GS1 Australia

The Global Language of Business

GS1 standards — Apparel and general merchandise

EPC-based RFID item level tagging

Implementation guideline for companies in the apparel, fashion and footwear sector

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GS1 Australia at a glance

GS1 Australia supports companies from all sectors in the adoption and practical implementation of modern communication and process standards to improve the efficiency of businesses.

GS1 Australia is responsible for the maintenance, operation and continued development of identification standards, among others. As an example, trade item identification using a GTIN (Global Trade Item Number) for globally unique identification, which is the basis for most barcodes and RFID tags.

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Document summary

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Contact

Sean Sloan
Industry Manager - Consumer Goods
GS1 Australia

8 Nexus Court
Mulgrave VIC 3170

D +61 3 9550 3492
M +61 4 0756 7240
E Sean.Sloan@gs1au.org

www.gs1au.org

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1. Introduction

1.1 Mission

EPC-based RFID Item Level Tagging (ILT) enables organisations to leverage a huge variety of use cases aimed at increasing efficiency, opening new business opportunities as well as improving transparency. Amongst other things, it especially provides a fast and accurate way to track and trace goods as well as manage inventory throughout the supply chain and at the Point of Sale (POS).

This document provides a best practice guideline in order to manage RFID ILT implementations in an international environment. The purpose of this guideline is to help the respective stakeholders along the supply chain to comply with GS1 standards as well as to handle all processes concerned with RFID item level tagging in an efficient manner.

Currently, the following trends can be observed in the Apparel, Fashion and Footwear (AFF) sector:

• Adoption of RFID ILT is gaining momentum

• More and more RFID pilots are leading to roll-outs

• ILT is used in more and more product categories

That being said, there is an increasing number of manufacturers, suppliers and solution providers who are involved in ILT-related processes (e. g., a manufacturer which is requested to attach RFID tags to the products by a brand owner placing an order). However, this is leading to a growing number of divergent adoption variants which impairs the overall efficiency and causes additional costs. For instance, RFID tags are placed at different positions, follow deviating encoding procedures and have varying backup approaches. Especially in supply chains of the AFF industry, which oftentimes are characterised by hundreds of business partners, this is becoming a serious issue.

Thus, there is a strong need among end user companies and solution providers to have a common understanding and alignment of ILT-related processes in order to reduce complexity as well as costs along the entire value chain. In the same context, it is required to define the contents of an EPC RFID ILT training program enabling companies to certify that they have the know-how to manage standard-compliant RFID item level tagging.

1.2 Scope

1.2.1 In scope

This guideline supplements the GS1 standards by offering best practice solution approaches for the following subjects:

• EPC Management (including serial number management and exception handling)

• Tag and Tagging (including tag placement, general advise as to tag performance, and SGTIN back-up)

• Quality Assurance (e. g., as to verification of the encoding process, applying tags, and maintaining high tag readability)

Thereby, this guideline explicitly deals with one-way (i. e. not reusable) RFID tags.

The audience of this document is stakeholders (see chapter 1.3) dealing with ILT processes, i. e. organisations of the AFF sector involved in the handling of AFF products, which assign serialised identifiers at product item level (or intend to do so) while using inexpensive, 96 bit EPC RFID tags containing an SGTIN (Serialised Global Trade Item Number) EPC.

Apart from that, this document shall serve as a conceptual basis for future user training material aiming at putting this guideline into execution in practice.

1.2.2 Out of scope

This guideline will not address:

- Solution approaches for business requirements from sectors other than AFF (though several approaches most likely will be transferable)

- Technical specifications for RFID tag performance (for this purpose, please refer to the corresponding surveys/guidelines, see references)

- Specifications for business messages of any kind

- Specifications for the encoding of barcodes/RFID tags (for this purpose, please refer to the EPC Tag Data Standard and the GS1 General Specifications)

- Recommendations as to hardware/software solutions and vendors

- Basic information on RFID technology (frequencies, functional principle, …)

- EPC Data Sharing

- Layout and print quality of labels

- Procedures for reusable RFID hard tags

- Descriptions of specific use cases such as RFID-based counterfeit protection

- Management of master data and how it relates to GTIN management / ILT processes

In terms of usability, this guideline will refer to other relevant documents rather than unnecessarily duplicate their contents whenever it is appropriate.

1.3 Stakeholders

The following table contains a brief description of the stakeholders involved. Thereby, it should be noted that a company can represent different roles. For instance, there are a growing number of retailers which have established private label brands and thus can be considered as brand owner, producer and retailer at the same time. On the other hand, there are also suppliers which have set up their own retail stores and which operate their own warehouses and thus can simultaneously be seen as brand owner, producer, retailer and solution provider. This is why the roles are to be interpreted in a functional way (i. e., producer function, retailer function, freight forwarder function, etc.).

Term	Definition
Agency	The party responsible for organising the sourcing, quality assurance and other connected services on behalf of the brand owner.
Brand Owner	The party that is responsible for allocating GS1 system Identification Keys. The administrator of a GS1 Company Prefix. [GenSpec 2016, 475] In the AFF sector, the brand owner oftentimes corresponds with the term 'supplier'.
Freight Forwarder	The party that arranges the carriage of goods including connected services and/or associated formalities on behalf of the shipper (consignor) or consignee. [GenSpec 2015, 477]
Logistics Service Provider	Party providing logistic services such as warehousing, re-packing products, distribution and assembly. Synonym: Third-party logistics provider (3PL) [GS1 LIM 2007, 84]
Producer	The party that produces, provides, or furnishes an item or service. In the AFF sector, the producer oftentimes corresponds with the term 'manufacturer' and/or 'vendor'.
Retailer	The party that sells directly to the consumer. [GDD GDSN]
Solution Provider	An organisation that develops and implements systems for end users that are based on or implement the GS1 system of standards in its various business processes. [GDD GS1 Architecture] In the context of this document, a solution provider is for instance a service bureau printing and/or encoding tags.

1.4 Basics as to EPC and RFID

It is vital to comprehend that 'EPC' and 'RFID' are not synonymous terms at all. The Electronic Product Code (EPC) is syntax for unique identifiers assigned to physical objects, unit loads, locations,or other identifiable entity playing a role in business operations. It is used in information systems that need to track or otherwise refer to these objects. RFID on the other hand is just a data carrier that is able to convey an EPC. However, an EPC can also be derived from appropriate 1d/2d codes (such as a GS1 DataBar or a GS1 DataMatrix). The latter is illustrated in the following figure.

Example: GTIN (01) 04012345777772 | Serial number (21) 123

EPC tag | GS1-128 | GS1 DataBar | GS1 DataMatrix

urn:epc:id:sgtin:4012345.077777.123

As this guideline is specifically concerned with RFID item level tagging, we consider an 'EPC tag' to be an RFID tag that complies with the GS1 EPC Tag Data Standard.

2. EPC Management

In a nutshell, this section paves the way for a successful and effective EPC management. Thereby, it explains the major challenges, describes general serialisation strategies, and gives advice for the most common scenarios in which organisations have to assign serial numbers.

2.1 General remarks

The owner of the GS1 Company Prefix (GCP) bears the overall responsibility for EPC management. This is usually the brand owner. Proper EPC management is of utmost importance for the overall success of RFID ILT. Above all, it must be ensured that:

(a)   There are never any overlapping (i. e. double) EPCs,

(b)   The encoding procedure is compliant with the GS1 EPC Tag Data Standard, and

(c)   The length of the GCP (which is always an inherent element of any EPC) is correct.

As to (a), it is key that a combination consisting of a GTIN and a serial number is assigned only once, since data inconsistencies are pre-programmed otherwise. In this context, please note, that once a GTIN has been allocated to a trade item, and it has been introduced to the market, under no circumstances, must it be transferred or reused for any other trade item.

Item (b) is based on the fact that all supply chain partners trust that each and every RFID tag can be read and interpreted according to the procedures described in the respective GS1 standards.

Last but not least, item (c) is referring to the issue that the length of the GS1 company prefix issued by GS1 Australia can vary between 7 and 9 digits. Thus, its value has to be known before the encoding procedure. Otherwise, information systems would be unable to filter/query for items of a specific brand owner or identify the respective items in the first place.

The following table provides two examples of how a GTIN (one with a GCP length of 7, the other with a GCP length of 9 digits) along with a serial number is converted into an SGTIN EPC.

Thereby, the EPC URI represents the format which, e. g., is used in EPCIS, whereas the EPC binary code would be encoded onto an EPC transponder (the depicted binary code was created based on the presumption of using 96-bit EPC tags encoding an SGTIN destined for retail POS). For further details as to the correspondence between GS1 keys and EPCs or the encoding procedure, please refer to the Tag Data Standard, section 7 and 14, respectively.

GCP + serial number	GCP	EPC URI	EPC binary code (hexadecimal)
04012345 + 9999	7	urn:epc:id:sgtin:4012345.012345.9999	3034F4E4E40C0E400000270F
0539150537 + 321	9	urn:epc:id:sgtin:539150537.0888.321	302E022C8C90DE0000000141

The serial number is generally written in decimal for purposes of human-readable representation, for encoding into barcodes, in EDI and EPCIS messages. The binary equivalent only occurs in the RFID tag itself, and in certain low-level software that interfaces directly to RFID readers and printers.

Apart from the items mentioned above, it is of vital importance that there is a congruent identification of an item of concern. For instance, the EPC (in our case, the SGTIN) which is stored on the EPC tag has to be consistent with any GS1-based product identification applied elsewhere on that very item (e. g., the price label containing the GTIN encoded in an EAN- 13/UPC-A barcode, see the following figure). Note: if organisations make use of proprietary product identification schemes, the latter has to be mapped to a proper GTIN.

It should be noted that even though the GS1 General Specifications define a serial number as an alphanumeric string of 1 to 20 characters, a 96-bit RFID tag only allows 1 to 12 digits, where the serial number does not have a leading "0" and is less than or equal to 274877906943 (274 billion+ instances).

2.2 IT-based vs. chip-based serialisation

In general, two approaches can be distinguished for serial number management: an "IT-based" and a "chip-based" serial number management. The IT-based approach relies on information systems managing the allocation of serial numbers. In contrast to that, the chip-based approach makes use of a hardware feature of RFID tags, the so-called Tag Identifier (TID) – a memory bank on RFID tags which – along with some descriptive information about the RFID chip – often includes a serial number assigned by the chip manufacturer.

Due to some technical reasons and to diminish the overall complexity in supply networks of the AFF sector, this guideline advocates using the IT-based serialisation approach. The following chapters will break down the IT-based approach for the most common scenarios. In order to ensure data security, all methodologies require organisations to set up appropriate back-up solutions.

2.3 Serialisation scenarios

Companies in the AFF sector have developed various strategies for serial number management. The following passages describe best practice approaches for the most common use cases.

2.3.1 Tagging finished goods based on sequential serialisation

This approach makes sense especially for (a) organisations with just one production line/plant manufacturing the entire production volume of a given GTIN or (b) solution providers (i. e. service bureaus) responsible for encoding all RFID tags for a given GTIN. In both cases, the brand owner usually entrusts a solution provider with the serialisation management. Thus, the serialisation mechanism is typically provided by this very solution provider, e. g. as part of the software controlling the RFID tag printer.

In this simple scenario, the only requirement is a counter allocating serial numbers one at a time, i. e. the first instance of a product receives serial number 1, the second receives serial number 2, and so on. In the case of a sequential serialisation, the software needs only keep track of a single number, i. e. the next available serial number in the sequence. This is critical information to ensure that serial numbers are not duplicated.

Note that serial numbers only have to be unique within a given GTIN. Thus, if there are multiple GTINs (i. e. multiple products), there is a "next number" for each GTIN and the serial number assignment database keeps track of the next available serial number for each of the respective GTINs.

GTIN	Serial number	Example
04012345123456	1 2 ...	urn:epc:id:sgtin:4012345.012345.1 urn:epc:id:sgtin:4012345.012345.2 ...
05391505378882	1 2 ...	urn:epc:id:sgtin:539150537.0888.1 urn:epc:id:sgtin:539150537.0888.2 ...

