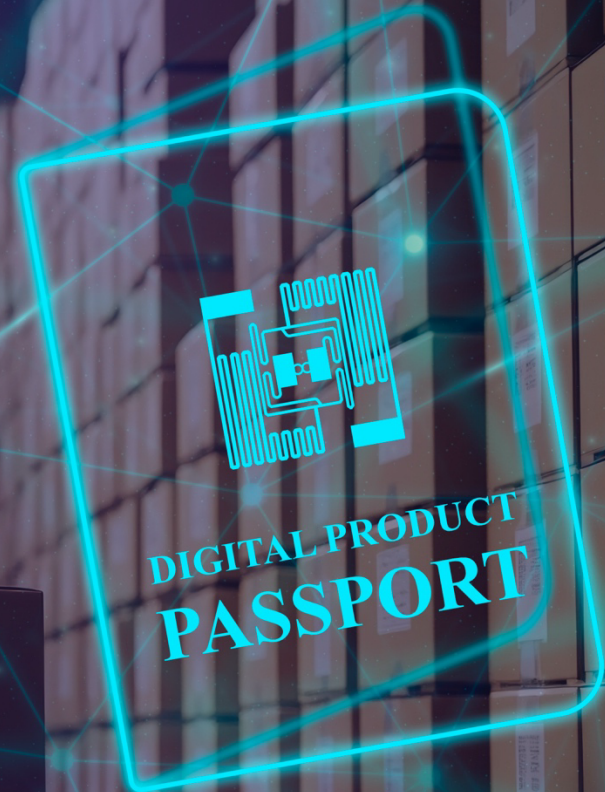




Digital Product Passports Enabled by RAIN RFID



The RAIN alliance, the leading industry consortium for RAIN RFID, strongly supports the Digital Product Passport (DPP) initiative in the European Union. We believe our technology is the optimal data carrier for DPP's and necessary to support the ESPR's goal of unlocking a circular economy.

The objective of this document is to share a list of Frequently Asked Questions and corresponding views on RAIN RFID, differentiating advantages and ongoing advancements to ensure a successful implementation of RAIN RFID in the DPP framework.

1. What is a Digital Product Passport (DPP)?

The European Union (EU) has introduced the Digital Product Passport (DPP) as a first-of-its-kind regulatory tool to create transparency and unlock circularity. It shall foster more sustainable business models, such as product as a service, product rentals, and refurbishing. Finally, the DPP shall provide details about the manufacturing process and thus help the end consumers to make informed choices. The EU Digital Product Passport (DPP) has a substantial global impact, particularly on supply chains and factories outside Europe.

The DPP is both a structured collection of product-related data and a digital system that serves three main functions: (1) collecting and recording product information across the product lifecycle, (2) digitally storing this data, and (3) providing easy data access to relevant stakeholders, in particular consumers and public authorities.

The Ecodesign for Sustainable Products Regulation ([ESPR](#)) leads the change as the main piece of legislation on DPP in the EU, outlining the general and technical requirements for its creation, access, and sharing. Several other EU regulations and legislative proposals, such as the Batteries Regulation, Toy Safety Regulation, and Detergents Regulation, build on the concept of DPP and introduce this tool. A large number of end consumer products and intermediary products that are likely to fall under the ESPR in the coming years are*:

- **End-use products:** textiles and footwear; furniture; ceramic products; tires; detergents; bed mattresses; lubricants; paints and varnishes; cosmetic products; toys; fishing nets and gear; absorbent hygiene products.
- **Intermediary products:** iron and steel; non-ferrous metals; aluminium; chemicals; plastic and polymers; paper, pulp paper, and boards; glass.

**This list is based on a preliminary list provided by the Joint Research Centre of the European Commission in a technical report published in 2023. This list is, as such, preliminary and may change over time.*

The intended scope of the DPP is information related to sustainability, circularity, value retention for re-use, remanufacturing, and recycling.

