EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 18220

June 2025

ICS 35.240.63

English version

Digital product passport - Data Carriers

Digitaler Produktpass - Datenträger

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

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CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 18220:2025) has been prepared by Technical Committee CEN/CENELEC/JTC 24 Digital product passport – Framework and systems ", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Introduction

In 2019, the European Commission introduced the European Green Deal, a detailed strategic plan aimed at sustainable growth. A key component of this plan is the Ecodesign for Sustainable Product Regulation (ESPR)[1], which is designed to guide the European Union towards achieving climate neutrality by 2050. The ESPR promotes a vision of a society that is equitable and thriving, functioning within a modern, competitive, and circular economy, all while preserving a toxin-free environment.

In detail, the ESPR mandates the adoption of production and consumption patterns that are in harmony with the Union's comprehensive sustainability goals related to climate change, environmental protection, energy use, resource efficiency, and biodiversity conservation, all within defined planetary boundaries. To achieve these goals, the regulation introduces a set of stringent ecodesign requirements.

These are specifically crafted to enhance the durability, reliability, repairability, upgradability, reusability, and recyclability of products. Such measures are vital for reducing waste, diminishing the presence of hazardous substances in products, and improving their energy and resource efficiency. Collectively, these requirements establish a rigorous framework for sustainability within the industry, pivotal for supporting the Union's transition to sustainability.

To support the implementation of these comprehensive requirements, the ESPR highlights Digital Product Passports (DPP) as a key element and a pivotal tool to ensure that all stakeholders in the value chain—manufacturers, distributors, consumers, and recyclers— have access to essential, traceable, and reliable product information, supporting informed consumer choices, and promoting better resource management and sustainability practices.

The roll-out of the digital product passport (DPP) concept is set to occur gradually over the coming years. Specific details, including what will be included in the DPP for various product groups and intermediate products, will be outlined in delegated acts. This approach ensures a comprehensive strategy that balances environmental objectives with regulatory requirements and stakeholder expectations.

To support the implementation of the DPP concept, this document addresses suitable data carriers and show how they meet the requirements. The ESPR defines 'data carrier' as a linear barcode symbol, a two-dimensional symbol or other automatic identification data capture medium that can be read by a device. It further stipulates that delegated acts will specify one or more data carriers to be used. This document specifies 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. These rules are based on the requirements derived from the ESPR and from the subsequent standardisation request issued by the European Commission. The requirements relate to the encoding capability, the dimensional characteristics, quality, persistence and durability as applicable. This document includes data carriers and shows how they meet the requirements.

1 Scope

This document defines requirements for data carriers used in a digital product passport system. This covers: symbology characteristics, format, error correction codes, encoding methods, printing and production quality, and durability.

This document also defines requirements on graphical or other indicators for easy recognition of DPP data carriers and the indication on the data carrier placement, machine readability, quality checking, links between physical product and digital representation.

The following aspects are out of scope: Architecture and use cases, Secure elements and any other cryptographic security features.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Identification related

EN IEC 61406-1:2022, *Identification Link - Part 1: General requirements*

EN IEC 61406-2:2024, *Identification link - Part 2: Types/models, lots/batches, items and characteristics*

ISO/IEC 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*

ISO/IEC 8859-1:1998, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

ISO/IEC 15418:2016, *Information technology — Automatic identification and data capture techniques — GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance*

ISO/IEC 15459-3:2015, Information technology — Automatic identification and data capture techniques — Unique identification — Part 3: Common Rules

ISO/IEC 15459-4:2014, *Information technology — Automatic identification and data capture techniques — Unique identification — Part 4: Individual products and product packages*

ISO/IEC 15459-6:2014, *Information technology — Automatic identification and data capture techniques — Unique identification — Part 6: Groupings*

ISO/IEC 18975:2024, *Information technology — Automatic identification and data capture techniques — Encoding and resolving identifiers over HTTP*

GS1 Digital Link Standard: URI Syntax, V1.6.0

Commented [SG1]: While others should confirm if there are additional gaps in the Normative References section, the section as it exists omits almost all references except for RFID, vocabulary, and direct part marking standards. The list misses important standards like DataMatrix, QR Code, NFC, 61406-1 and -2, barcode print quality standards, GS1 Digital Link URI and EPC Taga Data Standard.

Here is a (possibly incomplete) list of missing normative references. The standards may be referenced multiple times but for the purpose of this comment, we list the first occurrence. The additions were listed alphabetically not by their chronological use in the standard as we do not know the correct convention. The summary below starts with the Section # then uses shorthand titles for the standard to ease review.

5.2.2: 15459-2, 18975, 61406-1, 61406-2, 15424, 15418, GS1 Digital Link Standard: URI Syntax

5.6.2: 15415, 29158

5.6.3: 15426

6.2.2: 16022 (Data Matrix)

6.2.3: 18004 (QR Code)

6.2.4.1 15459-3, -4, -6

6.2.4.2: 8859

6.3.3.2: 18092, 21481 (NFC)

6.3.4.3 EPC Tag Data Standard, V2.2

2D Barcode Symbols related

ISO/IEC 15415:2024, *Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15424:2025, *Information technology — Automatic identification and data capture techniques — Data carrier identifiers (including symbology identifiers)*

ISO/IEC 15426-2:2023, *Information technology — Automatic identification and data capture techniques — Bar code verifier conformance specification — Part 2: Two-dimensional symbols*

ISO/IEC 16022:2024, *Information technology — Automatic identification and data capture techniques — Data Matrix bar code symbology specification*

ISO/IEC 18004:2024, *Information technology — Automatic identification and data capture techniques — QR code bar code symbology specification*

ISO/IEC 29158:2020, *Information technology — Automatic identification and data capture techniques — Direct Part Mark (DPM) Quality Guideline*

RFID related

GS1 EPC Tag Data Standard, V2.2

ISO/IEC 15961-1:2021, *Information technology — Data protocol for radio frequency identification (RFID) for item management — Part 1: Application interface*

ISO/IEC 15961-2:2019, *Information technology — Data protocol for radio frequency identification (RFID) for item management — Part 2: Registration of RFID data constructs*

ISO/IEC 15961-3:2019, *Information technology — Data protocol for radio frequency identification (RFID) for item management — Part 3: RFID data constructs*

ISO/IEC 18046-1:2011, *Information technology — Radio frequency identification device performance test methods — Part 1: Test methods for system performance*

ISO/IEC 18046-2:2020, *Information technology — Radio frequency identification device performance test methods — Part 2: Test methods for interrogator performance*

ISO/IEC 18046-3:2020, *Information technology — Radio frequency identification device performance test methods — Part 3: Test methods for tag performance*

NFC related

ISO/IEC 18092:2023, *Telecommunications and information exchange between systems — Near Field Communication Interface and Protocol 1 (NFCIP-1)*

ISO/IEC 21481:2021, *Information technology — Telecommunications and information exchange between systems — Near field communication interface and protocol 2 (NFCIP-2)*

Vocabulary related

ISO/IEC 19762:2025, *Information technology — Automatic identification and data capture (AIDC) techniques — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762:2025 and the terms and definitions defined in clause 3 apply.

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
additional software
additional application, program, or tool that a user will install or access separately from the default setup of most smartphones or similar devices to interact with the digital product passport

EXAMPLE Proprietary applications, plugins or extensions, dedicated apps, specialized middleware, or customized software readers.

Note 1 to entry: Standard functionalities, such as web browsers, camera-based QR readers, and universal communication protocols (e.g. DNS, HTTP, HTTPS), are not considered as additional software.

3.2
barcode
printed data carrier indicating either a reference to a linear or a 2D matrix

Note 1 to entry: It excludes RFID data carriers.

3.3
batch
subset of a model that is grouped by the economic operator based on the identical properties

3.4
consumer
individual member of the general public purchasing or using goods, property or services for private purposes

[SOURCE: [2]]

3.5
data carrier
device or medium used to store data as a relay mechanism in an automatic identification and data capture system

3.6
digital product passport
DPP
digital record of product characteristics throughout its life cycle as they pertain to the ESPR.