2.3.2 **Tagging finished goods based on static allocation of serial number ranges**

A static allocation of serial number ranges is applicable when products sharing the same GTIN are manufactured and/or tagged by more than one supply chain partner. This includes having several manufacturing lines within the same plant, manufacturing lines that are geographically distributed, or third parties providing value added services. In this case, the challenge is to ensure that one supply chain partner does not use the same serial number that a different entity has already used for the same product.

Here, the serialisation management should be accomplished by the brand owner. To this end, the brand owner does not require specific software. In fact, a spreadsheet (with an adequate backup) is sufficient. Based on this record, RFID tag printers at the manufacturing lines/plants are provided separate sets of serial numbers to use within each GTIN. In that way, a portion or the entire range of possible serial numbers for a GTIN is divided into blocks. Each block is then assigned one manufacturing line/plant.

Going for this approach usually only requires the brand owner a one-time configuration in the software controlling the RFID tag printer or a communication with the respective solution provider which has to configure the specified serial number ranges on behalf of the brand owner.

One option consists in constructing the serial number in pieces. For instance, each production line or manufacturing plant could be assigned a static one-, two- or three-digit code that prefixes a continuous number. In conjunction, both would build up to the actual serial number. In the example indicated beneath, a specific production line or plant would only be permitted to generate serial numbers beginning with a predefined prefix (in this case, "10" or "11").

GTIN	Serial number prefix	Example
Plant A, line 1	10	urn:epc:id:sgtin:4012345.012345. 101235
Plant A, line 2	11	urn:epc:id:sgtin:4012345.012345. 1198765
Plant B (one line)	12	urn:epc:id:sgtin:4012345.012345. 124
...	...	...

As an alternative to the above depicted method, companies assign continuous ranges of serial numbers to the respective units. In such a scenario, a production line/plant is given a predefined range of serial numbers. Within this range (for instance, 200000 to 399999) it is free to assign any serial number unless it does not exceed the specified lower and upper limit. A continuous range allocation table would look like this:

Production line/plant	Minimum serial number	Maximum serial number
Plant A, line 1	1	199999
Plant A, line 2	200000	399999
Plant B (one line)	400000	599999
...	...	...

All in all, this approach (in its different variants) is rather straightforward to apply, especially as there is no special software required. Organisations basically just need to maintain a record of what ranges/prefixes have been allocated to which production line/plant. However, it requires careful planning (e. g., as to the number of production lines/plants for a given GTIN, the likely volume, etc. both now and in the future).

2.3.3 Tagging finished goods based on dynamic allocation of serial number ranges

A dynamic allocation of serial number ranges allows overcoming the disadvantages of a static allocation indicated in the previous chapter. In this case, serial numbers are allocated on a demand-driven basis, rather than in advance. This requires a software solution which assigns serial numbers in response to requests.

To this end, a brand owner typically has to deploy a serial number range server providing a network-based application programming interface (API) through which supply chain partners can request a block of serial numbers: First, a production line/plant issues a request (containing the required number of serial numbers for a specified GTIN). Second, the serial number range server allocates a corresponding block of hitherto unused serial numbers. Third, the server responds by electronically providing these numbers (either by listing them or by indicating the lower and upper limit). In a simplified manner, the following table illustrates the basic functional principle:

Production line/plant	Query	Example
Plant A, line 1	"I (GLN 0123456789104) require 1000 serial numbers for GTIN 04012345123456."	"You can use serial number range 1-1000 for the requested GTIN (04012345123456)."
Plant A, line 2	"I (GLN 0123456789111) require 10000 serial numbers for GTIN 04012345123456."	"You can use serial number range 1001-11000 for the requested GTIN (04012345123456)."
Plant B (one line)	"I (GLN 9876543210913) require 150 serial numbers for GTIN 04012345123456."	"You can use serial number range 11001-11150 for the requested GTIN (04012345123456)."
Plant B (one line)	"I (GLN 9876543210913) require 150 serial numbers for GTIN 04012345123456."	"You can use serial number range 11151-11300 for the requested GTIN (04012345123456)."
Plant B (one line)	"I (GLN 9876543210913) require 2000 serial numbers for GTIN 04012345999990."	"You can use serial number range 1-2000 for the requested GTIN (04012345999990)."
…	…	…

For the time being, there is no GS1 standard as to the API required for a dynamic allocation of serial numbers. There are various commercial proprietary solutions (usually making use of web service technology), which however are akin in terms of their request and response messages. GS1 may come up with a set of standardised business messages for serial number management at a later point of time. The outcome of such a work effort would probably consist of an open web service description which can either be implemented by any end user or which can serve as a blueprint for a standardised serialisation service provided by a third party.

2.3.4   Dealing with non-functional RFID tags

Due to quality issues, poor handling, etc., it can occur that an RFID tag is not working anymore. As soon as an organisation realises such a situation, it is required to create a new EPC tag. In this case, the encoded SGTIN EPC is usually re-constructible as the label containing the corresponding GTIN and serial number (either encoded in a barcode or in plain writing) is still attached to the respective item. Thus, one should proceed as follows:

(a)   Take a blank RFID tag (usually a hang tag)

(b)   Conduct a teach-in process (i. e. enter/scan the GTIN and serial number of the item of concern and write the corresponding SGTIN onto the blank RFID tag)

(c)   Attach the newly written tag to the item (thereby, the old tag does not necessarily have to be removed as it encrypts the very same SGTIN)

2.3.5   Tagging existing untagged inventory (online scenario)

A retailer (or any other downstream party) wants to tag its existing (either partly or entirely) untagged inventory. This usually occurs when suppliers have not yet begun/just begun RFID source tagging and the retailer does not want to wait until the inventory is replaced by source- tagged items over time.

If there are RFID printers present, one should proceed as follows:

(a)   Request serial numbers/serial number ranges for each GTIN of the items to be tagged by making use of a serialisation service as outlined in section 2.3.3.

(b)   Print and encode the resulting SGTINs onto the (either hang or adhesive) labels. GTIN and serial number should be encoded in a GS1 DataMatrix with the GS1 Application Identifiers '01' and '21'. (See figure on the right-hand side for orientation purposes).

(c)   Attach the encoded tags to the respective items. Thereby, the GTIN on the RFID tag and on the price label have to be identical.

If there are no RFID printers available (e. g. for reasons of cost-efficiency or if the RFID printer within a store is out of order), one should proceed as follows:

(a)   Scan the EAN-13/UPC-A (encoding the GTIN) of an item to be tagged

(b)   Request a serial number for this very GTIN by making use of a serialisation service as outlined in section 2.3.3.

(c)   Take a RFID blank tag and scan it

Remark: the blank RFID tags should be discriminable to enable an RFID device to notify the person conducting the teach-in process in case that there is more than one RFID tag in its read range.

(d)   Encode the RFID blank tag with the resulting SGTIN

2.3.6   Tagging existing untagged inventory (offline scenario)

Price label

Blank RFID label with GIAI

If an online scenario as described in the previous chapter is not applicable and RFID printers are not available, organisations can also go for the following procedure.

As a precondition, the organisation which wants to conduct tagging of hitherto untagged inventory needs to be provided with pre-encoded/pre-printed GIAI tags. Ideally, the GS1 DataMatrix barcode encrypting the GIAI (GS1 AI '8004') should be easily removable (e.g., by incorporating a perforation line).

In pre-encoding the blank RFID tags, please note the following: If you are the owner of the GCP, ensure that the serial number portions contained in the individual asset references of the GIAI have not yet been assigned to other products sharing the same GTIN. If you are not the GCP owner, either contact the respective brand owner or use your own GCP. Even though the individual asset reference of a GIAI stored on a 96-bit RFID transponder can vary between 42 and 62 bits (depending on the length of the GCP), there are some restrictions to be considered when building the individual asset reference destined to serve as the serial number of an SGTIN: First, the actual serial number part must not exceed 38 bits, i. e. it should have a value between 1 and 274,877,906,943. Second, it must consist of numeric characters only. Last but not least, it shall have no leading zeros.

The actual procedure consists of the following steps:

(a)   Scan the EAN-13/UPC-A (encoding the GTIN) on an item you want to tag

(b)   Take one of the pre-encoded RFID tags, scan its GS1 DataMatrix code with the GIAI (thereby, the software makes an association)

(c)   Attach the RFID tag to the item and remove the part of the label depicting the GS1 DataMatrix

(d)   Repeat steps (a) to (c) for all the remaining items

(e)   Upload the teach-in data

(f)   Take an RFID reader device, capture all GIAI EPCs and replace them by SGTIN EPCs (whereas the last 38 bits of the serial number part persist). This is accomplished in a bulk operation. Thereby, a whitelist can ensure that all GIAI EPCs were successfully overwritten by SGTIN EPCs.

As to step (f), the software application in behind should work as follows:

- Take the pre-encoded GIAI, e. g. "urn:epc:id:giai:4012345.888888", in binary:
  001101000001010011110100111001001110010000000000000000000000000000000000000000001101100100000111000

- Query for the associated 14-digit GTIN, e. g. "04012345123456"

- Overwrite header, filter value, partition value, GCP, and item reference (but not the designated 38 bit serial number part) of the GIAI-96, resulting in a proper SGTIN-96, in our case: "urn:epc:id:sgtin:4012345.012345.888888", in binary:
  001100000011010011110100111001001110010000001100000011100100000000000000000000001101100100000111000

2.3.7   Handling customer returns with intact tags

In this case, the respective item only needs to be added to the inventory.

If a retailer makes use of the "untraceable mode" (available since the publication of the UHF Air interface protocol standard Generation 2/Version 2), it is required to deactivate that function before adding the item to the inventory. (Explanation: The untraceable mode was introduced to address privacy concerns and enables RFID users to diminish an RFID tag's operation range as well as to restrict the identifying information an RFID tag exposes.)

2.3.8   Handling customer returns with non-functional/killed RFID tags

This is quite similar to the case described in chapter 2.3.4. The only difference consists in the supplemental step of adding the respective item to the inventory.

2.3.9   Handling customer returns without any tag (online scenario)

If a customer returns a product with no tags attached to it at all, the first step consists in discovering the belonging GTIN (in this context, this guideline strongly recommends to use the original GTIN). This usually can be accomplished by checking the article information indicated on the receipt and/or by consulting the merchandise management system.

However, there is no efficient way of determining the original serial number. Thus, the retailer (or any other downstream party) has to assign a brand-new serial number to the product.

Once the original GTIN is known, an organisation can proceed as described in section 2.3.5.

2.3.10   Handling customer returns without any tag (offline scenario)

If an online scenario as described in the previous chapter is not applicable, organisations can also go for the following procedure.

As a precondition, the entity which wants to conduct an encoding of a brand-new SGTIN needs to be provided with non-colliding serial number ranges by the GCP owner. This e. g. can be accomplished by a static allocation of serial number ranges as described in section 2.3.2.

Having provided the RFID devices (e. g. an RFID handheld or printer) with GTIN-specific serial number ranges for all products on stock, an organisation can proceed as follows:

(a)   Take a blank RFID tag (usually a hang tag)

(b)   Scan the EAN-13/UPC-A (encoding the GTIN) on an item which needs to be retagged

(c)   Encode the RFID blank tag with the SGTIN consisting of the scanned GTIN and a serial number from the local serial number pool

(d)   Attach the newly written tag to the item

2.3.11   Dealing with lost RFID tags

Due to, e. g. handling errors, quality issues and deliberate tearing, RFID tags can be detached from the items they identify. As soon as an organisation realises that a product is missing its RFID tag, it should proceed as described in section 2.3.4 (if GTIN and serial number is still on hand) or 2.3.9 (if GTIN and serial number are lost as well), respectively.

2.4 Dealing with overproduction/underproduction

As it is not easy to predict the exact number of finished products leaving the manufacturing plant in the end, it is common practice that producers are allowed to deliver slightly fewer or more items than actually ordered. This leads to a couple of potential problems though. On the one hand, experience indicates that suppliers which had not a sufficient number of tags just copied existing ones, which led to data inconsistencies as well as to additional expenses as the respective objects were not identifiable via RFID. On the other hand, spare tags were (mis)used on the grey market.

In order to tackle the issue of copying, producers should be provided with a sufficient number of EPC tags which exceeds the purchase order quantity. Ideally, it should correspond with the maximum number of items a producer is allowed to supply increased by a safety buffer to compensate for non-functional RFID tags.

