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23-041	2D terminology in Gen Specs	Aug 2023

Associated Work Request (WR) Number:

WR-21-001 (Future State ASP request), WR-22-031 (ASP future state conformance requirements), WR-22-172 (section 8 optimisation), WR-22-327 (HRI), WR-22-376 (Multiple Barcodes)

Background:

The right terminology will depend on the context where it is being used. But the ask is to align where possible on one or two terminologies and make it consistent and clear. Business need: Global Migration to 2D has put a lot of traction to 2D barcodes. As 2D in Retail MSWG is

working through sections in GS1 General Specifications, different terminologies have been highlighted. This led us to investigate the use of 2D terminology in the GS1 General Specifications which seems quite diverse.

These are the various terminologies that exist currently in GS1 General Specifications:

GS1 2D symbols GS1 approved 2D symbols 2D symbols 2D matrix symbols 2D matrix barcodes 2D barcodes

2D data carriers

Two-dimensional matrix symbol

Two-dimensional symbol

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2 Application standards

2.1 Trade items

2.1.1 Introduction

A trade item is any item (product or service) upon which there is a need to retrieve predefined information and that may be priced, or ordered, or invoiced at any point in any supply chain. This definition covers services and products, from raw materials through to end user products, all of which may have predefined characteristics.

The identification and marking of trade items enable the automation of the point-of-sale (through Price Look Up (PLU) files), of goods receiving, inventory management, automatic re-ordering, sales analysis and a wide range of other business applications.

If the item is of variable measure, the respective measure or price information will often be of critical importance to business applications. Attributes relating to trade items (e.g., dates, lot number) are also available as standardised element strings.

Each trade item that is different from another in design and/or content is allocated a unique identification number, which remains the same as long as it is traded. The same identification number is given to all trade items sharing key characteristics. Such numbers must be treated in their entirety throughout the supply chain.

The serialised identification of trade items, which enables total connectivity of information and communication systems, is achieved through the use of GS1 Application Identifier AI (01) GTIN and AI (21) serial number.

Different standard solutions apply depending on the nature of the item and the scope of the user's applications. The following sections determine the identification and symbol marking rules applicable to a particular trade item.

2.1.1.1 Physical or non-physical trade items

Non-physical trade items are usually called services. Services may be identified with a unique GS1 identification key for use in open trade applications or in restricted distribution environments.

2.1.1.2 Open or restricted distribution

The main benefit of the GS1 system for trade items is that it provides a unique and unambiguous identification number for every trade item, which is applicable worldwide in open environments. In addition, the system provides for other number series that may be exclusively used for restricted distribution (e.g., national use, company internal use). Restricted Circulation Numbers are available to GS1 Member Organisations' members to help them develop solutions applicable within their territory.

2.1.1.3 Fixed or variable measure

Fixed measure trade items are those that are always produced in the same version and composition (e.g., type, size, weight, contents and design). Like a fixed measure trade item, a variable measure trade item is an entity with predefined characteristics, such as the nature of the product or its contents. Unlike a fixed measure trade item, a variable measure trade item has at least one characteristic that varies whilst other characteristics of the trade item remain the same. The variable characteristic may be weight, dimension, number of items contained, or volume information. The complete identification of a variable measure trade item consists of both an identification number and information about the variable data.

2.1.1.4 General retail consumer trade item, regulated healthcare retail consumer trade item or non-retail trade item

Scanning at the point-of-sale (POS) is a major application of the GS1 system, and trade items that are intended to cross a point-of-sale are subject to specific rules. Scanning of trade items are broken into three groups based on the application and sector.

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- General retail consumer trade items use omnidirectional linear barcodes that are read by high-volume omnidirectional retail POS scanners or linear hand-held scanners. This scanning environment cannot read 2D matrix symbolsbarcodes.
- Regulated healthcare retail consumer trade items require a high capacity symbology, such as 2D matrix symbolsGS1 DataMatrix, but these cannot be deployed for high-volume omnidirectional retail POS. Regulated healthcare retail consumer trade items marked with 2D matrix symbols GS1 DataMatrix are intended to be read in lower-volume retail scenarios such asor hospital pharmacies or in high volume applications such as retail POS and distribution centres.
- Non-retail trade items are any trade item that does not cross retail POS. Commonly, these
 trade items will appear in mixed scanning environments (laser, image-based, etc.) depending on
 the application and industry sector. Typical examples include trade item groupings, direct part
 marked items, etc.

2.1.1.5 Books and serial publications

Published material (newspapers, magazines and books) requires special consideration due to the following factors:

- A solution for published material should address the requirement to process returns (sorting and counting) to wholesalers and publishers. This implies the reading of a supplementary number that is not required for item identification.
- The international systems, ISSN, ISBN and ISMN, already handle the numbering of publications and books.

2.1.1.6 Single item or trade item grouping

A trade item may be a single, non-breakable unit or a predefined grouping of a series of single items.

Trade items that are single, non-breakable units may be comprised of items that are not uniquely identified on the package and are not marked for individual sale (e.g., a bag of individually wrapped candies or toothbrushes of varying colours), which were referred to as "Random assortments" in versions of the GS1 General Specifications prior to v.23.

Trade item groupings may be present in a wide variety of physical forms, such as a fibreboard case, a covered or banded pallet, a film wrapped tray, or a crate with bottles. Trade items consisting of a single unit are identified with a Global Trade Item Number (GTIN). Trade item groupings of identical or different units, each identified with a GTIN, are identified with a separate GTIN; the individual trade item GTIN, within any grouping, remains the same. Example: trade item A has the same GTIN whether it is sold as a single unit in a case of twelve or sold as a single unit in a case of twenty-four.

2.1.1.7 Trade item assortments/bundles

Trade item assortments/bundles are combinations of trade items. Trade item assortments/bundles can be classified as follows:

Physical trade item assortments/bundles are combinations of different trade items that are physically combined into a single trade item, thus creating a new trade item.



 Virtual trade item assortments/bundles are combinations of multiple (same or different) trade items that are not physically combined into a single trade item, but that are presented in selling environments as offers of combinations of multiple trade items (e.g., products or services).

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2.1.6 Healthcare secondary packaging (regulated healthcare retail consumer trade items)

A regulated healthcare retail consumer trade item not intended to be scanned in high volumes per consumer transaction at retail, but does require additional data beyond GTIN to support regulatory requirements. This means, these trade items support:

- GTIN-8, GTIN-12, or GTIN-13 data structures.
- GTIN attributes such as batch/lot number, expiration dates, or serial numbers.

They may be marked with 2D matrix barcodes-GS1 DataMatrix that require imaging-based scanners or linear symbologies such as GS1 DataBar or GS1-128. If an item is a general retail consumer trade item and regulated healthcare retail consumer trade item, then the barcode marking for general retail is required at a minimum.

GS1 key

Required

The allowed key formats for this application are:

- GTIN-8
- GTIN-12
- GTIN-13

GS1 firmly endorses the use of GTIN in all markets, however there are instances where GS1 Member Organisations have allocated a portion of their numbering capacity to identification schemes administered nationally by external agencies.

These coding schemes while recognised within the GS1 system framework by the assignment of a GS1 Prefix are defined, in Healthcare, as National Trade Items Numbers (NTINs) rather than Global Trade item Numbers (GTINs). NTINs are unique with respect to GTINs as their values are a subset of all possible values of GTIN. However, their definition, allocation and life cycle rules are defined by an organisation external to GS1.

The degree to which NTIN definitions and rules are compatible with those of GTIN is specific to each national definition. Whilst NTIN will always provide globally unique identification within the GTIN pool of numbers, this does not mean NTIN provides the same level of interoperability as GTIN with other GS1 standards, such as GDSN and ONS. In markets where NTIN is adopted exclusively of GTIN, the reciprocal nature of GTIN identification and marking across markets is lost and becomes problematic where one package which should serve multiple markets (e.g., common language) requires multiple NTINs rather than one GTIN.

Rules

See the GTIN rules in section 4.2.

Attributes

Required

Figure 2.1.6	5-1. Overv	iew of requi	red attributes
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AIDC marking level for regulated healthcare trade items	Кеу	Batch/lot number - AI (10)	Expiration date – AI (17)	Serial number – AI (21)	Other
Minimum – Pharmaceutical & medical device	GTIN-8, GTIN- 12, or GTIN-13	No	No	No	None
Enhanced – Pharmaceutical & medical device	GTIN-8, GTIN- 12, or GTIN-13	Yes	Yes	No	None

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AIDC marking level for regulated healthcare trade items	Кеу	Batch/lot number - AI (10)	Expiration date – AI (17)	Serial number – AI (21)	Other
Highest - Brand owner AIDC marking	GTIN-8, GTIN- 12, or GTIN-13	Yes	Yes	Yes	Potency AI (7004) (for pharmaceutical, and for medical device kits with pharmaceuticals)
Highest – Hospital AIDC marking of pharmaceuticals	GTIN-8, GTIN- 12, or GTIN-13	No	Yes, AI (7003) if needed for short life items	Yes	None
Highest - Hospital AIDC marking of certain medical devices (see section <u>2.1.8</u>)	GRAI, AI (8003), or GIAI, AI (8004), is optional if GTIN, AI (01), + serial number, AI (21), is not marked on the product.	No	No	GRAI, AI (8003), or GIAI, AI (8004), is optional if GTIN, AI (01), + serial number, AI (21), is not marked on the product.	

