successfully registers a chemical substance under the EU's REACH regulation (Registration, Evaluation, Authorisation, and Restriction of Chemicals).	[registration] EU REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals
European Biocidal Product Regulation	European Biocidal Products Regulation (EU BPR - Regulation EU No 528/2012) valid for biocidal active substances, biocidal products, and treated articles	Regulation (EU) No 528/2012
European Chemical Agency	European Chemicals Agency (ECHA) is an official agency of the European Union.	echa.europa.eu
European Construction Products Regulation	European Construction Products Regulation (EU CPR) lays down harmonised rules for the marketing of construction products in the EU. The regulation provides a common technical language to assess the performance of construction products. It ensures that reliable information is available to professionals, public authorities, and consumers, so they can compare the performance of products from different manufacturers in different countries.	Regulation (EU) 2024/3110
European Occupational Exposure Limit	European Occupational Exposure Limits (OEL) is an indicative or binding limit for the concentration of a chemical substance in the air of a workplace. OEL is a key component of workplace safety and risk management.	
European Persistent Organic Pollutant	European Persistent Organic Pollutant (EU POP) - organic substance that persist in the environment, accumulate in living organisms and pose a risk to our health and the environment.	Regulation (EU) 2019/1021
Food Contact Material	Food Contact Material (FCM) Regulation (EC) No 1935/2004 is the EU framework regulation establishing general safety and inertness requirements for all food contact materials	Regulation (EC) No 1935/2004
Full Material Declarations	A Full Material Declarations (FMD) is a composition declaration whereby all materials and substances are declared Note 1 to entry: Substances anonymously identified can be proprietary substances the responder retains as confidential business information (CBI). The mass of all substances including those that are identified as anonymous adds up to 100% of the mass of the product.	IEC 82474-1:2025
Full Substance Declarations	A Full Substance Declaration (FSD) is a composition declaration whereby all substances are declared.	IEC 82474-1:2025

Global Location Number	Global Location Number (GLN) is an identifier for a location or an entity in a business network issued by GS1	
Global Trade Item Number	Global Trade Item Number (GTIN) issued by GS1. It is a set of specifications and a standard family ISO/IEC 15495	
Hazard class	Hazard class defines the type of chemical risk, split into physical hazards (e.g., flammable liquids), health hazards (e.g., acute toxicity), and environmental hazards (e.g., hazardous to the aquatic environment)	Regulation - 1272/2008 - EN - clp regulation - EUR-Lex
Hazards and identifiers according to EU CLP Annex VI tab 3	If the substance(s) are listed in the table 3 EU CLP Annex VI, it has or have a set of classifications and identifiers in the EU.	ECHA CHEM Obligation list
Hazard Statement	A hazard statement (H-phrases) is a standardized phrase assigned to a chemical hazard class and category that describes the nature and degree of a physical, health, or environmental threat. These phrases form a core part of chemical safety labelling under the European Union's Regulation 1272/2008 on classification, labelling and packaging of substances and mixture (the CLP Regulation).	http://data.europa.eu/eli/reg/2008/1272/oj
Impurity	An unintended constituent present in a substance as manufactured. It may originate from the starting materials or be the result of secondary or incomplete reactions during the manufacturing process. While it is present in the final substance it was not intentionally added. NIAS (non-intentionally added substances) are impurities in accordance with (EU) No 10/2011 (18).	See "Constituent Substance"
International Nomenclature of Cosmetic Ingredients	INCI names are International Nomenclature Cosmetic Ingredients: Systematic names internationally recognized to identify cosmetic ingredients. Developed by the International Nomenclature Committee (INC) and published by the Personal Care Products Council (PCPC) in the International Cosmetic Ingredient Dictionary and Handbook, which is also available electronically as wINCI.	INCI - International Nomenclature of Cosmetic Ingredients
International Nomenclature of Cosmetic Ingredients name	International Nomenclature of Cosmetic Ingredients name (INCI name) is a systematic name internationally recognised to identify cosmetic ingredients.	
International Registration Data Identifier	The international registration data identifier (IRDI) is an internationally unique identifier for a data element used, e.g. in the IEC common data dictionary (CCD).	

IUPAC Name	IUPAC Nomenclature ensures that each compound (and its various isomers) has only one formally accepted name known as the systematic IUPAC name.	Nomenclature - IUPAC
Legal Entity Identifier	Is a Legal Entity Identifier issued by the Global Local Entity Identifier Foundation (GLEIF) under the direction of the G20 and the Financial Stability Board (FSB)	
Lower heating value	The lower heating value (LHV; net calorific value; NCV, or lower calorific value; LCV) is another measure of available thermal energy produced by a combustion of fuel, measured as a unit of energy per unit mass or volume of substance. In contrast to the HHV, the LHV considers energy losses such as the energy used to vaporize water. Lower heating value (LHV) is defined as the amount of heat released when a fuel is combusted, starting from 25°C and with the combustion products returned to 150°C, excluding the latent heat of vaporization of water.	Meherwan P. Boyce, 10 - Combustors, Editor(s): Meherwan P. Boyce, Gas Turbine Engineering Handbook (Fourth Edition), Butterworth-Heinemann, 2012, Pages 427-490, ISBN 9780123838421, https://doi.org/10.1016/B978-0-12-383842-1.00010-X .
Main Constituent	A constituent, not being an additive or impurity, in a substance that makes a significant part of that substance and is therefore used in substance naming and detailed substance identification.	See "Constituent Substance"
Mixture	Mixture or solution composed of two or more substances. Remark: MOCS (More than one constituent substance or Multi constituent substance) are excluded.	
Mixture substance	Parts list entry for a substance in a mixture. The proportions of all substances in a mixture should add up to 100%. Note to entry: If ranges will be declared to protect intellectual properties the sum could add up to less or more than 100%	
More than one constituent substance	More than one constituent substance (MOCS) is a substance, defined by its composition, in which more than one main constituent is present in a concentration $\geq 10\%$ (w/w) and $< 80\%$ (w/w).	
Nanoform	A nanoform is a form of a natural or manufactured substance containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1	ECHA Guidance on nanoforms

	nm-100 nm, including also by derogation fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm. Note to entry: Nanoform definitions could be different in accordance with national regulation.	
Packaged good	A product combined with its packaging, prepared in advance for sale and with a predetermined quantity that cannot be altered without opening or modifying the packaging. A packaged good is a combination of an unpackaged good and a packaging for safety, identification, logistic (transportability, storage), declaration (information) reasons.	
Packaging	Packaging (type) refers to processes and materials used to enclose or protect products for distribution, storage, sale and use. Including: Protection, preservation, information, marketing, convenience. We distinguish in the Chem-X Material model between product packaging and transport packaging.	
Primary material	See “Virgin material” (synonym), which will be used as leading term.	
Product Packaging	Is a packaging that is part of the product that is needed to bring the unpackaged goods to the customer. In direct contact with the product.	
Registration, Evaluation, Authorization and Restriction of Chemicals	Registration, Evaluation, Authorization and Restriction of Chemicals is abbreviated REACH.	ECHA
Safety Data Sheet	A Safety Data Sheet (SDS) in the European Union is a mandatory document providing comprehensive safety, hazard, and handling instructions for chemical substances and mixtures (to ensure safe handling, use, storage and disposal of chemical products).	
SCIP number	The SCIP number is a unique identifier assigned to a notification submitted to the SCIP database – the Substances of Concern In articles as such or in complex objects (Products) database – established under Article 9(1)(i) of the EU Waste Framework Directive (WFD). This database is managed by the European Chemicals Agency (ECHA) and is directly linked to Article 33 of the EU REACH Regulation, which mandates that suppliers of articles containing Substances of Very High Concern (SVHCs) above 0.1% w/w must communicate safe use information to downstream users and consumer	ECHA SCIP database

Substance	Substance is defined in Regulation (EC) No. 1907/2006 REACH. Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition. Note to entry 1: Mono-constituent substance: As a general rule, a substance, defined by its composition, in which one main constituent is present to at least 80% (w/w). Note to entry 2: More-than-one-constituent substance: As a general rule, a substance, defined by its composition, in which more than one main constituent is present in a concentration $\geq 10\%$ (w/w) and $< 80\%$ (w/w).	Point 1 of Article 3 of Regulation (EC) No 1907/2006
Substance Function Type	Type of Substance identifying the role and function of the substance in a mixture (e.g. EU BPR Product Type in accordance with Biocidal Products Regulation (EU BPR, Regulation (EU) No 528/2012) and/or detergent regulation (EC) No 648/2004)	EU BPR, Regulation (EU) No 528/2012 and/or detergent Regulation (EC) No 648/2004
Substance group	Two or more substances, which share at least one chemical sub-structure, or chemical or physical property under a generic name	
Substance Identifier	The product identifier for a substance shall consist of at least of one identifier (CAS name, CAS number, EC-Number, EU REACH registration number, INCI, IUPAC Name or a trivial name)	
Substance Main Function	Main function (role or effect) that a substance has in a mixture. There can only be one of these. The substance main function is listed in different regulations in so-called substance function types.	
Substance of Concern	Substance of concern (SoC) means a substance that: (a) meets the criteria laid down in Article 57 of Regulation (EC) No 1907/2006 and is identified in accordance with Article 59(1) of that Regulation; (b) is classified in Part 3 of Annex VI to Regulation (EC) No 1272/2008 in hazard classes or hazard categories.	
Substances of very high concern	Substances of very high concern (SVHC), published by ECHA in accordance with Article 59(10) of the EU REACH Regulation	Candidate List of substances of very high concern for Authorisation - ECHA

Toy Safety Directive	EU Toy Safety Directive 2009/48/EC sets mandatory safety requirements for toys sold in the European Economic Area (EEA) to protect children from hazards.	Directive 2009/48/EC
Transport Packaging	Is a packaging to assemble several unpackaged goods or packaged goods for transportation purposes. It is used several times in the life cycle stage.	
Trivial Name	1. Retained names are often used for the most fundamental parts of a nomenclature system: almost all the chemical elements have retained names rather than being named systematically, as do the first four alkanes, benzene and most simple heterocyclic compounds. Water and ammonia are other examples of retained names. Retained names may be either semi systematic or completely trivial; that is, they may contain certain elements of systematic nomenclature or none. 2. Non-systematic substance name which is not a formal name while describing the essential properties of the substance named.	
Unified Formula Identifier	Unified formula identifier (UFI) required for the notification of a hazardous mixture at a national poison centre.	ECHA
Uniform Resource Identifier	Uniform Resource Identifier (URI) a unique sequence of characters that identifies an abstract or physical resource such as a webpage, e-mail-address, etc.	
Uniform Resource Locator	Uniform Resource Locator (URL) as defined in RFC 1738	
Uniform Resource Name	The non-empty set of Uniform Resource Name (URN). Each value of this set is supposed to uniquely identify the resource owner.	
Universally Unique Identifier	Universally Unique Identifier (UUID) is 128-bit number identifier normally generated by random numbers	
Universal Product Code	Universal Product Code (UPC) issued by GS1. Part of the GTIN specification	
Unpackaged material	A material (substance, mixture, EU REACH Article) ready to be packaged for further value chain steps.	

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683 **10.1.3. Business Glossary – Sustainability**684 *Table 3. Business Glossary of the Domain Sustainability.*

Term	Definition	Source
Activity data	“Activity data are quantified measures of a level of activity that results in environmental impacts”¹. Activity data can be measured, modelled, or calculated. There are two categories of activity data: process activity data and financial activity data. Process activity data are physical measures of a process that results in environmental impacts. These data capture the physical inputs, outputs, and other metrics of the product’s life cycle (e.g. energy, mass, volume etc). Financial activity data are monetary measures of a process that results in environmental impacts. Alternatively, from ISO: quantitative measure of an activity that results in an environmental impact	TfS PCF Guideline v3.0
		ISO 14033
Allocation	Partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems.	TfS PCF Guideline v3.0
Annualization Period	Period over which the impacts associated with land-use change are allocated to subsequent production; a 20-year assessment period is commonly applied in product carbon-footprint and land-use accounting	(BSI, 2011; (GHG Protocol Product Standard, 2011)
Background data	Data that is indirectly measured, calculated or obtained quantified value of a unit process or activity and related information within a product system or company, not based on specific original source measurements	(ISO14064:1, 2018)
Bill of materials (BOM)	A structured list of all the components, and their quantities that make up an assembly or product.	TfS PCF Guideline v3.0
Biogenic carbon content	Fraction of carbon mass is classified as biogenic (out of total material mass).	Derived from ISO 59020:2024

Term	Definition	Source
	Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Note 2: If analytically measurable via ^{14}C-analysis, it can be classified as “bio-based carbon content”. Note 3: If not analytically measurable via ^{14}C-analysis (e.g., by applying mass balance chain-of-custody model), it can be classified as “bio-attributed carbon content”. “Biogenic carbon content” will be used as a leading term in this document.	Note 1: based on ISO 59020:2024 section A.2.1 “Introduction to resource inflow circularity indicators”, in analogy with “renewable content”
Biogenic emissions	CO_2 and CH_4 emissions from the combustion or biodegradation of biomass.	TfS PCF Guideline v3.0, adopted
Biogenic removals	The sequestration or absorption of GHG emissions from the atmosphere, which most typically occurs when CO_2 is absorbed by biogenic materials during photosynthesis.	TfS PCF Guideline v3.0
Biodiversity	The variability among living organisms, encompassing diversity within species, between species, and of ecosystems	(Convention on Biological Diversity, 1992; IPBES, 2019)
Biomass	Material of biological origin, excluding material embedded in geological formations and material transformed to fossilized material. Note 1: Biomass includes organic material (both living and dead), e.g. trees, crops, grass, tree litter, algae, animals, manure and waste of biological origin. Note 2: Excludes peat.	ISO 14067:2018
Burden Shifting	PEF assesses environmental impacts across a comprehensive set of 16 categories, each capturing a different dimension of environmental harm. These categories ensure that improvements in one	(European Commission (EC))

Term	Definition	Source
	area do not come at the expense of degradation in another, a phenomenon known as burden shifting.	
Chemical Abstracts Service Registry Number	A CAS Registry Number (CAS RN®) is a unique and unambiguous identifier for a specific substance that allows clear communication and, with the help of CAS scientists, links together all available data and research about that substance. Governmental agencies rely on CAS Registry Numbers for substance identification in regulatory applications because they are unique, easily validated, and internationally recognized.	TfS PCF Guideline v3.0 https://www.cas.org/cas-data/cas-registry
Carbon Capture and Storage	CCS involves the capture of carbon dioxide (CO ₂) emissions from industrial processes, such as steel and cement production, or from the burning of fossil fuels in power generation. This carbon is then transported from where it was produced, via ship or in a pipeline, and stored deep underground in geological formations.	TfS PCF Guideline v3.0
Carbon Capture and Utilization	Carbon capture and utilization (CCU) involves the capture of the greenhouse gas CO ₂ from point sources or ambient air and its subsequent conversion into valuable products.	TfS PCF Guideline v3.0
Carbon footprint of a product	See Product Carbon Footprint (PCF).	TfS PCF Guideline v3.0
Chlorofluorocarbon	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Collective dose	This is the sum of the individual doses received in a given period by a specified population from exposure to a specified source of radiation	(NRC, 2026)
Corporate Sustainability Reporting Directive	EU directive requiring companies within its scope to disclose material sustainability impacts, risks, and opportunities in	(European Parliament and Council, 2022)

Term	Definition	Source
	accordance with European Sustainability Reporting Standards	
Methane	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Contract manufactured products	Contract manufacturing occurs when a company outsources part of the manufacturing process to a third-party company to reduce the expenses of production.	TfS PCF Guideline v3.0
Characterization Factor	Factor derived from a characterization model which is applied to convert an assigned life cycle inventory analysis result to the common unit of the category indicator NOTE The common unit allows calculation of the category indicator result.	ISO 14044
Cradle-to-gate	An assessment that includes part of the product's life cycle, including material acquisition through the production of the studied product and excluding the use or end-of-life stages.	TfS PCF Guideline v3.0
Cradle-to-grave	A cradle to grave assessment considers impacts at each stage of a product's life cycle, from the time natural resources are extracted from the ground and processed through each subsequent stage of manufacturing, transportation, product use, recycling, and ultimately, disposal.	TfS PCF Guideline v3.0
Conformity assessment	Demonstration that specified requirements relating to a product, process, system, person or organization are fulfilled. Note 1 to entry: Adapted from ISO/IEC 17000: 2004, definition 2.1. ISO/TS 14441:2013(en), 3.13	TfS PCF Guideline v3.0
Consumption mix	This approach focuses on the domestic production and the imports taking place. These mixes can be dynamic for certain	TfS PCF Guideline v3.0

Term	Definition	Source
	commodities (e.g., electricity) in the specific country/region.	
Carbon Dioxide Equivalent	Carbon dioxide equivalent, or CO ₂ e is a metric measure representing all greenhouse gases by converting them to the equivalent amount of CO ₂ .	TfS PCF Guideline v3.0
Endpoint characterization models	Estimate the ultimate effects (or “endpoints”) of environmental impacts on areas of protection, such as human health, ecosystem quality, and resource availability. These models extend the analysis further along the cause-effect chain, translating inventory data through midpoint categories into final damage categories. In this sense Human health (DALYs), ecosystem damage (species loss), resource depletion are endpoint categories.	TfS PCF Guideline v3.0
Radiocarbon dating	A form of radiometric dating used to determine the age of organic remains in ancient objects, such as archaeological specimens, on the basis of the half-life of carbon-14 and a comparison between the ratio of carbon-12 to carbon-14 in a sample of the remains to the known ratio in living organisms.	TfS PCF Guideline v3.0
Declared Unit	Quantity of a product for use as a reference unit in the quantification of a partial LCA Note: Typically, the declared unit is referring to a physical quantity, for chemicals for example “1 kg of product (unpacked)”	ISO 14067:2019
Digital Material Passport	A structured digital record for a material that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates, and additional material information. It focuses on intermediate materials in the value chain which may not be subject to regulation, but whose data are required to enable the issue of regulated Digital Product	Chem-X Definition