In order to eliminate/diminish the risk that genuine tags are misused on the grey market, companies are advised to apply the following procedures: For seasonal items, they should demand from their suppliers to destroy all unused RFID tags. For NOS items, RFID tags should only be destroyed if the serial numbers are dedicated to a specific purchase order as they typically can be used for further purchase orders. In addition to that, a company can also set up an (internal) authenticity service to enable sample checks validating whether specific SGTINs were commissioned at all and if they were received in the Distribution Centre.

3. Tag and Tagging

3.1 Basic requirements on an EPC tag

An EPC tag has to fulfil essential requirements to be used in the context of this implementation guideline. These basic requirements are both functional and non-functional.

From a functional point of view, a tag has to be compliant to the Tag Data Standard (TDS), and the UHF Gen 2 Air Interface Protocol Standard. The first defines the Electronic Product Code, and also specifies the memory contents of Gen 2 RFID tags. The second specifies the physical and logical requirements for passive RFID systems operating in the 860 MHz – 960 MHz frequency range.

Thereby, it is recommended to use 96 bit EPC tags only. Remark: alternatively, an SGTIN EPC can also comprise 198 bits which would enable the encoding of alphanumeric characters in its serial number part. However, these tags are usually more expensive. What is more, the numbering capacity of RFID tags accommodating 96 bit SGTINs is more than sufficient for the needs of AFF companies.

Further, it is advisable to refrain from any usage of the user memory bank on RFID tags. Remark: the user memory bank can be used to store additional data (e. g., dimension and weight) about the item an RFID tag is attached to. However, this goes along with time-consuming bilateral agreements, a potentially impaired read performance, higher procurement costs, and the risk of running into process-related issues in case an RFID tag is not working anymore.

From a non-functional perspective, it is very important to inform the consumer about the usage of RFID to avoid possible speculation about the violation of the consumer's privacy. Therefore, it is strongly recommended to have an open communication about any RFID usage by appropriately marking all areas in which RFID is applied.

For this purpose, the European Commission recommends to use the signage specified in ISO/IEC 29160 (depicted on the right-hand side) on every RFID tagged item. Thereby, the minimum size of the ISO RFID emblem shall never go below a size of 5x5 mm.

In addition to that, this guideline strongly recommends incorporating the EPC logo as well. While the ISO RFID emblem indicates the presence of an RFID tag, the EPC logo (depicted on the right hand side in its two available versions – monochrome and coloured) provides a clear indication that the RFID tag stores an Electronic Product Code and that the operator complies with the GS1 Guidelines on EPC for Consumer Products. The size of the emblem shall be equal to the ISO RFID emblem. Both guideline and logos are accessible under the following URL: http://www.gs1.org/epcglobal/public_policy (as part of section 'Guidelines and Tools').

So far, there are no international regulations/recommendations regarding RFID signage and/or consumer information. Thus, any indication of RFID usage shall be compliant with relevant trading regulations in the respective country/region.

3.2 Tag placement

This chapter aims at achieving the highest possible consistency regarding RFID tag placement. It shall provide a common understanding where/how to apply EPC tags, ease any related training activities, and enhance efficiency (e. g. as it helps to avoid unnecessary costs due to retailer-specific requirements). First, this chapter provides some general guidance on RFID tag/label placement. Afterwards, best practice examples are given for two of the most common product categories. The latter are compliant with the EPC format and symbol placement guideline published by GS1 Australia.

3.2.1 General advice

Basically, there are three generic RFID tag types that have to be distinguished:

(a) Applied tags (e. g. RFID hang/adhesive tags, RFID price tickets)

(b) Integrated tags (e. g. sewn-on/pocket RFID labels, combined RFID/care labels)

(c) Embedded tags (i. e. literally sewn-in RFID tags and/or RFID tags which cannot be removed by the consumer without damaging the product)

With regard to option (a), organisations should use existing EAN-13/UPC-A marking or placement standards. As such, the EPC tag should be integrated in or placed on/adjacent to the price ticket. In general, this is the preferred way of mounting an EPC tag.

With regard to option (c), this guideline strongly recommends to refrain from any embedded tags. This is to prevent organisations to get involved in any privacy issues. In this context, please refer to the Privacy Impact Assessment (PIA) framework which helps companies to assess the privacy risks - and identify the measures to be taken to address them - before a new RFID application is introduced into the market. For more information on PIA and to access the GS1 EPC/RFID PIA Tool, please visit http://www.gs1.org/epcglobal/pia/

No matter if the chosen RFID tag is an applied or integrated one – it has to be removable by the customer after purchase.

In general, it sometimes is appropriate to have different placements for the same category of merchandise (e. g., as the items are designated for different genders or as some products contain metal fabrics).

For optimal readability and to prevent that tags are separated from the trade items, there are a couple of placement choices to be avoided:

- placing the EPC tag to media that is attached to the hanger

- placing the EPC tag where the hanger clips might shut (e. g. for denim, knit pants)

- direct contact with metal (please take into account that even a small proportion of metal fabrics in products can significantly impair the read performance)

- folding the EPC tag

- attaching the EPC tag directly to the hanger

- inserting an inlay loosely within a package

3.2.2 Illustrative examples for selected product categories

Trousers (pants, slacks, jeans, shorts)

This category includes items such as denim, twill, woven, fleece, and knit pants, slacks, jeans, shorts, skirts, swim trunks, bike shorts, and boxer shorts with either a constructed, elastic, or drawstring waistband.

Recommended tag locations:

- Left rear waistband (see figure beneath, left-hand side)

- Left side waist seam (see figure beneath, right-hand side)

- Integrated in the brand label

Sleeveless tops and slips

This category includes items such as woven and knit sleeveless shirts, blouses, tank tops, halter tops, camisoles, crop tops, slips, and one piece swimwear, body wear, dance wear, panties, briefs, and girdles intended to be merchandised hanging.

Recommended tag locations:

- Inside the collar through the care or brand label (see figure beneath, left-hand side)

- Integrated in the care or brand label

- Affixed to a cardboard (see figure beneath, left-hand side)

- Left-side seam (for slips)
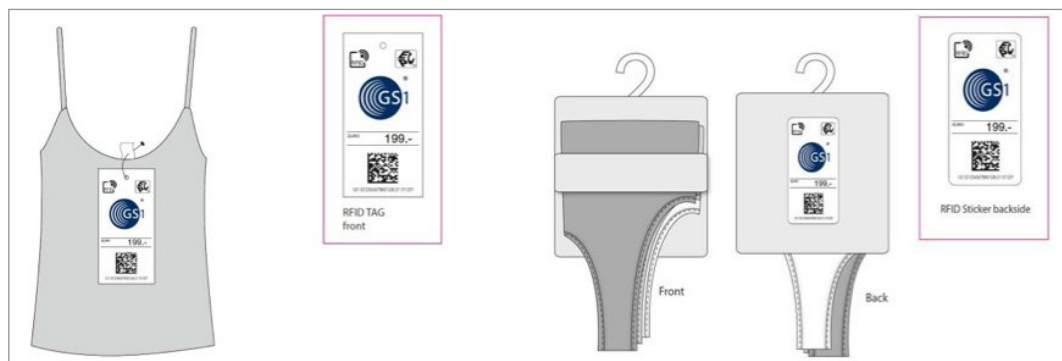
For a comprehensive description for all kinds of product categories please refer to the Format & Symbol Placement Guideline provided by GS1 US.

3.3 Tag performance (general advice)

Having an appropriate performance is critical for the success of an RFID implementation. In the past, the focus was on obtaining the highest performance (e. g. largest read range) possible. Nowadays, RFID technology (including tag performance) has reached a significant level of maturity. Thus, defining and maintaining RFID system performance has become equally important.

There are three major components having an impact on RFID tag performance:

• the RFID chip-reader combination,

• the antenna size, and

• the environment

In the context of RFID item level tagging, organisations can influence all three components:

(a) RFID chips shall be compliant to the UHF Gen 2 Air Interface Protocol Standard (see section 3.1) to support both multiple sourcing and an efficient communication between RFID tags and readers. Depending on the tag supplier, there are usually variances with regard to their characteristics which – in combination – can further improve the overall performance.

(b) The antenna shall have an adequate size. (For orientation: at the time of writing that guideline, RFID applications in the AFF sector typically require antenna sizes between 50 x 30 mm and 70 x 15 mm. However, antenna sizes most likely will become smaller in the future.)

(c) As to the environment, organisations should especially bear in mind that metal (e.g. in the item itself or in the store's furniture) can impair RFID read performance. For instance, if a garment consists of metallic threads, the RFID tag should not be integrated in the product, but applied on its outer side.

Note: a comprehensive overview on available passive UHF RFID tags including detailed test results on their performance (accomplished with various representative reference materials), their tag antenna designs and sizes are specified in the annual EECC UHF Transponder Performance Survey (UTPS).

3.4 SGTIN back-up

In order to reconstruct the SGTIN EPC stored on an RFID tag (e. g., when a tag was lost or is not operational anymore), it is strongly recommended to have appropriate back-up. The latter is accomplished by applying an additional symbology which – in contrast to the EAN-13/UPC-A barcode – can also encode the serial number.

The GS1 General Specifications allow applying additional GS1 approved data carriers if trading partners mutually agree on it. (GenSpec 2015, section 2.1.2.3). Therefore, this guideline recommends the usage of the GS1 DataMatrix while indicating the encrypted GTIN and serial number (GS1 Application Identifier '01' and '21') in human readable interpretation (HRI). HRI represents the same characters as encoded or carried in the bar code or tag. HRI appears below or otherwise adjacent to a barcode, and can be used to reconstruct the contents of a GS1 data carrier in the event the latter cannot be read anymore.

GLOBAL STANDARDS

Article	Evening Dress
Size	M
Colour	Sky Blue
Price	85,00 €

4 012345 123456

Front side

(01)04012345123456(21)9876

Back side
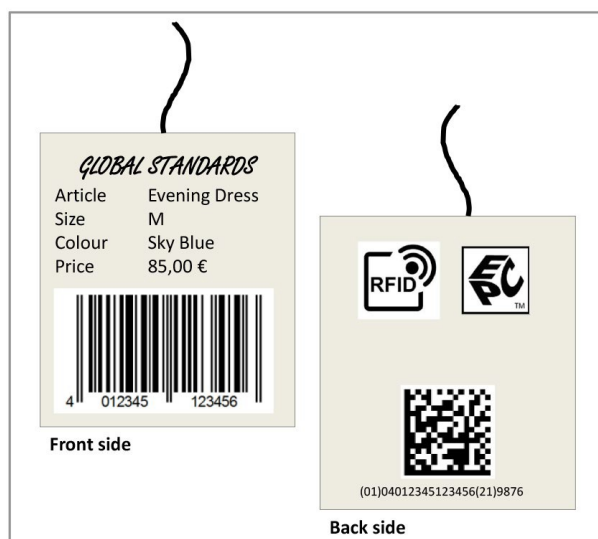
Independently of what is specified subsequently, please note: for general distribution and scanning at retail POS, the EAN-13/UPC-A barcode is always mandatory on the price label.

Basically, one has to distinguish applied and integrated labels.

Companies opting for applied labels typically make use of one of the following three approaches:

a) combined price/RFID hang tag/label,

b) adhesive RFID tags affixed on the price label's back side, or

c) stand-alone (either hang or adhesive) RFID tags.

The right-hand side of the figure to the right provides an illustrative example of the elements to be included on the back side of a combined price/RFID hang tag/label (a), an adhesive RFID sticker (b) or a stand-alone RFID tag (c).

Sewn-on/pocket RFID labels

(01)04012345123456(21)12

RFID inside: remove before wearing

Combined RFID/care label

(01)04012345123456(21)12

Machine wash, max. temp. 30°C/86°F, synthetic cycle reduce mechanical agitation/ Do not use bleach/ Cool iron 120°C/248°F/ Dry clean in any solvent except trichloroethylene, reduced cycle, moisture and heat/ Do not tumble dry

RFID inside: remove before wearing

Companies which have gone for integrated labels typically make use of one of the following two approaches:

a) sewn-on/pocket RFID labels, or

b) combined RFID/care labels

For those cases, illustrative examples of the elements to be included on the respective labels are provided in the figure on the left-hand side.