To manage healthcare data requirements within EPC/RFID tags, see section 3.11 and the most recent version of the <u>EPC Tag Data Standard</u>.

Optional

For compliance with a national/regional regulatory or industry requirement where the GTIN will not meet the need, a regulated healthcare trade item may be identified with GTIN and AI (710), AI (711), AI (712), AI (713), AI (714) and AI (715) National Healthcare Reimbursement Number. See section <u>3.8.19</u> for details on the use of AI (710), AI (711), AI (712), AI (713), AI (714) and AI (715).

Rules

National Healthcare Reimbursement Number AI (710), AI (711), AI (712), AI (713), AI (714) and AI (715) must always be used with the GTIN.

Data carrier specification

Carrier choices

See the "data carrier specification carrier choices" recommendations on preferred options, options in addition to the barcode and other acceptable options found at the end of section 2.1.5.

Symbol X-dimensions, minimum symbol height and minimum symbol quality

For regulated healthcare consumer trade items scanned in retail pharmacy and general distribution or non-retail pharmacy and general distribution see section <u>5.12.3.8</u>, *GS1 symbol specification table 8*.

For regulated healthcare retail consumer trade items not scanned in general distribution see section 5.12.3.10, GS1 symbol specification table 10.

Symbol placement

All the symbol placement guidelines defined in section $\underline{6}$.

Unique application processing requirements

For a description of processing requirements, see section $\underline{7}$.

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2.1.7 Fixed measure trade items scanned in general distribution

Every trade item that is different from another in any respect is assigned a unique Global Trade Item Number (GTIN). This includes trade item groupings of retail and non-retail trade items that are also trade items, and non-retail single units. For example, each of the packaging types in the figure below, if traded, is assigned a separate GTIN.

Trade item	GTIN numbering options							
	GTIN-8	GTIN-12	GTIN-13	GTIN-14				
Single product A	Х	Х	Х					
50 x product A (Trade item grouping)		Х	Х	x				
50 x product A (Trade item grouping, e.g., display case)		Х	Х	Х				
100 x product A (Trade item grouping)		Х	Х	Х				
Single product B	Х	Х	Х					
50 x product A 50 x product B		х	х					

Figure 2.1.7-1. Example of GTIN numbering options

If, at any time, the trade item is shipped or transported as an independent logistic unit, at the time of shipment it SHOULD additionally be identified with an SSCC. The combination of a GTIN and a serial number (also known as SGTIN) does not replace the SSCC as the identifier of a logistic unit.

If, in addition to the item being identified by GTIN, the item also has a product model, then this product model is identified with a Global Model Number (GMN). See section 2.6.13 for the application standard on GMN.

2.1.7.1 Identification of a trade item that is a single product

Application description

The manufacturer or supplier has the option of assigning a unique GTIN-8, GTIN-12, GTIN-13 or in the case of regulated healthcare trade items and trade items used in manufacturing and maintenance, repair & overhaul (MRO) processes, a GTIN-14 to a trade item that is a single product as shown in figure 2.1.7-1. Restricted Circulation Numbers (RCNs) SHALL NOT be used in this element string.

GS1 key

Required

The allowed key formats for this application are:

- GTIN-8
- GTIN-12
- GTIN-13
- For regulated healthcare trade items and trade items used in manufacturing and maintenance, repair & overhaul (MRO) processes: GTIN-14.

Rules

See the GTIN rules described in section $\underline{4}$.

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Attributes

Required

For regulated healthcare consumer trade items the following levels of AIDC marking are specified.

Figure 2.1.7.1-1. Overview of required attributes								
AIDC marking level for regulated healthcare trade items	Кеу	Batch/lot number - AI (10)	Expiration date – AI (17)	Serial number - AI (21)	Other			
Minimum	GTIN-8, GTIN-12, GTIN-13, or GTIN-14	No	No	No	None			
Enhanced	GTIN-8, GTIN-12, GTIN-13, or GTIN-14	Yes	Yes	No	None			
Highest – Brand owner AIDC marking	GTIN-8, GTIN-12, GTIN-13, or GTIN-14	Yes	Yes	Yes	Potency AI (7004) for pharmaceutical, and for medical device kits with pharmaceutical (cases only for both situations)			
Highest – Hospital AIDC marking of pharmaceutical	GTIN-8, GTIN-12, GTIN-13, or GTIN-14	No	AI (7003) for short-life products	Yes	None			
Hospital AIDC marking of medical devices	No	No	No	No	None			

To manage healthcare data requirements within EPC/RFID tags, see section <u>3.11</u> and the most recent version of the <u>EPC Tag Data Standard</u>.

Optional

Not applicable

Rules

Not applicable

Data carrier specification

Carrier choices

- Symbols from the EAN/UPC symbology family (UPC-A, UPC-E, may be used to encode the GTIN-12, EAN-13 to encode the GTIN-13 and, if the size requirements are met, EAN-8 to encode the GTIN-8 of the trade item that is a single product).
- ITF-14 symbols may be used where printing conditions require the application of a less demanding symbology. ITF-14 symbols can encode the GTIN-12, or GTIN-13 of the item.
- A GS1-128 barcode or GS1 DataBar barcode with GS1 Application Identifier (01) may be used to encode a GTIN that identifies the trade item if the printing conditions allow. The choice of one of these symbologies is particularly relevant if there is a need to encode attribute information in addition to the identification number.

Some scanning systems may be able to handle 2D barcodes as well as linear barcodes. In these environments, GS1 2D symbols DataMatrix and GS1 QR Code may be used in addition to linear symbols. For information on how to manage multiple barcodes see section 4.15.

For trade items used in manufacturing and maintenance, repair & overhaul (MRO) processes the following data carrier choices take precedence over the carrier choices above: GS1-128, GS1 DataMatrix, GS1 QR Code and EPC/RFID.

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For healthcare, the following carrier selections take precedence over the carrier choices above and apply to all regulated healthcare retail consumer trade items.

Figure	2.1.7.1-2.	Healthcare	carrier choice	es
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Preferred option(s) (this is the long-term direction for AIDC marking)	First preference: GS1-128 symbology. After Jan 2010, GS1 DataBar is permitted for use on all trade items and therefore may be encountered in general distribution however use of GS1-128 is preferred as the scanners in the field today pervasively support it.
	Second preference: When one linear symbol cannot accommodate the field length of the data (exceeds 48 characters), two symbols should be used.
	Third option: Where the package or label size does not permit the use of the first two options, GS1 DataMatrix symbology are permitted but should be avoided wherever possible if the package could be scanned by a mounted conveyorised scanner.
Option in addition to the barcode	See the "data carrier specification carrier choices" recommendations on options in addition to the barcode at the end of section $2.1.5$.
Other acceptable options (GS1 strongly supports existing options for symbol marking as a guiding principle and therefore supports all previous AIDC marking specifications)	See the "data carrier specification carrier choices" recommendations on other acceptable options found at the end of section $2.1.5$.

Symbol X-dimensions, minimum symbol height and minimum symbol quality

For multi-sector use except for retail or regulated healthcare trade items see section 5.12.3.2, GS1 symbol specification table 2.

For regulated healthcare non-retail consumer trade items see section <u>5.12.3.8</u>, GS1 symbol specification table 8.

For manufacturing and MRO processes see <u>5.12.3.4</u>, GS1 symbol specification table 4.

Symbol placement

All the symbol placement guidelines defined in section $\underline{6}$.

Unique application processing requirements

For a description of processing requirements, see section $\underline{\mathsf{Z}}.$

2.1.7.2 Trade item groupings of identical trade items

Application description

A trade item grouping that is a predefined grouping of identical trade items. The manufacturer or supplier has the option of either assigning a unique GTIN-13 or GTIN-12 to each trade item grouping or assigning a unique GTIN-14. These 14-digit GTINs incorporate the GTIN (less its check digit) of the trade item contained in each grouping. The check digit for each GTIN-14 is then recalculated.

The indicators have no meaning. The digits do not have to be used in sequential order, and some may not be used at all. The GTIN-14 structure for trade item groupings creates extra numbering capacity.

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Figure 2.1.7.	2-1.	GTIN-14	data	structures
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	Global Trade Item Number (GTIN)													
	Indicator		GTIN of contained trade items (without check digit)							Check digit				
GTIN-8 based	N1	0	0	0	0	0	N ₇	N ₈	N9	N ₁₀	N_{11}	N_{12}	N ₁₃	N_{14}
GTIN-12 based	N1	0	N_3	N_4	N_5	N_6	N ₇	N_8	N ₉	N ₁₀	N ₁₁	N_{12}	N ₁₃	N_{14}
GTIN-13 based	N1	N ₂	N_3	N_4	N_5	N_6	N_7	N ₈	N ₉	N_{10}	N_{11}	N_{12}	N ₁₃	N_{14}

The indicator is a digit with a value of 1 to 8. It is assigned as required by the company that constructs the identification number. It can provide up to eight separate GTIN-14s to identify trade item groupings.