2. What product data will be included in a Digital Product Passport?

The information included in the DPP will be specific to the product group and identified in product-specific EU delegated acts that are currently under discussion (the first delegated acts for textiles and steel are scheduled for 2026/2027). These may require the DPP to encompass data on one or more of the following areas:

- General Product Information, e.g., product identifier, manufacturer.
- Legal compliance, e.g., compliance assessments Supply Chain Due Diligence, e.g., environmental sustainability performance
- Technical performance, materials, and composition
- Circularity aspects (such as resource efficiency)
- Performance, such as durability and reparability
- Product-related information (e.g., manuals, additional labels)

3. Which DPP information do you envision for textile and footwear products?

The exact information requirements for textile and footwear products will be defined by the European Commission in the Textiles Delegated Act.

The DPP data attributes for textile products may potentially include, but not be limited to, the following examples:

- Location of manufacturing;
- Border crossings during shipment (import, export information);
- Raw materials used for the product;
- Production circumstances (wastewater, worker safety)
- Environmental impact, such as carbon footprint and water usage;
- Chemical usage, noting any chemicals used in manufacturing and dyeing;
- Recyclability and end-of-life options;
- Durability and reparability details;
- Care instructions for maintaining the product's quality.

4. What is the key feature of RAIN RFID compared to other digital labelling technologies on the market?

As with other digital labelling technologies, RFID complies with globally recognised standards and can store additional data beyond its codification. RAIN RFID offers several distinct advantages, as:

- **Long wireless read range** of several metres and mass reading capabilities, allowing for faster and more efficient data capture without line-of-sight requirements.
- **Near-simultaneous reading** increases efficiency in high-volume applications like inventory management and supply chain tracking.
- **Durability** will be secured when tagging RAIN products designed to withstand harsh conditions such as multiple washings of textiles or being used in the tire of a car. There is a growing portfolio and adoption of embedded RAIN RFID tags to ensure seamless tracking from manufacture to a product's end of life.
- **Scalability** accommodating growing business needs, making RAIN suitable for both small and large organisations.

Ultra-High Frequency (UHF) RFID technology enables the identification, authentication, and verification of items more efficiently, which is essential for automated and labour-efficient identification in dynamic environments such as supply chain management, logistics, inventory management, or retail until recycling of the product.

Rain RFID resources:

- [MP4: Barcode versus RFID](#)
- [FAQs - RAIN RFID](#)

5. What makes RAIN RFID a robust technology and what are the examples of use cases and applications?

The adoption of RAIN RFID technology is well established and proven reliable in its performance, robustness, and creating value for many users in various sectors.

Many of the largest retailers and brands in this world have been using RAIN RFID technology already for several years with compelling value models for driving significant commercial efficiencies.

RAIN RFID technology offers the most efficient means for the identification of a product at the lowest granule, the item level, with wireless mass readings. RAIN users harvest its benefits for product traceability, efficient supply chain, or circular topics.

Rain RFID resources:

- [Key Takeaways from the RAIN Alliance Tire Masterclass: RAIN RFID](#)
- [RAIN Alliance Resources](#)

6. What is the status of the Rain RFID technology adoption today?

In March 2024, the [RAIN RFID Alliance](#) announced that 44.8 billion RAIN RFID tag chips were shipped globally in 2023. This figure represents year-on-year growth of 32% and reflects increasing demand across a variety of industries for technology solutions that improve transparency, efficiency, traceability, and sustainability.

Rain RFID resources:

- [Rain RFID tag shipments forecast to reach 115bn units by 2028, a year-on-year growth of 20.4%](#)

7. What are the main vertical markets that have adopted RAIN RFID, and to what scale?

RAIN RFID technology has been widely adopted across various vertical markets, including general retail, textiles and footwear, healthcare, logistics, manufacturing, aviation, libraries, agriculture, and automotive (tires).

Retail and logistics show high adoption for inventory and supply chain management, while healthcare uses it for tracking medical equipment and patient medication. Manufacturing and automotive sectors utilise it for component tracking and production efficiency. Aviation employs RAIN RFID for baggage tracking, and libraries use it for managing collections. Agriculture is an emerging market, applying technology for

livestock and crop monitoring. Overall, adoption is growing as industries seek improved operational efficiency and cost reduction.

Rain RFID resources:

- [What is RAIN RFID Technology?](#)

8. Where can I, as a consumer, already experience RAIN RFID in use, when visiting a store?

Retailers across industries are embracing RFID technology to revolutionise their in-store operations and enhance the customer experience.

