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Identification Schemes

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Preparing the ground for the gradual piloting and deployment of DPPs, focusing on developing a roadmap for prototypes in three value chains: electronics, batteries and textiles.

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List of Abbreviations and Acronyms	
BatReg	EU Battery Regulation 2023/1542
DIDs	Decentralized Identifiers
DPP	Digital Product Passport
EO	Economic Operator
ESPR	EU DRAFT Ecodesign for Sustainable Products Regulation
EU	European Union
GTS	Global Textile Scheme
IMEI	International Mobile Equipment Identity
ISO	International Organization for Standardization
NFC	Near Field Communication
QR code	Quick-Response code
RFID	Radio Frequency Identification
SReq	Standardisation Request
URL	Uniform Resource Locator

About CIRPASS

The European Commission has strong interest and ambition in relation to emerging technologies to support the ‘twin’, green and digital, transitions and specifically in the development of a **Digital Product Passport (DPP)**. The DPP is defined by the CIRPASS consortium as a structured collection of product related data with pre-defined scope and agreed data management and access rights conveyed through a unique identifier, and that is accessible via electronic means through a data carrier. The intended scope of the DPP is information related to sustainability, circularity, value retention for re- use, remanufacturing and recycling and legal compliance.

The aim of CIRPASS is to prepare the ground for a gradual deployment of DPPs, with an initial focus on the electronics, batteries and textile sectors. Spurred by the need to accelerate the transition to a more circular and sustainable economy, combined with new opportunities offered by a burgeoning data market, a large number of European and international initiatives have emerged recently. CIRPASS’s methodology consists in uniting representatives from a large number of these early DPP pilots in order to build a balanced, open and transparent community dedicated to the design and roll- out of the upcoming European DPP.

To ensure a neutral and technology agnostic stance, CIRPASS relies heavily on the involvement of leading European Research and Technology organisations, supported by three standardization organisations, an experienced pool of circular economy and sustainability consultancies, several large European industrial associations, digital technologies and web experts and se digital solution providers. The CIRPASS consortium is made up of 31 partners in total.

By bringing together this community of expertise, the project will build consensus and momentum around the DPP concept and contribute to the development of common principles, prototypes and roadmaps to secure the interoperability of DPPs across value chains, sectors and market participants. Enhanced stakeholder dialogue will be achieved through extensive consultations addressing key DPP aspects such as ontologies, technical requirements and standardization needs.

1. Introduction

The introduction of the Digital Product Passport necessitates that the product to which each DPP relates is identified. Additionally, the economic operator responsible for placing the product on the market must be identified, as well as the facility (location) involved in the product's manufacture¹. This seemingly simple and obvious statement presents very real challenges when applied to the real world. This report sets out the challenges that any identification schemes must overcome to comply to the needs of the DPP and offers an analysis of the fitness for purpose of several identification schemes.

Faced with a moving regulatory and standardisation context, this report has been drafted to be as future-proof as possible, considering only recent official regulatory texts available at the time of this writing. Indeed, one of the challenges of our study relates to the fact that this document is being written as negotiations that will influence the DPP system are ongoing.

Industries around the world have developed and adopted a wide range of identifiers to suit their needs and operating practices. Many of these are underpinned by ISO standards. For example, the automotive industry developed the system of Vehicle Identification Numbers that were standardized in ISO 3779. Shipping container identification numbers are managed by the Bureau International des Containers according to ISO 6346 and so on.

Although those identifiers, like any string of characters, can be encoded in an optical data carrier (a 1- or 2-dimensional barcode) or radio frequency identification tags, this is not a primary concern of those industries. Typically those identifiers are read by a human being and used in an industry-specific environment.

In the context of the Digital Product Passport, identifiers are expected to be encoded for automatic reading in a variety of contexts by consumers, business partners and regulators. Discovery of a product's DPP is expected to begin by scanning a data carrier of some kind. This might be with a specialist device, such as an RFID reader, but in many contexts, scanning with a smartphone, perhaps using a specialist app, is expected. It is worth considering the capabilities of smartphones as commonly seen today.

Smartphone capabilities

The majority of smartphones can read QR codes just using the device's camera, that is, without first opening an app. Some smartphones can also read Data Matrix without an app. Other optical data carriers, such as 1-dimensional barcodes, digital watermarks and any number of standard and proprietary 2-dimensional codes can all be read by smartphones, but only when using an app.

For radio frequency data carriers, only NFC (Near Field Communication) tags are (currently) readable by smartphones. The kind of RFID tags seen commonly in textiles, tyres and other products, cannot be read without additional hardware.

¹ In this report, a clear distinction is made between the identification of the product and the identification of its corresponding DPP. While the first is an essential requirement from the DRAFT ESPR and SReq, the second is optional and is not discussed in this report.

Data carriers themselves are entirely agnostic about the data payload. There is no technical correlation between the type of data carrier and its payload.

Without using an app, smartphones can only process a few types of payload read from a data carrier. These include wi-fi configuration details and contact details (the kind of thing seen sometimes on conference name badges). However, the majority of QR codes seen on products encode a URL. It is now common experience in society to point a smartphone camera at a QR that contains a URL and for the device's Web browser to open at the relevant page. Both Apple's iOS and Google's Android operating systems have methods to trigger an app to open if the URL meets defined criteria.

Terminology

A **Digital Product Passport (DPP)** is a structured collection of mandatory, machine-readable (where appropriate), product-related data with pre-defined scope and agreed data management- and access rights extracted from a standardized product dataspace thanks to a unique product identifier and that is accessible via electronic means through a data carrier. The intended scope of the DPP is information related to sustainability and circularity, e.g., value retention from repair, re-sell, reuse, reconditioning, remanufacturing, and recycling, and legal compliance support. The intended target groups to use DPP data include (but are not limited to) consumers, trading partners, sorters, recyclers, and surveillance authorities including customs.

A **'unique product identifier'** as defined in DRAFT Ecodesign for Sustainable Products Regulation (ESPR) is a unique string of characters for the identification of products that also enables a web link to the product passport.

In the DRAFT ESPR and related Standardisation Request (SReq), multiple levels of product identification are defined:

Table 1 - Description of granularity levels used in SReq.

Product ID level	Definition
Model	'model' means a version of a product of which all units share the same technical characteristics and the same model identifier.
Batch	'batch' means a subset of a specific model composed of all products produced in a specific manufacturing plant at a specific moment in time.
Item	'item' means a single unit of a model.

2. Methodology

The legal texts used as basis for this document are:

- the Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC (March 30, 2022) (available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022PC0142>), to the exclusion of Articles 9(1c) and 11(1), referred to in this report as **DRAFT ESPR**;
- the latest version of the draft European Commission standardisation request to CEN/CENELEC (made available to members of these standardisation bodies on 26th September 2023), referred to in this report as **SReq**, to the exclusion of requirements on maximum length of the unique product identifier string and on Anticounterfeit/Authenticity requirements;
- the Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC published in the Official Journal of the European Union on 28 July 2023 (available at <https://eur-lex.europa.eu/eli/reg/2023/1542/oj>), to the exclusion of Article 77 (3), referred to in this report as **BatReg**;

The process followed, in order to assess the fitness for purpose of existing identification schemes, is summarised below:

- Based on the relevant legal texts, 10 criteria applicable to **product, economic operator** and **facility** identification systems have been highlighted.
- Next, a framework for assessing these three identification needs was established.
- This framework was used to collect information from CIRPASS partners, in particular from those involved in Standards Development Organisations, on existing identification schemes.
- These answers were then reviewed by all CIRPASS partners to identify areas where interoperability challenges might exist.

Based on the described process, this deliverable sets out the challenges that any identification scheme must overcome and it offers an analysis of the characteristics of each existing scheme and its fitness for purpose. Note that this document is solely concerned with unique identifiers and data encoded in data carriers. Other areas of standardisation, as shown in Annex C, slide 3, such as links between the physical product and its digital representation, access rights management, technical and semantic interoperability, are out of scope of the present study.

3. Criteria applicable to identification schemes

Multiple international standards-based product identification schemes exist that could bring value to the implementation of DPPs across any product category concerned by the EU DPP. Additionally, there are also multiple existing economic operator (EO) identification and facility identification schemes that could bring value to DPP implementations, again, independently of product category. To evaluate these schemes with respect to the needs of the DPP, this report first identifies a number of criteria to which any successful identification implementation must adhere, based on the above listed official texts (applicable to product, EO and Facility identification schemes unless otherwise stated explicitly). To provide an overview, these are:

- Uniqueness
- Interoperability
- Granularity (Product)
- Representation in Data Carriers
- Linking Physical to Digital
- Current Scope of Use/Pervasiveness
- Online Selling (Product)
- Persistence
- Offline data Encoded in AIDC Data Carrier
- Delegated Act or Regulatory Direction (of Choice of Identification Schemes)

An explanation of each of these criteria is provided below.

Uniqueness

Per DRAFT ESPR Considerando (30), “Unique identification of products is a fundamental element to enable traceability across the supply chain. Therefore, the product passport should be linked to a unique product identifier. In addition, where appropriate, the passport should allow for the tracing of the actors and manufacturing facilities related to that product. In order to ensure interoperability, the unique operator identifiers and unique facility identifiers enabling traceability should be released in accordance with internationally recognised standards.” Accordingly, the SReq requires, “Uniqueness of each identifier (i.e., the same identifier shall not be assigned to different products, different economic operators, or different facilities)” and “Any solution proposed should guarantee the uniqueness of the identifier string and compliance with existing legal requirements with particular reference to Commission Implementing Regulation (EU) 2015/2447⁴.” Furthermore, the DRAFT ESPR, Article 9(1)(a) confirms that “A product passport shall meet the following conditions: it shall be connected through a data carrier to a unique product identifier”.

It is understood that, considering the broad scope of the combination of the DRAFT ESPR legislation and the published BatReg, it is essential to consider that these criteria for uniqueness mean that all identifiers must be globally unique, thus avoiding that objects identified using different identification schemes are given the same ID. The identification may be composed of multiple components or elements in order to become globally unique for the manufacturer and for the model, batch or item level assigned by the manufacturer.

Interoperability

Per DRAFT ESPR Considerando (28): “In order to ensure interoperability, the types of permitted data carriers should be specified. For the same reason, the data carrier and the unique product identifier should be released in accordance with internationally recognised standards. The power to adopt acts in accordance with Article 290 TFEU should be delegated to the Commission to amend this Regulation by replacing or adding standards in accordance with which the data carrier and the unique identifiers may be released, in light of technical or scientific progress. This should ensure that the information contained in the product passport can be recorded and transmitted by all economic operators, as well as to guarantee the compatibility of the unique identifier with external components such as scanning devices.” In relation to this, the SReq advises that “The standard(s) should allow both the possibility to use ‘centralised’ and ‘decentralised’ Identifiers including the definition of conformance criteria if different methods to produce an identifier are allowed...” and that “Syntax-related requirements, Semantic-related requirements”

In a product centric system, the identifiers are on the product. There are various ways to durably attach an identifier to a tangible product. For interoperability, scanning/reading the identifier from the product must be easy and based on standards. Once an identifier has been scanned/read, an implementation must be able to access, or know how to retrieve, the DPP information. The more widespread the implementation of reading devices of a certain data carrier are, the more ubiquitous the access to DPP data will become. Interoperability does not mean that the identifier itself can be read by arbitrary implementations.

Interoperability means that an identification scheme integrates well into the subsequent system accessing the DPP Information, and that various identification schemes can be used in parallel without causing disruption due to lack of uniqueness (see the UNIQUENESS criterion above). With this approach to interoperability, there will not be a risk that two completely different products are assigned the exact same product identifier as a result of two or more different product identification schemes being used.

Furthermore, interoperability relies on product Identifiers that must either be in the form of a web URI or have a formal, specified and known transform into a web URI. If this URI is not present in the data carrier, this transform can be done within a dedicated application or as a cloud service. As soon as an identifier is in the form of a web URI, a web request to this URI will return DPP data or the link to the DPP.

If an application encounters an unknown identifier that it cannot resolve, and therefore who’s DPP cannot be found, this does not affect or disrupt the other software running in the user's environment used, e.g. in a recycling plant.

Please note that the project has not found an appropriate external definition of the term “interoperability” suitable for this context.²

Granularity (Product)

According to the SReq, “The unique product identifier should always allow the possibility to include the three different granularity levels introduced in DRAFT ESPR i.e., model, batch or item” and “The need to

² Remark: in the context of this document, interoperability is not referring to area of standardization, concerning the technical semantic and organizational as mentioned in the SReq. It does not apply to the data models etc. In this context it is referred to the DRAFT ESPR requirement to guarantee the compatibility of the unique identifier with external components such as scanning devices (see text above).

move from batch to item will also be needed for those product groups for which updates of passports will be relevant, for example those products for which repair activities can be expected. Moreover, in some cases like in Battery Regulation (EU) 2023/1542, the granularity level for the DPP passport is at item level.” And per DRAFT ESPR, Article 9(1)(e), “A product passport shall meet the following conditions: the information included in the product passport shall refer to the product model, batch, or item as specified in the delegated act adopted pursuant to Article 4”.