The check digit is explained in section 7.9. Its verification, usually carried out automatically by the barcode reader, ensures that the number is correctly composed.

Indicator	GTIN of trade item contained in the grouping, less its check digit	New check digit	Description	Quantity		
	061414112345	2	Trade item	Single		
1	061414112345	9	Trade item grouping	A grouping		
8	061414112345	8	Trade item grouping	Another grouping		
Indicators 1 to 8 may be used to create new GTIN-14s. When these eight indicators have been used, further groupings must be identified with either a GTIN-13 or GTIN-12. Indicator digit 9 is reserved for variable measure						

Figure 2.1.7.2-2. Different groupings of the same trade item

For packaging configuration hierarchies that include a retail consumer trade item identified with a GTIN-13, GTIN-12, or GTIN-8, this GTIN must always be one of the relevant levels of packaging contained, usually the lowest level (see note below related to GTIN-14 assignment on the primary packaging). Restricted Circulation Numbers must not be used in this element string.

Note: For regulated healthcare trade items on the primary packaging, the phrase "usually the lowest level" SHALL be interpreted as allowing for the use of GTIN-14 on packaging configurations below the retail consumer trade item level, if one exists. This interpretation may not be applied to other trade item categories such as Do It Yourself (DIY) or Foodservice.

Any product package which will encounter scanning or product listing for sale at point-of-sale SHALL be identified according to retail point-of-sale specifications.

When a GTIN change at the retail consumer trade item level is required, the GTIN change must be made at all configuration levels above the retail consumer trade item level. Where there is an association between primary packaging and retail consumer trade item levels and GTIN-14 assignment is used on the primary packaging, the GTIN-14 assigned to the primary packaging is based on the retail level GTIN. There are three scenarios to consider for the relationship of these GTIN assignments:

- If changes to the primary packaging drive the change of the GTIN assigned to the retail consumer trade item level, the GTIN of the primary packaging will change.
- If changes to retail consumer trade item level GTIN are not caused by a change in primary packaging, the GTIN at the primary package level may or may not change per the discretion of the brand owner.

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trade items, see section 2.1.10.



 If additional retail level package(s) are introduced beyond the original retail package or replace the original retail package, the GTIN-14 on the primary packaging may remain tied to the original retail level GTIN.

GS1 key

Required

The allowed key formats for this application are:

- GTIN-12
- GTIN-13
- GTIN-14

Note: Product groupings created prior to 2023 may be identified with a GTIN-8. Starting on 1 January 2023, GTIN-8 SHALL NOT be used for application.

Rules

All the GTIN rules described in section $\underline{4}$.

Attributes

Required

For regulated healthcare non-retail consumer trade items the following levels of AIDC marking are specified:

Figure 2.1.7.2-3. Required attributes							
AIDC marking level for regulated healthcare trade items	Кеу	Batch/lot number - AI (10)	Expiration date – AI (17)	Serial number – AI (21)	Other		
Minimum	GTIN-12, GTIN- 13, or GTIN-14	No	No	No	None		
Enhanced	GTIN-12, GTIN- 13, or GTIN-14	Yes	Yes	No	None		
Highest – Brand owner AIDC marking	GTIN-12, GTIN- 13, or GTIN-14	Yes	Yes	Yes	Potency AI (7004) for pharmaceutical, and for medical device kits with pharmaceutical (cases only for both situations)		
Highest – Hospital AIDC marking of pharmaceutical	GTIN-12, GTIN- 13, or GTIN-14	No	AI (7003) for short- life products	Yes	None		
Hospital AIDC marking of medical devices	No	No	No	No	None		

To manage healthcare data requirements within EPC/RFID tags, see section 3.11 and the most recent version of the <u>EPC Tag Data Standard</u>.

Optional

Not applicable

Rules

Not applicable



Data carrier specification

Carrier choices

- For multi-sector use symbols from the EAN/UPC symbology family (UPC-A, UPC-E and EAN-13) may be used to encode the GTIN-12 or GTIN-13 of the trade item grouping.
- ITF-14 symbols may be used on trade item groupings where printing conditions require the application of a less demanding symbology. ITF-14 symbols can encode the GTIN-12, GTIN-13, or GTIN-14 of the item.
- A GS1-128 barcode or GS1 DataBar barcode with GS1 Application Identifier (01) may be used to encode a GTIN-12, GTIN-13, or GTIN-14 that identifies the trade item if the printing conditions allow. The choice of one of these symbologies is particularly relevant if there is a need to encode attribute information in addition to the identification number.

Some scanning systems may be able to handle 2D barcodes as well as linear barcodes. In these environments, GS1 2D symbols DataMatrix and GS1 QR Code may be used in addition to linear symbols. For information on how to manage multiple barcodes see section 4.15.

For trade items used in manufacturing and maintenance, repair & overhaul (MRO) processes the following data carrier choices take precedence over the carrier choices above: GS1-128, GS1 DataMatrix, GS1 QR Code and EPC/RFID.

For healthcare the carrier selections noted at the end of section <u>2.1.7.1</u> take precedence over the carrier choices above and apply to all regulated healthcare retail consumer trade items.

Symbol X-dimensions, minimum symbol height and minimum symbol quality

For multi-sector use other than regulated healthcare trade items see section <u>5.12.3.2</u>, GS1 symbol specification table 2.

For regulated healthcare non-retail consumer trade items see section <u>5.12.3.8</u>, GS1 symbol specification table 8.

For manufacturing and MRO processes see <u>5.12.3.4</u>, GS1 symbol specification table 4.

Symbol placement

All the symbol placement guidelines defined in section $\underline{6}$.

Unique application processing requirements

For a description of processing requirements, see section $\underline{7}$.

2.1.7.3 Trade item groupings of mixed trade items

Application description

A trade item grouping that is a predefined grouping of two or more different trade items.

For example:

- Product C is a grouping of Product A (GTIN 'A') and Product B (GTIN 'B'), and is identified with either a GTIN-12 or GTIN-13, GTIN 'C.'
- GTIN 'C' could then be used to construct a GTIN-14 for a trade item grouping comprised of Product C.

As shown in figure 2.1.7.3-1, the GTIN-12s 614141234561 and 614141345670 identify the two trade items in the trade item assortment/bundle identified by the GTIN 614141456789.



Figure 2.1.7.3-1. Example of trade item grouping of mixed trade items

Indicator	GTIN of trade item less its check digit	Check digit	Description	Quantity
	061414123456 061414134567	1 0	Retail consumer trade item (Product A) Retail consumer trade item (Product B)	Single Single
	061414145678	9	Retail consumer trade item (Product C)	Trade item assortment/bundle
1	061414145678	6	Trade item grouping	A grouping of the trade item assortment/bundle
8	061414145678	5	Trade item grouping	Another grouping of the trade item assortment/bundle

The indicators 1 to 8 may be used to create new GTIN-14s. When these eight indicators have been used, further groupings must be identified with either a GTIN-13 or GTIN-12. Indicator digit 9 is reserved for variable measure trade items, see section 2.1.10.

GS1 key

Required

The allowed key formats for this application are:

- GTIN-12
- GTIN-13
- GTIN-14

Rules

All the GTIN rules described in section 4; in addition, the GTIN-14 is valid for trade item groupings only when the trade item contained is a trade item assortment/bundle of two or more different trade items.

Attributes

Not applicable

Data carrier specification

Carrier choices

- Symbols from the EAN/UPC symbology family (UPC-A, UPC-E and EAN-13) may be used to encode the GTIN-12 or GTIN-13 of the trade item grouping.
- ITF-14 symbols may be used on trade item groupings where printing conditions require the application of a less demanding symbology. ITF-14 symbols can encode the GTIN-12, GTIN-13, or GTIN-14 of the item.
- A GS1-128 barcode or GS1 DataBar barcode with GS1 Application Identifier (01) may be used to encode a GTIN-12, GTIN-13, or GTIN-14 that identifies the trade item if the printing conditions allow. The choice of one of these symbologies is particularly relevant if there is a need to encode attribute information in addition to the identification number.

Some scanning systems may be able to handle 2D barcodes as well as linear barcodes. In these environments, GS1 2D symbolsDataMatrix and GS1 QR Code may be used in addition to linear symbols. For information on how to manage multiple barcodes see section 4.15.

For trade items used in manufacturing and maintenance, repair & overhaul (MRO) processes the following data carrier choices take precedence over the carrier choices above: GS1-128, GS1 DataMatrix, GS1 QR Code and EPC/RFID.

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2.1.112.1.10 Variable measure trade items scanned in general distribution

Application description

Trade items may be of variable measure either because the production process does not guarantee consistency in weight, size, or length (e.g., carcasses of meat, whole cheeses) or because the items are created to meet a special order that states a quantity (e.g., textiles ordered by the metre, glass ordered by the square metre).

Only trade items that are sold, ordered, or produced in quantities that can vary continuously, are covered by the rules outlined in this section. Trade items that are sold in discrete and predefined bands (e.g., as a nominal weight) are treated as fixed measure trade items.

A trade item must be considered a variable measure trade item if its measure is variable at any point in the supply chain. For example, a supplier may sell and invoice chickens in cases of 15 kilograms each; therefore, the quantity of contained chickens will vary. The customer, a retailer in this example, may need to know the exact number of chickens contained in each case in order to organise the distribution to his stores. In this example, the supplier should source mark the trade item by using a variable measure Global Trade Item Number (GTIN) and the variable count element string.

