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Digital Product Passport - System interoperability

Passeports numériques de produit - Interopérabilité

Digital Produktpass - Interoperabilität

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/CLC/JTC 24.

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European foreword

This document (prEN 18223:2025) has been prepared by Technical Committee CEN/TC "Digital product passport – Framework and system", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Introduction

0.1 Organizational interoperability

Organizational interoperability should enable the following:

- easy integration into existing technology frameworks;
- human and machine (software) access.

0.2 Semantic interoperability

Semantic interoperability should enable the following:

- allow data structuring with standardized or established data schema languages;
- enable the usage and re-usage of known ontologies or context namespaces;
- avoid sector specific ontologies – allow parallel usage of different ontologies issued by the European Commission in delegated acts with a horizontal layer as general as possible (technology, ontology and domain agnostic).

0.3 Technical interoperability

Serialization of data with standardized data format.

1 Scope

The scope of this document includes:

- the semantic description of a product, including its properties where relevant and the semantic aspects to represent the product lifecycle;
- a common information model allowing for the implementation of data dictionary systems;
- metadata models and formats to be used in exchange and representation, allowing for the integration of dictionaries;
- rules on how to systematically use such metadata models when developing product group specific data models and dictionaries;
- technical and organizational interoperability.

This document follows the approach of standard interoperability layers and proposes the following aspects in this regard.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <http://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

interoperability

capability of two or more entities to exchange items in accordance with a set of rules and mechanisms implemented by an interface in each entity, in order to perform their specified tasks

[SOURCE: [1], 3.12]

3.2

semantic interoperability

ability for data shared by systems to be understood at the level of fully defined domain concepts

[SOURCE: [2]]

3.3

technical interoperability

ability that covers the applications and infrastructures linking systems and services

3.4

digital product passport

DPP

digital record of product characteristics throughout its life cycle

Note 1 to entry: Example characteristics include environmental sustainability, environmental impact, and recyclability

4 Semantic interoperability

4.1 Semantic model

4.1.1 General

To fulfil the interoperability requirements the semantic model representing the [digital product passport \(3.4\)](#) is based on an underlying data model presented in [4.1.2](#) which is used to définé the semantic model presented in [4.1.3](#).

4.1.2 Data model

Describes the basic data structures the [digital product passport \(3.4\)](#) relies on to handle the data points and the relationships between them.

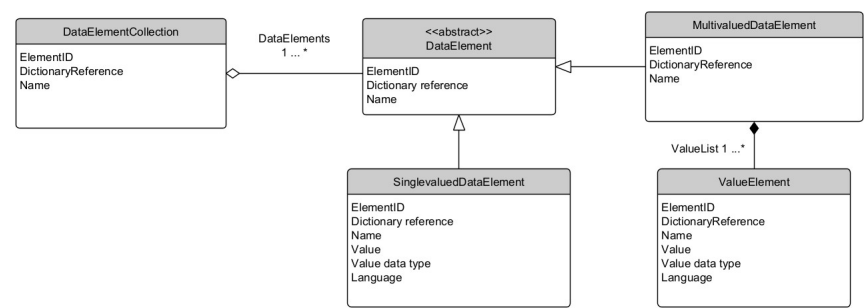


Figure 1 — UML representation of the entities of the data model

The data model includes the following entities: *DataElementCollection*, *DataElement*, *SinglevaluedDataElement*, *MultivaluedDataElement* and *ValueElement*. These entities are described in detail in the following subclauses.

4.1.3 Semantic model of the digital product passport

4.1.3.1 Digital product passport

The data structures définé in the data model [4.1.2](#) are used in the semantic model in order to définé how to publish a digital product passport instance and the data points it is required to contain.

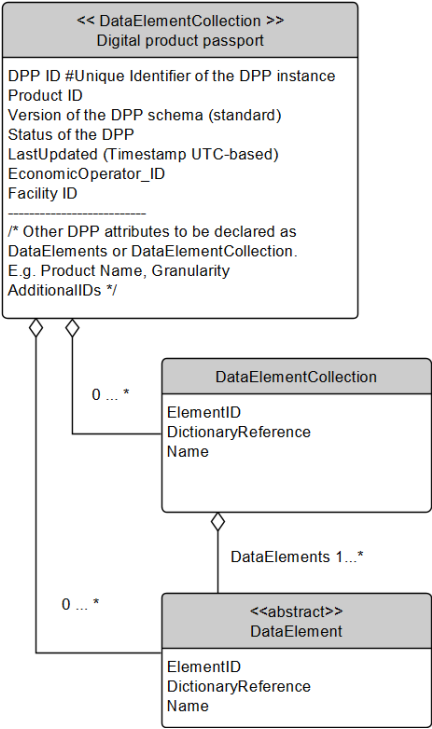


Figure 2 — UML representation of the entities of the semantic model of the DPP.