Term	Definition	Source
	Passports (DPPs). DMPs are designed to interoperate with one or more DPPs.	
Digital Product Passport	A structured digital record for a product that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates and additional product information. It focuses on a regulated end product in the value chain. Both its information content and technical requirements follow regulatory requirements and/or standards delegated by the legislator to designated standardization bodies.	Chem-X Definition <i>Note 1: based on DPP definition in ESPR.</i>
Direct Land-Use Change	change in the human use of land within the relevant boundary	ISO 14050
Disease incidence	Disease incidence is the occurrence of cases of a disease or health condition in a defined population over a specified period of time. It is commonly expressed as a rate or proportion and reflects the risk of developing the disease.	New York State Department of Health, 2017
Dun and Bradstreet Number	The Dun & Bradstreet D-U-N-S Number is a unique nine-digit identifier for businesses.	TfS PCF Guideline v3.0
Ecological Scarcity Method	A distance-to-target LCIA method that weights environmental pressures according to the relationship between current conditions and legally or politically defined environmental targets; its land-use indicator is linked to biodiversity and policy objectives	(Frischknecht et al., 2021)
Ecosystem	dynamic complex of communities of plants, animals and microorganisms and their non-living environment, interacting as a functional entity	ISO 14050
Ecosystem Services	benefit people obtain from <u>ecosystems</u>. Note 1 to entry: Benefits include provisioning services such as food and water; regulating services such as flood and disease control;	ISO 14055-1:2017, 3.1.2

Term	Definition	Source
	cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth.	
Environmentally extended input and output	Environmentally extended input–output analysis (EEIOA) is used in environmental accounting as a tool which reflects production and consumption structures within one or several economies.	TfS PCF Guideline v3.0
Environmental Footprint	It is a multi-criteria measure to calculate the environmental performance of a product, service or organization based on a life cycle approach. EF 3.1 is the currently official used approach for Environmental Footprint in the EU.	TfS PCF Guideline v3.0 adopted
Effective dose	The effective dose is the total amount of equivalent doses to the total health of the whole body under consideration of the different sensitivities of the single organs and tissues for stochastic radiation effects.	(BfS, 2026), adapted
Elementary flow	Material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation	ISO 14044 Amd 2: 2020
Energy flow	Input to or output from a unit process or product system, quantified in energy units	ISO 14044 Amd 2: 2020
End of Life	End-of-life describes the end of the life cycle of a product. Here one can distinguish between different treatment methods: Recycling, landfill and incineration	TfS PCF Guideline v3.0
Enterprise resource planning system	Enterprise resource planning is a system that helps automate and manage business processes across finance, manufacturing, retail, supply chain, human resources, and operations.	TfS PCF Guideline v3.0

Term	Definition	Source
Ecodesign for Sustainable Products Regulation	EU regulation establishing a framework for product-specific ecodesign circularity, resource efficiency, and overall environmental sustainability, circularity, resource efficiency, and overall environmental sustainability	(European Parliament and Council, 2024)
European Union	The European Union is a supranational political and economic union of 27 member states that are located primarily in Europe.	TfS PCF Guideline v3.0
Exposure factor	The exposure factor describes the pathways and mechanisms through which humans come into contact with radionuclides present in the environment. It includes parameters such as inhalation rates, ingestion rates (food and water), occupancy times, and behavioural patterns that influence the magnitude and duration of exposure. Exposure factors are used in radiological protection to estimate radiation doses to individuals or populations from environmental contamination.	(ICRP, 2007)
Fate factor	The fate factor indicates the distribution and transformation of chemicals or radionuclides released into the environment, and their transport among environmental compartments (e.g., air, water, soil). It thereby determines the concentrations available for exposure. Building on this, the exposure factor relates dissolved to total chemical mass in the environment, the ecotoxicity effect factor indicates potential ecotoxicity effects per unit of dissolved chemical mass in the environment, and the damage factor finally relates potential effects to damages on ecosystem quality.	(LC-Impact, a spatially differentiated life cycle impact assessment method, 2019; Paulillo, McKone, & Fantke, 2023)
Functional unit	A functional unit describes the function of a product in question. For example, for a laundry detergent, the functional unit could be defined as “washing 4.5 kg of dry fabric with the recommended dosage with medium-hard water”. Understanding the	TfS PCF Guideline v3.0

Term	Definition	Source
	functional unit is essential for comparability between products with the same function, as it provides the reference to which the input (materials and energy) and output (such as products, byproducts, waste) are quantified.	
Greenhouse Gases	Greenhouse gases constitute a group of gases contributing to global warming and climate change. The Kyoto Protocol, an environmental agreement adopted by many of the parties to the United Nations Framework Convention on climate change (UNFCCC) in 1997 to curb global warming, nowadays covers seven greenhouse gases: The non-fluorinated gases: Carbon dioxide (CO₂) Methane (CH₄) Nitrous oxide (N₂O) The fluorinated gases: Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulphur hexafluoride (SF₆) Nitrogen trifluoride (NF₃) Converting them to carbon dioxide (or CO₂) equivalents makes it possible to compare them and to determine their individual and total contributions to global warming.	TfS PCF Guideline v3.0
Greenhouse Gas Protocol Standard	International Standard on how to calculate Greenhouse Gases.	TfS PCF Guideline v3.0
Global Warming Potential	Global Warming potential is a term used to describe the relative potency, molecule for molecule, of a greenhouse gas, taking account of how long it remains active in the atmosphere.	TfS PCF Guideline v3.0
Hydrochlorofluoro carbon	See Greenhouse Gas definition.	TfS PCF Guideline v3.0

Term	Definition	Source
Fluorinated ethers	Liquid Chemical.	TfS PCF Guideline v3.0
Hydrofluorocarbons	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
International Electrotechnical Commission	Founded in 1906, the IEC (International Electrotechnical Commission) is the world's leading organization for the preparation and publication of international standards for all electrical, electronic and related technologies.	TfS PCF Guideline v3.0
International Life Cycle Data System	The International Reference Life Cycle Data System is an initiative developed by JRC and DG ENV since 2005, with the aim to provide guidance and standards for greater consistency and quality assurance in applying LCA.	TfS PCF Guideline v3.0
International Organization for Standardization	The International Organization for Standardization is an international standard development organization composed of representatives from the national standards organizations of member countries.	TfS PCF Guideline v3.0
European Diisocyanate and Polyol Producers Association	ISOPA is the European trade association for producers of diisocyanates and polyols, the main building blocks of polyurethanes.	TfS PCF Guideline v3.0
ISO standard on Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification	ISO 14067: 2018 specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product (CFP), in a manner consistent with International Standards on life cycle assessment (LCA) [ISO 14040 [ISO 14040: 2006] and ISO 14044].	TfS PCF Guideline v3.0
Land Occupation	Land occupation refers to the physical area of land required for an activity over a specified period, commonly expressed in m ² ·year. It captures the ongoing pressure on ecosystems caused by agricultural, forestry, industrial, or urban land use and is explicitly addressed in UNEP SETAC land use impact	(Koellner, 2013)

Term	Definition	Source
	assessment guidelines and the EF 3.1 methodology	
Land Transformation (Land Use Change)	Land transformation involves the conversion of land from one use or cover type to another (e.g., forest to cropland or urban land). Such transformations can cause long lasting or irreversible ecological impacts and are treated separately from land occupation in LCA to reflect their distinct impact pathways and regeneration dynamics	(Koellner, 2013)
Life Cycle Assessment	The compilation and evaluation of the inputs, outputs, and the potential environmental impacts of a product system throughout its life cycle [ISO 14040: 2006].	TfS PCF Guideline v3.0
Life Cycle Inventory	The phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle [ISO 14040:2006].	TfS PCF Guideline v3.0
Life Cycle Impact Assessment	The phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product [ISO 14040:2006].	TfS PCF Guideline v3.0
Midpoint characterization model	Approaches that assess the potential environmental impacts of a product or process at an intermediate stage in the cause-effect chain. Examples are climate change, acidification, eutrophication, ozone depletion.	TfS PCF Guideline v3.0
Lower heating value	The lower heating value (LHV; <i>net calorific value</i> ; <i>NCV</i> , or <i>lower calorific value</i> ; <i>LCV</i>) is another measure of available thermal energy produced by a combustion of fuel, measured as a unit of energy per unit mass or volume of substance. In contrast to the HHV, the LHV considers energy losses such as the energy used to vaporize water. Lower heating value (LHV) is defined as the amount of heat released when a fuel is combusted, starting from 25 °C and with the combustion	(Boyce, 2012)

Term	Definition	Source
	products returned to 150 °C, excluding the latent heat of vaporization of water.	
Nomenclature of Economic Activities	NACE (Nomenclature of Economic Activities) is the European statistical classification of economic activities. It is established by law.	TfS PCF Guideline v3.0
Nitrogen trifluoride	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Nitrous oxide	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Nutrient Loading	Nutrient loading refers to the increased input of nutrients, particularly nitrogen (N) and phosphorus (P), into the environment, which alters ecological dynamics and can impact the quality of resources available to organisms, including hosts and parasites. So, nutrient loading fuels the ecosystem. Excessive loading results in a catastrophic collapse when the resulting increase in metabolism exceeds the available oxygen supply of the river.	(Aalto, Decaestecker, & Pulkkinen, 2015; K.E. Limburg, 2013)
Organizational Carbon Footprint	Carbon Footprint of an Organisation.	TfS PCF Guideline v3.0
Ozone-depleting substance	It refers to gases containing either chlorine or bromine that are released to the atmosphere because of human activity and are controlled under Annexes A, B, C, or E of the Montreal Protocol. These include, among other CFCs, CCl ₄ , CH ₃ CCl ₃ , halons, CH ₃ Br and HCFCs. These ODSs typically have sufficiently long atmospheric lifetimes to reach the stratosphere after being emitted at the surface. Methyl bromide is the shortest-lived of the controlled substances and has natural and anthropogenic sources. Other substances contribute chlorine and bromine to the atmosphere but are not controlled under the Montreal Protocol for various reasons.	(WMO, 2022)

Term	Definition	Source
Partial carbon footprint of a product	Sum of GHG emissions and GHG removals of one or more selected process(es) in a product system, expressed as CO₂ equivalents and based on the selected stages or processes within the life cycle. Note 1 to entry: A partial CFP is based on or compiled from data related to (a) specific process(es) or footprint information modules, which is (are) part of a product system and can form the basis for quantification of a CFP. More detailed information on information modules is given in ISO 14025:2006, 5.4. Note 2 to entry: “Footprint information modules” is defined in ISO 14026:2017, 3.1.4. Note 3 to entry: The results of the quantification of the partial CFP are documented in the CFP study report expressed in mass of CO₂e per declared unit.	ISO 14025:2006, 5.4.; ISO 14026:2017, 3.1.4.
Primary data	Sometimes also called activity data. Data that concerns processes inside the operational control of the company or data from specific processes in the product life cycle. A partial LCIA is considered primary data if the measure of the activity data and the measure of the emission factor are based on data where the data generators have a direct access to via direct measurements or assessments where they have a direct control. “Data pertaining to a specific product or activity within a company’s value chain. Such data may take the form of activity data, emissions or emission factors. Primary data is site-specific, company-specific (if there	TfS PCF Guideline v3.0

Term	Definition	Source
	are multiple sites for the same product) or supply chain-specific. Primary data may be obtained through meter readings, purchase records, utility bills, engineering models, direct monitoring, material or product balances, stoichiometry or other methods for obtaining data from specific processes in the value chain of the company” [Path 2021:41]	
Primary particulate matter	Primary particulate matter consists of solid particles or liquid droplets that are emitted directly into the atmosphere from identifiable sources, such as combustion processes, industrial activities, construction sites, road dust, and wildfires.	(U.S. Environmental Protection Agency (EPA), 2025)
Product Carbon Footprint	The Product Carbon Footprint is the most established method for determining the climate impact of a product, considering the total greenhouse gas (GHG) emissions caused to produce a product, expressed as carbon dioxide equivalent. The PCF can be assessed from cradle-to-gate (partial PCF) or from cradle-to-grave (total PCF).	TfS PCF Guideline v3.0
Product Category Rules	Set of specific rules, requirements, and guidelines for developing Type III environmental declarations and footprint communications for one or more product categories. [ISO 14025:2006]. [ISO 14027]	TfS PCF Guideline v3.0
Perfluorocarbons	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Perfluoropolyethers	Perfluoropolyethers (PFPE) are a group of plastics, usually liquid to pasty at room temperature, that are fluoropolymers consisting of fluorine, carbon and oxygen.	TfS PCF Guideline v3.0
Particulate Matter ₁₀	PM ₁₀ refers to inhalable particulate matter with an aerodynamic diameter of 10 micrometres or smaller. These particles can penetrate the upper respiratory tract and are associated with adverse respiratory and cardiovascular health effects.	(U.S. Environmental Protection Agency (EPA), 2025; Fantke, et al., 2016)

Term	Definition	Source
	Often it is not well defined if PM ₁₀ refers to particles between 2.5 micrometres and 10 micrometres or if particles of 2.5 micrometres and smaller are included. However, Fantke et al. (2016) distinguish between “fine PM” as PM _{2.5} and “coarse PM” as particle fraction between 2.5 and 10 micrometres.	
Particulate Matter _{2.5}	PM _{2.5} refers to fine particulate matter with an aerodynamic diameter of 2.5 micrometres or smaller. Due to their small size, these particles can penetrate deep into the lungs and enter the bloodstream and are considered the most harmful fraction of particulate matter in terms of long-term health impacts.	(U.S. Environmental Protection Agency (EPA), 2025)
Production mix	This approach focuses on the domestic production routes and technologies applied in the specific country/region and individually scaled according to the actual production volume of the respective production route. This mix is generally less dynamic.	TfS PCF Guideline v3.0
Programme operator	Body or bodies that conduct an environmental declaration programme or footprint communication programme. A programme operator can be a company or a group of companies, industrial sector or trade association, public authorities or agencies, or an independent scientific body or other organization. [ISO 14027]	TfS PCF Guideline v3.0
Removal	The sequestration or absorption of GHG emissions from the atmosphere, which most typically occurs when CO ₂ is absorbed by biogenic materials during photosynthesis.	TfS PCF Guideline v3.0
Secondary data	secondary data is data obtained from sources other than primary data. Note 1 to entry: Such sources can include databases and published literature validated by competent authorities.	TfS PCF Guideline v3.0, adopted ISO 14064-1

Term	Definition	Source
	“Data that is not from specific activities within a company’s value chain but from databases, based on averages, scientific reports or other sources.” [Path 2021:41]	
Secondary particulate matter	Secondary particulate matter is not emitted directly, but forms in the atmosphere through chemical reactions of gaseous precursor pollutants—such as sulphur dioxide (SO ₂), nitrogen oxides (NO _x), ammonia (NH ₃), and volatile organic compounds (VOCs)—resulting in fine particles, often in the PM _{2.5} size range.	(U.S. Environmental Protection Agency (EPA), 2025)
Sulphur hexafluoride	See Greenhouse Gas definition.	TfS PCF Guideline v3.0
Standard Industrial Classification	The Standard Industrial Classification (SIC) is a four-digit classification system that classifies industries according to business activities.	TfS PCF Guideline v3.0
Soil Organic Carbon	Carbon contained in soil organic matter and frequently used as an indicator of soil condition.	(Vidal-Legaz, Sala, Antón, & Milà i Canal, 2016)
Spot transaction	A spot transaction is the sale of a commodity, asset or right, under the terms of which delivery is scheduled to be made within the longer of the following periods: (a) 2 trading days; (b) the period generally accepted in the market for that commodity, asset or right as the standard delivery period.	TfS PCF Guideline v3.0
Substance of Very High Concern	SVHC (Substance of Very High Concern) refers to chemicals identified under the EU REACH Regulation as posing serious risks—such as carcinogenic, mutagenic, reproductive toxicity, PBT, vPvB, or endocrine-disrupting properties—and listed by ECHA on the official Candidate List.	
System expansion	Expanding the product system to include the additional functions related to the co-	TfS PCF Guideline v3.0

Term	Definition	Source
	products. System expansion is a method used to avoid co-product allocation.	
Unit process	Smallest element considered in the life cycle inventory analysis for which input and output data are quantified.	ISO 14040:2006
Utilities	The term “utilities” includes here: Electricity, process steam, excess steam, cooling water, demineralized water, process water, compressed air and nitrogen.	TfS PCF Guideline v3.0
Validation	the process of evaluating a system or component to ensure compliance with the functional, performance and interface requirements. [ISO/IEC 14776: 2010]	TfS PCF Guideline v3.0
Verification	Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled. [ISO 9000: 2005; ISO 14025:2006]	TfS PCF Guideline v3.0
Waste	Any substance or object which the holder discards or intends or is required to discard Note 1: A substance or object resulting from a production process the primary aim of which is not the production of that substance or object is considered not to be waste, but to be a by-product if the following conditions are met: (a) further use of the substance or object is certain; (b) the substance or object can be used directly without any further processing other than normal industrial practice; (c) the substance or object is produced as an integral part of a production process; and (d) further use is lawful (i.e., the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will	(EU, 2008)

Term	Definition	Source
	not lead to overall adverse environmental or human health impacts).	
World Business Council for Sustainable Development	The World Business Council for Sustainable Development (WBCSD) is a business-led organization that focuses exclusively on business and sustainable development.	TfS PCF Guideline v3.0

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10.2. Data Catalogues

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10.2.1. Entity Catalogue

688 *Table 4. List of DMP Entities by Domain.*

Domain	Sub-Model	Sub-Model Description
DMP Collections/Circularity	Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Sub-model for attributes which refer to the circularity metric Biogenic Carbon Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.
DMP Collections/Circularity	Biogenic Content e4090a8f-188b-504b-9d65-3b68920601a2	Sub-model for attributes which refer to the circularity metric Biogenic Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.
DMP Collections/Circularity	Biogenic Origin 0f914e42-d2a2-5aa6-b982-8b2b4365778e	Set of additional indicators describing the biogenic origin of the biogenic content.
DMP Collections/Circularity	Chain of Custody 259bb4f6-c08d-5162-a1f6-b316fb975dbb	Sub-model for attributes which refer to the Chain of Custody model characterization. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details. Chain of Custody is a process by which inputs and outputs and associated information are transferred, monitored and controlled as they move through each step in the relevant supply chain.
DMP Collections/Circularity	Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	General sub-model for attributes that refer to all circularity metrics (e.g., Recycled Content, Biogenic Content, etc.).
DMP Collections/Circularity	CO ₂ -based Carbon Content 7c0485f1-4549-5c54-b185-b0c75c08803a	Sub-model for attributes which refer to the circularity metric CO ₂ -based Carbon Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.