Variable measure trade items scanned in general distribution are identified with a GTIN-14 beginning with '9'. The digit 9 in the indicator position indicates that the item identified is a variable measure trade item that is not scanned at POS.



Note: See section <u>2.6.8</u> for the GTIN-14 beginning with a '9' in combination with AI (242) Made-to-Order variation number and its use in the manufacturing and maintenance, repair & overhaul (MRO) environment.

Unlike GTIN-14s beginning with indicator 1 to 8 which are used to identify fixed measure trade items (see section 2.1.7.2 *Trade item groupings of identical trade items*), this GTIN-14 is not derived from the GTIN (without check digit) of the contained trade items. The GTIN-14 must be processed in its entirety and not broken down into its constituent elements.

		Figure 2.1.10-1. Format of the element string												
			Global Trade Item Number (GTIN)											
	Indicator	GS1 Company Prefix				Item reference Check dig				Check digit				
(GTIN-14)	9	N2	N ₃	N4	N5	N ₆	N ₇	N ₈	N9	N ₁₀	N_{11}	N_{12}	N ₁₃	N14

The check digit is explained in section 7.9. Its verification, usually carried out automatically by the barcode reader, ensures that the number is correctly composed.

Any trade item of a given composition where the quantity/measure information cannot be predetermined for any reason is a variable measure trade item. The most frequent types are shown in the figure below.

Figure 2.1.10-2. Main types of variable measure trade items

Туре	Item description
Α	Items traded in bulk, neither portioned nor pre-packed for retail sale, ordered in any quantity, and that are delivered as variable measure trade items (e.g., fish, fruit, vegetables, cables, carpets, timber, fabrics)
	The identification number denotes the item as a trade entity containing any quantity of the given product and, if applicable, the form of packaging. Weight or dimensions complete the identification of the individual unit.
В	Trade items ordered and delivered by piece (wrapped or unwrapped) and invoiced by weight or measure because weight or measure varies due to the nature of the product or due to the manufacturing process (e.g., whole cheese, sides of bacon, beef carcasses, fish, sausages, ham, chicken, cauliflower, motion picture films)
	The identification number denotes the item as a particular predefined entity and, if applicable, denotes the form of packaging. Price or weight or dimensions complete the identification of the individual item.

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Туре	Item description
С	Portioned trade items, pre-packed for sale by weight to the consumer, not fixed in quantity. (e.g., meat, cheese, vegetables, fruit, fillets of fish, sliced poultry, cold cuts)
	The identification number denotes the item type according to business practice and the form in which it is packed. Price weight or dimension completes the identification of the individual unit.
D	Trade items with selectable dimensions where GS1 system standard numbering does not make sense to cover the multiplicity of all variations (e.g., wooden planks, carpeting) The identification number denotes the predefined basic trade item. The applicable dimension(s) completes the identification of the individual unit.
E	Composition of a fixed number of trade items that are Type B or Type C (e.g., a trade item containing 10 chickens (Type B).) The identification number denotes the trade item grouping as an entity and, if applicable, its form of packaging. The total weight of all items contained completes the identification of the particular trade item.
F	Trade items made to customer specifications, restricted in use to the Maintenance, Repairs and Operations industrial supply sector, and sold business-to-business. The identification number denotes a base custom item. The specific variation is identified by the Made-to-Order variation number. (See in section 3.2 for the list of all GS1 Application Identifiers).

GS1 key

Required

GTIN-14 with indicator digit 9.

Rules

The GTIN-14 with the indicator 9 is used to identify a variable measure trade item. The presence of the variable measure information is mandatory for the complete identification of a variable measure trade item. The digit 9 in the first position is an integral part of the GTIN.

The GTIN-14 data structure beginning with indicator 9 is not used on an item intended to cross the retail point-of-sale. Numbering of variable measure fresh food trade items intended to cross retail point-of-sale is defined in section <u>2.1.12</u>.

Attributes

Required

The GTIN-14 identifies a variable measure trade item with respect to its fixed attributes or characteristics. To complete the identification of a variable measure trade item, the presence of an element string representing a trade measure is mandatory.

Optional

Applicable trade measures depend on the nature of the product. They may be a quantity, a weight, or any dimension.

- An element string with GS1 Application Identifier (30) is used if the variable measure of the trade item is the number of items contained. In order to generate a short barcode, always enter an even number of digits in the data field "variable count of items" by inserting a leading zero if necessary. Concatenation of this element string with the GTIN of the item enhances the accuracy of the application. See section 3.6.1, Variable count of items: AI (30).
- An element string with GS1 Application Identifiers (31nn), (32nn), (35nn) and (36nn) is used if the variable measure of the respective trade item is weight, dimension, area, or volume. Only one element string of a given unit of measure may be applied on a particular item. Several element strings containing trade measures are possible on a particular item if the item is available in either unit of measure and if the applicable unit of measure is not distinguished for ordering and billing. This might apply if weight must be expressed in kilograms and pounds, see section 3.2, Trade measures: AIs (31nn), (32nn), (35nn), (36nn).
- An element string with GS1 Application Identifier (8001) contains the predefined variable fields
 of a roll product and it may be used for those variable roll products where the trade measures

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AI (31nn), (32nn), (35nn), (36nn) are not sufficient. The GTIN-14 can denote a basic roll product.

Rules

An element string with GS1 Application Identifier (30) SHOULD never be used to indicate the quantity contained in a fixed measure trade item. However, if it appears on a fixed measure trade item, it SHOULD NOT invalidate the trade item identification.

An element string with GS1 Application Identifier (8001) must never be used together with other element strings representing trade measures.

Data carrier specification

Carrier choices

Variable measure trade items not crossing a point-of-sale SHOULD be marked with an ITF-14 barcode, GS1-128 barcode or GS1 DataBar barcode.

Some scanning systems may be able to handle 2D barcodes as well as linear barcodes. In these environments, GS1 $\frac{2D - symbolsDataMatrix and GS1 QR Code}{2D}$ may be used in addition to linear symbols. For information on how to manage multiple barcodes see section $\frac{4.15}{2}$.

Symbol X-dimensions, minimum symbol height and minimum symbol quality

See section <u>5.12.3.2</u>, GS1 symbol specification table 2.

Symbol placement

All the symbol placement guidelines defined in section $\underline{6}$.

Unique application processing requirements

For a description of processing requirements, see section $\underline{7}$.

Examples of variable measure trade item numbering and symbols

In the examples in the subsections that follow, the following factors apply:

- In order to be illustrative, all examples show the same presentation (e.g., price list, order, delivery, invoice and recording in a data file).
- GS1-128 barcodes are used.
- The examples are given to demonstrate the correct use of a given GS1 Application Identifier when used. When AI (02) is not used, information about the shipment must be received using Electronic Data Interchange (EDI) or other means prior to its physical receipt.

Example 1: Traded by piece

The following example shows the order and delivery of an item traded by piece and invoiced by weight.

- The supplier's catalogue contains one entry: one salami weighing ~ 500 grams.
- The order for 100 units is delivered in three boxes. Each box is marked with an SSCC (Serial Shipping Container Code) and, optionally, with information on the content of the box, expressed as follows:
 - AI (02) indicates the variable measure Global Trade Item Number (GTIN) of the units contained within the box.
 - AI (3101) indicates the total weight of the items contained within the box.
 - AI (37) indicates the count of items contained within the box.
- The three boxes may be stored on a pallet that may itself be marked with an SSCC and, optionally, with information on the contents of the pallet, expressed as follows:
 - □ AI (02) indicates the variable measure GTIN of the units contained within the pallet.

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parallel, the ID Issuer validates all other attributes of the Economic Operator ID (EOID) Request. Once validated, the ID Issuer UIC, GS1 UIC Extension 1 and Importer index are concatenated before the GLN to form the EOID. To identify parties, see sections <u>2.4.5</u> and <u>3.7.12</u> Identification of a party - Global Location Number: AI (417).

Rules

All the GLN rules described in section 4.6.

Attributes

Required

GS1 UIC with Extension 1 and Importer index AI (7040)

Rules

Per section 4.6.

Optional

Not applicable

Data carrier specification

Not applicable for EU 2018/574.

Unique application processing requirements

For a description of processing requirements, see section $\underline{7}$.

2.2 Logistic units

A logistic unit is an item of any composition established for transport and/or storage that needs to be managed through the supply chain.

Tracking and tracing logistic units in the supply chain is a major application of the GS1 system. Scanning the standard identification number, marked on each logistic unit, allows the physical movement of units to be individually tracked and traced by providing a link between the physical movement of items and the associated information flow. It also opens up the opportunity to implement a wide range of applications, such as cross docking, shipment routing and automated receiving.

Logistic units are identified with a GS1 identification number called the SSCC (Serial Shipping Container Code). The SSCC is the only GS1 key that SHALL be used as the identifier of a logistic unit. The SSCC ensures that logistic units are identified with a number that is unique worldwide.