As the latter two approaches go along with space constraints, it is justifiable to position the GS1 DataMatrix below the usual perforation line, while its accompanying HRI is placed above (along with the most crucial care instructions). This ensures that the article's unique identification can be restored while enabling consumers to remove the part of the label conveying the RFID transponder.

Remark: brand labels incorporating RFID tags are usually not applicable to contain an SGTIN backup themselves. Rather, the SGTIN backup has to be provided through another label.

However, this adds some complexity as serial numbers on two separate labels have to be matched accurately.

For an explanation of how a GTIN and its accompanying serial number are converted into an SGTIN EPC, refer to section 2.1. For a comprehensive description, see the corresponding GS1 Guideline (http://www.gs1.org/docs/gsmp/RFID_Barcode_Interoperability_Guidelines.pdf) dealing with RFID and barcode interoperability.

4. Quality Assurance

A consistently high tag performance is crucial for being able to conduct RFID-based use cases properly. Amongst other things, faulty RFID tags diminish data accuracy (e. g. in the course of stock taking or cycle counting), process reliability (e. g. in production, in electronic article surveillance, etc.), efficiency (e. g. delays in logistics operations) and – in the end – motivation of employees using the technology. Therefore, the following sub-sections provide guidance on measures to obtain and maintain high tag quality.

4.1 Maintaining high tag readability

In general, all stakeholders physically handling RFID tags can contribute to a continuously high read performance. Thereby, it has been proven to be beneficial that all supply chain parties agree on certain performance levels and to implement downstream to upstream feedback loops ("I was provided with a quality level of X."). Each member of the supply chain has to ensure compliance with the respective quality criteria to prevent a downstream accumulation of quality issues.

The **inlay and tag/label manufacturer** (producing the finished tag/label ready for printing and encoding) should ensure that:

• Inlays/tags/labels (either single, on rolls or on sheets) are correctly positioned,

• There are appropriate measures in place to verify both near and far field performance (e. g. by a 100% test in near field and random tests in far field),

• Tags/labels are correctly pre-printed and that the performance is within predefined ranges, and

• Faulty or weak inlays/tags/labels are marked, removed or destroyed.

The **party printing/encoding the tag/label** should ensure that:

• The chip is encoded with the correct EPC,

• One and the same EPC is never encoded twice (except in those scenarios as outlined in section 2.3),

• The printing is correct and corresponds with the data (i. e. the GTIN and serial number) encoded on the chip,

• The performance is within predefined ranges (far field),

• The printed linear or 2d codes are in accordance with given quality requirements, and

• Incorrectly or poorly printed/encoded tags/labels are marked, removed or destroyed and the missing number of tags/labels is replenished.
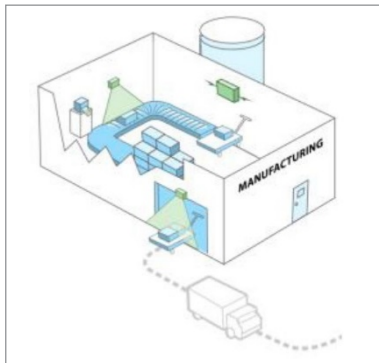
The Producer

(Optional) The **producer** should:

- Check the printed/encoded tags before commencing the production process (at least at random) e. g. by using an RFID handheld scanner and making a visual inspection,

- Check the quality of the tags/labels at the time of attachment e. g. by using a fixed reader integrated in the packing table,

- Check whether the captured SGTINs (read by an RFID handheld or tunnel scanner) correspond with the ordered quantities before goods issue. If there are any discrepancies, the respective logistics units should be sorted out and examined,

- Ensure that RFID tags/labels are not placed too densely (i.e. < 1 cm) e. g. by alternating their orientations when packing tagged items into cartons, and

- Remove and replace any faulty tags/labels.
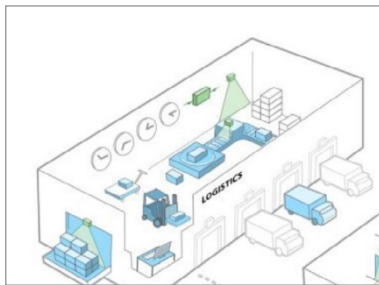
The Logistics Service Provider

(Optional) **The logistics service provider** (LSP) should:

- Validate the incoming logistics units whether they contain the expected quantities (e.g. through an RFID tunnel reader) at goods receiving. If there are any discrepancies, the respective logistics units should be sorted out and examined),

- Conduct exception processes as previously agreed with its customer (e.g. replacement of faulty tags, adjustment of advised quantities) if it turns out that there are faulty and/or missing tags/labels, and

- Conduct a 100% item validation, i.e. removing/replacing misplaced items as well as faulty tags/labels in the course of packing and goods issue.
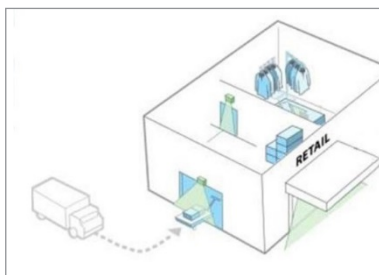
The Retail Store

(Optional) The **retail store** should:

- Conduct an RFID-based goods receiving process in order to determine whether agreed performance quality levels were met (thereby, it usually is sufficient to check each logistics unit whether it contains a number of EPCs exceeding a predefined threshold),

- Carry out a 100% control on a random basis from time to time, and

- Validate (when printing/teaching-in RFID tags) in near field that the tag can be read by means of the respective RFID printers/handhelds.

4.2   Applying tags to the right items

In order to ensure that tags are applied to the right items, organisations need to establish a well organised process for fast and efficient matching of tags and the items they are attached to. Suitable indicators for that matching are the GTIN and – depending on the type of label – the supplier item number as well as colour and size information. It is essential to ensure that the GTIN encoded in the EAN-13/UPC-A or GS1 DataMatrix corresponds with the SGTIN stored on the RFID tag.

It is recommended to source RFID tags in assorted batches (e. g. differentiated by the GTIN or any other applicable characteristic supporting the matching process). As a general rule of thumb, RFID tags should be sorted the same way as price tags. Sorting can be best deployed by making use of poly bags, which are labelled appropriately (see figures beneath).
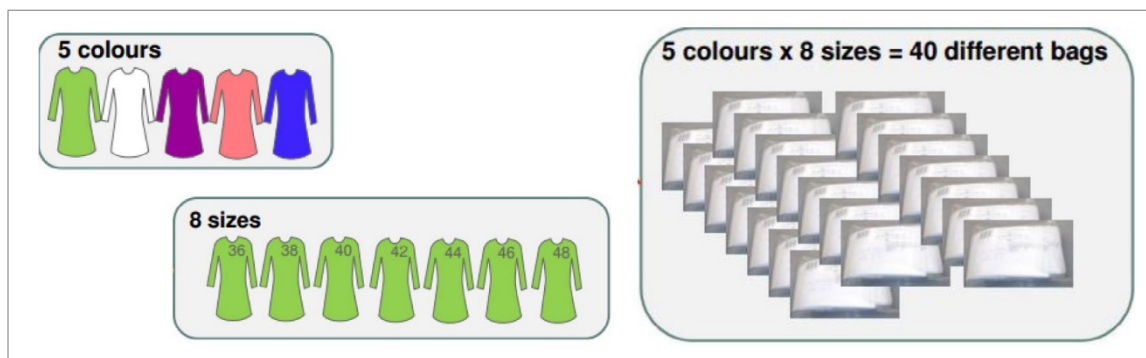
An additional help consists in sorting all items to be tagged by colour and size. Usually, tags are provided based on a production order to ensure that the right amount of RFID tags are available. In case the amount of RFID tags does not correspond with the number of items to be tagged, organisations should proceed as follows:

• Leftovers of tags do not need to be destroyed and can be re-used for future production if GTIN, supplier item number, colour, size and any other differentiating characteristics stay exactly the same. Each item shall be associated with only one RFID tag/label (i. e. it is not permissible putting leftovers of RFID tags/labels in pockets of finished goods).

• Any short shipment of tags should immediately be communicated to the tag supplier and/or brand owner. RFID tags must not be copied.

The matching process depends on the tag/label type and tagging method. On the one hand, the matching of an applied tag/label requires just one step and allows for easier error handling (e. g. if mismatched tags/labels have to be replaced). On the other hand, the process involving an RFID-enabled care label can be more challenging as there are two steps (first, the matching of the care labels to the right item and, after production is finished, the matching to the corresponding price tags). In the latter case, it is advisable to print supplier item number, colour and size on the care label in order to ease the matching. Sewn-on labels (such as RFID enabled brand labels) require separate measures, e. g. a clear separation of the work flow according to the production order.

To ensure a high process quality, organisations should conduct sample tests on a regular basis.

4.3 Pitfalls and mistakes in the tagging process

Although RFID technology and especially RFID tags are getting more and more robust, users should be aware of some general pitfalls and mistakes to be avoided. Creating this awareness is part of quality assurance as it contributes to flawless operation of RFID along the supply chain.

The pictures below give a good overview of the most common mistakes. Especially external forces like high pressure (e. g. in the course of industrial washing processes such as stone washing) can physically destroy or damage an RFID tag. The same holds true for bending or folding RFID tags/labels. Therefore, it might be necessary to consider special process requirements when dealing with products that are equipped with integrated tags.

Another source of trouble for the functioning of an RFID tag consists in water contact and exposure to high electric discharge. In this context, washable RFID tags are usually encapsulated appropriately to prevent them from being destroyed by water contact. An RFID tag supplier can provide more information on the suitability of distinct tags. Last but not least, RFID tags/labels should not be attached directly on top of each other.

People responsible for dealing with RFID-tagged items should generally be advised to handle both items and tags with reasonable care.

5. Training

Multiple individuals within a company and also across companies are involved when deploying an RFID project. To ensure a project's success and a full leverage of efficiency gains and/or turnover uplift, it is vital to train every person involved. In general, it needs to be distinguished between internal and external training as the project's scope and involved processes might differ while a product moves along the supply chain. We would like to emphasise that trainings should not be limited to producers or persons who apply tags. In order to maintain high process conformity, all stakeholders should be considered to attend trainings.

Internal training should cover internal marketing of the project, motivation of employees involved, RFID-based processes, awareness as to privacy issues and change management in general. Users with experience in deploying RFID projects put forward that it is also essential to answer questions such as "Why is the introduction of RFID of high relevance for the company?", or "Which goals shall be achieved with the project?" Internal training is out of scope of this guideline though.

Therefore, the following paragraphs focus on external training which – up to this moment of time – have been carried out on a highly individual basis, oftentimes causing unnecessary double work for companies being trained (e. g. the producer or the logistics service provider) and companies requiring RFID training (e. g. the brand owner or retailer). The standardised training concept outlined in the following sections aims at resolving these redundancies and speed up the implementation process.

5.1 Form and content of a stakeholder training

This guideline recommends a modular toolbox approach in terms of the content to be trained depending on the project's complexity (basic vs. advanced). The focus is on technical and/or procedural subjects. As a general rule of thumb, we recommend to train 'as much as necessary and as little as possible'.

The training concept is divided in level 1 ('basic') and level 2 ('advanced'). In level 1, organisations are only expected to attach RFID tags at previously specified positions on the garment. Thereby, tags are generally supplied by e. g. the brand owner. Producers do not necessarily have to read or encode tags. Level 2 is based on the assumption that a producer or any other stakeholder either reads tags and shares visibility event data based on EPCIS events with its business partners and/or encodes tags by itself.