DMP Collections/Circularity	CO2-based Content 0afd1dec-91e4-511c-9fe0-c2783da23997	Sub-model for attributes which refer to the circularity metric CO2-based Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.
DMP Collections/Circularity	CO2 Origin d83e440d-a8fd-581e-aac6-d3661ef57a8b	Set of additional indicators describing the CO2-origin of the CO2-based (Carbon) content.
DMP Collections/Circularity	Recycled Content 9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	Sub-model for attributes which refer to the circularity metric Recycled Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.
DMP Collections/Circularity	Renewable Content c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Sub-model for attributes which refer to the circularity metric Renewable Content. Refer to the latest version of the Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for further details.
DMP Collections/Circularity	Waste Origin & Recycling Technology 675ba06b-8344-5945-a249-b16316f238fe	Set of additional indicators describing the origin of the underlying waste material used for the recyclate, as well as the recycling technology adopted.
DMP Header	Business Partner Identifiers c72c5642-9f87-59ae-a04f-f2e5411d3308	A list of various identifiers that are used to uniquely identify business partners.
DMP Header	DMP 73ee472f-a5e0-5416-b92a-5a8fc150f0c9	The Digital Material Passport (DMP) is a structured digital record for a material that contains detailed information about sustainability and circularity, as well as required and potentially optional declarations, certificates, and additional material information. It focuses on intermediate materials in the value chain which may not be subject to regulation, but whose data are required to enable the issue of regulated Digital Product Passports (DPPs). DMPs are designed to interoperate with one or more DPPs.
DMP Header	Material Component d85def85-9ab4-5045-baa5-4ac6ddb03eca	An individual component of a Material or Product specified by the DMP/DPP. Materials can comprise multiple components (the unpacked material / unpacked good, packaging components, etc.), each managed separately for comprehensive sustainability data, circularity data and material declaration. The Unpacked material / unpacked good is one single component.

		Additionally, the model accommodates for the type "Packaged material", which encompasses the "unpacked material", the packaging (possibly including several "packaging components") and "other" components (if applicable).
DMP Header	Nameplate 357c450d-64a8-5d56-ab2b-f1498dec5227	A set of possible numbers to identify a business partner.
DMP Header	Trade Product Identifiers 53b3de9e-07da-5d7b-9a79-56f0ee084037	A list of various identifiers that are used to uniquely identify trade products.
DMP Collections/Material Declaration Model	Certificate of Analysis ad34ec13-bfb9-5083-9665-34fc63bb41a0	A document delivering proof of quality conformity of a manufactured material (unpackaged good) A Certificate of Analysis is a document issued by a manufacturer or accredited laboratory that confirms a product has been tested and meets its specified requirements/specifications. It accompanies a specific batch or lot of a product.
DMP Collections/Material Declaration Model	DoC 4fa89426-2e01-5612-9ae4-b6634d98366e	Document containing the declaration of conformity
DMP Collections/Material Declaration Model	Docu Box 9b83117d-420e-5bf5-9922-63a0b750ac78	Place to store documents.
DMP Collections/Material Declaration Model	EU REACH Article cbbda2a4-9d72-5696-a8ee-a21c982d4f35	An object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition;
DMP Collections/Material Declaration Model	EU REACH Mixture cb84ee7c-ff93-57ad-9e7f-fe3b9ae6151d	Solid mixture or solution composed of two or more substances (also called preparation). MOCS (More than one constituent substance or Multi component substance) are excluded.
DMP Collections/Material Declaration Model	EU REACH Substance 42e44ea6-20a6-51ec-945c-330a3078fc5f	Substance is defined in Regulation (EC) No. 1907/2006 REACH. Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition. Mono-constituent substance As a general rule, a substance, defined by its composition, in which one main constituent is present to at least 80% (w/w). More-than-one-constituent substance

		As a general rule, a substance, defined by its composition, in which more than one main constituent is present in a concentration $\geq 10\%$ (w/w) and $\leq 80\%$ (w/w).
DMP Collections/Material Declaration Model	EU REACH Substance(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	Substance is defined in Regulation (EC) No. 1907/2006 REACH. Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition. Mono-constituent substance As a general rule, a substance, defined by its composition, in which one main constituent is present to at least 80% (w/w). More-than-one-constituent substance As a general rule, a substance, defined by its composition, in which more than one main constituent is present in a concentration $\geq 10\%$ (w/w) and $\leq 80\%$ (w/w).
DMP Collections/Material Declaration Model	EU REACH Substance(s) in Mixture bfbf59f4-5ee8-546c-bbca-74318776e36e	Substance is defined in Regulation (EC) No. 1907/2006 REACH. Substance: means a chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition. Mono-constituent substance As a general rule, a substance, defined by its composition, in which one main constituent is present to at least 80% (w/w). More-than-one-constituent substance As a general rule, a substance, defined by its composition, in which more than one main constituent is present in a concentration $\geq 10\%$ (w/w) and $\leq 80\%$ (w/w).
DMP Collections/Material Declaration Model	General Material Information 067c0e9b-575c-553e-ace6-34f6157aa303	A good (mixture, substance or reach article) ready to be packed for further value chain steps. Other Material information for "packaging component" and "Packaged Material" could use the same attributes like "unpacked component" (currently not required by regulation).

DMP Collections/Material Declaration Model	Material Declaration 030388e3-6ab5-5290-ab1e-7790b0c460c3	A manufactured good (unpacked, packed) that requires a material passport. A material is either a Packaged good or an Unpacked good It is the abstract description of the material, a template.
DMP Collections/Material Declaration Model	SDS 2896cfd7-cfe2-5799-848b-802b1d4275df	Safety Data Sheet document
DMP Collections/Sustainability	PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	Product Carbon Footprint. Impact Category: Global Warming Potential (GWP)
DMP Collections/Sustainability	Sustainability 9871b20b-2611-50fd-8615-2219f73cca2b	General sub-model for attributes that refer to all sustainability metrics (e.g., PCF and other Lifecycle Assessment (LCA) impact categories).

10.2.2. Attribute Catalogue

Table 5. List of DMP Attributes by Entity.

Entity	Attribute	Required	Attribute Description
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Comment 6b196465-bab9-55ec-b881-80180928b59a	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't be documented in the attributes with specific purpose of this Circularity Assessment documentation.
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Date of issue ec281626-9783-5f11-9277-dd7e131c71ae	Mandatory	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Id 49c1da2d-821d-5d76-8ecb-a39f619e1212	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated.
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Preceding Ids ab279a45-1a39-57da-9458-8c2f1aa5e181	Optional	If defined, must be a non-empty set of preceding Biogenic Carbon Content identifiers (UUIDs). See also "Biogenic Carbon Content ID".

Entity	Attribute	Required	Attribute Description
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Standard applied da0c6359-2b2d-5260-9279-0de3bf799acd	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible.
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Total e32f1460-2e15-5b30-8a0d-542aff10dbea	Mandatory	Fraction of carbon mass (out of total material mass) classified as biogenic. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Note 2: If analytically measurable via 14C-analysis, it can be classified as “bio-based carbon content”. Note 3: If not analytically measurable via 14C-analysis (e.g., by applying mass balance chain-of-custody model), it can be classified as “bio-attributed carbon content”. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Biogenic Carbon Content 346feb73-a401-5915-aaa2-2e3702cea1cd	Biogenic Carbon Content Validity period start 538e5b9d-ecd0-5ad7-9291-b5592df84724	Optional	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), starts its validity. Unless specified separately. it shall be equal to the Date of Issue.
Biogenic Content e4090a8f-188b-504b-9d65-3b68920601a2	Biogenic Content Comment fc47939b-3a3d-5d94-82a7-8ba85271847a	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't be documented in the attributes with specific purpose of this Circularity Assessment documentation.
Biogenic Content e4090a8f-188b-504b-9d65-3b68920601a2	Biogenic Content Date of issue 32cf2597-2c87-5020-b19c-c91d90e2feea	Mandatory	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.
Biogenic Content e4090a8f-188b-504b-	Biogenic Content Id a2ae48b5-c898-56d1-a37a-6e182d14313b	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated.

Entity	Attribute	Required	Attribute Description
9d65-3b68920601a2			
Biogenic Content	Biogenic Content Preceding Ids	Optional	If defined, must be a non-empty set of preceding Biogenic Content identifiers (UUIDs). See also "Biogenic Content ID".
e4090a8f-188b-504b-9d65-3b68920601a2	6e2f8831-6e81-5712-8c9a-5ff42c17c0e5		
Biogenic Content	Biogenic Content Standard applied	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible.
e4090a8f-188b-504b-9d65-3b68920601a2	d27d1380-1914-557e-a5b8-a096d90e265b		
Biogenic Content	Biogenic Content Total	Mandatory	Fraction of material mass content classified as biogenic. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Note 2: This includes all molecules/atoms (carbon and non-carbon like nitrogen) derived from biomass and excluding added water. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
e4090a8f-188b-504b-9d65-3b68920601a2	2de3fca0-ab26-5d3d-8bcc-d2560571ed7e		
Biogenic Content	Biogenic Content Validity period start	Optional	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), starts its validity. Unless specified separately, it shall be equal to the Date of Issue.
e4090a8f-188b-504b-9d65-3b68920601a2	ecd68977-0019-56ec-84ec-af2411b0af2b		
Biogenic Origin	Biogenic Origin Content	Optional	Fraction of material mass content classified as per declared Biogenic origin indicators. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
0f914e42-d2a2-5aa6-b982-8b2b4365778e	bfb4807f-ce1c-56ff-aeab-026a51fee617		
Biogenic Origin	Biogenic Origin Feedstock Generation	Optional	Describes the biogenic feedstock generation type of the biogenic (carbon) content contribution reported under "Biogenic Origin Content". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
0f914e42-d2a2-5aa6-b982-8b2b4365778e	62028957-e779-5d08-8ad3-52d2e16060a6		

Entity	Attribute	Required	Attribute Description
Biogenic Origin 0f914e42-d2a2-5aa6-b982-8b2b4365778e	Biogenic Origin Other fd45828d-b079-5afd-8966-a59a94e53ae8	Optional	Describes the biogenic origin waste classification of the biogenic (carbon) content contribution reported under "Biogenic Origin Content". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	Business Partner Number ac505054-d0be-5573-82df-9ee05d7fcc72	Optional	A unique nine-digit code assigned by Dun & Bradstreet to identify individual business entities globally.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	D-U-N-S Number 29bfb8bd-8598-5bba-b8b3-8658db0a57bc	Optional	A unique nine-digit code assigned by Dun & Bradstreet to identify individual business entities globally.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	Generic Company Identifier bd20eafe-4f82-5c42-902d-e165b5f68a6c	Optional	A generic number to identify a company.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	Global Location Number abe819cb-2030-5c84-a0c6-e9f78ed304dc	Optional	Global Location Number (GLN) to identify a company.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	Legal Entity Identifier 6edfcd7e-8236-55f5-ba9f-144667f68364	Optional	Legal Entity Identifier (LEI) to identify a company.
Business Partner Identifier S c72c5642-9f87-59ae-a04f-f2e5411d3308	Uniform Resource Name Identifier f4492e48-07da-	Optional	The non-empty set of Uniform Resource Name (URN). Each value of this set is supposed to uniquely identify the resource owner.

Entity	Attribute	Required	Attribute Description
a04f-f2e5411d3308	5252-8266-7f3ceb154855		
Business Partner Identifier	Value Added Tax Identification Number	Optional	Value Added Tax ID uniquely identify companies engaged in the cross-border trade of goods and services within the European Union.
c72c5642-9f87-59ae-a04f-f2e5411d3308	66b71ef6-b610-5612-a4ec-09559affa7c4		
Certificate of Analysis	Date of issue	Optional	Date on which the certificate of analysis has been issued.
ad34ec13-bfb9-5083-9665-34fc63bb41a0	2cd513af-32a0-5237-8017-c4663b997eca		
Certificate of Analysis	End date (of production)	Optional	End date of production process
ad34ec13-bfb9-5083-9665-34fc63bb41a0	5a697a5d-9584-502d-b4c3-3c2af0fbedac		
Certificate of Analysis	Produced Quantity	Optional	Quantity [pieces, kg, lt] produced in batch from start-to end date (or up to now, if end date is null).
ad34ec13-bfb9-5083-9665-34fc63bb41a0	c493a4d0-96e1-5e60-9173-94fd5e30fe86		
Certificate of Analysis	Start date (of production)	Optional	Initial date of production process.
ad34ec13-bfb9-5083-9665-34fc63bb41a0	c56a102d-a89e-51ad-8494-b16143e73535		
Chain of Custody	CoC Balancing Period End	Optional	End of the time frame when the inputs and outputs with specified characteristics are balanced in the temporal boundaries of the system. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	9a10a3a7-da28-59f2-879c-a2d6b844dec5		
Chain of Custody	CoC Balancing Period Start	Optional	Start of the time frame when the inputs and outputs with specified characteristics are balanced in the temporal boundaries of the system. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	87aee441-e347-51b3-a1af-5a46f2353ba8		

Entity	Attribute	Required	Attribute Description
Chain of Custody	CoC Certification System	Mandatory	Name of the CoC certification system (certification scheme) applied. If CoC model has been applied this is a mandatory field. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	ebe21bcf-a8a6-53c1-9384-03a17727123f		
Chain of Custody	CoC Certification Systems Used Upstream	Optional	Name of additional certification system adopted upstream (background system) in case deviating from the last step/foreground system. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	7c5c5272-e8ec-50a3-aeff-596620eb7e8f		
Chain of Custody	CoC Certified share	Mandatory	Fraction of material mass which has been certified by an accepted conformity assessment party regarding the traceable sustainable sourcing of the raw materials and/or manufacturing of the product, and the related determination of the share. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	19bd57e6-07ff-5dc4-b083-a4808a06a5eb		
Chain of Custody	CoC Conformity Assessment Party	Mandatory	Attribute identifying the applied conformity assessment party. First party activity, if performed by the person or organization that provides or that is the object. Second-party activity, if performed by a person or organization that has a user interest in the object of conformity assessment. Third-party activity, if performed by a person or organization that is independent of the provider of the object and has no user interest in the object of conformity assessment. Value List includes: "1st party", "2nd party", "3rd party" Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	e14ffc26-13c0-5c55-83c0-0575e741d650		
Chain of Custody	CoC Link to certificate documents	Mandatory	Link to valid CoC certificates. This field is mandatory if CoC model has been applied.
259bb4f6-c08d-5162-a1f6-b316fb975dbb	5638c6e9-ee6b-5c18-9fc2-0a8377b20d61		
Chain of Custody	CoC Model	Mandatory	Defined system of rules and processes that ensures the tracking, transfer, and attribution of inputs, outputs, and their specified characteristics across a

Entity	Attribute	Required	Attribute Description
259bb4f6-c08d-5162-a1f6-b316fb975dbb	0af97ea7-7d09-552b-bf48-aafcd2ff7f33		supply chain, including the relationship between physical material flows and the claims made on resulting products. Value list includes: "Not applicable", "Identity preserved", "Segregated", "Controlled blending", "Mass balance (rolling average)", "Mass balance (credit method)", "Book & claim". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Chain of Custody 259bb4f6-c08d-5162-a1f6-b316fb975dbb	CoC Specific Rules Mass Balance Credit Method - credit transfer between sites 9e901cae-0566-592c-8d36-4fd5814f6b66	Mandatory	Attribute identifying whether in the Mass balance (credit method) CoC model attribution a credit transfer between sites has been applied. If CoC model has been applied this is a mandatory field. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Chain of Custody 259bb4f6-c08d-5162-a1f6-b316fb975dbb	CoC Specific Rules Mass Balance Credit Method - non proportion al attribution to the input adopted upstream 08b0a171-02a0-5eae-8f41-65e5fd2286de	Optional	Attribute identifying whether non-proportional attribution to the input in CoC mass balance (credit method) has been applied upstream (background system). Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Chain of Custody 259bb4f6-c08d-5162-a1f6-b316fb975dbb	CoC Specific Rules Mass Balance Credit Method - non	Optional	Attribute identifying whether non-proportional attribution to the output in CoC mass balance (credit method) has been applied upstream (background system). Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.