Commented [SG2]: Editorial: This definition could apply to any digital record not the digital record associated with the regulatory requirements of ESPR.

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

3.7
economic operator
manufacturer, authorized representative, importer, distributor, dealer or fulfilment service provider

3.8
item
single unit of a model

3.9
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal

[SOURCE: [3]]

3.10
model
version of a product of which all units share the same technical characteristics and the same model identifier

3.11
NFC
near field communication
subset of HF passive radio-frequency identification with low range

3.12
persistence
existence, and ability to be used in services outside the direct control of the issuing assigner, without a stated time limit

[SOURCE: [4]]

3.13
product
physical goods placed on the market or put into service

3.14
radio-frequency identification
RFID
identification technology that uses electromagnetic fields to automatically identify and track tags attached to objects

3.15
RAIN
radio identification
UHF passive *radio-frequency identification* as per ISO/IEC 18000-63 (3.14)

Commented [SG3]: Editorial: Change wording to: "UHF passive radio-frequency identification as per ISO/IEC 18000-63 (3.14)"

3.16
two-dimensional symbol
code representing data in machine-readable form by a collection of polygonal or circular cells in a regular pattern which are read optically by scanning

3.17
unique identifier
identifier which is guaranteed to be unique among all identifiers used for those objects and for a specific purpose

Note 1 to entry: A unique identifier refers to unique product identifier, unique economic operator identifier and unique facility identifier.

[SOURCE: ISO 29404:2015 (Modified: Note 1 added)]

4 Concepts

4.1 DPP objective

The general objective of the DPP is to ensure that all value chain stakeholders have access to essential, traceable, and reliable product information. This is done through a link to the web or a lookup mechanism associated with the product. The identifier is represented in a data carrier that can be read automatically. In cases where the lookup mechanism through an identifier is temporarily not available, and there is sufficient space (barcode) or memory (RFID tag), additional information may be made available in the data carrier.

4.2 Basic specifications

This document specifies the basic rules applicable to the data carriers. Additional legislations determine precisely the level of identification (model, batch, item) and the data carriers that apply to a given product group.

4.3 General considerations

4.3.1 New and non-new products

The DPP will apply to different product groups available on the market. The circular economy will facilitate products to be sold, used, re-sold and re-used multiple times. In some cases, the identifier and associated data carrier will remain unchanged through the lifecycle of the product. In other cases, if a new digital product passport is needed, then a new identifier and the associated data carrier will be required on products introduced into the market from that point in time forward. The fact that a data carrier has to remain usable after several used-reused-repair cycles for some product types has an impact on the durability of the support of the data carrier associated to the product.

Commented [SG4]: Editorial: These edits are needed to clarify that if a new product identifier is needed, it does not make those products previously placed on the market invalid.

4.3.2 DPP and other applications

Unique identification and associated data carrier technologies are widely used in some sectors for trade and logistic applications, consumer communication via the web and support for other regulatory requirements. Depending on the requirements set for a given product group, it may be that the existing data carriers related to the product meet the DPP requirements, at least partially. The data carrier specification for DPP should thus take into consideration the state of identification and data carriers' usage in the product group and this usage includes production specifications established by existing industry standards (eg: barcode module size, print quality and location, RFID tag frequency or memory constraints). This is to say that DPP implementation will not necessarily imply the use of a new data carrier.

4.3.3 Data carrier users and reading devices

It is expected that the DPP concept will be used by a large number of parties, where consumers are a key target. Consumers will have the ability to discover relevant information about a product, which might influence the purchasing decision. After purchase, the DPP will enable finding useful information such as user manuals, safety instructions or guidelines for recycling.

The DPP will also be used by manufacturers, distributors, resellers, recyclers, etc., for example to verify the availability and accuracy of information related to products, and to enable the reuse, repair, and recycling of products. In addition, governmental agencies, such as customs, will use the DPP to access relevant information about products.

The devices used to read the data carrier and access DPP information are smart devices and other AIDC devices (e.g: industrial barcode scanners and RFID readers in the supply chain).

5 Requirements

5.1 General

This chapter describes the requirements that data carriers should meet, as stipulated in the ESPR regulation.

~~A~~In line with the ESPR text (Recital 37), Delegated Acts should assess factors such as the nature, size, or use of the product concerned as the product ~~item~~ shall have at least one data carrier either on the product itself, on the packaging or on documentation accompanying the product ~~according to this document~~.

Commented [SG5]: In line with the ESPR text (Recital 37), standards should clarify that delegated act impact assessments consider the nature, size, or use of the product concerned when discussing where the data carrier will be placed.

5.2 Data encoding

5.2.1 Data content

The data carrier shall encode the unique identifier that allows to access the DPP. The data carrier shall comply with the rules of the unique ID to enable a smooth interoperability between systems, including the syntax when used.

5.2.2 Data syntax

The data syntax refers to the way data is represented and structured within a data carrier. Each data carrier type has a specific set of rules for encoding data, which ensures that readers and software can interpret the data correctly. These rules include the sequence of data elements, the character sets allowed, and the inclusion of start/stop characters or check digits for validation.

Data syntaxes as specified in Module 1 shall comply to (ISO/IEC 15459: 2016 — Part 3: Common Rules,) ISO/IEC 18975:2024 or EN IEC 61406-1:2022 or EN IEC 61406-2:2024 or ISO/IEC 15424:2025 or ISO/IEC 15418:2016 or GS1 Digital Link Standard: URI Syntax, V1.6.0.

~~syntaxes as specified in Module 1 in [5] or [6] or [7] or [8] or [9]~~

Commented [SG6]: ISO/IEC 15459-3 serves as the basis for interoperability for all syntax that fully comply with ISO/IEC 15459. The minimum requirement for 15459 compliance is to conform to Part 2 (Unique Identification) and Part 3 (Common Rules for Issuing Agencies)

For examples of data syntax, see Annex C.

5.2.3 Character set

The unique product identifier should be presentable in a URI, using the character set specified by IETF RFC 3986 (Uniform Resource Identifier (URI): Generic Syntax).

Other data can be encoded using characters specified in [10] (Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1) or [11] (Information technology — 7-bit coded character set for information interchange.

5.3 Data carrier reading

5.3.1 Reading process for barcodes

The process of reading the DPP data carrier is usually performed by a human operator, handling one product at a time. (Where individual products are scanned in hand, typical scan distances would be 2 to 15 centimetres. Where automated, distances will vary based on many factors which may impact the size specification for the barcode and typically impact either large products (i.e., home appliance, furniture, machine) or product groupings like master cartons or pallets. In such cases, the reading distance will typically be up to 30 centimetres)~~The reading distance of the DPP data carrier will typically be between 2 and 30 centimetres.~~ ~~For~~ In general, for barcodes, this distance can vary depending on several factors, such as barcode quality, lighting conditions, barcode size.

Commented [SG7]: Editorial: For a bit more precision.

5.3.2 Reading process for NFC

NFC technologies operate in a one-to-one communication mode between a reader and a tag. The DPP data carrier reading process is thus similar to the process used when the DPP data carrier is a bar code.

5.3.3 Reading process for UHF RFID

UHF RFID (RAIN RFID) technology is designed to read multiple tags simultaneously over a distance of several meters. Different techniques can be used to read only a specific tag, such as filtering by communications protocol, adjusting the power output of the reader and the placement of the antenna, filtering by software or letting the user choose (in a list).

5.3.4 Decoding software

For end consumer usage, the unique product identifier shall be useable to access DPP public information without the need to register, download DPP-specific software, or add user credentials. For smart devices, this implies that the decoding software should ideally be natively available in the operating system. Significant research is underway to enable singulation of UHF tags by consumer smart devices. It is expected this standard will be updated as international standards are established for this use of UHF RFID.

5.4 Marking or embedding methods on product, packaging, labelling or associated document on product

5.4.1 General

There shall be at least one data carrier containing the product identifier of the DPP provided either on the product ~~(preferred)~~, embedded in the product ~~(preferred)~~, on the packaging or in the documentation. The method will depend on the product type as detailed in this document.