Definitions of product ID for model, batch and item from SReq are available in the Terminology section of this document. Item numbers can be made as unique numbers or by combining model number and a serial component. It is understood that the possible product identifiers may include a) model, b) model identifier plus production batch number, and/or c) model identifier plus a serial component; and that these identification scenarios can support all the data sharing precision required by supply chain applications. Alternatively, it is understood that asset management applications may make use of product identifiers only at item level (only serial number). This means that such identification schemes only provide identification at the most granular level, and not at model or batch level.

To support buying decisions, the model-level content of the product’s DPP must be identifiable and available to buyers before they actually buy and come into possession of the product. The item that is then delivered may have an identifier with finer-level granularity (e.g., batch or item number) and an associated DPP with additional batch or item level data. Depending on which identification scheme is used, the granularity may or may not be expressed in the identifier physically attached to the product (for example, an item-level identifier may express the model number in the identifier itself). If the granularity is not expressed in this identifier, e.g. because only a unique item identifier is used to mark the product, then the information about the relations to higher granularity levels, such as product model ID, should be provided within the DPP of the product.

There may also be cases where products will be identified at more granular level than required by legislation. For example, it is already becoming more common in the textile industry to identify commodity items, such as socks, using itemized identifiers. However, in this case, item-level DPPs may not be required, depending on future ESPR delegated acts.

Representation in Data Carriers

DRAFT ESPR Considerando (31) states that, “Digitalised information about the product and its life cycle or, where applicable, its passport should be easily accessible by scanning a data carrier, such as a watermark or a quick response (QR) code. Where possible, the data carrier should be on the product itself to ensure the information remains accessible throughout its life cycle. However, exceptions are possible depending on the nature, size or use of the products concerned.” DRAFT ESPR, Article 9 (1) states “A product passport shall meet the following conditions:

- a. it shall be connected through a data carrier to a unique product identifier;
- b. the data carrier shall be physically present on the product, its packaging or on documentation accompanying the product, as specified in the applicable delegated act adopted pursuant to Article 4;
- c. the data carrier and the unique product identifier shall comply with standard (‘ISO/IEC’)
- d. 15459:2015;

The Commission is empowered to adopt delegated acts in accordance with Article 66 to amend the first subparagraph, point (c), of this Article in light of technical and scientific progress by replacing the standard referred to in that point or adding other European or international standards with which the data carrier and the unique identifiers shall comply for the purposes of meeting the conditions set out in this Article.”

Per BatReg, Article 77 (3) “The battery passport shall be accessible through the QR code referred to in Article 13(6) which links to a unique identifier that the economic operator placing the battery on the market shall attribute to it. The QR code and the unique identifier shall comply with the ISO/IEC standards 15459-1:2014, 15459-2:2015, 15459-3:2014, 15459-4:2014, 15459-5:2014 and 15459-6:2014 or their equivalent. The Commission is empowered to adopt delegated acts in accordance with Article 89 to amend the second subparagraph of this paragraph in light of technical and scientific progress by replacing the standards referred to in that subparagraph or adding other European or international standards with which the QR code and the unique identifier shall comply.

Per the SReq, “The standard(s) shall define common rules for how to construct the Automatic Identification and Data Capture (AIDC) media to be used as data carrier linked to the product passport. The requirements should concern, as applicable:

- a. symbology characteristics,
- b. data character encoding methods,
- c. symbol formats,
- d. dimensional characteristics,
- e. error correction rules,
- f. reference decoding algorithm,
- g. printing quality requirements,
- h. production quality requirements,
- i. user-selectable application parameters (if relevant),
- j. durability requirements.”

It is understood that items (a), (b), and (f) are to be found within the relevant ISO/IEC JTC1 SC31 symbol specifications for each (c) symbol format selected and the equivalent for ‘non-line of sight’ AIDC data carriers (e.g., RFID tags). With regards to (c) it should be noted that, in some cases, this aspect is not covered by ISO 15459:2015. It is understood that items (d), (e), (g), (h), (i), and (j) should reference current application standards established for each product category by industry in cooperation with the Standards Development Organization of each industry’s choice. For example, there may be very different criteria used for products sold online or at retail point-of-sale, versus products where the direct marking of parts is required, as the installed base of scanning/reading systems may differ. It is understood that item (g) requires a standard methodology for determining the achieved print quality “grade” (e.g., ISO/IEC 15426-2 for 2D symbols like QR Code), but also requires industry application standard specifications for what grade is acceptable for the scanning/reading install base. In case application standards for a product category or industry do not exist, it is expected that they are created based on appropriate international standards (ISO/IEC).

Linking Physical to Digital

Per DRAFT ESPR, recital (30), “Unique identification of products is a fundamental element to enable traceability across the supply chain. Therefore, the product passport should be linked to a unique product identifier.” Per the SReq, “The data carrier shall contain links to the product passport. These elements shall act as a reference to both the public and the restricted DPP-data (i.e., the information included in each DPP, to be identified through specific Delegated Acts at product group level).”

It is understood that, since a QR code *cannot* contain multiple links and still be scannable without specialist and currently non-existent software, the one link in a QR code must be the starting point for the discovery of multiple sources of data that together make up the DPP. Although it is possible to centralise the data in a single aggregated dataset, it is understood that the DPP system standards should also support individual economic operator’s choice to distribute components of the DPP, such as data, conformance certificates, repair instructions and recycling information, while still remaining responsible for the data. Such data may apply at different levels of granularity. For example, the DPP dataset may include one or more links that may refer to item-level data independently of product-level data. Where data is not public, different data sources might be managed by different business partners and subject to different licensing terms and access control methods. Use of a unique product identifier is a prerequisite for distributed data sources and shall be included within the link in the data carrier.

Current Scope of Use/Pervasiveness

Per DRAFT ESPR, Article 5 (5), “Ecodesign requirements shall meet the following criteria: (a) there shall be no significant negative impact on the functionality of the product, from the perspective of the user; (b) there shall be no adverse effect on the health and safety of persons; (c) there shall be no significant negative impact on consumers in terms of the affordability of relevant products, also taking into account access to second-hand products, durability and the life cycle cost of products; (d) there shall be no disproportionate negative impact on the competitiveness of economic actors, at least of SMEs; (e) there shall be no proprietary technology imposed on manufacturers or other economic actors; (f) there shall be no disproportionate administrative burden on manufacturers or other economic actors.” Per SReq, “The standards shall consider the diversity of identifiers currently used by economic operators and accommodate them as much as possible” and “As the reliability of the DPP-system is very important for policy implementation and enforceability, the standards shall be rooted in existing mature international standards while at the same time taking into consideration new and innovative approaches, provided that full cross-sectoral interoperability can be guaranteed. In particular, ISO/IEC standards should be looked at first, complemented (if necessary) by existing European standards, national standards and fora standards (in this order).” and “In order to promote interoperability, reduce costs for companies, and support coherency and consistency of digitalisation efforts, the standard(s) developed should adequately take into account typology of identifiers already used in other European legislations and initiatives.”

It is understood that we must consider how regulatory requirements can be met with the minimum impact to industry (particularly SMEs), to consumers, to regulatory partners like customs and logistics providers, and to solution providers who are creating the products that support enhancements to existing industry implementations. That is, implementations based on the use of existing standards can represent substantial investments, and so are an important factor when assessing the suitability of identification methods that can support the development of the DPP. In summary, the journey towards a circular

economy should begin by reusing international standards that have already been implemented by industry, wherever possible, as long as they [the standards] can be used without limitations in proprietary technologies and they comply with all legal requirements and policy objectives, including interoperability. This will ensure data, processes, training, systems, and interfaces of industry, used to support existing requirements, can be most effectively leveraged to facilitate regulatory goals for the new DPP data sharing use case, in a timely manner. In addition, it allows for continuous improvements and innovation as industry keeps developing the standards used to meet future business needs. It is understood the reliance on international rather than national standards is related to circularity demands crossing product categories and geographies. The criteria are global to the extent DRAFT ESPR requirements impact product exports to Europe, as well as products manufactured in Europe.

Online Selling (Product)

Per DRAFT ESPR, Article 8 (2)(e), “the manner in which the product passport shall be made accessible to customers before they are bound by a sales contract, including in case of distance selling;” Per SReq, “This is needed because the DPP of products sold online will only be available at model level, while the ESPR delegated acts may require the product specific DPP to be available at batch level, with the possibility for economic operators to serialise their DPPs having a DPP at item level.

It is understood that online marketplaces and other online sales channels offer most, not all (e.g., some intermediate products), products in the scope of the DRAFT ESPR or related Delegated Acts. This includes batteries, textiles and apparel, consumer electronics, and many other products. Insofar as a particular product category/type is sold online, implementers need to consider the prevalence and investment in systems based on existing standards as much as possible, when contemplating the various identification schemes that could be used for any product at any level of identification precision. It is understood that any online platform will be able to seamlessly integrate DPP information as it shares the same internet architecture.

Persistence

Per DRAFT ESPR Article 8 (3) “The requirements referred to in paragraph 2 shall: (a) ensure that actors along the value chain, in particular consumers, economic operators and competent national authorities, can access product information relevant to them;” and per DRAFT ESPR Article 21 (3) “Manufacturers shall keep the technical documentation and the EU declaration of conformity for 10 years after the product has been placed on the market or put into service. Delegated acts adopted pursuant to Article 4 may specify a period longer or shorter than 10 years in order to take account of the nature of the products or requirements concerned” And per DRAFT ESPR Article 21 (5), “Manufacturers shall ensure that their products bear a type*, batch or serial number or other element allowing their identification, or, where the size or nature of the product does not allow so, that the required information is provided on the packaging or in a document accompanying the product.” * *Editor’s note: It is assumed that in this context “type” has the same meaning as “model”.*

It is understood that DRAFT ESPR Articles 8 (3) and 21 (3), when taken together, mean the data carrier and the identifier must persist in correlation to the period of time where access to the data is required. It is also understood that Delegated Acts may permit the identifier to exist and be readable on packaging or documentation accompanying the product, when necessary due to the size or nature of the product.

Although not stated explicitly, it can be inferred that re-use of the same identifier after the original product's lifetime shall be avoided.

It is understood that persistence also refers to the need for the product identification to persist as long as access to the relevant data is required by the regulation. For ID systems relying on internet domain names for uniqueness, there must be a strong policy commitment that internet domain names used as a basis for product, economic operator or facility identifiers will be funded and maintained over the long term, even in the event of a change of ownership of the economic operator.

Offline data Encoded in AIDC Data Carrier

Per SReq mandate, “Finally, the data carrier may also include cross-sectoral basic data elements, i.e. data that can be consulted offline. These elements should make it possible to consult data from the data carrier even when the online information cannot be accessed. For example, when:

- the subject reading the data carrier is offline;
- a link present in the data carrier is broken;
- a link does not lead to a valid page on a website;
- the server hosting the DPP is down for maintenance or is overloaded.

... The cross-sectoral basic data elements should include the following six information elements:

1. DPP owner (the economic operator who created the DPP).
2. Unique operator identifier (the main manufacturer, if different from the DPP owner)
3. The facility identifier (the location where the main manufacturing stage took place)
4. The unique product identifier (identifier of the product registered in the DPP registry)
5. An additional product identifier (additional identifier associated to the product, optional)
6. The product typology group (information about the type of product).”

It is understood that 1, 2, 3, 4, and optionally 5, are identifiers. A clarification should be sought for the format and/or normative standards required for 6. Feasibility per product category should be piloted based upon the need to encode “dynamic” data (e.g., LOT, Serial Number) inline at high speeds, with print width constraints, or space limits for printing.

Furthermore, we refer the reader to a discussion on the (mostly negative) impacts of adding static data in the data carrier, provided in Annex D below, the principal of which is the need for specialist reader software.

Delegated Act or Regulatory Direction (of Choice of Identification Schemes)

Are there any specified standards from which identification must be derived for a particular product category? For example, BatReg states, “The battery passport shall be accessible through the QR code referred to in Article 13(6), which links to a unique identifier that the economic operator placing the battery on the market shall attribute to it.”

The QR code and the unique identifier shall comply with the ISO/IEC standards 18004:2015, 15459-1:2014, 15459-2:2015, 15459- 3:2014, 15459-4:2014, 15459-5:2014 and 15459-6:2014 or their equivalent.