If, in addition to being a logistic unit, the item is regarded as a trade item by the brand owner, it MAY additionally be identified with a GTIN. The combination of a GTIN and a serial number SHALL NOT replace the SSCC as the identifier of a logistic unit.

If, in addition to being a logistic unit, the item is part of a consignment and or a shipment, it MAY also be associated with the GINC and / or the GSIN.

Attribute information, such as a Global Identification Number for Consignment, AI (401), may be optionally encoded using internationally agreed data structures and a barcode symbology that allow unambiguous interpretation.

2.2.1 Individual logistic units

Application description

A logistic unit is an item of any composition established for transport and/or storage that needs to be managed through the supply chain. The identification and symbol marking of logistic units enables a large number of user applications. In particular, the SSCC (Serial Shipping Container

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Code) provides a link between the physical logistic unit and information pertaining to the logistic unit that is communicated between trading partners using Electronic Data Interchange (EDI).

The SSCC element string AI (00) is used for the identification of logistic units (see section 3). Each individual logistic unit is allocated a unique number, which remains the same for the life of the logistic unit. When assigning an SSCC, the rule is that an individual SSCC number must not be reallocated within one year of the shipment date from the SSCC assignor to a trading partner. However, prevailing regulatory or industry organisation specific requirements may extend this period.

In principle, the SSCC provides a unique reference number that can be used as the key to access information regarding the logistic unit in computer files. However, attributes relating to the logistic unit (e.g., ship to information, logistic weights) are also available as standardised element strings.

GS1 key

Required

SSCC

The GS1 Application Identifier for the SSCC is AI (00), see section 3.2.

Rules

All SSCC rules described in section 4.3.

Attributes

Required

Not applicable

Optional

For all the GS1 Application Identifiers that may be used with an SSCC, see section 3.2.

Note: Although the use of AI (02), Identification of trade items contained, and AI (37), Count of trade items or trade item pieces contained in a logistic unit, is common in some sectors to describe the content of a logistic unit, the healthcare sector prefers the use of the SSCC alone. The SSCC is used with EDI communications to enable identification and traceability.

Rules

Not applicable.

Data carrier specification

Carrier choices

The mandatory data carrier used to represent individual logistic units is the GS1-128 barcode symbology.

A GS1 DataMatrix or GS1 QR Code symbol MAY be included in addition to the GS1-128 symbol. When used, the GS1-2D symbol barcode SHALL include all element strings included in the GS1-128 symbol(s), and MAY include additional element strings.

If a logistic unit does not have at least one surface area greater than an A6 or 4" x 6" logistic label (see section <u>6.6.4.5</u>), a GS1 DataMatrix or GS1 QR Code MAY be used by itself on a logistic label, though a GS1-128 containing a SSCC is still recommended. If a logistic label is used with only a GS1 DataMatrix or GS1 QR Code, care must be taken to ensure trading partners are able to scan this barcode.

For healthcare, see the recommendations at the end of section 2.1.5 in figure 2.1.5-2 Carrier choices.

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Symbol size is determined by the amount of data and the number of rows and columns required encoding the data for the X-dimensions selected (see figures section 5.6.3.2).

Consult *GS1 symbol specification table 7*, section <u>5.12.3.7</u>, for minimum and maximum X-dimensions and other sizing requirements.

Durable labelling and marking:

For long distance scanning see section <u>5.12.3.13</u>, GS1 symbol specification table 13.

For short distance scanning see section 5.12.3.9, GS1 symbol specification table 9 (assets) or section 5.12.3.4, GS1 symbol specification table 4 (trade items).

Symbol placement

General principles on placement of barcodes are described in section $\underline{6}$.

The majority of uses for these symbols will be on very small items with curved surfaces such as vials, ampoules and very small bottles. For guidance in locating these symbols on curved surfaces, refer to section <u>6.2</u>.

Unique application processing requirements for direct part marking

See section $\underline{7}$ and section $\underline{5.12.4.3}$.

2.6.15 Encoding transport process information

Introduction

The global Transport & Logistics industry is experiencing exponential growth in freight volumes and becoming ever more open and competitive to support the growing needs. The increasing number of service providers (especially in Last Mile) and new entrants coming in from outside the traditional T&L environment causes challenges within the supply chain where parties involved in a supply chain at times don't even know each other, let alone have integrated systems. The fragmented nature of the industry, connectivity limitations (e.g., internet access) and the need for redundancy (e.g., absence of advance information exchange) drives the need for greater interoperability and the ability to capture transport process information via barcode(s). Information such as ship-to / deliver-to address and other delivery information is encoded directly on the logistic label to support first/last mile and sortation processes.

Note (informative): For further guidance and supporting standards see the <u>GS1 Encoding</u> <u>Transport Process Information Implementation Guideline</u>.

Application description

This application describes the creation of transport unit labels when using 2D barcodes to include necessary transport data on GS1 transport labels. The SSCC is the mandatory identifier required on all transport labels in a GS1-128 barcode and this application defines how it should be used together with optional attributes in 2D barcodes to support transport and logistic processes.

GS1 key

Required

SSCC

The GS1 Application Identifier for the SSCC is AI (00), see section 3.2.

Rules

All SSCC rules described in section 4.3.

Attributes

Required

Not applicable

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Optional

To provide optional transport process information, see figure below for a listing of GS1 Application Identifiers. For all the GS1 Application Identifiers that may be used with an SSCC in support of encoding transport process information and their format, see section 3.2.

Figure 2.6.15-1. Application	n Identifiers used to	support the tra	nsport process

AI	Data Content	Permits Non-Latin Characters
420	Ship-to / Deliver-to postal code with a single postal authority	
4300	Ship-to / Deliver-to company name	х
4301	Ship-to / Deliver-to contact	Х
4302	Ship-to / Deliver-to address line 1	Х
4303	Ship-to / Deliver-to address line 2	Х
4304	Ship-to / Deliver-to suburb	Х
4305	Ship-to / Deliver-to locality	Х
4306	Ship-to / Deliver-to region	х
4307	Ship-to / Deliver-to country code	
4308	Ship-to / Deliver-to telephone number	
4309	Ship-to / Deliver-to GEO location	
4310	Return-to company name	Х
4311	Return-to contact	Х
4312	Return-to address line 1	Х
4313	Return-to address line 2	х
4314	Return-to suburb	х
4315	Return-to locality	Х
4316	Return-to region	Х
4317	Return-to country code	
4318	Return-to postal code	
4319	Return-to telephone number	
4320	Service code description	Х
4321	Dangerous goods flag	
4322	Authority to leave	
4323	Signature required flag	
4324	Not before delivery date time	
4325	Not after delivery date time	
4326	Release date	

To encode non-Latin characters within the alphanumeric value, use percent-encoding as defined within RFC 3986. A space character should be encoded as a single plus symbol, +.

Rules

All transport process information rules see section 7.

For general human readable interpretation rules see section 4.14.



Data carrier specification

Carrier choices

- GS1-128
- GS1 DataMatrix
- GS1 QR Code
- EPC/RFID

The mandatory data carrier used to represent the SSCC on individual logistic units is the GS1-128 barcode symbology.

As indicated by figure 2.6.15, 2D symbols-barcodes MAY be included in addition to the GS1-128 symbol. When used, the GS1-2D symbol-barcode SHALL include all element strings included in the GS1-128 symbol(s) and MAY include additional element strings.

If a logistic unit does not have at least one surface area greater than an A6 or $4^{"} \times 6^{"}$ logistic label (see section <u>6.6.4.5</u>), a GS1 DataMatrix or GS1 QR Code MAY be used by itself on a logistic label, though a GS1-128 containing a SSCC is still recommended. If a logistic label is used with only a GS1 DataMatrix or GS1 QR Code, care must be taken to ensure trading partners are able to scan this barcode.

Symbol X-dimension, minimum symbol height and minimum symbol quality

For GS1-128, GS1 DataMatrix and GS1 QR Code, see section 5.12.3.5 GS1 symbol specification table 5.

Symbol Placement

All the symbol placement guidelines in section $\underline{6}$.

Unique application processing requirements

For a description of processing requirements, see section $\underline{7}$. Note that some transport process information may include accented / non-Latin characters and space characters which are not available in the subset of *ISO/IEC 646 International Reference Version* defined in figure $\underline{7.11}$ -1 used for all GS1 Application Identifier (AI) element strings. Encoding these characters can be accomplished using percent encoding as defined in RFC 3986 while using existing characters from the subset of *ISO/IEC 646 International Reference Version* defined in figure $\underline{7.11}$ -1. Note that space character can be encoded as a plus symbol (+) as an alias of %20.

2.6.16 Digital Signature (DigSig)

Application description

Digital signatures provide the ability to check:

- The data has not been changed (tamper detection)
- The provenance of the data, i.e., who digitally signed the data (non-repudiation)

ISO/IEC 20248: Information technology — Automatic identification and data capture techniques — Digital signature data structure schema (https://www.iso.org/standard/81314.html) specifies a method to add a digital signature, and other verifiable data, to a barcode or RFID data construct by which the verification of the following can be achieved without the need to connect to an external data source:

- The link with the physical object by using physical features and security marks.
- By using the unique and secured chip ID, it is possible to detect if the data on a specific RFID tag has been cloned from another tag.