5.4.2 Marking on product item

This method refers to the process of permanently marking or engraving information directly onto a ~~part, or~~ product. There are several techniques that could be used to permanently identify a product throughout its lifetime.

The advantage of durable product marking is that the identifier stays in principle with the product throughout its complete lifetime. The disadvantage is that product marking is not appropriate for small products or may be challenging due to the use conditions of a product.

5.4.3 Marking on packaging

The representation of the identifier with a data carrier is often part of the packaging of the product. This approach is used commonly for consumer goods.

Here are some of the techniques used for packaging marking:

— Laser Marking utilises lasers to engrave information onto a part's surface. It offers high precision, readability, and durability.

— Thermal Transfer which is a printing method where a thermal print head applies heat to a ribbon, transferring ink onto the substrate, usually label or film. It is commonly used for high-quality and durable printing, such as barcodes, images and texts on labels.

— Inkjet Printing can be used for product marking, especially on surfaces where other techniques may not be suitable.

— Digital printing presses which the barcode can be incorporated into the design and index for batch or serialisation.

— Conventional printing processes such as gravure, flexographic where the product model identifier is sufficient.

~~If the product is re-sold, possibly refurbished, and re-used, there is a high probability that the original packaging is damaged or no longer available. The data carrier encoding the link between the physical product and its identifier is then lost.~~

5.4.4 Labelling

Another method is to attach a label with the data carrier on the product or on the product packaging.

Label media should be selected to endure for the full life of the product and the environment of the product.

5.4.5 Document

The DPP product identifier may be included in a document accompanying the product. The document may be physical or digital.

If the documentation is the only source of the DPP product identifier the data carrier shall be included in the documentation accompanying the product.

— Examples of physical documentation: User manual, warranty documents customer printed receipt, conformity documents…

— Examples of digital documentation: E-commerce web page, Digital customer receipt, Digital Customer account, e-mail… We speak in this case of a digital copy of the data carrier.

Commented [SG8]: These preferences appear to be for durable products rather than retail consumer products and therefore should be removed here.

Commented [SG9]: Editorial: ESPR deals with products, some of which may be parts, but all of which are products.

Commented [SG10]: It is important to highlight that direct product marking may not be appropriate for small products or for products used under specific conditions. In the case of products used in constant contact with water, soap or formulations (e.g. toothpaste), this frequent exposure can impair the visibility of the product labeling. In particular, very small and detailed elements, such as QR codes, may become unreadable due to moisture or residue, making scanning and accessing the information more difficult. Any choice on the location of the data carrier should be left to the Delegated Acts setting EcoDesign requirements, based on an impact assessment.

Commented [SG11]: This statement does not apply to products where marking on the packaging is completely viable as in most retail consumer products. If the product is re-sold, refurbished, etc, it would likely be marked on the product itself if that mark was not tampered with or removed.

5.4.6 Embedded

A data carrier used for digital product passport can be embedded into the product itself. Example: textile products or tyres".

The main interest to permanently attach data carrier to the product is to ensure DPP will provide at any time of its life cycle relevant information related to the product (consumer, authorities, recyclers.) to increase circular economy. The main limit is that this technique is not appropriate for small products or may be challenging due to use conditions of a product.

Commented [SG12]: It is important to highlight that product marking may not be appropriate for small products or for products used under specific conditions. In the case of products used in constant contact with water, soap or formulations (e.g. toothpaste), this frequent exposure can impair the visibility of the product labeling. In particular, very small and detailed elements, such as QR codes, may become unreadable due to moisture or residue, making scanning and accessing the information more difficult. Any choice on the location of the data carrier should be left to the Delegated Acts setting EcoDesign requirements, based on an impact assessment.

5.5 Dimensional characteristics for barcodes

5.5.1 Error correction

Error correction code (ECC) is a crucial feature that helps 2D symbols, such as QR Codes and Data Matrix codes, remain readable even if they are partially damaged, obscured, or dirty. ECC involves adding extra data to the barcode a higher error correction level will in theory make the code more robust, but it will also make the code larger. The error correction level will not necessarily make a barcode easier to read, if the barcode print quality is poor.

5.5.2 Data carrier size

Several factors influence the size of the data carrier:

— the type of symbology;

— the X dimension that applies for the application;

— The selected error correction rate for data carrier technologies that support error correction;

— the amount of data encoded;;

— the encoding methods of characters and character sets

— the size of the product to which the dpp data carrier applies;

— the print method and the media.

Different industries and applications may have specific standards or recommendations for the X-dimension to ensure compatibility with their scanning and printing equipment. The X-dimension shall be chosen carefully to ensure that the barcode can be scanned accurately by the intended scanning environments (e.g., Point-of-Sale and consumer mobile devices). The combination of the above factors will determine the size of the data carrier. Opting for a smaller X-dimension to reduce the overall size based on the required encoded data may lead to a higher-density barcode, which can be challenging for lower-resolution scanners to read. The X-dimension also impacts printing. Printers need to have the appropriate resolution to produce clear and distinct bars or modules at the chosen X-dimension.

5.6 Data carrier quality/performance

5.6.1 General

The DPP data carrier shall reach a minimum level of quality/performance to ensure seamless usage in different environments. This section specifies the different standards that define good implementation of different data carrier technology.

Data carriers (UHF, NFC, ...) ~~should~~ shall be write protected.

Commented [SG13]: If UHF/NFC tags could be rewritten the DPP link could get lost. Therefore, write protection needs to be a "shall" requirement.

5.6.2 Two-dimensional symbols

The applicable standard for 2D barcode symbols is [12], Bar code symbol print quality test specification — Two-dimensional symbols. This standard defines the methodology for grading the quality of printed 2D barcodes. The grade includes a grade level, measuring aperture and the wavelength of light used for the measurement.

Minimum print quality grades are established based upon the scanner operating environment (e.g., retail point-of-sale, transport and logistics, smart device) but these specifications, established within industry application standards follow a convention of ~~The minimum quality grade is typically~~ 1,5 / 80%/ 660, where:

Commented [SG14]: This is critical to underscore as the quality minimum for a retail scanner is very different than for a smart device or perhaps a permanently etched 2D carrier where specialised scanners may be required. For this reason, the methodology must be common for all 2D barcodes, but the minimum quality must be established within industry application standards given the extremely broad range of products covered by ESPR.

— 1,5 is the overall symbol quality grade;

— 80% is the measuring aperture related to the measured X dimension;

592 — illumination 660 is the peak response wavelength in nanometres.

ISO/IEC 29158:2020, Direct Part Mark (DPM) Quality Guideline shall be used to assess the symbol quality of direct marked parts, where the mark is applied directly to the surface of the item and the reading device is a two-dimensional imager.

Consult industry application standards, where available, for minimum print quality specifications per the intended scanning environment for the product.

5.6.3 Barcode verification

The principle is that it is important to verify the barcodes quality, using conformant verifiers. In case the quality/performance is to be assessed, the quality/performance of 2D barcode symbols shall use the following standard: ~~References to:~~

— [13], Bar code verifier conformance specification — Part 2: Two-dimensional symbols

5.6.4 HF, UHF RFID and NFC

In case the quality/performance is to be assessed, the quality/performance of RFID (UHF or NFC) shall use the following standards:

— ISO/IEC 18046-1:2011: Information technology — Radio frequency identification device performance test methods — Part 1: Test methods for system performance

— ISO/IEC 18046-2:2020: Information technology — Radio frequency identification device performance test methods — Part 2: Test methods for interrogator performance

— ISO/IEC 18046-3:2020: Information technology — Radio frequency identification device performance test methods — Part 3: Test methods for tag performance

5.7 Data carrier design

5.7.1 Data carrier placement

To facilitate the choice of more sustainable products, DPP data carriers should be displayed in a clearly visible and identifiable way such as having ~~the~~ only one visible data carrier. In the case it is not possible to have a visible data carrier (e.g., RFID, NFC), a specific marking can inform the consumer of the presence of a data carrier. The marking ~~y~~ should be identifiable as ~~the labels, containers or tags~~ belonging to the product in question~~,~~ without customers, including potential customers, having to read the brand name and model number on the labels. For visible data carriers such as 2D, industry standards for their placement shall be followed to ensure scanning efficiency and safety (mitigation of repetitive motion injuries (e.g., GS1 General Specifications Section 6).)