For each product category, multiple identification schemes could concurrently support the requirements above, assuming that any product ID scheme can be used in combination with any product taxonomy/vocabulary. And so a framework is needed to address the opportunities and challenges that exist when: more than one identification scheme is to be used to address the specific requirements of any one product category; and for all identification schemes used across all product categories. At this stage, the SReq requirements focus on general (DRAFT ESPR Article 9 and 10) and specific requirements for batteries (EU 2023/1574 Article 78). Given that the EU BatReg 2023/1574 is published, the proposed framework can be used with this specific category. That said, framework outcomes will differ depending on existing product identification maturity in each product category and on the overall requirement for interoperability across all product categories, which is required per Article 78 (1), *“the battery passport shall be fully interoperable with other digital product passports required by Union law concerning eco-design, in relation to the technical, semantic and organisational aspects of end-to-end communication and data transfer”*.

Finally, we must assess a series of product categories to establish how they will interoperate, while the work across SReq modules must be *“organized in a modular way to ensure interoperability, reduce lock-in effects, and enable parallel standardisation work.”*

4. The Framework for Analysis of Identification Schemes

There are variables to consider as we evaluate the benefits and challenges of multiple international standards-based identification schemes for each individual product category. The situation may vary because:

- a. The choice may be straightforward, as there already exists a pervasive international standards-based identification scheme for identification of products and/or economic operators and/or facilities within the category that fits (or that can be adapted to fit) the criteria.
- b. There may be more than one international standards-based identification scheme within one product category, and this could be context-dependant. For example, in the context of product identification only, a laptop sold online with a ‘retail’ identifier on its packaging may separately contain an IMEI identifier on the product inside (see Annex B for more details).
- c. There may be company-specific solutions in a particular product category that do not today conform to any international standard. This would necessitate significant adaptation of current industry practice to establish or conform to international standards-based identification schemes for products, economic operators and/or facilities.

Based upon this, the analysis of international standards-based identification schemes has been approached as follows:

1. An excel spreadsheet was used to collect information from the CIRPASS community on how various identification schemes meet the criteria as described in this document (see Annex A). This activity was undertaken in a transparent way, in which everyone involved could see the entries from all contributors.
2. After undertaking the necessary assessments, the outcomes were analysed and the level of criteria compliance result for each identification scheme was made available.

Table 2 - Framework for assessing identification schemes

Entity	Framework Criteria
<p>International standards-based identification schemes for products.</p>	<ol style="list-style-type: none"> 1. UNIQUENESS: Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism. 2. INTEROPERABILITY: Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes. 3. GRANULARITY: How does the product identification scheme support the hierarchal relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure? 4. REPRESENTATION IN DATA CARRIERS: Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable? 5. LINKING PHYSICAL TO DIGITAL: Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed? 6. CURRENT SCOPE OF USE/PERVASIVENESS: Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned? 7. ONLINE SELLING: Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned? 8. PERSISTENCE: Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business. 9. OFFLINE DATA: Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so, please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of “offline data” within data carriers. 10. DELEGATED ACT OR REGULATORY DIRECTION: Are there any specified standards from which identification must be derived for a particular product

Entity	Framework Criteria
	category?
<p>International standards-based identification schemes for Economic Operators.</p>	<ol style="list-style-type: none"> 1 UNIQUENESS: Does a method exist to ensure uniqueness between all economic operator identifiers, independent of economic operator, within each economic operator identification scheme(s)? If so, explain the mechanism. 2 INTEROPERABILITY: Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different economic operators are assigned the exact same identifier, because different identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes. 3 REPRESENTATION IN DATA CARRIERS: Are there existing standards in place for the representation of the identifiers of each economic operator identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable? 4 CURRENT SCOPE OF USE/PERVASIVENESS: Is the economic operator identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned? 5 PERSISTENCE: Does the economic operator identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator. 6 DELEGATED ACT OR REGULATORY DIRECTION: Are there any specified standards from which economic operator identification must be derived for a particular product category?
<p>International standards-based identification schemes for facilities.</p>	<ol style="list-style-type: none"> 1. UNIQUENESS: Does a method exist to ensure uniqueness between all facility identifiers, independent of economic operator, within each facility identification scheme(s)? If so, explain the mechanism. 2. INTEROPERABILITY: Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different facilities are assigned the exact same identifier, because different facility identification

Entity	Framework Criteria
	<p>schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.</p> <ol style="list-style-type: none"><li data-bbox="450 353 1428 544">3. REPRESENTATION IN DATA CARRIERS: Are there existing standards in place for the representation of the identifiers of this facility identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?<li data-bbox="450 555 1428 701">4. CURRENT SCOPE OF USE/PERVASIVENESS: Is the facility identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?<li data-bbox="450 712 1428 891">5. PERSISTENCE: Does each facility identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.<li data-bbox="450 902 1428 1003">6. DELEGATED ACT OR REGULATORY DIRECTION: Are there any specified standards from which facility identification must be derived for a particular product category?

5. Recommendations

During work on this FRAMEWORK FOR ANALYSIS of IDENTIFICATION SCHEMES, the participating experts have had the opportunity to consider the practicability of the criteria for identification schemes formulated in the DRAFT ESPR and SReq, and would like to share their findings. The criteria descriptions and the associated assessment have been undertaken in relation to the DRAFT ESPR and SReq criteria as stated, and based on this experience, the expert team would like to offer some recommendations to the recipient of the assessment.

R1: No unnecessary data in data carriers: The presence of static/offline data in the data carrier beyond the strictly necessary UID-related URI should be avoided for several reasons, the most important being related to the data carrier (symbol size, printing cost, scanner performance) and the need for dedicated software installed by consumers. The (limited) advantages of offline data access (i.e., static product data available directly in the data carrier) will add unnecessary complexity and add cost for the remaining 99,99999% percent of scans when internet access is available, while caching is an alternative means to reach similar objectives. Instead, all data should be in the data space: All product-related data, excepting the UID-related URI link to the online information should go into the DPP data model (knowledge graph, data sheet, etc.)

R2: Non-compulsory identifier granularity: Some product identification schemes integrate information and semantics into the identification/numbering itself. For example, the model number can be part of the item number provided physically on the product, enabling extraction of the model in offline scanners at point-of-sale. This should not be a regulatory requirement, as it would exclude certain schemes, but it is not harmful either. In cases where the identification scheme does not support encoding the model number in item level product identifiers, model number should still be a property of the item that is made available as a data point in the DPP dataspace.

R3: Item level identification when needed: When defining the delegated acts, it should be considered that several circular business use cases such as reuse and repair will need identification on item level, and this should be mandatory for product groups that have such use cases.

R4: Product authentication mechanisms: Data related to product authentication mechanisms should be considered as part of the DPP information model.

R5: Expect dedicated Apps: While consumers must be able to access the DPP information without installing dedicated smartphone applications (i.e., natively installed applications on smartphones, such as QR-code reading camera applications and web browsers should be sufficient), uses of the DPP for non-consumer-facing applications/products should be expected. For example, while DIDs cannot currently be scanned without dedicated applications or Apps, they should be considered as one of the possible product identification schemes for non-consumer facing use cases since they are used in some European dataspace initiatives (e.g., Gaia-X), as well as in international traceability schemes such as the UN Transparency Protocol presented in the UNECE Recommendation 49 (https://unece.org/sites/default/files/2023-10/Rec49_ToR-v0.8.pdf).

Annex A: Assessment Framework

A.1 Assessment results for Product Identification Schemes

A.1.1 Decentralized Identifiers (DIDs)

The abstract for the definition of Decentralised Identifiers, as [standardised at W3C](#), is as follows:

Decentralised Identifiers (DIDs) are a new type of identifier that enables verifiable, decentralised digital identity. A DID refers to any subject (e.g., a person, organisation, thing, data model, abstract entity, etc.) as determined by the controller of the DID. In contrast to typical, federated identifiers, DIDs have been designed so that they may be decoupled from centralised registries, identity providers, and certificate authorities. Specifically, while other parties might be used to help enable the discovery of information related to a DID, the design enables the controller of a DID to prove control over it without requiring permission from any other party. DIDs are URIs that associate a DID subject with a DID document allowing trustable interactions associated with that subject.

Each DID document can express cryptographic material, verification methods, or services, which provide a set of mechanisms enabling a DID controller to prove control of the DID. Services enable trusted interactions associated with the DID subject. A DID might provide the means to return the DID subject itself if the DID subject is an information resource such as a data model.

Important aspects to highlight from the above abstract are as follows;

Firstly, the *raison d'être* of DIDs is that control of the DID can be proved by a secure means. This is typically a fingerprint or some other biometric control, however other methods based on cryptography are also used. If a product were to be identified by a DID issued by the manufacturer, then a system could verify that, yes, the manufacturer controls that DID.

Secondly, as the name makes clear, they are decentralised. There is no issuing agency like GS1 for GTINs or ICANN for internet domain names.

Thirdly, the DID Document – what you get back if you look up a DID on the internet – can contain any amount of information but its key feature is the 'cryptographic material' that enables control to be verified.

One common use for DID Documents is to list the URLs of services related to the identified item. That is, it's a kind of resolver— a way to find a set of links to relevant data.

What the quoted text doesn't make explicit is that there are different methods of generating, storing and resolving DIDs. Some, but not all, will make use of a blockchain. Others will rely on the direct exchange of cryptographic keys or on the control of an internet domain. Whichever method is used, there must be an infrastructure of some kind.

W3C maintains a [registry of DID methods](#) and lists the details that must be included in the method. These are all related to how the DID is constructed and how control can be verified. There are no rules about how identifiers should be allocated or managed although individual DID methods may specify such rules.

Criterion	Decentralized Identifiers (DIDs)	
	All sectors	Electronics
Uniqueness		
Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism.	<p>DIDs are designed to ensure uniqueness across all product identifiers, irrespective of the economic operator. Each DID is a globally unique URI, created through decentralized methods that prevent duplication, ensuring distinct identification for every product.</p> <p>https://www.w3.org/TR/did-core/</p>	<p>This is the approach used by the Obada standard - www.obada.io</p>
Interoperability		
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and decentralized identification schemes.	<p>DIDs can coexist with other identification schemes due to their decentralized nature and standardized format, avoiding duplication and ensuring consistent uniqueness across different systems.</p> <p>Decentralized identifiers would need to achieve a level of standardization and interoperability that is accepted internationally across industries to effectively serve as global product identifiers. We are not there yet.</p>	
Granularity		
How does the product identification scheme support the hierarchal relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure?	<p>DIDs support hierarchical identification, where a primary DID can be linked to more specific identifiers for different product levels. This hierarchy can be explored without necessarily relying on an internet-connected infrastructure.</p> <p>Product-Level Granularity: Each product, or each individual unit of a product, could have its own DID, which may include manufacturing details, ownership history, and more, thereby supporting traceability efforts.</p> <p>Component-Level Granularity: For complex products, individual components or subassemblies might also have their own DIDs, allowing for detailed tracking and management within supply chains</p>	
Representation in data carriers		

Criterion	Decentralized Identifiers (DIDs)	
	All sectors	Electronics
Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	<p>While DIDs can be encoded into data carriers like QR Codes or RFID tags, specific global standards for their representation in AIDC technology are not detailed in the DID Core specification.</p> <p>No. Creation of a specific W3C DID method specification is required. See https://www.w3.org/TR/did-core/#methods</p>	
Linking physical to digital		
Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed?	<p>DIDs support web URI syntax suitable for encoding in AIDC data carriers, following international standards, ensuring interoperability and seamless physical-to-digital linking.</p> <p>Yes. The AIDC would contain the Decentralized Identifier and the URL of the DID resolver service (most probably provided by DPP)</p>	
Current scope of use/pervasiveness		
Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	No.	
Online selling		
Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	To our best knowledge, no.	
Persistence		

Criterion	Decentralized Identifiers (DIDs)	
	All sectors	Electronics
Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business.	<p>DIDs ensure persistence of identifiers, designed to be independent of single points of failure like internet domain names, ensuring continuity even with changes in ownership or business closure.</p> <p>The DID is a persistent identifier which links to DID documents . DID documents register service endpoints that can record an unlimited number of entries during the lifetime of a product. So if an operator goes out of business, additional information can still be added.</p>	
Offline data		
Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so, please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of “offline data” within data carriers.	<p>A QR code type that allows for a web link plus additional attributes is defined in the following DIN specification https://www.beuth.de/de/technische-regel/din-spec-91406/314564057</p>	
Delegated act or regulatory direction		
Are there any specified standards from which identification must be derived for a particular product category?	No.	

A.1.2 GTS Identifiers

The Global Textile Scheme (GTS) is an association of well-known IT providers and companies from the textile value chain, which are operating largely in Europe. The primary focus of GTS standards is the interoperable exchange of data by translating & mapping (data sender: encoding & data receiver: decoding) into a harmonized classification system with defined semantics, which is likely to be highly relevant to the broader work around the DPP for textiles.

For finished product identification, the GTS system uses GS1 identifiers for product type (GTIN), batch/lot and serial numbers where necessary. These finished products identifiers can be augmented with purchase order numbers and SKUs (Stock Keeping Units) which are not covered by GS1. GTS also provides for suppliers a GTS company and facility identifiers, which allows in combination with the “supplier own” product number a unique product identifier for raw materials and production materials, likely to be highly relevant to generate DPP relevant data from suppliers in the textile value chain.