An ISO/IEC 20248 data construct is commonly known as a DigSig, a named thing with a specific meaning, while "digital signature" in lower case refers to the general and common digital signature.

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If element	If element string Ther asso elem		Rule
AI	Designation	AI	
8019	Service Relation Instance Number	8017 XOR 8018	The Service Relation Instance Number SHALL occur in combination with: • the GSRN for the provider; or • the GSRN for the recipient.
8020	Payment slip reference number	415	The payment slip reference number SHALL occur in combination with the GLN of the invoicing party.
8026	ITIP of contained pieces	00 AND 37	The ITIP of contained pieces SHALL occur in combination with an SSCC and the count of the pieces.
8030	Digital Signature (DigSig)	(01 AND 21) XOR (8006 AND 21) XOR (8010 AND 8011) XOR 8003 XOR 8004 XOR 8017 XOR 8017 XOR 8018 XOR 00 XOR 253 XOR 255	The Digital Signature (DigSig) SHALL occur in combination with one of the following: • Global Trade Item Number and Serial number • Identification of an individual trade item piece and Serial number • Component/Part Identifier and Component/Part Identifier serial number • Global Returnable Asset Identifier including Serial component • Global Individual Asset Identifier • Global Service Relation Number - Provider • Global Service Relation Number - Recipient • Serial Shipping Container Code • Global Coupon Number including Serial component
8111	Loyalty points of a coupons	255	Loyalty points of a coupon SHALL occur in combination with the GCN.
8200	Extended packaging URL	01	The extended packaging URL SHALL occur in combination with the GTIN.
* Th No	e AIs for trade measu te: All AIs in section	res are set out in se 3.6.2 can be used v	ection <u>3.6.2</u> Trade measures: AIs (31nn, 32nn, 35nn, 36nn). vith this AI 395n.
** Th	e AIs for logistics mea	asures are set out ir	n section 3.6.3 Logistic measures: AIs (33nn, 34nn, 35nn, 36nn)
*** If pie N An	used in combination w eces of the trade item y digit from 0 to 9	vith the identificatio SHALL be identical.	n of trade item pieces (ITIP), the optional AIs on all individual

Note: Exception for point-of-sale. See figure 2.7-1. Areas of GS1 system application.

4.14 Human readable interpretation (HRI) rules

Human readable interpretation (HRI) rules are provided to standardise printing requirements and facilitate training of staff on how to deal with GS1 AIDC data carriers that fail to scan or read. There are two categories of rules:

- General rules that apply independent of sector, intended application or product category, or region.
- Sector or application specific rules which must be aligned with the general rules and can be found in sections:
 - 4.14.1 Healthcare human readable interpretation
 - 4.14.2 General retail consumer trade item human readable text rules
 - 4.1.4.3 Manual date marking.

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Commented [DM15]: WR22-327 HRI

For the purposes of interpreting this standard, t<u>T</u>here are two types of text that appear on a<u>n object</u> label, package, or item;:</u> human readable interpretation (HRI) and non-HRI text.

- Human readable interpretation (HRI) is the information below, beside or above a barcode or tag which is encoded in the barcode or tag and represents the same characters data as carried encoded in the barcode or <u>RFID</u> tag (<u>s</u>See section <u>9</u> for full definition).
- Non-HRI text is all other text on <u>the object which may or may not be encoded in the barcode or</u> <u>RFID tag package, label or item (sSee section 9</u> for full definition).
 - Figure 4.14-1. Example of HRI and non-HRI texthuman readable text



Note: The following rules are intended for global use. Exceptions may occur only when local regulatory or legal requirements mandate otherwise.

Note: At present, HRI rules are applicable to barcodes as rules for EPC/RFID tags are under development.

Note: HRI rules for the EAN/UPC symbology and the add-on symbols are explained in section 5.2.5 *Human readable interpretation*.

General hHuman readable interpretation text rules

1. Rule 1-HRI Placement

- a. -Whether a GS1 AIDC data carrierbarcode encodes a GS1 identification key, GS1 key attributes, or a combination of both, the HRI SHOULD be placed included and placed below adjacent to the barcode. HRI SHOULD be and grouped together wherever physically possible while maintaining the HRI legibility, and minimum barcode height and/or Quiet Zones (as specified in the appropriate symbol specification table in section 5.12.3.
 - a.--referenced by the GS1 AIDC application standard).
 - i. In cases where the HRI must be printed above, to the left, or to the right of the symbol barcode due to packaging or space constraints, HRI SHALL SHOULD always be printed adjacent so that is is to (obviously associated with) the GS1 AIDC data carrier barcode.while protecting Quiet Zones. This rule applies to all barcodes independent of printing orientation (e.g., ladder orientation).

Figure 4.14-32. Locations of HRI for barcode in ladder orientation

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- b. When HRI is grouped together, it SHOULD be placed adjacent to the barcode and it SHALL always follow the sequence of the encoded in the barcode.
- c. b-If the HRI for GS1 identification keys and GS1 key attributes is split (for example GS1 key HRI is above the barcode and GS1 key attributes HRI is above the barcode), the preference for GS1 identification key HRI SHOULD be placed adjacent to the barcode. For example, the GS1 identification key HRI is below the barcode and the GS1 key attributes HRI is above the barcode. Placement is always below the barcode.

Figure 4.15-3. Example of split HRI placement



- a-d.An element string (application identifier and associated data) SHALL NOT be broken into multiple lines of HRI, for example the data for a serial number would appear on one line of HRI, e.g., (21) ABCDEF12345.
- b-<u>e.</u>When using non-HRI text, the element strings SHOULD NOT be broken into multiple lines.HRI is grouped together (for example, all HRI data is grouped below the barcode or all HRI data is grouped above the barcode), HRI SHALL always follow the encoding sequencing of the GS1 AIDC data carrier.
- f. HRI SHALL appear except in rare circumstances for specific applications where there are extreme space constraints (e.g., direct part marking, loose fresh produce). If the barcode cannot be read or scanned and the HRI does not appear on the object, non-HRI text SHOULD be used as backup information. A single data element SHALL NOT be broken into two lines of HRI, for example the data for a serial number would appear on one line of HRI.HRI SHALL appear except in rare circumstances for specific applications where there are extreme space constraints (e.g., direct part marking). If the GS1 AIDC data carrier cannot be read or scanned and the HRI does not appear on the label, package, or item, non-HRI text SHOULD be used as backup information.

As a non-HRI text option, the data title (see section 3.2) may be associated with the data instead of using the AI numbers. See figure above which shows expiration date and lot number identified with non-HRI text and where in the same figure the same data is shown using the all-AI format. These presentations can be used with all GS1 AIDC data carriers using GS1 Application Identifiers, except GS1-128 symbology.

2. Font and legibility

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 a. A clearly legible font SHALL be used (e.g., OCR-B as defined in <i>ISO/IEC 301161073-2</i>) and the character set as defined in section 7.11. Reasonable alternative type fonts and character sizes are acceptable provided the interpretation is clearly legible. When applying the "clearly legible" principle, the following principles and examples separate a best practice versus below average implementation. i. Monospaced font types such as OCR-B or Sans serif font types such as Arial are preferred. ii. Bold, italics, light or narrow versions of a font SHOULD NOT be used. iii. The font size SHOULD be at least 2 millimetres (0.0787 inch) in height iv. Spaces SHALL NOT be encoded in the barcode. v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. e-b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrierbarcode overhead such as separator characters. c. Rule 3 When using GS1 element string syntax, although pParentheses are not encoded in
 i. Monospaced font types such as OCR-B or Sans serif font types such as Arial are preferred. ii. Bold, italics, light or narrow versions of a font SHOULD NOT be used. iii. The font size SHOULD be at least 2 millimetres (0.0787 inch) in height iv. Spaces SHALL NOT be encoded in the barcode. v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. e-b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrier barcode overhead such as separator characters. c. Rule 3 When using GS1 element string syntax, although pParentheses are not encoded in
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 ii. Bold, italics, light or narrow versions of a font SHOULD NOT be used. iii. The font size SHOULD be at least 2 millimetres (0.0787 inch) in height iv. Spaces SHALL NOT be encoded in the barcode. v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. e.b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrier barcode overhead such as separator characters. c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
 iii. The font size SHOULD be at least 2 millimetres (0.0787 inch) in height iv. Spaces SHALL NOT be encoded in the barcode. v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. c. b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrier barcode overhead such as separator characters. c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
 iv. Spaces SHALL NOT be encoded in the barcode. v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. e.b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrierbarcode overhead such as separator characters. c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
v. Spaces may be used in the HRI itself to ease manual data input. vi. The spaces between characters driven by the font type SHOULD NOT be reduced. e.b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrierbarcode overhead such as separator characters. c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
 vi. The spaces between characters driven by the font type SHOULD NOT be reduced. c. b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrierbarcode overhead such as separator characters. c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
 c. <u>b. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrier barcode</u> overhead such as separator characters. c. <u>Rule 3.</u> When using GS1 element string syntax, although pParentheses are not encoded in
c. Rule 3. When using GS1 element string syntax, although pParentheses are not encoded in
the barcode, parentheses SHALL surround AIs in HRI. but are not encoded in the GS1 AIDC data carrier.
3. URL
a. When the GS1 Digital Link URI syntax for trade item extended packaging applications is
encoded in a barcode, it is left to the brand owner's discretion to use the GS1 Digital Link URI in non-HRI text (e.g., GTIN only 09520123456788 or URL https://brand.example.com/01/09520123456788).
b. When AI (8200) appears on the object, the expression of the URL SHALL NOT appear in
HRI. If it appears in non-HRI text, it SHALL be expressed as http://brandowperassignedURL.com/GTIN (where GTIN expressed as 14 digits)
4. Data titles
As a non-HRI text option, the data title (see section 3.2) may be associated with the data
instead of using the AI numbers. See figure 4.14-1 which shows expiration date and lot
number identified with non-HRI text and where, in the same figure, the same data is shown using the all-AI format. These presentations can be used with all GS1 AIDC data carriers
using GS1 Application Identifiers, except GS1-128 symbology.
5. GS1 Logistics Label Commented [DM16]: WR22-327
a. HRI alongside a 2D GS1-2D symbolbarcode on a logistic label is not required if this is already present with the GS1-128 symbol, or is present as data titles and data content elsewhere on the label.
b. When a logistic label displays a 2D symbol barcode encoding transport process information
that is otherwise represented in human readable format (text or graphic) elsewhere o n the label, additional HRI of this information is not required.
c. On GS1 Logistics Labels HRI characters SHALL be no less than 3 mm (0.1181 inch) high.
b. Rule 4. A clearly legible font SHALL be used (e.g., OCR-B as defined in ISO 1073-2) and the character set as defined in section 7.11. Reasonable alternative type fonts and character sizes are acceptable provided the interpretation is clearly legible.
c.— Rule 5. Rule 6. HRI SHALL be limited to element strings and will not include GS1 AIDC data carrier overhead such as separator characters.
d. Rule 7. If the required barcode and associated HRI is marked directly on the part, then both satisfy the requirements for healthcare primary package marking (see section <u>2.1.4</u>) if the barcode can be scanned and the HRI is legible through a panel in the primary packaging.
e
are extreme space constraints (e.g., direct part marking). If the GS1 AIDC data carrier Commented [DM17]: WR22-327