5.7.2 Human readable interpretation

Human readable interpretation (HRI) is the information encoded in the DPP data carrier presented close to it in a clearly legible font, such as OCR-B specified in [14][54]. Different industries may have specific recommendations for HRI. Additional legislations may specify rules applicable to different product groups and should defer to existing industry application standards wherever possible (e.g., GS1 General Specifications Section 4.14, ANS MH10 Data Identifier Standard Section 7.3).)

5.7.3 Signage

A 2D data carrier that links to a DPP may have a graphical marking to distinguish it from other data carriers.

When an optional graphical marking is used for equipment, it should comply with [15][16], symbol 6452 or 6452-1.

5.7.4 Accessibility

The design of the data carrier shall take into consideration the possible disabilities of consumers willing

Commented [SG15]: Editorial: For consistency with Section 5.6.4

Commented [SG16]: Editorial: If another Issuing Agency could provide a reference example, this would be helpful.

Commented [SG17]: These edits are important for retail consumer products where symbol placement was responsible for a 5% efficiency increase at retail POS beginning in the 1980s and where scanner operators in retail avoid repetitive motion injuries based on their being able to intuit where the symbol is located on various packaging types.

Commented [SG18]: Editorial: This refers to [14]→EN 1073-2:2002, Protective clothing against radioactive contamination - Part 2: Requirements and test methods for non-ventilated protective clothing against particulate radioactive contamination. Is this an error?

Commented [SG19]: Editorial: This specification also exists within the GS1 General Specifications, V25.

Commented [SG20]: Editorial: This is necessary to aid in the legislative process when assessing existing rules. If there are other pertinent examples, they could be added).

Commented [SG21]: The graphical symbol marking is specified for use on equipment and it may be perfectly appropriate there. It is however wholly inappropriate for use on retail consumer products where it mimics the convention used for “peel-off coupons” or information leaflets, Any standardisation by retail of a mark that is used to influence consumer behavior would come only after a very significant research effort with consumer focus groups.

Commented [SG22]: Editorial: As this is a shall, are there a list of examples that must be considered?

639 to access the DPP information.

5.8 Other considerations

5.8.1 References to recognised standards

Data carrier and quality standards used for digital product passport (DPP) applications shall be recognized by ISO and IEC. Where necessary, other specifications may be considered in the following order of preference: existing European standards, national standards, and specifications developed by industry fora. ~~The use of additional software to enhance accessibility [may]also be considered.~~

Commented [SG23]: Editorial: Delete as this sentence has nothing to do with references to recognised standards.

5.8.2 Proven technologies

The data carriers selected for DPP applications shall have proven implementations on the market, both for the production of the data carrier and for the capture and processing of the encoded data.

6 Data carrier technologies

6.1 General

This chapter introduces 2D barcodes and radio-frequency technologies. It provides an overview of their technical characteristics and shows how they meet the requirements specified in chapter 5. New data carriers emerging in the future could be included in a new version of this document and be subject to the same assessment against the identified requirements.

The detailed list of requirements expressed in the ESPR is available in Annex A and Annex B.

They are summarized as follows:

1. data capacity for URI and additional data;
2. ability to use ISO/IEC 15459 conformant identifier;
3. granularity: ability to identify the product item at model, batch and item level;
4. recognised by international standards;
5. adoption by the market;
6. data carrier scannable and readable with smart devices;
7. native scanning software at the operating system level;
8. supports error correction;
9. persistence/longevity.

The selection of the data carrier shall be performed according to Annex A.

6.2 Two-dimensional barcodes

6.2.1 General

Two-dimensional (2D) barcodes store data in both the horizontal and vertical dimensions through a pattern of dots, squares, hexagons or rectangles. 2D barcodes can in theory encode up to 7.000 characters.

6.2.2 Data Matrix

Data Matrix shall be implemented as specified in [17] is a compact 2D barcode that uses black and white cells arranged in a square or rectangular pattern. It can store text, numeric, or binary data and is highly efficient for encoding small amounts of information. Its robust error correction makes it ideal for marking small

Commented [SG24]: Conformance to the symbol specification shall be normative for both 2D barcode symbols.

items like medical devices and electronics and cosmetics and also in retail since its adoption within retail scanning systems is trending rapidly.

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6.2.3 QR Code

QR code (Quick Response Code) shall be implemented as specified in [18] is a 2D barcode that stores text, URLs, or data. It is easily scanned by smartphones or cameras, enabling quick access to information. Known for its versatility, fast readability, and error correction, it is widely used in marketing, payments, logistics, and digital interactions. QR code adoption within retail scanning systems is trending rapidly.

6.2.4 Two-dimensional barcodes characteristics

6.2.4.1 Common characteristics

The 2D barcodes considered in this document share the following common characteristics:

a) Data capacity for URI and additional data.

All 2D barcodes referred to in this document have the capacity to encode an URI and additional data.

b) Ability to use [19], [20] conformant identifier.

(All 2D barcodes referred to in this document have the capacity to encode ISO/IEC 15459-4:2014, ISO/IEC 15459-6:2014 conformant identifier.)

Commented [SG25]: Editorial: This clause and the one below c are added to be consistent with a and d.

c) Granularity: ability to identify the product item at model, batch and item level.

All 2D barcodes referred to in this document shall have the capacity to encode ISO/IEC 15459 compliant (requires compliance with parts 2 and 3 at a minimum) and ISO/IEC 15418 qualifiers to parse model, batch, and item level data elements.

~~Several methods enable to verify the legitimacy of a 2D barcode: Verify the check digit when available; Verify that the scanned data matches the expected data; Check the barcode's data against a trusted database; Confirm the legitimacy of the item or product associated with the barcode).~~

Commented [SG26]: This has nothing to do with point c (granularity). Check digits, visual checks, and database matches are not specific to data carriers. These are specific to identification schemes and data alignment processes. For all these reasons, it seems appropriate to delete this.

~~b)~~d) Persistence/Longevity.

The persistence/Longevity of a 2D barcode is related to the method used to mark the product item to which the barcode is related, as described in section 5.4.

6.2.4.2 Specific characteristics

Table 1 describes the following characteristics of each ~~linear~~2D barcode under consideration:

Commented [SG27]: Editorial: Typo

1. character set;
2. data capacity;
3. recognised by international standards;
4. adoption by the market;
5. native reading software on smart devices;
6. supports error correction.

Table 1 — Specific Characteristics of 2D data carriers

		Data Matrix	QR Code
Character set		[11] [21]	[11] [21]
Capacity	**Digits/ AN**	**3,116 numeric, 2,335 alphanumeric characters**	**numeric, 7089, 4,296 alphanumeric, 2,953 Kanji Characters**
	bits	**12,44,**	**14,81 (H) 34,36 (L)**
	bytes	**up to 1555 bytes**	**1852 bytes (H) to 4296 bytes (L)**
Encode URI		**Yes**	**Yes**
ISO/IEC 15459		**Yes**	**Yes**
Granularity		**Yes**	**Yes**
Standard		**[17]**	**[18]**
Market adoption		**Pervasive**	**Pervasive**
Native software smart devices		**Partial/Pervasive**	**Partial/Pervasive**
Error correction		**Automatic. 25% to 33% of the symbol's data capacity**	**7% to 30% of the symbol's data capacity**
Reading/scanning range		**10 2 to 20 30 cm**	**10 2 to 20 30 cm**
Bulk reading Simultaneous scans		**No**	**No**
Power supply		No Not applicable	No Not applicable
Security		Limited (serial, batch, data encryption, ...) Nothing inherent as any optical symbology can be copied	Limited (serial, batch, data encryption, ...) Nothing inherent as any optical symbology can be copied
Cost	**Static data**	Low	Low
	Dynamic data	Low to medium	Low to medium
Frequency		N/A	N/A
Radio regulation		N/A	N/A

6.3 Radio frequency data carriers

6.3.1 General

There are many different RFID technologies. In this document, and for DPP-related purposes, we only consider 3 of them:

- ~~High Frequency (HF) passive RFID;~~
- Near Field Communication (NFC);
- Ultra High Frequency (UHF) passive RFID.