Criterion	GTS	
	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)	Textiles - Finished products
Uniqueness		
Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism.	GTS provides centrally by the GTS Cat platform a unique legal Operator ID with a defined semantic (4 times 0 means legal headquarter). For products on the supply side of textile value chains, the supplier uses this GTS legal operator ID, adds a "-" and then its own individual product identifier. Due to the centrally assigned GTS ID the identifier is unique.	GTS provides centrally by the GTS Cat platform a unique legal Operator ID. For finished products additionally to the GTIN (if applicable) the core data set consists with a defined taxonomy using symbols out of article-color-size-batch-lot-(serializing) item ID
Interoperability		
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	We are preparing the assignment of a prefix at ISO to be totally safe in the future. As GTS is very new this takes some time.	The GTIN, we are providing as leading identifier within the GTS data set, is only in use for applications, e. g. in E-commerce, where this is sufficient. We do so, as the GTIN is globally interoperable. For many use cases this is not enough though. This is the reason, when we additionally provide the data set behind the GTIN which is: article-color-size-batch-lot-(serializing) item ID

Criterion	GTS	
	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)	Textiles - Finished products
Granularity		
How does the product identification scheme support the hierarchal relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure?	The supply side doesn't work with GLN and GTIN. This is the reason, why the core data set we additionally provide contains the extended granularity (if needed) which is: article-color-size-batch-lot-(serializing) item ID	For many use cases this the GTIN is not enough. This is the reason, why the core data set we additionally provide is the data set, which is anyway behind the GTIN in the extended granularity which is: article-color-size-batch-lot-(serializing) item ID
Representation in data carriers		
Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	Not yet. For components we currently work on a new approach, based on QR codes and with a new process concept for the whole sector to allow automatic exchange of BOM master data - only indirectly relevant for DPP - but important for DPP data coming from various players from the value chain	Not yet. For finished products we follow the work of GS1.
Linking physical to digital		
Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed?	No, but currently not needed for these use cases.	Not yet. For finished products we follow the work of GS1.
Current scope of use/pervasiveness		
Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	The GTS standard will be critical to generate the supplier data needed for the DPP and just started its use in 2023.	The GTIN for finished products yes. The GTS standard will be critical to generate the data for the DPP and just started its use in 2023.
Online selling		

Criterion	GTS	
	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)	Textiles - Finished products
Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	Talks are ongoing.	GTIN is the leading Product ID on this field . In the textile sector, GTS is providing a new tool set for automated data exchange of product related attributes, where the talks just have started and first proof of concept pilots have been successfully finished. By using GTIN as an additional element within the GTS SKU-data set, GTS uses the benefits of GTIN and provides the sector specific functions.
Persistence		
Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business.	Supplier data will enrich the generation of DPP data. After this point the persistence is no topic any more as the responsibility is with the brand.	Theoretically yes. GTS offers also the possibility to host data. How persistent this will be depends on the concrete ESPR legal requirements and will be considered with network partners, that will host data within the future DPP data spaces.
Offline data		
Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so, please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of “offline data” within data carriers.	Yes, tbd.	Yes, tbd.
Delegated act or regulatory direction		

Criterion	GTS	
	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)	Textiles - Finished products
Are there any specified standards from which identification must be derived for a particular product category?		

A.1.3. IEC 61406-1 Identification Link

The first in its series of Identification Link Standards, [IEC 61406-1](#), uses a complete URL as the product identifier and specifies that the string of characters encoded in the data carrier should be treated as an immutable string that can be used in data systems other than the one addressed in the URL. There is no definite structure to a URL following IEC 61406-1 and it does not require the use of, for example, identifiers that conform to the ISO/IEC 15459 series. The standard is primarily designed to identify serialised items.

Criterion	IEC 61406-1 Identification Link
	All sectors
Uniqueness	
Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism.	The IEC 61406 - series ID Link is a URL more concrete an URL. Therefore, it is based on a web domain, this ensures by default technically the uniqueness of the identifier.
Interoperability	
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	Any existing identification scheme whether it is centralised or decentralised can be embedded as unique freetext in the IEC 61406 series ID Link. Therefore, it offers maximum interoperability between different identification schemes.
Granularity	
How does the product identification scheme support the hierarchal relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure?	Hierarchical relations between product level and more granular levels can be created based on ISO/IEC 15418 without reliance on a connected data infrastructure.
Representation in data carriers	

Criterion	IEC 61406-1 Identification Link
	All sectors
<p>Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?</p>	<p>Yes</p>
Linking physical to digital	
<p>Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed?</p>	<p>Yes</p>
Current scope of use/pervasiveness	
<p>Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>Till today product with a net worth of more than 3 billion € has been purchased with IEC 61406 - series ID Link.</p>
Online selling	
<p>Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>Electronic products with IEC 61406 - series ID Link were sold by retailers since 2023.</p>
Persistence	
<p>Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business.</p>	<p>Products with IEC 61406 - series ID Link were used e.g., on safety valves. The Digital Twin of the safety valve is stored on a manufacturer independent Information Exchange Platform. The information on the platform is accessed via the IEC 61406 - series ID Link. Due to more strict EU regulations than the ESPR, the accessibility of the Digital Twin must be ensured for the whole lifecycle of the Equipment. Some Equipment identified with IEC 61406 - series ID Link, have a lifespan of 50+ years.</p>
Offline data	

Criterion	IEC 61406-1 Identification Link
	All sectors
Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so, please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of “offline data” within data carriers.	Yes.
Delegated act or regulatory direction	
Are there any specified standards from which identification must be derived for a particular product category?	

A.1.4 ISO/IEC 15459 Identifiers

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
Uniqueness				
Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism.	<p>Yes, there exists a globally-recognized method (common rules) to ensure that all product identifiers are globally unique and persistent.</p> <p>ISO/IEC JTC1 formed SC31 to manage identification and data carrier (e.g., barcode, RFID) standards within the automatic identification and data capture technology (AIDC) domain. The ISO/IEC 15459 Registrar allocates Issuing Agency Codes (IAC) to Issuing Agencies (e.g., Dun & Bradstreet, EuroData, GS1, ICCBBA, NATO, Odette). Both ANS Data Identifiers and GS1 Application Identifiers provide for granular product identification.</p> <p>Each Issuing Agency works with the industry they serve to establish standards, specifications, and rules (e.g., *qualifier for and definition of</p>	ISO/IEC Issuing Agencies develop rules for allocation of identifiers in conjunction with application standards.	ISO/IEC Issuing Agencies develop rules for allocation of identifiers in conjunction with application standards. For example, retail and healthcare companies collaborate within GS1's Global Standards Management Process (GSMP) to establish rules for when a product identification SHALL be changed and rules that state the product identifier, once assigned, SHALL NOT be reassigned (see https://www.gs1.org/1/gtinrules/en/).	ISO/IEC Issuing Agencies develop rules for allocation of identifiers in conjunction with application standards. For example, retail and healthcare companies collaborate within GS1's Global Standards Management Process (GSMP) to establish rules for when a product identification SHALL be changed and rules that state the product identifier, once assigned, SHALL NOT be reassigned (see https://www.gs1.org/1/gtinrules/en/).

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	entity identified, character set, identifier structure, identifier length, identifier granularity, reuse rules) that ensure uniqueness between each company and within each company. Each year, each Issuing Agency makes a conformance report to the Registrar.		org/1/gtinrules//en/).	Other Issuing Agencies establish similar rules according to the requirements of the industries they serve, support product identification granularity, and product identification persistence.
Interoperability				
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	<p>Yes, there exists a globally-recognized method (Issuing Agency Code) to ensure that all product identifiers issued across all Issuing Agency are globally unique.</p> <p>ISO/IEC JTC1 formed SC31 to manage identification and data carrier (e.g., barcode, RFID) standards within the automatic identification and data capture technology (AIDC) domain. The ISO/IEC 15459 Registrar allocates Issuing Agency Codes (IAC) to Issuing Agencies (e.g., Dun & Bradstreet, EuroData, GS1, ICCBBA, NATO, Odette). Both ANS Data Identifiers and GS1 Application Identifiers provide for granular product identification.</p> <p>There is no overlap of the Issuing Agency Code (IAC) values. As each Issuing Agency is obliged to use only their IAC at the beginning of the product identifier, uniqueness between Issuing Agencies is assured within the printing/encoding and scanning/reading hardware and software for barcodes and tags.</p> <p>For product categories who</p>	The new battery regulation relies upon ISO/IEC 15459 and therefore battery manufacturers will need to work with an ISO/IEC Issuing Agency to ensure identifier uniqueness through development of the appropriate technical and application standards.	For textile, apparel and foot wear placed on the EU market via retail channels, whether instore or online, GS1's Global Trade Item Number (based on GS1's Issuing Agency Code (IAC) of '0 to 9') is widely implemented worldwide. Millions of EU retail transactions occur each day using GTIN on textile, apparel, and footwear items (e.g., on packaging, on hangtags, sewn in labels, embedded RFID tags). Serialised GTIN permits more granular identification and there is one GS1 Application Identifier (8006) that permits identification of various parts of one product to ensure all parts	For consumer electronics placed on the EU market via retail channels, whether instore or online, GS1's Global Trade Item Number (based on GS1's Issuing Agency Code (IAC) of '0 to 9') is widely implemented worldwide. Millions of EU retail transactions occur each day using GTIN on consumer electronic items (typically on packaging). In addition, other identifiers may be used for other purposes. For example, device to device communications using MAC addresses allocated by Institute of Electrical and Electronics Engineers identifiers (IEEE) and while IEEE is

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	<p>have implemented ISO/IEC 15459 for all existing product data sharing links, failure to reuse their current, standardised product identifiers and AIDC data carriers, would require an entirely new layer of international standards and require a second, redundant barcode/RFID tag, as current international standards, implemented in millions of devices, would not support this yet to be drafted, much less agreed and implemented standard. Alternatively, if we view DPP data haring as a new use case for product data that sits on top of many use cases that proceed it, reusing existing ISO/IEC 15459 identifiers already supported internationally by AIDC printing, scanning, reading systems, will permit one AIDC data carrier to support today's as well as the novel DPP use case.</p> <p>If non-ISO/IEC 15459 conformant product identities are introduced, there exists a risk of breakage of the guarantee of interoperability, as other identity issuance schemes may not, themselves, have taken care to avoid potential collision of identity. Rigour should be applied to the analysis of any other identification schemes to ensure that they have been developed with the guiding principle of interoperability by design.</p>		<p>are presented to complete a transaction (e.g., left shoe, right shoe).</p>	<p>an ISO/IEC 15459 Issuing Agency, MAC addresses are unique between companies per IEEE standards and used in barcodes, unless a MAC address began with IEEE's Issuing Agency Code ('VIE'), MAC addresses are not ISO/IEC 15459 conformant. There are other identifiers used for niche products like mobile devices using an International Mobile Equipment Identity (IMEI) for device authentication, or 'internal' model/serial numbers which are unique only to each manufacturer for the purposes like warranty or service. It should be noted, GS1, IEEE, EDIFICE, or other ISO/IEC Issuing Agencies can provide serialised product identifiers to ensure global uniqueness across manufacturers.</p>
Granularity				
How does the product identification scheme support the hierarchal	Yes, the system supports the hierarchical relationship between product-level identity and more granular levels of identity needed.			