Figure 2 presents the base semantic model of the digital product passport (3.4).
The digital product passport is modelled as a collection that contains zero-to-many DataElementCollections (see 4.1.3.2) and zero-to-many DataElements (see 4.1.3.3).
Data points mentioned in the ESPR [3] Annex III, when required, they are to be encoded as follows.
The following data points (see Table 1) shall be published as attributes in the digital product passport object:

Table 1 — Attributes of the digital product passport object

Attribute name	Description	Data Type	Cardinality	Example
DigitalProductPassportID	The unique identifier of an instance of the digital product passport. It shall be globally unique and should be based on a URI/URL structure, such as provided for example in [Module 1] schemas.	String (Format from WG2)	[1]	
ProductID	A unique string of characters for the identification of a product, that also enables a web link to the digital product passport. [Source Module 1 3.25]	String (Format from WG2)	[1]	
Granularity	The level of granularity of the ProductID as per ESPR.	String/Enum	[1]	
DPPSchemaVersion	The reference standard the DPP instance schema refers to.	String	[1]	
DPPStatus	The status of the DPP instance as digital resource.	String/Enum	[1]	"Active", "Archived"
LastUpdate	The date and time of the latest update to the DPP instance.	Timestamp UTC- based	[1]	
EconomicOperatorID	A unique string of characters for the identification of an actor involved in a product's life cycle [Source Module 1 3.24]	String (Format from WG2)	[1]	
FacilityID	A unique string of characters for the identification of locations or buildings involved in a product's value chain or used by actors involved in a product's life cycle. [Source Module 1 3.23]	String (Format from WG2)	[0...1]	

Commented [PL1]: The name "DigitalProductPassportID" name and definition may generate confusion with the identifiers in scope to the regulation. To avoid confusion, the suggested changes are:

- Change the name: DigitalProductPassportRecordIdentifier
- Change the definition into "Unique identifier to a record of DPP data stored into a registry or into a DPP platform, primary or backup"

Commented [PL2]: Economic Operator ID and Facility ID are not mandatory features of DPP:

- Recital 36 states that "In addition, where appropriate, the digital product passport should be linked to a unique operator identifier and a unique facility identifier which would allow the actors and manufacturing facilities related to that product to be traced"

ID schemes for economic operators and facilities are not mentioned in the essential requirements for Digital Product Passports (Art. 10 (1))

Solution: add the note "the unique identifiers for economic operators and facilities is not mandatory according to the ESPR, but should only be set where appropriate and required by delegated acts setting ecodesign requirements."

Change the cardinality of EconomicOperatorID from (1) to (0..1)

Other data points, including the ones mentioned in ESPR [4] Annex III and not included in Table 1, shall be published as DataElement or DataElementCollection in the digital product passport object.

The possible data points that can be declared in a DPP instance are of two types: product property (see [4.1.4.1](#)) and document (see [4.1.4.2](#)).

4.1.3.2 DataElementCollection

Collection of DataElements included in the [digital product passport \(3.4\)](#) entity. It contains one-to-many DataElements. It also includes the following attributes (see [Table 2](#)).

Table 2 — Definition of DataElementCollection attributes

Name	Description	Datatype	Cardinality	Example
ElementId	The relative identifier of the data element shall be unique within its location (i.e. in the DPP or in the level of DataElementCollection) and it is recommended to be unique in the DPP instance. The corresponding absolute path of the data element shall be unique within the DPP instance.	non_translatable_string_type	[1]	
DictionaryReference	Unique identifier of the semantic description of the collection	non_translatable_string_type	[0..1]	
Name	The human-readable name of the DataElementCollection instance within a digital product passport instance	translatable_string_type	[0..1]	
DataElements	The dataElements contained in the DataElementCollection	List of <DataElement>	[1]	

A DataElementCollection shall contain at least one instance of a DataElement's subclasses (SinglevaluedDataElement or MultivaluedDataElement).

4.1.3.3 DataElement

Represents a single data point. It is an abstract class which can be instantiated by SinglevaluedDataElement [4.1.3.4](#) or MultivaluedDataElement [4.1.3.5](#). It contains the following attributes:

- ElementID
- DictionaryReference
- Value data type

The *Value data type* should allow xsd data types conformant to W3C XML Schema [\[5\]](#) and [\[6\]](#) except:

- XSD BuiltIn List types shall not be supported (ENTITIES, IDREFS and NMTOKENS),

- XSD string BuildIn types shall not be supported, and
- the following XSD primitive types shall not be supported: NOTATION, QName.