NOTE Technology can be considered as a subset of HF RFID because it operates at the same frequency. Its implementation in and use with smart devices is mainly described in NFC Forum Technical Specifications.

6.3.2 HF RFID

6.3.2.1 General

The different HF (High Frequency) RFID technologies shall be implemented as ~~are~~ specified in: [22], [23], [24], [25], [26], [27],

741 [28] and [29].

6.3.2.2 General overview of HF RFID

High Frequency (HF) passive RFID is a set of RFID technologies that operate at 13,56 MHz. These technologies mainly use magnetic field coupling between readers and tags to wirelessly exchange data. They are used for proximity or vicinity applications like product identification / authentication, transport ticketing system, access control, contactless payment and much more.

6.3.2.3 Data encoding

Data encoding of HF RFID tag shall be as~~are~~ defined in [30], [31], [32] and [33].

Commented [SG37]: Conformity with these specifications is normative.

6.3.2.4 Air interface protocols

Air interface protocols for HF RFID are mainly defined in [22], [23], [24], [25], [26], [27], [28], [29].

6.3.2.5 Test methods for HF/RFI~~I~~~~F~~D air interface compliance

[34] defines test methods which are specific to proximity cards and objects, and proximity coupling devices and proximity extended devices, defined in [22], [23], [24] and [25].

[35] defines test methods which are specific to vicinity cards and objects, and vicinity coupling devices, defined in [26], [27], [28].

[36] defines test methods for determining the conformance of radio frequency identification devices (tags and interrogators) for item management with the specifications given in [29].

6.3.3 NFC

6.3.3.1 General overview of NFC (HF)

NFC (Near Field Communication) is a wireless communication technology that enables devices to exchange data over short distances, typically within 4 centimetres. Like HF RFID, NFC operates at 13,56 MHz. NFC is designed for secure, proximity-based interactions. It supports three modes:

— reader/writer;

— card emulation; and

— peer-to-peer communication.

6.3.3.2 Air interface protocols

NFC air interface protocols shall be as~~are~~ defined in [37] and [38]. Additional information can also be found in NFC Forum Analog and Digital Specifications [39](type2, type 3, type 4, type 5).

Commented [SG38]: Conformity with these specifications is normative.

6.3.3.3 Data Encoding

Data Encoding of UHF RFID shall be as~~is~~ described in [30], [31], [32] and [33]. To be natively read by smart devices, NFC Forum Technical Specifications provides ways encode data in NFC tags [39].

Commented [SG39]: Conformity with these specifications is normative.

6.3.3.4 Test methods for NFC air interface compliance

Compliance with NFC Forum Specifications is described in the NFC Forum Certification program [39] (NFC certification release 14).

6.3.4 UHF RFID

6.3.4.1 General overview of UHF RFID

UHF passive RFID (Radio Frequency Identification) is a wireless technology used to automatically identify and track objects using radio waves. It consists of two main components: tags, which are small devices attached to items, and readers, which emit radio waves to detect and read the tags.

This technology is widely used in industries like retail, logistics, healthcare, and manufacturing for inventory management, asset tracking, access control, and more. Unlike barcodes, UHF RFID does not require line-of-sight and can read multiple tags simultaneously, making it a highly efficient tool for tracking large quantities of items in real-time. UHF passive RFID also known as RAIN RFID.

6.3.4.2 Air interface protocols

The air interface protocol for UHF RFID shall be as ~~is~~ defined in ,[40] and~~. It is also defined in~~ [41]

6.3.4.3 Data Encoding

Data Encoding of UHF RFID is described in [40]. It defines the numbering system identifier toggle bit. If the toggle bit is set to 0_2, then the application referred to as a GS1 EPC global application and the data encoding shall be as~~is~~ described in GS1 Tag Data Standard [42]. If the toggle bit is set to 1_2, the application is referred to as a non-GS1 EPC global application and the encoding shall be as defined in ISO/IEC 15961-1:2021, ISO/IEC 15961-2:2019 and ISO/IEC 15961-3:2019.

Note: Publication of EPC Tag Data Standard (TDS) 2.3 by GS1 is planned for late 2025. TDS 2.3 will accommodate encoding of domain name information along with an EPC on the RFID tag, enabling seamless encoding/decoding to/from a resolvable Web URI. This is required in order for EPC tags to support current value chain applications as well as smart device connectivity.

6.3.4.4 Test methods for UHF RFID air interface compliance

[43] specifies test methods for determining the conformance of radio frequency identification (RFID) devices (tags and interrogators) for item management with the specifications given in . It is also described in [44].

6.3.4.5 Radio Frequency Privacy

[45] (RFID Privacy Impact Assessment Process). This EN describes when to implement a PIA and how to assess the level of risk. It also describes all kind of possible threats and proposes mitigation techniques to reduce the risk to an acceptable level. It covers all kind of RFID technologies including UHF passive and NFC.

6.3.4.6 Radio frenquency data carriers characteristics

This clause describes the characteristics of the radio data carrier technologies.

Table 2 — Typical use and specific characteristics of RFID data carriers

		UHF RFID	NFC
Character set		Depends on the application standard	UTF-8
Capacity	Digits/ AN	Depends on the application standard	32 to ~ 16000 UTF-8 characters
	bits	96 bits typical ~ up to 480 bits. With optional additional user memory of several kbits	256 bits to ~ 130 kbits
	bytes	12 to 60 bytes	32 bytes to ~16 kbytes
Encode URI		No	Yes

Commented [SG40]: Conformity with these specifications is normative.

Commented [SG41]: While this standard is moving through the GS1 Standards process (GSMP), this note may provide greater insight into GS1's ongoing support of the RFID stakeholder initiative to enable one RFID tag to support its current open, product value chain applications and smart devices after that initiative has progressed. This standards work by GS1 cannot be added to this version of the CEN/CENELEC standard as of the date of this comment, but it should be in Public Review (open to anyone to see) and should be added as an additional AIDC data carrier to GS1's Application Standard for "extended packaging" (related to use of GS1 Digital Link URI by smart devices) before the conclusion of the Public Enquiry stage. It will also be positioned by GS1 for use as an alternative to 2D barcode where the necessary support for its implementation is conformant with GS1's Policy of Data Carrier Adoption which can be found here.

Commented [SG42]: Editorial: Is there content missing here?

Commented [SG43]: Editorial: Can this be defined in Chapter 3?