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
<p>relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure?</p>	<p>ISO/IEC JTC1 SC31 standards ensure identification of the Issuing Agency via IACs to ensure uniqueness but also requires a "qualifier" preceding the identity to allow printing/encoding and scanning/reading systems to encode and decode then parse then process identification key components (e.g., class level, lot level, serial level) or data (e.g., weights, dates) in an interoperable way. Per ISO/IEC 15459-3 general rules (see Section 6), the following requirements apply to this answer:</p> <ul style="list-style-type: none"> a) an identity shall include a qualifier from one of the qualifier identification methods (GS1 Application Identifiers (AI), ASC MH10 Data Identifiers (DI) and ISO/IEC 9834-1 Object Identifiers (OID)) that are used as legitimate examples within the specific identity type.) b)... c) the string shall conform to the format specified for the qualifier to which it applies. d)... e) each qualifier shall require its own independent set of rules that enable the identities for this qualifier to be held in a separate field on a database, be defined as a separate data element in an EDI message or as a separate search criterion in a directory search. For each qualifier the rules should minimally determine (1) the maximum length of the string for that qualifier and (2) the repertoire of characters that may be used in the string following the identity issuer 			



Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	identification. f) ...			
Representation in data carriers				
Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	<p>Yes, there are existing standards in place for the representation of the identifiers in AIDC technology and they are widely used around the world today.</p> <p>ISO/IEC JTC1 SC31 standards are the international standards for "<i>Information technology — Automatic identification and data capture techniques</i>". Today, within millions of EU printing/scanning or encoding/reading systems, they ensure:</p> <ol style="list-style-type: none"> 1. Uniqueness between Issuing Agencies per ISO/IEC 15459-2 Registrar of Issuing Agency Codes 2. Interoperability of Issuing Agency identities via ISO/IEC 15459-3 (general rules) and ISO/IEC 15418 (qualifier methods) 3. Interoperability of the identities in point 2 by establishing standards to recognise: <ol style="list-style-type: none"> a) identification of barcode symbology (ISO/IEC 15424) b) start character or mode within AIDC data carrier to designate which type of Issuing Agency standard identity is encoded and decoded (QR Code per ISO/IEC 18004, Section 7.4.8, Data Matrix per ISO/IEC 16022, Section 11) c) identification of the Issuing Agency via IACs to ensure identity uniqueness (ISO/IEC 15459-2) d) "qualifiers" preceding the identity to allow 			

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	<p>printing/encoding and scanning/reading systems to encode and decode then parse then process identification key components (e.g., class level, lot level, serial level) or data (e.g., weights, dates) in an interoperable way (ISO/IEC 15418)</p> <p>e) AIDC data carrier 2D bar code print quality test specification (ISO/IEC 15415)</p> <p>f) A recommendation for each Issuing Agency to provide application guidance to identity issuers (e.g. check-digit algorithms, selection of GS1 Application Identifier or ASC MH10 Data Identifier, etc).</p>			
Linking physical to digital				
<p>Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed?</p>	<p>Yes for some ISO15459 IAs, soon yes for ALL ISO15459 IAs.</p> <p>Today, just as ISO/IEC 15418 and 15459 refer to two primary "qualifier" methods, GS1 Application Identifiers used for GS1 identities and ASC Data Identifiers for other Issuing Agencies, two basic approaches to web-enabled ISO/IEC SC31 JTC1 identification in AIDC data carriers have evolved. Industries in retail, healthcare and other sectors using GS1 standards have developed an approach called GS1 Digital Link. Technical industries supported by other Issuing Agencies developed IEC 61406-*. Now ISO/IEC SC31 JTC1 is advancing one standard (DIS 18975) that provides frameworks that are developed into fully implementable standards in GS1 Digital Link and IEC</p>			

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	61406-2 (not -1). The level of adoption differs but, in the case of GS1 Digital Link, its already pervasive support is coupled to the retail sector's 2027 ambition for pervasive 2D scanning support worldwide.			
Current scope of use/pervasiveness				
Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	For ISO/IEC SC31 JTC1 standards such as 15459, most product categories impacted by the DPP requirements have 100s of €billions in implementation investments. This is not limited to identifiers and automation of identification via AIDC, but also in data, interface, and messaging standards for master data, transactional data, and critical traceability event visibility data. In the case of all product categories placed on the market via retail and healthcare channels (e.g., textile, apparel, footwear, consumer electronics, personal hygiene, pharmaceuticals, medical devices), GS1 standards have been designed by industry consensus since the adoption of the product identifier (GTIN) in 1971. As one European retailer stated, "Our customers are informing themselves via digital channels, and we are using our mobile phones for all kinds of information. For us to have a trusted source of data and a uniquely identified product with the right set of attributes is crucial." - Christian Zaeske, Global Head of Master Data Management,			



Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	<p>METRO AG.</p> <p>Various technical industries work with many different ISO/IEC 15459 Issuing Agencies to define the appropriate identification, automated identification, and data sharing standards. These Issuing agencies cover many sectors such as automotive, electrical, telecommunications, and healthcare.</p> <p>In some cases, more than one Issuing Agency may be involved such as GS1 (medical device) and ICCBBA (blood or tissue) when the two form one entity. In another example, an Apple Watch will have a GTIN for trade but also an IMEI or EID for communication between devices and other purposes.</p>			
Online selling				
<p>Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>Yes, the product identification system is currently in broad use across the vast majority of retailers globally and is additionally in use in many of the world's largest online platforms.</p> <p>There are many online marketplace platforms. Those supporting retail sales, online and instore, such as bol.com in the Netherlands, Google Shopping and Amazon, work within GS1's Global Standard Management Process (GSMP) to adapt and extend existing standards to support marketplaces today. Over the past two years, the companies above and many others using GS1 standards have convened three Mission Specific Working Group in the Global Standards Management</p>			

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
	Process to ensure GS1 standards are fit for purpose online, migrate to pervasive market use of 2D barcodes, and support sustainability.			
Persistence				
Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business.	<p>Yes and, in some cases (such as GS1 identifiers) all issued product identifiers are prevented from reuse forever.</p> <p>Per ISO/IEC 15459-3 Section 6 general rules... d) the string shall be unambiguous within its qualifier in the sense that no issuer re-issues the string within the qualifier over the entire life cycle for the identified entity or until a sufficient period time has passed so that the identity has ceased to be of significance to any user. For example, GS1 standard conformant implementations have supported non-reuse for the product identifier GTIN since January 2019 with few exceptions. See GS1 General Specifications, Section 4.2.5. For other ISO/IEC Issuing Agencies, other rules may apply as established by specific application guidelines or standards.</p>			
Offline data				
Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so,	<p>Yes, the product identification system can support a web URI syntax that could include such additional data.</p> <p>GS1 Digital Link and IEC 61406-2, both conformant to the emerging draft ISO/IEC 18975, define how to encode ISO/IEC 15459 identifiers in a Web URI. The requirement to support 'offline data' is yet to be confirmed. Once confirmed, the solution for</p>			



Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
<p>please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of "offline data" within data carriers.</p>	<p>"offline" data, whether encoded or not, needs greater discussion in terms of the mechanism. If encoded, it will add a significant amount of encoded data. It is technically possible in some, but not all use cases, to 'overload' the AIDC data carrier (go beyond 70 encoded characters), but even where it is possible, it is practically very disruptive and expensive to do so. It could even introduce packaging waste as some product packaging may become larger to provide for the larger 2D symbol. For RFID, the cost of tags would increase dramatically if not confined to tag sizes used today to provide granular product identification. That coupled with the inability of a human to derive any information from an identifier in offline mode unless that data is resident on the scanning/reading device would indicate the preferred approach to provision this data would be in text rather than the AIDC data carrier.</p>			
Delegated act or regulatory direction				
<p>Are there any specified standards from which identification must be derived for a particular product category?</p>	<p>See EV Battery column</p>	<p>QR Code per ISO/IEC Standard 18004. The QR code and the unique identifier shall comply with the ISO/IEC standards 15459-1:2014, 15459-2:2015, 15459- 3:2014, 15459-4:2014, 15459-5:2014 and 15459-6:2014 or their</p>		

Criterion	ISO/IEC 15459 Identifiers			
	All sectors	Batteries	Textiles	Electronics
		equivalent. ISO 14040:2006 terminology.		

A.1.5 UUIDs

Universally Unique Identifiers (UUIDs), also known as Globally Unique Identifiers, GUIDs, are 128-bit strings generated by an algorithm rather than being issued. There are several algorithms in use and it's important to note that UUIDs are not random numbers. The chances of the same UUID being generated by two separate systems, although not zero, is so small as to be negligible. There are many recognised algorithms for generating UUIDs and these are documented in a variety of standards. These include ISO/IEC 11578:1996 "Information technology – Open Systems Interconnection – Remote Procedure Call (RPC)" and, more recently, ITU-T Rec. X.667 | ISO/IEC 9834-8:2014. The IETF's [RFC 4122](#) defines UUIDs as a URN.

UUIDs can be represented in different formats, most commonly as hexadecimal strings like 550e8400-e29b-41d4-a716-446655440000. The same UUID can be represented as a decimal number: 113059749145936325402354257176981405696.

Criterion	UUID
	All sectors
Uniqueness	
Does a method exist to ensure uniqueness between all product identifiers, independent of economic operator, within each product identification scheme(s)? If so, explain the mechanism.	A UUID – that's short for Universally Unique Identifier, by the way – is a 36-character alphanumeric string that can be used to identify information. Can be generated in almost any software / standard supported.
Interoperability	
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different products are assigned the exact same product identifier, because different product identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	UUID can be used in any context and any industry. Easy to understand and implement. No need for central repository and no need to align on number ranges for different industries, since a UUID has no context.
Granularity	

Criterion	UUID
	All sectors
<p>How does the product identification scheme support the hierarchal relationship between model-level identity and more granular levels of identity? Can the relation be explored without reliance on an internet-connected data infrastructure?</p>	<p>Hierarchical relationship not supported, so batch/item will also have a UUID, which also have to be exchanged (Machine-to-Machine as separate fields) and/or be encoded in the carrier. More complex products will most likely have two DPPIDs (so 2 UUIDs), one on model level for commercial applications and one on Individual Item level (similar to serial number for a laptop).</p>
<p>Representation in data carriers</p>	
<p>Are there existing standards in place for the representation of the identifiers of each product identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?</p>	
<p>Linking physical to digital</p>	
<p>Does each product identification scheme support a web URI syntax that can also be encoded within an AIDC data carrier (e.g., QR Code, RFID tag) that is based on international standards? If not, what would be required to establish such a standards-based syntax and encoding in such a way that interoperability is guaranteed?</p>	<p>yes, most likely the GS1 Digital Link format extended with a key for the DPP ID (e.g. "30")</p>
<p>Current scope of use/pervasiveness</p>	
<p>Is each product identification scheme currently in use within the product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>The DPP gets its own ID, a DPP ID can refer to a DPP on Model, Batch or Individual Item level. The DPPID will co-exists with current other item identifiers like GTIN (for trade items)</p>
<p>Online selling</p>	
<p>Is each product identification scheme currently used within the product category by retail and/or online platforms and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>No, since the DPP ID based on UUID will be a new identifier that will be exchanged across the value chain. Online sales for new items will in most cases have the DPP ID on model level. But online commerce for second-hand sales (or used sales) the DPP ID can be the DPP of the individual item (e.g. a car or industrial machine).</p>
<p>Persistence</p>	
<p>Does the product identification scheme ensure persistence of the identifier so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator, or that the economic operator goes out of business.</p>	<p>Yes</p>

Criterion	UUID
	All sectors
Offline data	
<p>Can the product identification scheme support a web URI syntax within an AIDC data carrier (e.g., QR Code, RFID tag) in combination with economic operator, location identifiers and other “offline data”? If so, please provide references citing appropriate standards. Also, explain any concerns related to the inclusion of “offline data” within data carriers.</p>	<p>Yes, most likely the GS1 Digital Link format extended with a key for the DPP ID (e.g. "30")</p>
Delegated act or regulatory direction	
<p>Are there any specified standards from which identification must be derived for a particular product category?</p>	<p>No, universal, no limitations</p>

A.2 Assessment results for Operator Identification Schemes

A.2.1 Decentralized Identifiers (DIDs)

Criterion	Decentralized Identifiers (DIDs)
	All sectors
Uniqueness	
Does a method exist to ensure uniqueness between all economic operator identifiers, independent of economic operator, within each economic operator identification scheme(s)? If so, explain the mechanism.	<p>DIDs are designed to ensure uniqueness across all product identifiers, irrespective of the economic operator. Each DID is a globally unique URI, created through decentralized methods that prevent duplication, ensuring distinct identification for every product.</p> <p>https://www.w3.org/TR/did-core/</p>
Interoperability	
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different economic operators are assigned the exact same identifier, because different identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	<p>DIDs can coexist with other identification schemes due to their decentralized nature and standardized format, avoiding duplication and ensuring consistent uniqueness across different systems.</p> <p>Decentralized identifiers would need to achieve a level of standardization and interoperability that is accepted internationally across industries to effectively serve as global product identifiers. We are not there yet.</p>
Representation in data carriers	
Are there existing standards in place for the representation of the identifiers of each economic operator identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	<p>While DIDs can be encoded into data carriers like QR Codes or RFID tags, specific global standards for their representation in AIDC technology are not detailed in the DID Core specification.</p> <p>No.</p> <p>Creation of a specific W3C DID method specification is required. See https://www.w3.org/TR/did-core/#methods</p>
Current scope of use/pervasiveness	
Is the economic operator identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programs underway or planned?	No.
Persistence	

Criterion	Decentralized Identifiers (DIDs)
	All sectors
Does the economic operator identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	<p>DIDs ensure persistence of identifiers, designed to be independent of single points of failure like internet domain names, ensuring continuity even with changes in ownership or business closure.</p> <p>The DID is a persistent identifier which links to DID documents . DID documents register service endpoints that can record an unlimited number of entries during the lifetime of a product. So if an operator goes out of business, additional information can still be added.</p>
Delegated act or regulatory direction	
Are there any specified standards from which economic operator identification must be derived for a particular product category?	No.