4.1.3.4 SinglevaluedDataElement

Represents a single data point with one value. It includes the following metadata (see [Table 3](#)).

Table 3 — Definition of SinglevaluedDataElement attributes

Name	Description	Datatype	Cardinality	Example
ElementId	The relative identifi�er of the DataElement shall be unique within its location (i.e. in the DPP or in the level of DataElementCollection) and it is recommended to be unique in the DPP instance. The corresponding absolute path of the data element shall be unique within the DPP instance.	non_translatable_string_type	[1]	
DictionaryReference	The reference to the unique identifi�er of the data point sp�cification d�fin�e in the repository/ data dictionary	non_translatable_string_type	[0..1]	
Name	The human-readable name of the DataElement instance within the DPP instance	Translatable_string_type	[0..1]	
Value	Contains the data of the value encapsulated in the DataElement	<any JSON datatype>	[1]	
ValueDataType	Sp�cifi�es the data type of the value needed for the interpretation of the value data	As described in 4.1.3.3	[0..1]	Further examples to be provided.
Language	Sp�cifi�es the language of the value. If the “Value data type” is “translatable string”, this attribute shall be ignored.	[7] (e.g “en”) + [8]	[0..1]	“en-GB”

4.1.3.5 MultivaluedDataElement

Represents a single data point containing a list of values. It can refer to one-to-many ValueElements. It includes the following metadata (see [Table 4](#)).

Table 4 — Definition of *MultivaluedDataElement* attributes

Name	Description	Datatype	Cardinality	Example
ElementId	The relative identifier of the data element shall be unique within its location (i.e. in the DPP or in the level of data element collection) and it is recommended to be unique in the DPP instance. The corresponding absolute path of the data element shall be unique within the DPP instance.	non_translatable_string_type	[1]	
DictionaryReference	The reference to the unique identifier of the data point specification defined in the repository/ data dictionary	non_translatable_string_type	[0..1]	
Name	The human-readable name of the DataElement instance in the DPP instance	translatable_string_type	[0..1]	
ValueList	List including the ValueElements associated with the DataElement instance	List of <ValueElement>	[1]	Further examples to be provided.

4.1.3.6 ValueElement

Represents a value associated to a *MultivaluedDataElement* instance. It includes the following metadata (see [Table 5](#)).

Table 5 — Definition of *ValueElement* attributes

Name	Description	Datatype	Cardinality	Example
ElementID	The relative identifier of the data element shall be unique within its location (i.e. in the DPP or in the level of data element collection) and it is recommended to be unique in the DPP instance. The corresponding absolute path of the data element shall be unique within the DPP instance.	non_translatable_string_type	[1]	

DictionaryReference	The reference to the unique identifier of the data point specification defined in the repository/ data dictionary	non_translatable_string_type	[0..1]	
Name	Human-readable name associated to the ValueElement	translatable_string_type	[0..1]	
Value	Contains the data of the value encapsulated in the ValueElement	<any JSON datatype>	[1]	
Value data type	Specifies the data type of the ValueElement needed for the interpretation of the value data	As described in 4.1.3.3	[1]	Further examples to be provided.
Language	Specifies the language of the Value within the ValueElement. If the "Value data type" is "translatable string", this attribute shall be ignored.	[7] (e.g "en") + [8]	[0..1]	"en-GB"

4.1.4 Elements of the DPP semantic model

4.1.4.1 Product property

This clause describes the semantic representation of a defined parameter suitable for the publication of regulated product properties.