Companies commonly use RFID tags to ensure the accuracy of inventory of products. RAIN RFID not only eliminates the need for manual counting but also allows for features like “endless aisle shopping,” where customers can see online if a desired size or colour is available in the backroom. Additionally, RFID tags can be used for self-checkout kiosks, allowing for a faster and more convenient checkout process. Decathlon is well known for its RAIN RFID checkout experience. Grocery stores are also taking advantage of RAIN RFID. Walmart, for instance, utilises RFID tags on pallets of goods to streamline warehouse management and ensure more efficient on-shelf replenishment of products, and fully automated and autonomous grocery stores are uniquely enabled by RAIN RFID technology.

9. How does RAIN RFID respects the privacy of personal data?

RAIN RFID tags that are used in the market follow the GS1 EPC G2V2 standard and only contain globally unique product identification numbers that do not store any personal data, herewith complying with the European Commission [Data Act](#).

RAIN RFID tags do not include GPS or location-tracking capabilities, ensuring that an individual's movements cannot be monitored.

Data transmission is limited to RAIN readers and occurs only when the tag is close by.

10. How can RAIN RFID help ensure that the DPP data are authentic and reliable?

Once a product category is covered by an ESPR delegated act, the company that places a product to the EU market (economic operator) is responsible for issuing a DPP for that product and, therefore, for the authenticity and reliability of DPP data. However, it is expected that more than one organisation will need to fill in DPP data.

The advantage of RAIN RFID technology is the ability for accurate and efficient tracking of unique products during their journey from production to retail to consumer and the products end of life.

Because of the frequent tracking points, intelligent software can perform consistency checks, which may detect false entries as well as missing entries into the DPP. E.g., a product was “seen” in a country, which according to DPP it has never entered.

It is the constant tracking and creation of verifiable data that helps keep the DPP data correct and authentic. RAIN RFID technology is by far the most efficient means to perform this tracking.

11. Can RAIN RFID meet the ESPR requirement for a data carrier to remain physically attached to the product throughout its lifetime?

RAIN RFID is a durable data carrier when designed and manufactured to survive the stress and wear throughout the life cycle of products.

This qualifies RAIN RFID as a 'durable' data carrier and a valid candidate to be accepted as a data carrier under the ESPR (best durability amongst ESPR data carrier candidates). There is an increased offer of integrated RFID label solutions proven to function throughout the product life cycle. These RAIN RFID solutions are designed and durable to stay with the product during its entire life and function.

Durable RAIN RFID tags, often passive, are made from robust materials like high-grade plastics, ceramics, or other sustainable materials, allowing them to withstand extreme temperatures, moisture, and physical impacts. These passive tags have no internal battery, relying on energy from the RFID reader, which contributes to their long lifespan and ability to remain with the product throughout its lifetime. Their rugged design and lack of a power source make them ideal for continuous use in challenging environments.

12. What measures are in place to prevent sensitive brand or retailer data on the RAIN RFID data carrier from being copied? or accessed by unauthorised individuals?

One of the critical challenges in data management is ensuring data integrity. It's essential to prevent data corruption, duplication, or unauthorised access. RAIN RFID offers several inherent security features to address these concerns.

At its core, RAIN RFID employs a dual identification system:

- **EPC (Electronic Product Code):** Uniquely identifies the product and can be modified under specific protocols.
- **TID (Transponder ID):** A unique identifier embedded by the chip manufacturer, ensuring the tag's authenticity and preventing cloning.

Modifying a RAIN RFID tag requires specialised equipment and knowledge of RFID communication protocols.

To further enhance security, specific RAIN RFID tags and protocols offer advanced protection:

- **Tag locking:** prevents data overwriting to maintain data integrity.
- **Cryptographic Security:** Offers an extra layer of protection through encryption and authorisation.

In conclusion, RAIN RFID's robust security features, including unique identifiers, access control mechanisms, and cryptographic options, make it a reliable choice for safeguarding sensitive data.

13. How do we ensure that the DPP standard considers RAIN RFID?

The RAIN alliance holds an official liaison with CEN/CENELEC JTC24, where the DPP framework and system standards are being developed. With this, the RAIN alliance is actively ensuring DPP requirements are understood and communicated to RAIN alliance members.