Level 1 ('basic')

	Producer	Agency	Brand owner	Retailer	Logistics service provider	Freight forwarder	Solution provider
Basic RFID knowledge	M	M	M	M	M	O	X
Relevant GS1 standards	O	O	M	M	O	O	X
RFID within the apparel supply chain	O	O	M	M	O	O	X
Tag & tagging best practices	M	M	M	M	M	O	O
Individual processes (if applicable)	M	M	M	M	M	M	M
PIA	O	O	M	M	O	O	X
M = Mandatory, O = Optional, X = Not relevant							

Level 2 ('advanced')

	Producer	Agency	Brand owner	Retailer	Logistics service provider	Freight forwarder	Solution provider
Basic RFID knowledge	M	M	M	M	M	M	X
Relevant GS1 standards	M	M	M	M	M	M	X
RFID within the apparel supply chain	M	M	M	M	M	M	X
Tag & tagging best practices	M	M	M	M	M	M	O
Individual processes (if applicable)	M	M	M	M	M	M	M
PIA	M	M	M	M	M	M	X
M = Mandatory, O = Optional, X = Not relevant							

There are several training techniques companies can choose from, e.g. self-study, webinars, and face-to-face trainings.

To ensure at least the minimum required level of conformity, the stakeholder training should cover the following subjects: basic RFID knowledge with focus on the apparel sector, RFID-related GS1 standards, best practices as well as do's and don'ts for tag and label handling. Those subjects are addressed in the following sections.

5.2   Suggested training content

5.2.1   Basic RFID knowledge

It is very likely that training participants have never had any previous experience with RFID at all. Therefore, it is necessary to offer a complete as possible overview with respect to the technology (software & hardware), its current usage and its advantages. The goal of this section is to create a sound basis of understanding.

This training section shall cover the following topics in an understandable language:

• Introduction to RFID

• RFID usage in everyday life

• Components of an RFID system

• Privacy issues as regards to RFID

5.2.2   Relevant GS1 standards

Along the entire AFF supply chain, GS1 standards are being used to identify items, capture data, and share information between business partners. A trend towards source tagging leads to the necessity to integrate stakeholders and technologies sometimes across distant regions. Standards constitute the basis to communicate and interact efficiently.

The below pictures highlight the corresponding GS1 standards and t

IDENTIFY *Identifiers*   GLN   GTIN   SGTIN   SSCC

When implementing an RFID project it is necessary to move from GTIN (style, colour, size) to SGTIN (style, colour, size + serial number) to identify individual items (in other words, from class to instance level identification). To ensure a high process quality and conformity, it is vital for the stakeholders to understand the difference between the two concepts. Example: Although not accepted as common practice, producers sometimes copy existing price tags or care labels (including barcodes) when tags are missing. Having moved from GTIN to SGTIN, such wrongdoing would corrupt the entire system as a GTIN - serial number combination has to be unique (see section 2.1).

The GLN is used to identify legal entities and locations such as production facilities, distribution centres, retail stores, and sub-locations (e. g. goods receiving area within a distribution centre). Moreover, it might be required that logistics units (carton, pallet, etc.) have to be identified with an SSCC (Serial Shipping Container Code). Both GLN and SSCC are out of scope of this guideline though.

CAPTURE
Data carrier

In an RFID context, there is usually more than one GS1 data carrier to capture the GTIN and/or SGTIN. Most of the users are already familiar with EAN-13/UPC barcodes encoding the GTIN. Nevertheless, it is necessary to remember that an EAN-13/UPC cannot store a serial number. Therefore, price tag, care label, brand label or a supplementary label accommodating an EPC/RFID transponder are usually also equipped with a GS1 Data Matrix to serve as proper backup for the SGTIN EPC (see sections 1.4 and 3.4). The training should cover all data carriers used in the respective RFID project.

SHARE
Data exchange

EPCIS   EANCOM

Within an RFID project, various communication standards might be employed to share data between stakeholders. Most of the users within the apparel supply chain are already familiar with EANCOM for the exchange of transactional data such as orders, advanced shipping notes or invoices. With respect to the above specified "advanced" level, it is recommended to make the training participants familiar with EPCIS (EPC Information Services). Thereby, it is vital to explain that EPCIS is the enabler for near to real-time visibility event data providing answers to four distinct questions, i. e. "what" (e. g. SGTIN of an item), "where" (e. g. GLN of a given location), "when" (timestamp), and "why" (e. g. business process such as 'packing').

USE
Efficient
business processes

receiving

The success of an EPC/RFID source tagging project depends on whether a company manages to deploy the technology in a way it best leverages efficiencies within its business processes. That part of the training is usually more customised as it depends on an organisation's project scope and set-up. This is why GS1 also provides a set of process standards, such as this guideline, explaining how to best USE and/or implement GS1 standards in the most appropriate way.

5.2.3 Relevant Australian technical standards

For information relating to Australian specific standards authored by the Australian Communications and Media Authority (ACMA) please refer to:
http://www.acma.gov.au/Industry/Suppliers/Product-supply-and-compliance/Commonly-supplied-equipment/rfid-devices

5.2.4 RFID within the apparel supply chain

In order to create a better understanding among all supply chain partners of why GS1 standards are adopted and why e. g. a brand owner plans to implement RFID and tag at source, the below tables and pictures provide an overview of the most common use cases. With respect to training, it will not be necessary to explain and/or understand all use cases. We recommend to select those that have the best fit with the own project's scope.

1	RFID tag & label delivery from tag supplier	• Pre-encoded RFID tags are delivered from tag suppliers/label suppliers • RFID tags with SGTIN are applied to each garment.
2	Work in process progress tracking via RFID	• Tracking of production processes e. g. sewing, colouring, finishing of clothes. • Tracking of production progress e. g. against production plan.
3	Target-actual comparison of quantities	• Capture packing process by scanning item SGTINs and the carton ID (SSCC). • Capture loading process by scanning the carton SSCCs and the pallet SSCC. • Completeness check against order.
4	RFID-supported goods issue	• Automated capture of item/logistics unit IDs (or inference of logistics unit IDs if there are only RFID tags encoding item-level SGTINs). • Completeness check against packing or loading list.
5	Automated DESADV generation	• Based on outbound scan and shipping order, a dispatch advice (DESADV) is created and sent to a recipient, e.g the customer's distribution centre.
6	RFID-supported goods receiving	• Automated capture of item/logistics unit IDs (or inference of logistics unit IDs if there are only RFID tags encoding item-level SGTINs).
7	RFID-supported pick & pack	• Completeness check of picked logistics units (cartons/packs) at RFID-enabled packing station by conducting a target-actual comparison against the picking order.

8	RFID-based stock-taking	• Accelerated inventory checking with either mobile or fixed RFID readers.
9	Automated DESADV generation	• Based on outbound scan and shipping order, a dispatch advice (DESADV) is created and sent to a recipient, e.g a customer's retail store.
10	RFID-supported goods receiving	• RFID scan of SGTINs with handheld/gate/fixed reader against advanced shipping note for completeness check and automated inventory booking. • Automated correction of stocks / inbound for correction in accounting processes.
11	Exception reporting for immediate sales floor replenishment	• Direct feedback to sales staff at inbound for immediate replenishment process on sales floor.
12	Rapid RFID inventory scanning	• Accelerated and permanent inventory taking with RFID handhelds on the sales floor and in the back store.
13	RFID point of sale transaction	• RFID scan at the cash desk for payment process. • Automated booking of sold clothes and deletion from "observation list" (EAS deactivation). • Automated correction of shop inventory (in real time).
14	RFID tag scanning for loss prevention	• RFID-based EAS functionality for theft protection at shop exit. Thereby, all RFID tagged items of the shop's inventory are monitored. • Deactivation process after cash process.
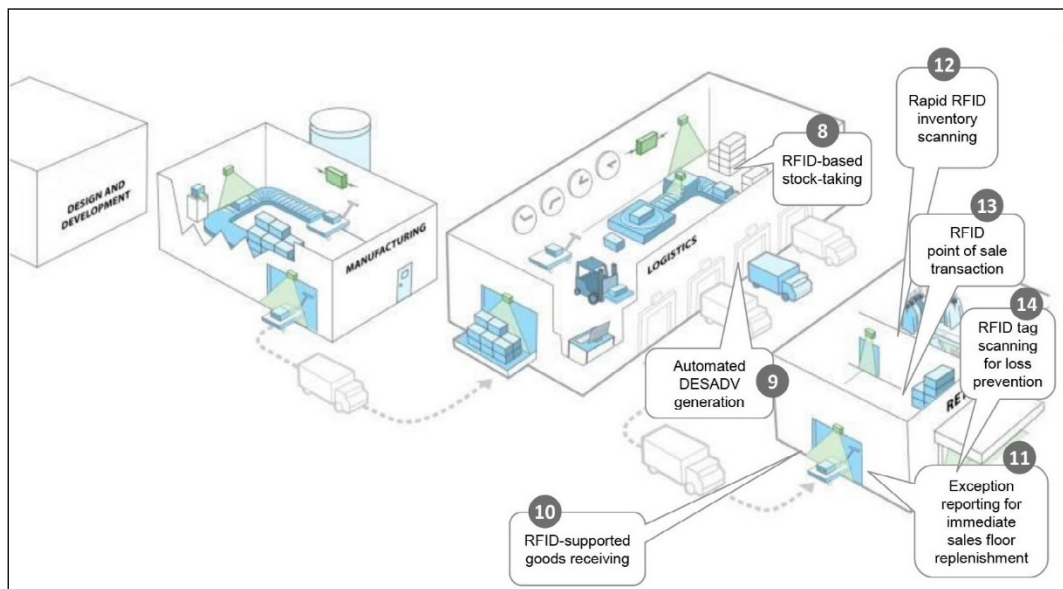
Please note that the above list does not claim to be complete. Rather, it shall support the explanation of the benefits of RFID source tagging through illustrative examples. To enable these use cases, goods need to be tagged properly. The next section will look into this matter and explain the relevance of tag and tagging best practices for RFID training. This part is considered mandatory for any training level or stakeholder except freight forwarders, which usually do not handle single items or tags.

5.2.5 Tag & tagging best practices

This section shall focus on best practices with respect to tags in general and the tagging process. It is recommended to integrate some practical demonstrations or videos within this part of the training to improve the level of understanding among participants and to reduce the participants' reservation and fears of the new technology.

General placement and handling of tags: As described in chapter 3.2 on tag placement, it is recommended to base this training section on the available placement guidelines, e. g. the EPC format and symbol placement guideline published by GS1 Australia. Moreover, it might be necessary to amend or adapt these placement best practices based on the project's needs and/or requirements derived from a brand owner's or retailer's production specifications.

Do's & don'ts for RFID tag & label handling: As there are various potential pitfalls and handling mistakes that can influence the success of an RFID project, it is recommended to ensure that all stakeholders involved are aware of the most important do's and don'ts for tag and label handling. In order to accomplish a sound understanding, this topic should be integrated in any form of training, e. g. by providing self-explanatory pictograms as shown in chapter 4.

5.2.5 Knowledge review

We recommend providing a brief knowledge review or self-assessment after the training to ensure a maximum understanding of the content presented. For example, it helps to identify topics that have not been fully understood by the participants so that the trainer can repeat those very subjects with the respective individuals.

A knowledge review could either follow an open questions or multiple choice approach. In general, any knowledge review should be in line with existing quality assurance standards within the respective companies. Moreover, the format might also depend on the training set-up, i. e. classroom setting or e-learning platform etc., and local conditions such as illiterate persons and/or language constraints. The training itself (impart of theoretical knowledge accompanied by practical demonstrations) plus knowledge review constitute the basis for the certificate of participation. The latter shall indicate that employees have received a proper training to be able to meet the RFID project's requirements for item-level tagging in the AFF supply chain.