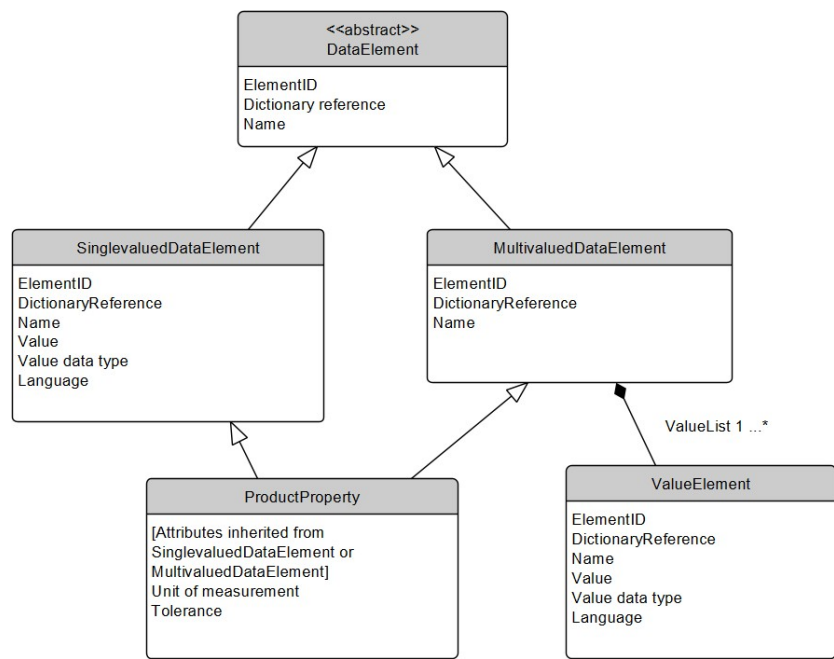


Figure 3 — The UML representation of the product property

The product property shall be instantiated either from **SinglevaluedDataElement** (4.1.3.4) or from the **MultivaluedDataElement** (4.1.3.5) and it shall not be instantiated from both entities at the same time. It inherits the attributes of the entity it is instantiated from. Additionally it may include the *unit of measurement* and the *tolerance* as defined in [9] as optional attributes.

Table 6 — Definition of product property

Name	Description	Datatype	Cardinality	Example
ElementId	The relative identifier of the Product property shall be unique within its location (i.e. in the DPP or in the level of data element collection) and it is recommended to be unique in the DPP instance. The corresponding absolute path of the data element shall be unique within the DPP instance.	non_translatable_string_type	[1]	

DictionaryReference	The reference to the unique identifier of the data point specification defined in the repository/ data dictionary	non_translatable_string_type	[0..1]	
Name	The human-readable name of the Product property instance in the DPP instance	Translatable_string_type	[0..1]	
Value or ValueList	Contains the data of the value encapsulated in the Product property	<any JSON datatype> in case of "Value", and List of ValueElement in case of "ValueList"	[1]	
ValueDataType	Specifies the data type of the value needed for the interpretation of the value data	As described in 4.1.3.3	[0..1]	Further examples to be provided.
Language	Specifies the language of the value within the Product property. If the "Value data type" is "translatable string", this attribute shall be ignored.	[7] (e.g "en") + [8]	[0..1]	"en-GB"

4.1.4.2 Document

This clause describes the semantic representation of any instance of a document that might be required to be included into a [digital product passport \(3.4\)](#) instance.

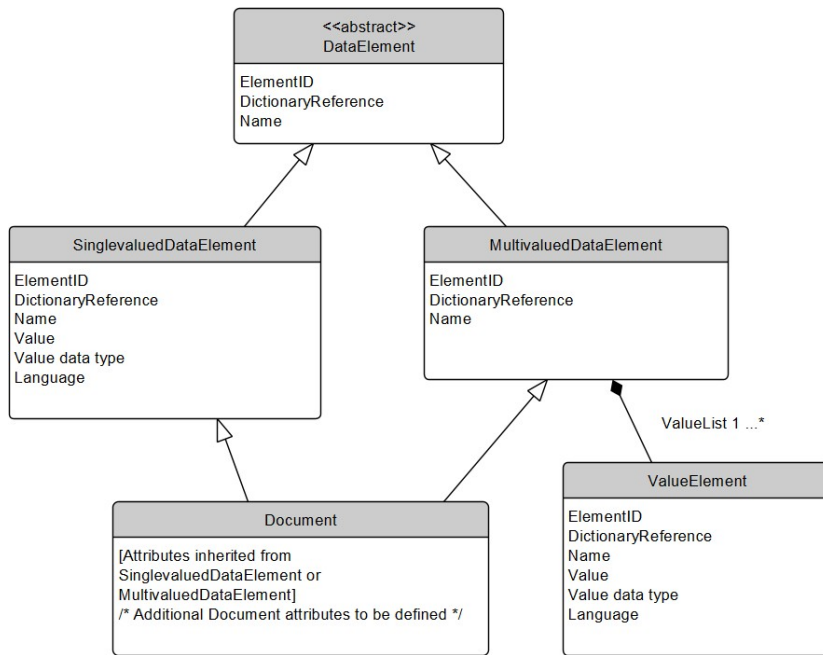


Figure 4 — The UML representation of a Document

The Document shall be instantiated either from *SinglevaluedDataElement* (4.1.3.4) or from the *MultivaluedDataElement* (4.1.3.5), and it shall not be instantiated from both entities at the same time. It inherits all the attributes from the *SinglevaluedDataElement* (4.1.3.4) or the *MultivaluedDataElement* (4.1.3.5). Additionally it can include other attributes to be définéd.