As part of the liaison work, efforts are made to ensure that the DPP standards leverage existing industry standards related to RAIN RFID, such as GS1 EPC Gen 2 (harmonised with ISO 18000-63).

To effectively incorporate RAIN RFID as a data carrier for DPP, the interoperability and compatibility with data carriers such as NFC, QR, and barcodes must be ensured.

This requires defining protocols and interfaces that allow seamless integration and data exchange between the different technologies. Education about the benefits of RAIN RFID and guidance for implementation within the DPP framework must be fostered by the RAIN RFID alliance.

Rain RFID resources:

- [Enabling a new wave of innovation: RAIN RFID in mobile handsets](#)

14. How can DPP and RAIN RFID contribute to corporate sustainability strategies through enhanced traceability?

Across a range of global industries, growing regulatory pressure to disclose climate risks and provide supply chain transparency is forcing organisations to investigate how they can improve efficiency, traceability, and drive more sustainable operations.

The RAIN Alliance report, entitled “Bridging the Gap: Connecting Corporate Sustainability with RAIN RFID,” highlights how RAIN RFID data is starting to help companies meet this urgent, unmet need.

Rain RFID resources:

- The full survey findings and more information on RAIN RFID’s role in driving sustainability can be found in the RAIN Alliance’s recent report. [“Bridging the Gap: Connecting Corporate Sustainability with RAIN RFID”](#).
- [2023 RAIN RFID TAG IC Shipment Data](#)

15. How can RAIN RFID help enable a circular textile industry?

To enable a circular textile industry and reduce the textile sector’s environmental impact, sustainability and circular business models need to be expanded. Today, the textile sorting and recycling processes face multiple challenges that hinder efficiency and scalability.

RAIN RFID is a data carrier that provides access to product data required to support all strategies for a circular economy. For example, overproduction can be avoided by knowing how many products are needed. This precision helps companies reduce overproduction and excess inventory, ensuring compliance with the ESPR ban on destroying unsold consumer products.

By knowing the bill of materials and repair instructions, it is easier to repair the product and reuse or resell it. Intelligent sorting and recycling are enabled by knowing what the product is made of its repair history, specific disassembly, and disposal instructions.

Unlike traditional printed textile labels that degrade during wash and wear, embedded RAIN RFID tags act as a persistent data carrier, holding the information in each garment needed to enable an efficient, industrial sorting and recycling process.

Rain RFID resources:

- DPP Podcast: [Exploring Digital Product Passport](#)
- DPP webinar: [Deep Dive into DPP](#)

16. How will RAIN RFID help the recycling process?

RAIN RFID can significantly optimise the recycling process by improving the identification, intelligent sorting, and tracking of recyclable materials. To make sure that RAIN RFID still functions during the product’s end of life, the durability of the tag is essential.

When leveraging RAIN RFID for recycling, the RAIN RFID tags need to be embedded in the product or packaging, ensuring the tags contain relevant recycling information.

At key points in the recycling chain, RAIN RFID readers need to be installed, including collection points, sorting facilities, and recycling centres.

To collect, store, and analyse data from RAIN RFID tags. The data framework will need to ensure the systems are interoperable with existing waste management and recycling software. It is one of the DPP targets.

17. How can RAIN RFID facilitate the resale of products for a second or third life?

Attaching a RAIN RFID tag to a product facilitates resale and reuse by providing a unique identifier that ensures authenticity and prevents counterfeiting.

The tag is the entry point guaranteeing detailed product information, including origin, materials, and maintenance history, which helps buyers make informed decisions. It also tracks the product's condition and repairs, offering transparency about its history. Additionally, RAIN RFID technology is designed to streamline inventory management, automate sorting and listing processes, and enhance security, ultimately extending the product's lifecycle and promoting a circular economy.

18. How can RAIN RFID help with repair and spare parts availability to promote product longevity?

Today, RAIN RFID is widely adopted for use cases till point of sales. The B2B user cases are scaled fast and drive powerful value models for commercial efficiencies. Through DPP, we extend the use cases of RAIN beyond the point of sales to the consumer for the product's entire lifecycle.

By scanning tags customised with sustainability information on repair and spare part availability, the consumer can make informed decisions to extend the longevity of the product.

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