ISO/IEC 15459		Yes	Yes
Granularity		Yes	Yes

816

		UHF RFID	NFC
Standard		-	[37], [38] Note: NFC Forum also provide additional information in NFC Forum Technical Specifications[39]
Market adoption in industrial applications		Pervasive	Pervasive
~~Native software s~~Smart devices native (OS level) readings		~~Partial~~No	Pervasive
Error correction		Yes	Yes
Reading/scanning range		Up to 10 meters or more	Less than 5 cm
~~Bulk reading~~ Simultaneous reads		Up to 1000 different tags per second	No
Power supply		Tags can be battery assisted or derive power from the reader's electromagnetic field	Tags can be battery assisted or derive power from the reader's magnetic field
Security		Yes	Yes
Cost_____	**Static data**	~~Low~~Medium	~~Low~~Medium
	Dynamic data	~~medium~~High	~~Low~~Medium
Frequency		860-930 MHz	13.56 MHz
Radio regulation		Regulations vary by region	Widely available

Annex A
(normative)

Criteria for selection of data carriers - Mandatory criteria

Table A.1 — Mandatory requirements for selecting the data carrier

Requirement	Reference	Data carrier status
Ref ISO/IEC	**ESPR Article 12 - 6 (b)**	
The data carrier shall connect unique identifier to a DPP	**ESPR Article 10, 1 (a)**	
DPP Access: Relevant actors shall have free of charge and easy access to the digital product passport	**ESPR Article 9, 2 (f) Article 11 (b)**	
Interoperable: data carrier and supporting systems shall be interoperable between different approaches by, for example, use of international standards	**ESPR p42 Article 12 Unique ID - 6 (a), (b), (c). Article 10 a)**	
Granularity: support differentiating model/batch/ item	**ESPR Article 9, 2. (d)**	
Manufacturability: Demonstrated compatibility with mass or serial nature of product production processes	**ESPR Art 60 - (2)**	
Improve Traceability: Enables the ~~tracing~~ traceability of ~~individual items~~products along the value chain (and entire supply chain)	**ESPR Article 9 - 3. (c)**	
No undue restrictions: The data carrier shall not result in vendor lock-in. It shall also not impose limitations on use except where such restrictions are technically necessary	**ESPR , Article 10 (d)**	
Availability: Take into account relevant existing technical solutions and standards. Compliance by end of 2027	ESPR 12 Unique ID 6 (b)	

Annex B
(informative)

List of criteria to be considered when selecting a data carrier to ensure success

Table B.1 — Criteria to be considered when selecting a data carrier to ensure success

Requirement	Reference	Data carrier status
Native Access: Access with smart devices without need to download software		Optional
Resolvable: data carrier makes it possible to access additional information		Optional - depends on other rules.
Adopted: demonstration of broad adoption of data carrier in the market		**To be considered in the solution**
Impact of large URI: data carrier or its readability are impacted by large unique identifiers, such as full-length URLs		
Persistence/Longevity: data carrier survives the stress and wear thorough the life cycle of products	ESPR article 10/1/a, and 11/b	
Parallel reading: data carriers can be read efficiently in bulk		
Data carrier support by native reader of operating system of consumer mobile devices		
Unique ID: Is the data carrier enabling the use of identifier ISO/IEC 15459 series or similar ?		
Syntax: Is the data carrier supported by a syntax used to carry ISO/IEC 15459 series or equivalent?		
Barcode Assessment [46]. NOTE 1 This will only apply to 2D barcodes.		
[47] Information technology — Radio frequency identification device performance test methods — Part 1: Test methods for system performance [48] Part 2: Test methods for interrogator performance [49] Part 3: Test methods for tag performance NOTE 2 This will only apply to RFID		
NFC data carrier quality :		

Requirement	Reference	Data carrier status
Data carrier quality [50] Cards and security devices for personal identification — Test methods — Part 6: Contactless proximity objects NOTE 4 This will only apply to HF RFID operating according to the ISO 15693 series.		
[51], [52], NFC Performance data carrier		

Annex C
(informative)

Examples of Data Syntax

C.1 Example as described in ISO/IEC 18975

Figure C.1 provides an examples as described in [5].

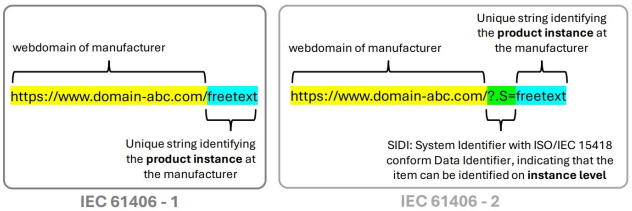
Encoded data: "https://example.com/01/09524810000339/10/YA12AB~~?17=271231~~"

Figure C.1 — Example of QR code encoding a GS1 identifier in an ISO/IEC 18975 compliant: GS1 Digital Link URI

~~Example of a structured path URI that uses GS1 Application Identifiers~~

These ideas are expanded upon to provide a fully implementable system in GS1 Digital Link URI syntax.

C.2 Example as described in [6] and [7]



Commented [SG49]: Editorial: Delete as dates have no relevance to ESPR. Also revise the QR Code example accordingly.

Commented [SG50]: Editorial: For accuracy

C.3 Example of [6]

Example of [6]

Encoded data: "https://www/domain-abc.com/freetext"

NOTE [18] requires a 4X quiet zone around the QR Code.

C.4 Example of [7]

Example of [7]

Encoded data: "https://www.domain-abc.com/?.P=freetext "

NOTE [18] requires a 4X quiet zone around the QR Code.

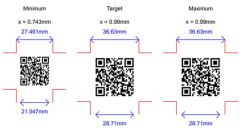
C.5 Examples of syntax with MH-10.2 Data Identifiers

Commented [SG51]: Editorial: For precision

These ideas are expanded upon to provide a fully implementable system in the AutoID specification.

Figure C.2 — Example of the query string approach using ANSI MH10.8.2 Data Identifiers to identify a product and its expiry date

Encoded data :"HTTPS://WWW.DOMAIN-ABC.COM?.25P=QCELMI12345&.S=654321"



~~C.6 Example of QR code embedding an identifier in URI a link, ISO/IEC 18975 compliant: GS1 Digital Link [URI]~~

Commented [SG52]: Editorial: Delete as this is redundant with C.1

Annex D
(informative)

Data carriers and ID schemes for products

D.1 General

With reference to digital product passport - Unique ID Schemes, the data carriers shall be interoperable, by ensuring: *Unique Identification:* The unique product identification shall be retrievable from a data carrier as specified in EN XXXXX (no number yet), linking it to the digital product passport.

D.2 ID Scheme 5.1.2.1 Web enabled structured path identification for products

D.2.1 General

Table D.1

Component	Meaning	Value
GTIN (01)	**Global Trade Item Number**	**09524810000339**
Batch/Lot	**Unique item-level identifier**	**YA12AB**
~~**Date of Expiry (17)**~~	~~**YYMMDD format**~~	~~271231~~
Data carriers	**QR Code, Data Matrix and NFC examples**	
Scheme & Domain	**https://example.com**	
Encoded data	https://example.com/01/09524810000339/10/YA12AB	

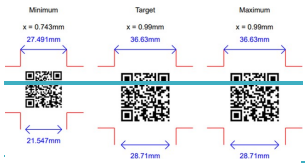
Commented [SG53]: Editorial: Date of Expiry (17) has no relevance to ESPR. Therefore, delete "Date of Expiry (17) and also delete corresponding information in the GS1 Digital Link (https://example.com/01/09524810000339/10/YA12AB~~17/271231~~)

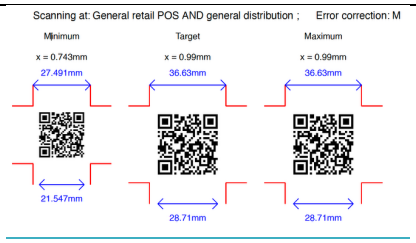
D.2.2 Example with a QR Code

Using [53] and the ISO/IEC 15459 series.