Entity	Attribute	Required	Attribute Description
	proportion al attribution to the output adopted upstream cb0fc163-a793- 5705-bced- 9c8eeee93a52		
Chain of Custody 259bb4f6- c08d-5162- a1f6- b316fb975dbb	CoC Specific Rules Mass Balance Credit Method - proportion ality to input 7a8368ae-4359- 5ced-a019- e9b7d375bd2c	Mandatory	Attribute identifying the modality of attribution applied in Mass balance (credit method) CoC model with regard to the proportionality to the input. Value List includes: "not applicable", "proportional", "non-proportional". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Chain of Custody 259bb4f6- c08d-5162- a1f6- b316fb975dbb	CoC Specific Rules Mass Balance Credit Method - proportion ality to output 24f535f1-a3ed- 5e6a-bdb9- 5f69b409d2ab	Mandatory	Attribute identifying the modality of attribution applied in Mass balance (credit method) CoC model with regard to the proportionality to the output. Value List includes: "not applicable", "proportional", "non-proportional". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Chain of Custody 259bb4f6- c08d-5162- a1f6- b316fb975dbb	CoC System Boundary Informatio n - existence of a physical link d8ebef66-2b5e- 5a58-89f5- 7080d24222df	Optional	Attribute identifying if physical link exists. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.

Entity	Attribute	Required	Attribute Description
Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	Circularity Granularity	Optional	Specifies whether Circularity data applies at Batch, Model, or Item level. Defaults to Model level. Overrides Granularity on Material Component level.
Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	Circularity Legal Statement	Optional	In case your organization defined certain legal conditions which apply to the publication of this circularity data, you can state the legal disclaimer in here. The text might include an URL link to the legal disclaimer of the circularity data provider.
Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	Declared unit	Mandatory	Quantity of a product for use as a reference unit in the quantification of circularity metrics Note: Typically, the declared unit is referring to a physical quantity, for chemicals for example “1 kg of product (unpackaged)”
Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	Product mass [kg] per declared unit	Mandatory	The mass of the product per declared unit amount (e.g., the declared unit of a circuit board is one piece; one piece represents 0.123 kg) excluding packaging. This is required, especially if piece is selected.
Circularity 69a98ed2-eafb-58e1-9eae-30cca80f3d71	Quantity (of declared unit)	Mandatory	The quantity (amount) of the declared unit as numerical value to which the sustainability metric (e.g., PCF) is referring to. Typically, is equal to 1.
CO2-based Carbon Content 7c0485f1-4549-5c54-b185-b0c75c08803a	CO2-based Carbon Content Comment	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't be documented in the attributes with specific purpose of this Circularity Assessment documentation.
CO2-based Carbon Content 7c0485f1-4549-5c54-b185-b0c75c08803a	CO2-based Carbon Content Date of issue	Mandatory	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.

Entity	Attribute	Required	Attribute Description
CO2-based Carbon Content	CO2-based Carbon Content Id	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated.
7c0485f1-4549-5c54-b185-b0c75c08803a	fb848f6c-a854-52fa-b1f8-12d5596d4d77		
CO2-based Carbon Content	CO2-based Carbon Content Preceding Ids	Optional	If defined, must be a non-empty set of preceding CO2-based Carbon Content identifiers (UUIDs). See also "CO2-based Carbon ID".
7c0485f1-4549-5c54-b185-b0c75c08803a	f33e47c0-8d3d-54c7-8d18-c8ff257d6cc1		
CO2-based Carbon Content	CO2-based Carbon Content Standard applied	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible.
7c0485f1-4549-5c54-b185-b0c75c08803a	a90d76a5-beff-5aa3-995a-f7eaa4b3a6eb		
CO2-based Carbon Content	CO2-based Carbon Content Total	Mandatory	Fraction of carbon mass (out of total material mass) originating from CO2 capture and utilization Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
7c0485f1-4549-5c54-b185-b0c75c08803a	caa4ccf7-7962-5a3e-98eb-54fa0f353779		
CO2-based Carbon Content	CO2-based Carbon Content Validity period start	Optional	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), starts its validity. Unless specified separately, it shall be equal to the Date of Issue
7c0485f1-4549-5c54-b185-b0c75c08803a	f84bf8a0-9f7d-5127-99e3-dfcdefa466d		
CO2-based Content	CO2-based Content Comment	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't
0afd1dec-91e4-511c-9fe0-c2783da23997	b2ca8cb2-bdc8-		

Entity	Attribute	Required	Attribute Description
	5dc0-ac08-b494c480261e		be documented in the attributes with specific purpose of this Circularity Assessment documentation.
CO2-based Content	CO2-based Content Date of issue	Mandatory	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.
0afd1dec-91e4-511c-9fe0-c2783da23997	7fee005d-71e2-5620-b7c1-e0c88b470100		
CO2-based Content	CO2-based Content Id	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated.
0afd1dec-91e4-511c-9fe0-c2783da23997	afb1e275-4b03-561b-b403-8b32448e42f6		
CO2-based Content	CO2-based Content Preceding Ids	Optional	If defined, must be a non-empty set of preceding CO2-based Content identifiers (UUIDs). See also "CO2-based Content ID".
0afd1dec-91e4-511c-9fe0-c2783da23997	9eea1667-f6b9-5d0a-b310-577ab84acae5		
CO2-based Content	CO2-based Content Standard applied	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible.
0afd1dec-91e4-511c-9fe0-c2783da23997	177f47d7-3f37-53f0-be44-d61c1e424c00		
CO2-based Content	CO2-based Content Total	Mandatory	Fraction of material mass originating from CO2 capture and utilization Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
0afd1dec-91e4-511c-9fe0-c2783da23997	df7fb09c-2672-5a48-8144-9f0d781889f9		
CO2-based Content	CO2-based Content Validity period start	Optional	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), starts its validity. Unless specified separately, it shall be equal to the Date of Issue.
0afd1dec-91e4-511c-9fe0-c2783da23997	026a76f8-0134-55c9-9abe-c7c258e8c661		

Entity	Attribute	Required	Attribute Description
CO2 Origin	CO2 Origin Content	Optional	Fraction of material mass content classified as per CO2-origin indicators; Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
d83e440d-a8fd-581e-aac6-d3661ef57a8b	9c92fd33-6c97-5d42-acb2-e01b08b59d15		
CO2 Origin	CO2 Origin Source	Optional	Describes the CO2 source type of the CO2-based (carbon) content contribution reported under "CO2 Origin Content". Value List: "atmospheric CO2 (DAC)", "Biogenic CO2 CCU". "Other CO2 CCU". Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
d83e440d-a8fd-581e-aac6-d3661ef57a8b	92453eea-39cf-587c-b9b6-da355a13bb5e		
DMP	DMP Identifier	Mandatory	Unique identifier of the Material Passport.
73ee472f-a5e0-5416-b92a-5a8fc150f0c9	ed108afc-4607-5b71-b09e-0751d93f251b		
DMP	DMP Issue Date	Mandatory	Timestamp of the DMP when issued
73ee472f-a5e0-5416-b92a-5a8fc150f0c9	bdf97679-c093-583c-9910-f7b932337dee		
DMP	DMP Version	Mandatory	Version of the DMP specification/data model used for the assessment. This field identifies the specific version applied and may be automatically populated by the application. Multiple versions may be recorded where applicable.
73ee472f-a5e0-5416-b92a-5a8fc150f0c9	16d3daed-cfd1-584f-9991-c592e53f0007		
EU REACH Article	SCIP	Optional	The SCIP database lists Substances of Concern In articles, as such or in complex objects (Products). It is an EU database managed by the European Chemicals Agency (ECHA) under the Waste Framework Directive, requiring companies to report items containing Substances of Very High Concern (SVHCs) above 0.1% w/w.
cbbda2a4-9d72-5696-a8ee-a21c982d4f35	2609d654-bf87-5387-adb0-fa4713b913f0		
EU REACH Article	Substance declaration (accord. to REACH Art. 33)	Optional	REACH Article 33 requires suppliers to inform recipients and consumers if an article contains Substances of Very High Concern (SVHCs - SoC Type A in accordance with ESPR) from the ECHA Candidate List in a concentration above 0.1% weight by weight (w/w). Suppliers must provide sufficient safe-use information, including the substance name, free of charge within 45 days of a request.
cbbda2a4-9d72-5696-a8ee-a21c982d4f35	a6dace91-4ecb-5d36-8199-b1ae9e057e15		
EU REACH Mixture	As manufactured?	Mandatory	Mixture as manufactured before application (unreacted e.g.: not polymerized, not hardened)
cb84ee7c-	6b930698-a179-		

Entity	Attribute	Required	Attribute Description
ff93-57ad-9e7f-fe3b9ae6151d	55c1-8829-b87d3bab1b87		
EU REACH Mixture	EU UFI-Number (Mixtures)	Optional	An EU label element which will be required on certain product labels – a 16-character code called the unique formula identifier (UFI)
cb84ee7c-ff93-57ad-9e7f-fe3b9ae6151d	2ff58d3f-812b-5cc5-bafd-297a745f1eae		
EU REACH Substance	active biocide EU?	Mandatory	A substance defined as active biocide according Regulation (EU) No 528/2012
42e44ea6-20a6-51ec-945c-330a3078fc5f	f0441a36-d170-5c6a-bb6f-9ff1a52eff97		
EU REACH Substance	Concentration	Mandatory	Is a proportion of a substance [e.g.: %, ppb, ppm, mass or volume percentage]
42e44ea6-20a6-51ec-945c-330a3078fc5f	a186c21c-134d-5e03-a484-b153bb834a10		
EU REACH Substance	Constituent Substance category	Mandatory	Constituent Substance categories are defined by REACH as "Main constituents", "Additives" and "Impurities".
42e44ea6-20a6-51ec-945c-330a3078fc5f	d5aa90a5-2fb6-58f8-82de-e1328993b1aa		
EU REACH Substance	Country of national OEL	Optional	Country of national OEL (Occupational Exposure Limits). Note to entry: In the case that the optional OEL Boolean = 'yes' the country should be indicated.
42e44ea6-20a6-51ec-945c-330a3078fc5f	32988c45-fc9a-5de4-a568-86dd0f6e1dc2		
EU REACH Substance	CRMA material type substance ?	Mandatory	Critical Raw Material (CRM) and Strategic Raw Material (SRM) substance names in accordance with the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020 Annex I and Annex II. Code Structure: AIS1: Annex I Section 1 - List of strategic raw materials (from (a) to (p))
42e44ea6-20a6-51ec-945c-330a3078fc5f	e8c51475-39cd-5a9b-bce1-f971abc41bb6		

Entity	Attribute	Required	Attribute Description
			AIIS1: Annex II Section 1 - List of critical raw materials (from (a) to (hh)) Abbreviations: SRM: Strategic Raw Materials CRM: Critical Raw Materials
EU REACH Substance 42e44ea6-20a6-51ec-945c-330a3078fc5f	EU ESPR SoC type 5ec59a9b-77df-54af-a344-5587afdb0acf	Mandatory	Which SoC type according to Regulation (EU) 2024/1781 is a substance may be none or at least one SoC type. The SoC types are defined under Chem-X terminology as SoC A to SoC D. ‘Substance of concern’ means a substance that: (A) meets the criteria laid down in Article 57 of Regulation (EC) No 1907/2006 and is identified in accordance with Article 59(1) of that Regulation; (B) is classified in Part 3 of Annex VI to Regulation (EC) No 1272/2008 in one of the following hazard classes or hazard categories: (i) carcinogenicity categories 1 and 2; (ii) germ cell mutagenicity categories 1 and 2; (iii) reproductive toxicity categories 1 and 2; (iv) endocrine disruption for human health categories 1 and 2; (v) endocrine disruption for the environment categories 1 and 2; (vi) persistent, mobile and toxic or very persistent, very mobile properties; (vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties; (viii) respiratory sensitisation category 1; (ix) skin sensitisation category 1; (x) hazardous to the aquatic environment — categories chronic 1 to 4; (xi) hazardous to the ozone layer; (xii) specific target organ toxicity — repeated exposure categories 1 and 2; (xiii) specific target organ toxicity — single exposure categories 1 and 2; (C) is regulated under Regulation (EU) 2019/1021; or (D) negatively affects the reuse and recycling of materials in the product in which it is present.
EU REACH Substance 42e44ea6-20a6-51ec-945c-330a3078fc5f	EU OEL? 1b22287d-8345-50ed-b5e9-d0a68991ed63	Mandatory	EU Occupational Exposure Limit values (indicative OELs and binding OELs) published in various EU directives
EU REACH Substance 42e44ea6-	Hazard classification (Substance)	Mandatory	Hazard Classification of Substances defines the type of chemical risk of substances, split into physical hazards (e.g., flammable liquids), health hazards (e.g., acute toxicity), and environmental hazards (e.g., hazardous to the aquatic environment)

Entity	Attribute	Required	Attribute Description
20a6-51ec-945c-330a3078fc5f	bbe8b3ae-b603-5a6b-8570-e51eaedc1b8a		
EU REACH Substance	Listed in Annex VI CLP?	Mandatory	Is the substance listed in CLP Annex VI then this Boolean = 'yes'! Note to entry: Different requirements from EU regulation should be considered.
42e44ea6-20a6-51ec-945c-330a3078fc5f	399a06d0-8ba4-5d55-a41b-5945e214ecdc		
EU REACH Substance	Nanoform ?	Mandatory	A nanoform is a form of a natural or manufactured substance containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm-100 nm, including also by derogation fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm. Note to entry: Nanoform definitions could be different in accordance with national regulation.
42e44ea6-20a6-51ec-945c-330a3078fc5f	2f59720d-dc9d-5bce-b797-23a4db2d6832		
EU REACH Substance	National OEL?	Optional	Occupational Exposure Limit (OEL) published by national authorities e.g.: OEL published in TRGS900 for Germany
42e44ea6-20a6-51ec-945c-330a3078fc5f	346d22c3-e0b3-5cef-a5f7-b0b43efc8b96		
EU REACH Substance	Substance identifiers	Mandatory	The product identifier for a substance shall consist of at least the following: (a) if the substance is included in Part 3 of Annex VI, a name and an identification number as given therein; (b) if the substance is not included in Part 3 of Annex VI, but appears in the classification and labelling inventory, a name and an identification number as given therein; (c) if the substance is not included in Part 3 of Annex VI nor in the classification and labelling inventory, the number provided by the CAS (hereinafter referred to as 'the CAS number'), together with the name set out in the nomenclature provided by the IUPAC (hereinafter referred to as 'the IUPAC Nomenclature'), or the CAS number together with another international chemical name(s); or (d) if the CAS number is not available, the name set out in the IUPAC Nomenclature or another international chemical name(s).
42e44ea6-20a6-51ec-945c-330a3078fc5f	6abfd942-2432-5499-a1e9-4b6e9dc11605		
EU REACH Substance	Supplemental Hazard Classification	Optional	EUH-phrases are supplementary hazard statements mandated by the CLP Regulation (EC No 1272/2008) to address specific risks not fully covered by standardized GHS hazard codes, such as physical,

Entity	Attribute	Required	Attribute Description
42e44ea6-20a6-51ec-945c-330a3078fc5f	ion (Substance)		health, or environmental hazards. Key examples include EUH001 (Explosive when dry), EUH014 (Reacts violently with water), and EUH066 (Repeated exposure may cause skin dryness or cracking)
e50805ca-5d8d-51d7-a961-734518a15e27			
EU REACH Substance(s) in Article	active biocide EU?	Mandatory	A substance defined as active biocide according Regulation (EU) No 528/2012
f0441a36-d170-5c6a-bb6f-9ff1a52eff97			
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Article	Constituent Substance category	Mandatory	Constituent Substance categories are defined by REACH as "Main constituents", "Additives" and "Impurities".
d5aa90a5-2fb6-58f8-82de-e1328993b1aa			
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Article	Country of national OEL	Optional	Country of national OEL (Occupational Exposure Limits). Note to entry: In the case that the optional OEL Boolean = 'yes' the country should be indicated.
32988c45-fc9a-5de4-a568-86dd0f6e1dc2			
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Article	CRMA material type substance ?	Mandatory	Critical Raw Material (CRM) and Strategic Raw Material (SRM) substance names in accordance with the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020 Annex I and Annex II. Code Structure: AIS1: Annex I Section 1 - List of strategic raw materials (from (a) to (p)) AIIS1: Annex II Section 1 - List of critical raw materials (from (a) to (hh)) Abbreviations: SRM: Strategic Raw Materials CRM: Critical Raw Materials
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH	EU ESPR SoC type	Mandatory	Which SoC type according to Regulation (EU) 2024/1781 is a substance may be none or at least one

Entity	Attribute	Required	Attribute Description
Substance(s) in Article	5ec59a9b-77df-54af-a344-5587afdb0acf 7ab9433c-5a4b-5053-9c58-c99aba641c8a		SoC type. The SoC types are defined under Chem-X terminology as SoC A to SoC D. 'Substance of concern' means a substance that: (A) meets the criteria laid down in Article 57 of Regulation (EC) No 1907/2006 and is identified in accordance with Article 59(1) of that Regulation; (B) is classified in Part 3 of Annex VI to Regulation (EC) No 1272/2008 in one of the following hazard classes or hazard categories: (i) carcinogenicity categories 1 and 2; (ii) germ cell mutagenicity categories 1 and 2; (iii) reproductive toxicity categories 1 and 2; (iv) endocrine disruption for human health categories 1 and 2; (v) endocrine disruption for the environment categories 1 and 2; (vi) persistent, mobile and toxic or very persistent, very mobile properties; (vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties; (viii) respiratory sensitisation category 1; (ix) skin sensitisation category 1; (x) hazardous to the aquatic environment — categories chronic 1 to 4; (xi) hazardous to the ozone layer; (xii) specific target organ toxicity — repeated exposure categories 1 and 2; (xiii) specific target organ toxicity — single exposure categories 1 and 2; (C) is regulated under Regulation (EU) 2019/1021; or (D) negatively affects the reuse and recycling of materials in the product in which it is present.
EU REACH Substance(s) in Article	EU OEL? 1b22287d-8345-50ed-b5e9-d0a68991ed63 7ab9433c-5a4b-5053-9c58-c99aba641c8a	Mandatory	EU Occupational Exposure Limit values (indicative OELs and binding OELs) published in various EU directives
EU REACH Substance(s) in Article	Hazard classification (Substance)	Mandatory	Hazard Classification of Substances defines the type of chemical risk of substances, split into physical hazards (e.g., flammable liquids), health hazards (e.g., acute toxicity), and environmental hazards (e.g., hazardous to the aquatic environment)
EU REACH Substance	Listed in Annex VI CLP?	Mandatory	Is the substance listed in CLP Annex VI then this Boolean = 'yes'!