6. List of abbreviations

Term	Definition	Term	Definition
AFF	Apparel/Fashion/Footwear	LSP	Logistics Service Provider
API	Application Programming Interface	NOS	Never Out of Stock
DESADV	Dispatch advice	PIA	Privacy Impact Assessment
EDI	Electronic Data Interchange	POS	Point of Sales
EPC	Electronic Product Code	RFID	Radio Frequency Identification
EPCIS	EPC Information Services	SGTIN	Serialised Global Trade Item Number
GCP	GS1 Company Prefix	TDS	Tag Data Standard
GDD	Global Data Dictionary	TID	Tag Identifier
GIAI	Global Individual Asset Identifier	UHF	Ultra High Frequency
GTIN	Global Trade Item Number	UPC	Universal Product Code
HRI	Human-Readable Interpretation	URI	Uniform Resource Identifier
ILT	Item Level Tagging	URL	Uniform Resource Locator

7. References

Apparel and General Merchandise – Format & Symbol Placement for the Electronic Product Code (EPC), GS1 US Guideline, August 2014,
https://www.gs1us.org/DesktopModules/Bring2mind/DMX/Download.aspx?command=core_downl oad&entryid=1262&PortalId=0&TabId=785

EECC UHF Tag Performance Survey 2013/14, August 2013,
http://eecc.info/eecc-uhf-tag- performance-survey/?lang=en

EPC-enabled RFID Serialization Management for SGTIN-96, GS1 US Guideline, May 2012,
http://www.gs1us.org/DesktopModules/Bring2mind/DMX/Download aspx?Command=Core_Down load&EntryId=860&PortalId=0&TabId=785

GS1 Bar Code Interoperability, Version 1, August 2012,
http://www.gs1.org/docs/gsmp/RFID_Barcode_Interoperability_Guidelines.pdf

GS1 Core Business Vocabulary (CBV) Standard, Version 1.1, May 2014,
http://www.gs1.org/gsmp/kc/epcglobal/cbv

GS1 EPC Information Services (EPCIS) Specification, Version 1.1, May 2014,
http://www.gs1.org/gsmp/kc/epcglobal/epcis

GS1 EPC Radio-Frequency Identity Protocols Generation-2 UHF RFID, Version 2.0.0, November 2013,
http://www.gs1.org/gsmp/kc/epcglobal/uhfc1g2

GS1 General Specifications (GenSpec) Version 15; January 2015,
http://www.gs1.org/barcodes- epcrfid-id-keys/gs1-general-specifications

GS1 Logistics Interoperability Model (GS1 LIM), Version 1, August 2007,
http://www.gs1.org/sites/default/files/docs/sectors/transportlogistics/LIM_Foundation_Report.pdf

GS1 Tag Data Standard (TDS), Version 1.9 (unratified), July 2014,
http://www.gs1.org/gsmp/kc/epcglobal/tds/

Guidelines on EPC for Consumer Products,
http://www.gs1.org/epcglobal/public_policy/guidelines

ISO/IEC 29160:2012. Information technology – Radio frequency identification for item management – RFID Emblem,
http://www.iso.org/iso/catalogue_detail?csnumber=45239

ISO/IEC 29160:2012. Information technology – Radio frequency identification for item management – RFID Emblem,
http://www.iso.org/iso/catalogue_detail?csnumber=45239

Regulatory status for using RFID in the EPC Gen 2 band (860 to 960 MHz) of the UHF spectrum
http://www.gs1.org/docs/epc/UHF_Regulations.pdf

Australian Communications and Media Authority (ACMA) please refer to:
http://www.acma.gov.au/Industry/Suppliers/Product-supply-and-compliance/Commonly-supplied-equipment/rfid-devices

GS1 EPC/RFID PIA Tool:
http://www.gs1.org/epcglobal/pia/

9 312345 024131

GS1 standards — Apparel and general merchandise

Format and symbol placement for the Electronic Product Code (EPC)

Addendum to GS1 apparel guidelines

Table of contents

ACKNOWLEDGMENTS

These guidelines have been localised for the Australian market based on the GS1 US EPC Based Guidelines for the Apparel Industry 2014.

ABOUT GS1

GS1® is a neutral, not-for-profit, global organization that develops and maintains the most widely-used supply chain standards system in the world. GS1 standards improve the efficiency, safety, and visibility of supply chains across multiple sectors. With local Member Organizations in over 110 countries, GS1 engages with communities of trading partners, industry organisations, governments, and technology providers to understand and respond to their business needs through the adoption and implementation of global standards. GS1 is driven by over a million user companies, which execute more than six billion transactions daily in 150 countries using GS1 standards.

1. Introduction

1.1 Release summary

This release has been revised solely to reflect that the materials herein are proprietary to GS1 Australia. GS1 Australia would like to acknowledge GS1 US for the base document from which this release is derived.

1.2 Preface

As a global standards body, GS1 ® also develops standards for radio frequency identification (RFID) technology. These standards support the identification, capturing, and sharing of data about physical objects in the supply chain..

This document, along with the 'EPC-based RFID Item Level Tagging – Implementation Guideline for Companies in the Apparel Fashion and Footwear sector' are complimentary documents designed to provide the reader with the implementation assistance needed to implement EPC based RFID. Further technical documents are available as needed.

1.3 Problem statement / business need

RFID technology is taking hold in the apparel industry. To help suppliers comply with EPC/RFID standards and remain efficient within their supply chains, it is imperative that retailers agree on a set of guidelines. Adherence to a set of guidelines should enable suppliers and retailers to improve the value of products delivered to the consumer with the potential of increasing profit.

Obviously, the best economics will be obtained when there is a consistency of a given service and the GS1 EPC application happens simultaneously with the item tagging or labelling process, usually at point of manufacture. Understanding that not all companies are ready to tag at point of manufacture, these guidelines offer a number of tag placement options.

1.4 Mission

Provide suppliers, retailers, technology providers, and service providers with guidelines for the efficient identification, serialisation and placement of a GS1 EPC tag, which is an RFID swing tag carrying a Global Trade Item Number (GTIN).

1.5 Scope

The initial scope will focus on Apparel, Footwear and General Merchandise categories. The Addendum will have future revisions. Discussions continue regarding the use of EPC woven labels, the presence of the ISO seal, placement options for items that are purposefully RFID opaque, and items sold as sets or in pairs.

1.6 Audience

This document is designed to be used by suppliers, retailers, technology providers, and service providers.

2. GENERAL PLACEMENT GUIDELINES

2.1 Bi-directional conversations to ensure successful GS1 EPC rollout

Best practice requires bi-directional communication between supplier and retailer during an EPC implementation to determine optimal EPC type and placement with the goal to minimise work effort and keep implementation costs low.

Although the guidelines ask that retailers mandate these placement options, it is important that the supplier confers with the retailer prior to implementation.

2.2 General intent to leverage current tag placement

The general intent is to use a serialised Global Trade Item Number (sGTIN) imbedded into an RFID tag. There is no intention to override or change the tag marking or placement standards. As such, the EPC Tag should be placed on or imbedded into the tag, media, trim, or packaging that is attached to the garment itself and is removable by the customer after purchase. Alternatively, the EPC Tag could be affixed separately, close to the tag. It is possible that the same category of merchandise might have different placements between men's, women's, and children's garments.

2.3 General placement to optimise readability

For optimal readability there are certain placement options that should be avoided:

• Avoid placing the EPC Tag where the hanger clips might go

• Avoid contact with metal

• Avoid folding the EPC Tag

• Avoid attaching the tag directly to the hanger

• Avoid inserting a dry inlay loosely within a package

3. About the EPC tag

3.1 EPC tag types

• A combined EPC tag where the inlay is sandwiched (encapsulated) between label layers. This could be a swing tag or a sticker

• Wet inlay, more specifically, an inlay that is affixed on the back of existing media/packaging/trim

• A secondary tag that has EPC functionality. This could be a swing tag or a sticker.

3. 2 Required in formation on the EPC tag

The EPC seal is to be visible on the human-readable side of media, packaging or trim that has the tag. Note that both the front and back of a swing tag are considered human-readable.

4. Placement guidelines by category of merchandise

4.1 Pants, trousers, jeans, leggings, shorts-folded

This category includes items such as denim, twill, woven, fleece, performance/sportswear, and knit pants, trousers, and jeans with either a constructed, elastic, or drawstring waistband that are intended to be folded.

GS1 Australia Guidelines suggest tag. is affixed on left rear waistband.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.
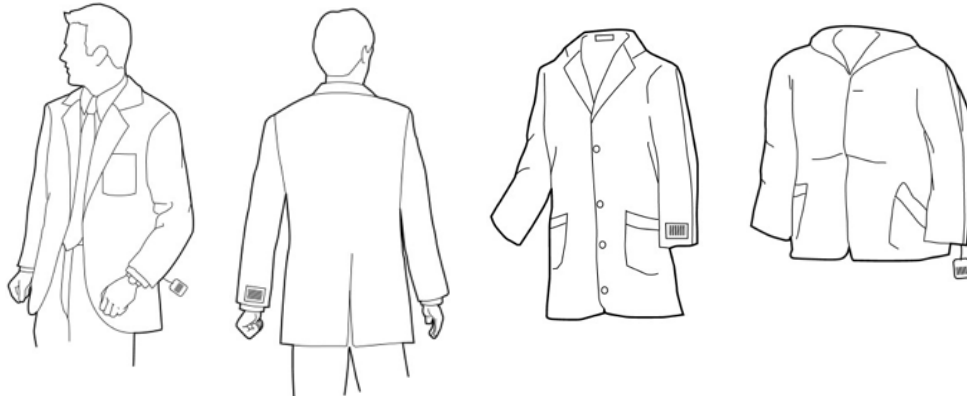
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Environmental/Display Considerations Metal shelving will effect readability.

4.2 Pants, trousers, jeans, leggings, shorts-hanging

This category includes items such as denim, twill, woven, fleece, performance/sportswear, and knit pants, Trousers, Jeans, Leggings, Shorts, swim trunks, bike shorts, and boxer shorts with either a constructed, elastic, or drawstring waistband that are intended to be hanging.

GS1 Australia Guidelines suggest tag. is affixed on either the left rear waistband or left side waist seam.
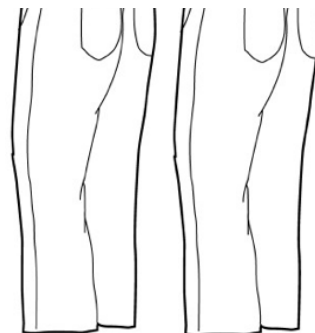
EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Environmental/Display Considerations

Do not place the EPC Tag where a hanger clips might go.

4.3 Overalls, shortalls, rompers-hanging

This category includes items such as fabrications of bib and sku overalls, shortalls, and rompers.

GS1 Australia Guidelines suggest tag. is affixed on the left side waistband seam. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

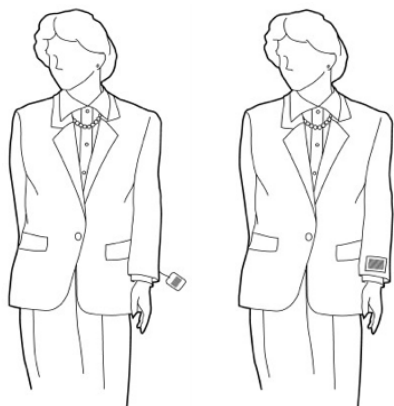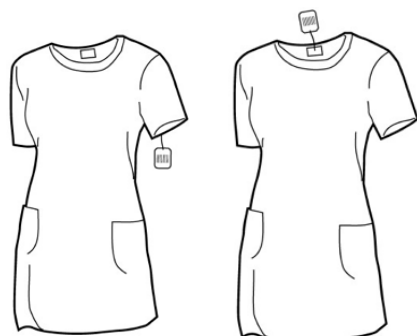***Alternate:*** Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.4 Skirts

This category includes items such as denim, twill, woven, fleece, performance/sportswear, and knit skirts with either a constructed, elastic, or drawstring waistband.

GS1 Australia Guidelines suggest tag. is affixed (preferred) on the left side waistband seam or (alternate) on the left rear waistband seam.
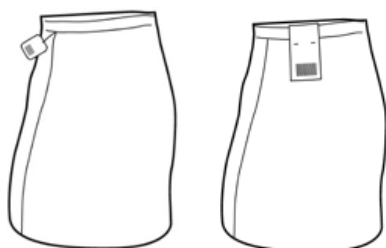
EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Environmental/Display Considerations

Do not place the EPC Tag where a hanger clips might go.

4.5 Vests

This category includes items such as vests for men, women, boys, and girls.

GS1 Australia Guidelines suggest tag. is affixed (preferred) through the lower left arm hole seam or (alternate) to the front lower panel of the vest.
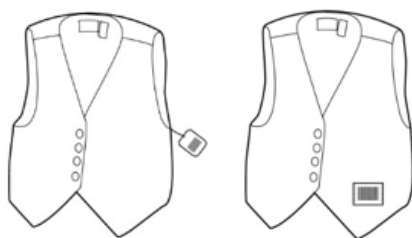
EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.6   Men's sport coats, blazers, suits, tuxedos, outerwear coats and jackets

This category includes items such as men's and boys' sport coats, blazers, two-piece and three-piece suits and tuxedos, trench coats, overcoats, raincoats, ski jackets, leather jackets, bombers, quilted flannel shirts, wind breakers, and ponchos.