Table D.2 — QR Code estimation size (mm)

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	37 x 37	27.491	36.63	36.63
M	~~41 x 41~~37 x 37	27.491~~30.463~~	~~40.589~~36.63	36.63~~40.589~~
Q	~~45 x 45~~41 x 41	~~33.435~~30.463	~~44.55~~36.63	36.63~~44.55~~
H	~~49~~ 45 x ~~49~~45	33.435~~36.407~~	~~48.51~~36.63	36.63~~48.51~~
Module x-dimensions (mm) ➔		0.743	0.99	0.99




Scanning at: General retail POS AND general distribution ;
Error correction: M
Minimum
x = 0.743mm
27.491mm
21.547mm
Target
x = 0.99mm
36.63mm
28.71mm
Maximum
x = 0.99mm
36.63mm
28.71mm

911

D.2.3 Example of QR Code with [53] using GS1 Digital Link URI syntax for ECC L

Encoded data:

~~https://example.com/01/09524810000339/10/YA12AB?17=271231https://exam~~

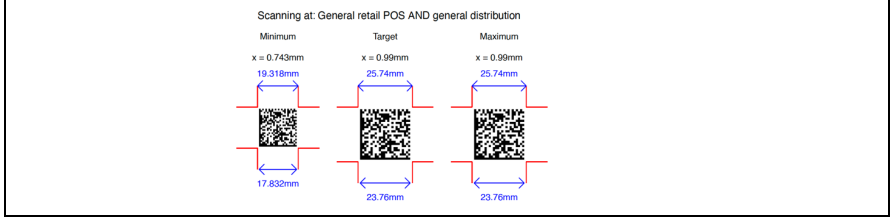
(01)09524810000339

~~ple.com/01/09524810000339/10/YA12AB?17=271231~~https://example.com/01/0

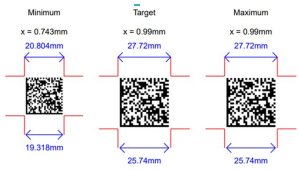
9524810000339/10/YA12AB

D.2.4 Example with a Data Matrix

Table D.3 — Data Matrix estimation size (mm)

Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
~~28~~ 26 x 26~~28~~	~~20,804~~19,318	~~27,72~~25,74	~~27,72~~25,74
Module x-dimensions (mm) ➔	0,743	0,99	0,99
			

~~#### D.2.4.1 Example of Data Matrix with [53] using GS1 Digital Link URI syntax~~



D.2.5 Example of Data Matrix with [53] using GS1 Digital Link URI syntax

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Encoded data:

~~https://example.com/01/09524810000339/10/YA12AB?17=271231~~https://exam

ple.com/01/09524810000339/10/YA12AB

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D.2.6 Example of Data in an NFC tag

No visual representation of the encoding in an NFC tag.

D.3 ID Scheme 5.1.2.2 Web enabled query string ID for products, without structure

D.3.1 Web enabled query string ID for products

Table D.4

Component	Meaning	Value
Product ID (.25P)	IAC + CIN + Product Number	QCELMI12345
Serial number (.S)	Unique serial number	654321
Scheme and Domain	HTTPS://WWW.DOMAIN-ABC.COM	
Encoded data	HTTPS://WWW.DOMAIN-ABC.COM/?.25P=QCELMI12345&.S=654321	

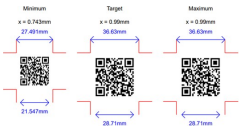
D.4 Example with a QR Code

QR Code size

Table D.5 — QR Code estimation size

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	37 x 37	27.491	36.63	36.63
M	41 x 41	30.463	40.589	40.589
Q	45 x 45	33.435	44.55	44.55
H	49 x 49	36.407	48.51	48.51
Module x-dimensions (mm) ➔		0.743	0.99	0.99

Example of web enabled query in a QR Code ECC L



D.5 ID scheme 5.2.2.1: Identification Link (IL) with structure

D.5.1 Example of Identification Link (IL) with structure, with graphical frame to indicate item

Identification Link (IL) without structure

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Table D.6 — Identification link (IL) without structure

Component	Meaning	Value
Identifier (freetext)	Unstructured ID string	freetext
Scheme & Domain	https://www.domain-abc.com	
Full example	https://www.domain-abc.com/freetext	

D.5.2 QR Code size of IL with graphical marking

Table D.7

Error correction	Module Count including quiet zone	Including the graphical marking in Quiet Zone (additional 1X on each side)	Minimum size (mm)	Maximum size (mm)
L	-	-	-	-
M	37 x 37	38x38	28,23	36,63
Q	41 x 41	42x42	31,21	40,59
H	45 x 45	46x46	33,44	44,55
Module x-dimensions (mm) ➔			0,743	0,99

Table D.8 — QR Code size with the graphical Marking

Example of an Identification Link with Graphical marking

Encoded Data: "https://www.domain-abc.com/freetext" - ECC Q

NOTE [18] requires a 4X quiet zone around the QR Code.

D.6 ID scheme 5.2.2.2: Identification Link (Structured ID Link)

D.6.1 Example of Identification Link (IL) with structure and graphical frame to indicate item

Identification Link (IL) with structure

Table D.9 — Identification Link (IL) with structure and serial per [9]

Component	Meaning	Value
Scheme & Domain	Protocol and domain	https://www.domain-abc.com
Serial Number (.S)	Serial number, free format or per standard	freetext
Batch Number (.10B)	Batch or lot number	20250423
Full example:	https://www.domain-abc.com/?.S=freetext&.16D=20250423	

D.6.2 QR Code size of IL with graphical marking

Table D.10 — QR Code size with the graphical Marking

Error correction	Module Count including quiet zone	Including the graphical marking in Quiet Zone (additional 1 X on each side)	Minimum size (mm)	Maximum size (mm)
L	-	-	-	-
M	37 x 37	38x38	28,23	37,62
Q	45 x 45	46x46	34,18	45,54
H	53x53	54x54	40,12	52,47
Module x-dimensions (mm) ➔			0,743	0,99

Example of Identification Link with serial number per [9]

Encoded data: "https://www.domain-abc.com/?.S=freetext&.16D=20250423" - ECC Q

NOTE [18] requires a 4X quiet zone around the QR Code.

D.6.3 Model Identification IL (product level with optional reuse of existing ID solutions) QR Code size with graphical marking

Table D.11

Model Identification (Product Code Level with optional reuse of existing ID solutions)

Error correction	Module Count including quiet zone	Including the graphical marking in Quiet Zone (additional 2X on each side)	Minimum size (mm)	Maximum size (mm)
L	-	-	-	-
M	37 x 37	39x39	28,98	38,61
Q	45 x 45	49x49	36,41	46,53
H	53x53	57x57	42,35	56,43
Module x-dimensions (mm) ➔			0,743	0,99

Example of Model Identification :

Encoded data: " https://www.domain-abc.com/?.P=freetext" - ECC Q

NOTE [18] requires a 4X quiet zone around the QR Code.

D.6.4 Example Model Identification (Product Code Level with optional reuse of existing ID solutions)

Identification Link (IL) with structure

Table D.12 — Model Identification (Product Code Level with optional reuse of existing ID solutions)

Component	Meaning	Value
Scheme & Domain	Protocol and domain	https://www.domain-abc.com
Product Code (.P)	Model-level identifier	freetext *(or from ID scheme)*
Data carrier	QR-code example with graphical frame to indicate model.	
Full example	https://www.domain-abc.com/?.P=freetext	

D.7 ID scheme 5.3: Decentralized Identifiers

D.7.1 General

Table D.13

Component	Meaning	Value
Product DID	Full DID identifying a product (DID method = web)	did:web:abc.com:model4TR
Service Endpoint	Optional service query parameter – specifies what to retrieve	?service=item-dpp
DID Method	Method part of the DID – determines resolution rules	web
Resolution Standard	Resolver must follow Decentralized Identifier Resolution (DID Resolution) v0.3:2025	W3C-compliant
Returned Resource	Based on service: may return a UI, machine-readable Verifiable Credential, or other digital product passport data	DPP (e.g. for item)

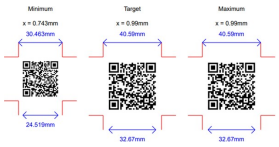
Component	Meaning	Value
Data carrier	QR-code example	
Scheme & Domain	https://resolver.io (DID resolver domain used to resolve the DID)	
Full example	https://resolver.io/did:web:abc.com:model4TR/?service=item-dpp	

D.7.2 Example with a QR Code

Using DIDs

Table D.14 — QR Code estimation size (mm)

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	41 x 41	30.463	40.589	40.589
M	41 x 41	30.463	40.589	40.589
Q	49 x 49	36.407	48.51	48.51
H	53 x 53	39.379	52.47	52.47
Module x-dimensions (mm) ➔		0.743	0.99	0.99
Example of QR Code DID ECC L				



DID in QR Code ECC L.

Contained data: "https://resolver.io/did:web:abc.com:model4TR/?service=item-dpp"

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D.8 ID scheme 5.4.2.1: Product and group identification, RFID

No visual representation of the encoding in an RFID tag.