Entity	Attribute	Required	Attribute Description
e(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	399a06d0-8ba4-5d55-a41b-5945e214ecd		Note to entry: Different requirements from EU regulation should be considered.
EU REACH Substance e(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	Nanoform ? 2f59720d-dc9d-5bce-b797-23a4db2d6832	Mandatory	A nanoform is a form of a natural or manufactured substance containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm-100 nm, including also by derogation fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm. Note to entry: Nanoform definitions could be different in accordance with national regulation.
EU REACH Substance e(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	National OEL? 346d22c3-e0b3-5cef-a5f7-b0b43efc8b96	Optional	Occupational Exposure Limit (OEL) published by national authorities e.g.: OEL published in TRGS900 for Germany
EU REACH Substance e(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	Substance Concentration in Article a186c21c-134d-5e03-a484-b153bb834a10	Mandatory	Is a proportion of a substance [e.g.: %, ppb, ppm, mass or volume percentage]
EU REACH Substance e(s) in Article 7ab9433c-5a4b-5053-9c58-c99aba641c8a	Substance identifiers 6abfd942-2432-5499-a1e9-4b6e9dc11605	Mandatory	The product identifier for a substance shall consist of at least the following: (a) if the substance is included in Part 3 of Annex VI, a name and an identification number as given therein; (b) if the substance is not included in Part 3 of Annex VI, but appears in the classification and labelling inventory, a name and an identification number as given therein; (c) if the substance is not included in Part 3 of Annex VI nor in the classification and labelling inventory, the number provided by the CAS (hereinafter referred to as 'the CAS number'), together with the name set out in the nomenclature provided by the IUPAC (hereinafter referred to as 'the IUPAC Nomenclature'), or the CAS number together with another international chemical name(s); or (d) if the CAS number is not available, the

Entity	Attribute	Required	Attribute Description
			name set out in the IUPAC Nomenclature or another international chemical name(s).
EU REACH Substance(s) in Article	Substance intended to be released? 93310fe0-2a5a-551d-81de-a1dec2790cd7	Mandatory	Mark boolean as "yes" if the substance is intended to be released from an article.
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Article	Substance main function baeecc80-73f6-54f9-ab40-b29a415c2692	Optional	Main function (role or effect) that a substance has in a mixture. There can only be one of these. The substance main function is listed in different regulations in so-called substance function types.
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Article	Supplemental Hazard Classification (Substance) e50805ca-5d8d-51d7-a961-734518a15e27	Optional	EUH-phrases are supplementary hazard statements mandated by the CLP Regulation (EC No 1272/2008) to address specific risks not fully covered by standardized GHS hazard codes, such as physical, health, or environmental hazards. Key examples include EUH001 (Explosive when dry), EUH014 (Reacts violently with water), and EUH066 (Repeated exposure may cause skin dryness or cracking)
7ab9433c-5a4b-5053-9c58-c99aba641c8a			
EU REACH Substance(s) in Mixture	active biocide EU? f0441a36-d170-5c6a-bb6f-9ff1a52eff97	Mandatory	A substance defined as active biocide according Regulation (EU) No 528/2012
bfbf59f4-5ee8-546c-bbca-74318776e36e			
EU REACH Substance(s) in Mixture	Constituent Substance category d5aa90a5-2fb6-58f8-82de-e1328993b1aa	Mandatory	Constituent Substance categories are defined by REACH as "Main constituents", "Additives" and "Impurities".
bfbf59f4-5ee8-546c-bbca-74318776e36e			
EU REACH Substance(s) in Mixture	Country of national OEL 32988c45-fc9a-	Optional	Country of national OEL (Occupational Exposure Limits). Note to entry: In the case that the optional OEL Boolean = 'yes' the country should be indicated.

Entity	Attribute	Required	Attribute Description
bfbf59f4-5ee8-546c-bbca-74318776e36e	5de4-a568-86dd0f6e1dc2		
EU REACH Substance(s) in Mixture	CRMA material type substance ?	Mandatory	Critical Raw Material (CRM) and Strategic Raw Material (SRM) substance names in accordance with the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020 Annex I and Annex II. Code Structure: AIS1: Annex I Section 1 - List of strategic raw materials (from (a) to (p)) AIIS1: Annex II Section 1 - List of critical raw materials (from (a) to (hh)) Abbreviations: SRM: Strategic Raw Materials CRM: Critical Raw Materials
bfbf59f4-5ee8-546c-bbca-74318776e36e	e8c51475-39cd-5a9b-bce1-f971abc41bb6		
EU REACH Substance(s) in Mixture	EU ESPR SoC type	Mandatory	Which SoC type according to Regulation (EU) 2024/1781 is a substance may be none or at least one SoC type. The SoC types are defined under Chem-X terminology as SoC A to SoC D. ‘Substance of concern’ means a substance that: (A) meets the criteria laid down in Article 57 of Regulation (EC) No 1907/2006 and is identified in accordance with Article 59(1) of that Regulation; (B) is classified in Part 3 of Annex VI to Regulation (EC) No 1272/2008 in one of the following hazard classes or hazard categories: (i) carcinogenicity categories 1 and 2; (ii) germ cell mutagenicity categories 1 and 2; (iii) reproductive toxicity categories 1 and 2; (iv) endocrine disruption for human health categories 1 and 2; (v) endocrine disruption for the environment categories 1 and 2; (vi) persistent, mobile and toxic or very persistent, very mobile properties; (vii) persistent, bioaccumulative and toxic or very persistent, very bioaccumulative properties; (viii) respiratory sensitisation category 1; (ix) skin sensitisation category 1; (x) hazardous to the aquatic environment — categories chronic 1 to 4; (xi) hazardous to the ozone layer; (xii) specific target organ toxicity — repeated exposure categories 1 and 2; (xiii) specific target organ toxicity — single exposure categories 1 and 2; (C) is regulated under Regulation (EU) 2019/1021; or
bfbf59f4-5ee8-546c-bbca-74318776e36e	5ec59a9b-77df-54af-a344-5587afdb0acf		

Entity	Attribute	Required	Attribute Description
			(D) negatively affects the reuse and recycling of materials in the product in which it is present.
EU REACH Substance(s) in Mixture	EU OEL? 1b22287d-8345-50ed-b5e9-d0a68991ed63 bfbf59f4-5ee8-546c-bbca-74318776e36e	Mandatory	EU Occupational Exposure Limit values (indicative OELs and binding OELs) published in various EU directives
EU REACH Substance(s) in Mixture	Hazard classification (Substance) bfbf59f4-5ee8-546c-bbca-74318776e36e	Mandatory	Hazard Classification of Substances defines the type of chemical risk of substances, split into physical hazards (e.g., flammable liquids), health hazards (e.g., acute toxicity), and environmental hazards (e.g., hazardous to the aquatic environment) bbe8b3ae-b603-5a6b-8570-e51eaedc1b8a
EU REACH Substance(s) in Mixture	Listed in Annex VI CLP? 399a06d0-8ba4-5d55-a41b-5945e214ecdc bfbf59f4-5ee8-546c-bbca-74318776e36e	Mandatory	Is the substance listed in CLP Annex VI then this Boolean = 'yes'! Note to entry: Different requirements from EU regulation should be considered.
EU REACH Substance(s) in Mixture	Nanoform ? 2f59720d-dc9d-5bce-b797-23a4db2d6832 bfbf59f4-5ee8-546c-bbca-74318776e36e	Mandatory	A nanoform is a form of a natural or manufactured substance containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm-100 nm, including also by derogation fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm. Note to entry: Nanoform definitions could be different in accordance with national regulation.
EU REACH Substance(s) in Mixture	National OEL? 346d22c3-e0b3-5cef-a5f7-b0b43efc8b96 bfbf59f4-5ee8-546c-bbca-74318776e36e	Optional	Occupational Exposure Limit (OEL) published by national authorities e.g.: OEL published in TRGS900 for Germany
EU REACH Substance(s) in Mixture	Substance Concentration in Mixture	Mandatory	Is a proportion of a substance [e.g.: %, ppb, ppm, mass or volume percentage]

Entity	Attribute	Required	Attribute Description
bfbf59f4-5ee8-546c-bbca-74318776e36e	a186c21c-134d-5e03-a484-b153bb834a10		
EU REACH Substance e(s) in Mixture	Substance identifiers	Mandatory	The product identifier for a substance shall consist of at least the following: (a) if the substance is included in Part 3 of Annex VI, a name and an identification number as given therein; (b) if the substance is not included in Part 3 of Annex VI, but appears in the classification and labelling inventory, a name and an identification number as given therein; (c) if the substance is not included in Part 3 of Annex VI nor in the classification and labelling inventory, the number provided by the CAS (hereinafter referred to as 'the CAS number'), together with the name set out in the nomenclature provided by the IUPAC (hereinafter referred to as 'the IUPAC Nomenclature'), or the CAS number together with another international chemical name(s); or (d) if the CAS number is not available, the name set out in the IUPAC Nomenclature or another international chemical name(s).
bfbf59f4-5ee8-546c-bbca-74318776e36e	6abfd942-2432-5499-a1e9-4b6e9dc11605		
EU REACH Substance e(s) in Mixture	Substance main function	Optional	Main function (role or effect) that a substance has in a mixture. There can only be one of these. The substance main function is listed in different regulations in so-called substance function types.
bfbf59f4-5ee8-546c-bbca-74318776e36e	baeccc80-73f6-54f9-ab40-b29a415c2692		
EU REACH Substance e(s) in Mixture	Supplemental Hazard Classification (Substance e)	Optional	EUH-phrases are supplementary hazard statements mandated by the CLP Regulation (EC No 1272/2008) to address specific risks not fully covered by standardized GHS hazard codes, such as physical, health, or environmental hazards. Key examples include EUH001 (Explosive when dry), EUH014 (Reacts violently with water), and EUH066 (Repeated exposure may cause skin dryness or cracking)
bfbf59f4-5ee8-546c-bbca-74318776e36e	e50805ca-5d8d-51d7-a961-734518a15e27		
General Material Information	Identified use	Optional	Identified use(s) by the legal entity that places the product on the market (not synchronized with REACH registration)
067c0e9b-575c-553e-ace6-34f6157aa303	6c9c7070-9af0-557e-99ec-e9f908a96921		
General Material Information	Material Category	Mandatory	In accordance with REACH three material categories have been defined.
	c3b8252b-dd59-		

Entity	Attribute	Required	Attribute Description
067c0e9b-575c-553e-ace6-34f6157aa303	5ebf-b257-c6c236352763		
General Material Information	Material Hazard Classification	Mandatory	Hazard Classification of Mixture or Substance (SDS 2.1 and 2.2)
067c0e9b-575c-553e-ace6-34f6157aa303	7d4ad8b9-bc3d-550a-93d4-0b410e6d4084		
General Material Information	Material Labelling Information (CLP)	Mandatory	Selected labelling information elements according with CLP regulation which could be used for automated safety data integration into the digital material passport in the supply chain.
067c0e9b-575c-553e-ace6-34f6157aa303	72693326-c014-57c5-be16-a5aea646edf4		
General Material Information	Uses advised against	Optional	"Uses advised against" means specific applications of a chemical substance or mixture that the supplier explicitly recommends against doing, listing these restrictions in Section 1.2 of the Safety Data Sheet (SDS) under EU REACH regulations.
067c0e9b-575c-553e-ace6-34f6157aa303	918b9108-3e12-5c4f-9e1e-886be9378d7b		
Material Component	Material Component External Passport Link	Optional	Stores a reference to an external Digital Material Passport document. This field enables Material Components to link directly to specific passport data of the Material Component (e.g. Packaging Material) maintained in another DMP /DPP.
d85def85-9ab4-5045-baa5-4ac6ddb03eca	ec091571-b501-546b-996c-827155899205		
Material Component	Material Component Granularity	Optional	Specifies whether Material Component data applies at the Batch, Model, or Item level.
d85def85-9ab4-5045-baa5-4ac6ddb03eca	cbedeede-85d4-5189-9529-20c126a79a96		
Material Component	Material Component ID	Mandatory	Unique identifier (UUID) for the Material Component across systems. Additional identifiers may be stored in the Nameplate section.
d85def85-9ab4-5045-baa5-4ac6ddb03eca	e1e2a0d0-deb2-5231-81ab-968bae43da17		

Entity	Attribute	Required	Attribute Description
Material Component	Material Component Name	Optional	State the name of the material component in order for it to be recognizable by the receiver.
d85def85-9ab4-5045-baa5-4ac6ddb03eca	5397d523-680b-5aa2-b506-d6a4ed808c62		
Material Component	Material Component Type	Optional	Categorizes Material Components by their functional characteristics within the product ecosystem. This classification facilitates precise material identification and management by distinguishing between unpacked good, (components of) the packaging, the packaged product, and miscellaneous items, enabling comprehensive material data organization and lifecycle transparency.
d85def85-9ab4-5045-baa5-4ac6ddb03eca	297eae7c-4ded-5b26-ad9a-6cc9124213bf		
Nameplate	Batch Number	Optional	Unique ID for a specific batch.
357c450d-64a8-5d56-ab2b-f1498dec5227	090f3774-8f75-54d2-8303-518acda96c1b		
Nameplate	Business Partner Identifier	Mandatory	
357c450d-64a8-5d56-ab2b-f1498dec5227	24470346-2af2-510a-b4fc-98c135864457		
Nameplate	Company Name	Mandatory	Name of the legal entity.
357c450d-64a8-5d56-ab2b-f1498dec5227	9290c8d4-6f62-570f-94fd-67092edc3e6d		
Nameplate	Granularity Level	Optional	Specifies whether Digital Material Passport data applies at the Batch, Model, or Item level.
357c450d-64a8-5d56-ab2b-f1498dec5227	b19b2a2a-19b5-57b0-9ccf-93f8c0ce7d95		
Nameplate	Material Number	Optional	A generic number that represents a material in the material management system.
357c450d-64a8-5d56-ab2b-f1498dec5227	c2672b1d-12fb-5ac1-a744-1e02cc4a838e		
Nameplate	Product Name	Mandatory	Official commercial product name (Could also be the REACH Article name)
357c450d-64a8-5d56-ab2b-f1498dec5227	30e9ced6-665c-5253-bb14-39d10029234f		

Entity	Attribute	Required	Attribute Description
Nameplate	Serial Number	Optional	Unique ID, identifying this physically existing instance of a material.
357c450d-64a8-5d56-ab2b-f1498dec5227	9a966793-9756-5eb0-8029-05d42d92499f		
Nameplate	Trade Product Identifier	Mandatory	A list of identifiers for a trade product.
357c450d-64a8-5d56-ab2b-f1498dec5227	771b3394-d587-5410-a91e-6150924a4c8f		
PCF	PCF Allocation approach used for waste incineration with energy recovery	Mandatory	Approach applied for allocation of impacts in the case or waste treatment with energy recovery. One of the three allocation approaches shall be followed: * Cut-off approach also known as recycled content approach; * Reverse Cut-off approach also known as waste allocation; * System expansion & substitution. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
8ec42a82-2a93-57c0-9b70-eb214d50dd0b	cc00cb6c-9755-5c47-a5ea-a91d518575ad		
PCF	PCF Allocation rules used	Optional	Describe the allocation rules applied to your foreground data (e.g., physical, economic allocation). Multiple entries possible. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
8ec42a82-2a93-57c0-9b70-eb214d50dd0b	b1379e2e-c431-589f-abb1-a839141a6c07		
PCF	PCF Biogenic carbon content per DU	Mandatory	Carbon content defined as "biogenic". It can be attributed by means of Mass Balance (if declared in attribute "CoC Model", [CoC Model dataspot@chem-x](https://www.dataspot.io/web/chem-x/attributes/cc0e077b-72ca-4f7f-90a0-d6c0523dac1a)). Expressed as kg C / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged)
8ec42a82-2a93-57c0-9b70-eb214d50dd0b	55774bd7-546f-5bef-9884-229b5d135956		
PCF	PCF Calculation approach for material	Mandatory	Declare which approach for material recycling has been applied. Possible options: not-applicable/empty, cut-off, cut-off plus, Upstream system expansion (USE). Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline)
8ec42a82-2a93-57c0-9b70-eb214d50dd0b			