GS1 Australia Guidelines suggest tag. is affixed (preferred) on the left sleeve cuff of jacket or (alternate) to the left-sleeve seam of jacket.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.7   Poncho, parka

This category includes pullover outerwear without waistbands such as ponchos and parkas.

GS1 Australia Guidelines suggest tag. is affixed through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.
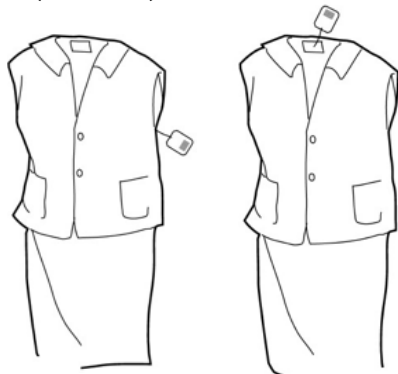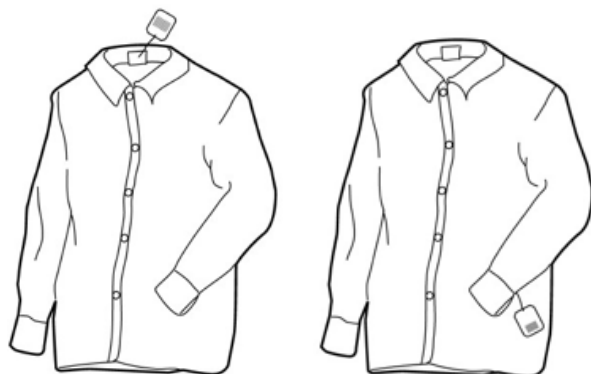
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.8   Women's sport coat s, blazers, suits, tuxedos, outerwear coats and jackets

This category includes items such as women's and girls' blazers and suits.

GS1 Australia Guidelines suggest tag. is affixed (preferred) to the left-sleeve seam of jacket or (alternate) to the left sleeve cuff of jacket.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.9   Dresses with sleeves

This category includes all length of dresses that have a constructed. If the dress has an outer jacket, the sleeve of the jacket is considered part of the dress for symbol placement purposes.

GS1 Australia Guidelines suggest tag. is affixed (preferred) to the left sleeve hem or (alternate) inside the collar through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.10   Dresses, sleeveless

This category includes items such as dresses that have no constructed sleeves.

GS1 Australia Guidelines suggest tag. is affixed on (preferred) the left arm hole seam or (alternate) inside the collar through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

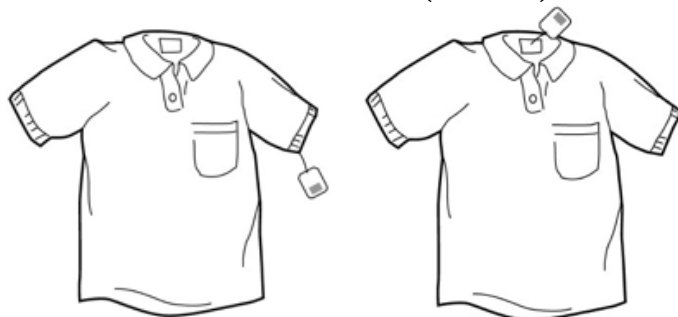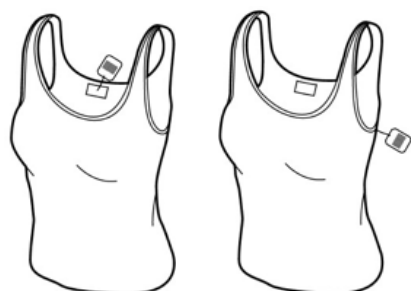*Alternate:* Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.11   Tops, jumpers, cardigans, knitwear, long sleeve-hanging

This category includes items such as woven, performance/sportswear and knit long sleeve shirts, sweaters, turtlenecks, and blouses that are intended to be merchandised hanging.

GS1 Australia Guidelines suggest tag. is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left cuff seam.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.12   Tops, cardigans, knitwear, short sleeve-hanging

This category includes items such as woven, performance/sportswear and knit short sleeve shirts, sweaters, polos, and blouses that are intended to be merchandised hanging.

GS1 Australia Guidelines suggest tag. is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left-sleeve seam.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/ onto current trim ***Alternate:*** Affix separate EPC Tag close to the tag.

4.13   Tops, sleeveless-hanging

This category includes items such as woven, performance/sportswear and knit sleeveless shirts, blouses, tank tops, sweater vests, and halter tops that are intended to be merchandised hanging.

GS1 Australia Guidelines suggest tag. is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) to the left armhole seam.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

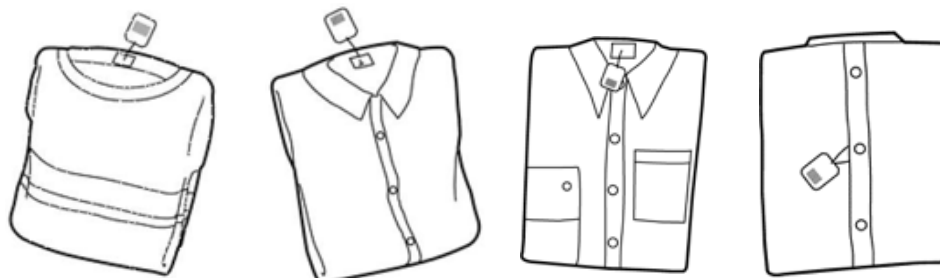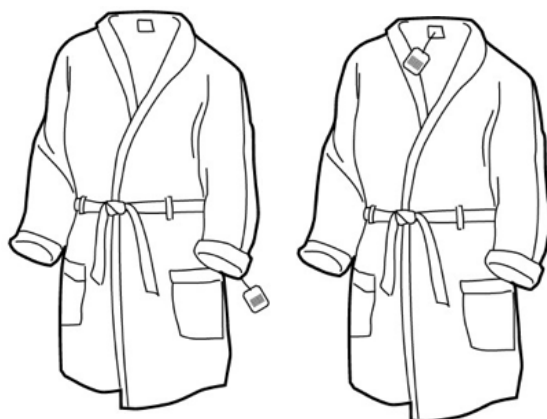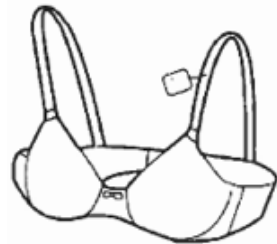***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.14 Tops - folded

This category includes all sleeve lengths of tops, such as woven, performance/sportswear or knit skirts, blouses, sweaters, and turtlenecks that are intended to be folded merchandise.

GS1 Australia Guidelines suggest tag. is affixed (preferred) inside the collar through the manufacturer label or care label or (alternate) looped through the centre button hole on the back of the folded shirt.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

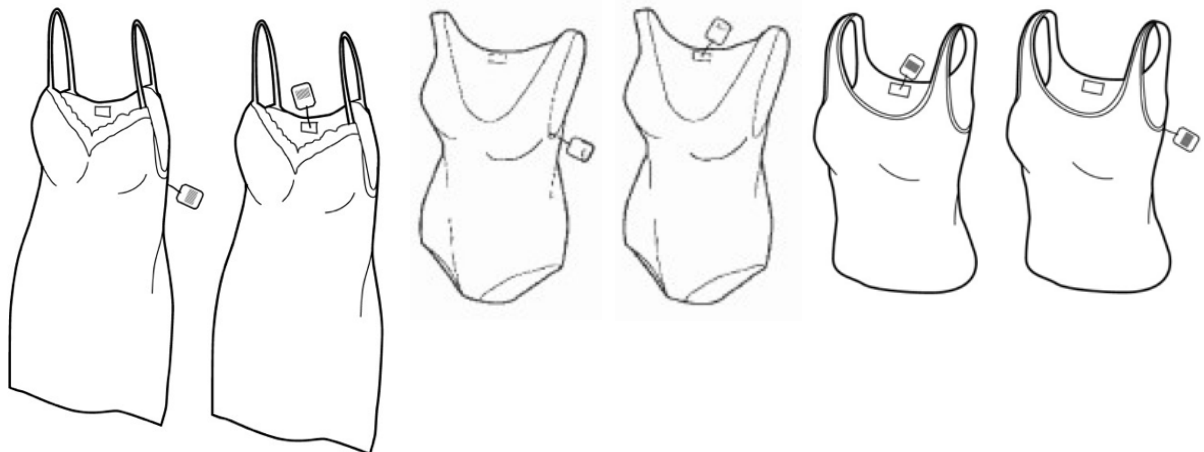*Alternate:* Affix separate EPC Tag close to the tag.

4.15 Robes

This category includes items such as pyjamas, bathrobes, housecoats, and nightgowns.

GS1 Australia Guidelines suggest tag. is affixed on (preferred) the left-sleeve cuff seam or (alternate) inside the collar through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/ onto current media

Alternate: Incorporate EPC into/ onto current trim
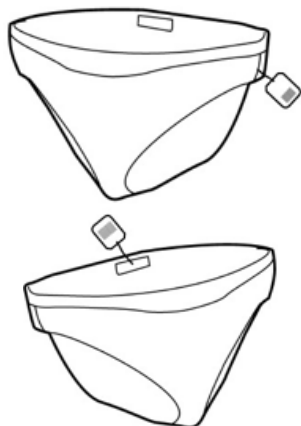
Alternate: Affix separate EPC Tag close to the tag.

4.16 Bras - hanging

This category includes items such as bras intended to be merchandised on hangers.

GS1 Australia Guidelines suggest tag is affixed (preferred) through the left side seam or (alternate) through the front left strap.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Don'ts

Do not place the EPC Tag on external packaging that could get separated from the garment itself. For example, do not affix the EPC Tag to media that is attached to the hanger.

4.17 Camisoles, teddies, crop tops, slips, one piece swimwear, body wear, dance wear-hanging

This category includes items such as camisoles, teddies, crop tops, slips, and one piece swimwear, body wear, and dancewear.

GS1 Australia Guidelines suggest tag. is affixed (preferred) through the top left side (arm hole) seam or (alternate) through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

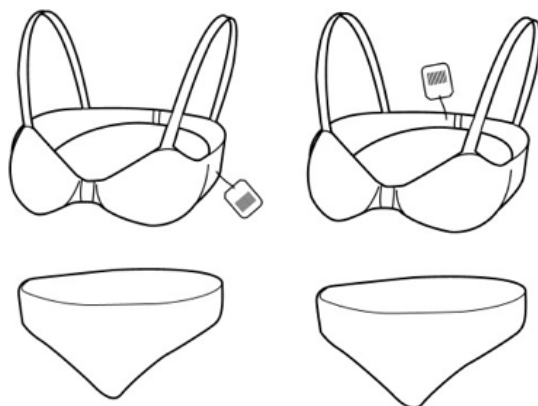***Alternate:*** Affix separate EPC Tag close to the tag.

Don'ts

Do not place the EPC Tag on external packaging that could get separated from the garment itself. For example, Do not affix the EPC Tag to media that is attached to the hanger.

4.18   Underwear, control garments-hanging

This category includes items such as Underwear, briefs, and girdles intended to be merchandised on hangers.

GS1 Australia Guidelines suggest tag. is affixed (preferred) through the left side seam or (alternate) through the manufacturer label or care label.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Don'ts

Do not place the EPC Tag on external packaging that could get separated from the garment itself. For example. Do not affix the EPC Tag to media that is attached to the hanger.

4.19   Swimwear, bra and underwear, two piece

This category includes items such as bathing swimwear sold as a two piece set.

GS1 Australia Guidelines suggest tag. is affixed (preferred) through the top left side seam or (alternate) through the back of the top.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

Environmental/Display Considerations:

Do not place the EPC Tag where a hanger clips might go

4.20   Banded apparel

This category includes packaged items such as hosiery and socks, with labels placed around the product. Items in this category do not have an outer cover or package.