D.9 ID scheme 5.4.1.2 Product and group identification, 2D-symbols

Table D.15

Component	Meaning	Value
~~GTIN (01)~~	~~Global Trade Item Number used as a base for batch-level identification (ISO/IEC 15459-6)~~	~~09506000134352~~
~~Expiration date (17)~~	~~Use by or expiry~~	~~250101~~
Data carrier Syntax	Encoded using high-capacity AIDC media syntax (e.g., QR Code) per ISO/IEC 15434	Encoded in QR Code using ISO/IEC 15434
Resolution	Web resolver returns batch-level Digital Product Passport	Handled via example.com
Data carrier	QR-Code example	
Scheme & Domain	https://example.com	
~~Full example~~	~~https://example.com/01/09506000134352/17/250101~~	

Example of QR Code Product and Group identification

Encoded data: "https://example.com/01/09506000134352/10/250101" - ECC M

Commented [SG54]: As was stated in the Identification Standard, ISO/IEC 15434 is not approved for use by GS1 in any application standards, never has been, and therefore it is not in conformity with GS1 standards to use GS1 identifiers in Table d.15.

Please use a different example, including the symbol and note below it associated with the QR Code.

Table D.16

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	37 x 37	27.491	36.63	36.63
M	37 x 37	27.491	36.63	36.63
Q	41 x 41	30.463	40.589	40.589
H	45 x 45	33.435	44.55	44.55
Module x-dimensions (mm) ➔		0.743	0.99	0.99

Example of QR Code for product and group identification :

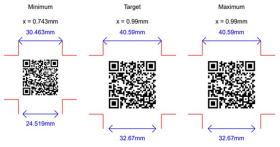
~~Encoded data: "https://example.com/01/09506000134352/17/250101~~

D.9.1 Example with a QR Code

Using DIDs

Table D.17 — QR Code estimation size (mm)

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	41 x 41	30.463	40.589	40.589
M	41 x 41	30.463	40.589	40.589
Q	49 x 49	36.407	48.51	48.51
H	53 x 53	39.379	52.47	52.47
Module x-dimensions (mm) ➔		0.743	0.99	0.99
Example of QR Code DID ECC L Encoded data: "https://resolver.io/did:web:abc.com:model4TR/?service=item-dpp"				



DID in QR Code ECC L.

Encoded data: "https://resolver.io/did:web:abc.com:model4TR/?service=item-dpp"

D.10 ID scheme 5.5: Digital Object Identifier for products

Table D.18

Component	Meaning	Value
Scheme & Domain	DOI resolver domain	https://doi.org
~~Path Prefix (XID)~~ISO/IEC 15459-2 Registered Issuing Agency Code (XID)	~~Identifier prefix signalling ISO/IEC 15459-compliant structure~~Issuing Agency Code assigned to DOI by the ISO/IEC 15459 Registrar	XID

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Commented [SG55]: ISO/IEC 15459 compliance is based upon part 2 (Issuing Agency Codes) but also part 3 (Issuing Agency Common Rules). This identifier is in no way conformant with 15459-3 as it does not include a qualifier in front of the identifier (what part of the string is the identifier and what level of granularity does it define)? It is also not conformant with the DOI standard. It should be renamed as mentioned in the ID standard as a hybrid DOI prefaced by an ISO/IEC 15459-2 IAC.

DOI Indicator	Constant prefix defined in ISO 26324 for DOI	10
Issued Org Code	Code assigned by the DOI issuing agency ~~(registered under ISO/IEC 15459)~~	21
Product ID (Suffix)	Unique ~~ID~~ reference number assigned by the org or agency (e.g., product, batch, item) according to specification XYZ	PRW82MJF
Resolution	DOI resolver translates to the digital product passport location	Handled via doi.org
Data carrier	QR-code example	
Full Identifier	ISO 26324-compliant identifier including prefix and suffix	XID10.21/PRW82MJF
Full example	https://doi.org/XID10.21/PRW82MJF	

Component	Meaning	Value
Issued Org Code	Code assigned by the DOI issuing agency (registered under ISO/IEC 15459)	21
Product ID (Suffix)	Unique ~~ID~~ reference number assigned by the org or agency (e.g., product, batch, item) according to specification XYZ	PRW82MJF
Resolution	DOI resolver translates to the digital product passport location	Handled via doi.org
Data carrier	QR-code example	
Full Identifier	ISO 26324-compliant identifier including prefix and suffix	XID10.21/PRW82MJF
Full example	https://doi.org/XID10.21/PRW82MJF	

D.10.1 Example of DOI with a QR Code

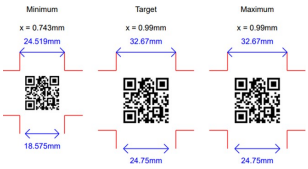
Using DOI

Table D.19 — QR Code estimation size (mm)

Error correction	Module Count including quiet zone	Minimum size (mm)	Target size (mm)	Maximum size (mm)
L	33 x 33	24.519	32.67	32.67
M	37 x 37	27.491	36.63	36.63
Q	37 x 37	27.491	36.63	36.63
H	41 x 41	30.463	40.589	40.589
Module x-dimensions (mm) ➔		0.743	0.99	0.99

Example of QR Code DOI ECC L

Encoded data: "https://doi.org/XID10.21/PRW82MJF"



Example of QR Code DOI ECC L

Encoded data: "https://doi.org/XID10.21/PRW82MJF"

077
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Annex E
(informative)

DPP data carrier recognition

E.1 Example of Data carrier multiple use with implicit recognition (no need for recognition)

Example of QR code embedding an identifier in URI a link, [5] compliant: GS1 Digital Link URI used either for consumer engagement and price look-up at point of sales, link to DPP.

Encoded data: "https://example.com/01/09524810000339/10/YA12AB?~~17=271231~~"

(01)09524810000339

E.2 Examples of data carrier with explicit recognition

An example of an explicit indication that a data carrier includes the DPP is to surround the 2D barcode by a frame and a triangularly filled corner.

This technique is specified in [6] and [7].

Example with [6]

Encoded data: "https://www/domain-abc.com/freetext"

Commented [SG58]: Editorial: For precision

Commented [SG59]: Editorial: Date of expiry, which is Application Identifier (17), has no relevance to ESPR. That is why it is proposed to adjust the example by leaving out this date of expiry information.

NOTE 1 [18] requires a 4X quiet zone around the QR Code.

Example from [7]

Encoded data: "https://www/domain-abc.com/freetext?.P=feeetext"

NOTE 2 [18] requires a 4X quiet zone around the QR Code.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of 2024/1781

This European Standard has been prepared under a Commission's standardization request.

This European Standard has been prepared under a Commission's standardization request M/604 to provide one voluntary means of conforming to essential requirements of Article 10 and 11 of 2024/1781 Ecodesign for Sustainable Products Regulation (ESPR).

Once this standard is cited in the Official Journal of the European Union under that 2024/1781, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding requirements of that 2024/1781, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and the essential requirements of Article 9 and 10 of 2024/1781

Essential requirements specified in Article 9, 10 and 11 of 2024/1781	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
Article 9, (2),N/N/ (b)	5.1	Enable to use one or more data carrier
Article (9), (c),	5.4, 5.7.1, 5.7.2	Enable data carrier presentation and positioning
Article (9), (d),	4.2, 6.1, 6.2.4	Enable multiple level of identification to be carried by the data carrier
Article (10), (1), (a)	4.3.3, 5.2.1, 5.3.1, 5.3.2, 5.4.5	Data carrier enables to access to the DPP
Article (10), (1), (b)	5.4, 5.7.1, 5.7.2	Presence of the data carrier on the product, packaging or documentation accompanying the product
Article (10), (1), (c)	5.2, 5.3	Ensures structured, machine readable, based on open standard interoperable, without vendor lock-in
Article (10), (1), (f)	4.2, 6.1, 6.2.4	Enable to provide different identification granularity
Article (10), (1), (g)	Annex A	Enable data carriers' evolutions

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

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

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Field Code Changed

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