Entity	Attribute	Required	Attribute Description
	recycling		initiative.com/pcf-guideline)), Environmental Sustainability Guideline (https://www.chem-x.de/publication/1 (https://www.chem-x.de/publication/1)) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Calculation Approach used for CCU	Mandatory	Declare which approach for CCU has been applied. Possible options: not-applicable; cut-off method; credit method.
	1feafcfb-b0ee-54bd-a24b-c36395cd6b15		
	c2c87864-5490-5f80-b3b9-1da5de5caa86		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF CCS/BEC CS applied	Mandatory	Declare if CCS/BECCS (incl. geological storage) technology has been employed. BECCS stands for Bioenergy with Carbon Capture and Storage.
	bea6cba2-0a14-595d-bc02-bfaba3edf19b		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF CCS capturing	Optional	Declare CO2/kg captured and stored. Apply optionally only if in "CCS/BECCS applied" the option "true" has been selected.
	9b4a127a-faae-5f31-a698-9ddac975cf68		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF CCU- based carbon content	Optional	Carbon content from Carbon Capture and Utilization (CCU). Apply if in "Calculation Approach used for CCU" the options "cut-off method" or "credit method" have been selected. If "credit method" is followed, this position indicates the amount of the credit. Defined as kg CCU-C/declared unit
	5e655195-f93b-5cfd-a67a-f1618a392bde		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF CCU CO2-origin	Optional	Source from where CO2 is captured (e.g. direct air capture (DAC) or source ammonia plant). Leave empty or enter "not applicable" in case field is not relevant.
	ca07fcac-738a-5b4c-a642-3d37fef49cb2		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF CCU Credit Certificate Scheme	Optional	Required only if in "Calculation Approach used for CCU" the option "credit method" has been selected. Declare which certification scheme has been used for CCU credit method.
	0dcca072-984c-5d5b-b178-4f751fe59394		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Comment	Optional	Comment on anything relevant for the receiving party or declarant (e.g. useful to understand the representativeness of this PCF). This free text may contain any non-confidential information, which can't be documented in the data model attributes.
	4c3a4b90-b7af-57b8-ac86-0738707cdfb2		
PCF	PCF Cross-	Mandatory	Standards the PCF calculation is based on (multiple entries are possible). Please note: the PCF can be

Entity	Attribute	Required	Attribute Description
8ec42a82-2a93-57c0-9b70-eb214d50dd0b	sectoral standards applied		calculated according to another standard than the standards which defines the communication format (data model). It can be a list of multiple selected standards.
	c1f59ba8-a5ca-5d2b-9bc1-618c8b3cb0ce		
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Cut-off rule e48ca8ea-c43f-517b-9760-0a5229f939e5	Mandatory	Applied cut-off criteria in percent of total emissions. This specifies which percentage of emissions were excluded from the PCF in total, in order to reduce efforts in data collection of irrelevant processes. Value has to be between 0 and 10, Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details and requirements.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Data Quality Rating - Geographical representativeness 11bfe7ae-3404-5d57-b3be-5a0df46ccd8b	Optional	Component of the Data Quality Rating (DQR). The degree to which the data reflects the actual geographic location of the manufacturing process. processes within the inventory boundary (e.g., country or region). Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Data Quality Rating - Technological representativeness e97b712f-8721-5d93-815d-411dcd84e5a8	Optional	Component of the Data Quality Rating (DQR) The degree to which the data reflects the actual technology(ies) used. Decimal value between 1 and 5. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Data Quality Rating - Temporal representativeness 6838cfe3-cb0c-522c-8f01-ebcd4f46b731	Optional	Component of the Data Quality Rating (DQR). The degree to which the reference period is for the data set is close to the issue date. Decimal value between 1 and 5. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF	PCF Date of issue	Mandatory	The time stamp at which the PCF has been declared, independently of when or if it has been shared. This

Entity	Attribute	Required	Attribute Description
8ec42a82-2a93-57c0-9b70-eb214d50dd0b	f47068f8-37c9-534e-af8b-3410ee46dd76		represents the validity period start unless specified separately.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distributio n Stage GWP Aviation emissions (productio n gate to customer gate if applicable) d508dec6-e6d0-5708-9b10-4a2fbda9e1c4	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate). Position H: Aviation emissions occurring in the reported distribution stage after the production gate until customer gate (if applicable). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distributio n Stage GWP biogenic CO ₂ - uptake (biogenic CO ₂ contained in the product) 305507bc-5dee-5394-bd55-eda000821934	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate). Position D (negative contribution): biogenic CO ₂ uptake in the product. It can be attributed by means of Mass Balancing: in such a case the "Mass Balancing used" must be set to "True". Apply mandatorily if in "Biogenic Carbon Content" a non-"0" has been selected. It's required if Biogenic Carbon Content is specified. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distributio n Stage GWP biogenic emissions other than CO ₂ 91a57c38-1a43-5e05-8b7c-331bf3e4d4a9	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate). Position C: non-CO ₂ biogenic emissions related to agricultural activities. It encompasses emissions as described in PACT v3.0: CH ₄ emissions from livestock and manure; CH ₄ emissions from biomass burning and fires; CH ₄ emissions from rice production; CH ₄ emissions from transformation and degradation (e.g., combustion, digestion, composting, landfilling). It must be noted that N ₂ O from land management activities are not included in this position and are reported in position A and A1 (as a detail). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-	PCF Distributio n Stage	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate).

Entity	Attribute	Required	Attribute Description
9b70- eb214d50dd0b	GWP fossil		Position A: includes all fossil emissions, including industrial processes, stationary/mobile combustion and fugitive emissions. This position includes the fossil emissions associated to land management (A1: “GWP fossil land management”). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
23c250a0-e181- 51a0-9f46- 36d260606de5			
PCF	PCF	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate).
8ec42a82- 2a93-57c0- 9b70- eb214d50dd0b	Distributio n Stage		Position A1: fossil emissions occurring in land management activities. This is an optional detail, which must be included in the total position A “GWP fossil”. It encompasses emissions as described in PACTv3.0: N ₂ O emissions from fertilizers; fossil CO ₂ emissions from soil management; CO ₂ ; emissions from soil amendments (such as lime, urea and other inputs); land management production emissions (including CO ₂ emissions from on-site machinery, and emissions from manufacturing of production inputs such as fertilizers and chemical inputs,); hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) emissions from air-conditioning and refrigerant use; emissions from on-site waste or wastewater management; indirect emissions from purchased energy associated with land management production activities. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
	GWP fossil land managem ent		
			9a7908f7-f949- 594c-b20d- 7d6754b3dda5
PCF	PCF	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate).
8ec42a82- 2a93-57c0- 9b70- eb214d50dd0b	Distributio n Stage		Position F: carbon stock losses occurring within the same land use category or subcategory due to agricultural practices such as tillage, field preparations, pruning and harvest. Land Management CO ₂ emissions measures biogenic CO ₂ emissions from a net loss in carbon stock within one land use category or subcategory. This includes impact on the land-carbon pools, including above- and below-ground biomass, dead organic matter, and soil carbon pools. If the carbon stock increases within the same land use category and the conditions to report removals are met, this may be calculated as a land management CO ₂ removal (position G). Refer to PACT v3.0 for details.
	GWP Land Manageme nt CO2 Emissions		Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
			fc3a9ec3-32d0- 5498-94e3- b9206f845783
PCF	PCF	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate).
8ec42a82- 2a93-57c0-	Distributio n Stage		Position G (negative contribution): Land management removals are net CO ₂ removals resulting from net
	GWP Land		

Entity	Attribute	Required	Attribute Description
9b70- eb214d50dd0b	Management CO2 Removals		increases to carbon stored in land-based carbon pools (biomass, dead organic matter and soil carbon pools) due to ongoing land management practices. This extra net carbon stock is gained over the crop rotation or crop cultivation cycle (e.g., multiple years for perennial crops and multiple years in a rotation that includes annual crops). Refer to PACT v3.0 for details. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
24bed797-52b9-5c0e-bce8-da6b3e36a27d			
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distribution Stage GWP land use change (LUC, excluding iLUC)	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate). Position E: Emissions from LUC constitute a release of GHG emissions due to a change in land use from one land use category or subcategory to another, such as primary forest to agricultural land, or peat land (type of wetland) to cropland. This position encompasses dLUC (direct land use change) emissions. If that data is not available, companies should account for LUC using statistical land-use change (sLUC) emissions. iLUC emissions are excluded. Refer to PACT v3.0 for details. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
850b9fcd-9124-54e7-94ff-673cd6a94476			
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distribution Stage GWP Removals (BECCS)	Optional	Referring to the lifecycle stage "Distribution" (outbound logistics: gate-to-gate). Position B (negative contribution): carbon capture and geologic storage of CO ₂ emissions and counting as removal (e.g. technology capture of biogenic CO ₂ emissions / BECCS - refer to PACT v3.0). Apply mandatorily only if in "CCS / BECCS applied" the option "True" has been selected, AND only if the case of "removal" (e.g. BECCS) applies. If it's not a removal, the field should be declared as "0". Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
34f9a901-7f41-59bf-8277-3eeca120083			
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distribution Stage GWP total excl. bio. uptake	Optional	Product carbon footprint - value of Global Warming Potential impact category - for the lifecycle stage "Distribution" (outbound logistics: gate-to-gate) excluding biogenic uptake (Position T2 below). Reference: Tfs PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/). Position T2 = A + B(negative contribution) + C + E + F + G(negative contribution) + H. Description of positions A, B, C, E, F, G, H provided in respective following attributes. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
da24cddf-4198-55a6-862a-62d35bbba54b			

Entity	Attribute	Required	Attribute Description
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Distributio n Stage GWP total incl. bio. uptake d66c85cc-9fa3-5a9e-b7bc-9b85bb702126	Optional	Product carbon footprint - value of Global Warming Potential impact category - for the lifecycle stage "Distribution" (outbound logistics: gate-to-gate) including biogenic uptake (Position T1 below). Reference: TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/). Position T1 = A + B(negative contribution) + C + D(negative contribution) + E + F + G(negative contribution) + H. Description of positions A, B, C, D, E, F, G, H provided in respective following attributes. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Exemption rules: explanatio n f0a616a3-6e3e-5aea-b845-b749b7dbb5ac	Optional	Rationale behind exclusion of specific PCF emissions. Potential Cut-offs are defined in the TfS Guideline
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Fossil carbon content per DU 5b40c259-b317-5adb-a70d-180239ce6efd	Optional	Fossil carbon content: defaulted equal to "Total carbon content - Biogenic carbon content". Expressed as kg C / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged)
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Geography Country 09a53073-4fe0-5669-8549-ec6ff7422e4	Optional	The location of factory gate(s) refers to the last manufacturing step. It is the country location where the product is produced. State the country as country code according to ISO 3166-1 alpha-2 (example: 'United States' = US, 'France' = FR); https://www.iso.org/glossary-for-iso-3166.html; If present, the value MUST conform to data type ISO3166.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Geography Country Subdivisio n d4e2f104-24bb-5ad7-a48e-06f97f8fb33e	Optional	The location of factory gate(s) refers to the last manufacturing step. It is the location where the product is produced. State the country subdivision as subdivision code according to ISO 3166-2 (example: 'Germany, Bavaria' = DE-BY); https://www.iso.org/glossary-for-iso-3166.html. If present, the value MUST conform to data type RegionOrSubregion.

Entity	Attribute	Required	Attribute Description
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Geography Region or Subregion c1ea9e38-44d3-58d2-ac99-398387cd6bc1	Mandatory	Region of the supplier production site and for which the declared PCF is valid. Examples: "Global", "Europe", "Eastern Europe".
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF ID 7269eb6d-d6da-5b9f-bc1e-bb6554f574b6	Mandatory	Product Carbon Footprint Identifier (PCF ID) is used to identify a specific PCF. In case of update a new PCF ID is required. It is an automatically generated number (UUID). The product carbon footprint identifier has to be a global unique value. In case of manual entry, it can be generated by applications like www.uuidgenerator.net/version4
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Important unit processes and used technologies 2485dd68-a0f6-5cd9-86d1-b17ae431f13f	Optional	Brief description of the manufacturing steps of the product (including general description of used technologies) significantly contributing to the PCF value. The processes are attributable to each lifecycle stage.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF IPCC report version of GWP values a838f4ae-aed6-5179-89c4-b2c25a3e6ded	Mandatory	Version of the Intergovernmental Panel of Climate Change (IPCC) Assessment Report (AR) used for PCF determination. It provides the global warming potential values for climate gases related to CO2. Current default report is AR6. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Mass-Balance Calculation approach 604b87ee-095e-5c0e-8726-ae9ce4c69e37	Mandatory	Required if "CoC Model" ([CoC Model dataspot@chem-x](https://www.dataspot.io/web/chem-x/attributes/cc0e077b-72ca-4f7f-90a0-d6c0523dac1a)). is equal to "Mass Balance (credit method). Options: "Conventional reference"; "Inventory"; "Both Conventional reference & Inventory". Indicating the mass-balance calculation approach followed. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental

Entity	Attribute	Required	Attribute Description
			Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Partial or a full PCF declaration 562c9099-3429-544d-8119-e50134636c6d	Mandatory	A partial PCF (cradle-to-gate) is covering the emissions from resource extraction until the product leaves the gate of your organization (optionally including the distribution stage). A full PCF (cradle-to-grave) is covering the complete lifecycle of the product from resource extraction all the way to end-of-life stage. 'Cradle-to-gate' selected as default value for TfS.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Preceding IDs 79a9c9b5-4114-5264-909e-b95bce6b4a9e	Optional	If defined, must be a non-empty set of preceding product carbon footprint identifiers (UUIDs). See also "PCF ID" ([PCF ID dataspot@chem-x](https://www.dataspot.io/web/chem-x/attributes/f3b5cdd4-7ae4-4e16-81a4-26cbb7555c17)).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Primary Data Share (PDS) b0b197a7-798c-5c74-a4fe-b3db4b1090cb	Optional	Share of primary data in the final PCF Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP Aviation emissions (upstream) 4ca58341-337a-5a2f-b1df-7798ad4927ab	Mandatory	Referring to the lifecycle stage "Production" (cradle-to-gate). Position H: Aviation emissions which have occurred in upstream distribution stages cradle-to-gate (if applicable). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP biogenic CO ₂ -uptake (biogenic CO ₂ contained in the product) f83d838a-2064-589d-b2b0-1648c0d14ff1	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position D (negative contribution): biogenic CO ₂ uptake in the product. It can be attributed by means of Mass Balancing: in such a case the "Mass Balancing used" must be set to "True". Apply mandatorily if in "Biogenic Carbon Content" a non-"0" has been selected. It's required if Biogenic Carbon Content is specified. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-	PCF Production Stage GWP	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate).

Entity	Attribute	Required	Attribute Description
2a93-57c0-9b70-eb214d50dd0b	biogenic emissions other than CO ₂		Position C: non-CO ₂ biogenic emissions related to agricultural activities. It encompasses emissions as described in PACT v3.0: CH ₄ emissions from livestock and manure; CH ₄ emissions from biomass burning and fires; CH ₄ emissions from rice production; CH ₄ emissions from transformation and degradation (e.g., combustion, digestion, composting, landfilling). It must be noted that N ₂ O from land management activities are not included in this position and are reported in position A and A1 (as a detail). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP fossil	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position A: includes all fossil emissions, including industrial processes, stationary/mobile combustion and fugitive emissions. This position includes the fossil emissions associated to land management (A1: "GWP fossil land management"). Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP fossil land management	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position A1: fossil emissions occurring in land management activities. This is an optional detail, which must be included in the total position A "GWP fossil". It encompasses emissions as described in PACTv3.0: N ₂ O emissions from fertilizers; fossil CO ₂ emissions from soil management; CO ₂ emissions from soil amendments (such as lime, urea and other inputs); land management production emissions (including CO ₂ emissions from on-site machinery, and emissions from manufacturing of production inputs such as fertilizers and chemical inputs,); hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) emissions from air-conditioning and refrigerant use; emissions from on-site waste or wastewater management; indirect emissions from purchased energy associated with land management production activities. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP Land Management CO ₂ Emissions	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position F: carbon stock losses occurring within the same land use category or subcategory due to agricultural practices such as tillage, field preparations, pruning and harvest. Land Management CO ₂ emissions measures biogenic CO ₂ emissions from a net loss in carbon stock within one land use

Entity	Attribute	Required	Attribute Description
	aa434d16-bccb-512a-9a07-be433c8df56d		category or subcategory. This includes impact on the land-carbon pools, including above- and below-ground biomass, dead organic matter, and soil carbon pools. If the carbon stock increases within the same land use category and the conditions to report removals are met, this may be calculated as a land management CO ₂ removal (position G). Refer to PACT v3.0 for details. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP Land Manageme nt CO2 Removals ccc56543-6741-5079-98a8-306786d3676c	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position G (negative contribution): Land management removals are net CO ₂ removals resulting from net increases to carbon stored in land-based carbon pools (biomass, dead organic matter and soil carbon pools) due to ongoing land management practices. This extra net carbon stock is gained over the crop rotation or crop cultivation cycle (e.g., multiple years for perennial crops and multiple years in a rotation that includes annual crops). Refer to PACT v3.0 for details. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP land use change (LUC, excluding iLUC) 81ba141c-2bb6-5634-9135-98189b43943a	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Emissions from LUC constitute a release of GHG emissions due to a change in land use from one land use category or subcategory to another, such as primary forest to agricultural land, or peat land (type of wetland) to cropland. This position encompasses dLUC (direct land use change) emissions. If that data is not available, companies should account for LUC using statistical land-use change (sLUC) emissions. iLUC emissions are excluded. Refer to PACT v3.0 for details. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP Removals (BECCS) d6dff9da-64a3-5897-87a3-ccc348af8ee6	Optional	Referring to the lifecycle stage "Production" (cradle-to-gate). Position B (negative contribution): carbon capture and geologic storage of CO ₂ emissions and counting as removal (e.g. technology capture of biogenic CO ₂ emissions / BECCS - refer to PACT v3.0). Apply mandatorily only if in "CCS/BECCS applied" the option "True" has been selected, AND only if the case of "removal" (e.g. BECCS) applies. If it's not a removal, the field should be declared as "0". Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).