4.2 Data model requirements to manage DPP changes

During its lifetime, the [digital product passport \(3.4\)](#) may undergo changes that impact the data points to be declared, like for example the environmental performance. These changes could lead to a modification of the DPP initially published for a product, either through a change of an existing property or document, or through the addition of information or a property not in the initial instance. To be properly archived, every digital product passport lifetime event resulting into a change of a DPP and its data shall include (and be kept track of):

- identifier (e.g., DPP, product ID);
- change object (what was changed);
- timestamp (when the change occurred);
- actor (who made the change);
- changed properties (specific properties modified).

Any changes to a DPP shall be logged and archived by the responsible economic operator according to module 6 [reference] requirements. Delegated act can définéd to what extent.

4.3 Model for repositories for the data dictionaries

To enable cross-sector [semantic interoperability \(3.2\)](#) for [digital product passport \(3.4\)](#), while avoiding constraints on how DPP information may be defined, and ensuring openness to different technologies (or technological approaches), a decoupled approach shall be applied. In this approach, data points and their definitions are managed independently.

Each data point should be associated with a machine-readable semantic definition stored in a repository. The governance of such repository should be regulation-based, but shall allow for the inclusion of definitions beyond regulatory requirements where appropriate. Each definition shall have a unique identifier and shall occur only once within a repository to enable unambiguous referencing. This also allows for mapping between definitions contained in different semantic catalogues (repositories).

This approach contributes to long-term availability and consistency of definitions, supports multilingual use, and facilitates the management of controlled value lists (e.g. non-numeric values of product properties). It also enables leaner DPP instances by reducing the volume of embedded semantic information. In the DPP data model [4.1.2](#), semantic definitions are referenced using the attribute "*DictionaryReference*". This attribute links a given DataElement to its corresponding definition in the repository.

5 Technical interoperability

5.1 General

It enables the efficient employment of the semantic representation defined in [Clause 4](#) by notified actors, systems and processes involved with the DPP.

5.2 Serialization syntax

The serialization of data with standardized data structures, choosing data formats and how to serialize them following the data syntaxes is defined in [\[10\]](#).

Serialization shall follow the model provided in [Clause 4](#).

Annex ZA
(informative)

Relationship between this European Standard and the the ecodesign requirements of Commission Regulation (EU) No 2024/1781 aimed to be covered

This European Standard has been prepared under a Commission's standardization request C(2024) 5423 final of 31.07.2024 to provide one voluntary means of conforming to the ecodesign requirements of Commission Regulation (EU) No 2024/1781 of 28.06.2024 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for digital product passports in support of Union policy on ecodesign requirements for sustainable products and on batteries and waste batteries

Once this standard is cited in the Official Journal of the European Union under that Regulation, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding ecodesign requirements of that Regulation and associated EFTA regulations.

part 4: European standard(s) on interoperability (technical, semantic, organization)

Table ZA.1 — Correspondence between this European Standard and Commission Regulation (EU) No 2024/1781 of 28.06.2024

implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements and digital product passports in support of Union policy on ecodesign requirements for sustainable products and on batteries and waste batteries and Commission's standardisation request C(2024) 5423 final of 31.07.2024

[Essential]/ [interoperability]/[...] Requirements of [Directive]/[Regulation]/ [Decision] [...]	Clause(s)/sub- clause(s) of this EN	Remarks/Notes
7.8	Clause 4.1.1, 4.1.2	language property at data collection level
10.1.d	Clause 4.1	interoperable semantic model
10.1.f	Clause 4.1.2	semantic model covers all granularity levels
10.1.g	Clause 4.3	data model references repository containing access rights définition on data element level
10.4	Clause 4.1.2, 4.2	data model and sematic model enable change management, back-up and archiving
11.a	Clause 4	fully interoperable semantic and data model
11.d	Clause 4.1	data element collection may include also references to former or component dpp
15.4	Clause 4.1	semantic model covers special requirements of authorities via data collection in fléxible way

WARNING Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING Other Union legislation may be applicable to the falling within the scope of this standard

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Bibliography

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- [10] prEN 18216, *Digital product passport - Data exchange protocols*
- [11] EN ISO 11354-1:2011, *Advanced automation technologies and their applications - Requirements for establishing manufacturing enterprise process interoperability - Part 1: Framework for enterprise interoperability (ISO 11354-1:2011)*