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4.14.24.14.3 Manual date marking

Where regulations and/or trade partner agreements require applied date markings for stock rotation and manual identification, the ISO standard (8601) for date sequence SHOULD be used. The format SHOULD be YYYY-MM-DD preceded by the date type short form (See figure below for respective date types) based on ISO standard abbreviations (15223).

Figure 4.14	.3-1. Shor	t forms by	date type

Date type	Short form
Production	PROD
Packaging	PACK
Best Before	BEST
Expiration	EXP

AIDC techniques are suggested over any manual process to ensure accurate and timely stock rotation. Every effort should be made to adopt an automated process to increase productivity and date management.

4.15 Multiple barcode management practices for trade items (cross-sector)

When additional barcodes are introduced into an existing scanning environment or business application, all application standard conformant existing barcodes must SHALL remain acceptableas choices. This section provides a set of management practices intended to permit the use of multiple barcodes on the same packagetrade item.

Note: Additional barcodes encoded with GTIN and GTIN attributes such as lot number, serial number or expiry date are also stored in the respective master data records.

4.15.1 Multiple barcode management practices for trade items (all sectors)

- Current standards: All scanning systems SHALL deploy symbology identifiers (see section 5.1.3) and when using GS1 Application Identifiers, process them according to GS1 rules (see section 7.8).
- 2. **Use of GTIN:** All GS1 data carriers on a single trade item SHALL encode the same GTIN.
- Use of GTIN attributes: When the GTIN and GTIN attributes occur in multiple data carriers on a single trade item, the attribute values SHALL be the same.
- 2.4.GTIN plus attribute(s) flag: Whene applications require GTIN plus additional data to be captured in a multiple barcode symbol environment, modifications to systems should SHOULD be made to automate this requirement to optimise efficiency.
- Adjacent placement: Wherever-When two symbols-barcodes can be used for the same application (i.e., point-of-sale, point of care, POS, POC, general distribution) they SHOULD be

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Commented [DM23]: WR22-376 Multi barcode mgt

Commented [DM24]: WR23-056 Symbol placement

Commented [DM25]: WR22-376 Multi barcode mgt

Commented [DM26]: WR23-060



placed adjacent to each one another while maintaining their . Adjacent placement of symbols SHALL never infringe on symbol Quiet Zones. The orientation (stack or row of symbolsbarcodes) or sequence (which symbol barcode is placed on the left, right, top, or bottom) shall SHALL be determined by the brand owner. -Whenre adjacent placement on one panel surface of an object is not possible, the barcodes SHOULD be placed on an adjoining surface of the object. is not permitted based on space limitations, placement on adjacent panels SHOULD be attempted. This practice does not supersede any section 6 symbol barcode placement rule (e.g., 8 mm (0.3 inch) free space between symbols barcodes and panel edge.). 3.6. Non-adjacent placement: Wherever When two symbols barcodes are used for different applications (e.g., point-of-sale, POS, B2C extended packaging), they SHOULD be placed nonadjacent to one another. 4.7.Obscure placement: Wherever When a symbol barcode is used for production control purposes only (e.g., Data Matrix encoded with a non-GS1 syntax to match label to product), it SHOULD be made as obscure as possible or even obstructed on the trade item package. Product URL barcode indication: For barcodes encoding AI (01) (8200) see section 4.14 5___ Commented [DM27]: WR22-376 Human readable interpretation rules, rule 12.) 8. Use of GS1-128 or GS1 2D symbol barcode as supplemental symbol barcode with EAN/UPC or ITF-14 as the main symbolbarcode:- In general retail and general distribution, where EAN/UPC or ITF-14 is used to encode the GTIN and where a GS1-128 or GS1-2D symbol barcode is used to encode GTIN attributes, the same GTIN SHALL be encoded in all GS1 symbolsbarcodes. 6-9.GS1-128 as supplemental barcode: When an EAN/UPC or ITF-14 is used to encode GTIN and where GS1-128 is used to encode GTIN attributes, GS1-128 SHOULD encode GTIN and the GTIN attributes in a single barcode to ensure accurate data association. Commented [DM28]: WR22-376 7.<u>10.</u> Use of <mark>GS1</mark> 2D symbol <u>barcode</u> as supplemental symbol <u>barcode</u> with GS1-128 as main symbolbarcode: In general distribution, where GS1-128 is used to encode GTIN and attributes, these element strings at a minimum SHALL be encoded in the supplemental GS1 2D symbolbarcode. 4.15.2 GS1 multiple barcode management practice for general retail In addition to the requirements outlined in section 4.15.1, the following rules applies apply to the use of multiple barcodes for general retail. 1. Use of GTIN: All GS1 barcodes on a single trade item SHALL encode the same GTIN. 1. Use of GTIN attributes: When the GTIN and GTIN attributes occur in multiple barcodes on a single trade item, the attribute values SHALL be the same. Commented [DM29]: WR23-060 Migration to 2D barcodes: A GS1 DataMatrix, OR Code (GS1 Digital Link URI) or Data Matrix (GS1 Digital Link URI), SHALL be used in addition to the EAN/UPC, or a GS1 DataBar retail POS family of barcodes, to ensure stakeholders that are not yet able to consistently scan 2D barcodes are not negatively impacted. Application Standard Profiles in section 8 provide information on conformance requirements for the transition period and future use of 2D barcodes at retail POS. Commented [DM30]: WR22-376 Multi barcode mgt When there is more than one barcode with GTIN on trade items, it is essential that the POS systems will ensure: The system SHALL only process one set of the desired data in the final transaction. Scanning systems SHOULD only produce one acknowledgement (e.g., beep) when multiple barcodes are scanned from the same trade item. Important: If the points above are not implemented, unintended POS transactions may occur. Commented [DM31]: WR23-056 Symbol Placement GSCN

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When using GS1 DataBar Expanded or GS1 DataBar Expanded Stacked symbols to encode the Global Trade Item Number (GTIN), any required additional data SHOULD be included within the same symbol.

If GS1 DataBar is used on small items that do not need omnidirectional scanning capability, then GS1 DataBar Stacked, GS1 DataBar Limited, or GS1 DataBar Truncated SHOULD be used. GS1 DataBar Limited cannot be used to encode a GTIN-14 data structure with an indicator value greater than 1. Otherwise GS1 DataBar Truncated or GS1 DataBar Stacked must be used. GS1 DataBar Stacked is the smallest symbol; however, as the heights of both rows are very low, it is harder to scan and cannot be used with wand scanners. If space is available, GS1 DataBar Limited can be used for number structures that it can encode. Otherwise GS1 DataBar Truncated SHOULD be used for GTIN-14 data structures with an indicator value greater than 1.

If the symbol is a GS1 DataBar Composite symbol, then using a wider GS1 DataBar symbol such as GS1 DataBar Truncated instead of GS1 DataBar Limited may be preferable because the wider companion 2D Composite Component may result in a GS1 DataBar Composite symbol of lower overall height even though the GS1 DataBar component itself is slightly taller.

If the data capacity in a two-column or three-column CC-B 2D Composite Component is inadequate to encode the required 2D component's data message, then the linear component can be changed to increase the number of columns of the companion CC-B component. This will increase the maximum data capacity of the CC-B component as shown in the figure below.