A.2.2 GTS Identifiers

Criterion	GTS	
	Textiles - finished products	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)
Uniqueness		
Does there exist a method to ensure uniqueness between all economic operator identifiers, independent of economic operator, within each economic operator identification scheme(s)? If so, explain the mechanism.	GTS provides centrally by the GTS Cat platform a unique legal Operator ID with a defined semantic (4 times 0 means legal headquarter). It is unique, as this ID is centrally assigned and can be proved on the GTS platform.	GTS provides centrally by the GTS Cat platform a unique legal Operator ID with a defined semantic (4 times 0 means legal headquarter). It is unique, as this ID is centrally assigned and can be proved on the GTS platform.
Interoperability		
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption because two completely different economic operators are assigned the exact same identifier just because different identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	GTS ID follows a defined and unique taxonomy. An ISO Prefix is planned.	GTS ID follows a defined and unique taxonomy. An ISO Prefix is planned.
Representation in data carriers		

Criterion	GTS	
	Textiles - finished products	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)
Are there existing standards in place for the representation of the identifiers of each economic operator identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	Yes	Yes
Current scope of use/pervasiveness		
Is the economic operator identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programs underway or planned?	Just started but working.	Just started but working
Persistence		
Does the economic operator identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	Theoretically yes. GTS host economic operator ID data. How persistent this will be depends on the concrete ESPR legal requirements and will be considered with network partners, that will host data within the future DPP data spaces.	Supplier data will enrich the generation of DPP data. After this point the persistence is no topic any more as the responsibility is with the brand.
Delegated act or regulatory direction		
Are there any specified standards from which economic operator identification must be derived for a particular product category?	No	No

A.2.3. IEC 61406-1 Identification Link

Criterion	IEC 61406-1 Identification Link
Uniqueness	
Does a method exist to ensure uniqueness between all economic operator identifiers, independent of economic operator, within each economic operator identification scheme(s)? If so, explain the mechanism.	As the IEC 61406 - series ID Link is based on a web domain, the uniqueness of the economic operator is ensured via the web domain. A web domain is globally unique by default.
Interoperability	

Criterion	IEC 61406-1 Identification Link
	All sectors
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption because two completely different economic operators are assigned the exact same identifier just because different identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	
Representation in data carriers	
Are there existing standards in place for the representation of the identifiers of each economic operator identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	Yes
Current scope of use/pervasiveness	
Is the economic operator identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programs underway or planned?	The IEC 61406 - series ID Link is not limited to the ecosystem of a specific product category. It is applicable cross industry.
Persistence	
Does the economic operator identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	As the IEC 61406 - series ID Link is based on a web domain the persistence of the economic operator identification scheme is ensured by the domain name registration infrastructure.
Delegated act or regulatory direction	
Are there any specified standards from which economic operator identification must be derived for a particular product category?	No

A.2.4 ISO/IEC 15459 Identifiers

Criterion	ISO/IEC 15459 Identifiers
	All sectors
Uniqueness	

<p>Does a method exist to ensure uniqueness between all economic operator identifiers, independent of economic operator, within each economic operator identification scheme(s)? If so, explain the mechanism.</p>	<p>Yes, there exists a globally-recognized method (common rules) to ensure that all economic operator identifiers (EOIDs) are globally unique and persistent.</p> <p>ISO/IEC 15459 standard relies upon ISO/IEC 15418 qualifiers such as ANS MH10.8 Data Identifiers and GS1 Application Identifiers. The ISO/IEC 15459 Registrar allocates Issuing Agency Codes (IAC) to Issuing Agencies (e.g., Dun & Bradstreet, EuroData, GS1, ICCBBA, NATO, Odette). Both ANS Data Identifiers (used by Issuing Agencies to industry sectors not supported by GS1) and GS1 Application Identifiers (used by industry sectors supported by GS1) provide for economic operator identification.</p> <p>Each Issuing Agency works with the industry they serve to establish standards, specifications, and rules (e.g., *qualifier for and definition of entity identified, character set, identifier structure, identifier length, identifier granularity, reuse rules) that ensure uniqueness between each company and within each company. Each year, each Issuing Agency makes a conformance report to the Registrar.</p> <p>There is no overlap of the Issuing Agency Code (IAC) values. As each Issuing Agency is obliged to use only their IAC at the beginning of their identifiers, uniqueness between Issuing Agencies is assured within the printing/encoding and scanning/reading hardware and software for barcodes and tags.</p>
<p>Interoperability</p>	

<p>Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption because two completely different economic operators are assigned the exact same identifier just because different identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.</p>	<p>Yes, interoperability can be ensured when all industry players follow the established standards, in addition to common rules set forth in ISO/IEC 15459, data qualifier methods for economic operator identifier per ISO/IEC 15418, and web-enabled identification per ISO/IEC NP 18975). This can work in either centralized or decentralized identification issuance implementations, by the very design of ISO/IEC 15459.</p> <p>Should it become necessary to encode EOIDs into AIDC data carriers, reuse of ISO/IEC 15459-compatible identifiers ensures uniqueness across multiple Issuing Agencies and companies supported by each Issuing Agency. These identifiers can support existing as well as DPP related use cases using internationally implemented printer/scanner, encoder/reader hardware and software. Any attempt to introduce identities that are not conformant with ISO/IEC 15459, whether centralised or decentralised, would require an entirely new layer of international standards and require a second, redundant barcode as current international standards, implemented in millions of devices, would not support this yet to be drafted much less agreed and implemented, disruptive standard. If we view DPP data as a new use case for product and associated economic operator and/or facility data that sits on top of many use cases that proceed it, reusing existing identifiers already supported broadly by AIDC data carrier printing/scanning and encoding/reading systems, will allow one AIDC data carrier to support today's as well as the new DPP use case.</p>
<p>Representation in data carriers</p>	
<p>Are there existing standards in place for the representation of the identifiers of each economic operator identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?</p>	<p>Yes, there are existing standards in place for the representation of the identifiers in AIDC technology and they are widely used around the world today.</p> <p>ISO/IEC JTC1 SC31 standards are the international standards for "<i>Information technology — Automatic identification and data capture techniques</i>". Today, within millions of EU printing/scanning or encoding/reading systems, they ensure:</p> <ol style="list-style-type: none"> 1. Uniqueness between Issuing Agencies per ISO/IEC 15459-2 Registrar of Issuing Agency Codes 2. Interoperability of Issuing Agency identities via ISO/IEC 15459-3 (general rules) and ISO/IEC 15418 (qualifier methods) 3. Interoperability of the identities in point 2 by establishing standards to recognise: <ol style="list-style-type: none"> a) identification of barcode symbology (ISO/IEC 15424) b) start character or mode within AIDC data carrier to designate which type of Issuing Agency standard identity is encoded and decoded (QR Code per ISO/IEC 18004, Section 7.4.8, Data Matrix per ISO/IEC 16022, Section 11)

	<p>c) identification of the Issuing Agency via IACs to ensure identity uniqueness (ISO/IEC 15459-2)</p> <p>d) "qualifiers" preceding the identity to allow printing/encoding and scanning/reading systems to encode and decode then parse then process identification key components (e.g., class level, serial level) in an interoperable way (ISO/IEC 15418)</p> <p>e) AIDC data carrier 2D bar code print quality test specification (ISO/IEC 15415)</p> <p>f) A recommendation for each Issuing Agency to provide application guidance to identity issuers (e.g. check-digit algorithms, selection of GS1 Application Identifier or ASC MH10 Data Identifier, etc).</p>
Current scope of use/pervasiveness	
Is the economic operator identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	For ISO/IEC SC31 JTC1 standards, many parties impacted by the DPP requirements have been identified for traceability, order-to-cash business transactions, and more. This is not limited to identifiers and automation of identification via AIDC, but also in data, interface, and messaging standards for master data, transactional data, and critical traceability event visibility data. These party identifiers are joined by other party identifiers to identify parties for non-supply chain purposes such as an actual financial transaction.
Persistence	
Does the economic operator identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	Yes, as per ISO/IEC 15459-3 Section 6 general rules... d) the string shall be unambiguous within its qualifier in the sense that no issuer re-issues the string within the qualifier over the entire life cycle for the identified entity or until a sufficient period time has passed so that the identity has ceased to be of significance to any user. For example, ISO/IEC Issuing Agency standard conformant implementations supporting DPP would require non-reuse for the party identifier within specific application guidelines or standards.
Delegated act or regulatory direction	
Are there any specified standards from which economic operator identification must be derived for a particular product category?	No

A.3 Assessment results for Facility Identification Schemes

A.3.1 Decentralized Identifiers (DIDs)

Criterion	Decentralized Identifiers (DIDs)
	All sectors
Uniqueness	
Does a method exist to ensure uniqueness between all facility identifiers, independent of economic operator, within each facility identification scheme(s)? If so, explain the mechanism.	DIDs ensure uniqueness as they refer to any subject (e.g., person, organization, thing) determined by the DID controller. This uniqueness is independent of centralized registries, identity providers, and certificate authorities, allowing unique association with a DID subject and its DID document.
Interoperability	
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different facilities are assigned the exact same identifier, because different facility identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	DIDs are designed to be interoperable with various identifier systems, including centralized and federated identity management systems. This interoperability is facilitated by not being dependent on any specific technology or cryptography, enabling DIDs to be integrated with existing computing infrastructures like distributed ledgers or databases
Representation in data carriers	
Are there existing standards in place for the representation of the identifiers of this facility identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	<p>DID documents, which contain information associated with a DID, can be serialized into a byte stream and encoded into data carriers like QR codes or RFID tags. Furthermore, the DID use cases (https://www.w3.org/TR/did-use-cases/#actionPresent) mention that data carriers such as QR code may be used to present DIDs.</p> <p>Creation of a specific W3C DID method specification is required. See https://www.w3.org/TR/did-core/#methods</p>
Current scope of use/pervasiveness	
Is the facility identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	Different GIA
Persistence	

Criterion	Decentralized Identifiers (DIDs)
	All sectors
Does each facility identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	<p>DIDs ensure persistence of identifiers, designed to be independent of single points of failure like internet domain names, ensuring continuity even with changes in ownership or business closure.</p> <p>The DID is a persistent identifier which links to DID documents . DID documents register service endpoints that can record an unlimited number of entries during the lifetime of a product. So if an operator goes out of business, additional information can still be added.</p>
Delegated act or regulatory direction	
Are there any specified standards from which facility identification must be derived for a particular product category?	No

A.3.2 GTS Identifiers

Criterion	GTS	
	Textiles - finished products	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)
Uniqueness		
Does a method exist to ensure uniqueness between all facility identifiers, independent of economic operator, within each facility identification scheme(s)? If so, explain the mechanism.	<p>GTS provides centrally by the GTS Cat platform a unique legal Operator ID with a defined semantic (4 times 0 means legal headquarter). Legally independent facilities follow the same scheme. Legally dependent facilities can be marked from 1 to 9999. The ID is unique, as this ID is centrally assigned and can be proved on the GTS platform.</p>	<p>GTS provides centrally by the GTS Cat platform a unique legal Operator ID with a defined semantic (4 times 0 means legal headquarter). Legally independent facilities follow the same scheme. Legally dependent facilities can be marked from 1 to 9999. The ID is unique, as this ID is centrally assigned and can be proved on the GTS platform.</p>
Interoperability		

Criterion	GTS	
	Textiles - finished products	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)
Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different facilities are assigned the exact same identifier, because different facility identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.	GTS ID follows a defined and unique taxonomy. An ISO Prefix is planned.	GTS ID follows a defined and unique taxonomy. An ISO Prefix is planned.
Representation in data carriers		
Are there existing standards in place for the representation of the identifiers of this facility identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?	Yes	Yes
Current scope of use/pervasiveness		
Is the facility identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?	Just started but working.	Just started but working.
Persistence		
Does each facility identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.	Theoretically yes. GTS host facility ID data. How persistent this will be depends on the concrete ESPR legal requirements and will be considered with network partners, that will host data within the future DPP data spaces.	Theoretically yes. GTS host facility ID data. How persistent this will be depends on the concrete ESPR legal requirements and will be considered with network partners, that will host data within the future DPP data spaces.