Entity	Attribute	Required	Attribute Description
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP total excl. bio. uptake f7f55b38-05c6-531c-a83b-e5f5af2f3746	Mandatory	Product carbon footprint - value of Global Warming Potential impact category - for the lifecycle stage "Production" (cradle-to-gate) excluding biogenic uptake (Position T2 below). Reference: TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/). Position T2 = A + B(negative contribution) + C + E + F + G(negative contribution) + H. Description of positions A, B, C, E, F, G, H provided in respective following attributes. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Production Stage GWP total incl. bio. uptake 721635df-5b5a-5359-9d7a-bede8abb1b0f	Mandatory	Product carbon footprint - value of Global Warming Potential impact category - for the lifecycle stage "Production" (cradle-to-gate) including biogenic uptake (Position T1 below). Reference: TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/). Position T1 = A + B(negative contribution) + C + D(negative contribution) + E + F + G(negative contribution) + H. Description of positions A, B, C, D, E, F, G, H provided in respective following attributes. Expressed as kg CO ₂ e / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Product or sector rules bb06d6a8-6f4c-55ed-a390-3330063d040e	Mandatory	Name of the most specific rule followed to calculate the PCF (i.e., sectoral standard, sectoral category rule, product category rule (PCR)). It can be a list of multiple selected standards.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Recycled carbon content per DU 805054d9-dec4-5ecc-8b61-891c866b4228	Optional	Carbon content defined as recycled. It can be attributed by means of Mass Balance (if declared in attribute "CoC Model", [CoC Model dataspot@chem-x](https://www.dataspot.io/web/chem-x/attributes/cc0e077b-72ca-4f7f-90a0-d6c0523dac1a)). Expressed as kg C / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged)
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Reference period end 6b37aade-4c54-55ca-9092-87dd695ba719	Mandatory	End of time period of data collection for primary data sources

Entity	Attribute	Required	Attribute Description
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Reference period start efde1b4c-cff4-599f-ac83-69fb1d1c87bc	Mandatory	Start of time period of data collection for primary data sources (this does not refer to publication dates of secondary data)
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Secondary data source and version 77e83c5a-330c-588a-9f56-c12494503272	Mandatory	Which secondary data sources and versions have been used for the foreground and background systems (e.g. data bases such as ecoinvent). Multiple entries possible.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF status c45a7715-96d4-5ff1-8277-b0b1406d86ce	Optional	The PCF status is a WBCSD PACT pathfinder specific attribute, which is not used by Chem-X/TfS but kept for interoperability reasons. If defined, the value must be one of the following: "Active", "Deprecated". It is defaulted to "Active".
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF System expansion & Substitutio n used 46566f99-eec1-50f8-99c6-9d2d131dc71a	Optional	Optionally declare if and which system expansion and substitution has been used form the positive list for system expansion and substitution of TfS (https://www.tfs-initiative.com/app/uploads/2024/11/List-of-substitued-products-Multi-output-TfS.pdf).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF TfS PCR used 36d8dd99-25ae-59b9-a181-58c64cfbc4ee	Optional	Optionally declare if and which PCR has been used from the positive list for PCR of TfS. https://www.tfs-initiative.com/app/uploads/2024/11/List-of-accepted-PCR-by-TfS.pdf
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Total carbon content per DU ead61d04-47d4-59d7-9498-acb848cc904b	Mandatory	Total carbon content. Expressed as kg C / Declared Unit. Typically, the Declared Unit (DU) is 1 kg of product (unpackaged).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Type of recycled content da2e6772-bc37-5971-b400-f5c925bbe7a6	Optional	Type of recycled content chosen from value list (post-consumer; post-industrial)

Entity	Attribute	Required	Attribute Description
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF USE Credit 736cf372-d86b-5a7b-be0e-11a43cdcf8f7	Optional	Required only If in "Calculation approach for material recycling" the option "Upstream System Expansion (USE)" has been selected. Declare the CO ₂ /kg amount of the Upstream System Expansion (USE) credit. Refer to TfS PCF Guideline (https://www.tfs-initiative.com/pcf-guideline), Environmental Sustainability Guideline (https://www.chem-x.de/publication/) for details.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF USE Credit Certificate Scheme 64f95399-2d11-5df5-9600-9cc888e2d748	Optional	Required only If in "Calculation approach for material recycling" the option "Upstream System Expansion (USE)" has been selected. Declare which certification scheme has been used for Upstream System Expansion (USE).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Validity period end 1b719474-d3c3-57fa-bd38-1178426b89b1	Mandatory	Time stamp defining the expected end of the validity period of the PCF declaration or expressing the date of PCF update. Default attribute is 3 years after "reference period start" (as per TfS PCF Guideline).
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF Validity period start 5628e142-6a3f-5c06-be09-20c84ef007eb	Optional	If defined, representing start time of PCF validity, deviating from "Date of Issue" (in which case "PCF Validity Period Start" would fall after the "PCF Date of Issue". If not defined, the "PCF Date of Issue" will represent the start of PCF validity.
PCF 8ec42a82-2a93-57c0-9b70-eb214d50dd0b	PCF version f65984e4-590f-5991-9344-b5b62501a9f0	Optional	The PCF version is a WBCSD PACT pathfinder specific attribute, which is not used by Chem-X/TfS but kept for interoperability reasons. It is defaulted to "1"
Recycled Content 9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	Recycled Content Comment 3989c6d2-af6e-58ad-8527-2a099dba7bdd	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't be documented in the attributes with specific purpose of this Circularity Assessment documentation.
Recycled Content 9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	Recycled Content Date of issue a6f76d06-f921-5d9c-8dba-92ebc53b78d7	Mandatory	The time stamp at which the Circularity Content (e.g., Recycled, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.

Entity	Attribute	Required	Attribute Description
Recycled Content	Recycled Content Id	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated.
9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	8104bd34-1d5e-51d9-a60a-a7c2e741aea1		
Recycled Content	Recycled Content Preceding Ids	Optional	If defined, must be a non-empty set of preceding Recycled Content identifiers (UUIDs). See also "Recycled Content ID".
9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	fe2edd51-9f83-52ef-9b42-c84c27dbe5e3		
Recycled Content	Recycled Content Standard applied	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible.
9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	0bcb7ab0-862d-597e-b13f-34430f40d645		
Recycled Content	Recycled Content Total	Mandatory	Fraction of material mass content classified as recycled. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	57eb5b8e-df6e-56ce-88d9-e0dc35ae89a1		
Recycled Content	Recycled Content Validity period start	Optional	If defined, representing start time of Recycled Content validity, deviating from "Date of Issue" (in which case "Recycled Content Validity Period Start" would fall after the "Recycled Content Date of Issue". If not defined, the "Recycled Content Date of Issue" will represent the start of Recycled Content validity.
9a7b3bd3-4f58-587c-bd6a-7c630bd01a02	cb3c3bff-d274-5c14-b65a-0689f0c8ba30		
Renewable Content	Renewable Content Comment	Optional	Comment/Document of anything relevant for the receiving party or your own company, necessary to understand the representativeness of this Circularity Assessment for his/her application. This free text may contain any non-confidential information, which can't be documented in the attributes with specific purpose of this Circularity Assessment documentation.
c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	f7cf9310-fa99-57a6-a9c5-83d1b20b900e		
Renewable Content	Renewable Content Date of issue	Mandatory	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), has been declared, independently of when or if it has been shared. This represents the validity period start unless specified separately.
c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	5a6c56c4-fdbe-5638-93ad-f6b121d00784		

Entity	Attribute	Required	Attribute Description
Renewable Content	Renewable Content Id c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Mandatory	This ID is used to identify a specific metric. In case of update of the metric a new ID is required. It is automatically generated. 91408167-9b7d-5a49-af58-26815c3b87bb
Renewable Content	Renewable Content Preceding Ids c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Optional	If defined, must be a non-empty set of preceding Renewable Content identifiers (UUIDs). See also "Renewable Content ID". 58769f2f-0f58-5079-a8ea-1535086c8889
Renewable Content	Renewable Content Standard applied c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Mandatory	Select standard used (cross-sectoral, sectoral) or the detailed prescription of a regulation. Multiple entry possible. 0cbcf975-a003-5694-a976-a593d369af01
Renewable Content	Renewable Content Total c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Mandatory	Fraction of material mass content classified as renewable. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095, where applicable by sector specific rules. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Renewable Content	Renewable Content Validity period start c7b0b5e1-b376-5cd0-b7cc-b2ea4bc9b9bd	Optional	The time stamp at which the Circularity Content (e.g., Biogenic, Renewable), starts its validity. Unless specified separately, it shall be equal to the Date of Issue. 01cd2ca4-17eb-5d32-b3e1-afe230ac5ead
Sustainability	Declared unit 9871b20b-2611-50fd-8615-2219f73cca2b	Mandatory	Quantity of a product for use as a reference unit in the quantification of a partial LCA. Note: Typically, the declared unit is referring to a physical quantity, for chemicals for example "1 kg of product (unpackaged)".
Sustainability	Product mass [kg] per declared unit 9871b20b-2611-50fd-8615-2219f73cca2b	Mandatory	The mass of the product per declared unit amount (e.g., the declared unit of a circuit board is one piece; one piece represents 0.123 kg) excluding packaging. This is required, especially if piece is selected. ec1840a5-f5cd-51a7-8ccf-fbdc9af2c8bb

Entity	Attribute	Required	Attribute Description
Sustainability 9871b20b-2611-50fd-8615-2219f73cca2b	Quantity (of declared unit) 4ff37bf9-cfc4-52fb-aa02-953599f3ae1b	Mandatory	The quantity (amount) of the declared unit as numerical value to which the sustainability metric (e.g., PCF) is referring to. Typically, is equal to 1.
Sustainability 9871b20b-2611-50fd-8615-2219f73cca2b	Sustainability Granularity 3f814fcd-9d66-5d1a-8c5a-6ba14e611cca	Optional	Specifies whether Sustainability data applies at Batch, Model, or Item level. Defaults to Model level. Overrides Granularity on Material Component level.
Sustainability 9871b20b-2611-50fd-8615-2219f73cca2b	Sustainability Legal Statement 5ea1e977-3437-5d82-886d-5a3d2b862f41	Optional	In case your organization defined certain legal conditions which apply to the publication of this sustainability data, you can state the legal disclaimer in here. The text might include an URL link to the legal disclaimer of the sustainability data provider.
Trade Product Identifiers 53b3de9e-07da-5d7b-9a79-56f0ee084037	Company Material Identifier 0f43fcd7-c105-5c5b-8923-338b82b43ea3	Optional	A generic number that represents a material in the material management system.
Trade Product Identifiers 53b3de9e-07da-5d7b-9a79-56f0ee084037	Digital Object Identifier dd9d4bd6-a8ba-5691-ba0a-f0f192c141ed	Optional	A DOI, or Digital Object Identifier, is a string of numbers, letters and symbols used to uniquely identify an article or document, and to provide it with a permanent web address (URL).
Trade Product Identifiers 53b3de9e-07da-5d7b-9a79-56f0ee084037	ETIM Technical Information Model 4c6db8e3-f09a-5055-b495-9ae417f056c5	Optional	ETIM stands for European Technical Information Model (originally Electro-Technical Information Model) and is an open international standard for the unambiguous classification and specification of technical products.
Trade Product Identifiers 53b3de9e-07da-5d7b-9a79-56f0ee084037	European Article Number 68a2e080-7024-5d45-844a-ea7b998cf2ab	Optional	EAN stands for European Article Number (also known as International Article Number) and is a global standard for product identification in retail and trade.

Entity	Attribute	Required	Attribute Description
Trade Product Identifiers	Global Trade Item Number 8ab9dddb-4ec9-553f-97da-f2417d4cb57c 53b3de9e-07da-5d7b-9a79-56f0ee084037	Optional	Global Trade Item Number (GTIN) is a standardized, globally unique identifier used to uniquely identify trade items, such as products or services, anywhere in the supply chain.
Trade Product Identifiers	Universal Product Code d9d7019e-a100-51ab-89f6-febd5c790848 53b3de9e-07da-5d7b-9a79-56f0ee084037	Optional	UPC stands for Universal Product Code, a standardized 12-digit barcode symbology used globally to identify retail trade items in stores and supply chains.
Waste Origin & Recycling Technology	Waste Origin & Recycling Technology Content 012805ad-eb7a-507e-bc60-e2434c30eab5 675ba06b-8344-5945-a249-b16316f238fe	Optional	Fraction of material mass content classified as per declared waste origin or recycling technology indicators. Note 1: Can be attributed by means of a mass balance chain of custody model as defined in ISO 22095. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Waste Origin & Recycling Technology	Recycling Technology 3cfe4bf0-9b27-5308-9372-e1ed8d36c726 675ba06b-8344-5945-a249-b16316f238fe	Optional	Describes the recycling technology employed to obtain the recycled content contribution reported under "Waste Origin & Recycling Technology Content". Reference: Circularity Guideline (https://www.chem-x.de/publication/)
Waste Origin & Recycling Technology	Waste Origin Geography 301a070d-379a-55ec-a657-327f9f9e669e 675ba06b-8344-5945-a249-b16316f238fe	Optional	Describes the geographic origin of the waste from which the recycled content contribution reported under "Waste Origin & Recycling Technology Content" originates. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
Waste Origin & Recycling Technology	Waste Origin Industry 7ae515f9-68ad-5067-8adb-314abbc6f457 675ba06b-8344-5945-a249-b16316f238fe	Optional	Describes the industry origin of the waste from which the recycled content contribution reported under "Waste Origin & Recycling Technology Content" originates. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.

Entity	Attribute	Required	Attribute Description
Waste Origin & Recycling Technology	Waste Origin value chain step	Optional	Describes the value chain step of the waste from which the recycled content contribution reported under "Waste Origin & Recycling Technology Content" originates. Refer to Chem-X Circularity Guideline (https://www.chem-x.de/publication/) for details and requirements.
675ba06b-8344-5945-a249-b16316f238fe	2cd84adc-7179-52f8-9738-ffb49d27fc7d		

11. Metamodel Physical Architecture

The Chem-X Data Model v0.9 employs a highly modular, multi-file JSON Schema architecture. Instead of relying on a single, monolithic schema file, the architecture is designed around a core root schema that dynamically references independent sub-schemas for specialized data domains.

This decoupling ensures that individual domains (such as Sustainability or Material Declaration) can be updated, versioned, or expanded in the future without invalidating the core identity structure of the Digital Material Passport.

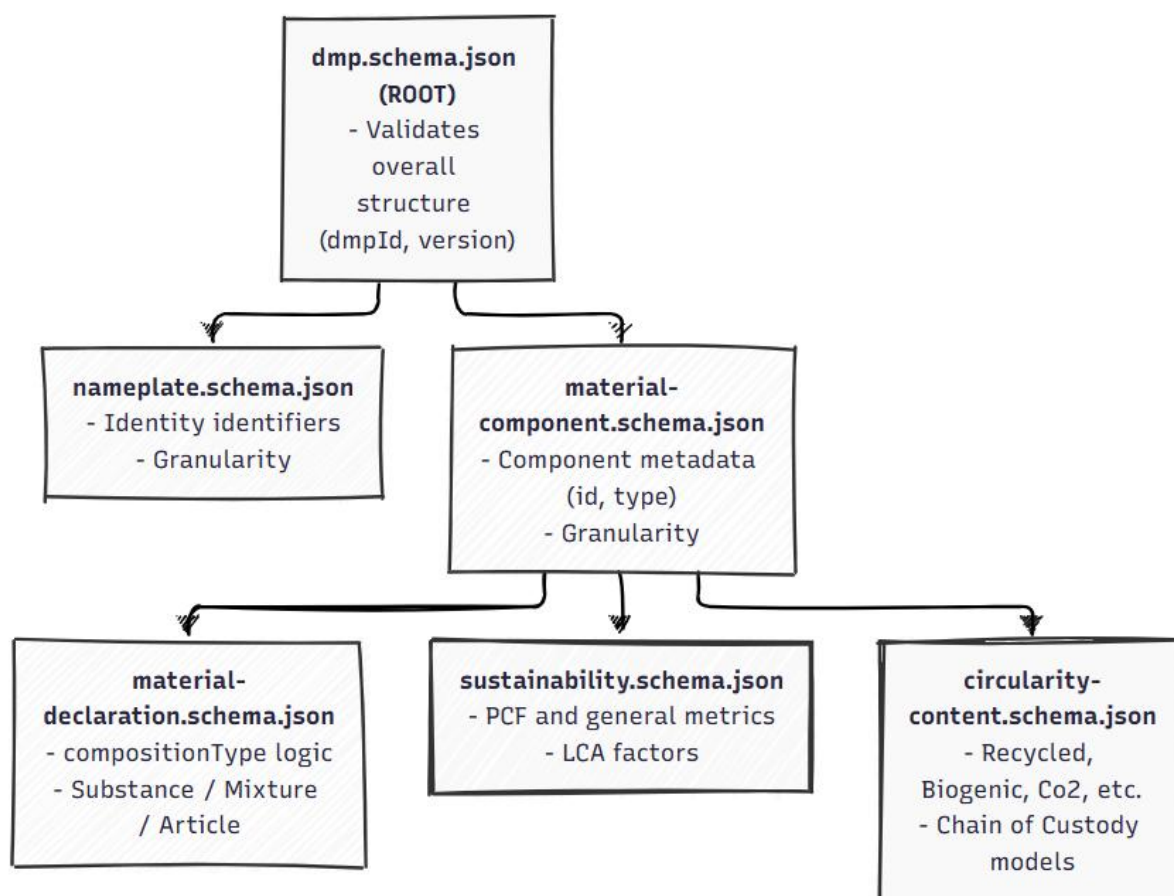


Figure 4. Physical Architecture of the DMP Metamodel.