GS1 Australia Guidelines suggest tag. is affixed on the centre back portion of the label. There is no alternate location.

EPC Placement Options
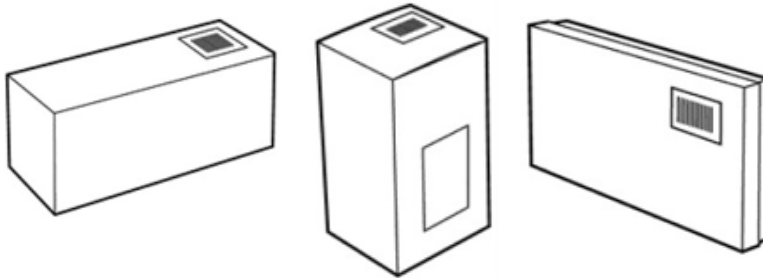
Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.21 Boxed apparel - flap

This category includes apparel packaged in boxes with a flap lid that are to be merchandised with the product, such as men's underwear and slippers.

GS1 Australia Guidelines suggest tag. is affixed on (preferred) the top right quadrant of the package or (alternate) on the front upper-right corner of the box.

EPC Placement Options
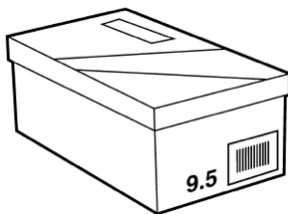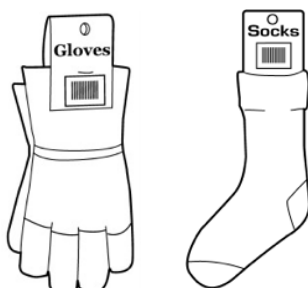
Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.22 Boxed apparel - lid

This category includes apparel packaged in boxes with a removable lid, such as shoes.

GS1 Australia Guidelines suggest tag. is affixed on the side of the box next to the size identification. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.23 Carded apparel - flap

This category includes merchandise that is affixed to a cardboard for display purposes.

GS1 Australia Guidelines suggest tag. is affixed on the face of the card. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

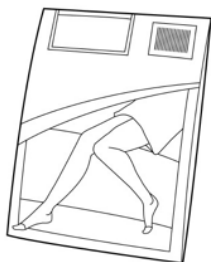***Alternate:*** Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.24   Flat packed apparel

This category includes product packages that are thin and have no sides, such as women's hosiery.

NOTE: If metal dividers are used for display purposes, placement that may occur on the back of the package should be affixed next the top of the package to avoid direct contact with metal. This will affect tagged item performance and readability of the product.

GS1 Australia Guidelines suggest tag. is affixed on the front upper-right corner of the package. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.25   Plastic packaged apparel

This category includes merchandise wrapped in plastic that may or may not include cardboard inserts, such as packages of underwear or socks.

NOTE: If metal dividers are used for display purposes, placement that may occur on the back of the package should be affixed next the top of the package to avoid direct contact with metal. This will affect tagged item performance and readability of the product.

GS1 Australia Guidelines suggest tag. is affixed (preferred) on the front upper-corner of the package, (also preferred) on the back of the package, or (alternate) in a location that is easily discernible and readable by the consumer.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.26   Shirts - packaged

This category includes woven shirts with an outer packaging to be merchandised with the shirt.

GS1 Australia Guidelines suggest tag. is affixed on back lower-right corner. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

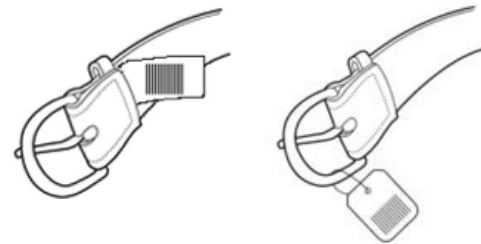**_Alternate:_** Incorporate EPC into/onto current media

Alternate: Affix separate EPC Tag close to the tag.

4.27   Backpacks

This category includes items such as backpacks, knapsacks, and bum bags.

GS1 Australia Guidelines suggest tag. is affixed through the left strap buckle. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.28   Belts

This category includes items such as belts.

GS1 Australia Guidelines suggest tag. is affixed (preferred) inside the base of the buckle or (alternate) through the buckle.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.29   Bibs

This category includes items such as free-hanging infant bibs.

GS1 Australia Guidelines suggest tag is affixed through the left-hand seam. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim
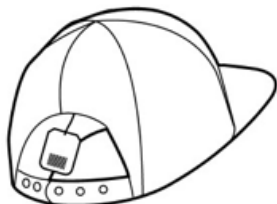
Alternate: Affix separate EPC Tag close to the tag.

4.30   Caps, visors

This category includes items such as caps that do not have a full brim or headband such as baseball caps, berets, visors, and beanies.

GS1 Australia Guidelines suggest tag. is affixed through the outside centre back seam or centre of the headband. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.31   Hats

This category includes items such as hats with or without a brim such as cowboy hats, straw hats, fedoras, pillbox hats, felt hats, and dressy hats.

GS1 Australia Guidelines suggest tag. is affixed inside the hat through the headband. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

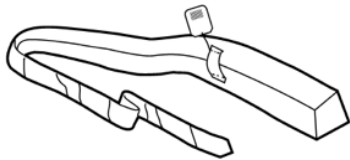***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.32   Hats, knit

This category includes items such as unconstructed hats with no brim or headband such as knit hats and ski masks.

GS1 Australia Guidelines suggest tag. is affixed through the outside top of the hat. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.33 Neckwear

This category includes items such as unknotted ties, clip-on ties, and bow ties of all fabrication.

GS1 Australia Guidelines suggest tag. is affixed through the manufacturer label. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.34 Cummerbunds

This category includes items such as non-packaged cummerbunds.

GS1 Australia Guidelines suggest tag. is affixed adjacent to the fastening device. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.36 Footwear - open

This category includes items such as sandals, slippers, athletic shoes, or other footwear that is banded together and intended to be sold loose or unboxed.

GS1 Australia Guidelines suggest tag. is affixed to the connecting string. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

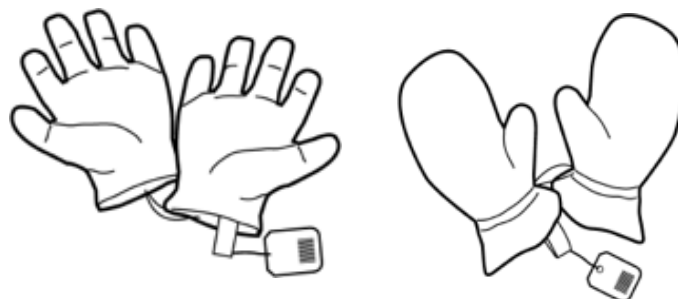***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.37 Glasses

This category includes items non-prescription eyeglasses such as sunglasses or pre-made readers.

GS1 Australia Guidelines suggest tag. is affixed around the left arm of the glasses. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.38 Gloves, mittens

This category includes items such as gloves and mittens.

GS1 Australia Guidelines suggest tag. is affixed through the connecting string of the gloves or mittens. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.39 Handbags - hinged

This category includes items such as clutches, coin purses, and drop kits.

GS1 Australia Guidelines suggest tag. is affixed (preferred) through an outside hinge joint or (alternate) to the inside of a main compartment.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.
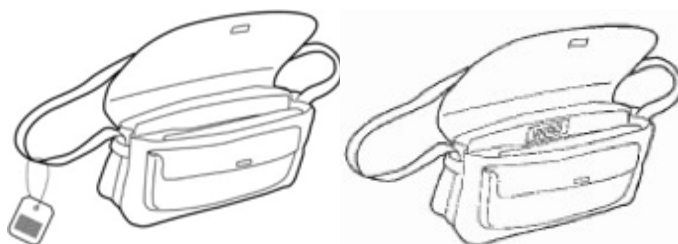
Alternate: Incorporate EPC into/ onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.40 Handbags, purses

This category includes purses and cinch sacks.

GS1 Australia Guidelines suggest tag. is affixed (preferred) around the main outside strap, handle, zipper, or frame joint or (alternate) to the inside of a main compartment.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.41 Luggage, briefcase

This category includes items such as briefcases, suitcases, garment bags, back packs and duffle bags.

GS1 Australia Guidelines suggest tag. is affixed around the main carrying handle. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

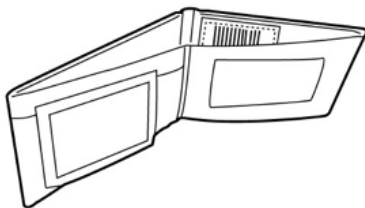***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.42 Wallets

This category includes items such as wallets, billfolds, and trifolds.

GS1 Australia Guidelines suggest tag. is affixed to the inside of the bill compartment. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.43 Loose watches, fitness trackers

This category includes items such as watches, fitness trackers/Fitbits and pocket watches.

GS1 Australia Guidelines suggest tag. is affixed to the base of the wristwatch or the stem of the pocket watch. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

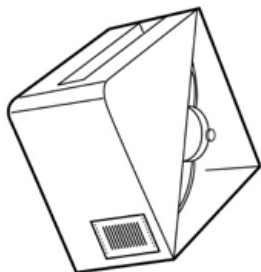***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.44 Watches displayed in a box or case

This category includes items such as watches and pocket watches.

GS1 Australia Guidelines suggest tag. is affixed to the base of the wristwatch or the stem of the pocket watch AND an additional symbol on the bottom of the box. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.
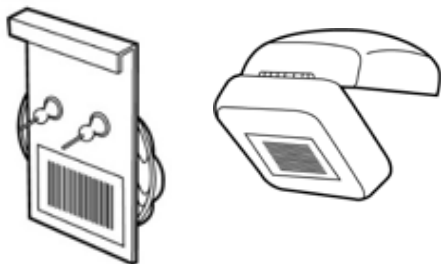
Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.45 Jewellery - carded

This category includes items such as jewellery that is sold attached to a card such as earrings, pins, broaches, charms, hair clips, tie tacks, cuff links, and studs.

GS1 Australia Guidelines suggest tag. is affixed (preferred) to the back of card or (alternate) to the bottom of the box if the card is mounted in a box.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.46 Jewellery - loose

This category includes items such as necklaces, chains, bracelets, bangles, and rings.

GS1 Australia Guidelines suggest tag. is affixed through the item. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.47   Key chain

This category includes items such as key chains.

GS1 Australia Guidelines suggest tag is affixed around the key ring. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.48   Scarves and shawls

This category includes items such as winter scarves, silk scarves, and shawls.

GS1 Australia Guidelines suggest tag. is affixed through the manufacturer label or care label. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.49   Suspenders, braces

This category includes items such as suspenders and braces.

GS1 Australia Guidelines suggest tag. is affixed to the inside seam of the rear clip or button loop. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.50 Sweatbands

This category includes items such as sweatbands, headbands, wrist bands, and ankle bands.

GS1 Australia Guidelines suggest tag. is affixed through the middle of the band. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

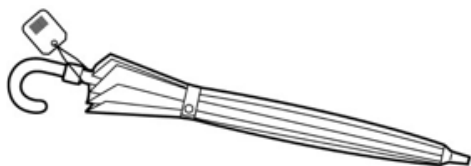***Alternate:*** Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.51 Loose umbrellas

This category includes items such as umbrellas.

GS1 Australia Guidelines suggest tag. is affixed around the base of the handle. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag.

Alternate: Incorporate EPC into/onto current media
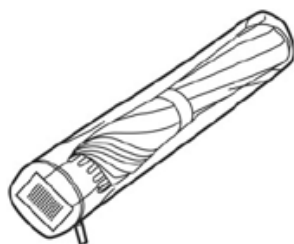
Alternate: Incorporate EPC into/onto current trim

Alternate: Affix separate EPC Tag close to the tag.

4.52 Packaged umbrellas

This category includes items such as packaged umbrellas.

GS1 Australia Guidelines suggest tag is affixed at the handle end of the package. There is no alternate location.

EPC Placement Options

Preferred: Incorporate EPC into/onto tag

Alternate: Incorporate EPC into/onto current media

Alternate: Incorporate EPC into/onto current trim

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