Criterion	GTS	
	Textiles - finished products	Textiles - raw materials to finished products (as full package component, where the DPP registration comes from the brand)
Delegated act or regulatory direction		
Are there any specified standards from which facility identification must be derived for a particular product category?	No	No

A.3.3 ISO/IEC 15459 Identifiers

Criterion	ISO/IEC 15459 Identifiers
Uniqueness	
Does a method exist to ensure uniqueness between all facility identifiers, independent of economic operator, within each facility identification scheme(s)? If so, explain the mechanism.	<p>Yes, there exists a globally-recognized method (common rules) to ensure that all facility identifiers (FIDs) are globally unique and persistent.</p> <p>ISO/IEC 15459 standard relies upon ISO/IEC 15418 qualifiers such as ANS MH10.8 Data Identifiers and GS1 Application Identifiers. The ISO/IEC 15459 Registrar allocates Issuing Agency Codes (IAC) to Issuing Agencies (e.g., Dun & Bradstreet, EuroData, GS1, ICCBBA, NATO, Odette). Both ANS Data Identifiers (used by Issuing Agencies to industry sectors not supported by GS1) and GS1 Application Identifiers (used by industry sectors supported by GS1) provide for facility identification.</p> <p>Each Issuing Agency works with the industry they serve to establish standards, specifications, and rules (e.g., *qualifier for and definition of entity identified, character set, identifier structure, identifier length, identifier granularity, reuse rules) that ensure uniqueness between each company and within each company. Each year, each Issuing Agency makes a conformance report to the Registrar.</p> <p>There is no overlap of the Issuing Agency Code (IAC) values. As each Issuing Agency is obliged to use only their IAC at the beginning of their identifiers, uniqueness between Issuing Agencies is assured within the printing/encoding and scanning/reading hardware and software for barcodes and tags.</p>
Interoperability	

<p>Explain how the identification scheme can be used in parallel with other identification schemes without causing disruption due to lack of uniqueness (see criterion 1 UNIQUENESS, above). The goal is to avoid disruption in cases where two completely different facilities are assigned the exact same identifier, because different facility identification schemes are used. This criterion includes coexistence between centralized and de-centralized identification schemes.</p>	<p>Yes, interoperability can be ensured when all industry players follow the established standards, in addition to common rules set forth in ISO/IEC 15459, data qualifier methods for economic operator identifier per ISO/IEC 15418, and web-enabled identification per ISO/IEC NP 18975). This can work in either centralized or decentralized identification issuance implementations, by the very design of ISO/IEC 15459.</p> <p>Should it become necessary to encode EOIDs into AIDC data carriers, reuse of ISO/IEC 15459-compatible identifiers ensures uniqueness across multiple Issuing Agencies and companies supported by each Issuing Agency. These identifiers can support existing as well as DPP related use cases using internationally implemented printer/scanner, encoder/reader hardware and software. Any attempt to introduce identities that are not conformant with ISO/IEC 15459, whether centralised or decentralised, would require an entirely new layer of international standards and require a second, redundant barcode as current international standards, implemented in millions of devices, would not support this yet to be drafted much less agreed and implemented, disruptive standard. If we view DPP data as a new use case for product and associated economic operator and/or facility data that sits on top of many use cases that proceed it, reusing existing identifiers already supported broadly by AIDC data carrier printing/scanning and encoding/reading systems, will allow one AIDC data carrier to support today's as well as the new DPP use case.</p>
<p>Representation in data carriers</p>	
<p>Are there existing standards in place for the representation of the identifiers of this facility identification scheme in AIDC technology (e.g., QR Code, RFID tag)? If not, what work would be required to establish such standards in a way that they are globally consistent and guaranteed interoperable?</p>	<p>Yes, there are existing standards in place for the representation of the identifiers in AIDC technology and they are widely used around the world today.</p> <p>ISO/IEC JTC1 SC31 standards are the international standards for "Information technology — Automatic identification and data capture techniques". Today, within millions of EU printing/scanning or encoding/reading systems, they ensure:</p> <ol style="list-style-type: none"> 1. Uniqueness between Issuing Agencies per ISO/IEC 15459-2 Registrar of Issuing Agency Codes 2. Interoperability of Issuing Agency identities via ISO/IEC 15459-3 (general rules) and ISO/IEC 15418 (qualifier methods) 3. Interoperability of the identities in point 2 by establishing standards to recognise: <ol style="list-style-type: none"> a) identification of barcode symbology (ISO/IEC 15424) b) start character or mode within AIDC data carrier to designate which type of Issuing Agency standard identity is encoded and decoded (QR Code per ISO/IEC 18004, Section 7.4.8, Data Matrix per ISO/IEC 16022, Section 11) c) identification of the Issuing Agency via IACs to ensure identity uniqueness (ISO/IEC 15459-2) d) "qualifiers" preceding the identity to allow printing/encoding and scanning/reading systems to encode and decode then parse then process identification key components (e.g., class level, serial level) in an interoperable way (ISO/IEC 15418) e) AIDC data carrier 2D bar code print quality test specification (ISO/IEC 15415) f) A recommendation for each Issuing Agency to provide application guidance to identity issuers (e.g. check-digit algorithms, selection of GS1 Application Identifier or ASC MH10 Data Identifier, etc).
<p>Current scope of use/pervasiveness</p>	

<p>Is the facility identification scheme currently in use within the ecosystem of this product category and, if so, what is the level of implementation today? Are there any ongoing adoption or migration programmes underway or planned?</p>	<p>For ISO/IEC SC31 JTC1 standards, many locations and sub-locations impacted by the DPP requirements have been identified for transport, traceability, order-to-cash business transactions, and more. This is not limited to identifiers and automation of identification via AIDC, but also in data, interface, and messaging standards for master data, transactional data, and critical traceability event visibility data.</p>
<p>Persistence</p>	
<p>Does each facility identification scheme ensure persistence of the identifier independently of any encoding within a link so long as access to the data is required by the regulation? If an internet domain name is used to provide uniqueness, describe how persistence is achieved in the event of change of ownership of the economic operator.</p>	<p>Yes, as per ISO/IEC 15459-3 Section 6 general rules... d) the string shall be unambiguous within its qualifier in the sense that no issuer re-issues the string within the qualifier over the entire life cycle for the identified entity or until a sufficient period time has passed so that the identity has ceased to be of significance to any user. For example, ISO/IEC Issuing Agency standard conformant implementations supporting DPP would require non-reuse for the party identifier within specific application guidelines or standards.</p>
<p>Delegated act or regulatory direction</p>	
<p>Are there any specified standards from which facility identification must be derived for a particular product category?</p>	

Annex B: Product Scenario Detail

Different international standard identification schemes may accommodate different product scenarios (see examples below). If the answers to any evaluation criteria differ by scenario, they should be answered separately. If a scenario is not included in the list below, the SDO can provide an additional scenario with a definition.

Examples:

1. Consumable product sold without packaging (paint brush)
2. Consumable product sold inside packaging (shampoo, disposable batteries)
3. Durable product sold in packaging (laptop)
4. Durable product sold without packaging (tire)
5. Intermediate product sold without packaging (sand sold by weight in reusable container)
6. Intermediate product sold inside packaging (chemical in non-reusable package)
7. Post-sale tracking of assets (Note that this is not a scenario targeted by the ESPR. It is however of major interest to many DPP stakeholders.)
8. Pre-sale tracking of raw or transformed materials or components over supply chains (Note that this is not a scenario targeted by the ESPR. It is however of major interest to many DPP stakeholders.)

Where:

Consumable products = used within a relatively short window of time and, if packaged, whose packaging is recycled.

Durable products = for which repair, reuse, refurbishment, second-hand sales may occur after they are placed on the market. This may be an end-use product, a product which is a part within another product (sub-assembly or end-use), or a product that is available as a replacement part within an existing product.

Intermediate product = product that requires further manufacturing or transformation such as mixing, coating or assembling to make it suitable for end-users

Annex C: European Commission terminology

The following screenshots show slides presented by Michele Galatola of the European Commission during the [webinar on 12 June 2023](#). As well as being consistent with the texts quoted in the main body of this document, they provide useful guidance on the terminology used.

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Key design elements

There are some key decisions that have already been taken, when designing the DPP, and that should be adequately reflected in the standards to be delivered in order to make them useful for the policy implementation. In particular:

- The DPP shall **specifically and uniquely identify / be linked to** products or components, not a document or a website
- All standards should be global and open. The starting point should be **existing international standards** (ISO and/or IEC). When those are not considered sufficient, they should be complemented with **existing standard at EU level** (CEN). When this is not sufficient, they should be complemented with **existing standards at national or fora level**
- DPP is based on a **decentralised** approach for data storage
- Access to DPP-data based on a **need-to-know** basis (there will be public and restricted data)



Structure of the draft standardisation request

- Commission decision + 1 Annex
- The Decision identifies the scope of the mandate, the references to the legislation(s) that originate the request, the administrative steps required.
- The Annex is divided in two parts:
 - **Part A:** general requirements. It includes definitions relevant to the standardisation request and the references to the legal requirements to be supported by the standards.
 - **Part B:** it describes each of the 8 areas to be standardised, providing some key elements to be considered and a non-exclusive list of the existing standards that have been identified - through a landscaping report - as more relevant to each of the 8 areas.

The landscaping report on available standards for DPP is available at:

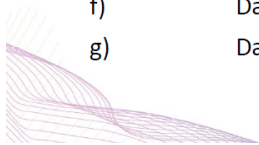
<https://www.standict.eu/landscape-analysis-report/landscape-digital-product-passport-standards>



Standardisation request in support of DPP

The scope and legal requirements

- Basis for future **harmonised standards**
- **8 new areas of harmonised standards to be drafted** to support the implementation of the proposed **DPP-system**. In particular:
 - a) Unique identifiers
 - b) Data carriers
 - c) Links between physical product and digital representation, including look-up mechanism
 - d) Access rights management
 - e) Interoperability (technical, semantic, organisation), including data exchange protocols and formats and data processing (introduction, modification, update)
 - f) Data authentication, reliability, integrity
 - g) Data security and privacy



This slide only shows 7 areas. It is believed that the missing area for standardisation is the relevant APIs.

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Unique identifiers

- The standard(s) shall define requirements related to the following areas:
 - (a) **Global uniqueness** of each identifier (i.e., the same identifier can not be assigned to different products, different economic operators, or different facilities),
 - (b) Syntax-related requirements,
 - (c) Semantic-related requirements
- The standard(s) should allow both the possibility to use '*centralised*' and '*decentralised*' identifiers
- The standards shall consider the diversity of identifiers currently used by economic operators and accommodate them as much as possible, for example through the use of **contextual prefix** (e.g., issuing agencies codes) where relevant.
- The maximum length of the unique product identifier string shall be **70 characters** (to be consistent with customs requirements)

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Data carriers

- The requirements should concern, as applicable:
 - (a) symbology characteristics,
 - (b) data character encoding methods,
 - (c) symbol formats,
 - (d) dimensional characteristics,
 - (e) error correction rules,
 - (f) reference decoding algorithm,
 - (g) printing quality requirements,
 - (h) production quality requirements,
 - (i) user-selectable application parameters (if relevant)
- Each data carrier shall encode **three sets of data**:
 - (a) Cross-sectoral basic data elements
 - (b) Links to the product passport (online data)
 - (c) Control data elements (optional)

The **links to the product passport** should include both the link to the public DPP-data and to the restricted DPP-data.

The **control data elements** could be, for example, a link about how to identify counterfeiting and a hash of the DPP registered in the DPP registry



Annex D: Impact of Offline Data in Data Carriers

D.1 Introduction and background

Recent drafts of the CEN/CENELEC Standardisation Request for the Digital Product Passport has introduced requirements for placing static product data in the data carrier:

“The data carrier shall contain links to the product passport. These elements shall act as a reference to both the public and the restricted DPP-data (i.e., the information included in each DPP, to be identified through specific Delegated Acts at product group level)

The data carrier should also include control data elements. These elements should enable the verification of:

(a) the authenticity of the data carrier, e.g. by matching the hash of the data carrier against the one registered in the DPP registry. This is a way to combat the creation of fake data carriers.

(b) the product itself, e.g. by including a link to resources that help distinguish a genuine product from a counterfeit/ fake product. This is a way to combat the use of authentic data carriers on such products.

Finally, the data carrier may also include cross-sectoral basic data elements, i.e. data that can be consulted offline. ... The cross-sectoral basic data elements should include the following six information elements:

(1) DPP owner (the economic operator who created the DPP).

(2) Unique operator identifier (the main manufacturer, if different from the DPP owner)

(3) The facility identifier (the location where the main manufacturing stage took place)

(4) The unique product identifier (identifier of the product registered in the DPP registry)

(5) An additional product identifier (additional identifier associated to the product, optional)

(6) The product group (information about the type of product).”

“The links to the product passport should include both the link to the public DPP-data and to the restricted DPP-data.

The control data elements could be a link about how to identify counterfeiting and a hash of the DPP registered in the DPP registry.”

In this Annex, the “links” mentioned in the first sentence of the above quoted text is assumed to be a **single UID-related URI**, where the UID is the unique product identifier and URI is a web Universal Resource Identifier. The purpose of this document is to gather an exhaustive list of arguments both supporting and against additional static data in the data carrier with a caveat that what is true for one data carrier is not necessarily true for another.

The question under investigation can be formally defined as:

Should the DPP data carrier (QR code, data matrix code, wireless communications-enabled tag (NFC, RFID, Bluetooth, WIFI, etc.), digital watermark, ...) contain static data beyond the UID-related URI?