703 The physical architecture is structured as follows:

- 704 • **Root Schema (dmp.schema.json):** This acts as the master schema for the entire
705 payload. It enforces the presence of the core administrative metadata, the nameplate,
706 and the components array.
- 707 • **Identity and Components:** The root schema directly references the
708 nameplate.schema.json and the material-component.schema.json. Both of these
709 schemas utilize the granularity.schema.json to enforce consistent granularity levels
710 across the model.
- 711 • **Content Modules (Sub-models):** The material-component.schema.json acts as an
712 anchor point. Using the JSON Schema \$ref keyword, it references the specific content
713 sub-schemas:
- 714 • material-declaration.schema.json
- 715 • sustainability.schema.json
- 716 • circularity-content.schema.json

717 This modular approach allows the DMP to remain lightweight and adaptable. When a payload is
718 validated, the JSON Schema validator resolves these references dynamically, ensuring that the
719 entire document conforms to the combined rules of all applicable sub-schemas.

720 12. Technical Description

721 The JSON model of the Digital Material Passport relies on a robust hierarchy of objects and
722 properties. Below is a description of the primary structural elements based on the v0.9 schema.

723 12.1. The Root Object (dmp)

724 The root object represents the entire passport.

- 725 • dmpId [string]: A globally unique identifier for the specific DMP instance.
- 726 • version [string]: A constant value indicating the schema version (e.g., "0.9").
- 727 • createdAt [string]: The timestamp of the DMP creation in date-time format.
- 728 • nameplate [object]: The mandatory object describing the overarching identity of the
729 material.
- 730 • components [array]: A mandatory array containing one or more material entities.

731 12.2. The Nameplate Object

732 The nameplate object anchors the material identity.

- 733 • materialId [string]: The Digital Twin ID of the material.

- 734 • `companyName` [string]: The name of the company issuing or associated with the DMP.
- 735 • `productName` [string]: The commercial or generic name of the product.
- 736 • `granularity` [string]: Defines the scope of the DMP (model, batch, or item).

737 **12.3. The Material Component Object**

738 Each object within the `components` array represents a specific constituent of the product.

- 739 • `id` [string]: A unique identifier for the component itself.
- 740 • `type` [string]: Describes the nature of the component (e.g., "Unpacked").
- 741 • `granularity` [string]: Defines the specific granularity level for this individual component,
742 which may differ from the root DMP granularity.
- 743 • `materialDeclaration` [object]: An optional reference to the Material Declaration sub-
744 model.
- 745 • `sustainability` [object]: An optional reference to the Sustainability sub-model.
- 746 • `circularity` [object]: An optional reference to the Circularity sub-model.

747 **12.4. Material Declaration Sub-Model**

748 This sub-model manages chemical and regulatory composition. It uses a polymorphic structure
749 based on the `compositionType` (substance, mixture, or eu-reach-article).

- 750 • `safeUseInformation` [object]: Contains arrays of strings for `identifiedUses` and
751 `usesAdvisedAgainst`.
- 752 • `substance / mixture / euReachArticle` [object]: Conditional objects that contain specific
753 properties like `substanceIdentifiers` (CAS, EC numbers), regulatory (OEL, Biocide flags),
754 and classification (hazard codes and texts).

755 **12.5. Sustainability Sub-Model**

756 This sub-model captures environmental impacts, specifically the Product Carbon Footprint.

- 757 • `sustainabilityGeneral` [object]: Contains cross-cutting attributes such as
758 `sustainabilityDeclaredUnitMeasurement` and
759 `sustainabilityProductMassPerDeclaredUnit`.
- 760 • `impactCategories` [object]: A container for specific metrics. Currently, it includes the
761 `productCarbonFootprint` object, which houses extensive data points such as `pcfId`,
762 `pcfGeography`, `carbonContent`, and the nested `lifeCycleStagesAndEmissions` (detailing
763 the GWP for production and distribution stages).

12.6. Circularity Sub-Model

This sub-model manages circular material flows.

- **general [object]:** Contains cross-cutting circularity attributes like the `declaredUnitMeasurement` and `contentValidityPeriodStart`.
- **Metric Objects:** Specific objects such as `recycledContent`, `biogenicContent`, and `co2basedContent` track the respective circular fractions.
- **chainOfCustody [object]:** Embedded within the metric objects, this structure details the certification system, `cocModel`, `certifiedShare`, and links to the official certificates validating the claims.

13. Technical Dictionary

The Chem-X Data Model leverages standard JSON data types alongside stringent constraints and external vocabularies to ensure data consistency and semantic interoperability.

13.1. Standard Data Types and Formats

- **String:** Textual data. For identifiers like UUIDs or URIs, specific format constraints (`format: "uuid"`, `format: "uri"`) are enforced by the schema.
- **Date and Time:** Temporal data strictly follows the ISO 8601 standard. Dates are typically formatted as YYYY-MM-DD (enforced via Regex pattern `^[0-9]{4}-(0[1-9]|1[0-2])-(0[1-9]|1[0-9]|2[0-9]|3[01])$`), while combined date and time fields use the date-time format.
- **Number / Integer:** Used for continuous quantitative values (e.g., `certifiedShare`, `sustainabilityProductMassPerDeclaredUnit`). Schema rules often apply boundaries, such as `minimum: 0` or `maximum: 1` to ensure valid percentages or fractions.
- **Boolean:** Binary indicators (`true` or `false`), used extensively for regulatory flags (e.g., `activeBiocide`, `labelRequired`).
- **Array:** Lists of values or objects (e.g., `components`, `hazardStatements`). Arrays may have constraints such as `minItems` or `uniqueItems`.

13.2. Multilingual and Language-Dependent Values

For textual information that requires localization (such as hazard statement texts or precautionary advice), the model employs a structured object comprising two properties:

- **text [string]:** The actual textual value.
- **language [string]:** An IETF BCP 47 language tag (e.g., `en-GB`, `de-DE`).

13.3. External Taxonomies and Controlled Vocabularies

To ensure the Data Model remains lightweight and adaptable to regulatory or scientific updates, the architecture minimizes hardcoded enumerations within the JSON Schema itself. Instead, the DMP relies heavily on external controlled vocabularies managed via SKOS (Simple Knowledge Organization System) taxonomies. The SKOS taxonomies of DMP 0.9 are evolving and expected to be finalized by DMP version 1.0.

When populating the JSON payload, the JSON schema defines **where** the data goes, while the external taxonomies define **what** specific controlled values are permitted. Data creators must utilize the standardized concepts defined in these external semantic files. Examples of attributes driven by external taxonomies include:

- **Chain of Custody Models:** Attributes like `cocModel` or `proportionalityToInput` reference taxonomies such as `coc_models.ttl` and `mass_balance_credit_methods.ttl`.
- **Circularity Origins:** Characteristics like `feedstockGeneration` or `classification` (for biogenic origins) reference `feedstock_generation.ttl` and `biogenic-origin_classification.ttl`.
- **Concentration Operators:** In the Material Declaration, logical operators for defining concentration limits (e.g., `>`, `<=`) reference the `concentration_operators.ttl` taxonomy.
- **Standards and Rules:** Fields capturing applied standards like `pcfCrossSectoralStandards` or `standardsApplied` rely on external vocabularies (e.g., `circularity_standards.ttl`).

By abstracting these lists into external files, the Chem-X framework ensures that the vocabulary can evolve independently of the core technical schema, guaranteeing long-term semantic stability and interoperability without triggering continuous versioning of the JSON structural models.

14. Contacts

In case of questions, please contact:

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15. Appendix I – Abbreviations & Acronyms

Abbreviation	Full form
¹⁴ C-method	Radiocarbon dating method
AG	Aktiengesellschaft (engl.: Public Limited Company)
API	Application Programming Interface
BMWE	Bundesministerium für Wirtschaft und Energie (engl.: Federal Ministry for Economic Affairs and Energy)
BMWK	Bundesministerium für Wirtschaft und Klimaschutz (engl.: Federal Ministry for Economic Affairs and Climate Action)
BoM	Bill of Materials
BPDM	Business Partner Data Management
BPN	Business Partner Number
BPNA	Business Partner Number – Address
BPNL	Business Partner Number – Legal Entity
BPNS	Business Partner Number – Site
CAS Number	Chemical Abstracts Service number
CAS RN	Chemical Abstracts Service Registry Number
Catena-X	Catena-X Automotive Network
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilization
CEN/CLC/JTC 24	Comité Européen de Normalisation/Comité Européen de Normalisation Électrotechnique/Joint Technical Committee 24
CFC	Chlorofluorocarbon
CFP	Carbon footprint of a product
CH ₄	Methane
Chem-X	Chemical Industry Extension of Catena-X
CMP	Contract manufactured products
CO ₂ e	Carbon Dioxide Equivalent
CRM	Customer Relationship Management
CRUD	Create, Read, Update, Delete
CX	Catena-X Standard Identifier Prefix
DIN EN	Deutsches Institut für Normung – European Norm
DMP	Digital Material Passport
DPP	Digital Product Passport
DU	Declared Unit
DUNS	Data Universal Numbering System
ECHA	European Chemical Agency
ECICS	European Customs Inventory of Chemical Substances
EDC	Eclipse Dataspace Connector
EDI	Electronic Data Interchange
EEIOA	Environmentally-Extended Input and Output Analysis
EF	Environmental Footprint
EINECS	European Inventory of Existing Commercial chemical Substances
ELINCS	European List of Notified Chemical Substances
End of Life	
ERP	Enterprise Resource Planning

ERP system	Enterprise resource planning system
ESPR	Ecodesign for Sustainable Products Regulation
EU	European Union
EU BPR	European Biocidal Product Regulation
EU CPR	European Construction Products Regulation
EU OEL	European Occupational Exposure Limit
EU POP	European Persistent Organic Pollutant
FCM	Food Contact Material
GHG	Greenhouse Gases
GHG protocol standard	Greenhouse Gas Protocol Standard
GLN	Global Location Number
GLO	Global Learning Outcomes
GTIN	Global Trade Item Number
GWP	Global Warming Potential
HCFC	Hydrochlorofluorocarbon
HEF	Fluorinated ether
HFC	Hydrofluorocarbon
HRB	Handelsregisternummer (engl.: German Commercial Register Number)
HS	Harmonized Commodity Description and Coding Systems
IBR	International Business Registration
IDSA	International Dataspace Association
IEC	International Electrotechnical Commission
ILCD	International reference Life Cycle Data system
IM	Information Model
INCI	International Nomenclature of Cosmetic Ingredients
INCI Name	International Nomenclature of Cosmetic Ingredients Name
IRDI	International Registration Data Identifier
IRI	Internationalized Resource Identifier
ISO	International Organization for Standardization
ISO 14067: 2018	ISO standard on Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
ISOPA	European Diisocyanate and Polyol Producers Association
IUPAC name	International Union of Pure and Applied Chemistry name
JTC	Joint Technical Committee
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
LEI	Legal Entity Identifier
LHV	Lower heating value
MOCS	More than One Constituent Substance
NACE	Nomenclature of Economic Activities
NF ₃	Nitrogen trifluoride
NIF	Número de Identificación Fiscal (engl.: Tax Identification Number)
NLP	No-Longer Polymers
N ₂ O	Nitrous oxide
NPM	Non-Production Material

OCF	Organizational Carbon Footprint
ODS	Ozone-depleting substance
PCF	Product Carbon Footprint
PCF ID	Product Carbon Footprint Identifier
PCR	Product Category Rules
PFC	Perfluorocarbon
PFPE	Perfluoropolyether
PI	Program Increment
PIM	Product Information Management
PRODCOM	Production Communautaire (engl.: Community Production)
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
SCIP DB	Substances of Concern In Products database
SDS	Safety Data Sheet
SF ₆	Sulphur hexafluoride
SIC	Standard Industrial Classification
SMILES	Simplified Molecular Input Line Entry System
SVHC	Substances of Very High Concern
TfS	Together for Sustainability
TIN	Taxpayer Identification Number
TÜV	Technischer Überwachungsverein (engl.: MOT)
UFI	Unified Formula Identifier
UID	Unique Identifier
UNSPSC	United Nations Standard Products and Services Code
UPC	Universal Product Code
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
UUID	Universally Unique Identifier
VC	Verifiable Credential
W3C	World Wide Web Consortium
WBCSD	World Business Council for Sustainable Development
WFD	Waste Framework Directive

16. Appendix II – Domain Rules

16.1. Typologies of Domain Rules

Two types of Domain Rules exist:

- **Framework Rules** at *Model/Sub-model level*: entailing – for example – provisions for default granularity requirements, provisions for inclusion or exclusion of sub-models and respective metrics, provisions for data revisions or other general aspects.
- **Attribute/Enumeration Rules** at Attribute or Enumeration level: entailing – for example – provisions regarding conditional requirements (i.e., “mandatory if” conditions), provisions on deadlines determining that a given attribute shall become mandatory.

16.1.1. Framework Rules for Sustainability & Circularity Metrics

Refer to table below:

Table 6. List of Framework Rules of the DMP for the Domains Sustainability and Circularity

Rule Code	Rule Name	Models or Sub-Models affected	Rule Description
041b2862-98eb-5158-9ec2-eec78d2e56bf	Default granularity – Sustainability & Circularity Metrics	All Sustainability & Circularity sub-models	Default granularity of sustainability of circularity metrics shall be “MODEL” level
51a39687-ff87-55de-82b3-fbb4feb582bc	Circularity Metrics optionality	All Circularity sub-models	The inclusion of any Circularity Sub-Model (e.g. “Renewable Content”) in the DMP payload is subject either to the acceptance of a specific and explicit DMP data request or to the provisions of another framework business rule declaring such metric as mandatory. The “mandatory” attributes for such Sub-Model shall be required to be included in the DMP payload only upon such Sub-Model inclusion.

16.1.2. Attribute/Enumeration Rules for Sustainability & Circularity Metrics

Refer to table below:

Table 7. List of Attribute and Enumeration Rules of the DMP for the Domains Sustainability and Circularity

Rule Code	Rule Name	Models or Sub-models / Attributes affected	Rule Description	Triggering Attribute
c2fd2e90-9e20-5897-b2d1-80746ee8a161	CCU Required Fields	PCF/PCF CCU-based carbon content 5e655195-f93b-5cfd-a67a-f1618a392bde	Mandatory IF pcfCcuCalculationApproach is equal to “cut-off method” OR “credit method”	PCF Calculation Approach used for CCU c2c87864-5490-5f80-b3b9-1da5de5caa86
c2fd2e90-9e20-5897-b2d1-80746ee8a161	CCU Required Fields	PCF/PCF CCU Credit Certificate Scheme 0dcca072-984c-5d5b-b178-4f751fe59394	Mandatory IF pcfCcuCalculationApproach is equal to “cut-off method” OR “credit method”	

a0821169-acac-561a-9d3c-729c6c6ba82e	Mandatory 2027	PCF/PCF Data Quality Rating - Geographical representativeness 11bfe7ae-3404-5d57-b3be-5a0df46ccd8b	Attributes currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028).
a0821169-acac-561a-9d3c-729c6c6ba82e	Mandatory 2027	PCF/PCF Data Quality Rating - Technological representativeness e97b712f-8721-5d93-815d-411dcd84e5a8	Attributes currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028).
a0821169-acac-561a-9d3c-729c6c6ba82e	Mandatory 2027	PCF/PCF Data Quality Rating - Temporal representativeness 6838cfe3-cb0c-522c-8f01-ebcd4f46b731	Attributes currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028).
8cebbfc3-3812-50ae-a9a2-f1dccc297574	Required Chain of Custody & PCF	PCF/PCF Mass-Balance Calculation approach 604b87ee-095e-5c0e-8726-ae9ce4c69e37	Require IF cocModel is equal to “Mass Balance (credit method)”
a0821169-acac-561a-9d3c-729c6c6ba82e	Mandatory 2027	PCF/PCF Primary Data Share (PDS) b0b197a7-798c-5c74-a4fe-b3db4b1090cb	Attributes currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028)
a0821169-acac-561a-9d3c-729c6c6ba82e	Sustainability/PCF/Mandatory 2027	PCF/PCF Production Stage GWP fossil f6648190-297f-5b17-aa1e-591aba026466	Attribute currently optional, becoming mandatory after End 2027

a0821169-acac-561a-9d3c-729c6c6ba82e	Mandatory 2027	PCF/PCF Production Stage GWP Land Management CO2 Emissions aa434d16-bccb-512a-9a07-be433c8df56d	Attributes currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028)	
a0821169-acac-561a-9d3c-729c6c6ba82e	Sustainability/PCF/Mandatory 2027	PCF/PCF Production Stage GWP land use change (LUC, excluding iLUC) 81ba141c-2bb6-5634-9135-98189b43943a	Attribute currently optional, becoming mandatory after End 2027 (i.e. from the Beginning of 2028).	IF (Current Date > Jan-01-2028) THEN Required=Mandatory
c48fd232-adc1-5d7b-8a5a-3ea23c220c9b	Required upstream system expansion - USE	PCF/PCF USE Credit 736cf372-d86b-5a7b-be0e-11a43cdcf8f7	Mandatory, IF pcfAllocationRecycled Carbon is equal to “upstream system expansion - USE”	
c48fd232-adc1-5d7b-8a5a-3ea23c220c9b	Required upstream system expansion - USE	PCF/PCF USE Credit Certificate Scheme 64f95399-2d11-5df5-9600-9cc888e2d748	Mandatory, IF pcfAllocationRecycled Carbon is equal to “upstream system expansion - USE”	

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CHEM-X



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DEUTSCHE
AMPHIBOLIN-WERKE
VON ROBERT MURJAHN



MERCK



SPHERITY



SIEMENS



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Funded by the Federal Ministry of
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on the basis of a decision
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