D.2 Arguments supporting mandatory additional static data in the data carrier

- The CEN/CENELEC Standardisation Request for the Digital Product Passport provides the following arguments:

“These elements should make it possible to consult data from the data carrier even when the online information cannot be accessed. For example, when:

*-the subject reading the data carrier is offline;
-a link present in the data carrier is broken;
-a link does not lead to a valid page on a website;
-the server hosting the DPP is down for maintenance or is overloaded.”*

- As internet availability is not guaranteed everywhere, storing the DPP data on the data carrier enables access to the DPP data without internet connectivity.
- Historically, storing data locally on the data carrier may have been useful for the process (chemical) industry where explosive atmospheres made it difficult to use internet connected devices. In environments where a network connection is difficult if not impossible or plainly prohibited, some additional static data might need to be stored in the data carrier, e.g., offshore platforms, shipping vessels on high ocean or under water, underground areas (mining, construction), heavily armored containers.
- Static data in the data carrier is sometimes seen as a means for improving data availability which is critical for safety information.
- Storing some DPP data on the data carrier may calm fears about tampered data carriers which could be used for phishing attacks by redirecting to fraudulent websites.
- Limited, key product information could be statically encoded on the data carrier to enable use cases such as inventory management. Indeed, many inventory management systems that process digital data carriers have connectivity to local applications, not to open internet resources. It is not a matter of cost or technical capability. It is a matter of application requirements and security. Therefore, it seems appropriate to stipulate that DPP compliance will be achieved with a UID-related URI, optionally complemented with static data, at the discretion of the data carrier issuer, based on his own needs and the expected needs of other parties along the chain. Additional static data in the data carrier should not be a legal requirement, but they should not be prohibited.

D.3 Arguments against mandatory additional static data in the data carrier

- The concern related to broken links in the data carrier is addressed by the architecture of the DPP system itself. The DPP system is designed using resilient web technology with the objective to minimize the likelihood of broken links thanks to the following mechanisms:
 - extensive use of well-known resolver-based redirection mechanisms to manage situations of load balancing, server maintenance and data migration to account for the displacement of data on the server's own file system or towards a different decentralized DPP data repository (e.g., a DPP-as-a-Service operator's server, a DPP Backup Service Provider's server or a DPP archiving solution);
 - the use of a root resolver that can be invoked to provide updated links.
- The concern about a link not leading to a valid page on a website (or more precisely, to valid DPP data content) is addressed by the fact that public authorities are assumed to be able to validate DPP compliance using appropriate automatic tools (e.g., a SHACL control engine).
- The presence of static data beyond the UID-related URI would mean that it would not be possible to read the additional static data from the data carrier with the native 2D-code or NFC/RFID reader functionalities of operating systems of mobile devices. Therefore, each consumer will

have to install an application on his/her mobile device to be able to consume the additional data. In the worst case, installing or using such an app (which must be developed and maintained for different operating systems) would incur a fee. This would raise the hurdle to access this data especially outside of Europe and lower the acceptance of the DPP system.

- As the mandatory DPP information set will be much bigger than the capacity of most data carriers, especially in the case of 2D-codes (QR, data matrix) or for RFID/NFC tags that are in a relevant price range for consumer items, this will likely only represent a small portion of the mandatory DPP data.
- Adding static data in the data carrier would require larger QR codes that will not fit on small products (e.g. cosmetic products). This means that either the QR code symbol will get too big, or the X-dimension (pixel size) will get too small, compromising error correction. While we can imagine that larger products might have larger QR codes, this would create heterogeneity in the DPP system architecture.
- While storing all mandatory DPP data on an RFID or NFC tag is possible, this requires tags with larger memory capacities which come with increased cost and higher environment impact (due to increased silicon die size and higher complexity chips requiring more read/write and storage energy). This is especially important since, to our knowledge, these chips are difficult to recover and recycle. So, any potential benefit of this solution in rather rare use cases would have to be weighed against the negative environmental impact in order to fulfil the goals of the DPP to move towards a more sustainable future.
- Due to the limitation of the amount of data that can be stored in the data carrier and the fact that most products will be sold to different industries and used by different consumer groups it will be impossible to fulfil the specific information requirements of all stakeholders and agree on the data set to be encoded into the data carrier. There will be always some data missing and the users will have to access the web to find all data required anyhow.
- Consumers who are not accessing the DPP information directly on the internet (i.e. a merchant website) will be accessing the DPP after having read the data carrier most probably with a smartphone (camera scan of QR code, tap on NFC tag, etc.) and will typically have internet connectivity on their smartphone (except in rare cases).
- In most industrial uses of the DPP, tools that read the data carrier also have online access to the data (in synchronous or asynchronous mode) so there is no need to store the data a second time in the carrier.
- In practice, the use of any kind of electronic device in explosive atmospheres, whether it is connected to the internet or not, is only allowed if it is certified ATEX zone 1 or 2. Since they are typically used for mobile plant maintenance, today all industrial mobile devices that can scan a 2D-Code or RFID/NFC tag are at the same time connected to the internet. Therefore, from the perspective of improving safety in explosive atmospheres, there is no benefit of static data in the data carrier. Static data in the data carrier would even lead to problems, as an additional mobile application will be needed that might not be possible to be installed on industrial mobile devices, as some of them do not allow to install third party applications.
- International standards state that safety relevant information must be printed as human readable text or graphical symbol according to GHS (Globally Harmonized System of Classification, Labelling and Packaging of Chemicals), and regulation (EU) Nr. 1272/2008 (CLP).

- Mandatory “Static” product information (e.g., energy efficiency, proposer disposal) is already mandatory at point of sale or on the product itself.
- A data carrier containing only the minimum set of necessary information (a unique URI) would simplify the roll-out of the DPP system. Indeed, this limits complexity, hurdles and costs. Once the DPP system is running, new requirements will emerge. Any static data requirement beyond the UID-related URI could then be standardized later, when dedicated consumer apps have widely appeared, leaving time for all types of readers, devices to be prepared to follow the evolution of the standard.
- If the static data points that are encoded into the data carrier are codes that need to be looked up to be useful, looking up things in offline mode means that there will be a need for specific DPP-apps with build-in offline databases to look up what the codes mean.
- Mirroring DPP data statically onto the data carrier may lead to data synchronization errors between the online DPP and the offline data, in case data needs to be updated/corrected. This is of particular concern on manufacturing production lines.
- Many manufacturing processes would be made more complex and costly by the need add static data in the data carrier during mass production. Some manufacturers and some product categories would be more affected than others.
- Storing DPP data in the carrier may mean that the data cannot be modified/updated, which is not coherent with many use cases.
- Experience by GS1 is that the only two things beyond product identification (model/batch/instance) that usually make sense for offline encoding is expiry date and weight (for variable measure products priced by weight). However, food, beverages and medical products are not target product groups for ESPR and it is unlikely that product groups targeted by the ESPR have expiry data and variable weight pricing.

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Annex E: Examples of Schemes for Encoding Product Identifiers within URIs

E.1 Application Identifiers and Data Identifiers encoded within URIs

The purpose of this annex is to outline examples of schemes for encoding product identifiers with URIs. Standards exist for encoding both GS1's Application Identifiers (AIs) and ANSI's Data Identifiers (Dis) in web addresses. In both cases, the structure of the complete URI is sufficiently well-defined so that software can be used to extract the identifiers without an online lookup. As the identifiers themselves are globally unique, following the ISO/IEC 15459 framework, the internet domain name is not used in the identity of the product. This means that, even if the data infrastructure that the URI points to ceases to exist or is changed, rendering the URI encoded on the item unusable directly, the product identity itself remains unchanged.

The two standards are both discussed briefly below.

E.1.1 GS1 Digital Link

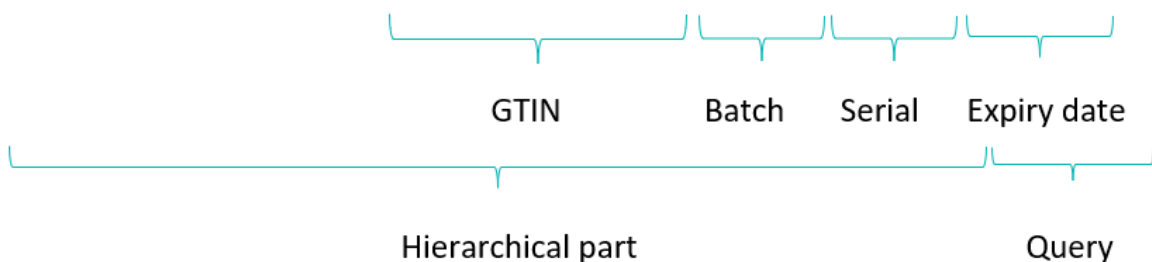
The introduction to the Assessment Framework outlines the GS1 system for identifying products at different levels of granularity using the GTIN plus batch/lot, consumer product variant and serial identifiers¹. These identifiers can be encoded in a variety of syntaxes:

GS1 Element string syntax is highly efficient and is used particularly in healthcare to provide GTIN, batch/lot, serial number and expiry date for pharmaceuticals, usually in a Data Matrix Code. The encoded text here is 01095060001343761724070510ABCD\F211234. The precise details of this syntax are unimportant for the current discussion but it's worth noting that it is massively adopted across many sectors, not just healthcare. This syntax supports many supply chain operations but is not 'understood' by non-specialist applications. It does not include a Web address.

Exactly the same GS1 identifiers can be encoded in a more familiar syntax that is also a Web address:



<https://example.com/any/01/09506000134376/10/ABDC/21/1234?17=240705>



This is known as [GS1 Digital Link URI syntax](#). The same identifiers can be extracted from this string of characters *without* an online lookup. However, it is *also* a URL that can point to sources of online data. Identifiers, as distinct from descriptive attributes like an expiry date, are included in the hierarchical part of the URI (the internet domain name and 'path' segments separated by slashes) [[RFC 3986](#)]. This means that a different location on the Web is associated with every GS1 Digital Link URI. GS1 strongly encourages manufacturers to redirect from this location to one or more sources of data about the item, emphasising that a GS1 Digital Link URI identifies the product, not the data about it [[QR-BP](#)]

At the time of writing, *all* major scanner manufacturers have implemented, or are implementing, the ability to read this syntax in addition to the older GS1 element string syntax. Major supermarkets in different countries have already committed to updating their scanners to work with this. At the same time, many major brands are beginning to add QR codes containing their GS1 identifiers encoded in the GS1 Digital Link URI syntax. Examples include both Pepsi and Coca-Cola, L'Oréal, Puma and fashion retailer C&A.

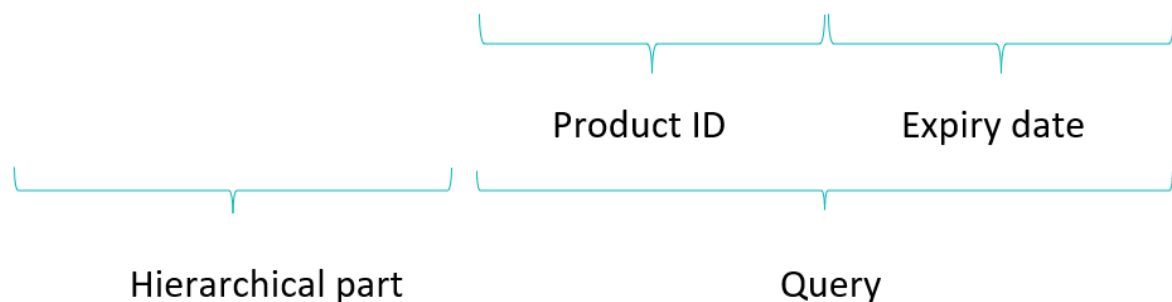
It is anticipated that the 1-dimensional barcode that has been a familiar part of retail for 50 years will gradually disappear from 2027 and that QR codes containing this kind of syntax will become the norm. GS1 has a major programme in place to encourage this.

E.1.2 IEC 61406-2 Identification Link

At the time of writing, the second standard in the IEC 61406 series has not been finalised, therefore the following text may be subject to revision.

IEC 61406-2 Identification Link extends IEC 61406-1² to cover use cases where the identification link does not relate to an individual instance or when attributes are encoded as well as the identifier. In contrast to the GS1 Digital Link approach, this is done by encoding ANSI MH 10.8.2 [[MH10](#)] Data Identifiers as parameter names in the query string of the URI (everything after the '?' character). For example:

<https://example.com/any/? .25P=LEIBMPRODX12&.14D=20241231>



This means that multiple IEC 61406-2 Identification Links can encode a query that can be run against the single resource identified by the hierarchical part of the URI.

Some issuing agencies operating under ISO/IEC 15459 may assert IP over their identifiers when used with DIs (GS1 does not). But it is important to recognise that such limitations do not originate from the IEC 61406-series or from ANSI. IEC 61406-2 includes details of how the Identification Link should be encoded in a specific data carrier and how it should be affixed to the product. The equivalent information for GS1 Digital Link is included in the GS1 General Specifications [[GenSpecs](#)].



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