Number of CC- B columns	Used with	Maximum numeric characters	Maximum alpha characters
2	GS1 DataBar Stacked GS1 DataBar Stacked Omnidirectional	95	55
3	GS1 DataBar Limited	219	127
4	GS1 DataBar Omnidirectional GS1 DataBar Expanded GS1 DataBar Expanded Stacked	338	196

Figure 5.5.8-1. Data capacity of CC-B

5.6 Two-dimensional barcodes - GS1 DataMatrix symbology

5.6.1 Introduction

This section of the *GS1 General Specifications* addresses some of the technical aspects of the twodimensional barcode symbology called GS1 DataMatrix. GS1 DataMatrix is a standalone, twodimensional matrix-barcode symbology that is made up of square modules arranged within a perimeter finder pattern. Unlike a Composite Component symbol (see section <u>5.11.1</u>), GS1 DataMatrix does not require a linear symbol. GS1 DataMatrix has been used in the public domain since 1994.

This section provides only a brief technical description and overview of the GS1 DataMatrix symbology. A more detailed technical specification can be found in the International Standard *ISO/IEC 16022*. The GS1 system has adopted GS1 DataMatrix partly because, like GS1 QR Code, GS1 DataMatrix can encode GS1 system data structures and offers other technical advantages. Its compact design and the existence of various production methods that accommodate placing the symbology onto various substrates offer certain advantages over other symbologies currently in the GS1 system.

Data Matrix ISO version ECC 200 is the only version that supports GS1 system data structures, including Function 1 Symbol Character (FNC1). The ECC 200 version of Data Matrix uses Reed-Solomon error correction and this feature helps correct for partially damaged symbols. In the remainder of this section, the ECC 200 version of Data Matrix is assumed when the symbology is described as GS1 DataMatrix. This version of Data Matrix is similar in stability to ISO versions of current GS1 system symbologies.

Implementation of GS1 DataMatrix SHALL be done per approved GS1 system application guidelines. This section will not describe the specific applications. The user needs to refer to specific application standards and guidelines in other sections of these *GS1 General Specifications* as they are approved

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Note: Scanning systems that need to read GS1 DataMatrix symbols must be 2D imaging scanners and be appropriately programmed to read the GS1 system version of Data Matrix or ECC 200.

5.6.3.7 Human readable interpretation of GS1 DataMatrix symbols

For human readable interpretation rules see section 4.14. For HRI rules specific to regulated healthcare retail consumer trade items, see section 4.14.1.

5.7 Two-dimensional barcodes - GS1 QR Code symbology

5.7.1 Introduction

This section of the *GS1 General Specifications* addresses some of the technical aspects of the twodimensional barcode symbology called GS1 QR Code. GS1 QR Code is a standalone, twodimensional matrix-barcode symbology that is made up of square modules arranged in an overall square pattern, including a unique finder pattern located at three corners of the symbol. Unlike a Composite Component symbol (see section 5.11), GS1 QR Code does not require a linear symbol.

This section provides only a brief technical description and overview of the GS1 QR Code symbology. A more detailed technical specification can be found in *ISO/IEC 18004:2015 Information technology* -- Automatic identification and data capture techniques -- QR Code bar code symbology specification. ISO/IEC QR Code also contains specifications for Micro QR Code, but this symbology is not supported in the GS1 system.

The GS1 system has adopted GS1 QR Code partly because, like GS1 DataMatrix, GS1 QR Code can encode GS1 system data structures and offers other technical advantages. Its compact design and the existence of various production methods that accommodate placing the symbology onto various substrates offer certain advantages over other symbologies currently in the GS1 system.

QR Code supports all GS1 system data structures, including Function 1 Symbol Character (FNC1). QR Code uses Reed-Solomon error correction (four selectable levels of error correction are specified) and this feature helps correct for partially damaged symbols.

Implementation of GS1 QR Code SHALL be done per approved GS1 system application standards. This section will not describe the specific applications. The user needs to refer to specific application standards in other sections of these *GS1 General Specifications* as they are approved for use.

GS1 QR Code symbols are read by two-dimensional imaging scanners or vision systems. Most other scanners that are not two-dimensional imagers cannot read GS1 QR Code. GS1 QR Code symbols are restricted for use with applications that will involve imaging scanners throughout the supply chain.

5.7.2 GS1 QR Code features and symbol basics

GS1 QR Code is a subset of ISO/IEC QR Code that is a matrix symbology with the following characteristics:

Formats:

- QR Code, with full range of capabilities and maximum data capacity.
- Not supported for the GS1 system: Micro QR Code, with reduced overhead, some restrictions on capabilities and reduced data capacity.

Encodable character set

- numeric data: digits 0 9
- alphabetic data: upper case letters A Z
- nine special characters: space \$ % * + . / :

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5.12.2 Dimensional specifications and operational requirements

Over the years, operational requirements of GS1 system users have influenced the dimensional specifications of GS1 system symbols and these dimensional specifications have in turn influenced the development of scanning system optics and printing processes. The dimensional requirements for each application area defined in section 2 are set out in the GS1 symbol specification tables (SSTs) (see section 5.12.3). Each SST provides the following barcode specification detail:

- The barcode(s) specified by the GS1 system for each application area.
- The minimum, target and maximum X-dimension (narrow element width) for the symbol, based on the scanning environment. Please note that a smaller X-dimension may result in a lower scanning performance.
- The minimum and target barcode height, based on the scanning environment. Please note that reducing the symbol height may result in a lower scanning performance.
- The Quiet Zone width and, for main and supplemental symbols, the minimum and maximum separation between the two symbols. (These measurements are expressed as multiples of the X-dimension in the form nX.)
- The minimum ISO quality specification expressed as g.g/aa/www, where g.g is the minimum overall symbol grade to one decimal place (on a 4.0 scale), aa is the effective measuring aperture in thousandths of an inch and www is the wavelength of the light source in nanometres.



Note: Please refer to section 2 for any specific application standard (such as section 2.1.6, *Healthcare secondary packaging* and section 2.6.14, *Permanently marked items*) that may supplement or supersede these symbol specification tables for specific application areas.

Before determining the exact symbol specification required, additional factors, such as the scanning environment, SHALL be considered. These are summarised in section <u>5.12.2.1</u>.

5.12.2.1 Role of the symbol's dimensional specifications

The four major dimensional specifications are the symbol's minimum, target and maximum Xdimensions and the symbol's minimum bar height. These dimensional characteristics are always specified for a particular operating environment. The minimum and maximum X-dimensions are determined by the scanner's operating range (field of view). The target X-dimension is the ideal size for a particular application and is only affected by the choice between linear or two-dimensional symbols (when the application allows for both symbol types). The barcode's height is determined by the ergonomic aspects of product handling when using a scanner. These dimensional specifications are critical for the efficient use of all scanners.

5.12.2.2 Omnidirectional scanning and the term magnification

The EAN/UPC symbology was originally designed for omnidirectional scanners. For this type of scanner, the specifications define a fixed relationship between the symbol's width and height. The term "fixed aspect ratio" is used to refer to this fixed proportion. For example, an EAN-13 symbol with an X-dimension of 0.330 mm (0.0130 inch), its nominal dimension, has a width of 37.29 mm (1.468 inch) and a bar height of 22.85 mm (0.900 inch). The term magnification has been used to refer to a range of sizes below, at, or above the nominal dimension (100% magnification) for EAN/UPC symbols used in the omnidirectional scanning environment. The symbol specification tables (SSTs) do not use magnification values and instead list the target, minimum and maximum values for the symbol's X-dimension and height.

5.12.2.3 Laser versus image-based scanning

Most scanners based on laser technology can scan all linear symbologies in the GS1 system. New laser and linear array scanners are even capable of scanning GS1 DataBar and Composite Component symbols. 2D Imaging technology, such as array scanners and vision systems, are capable of scanning all symbols in the GS1 system, including GS1 <u>approved_conformant 2D symbols</u> <u>barcodes</u> (GS1 DataMatrix,_<u>and</u>-GS1 QR Code, <u>GS1 DotCode</u>, <u>QR Code</u> (<u>GS1 Digitial Link URI</u>) and

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Data Matrix (GS1 Digitial Link URI)). Note that linear imagers, like laser scanners, cannot scan approved-2D symbolsbarcodes; only 2D or array imaging scanners can scan GS1 approved conformant 2D symbolsbarcodes, as well as camera based or vision systems.

5.12.2.4 Printing considerations

The functional and operative bands provide printers and labellers with the flexibility needed to produce quality symbols over a wide range of processes. Once a scanning operational environment is determined and the allowable specification range is known, the printer should be consulted for guidance on:

- The minimum recommended symbol size based on printing press or print characterisation tests.
- Colour/substrate considerations (e.g., separate print station for symbol or double ink layer).
- The optimum orientation of the symbol on the printed web (the direction of movement of the media in relation to a printing plate on a printing press).
- Direct part marking, such as is done by dot peening on items, requires special considerations for material properties.
- Laser or chemically etched parts with low contrast or light marked elements on a dark background (e.g., circuit boards and electronic components, medical instruments, surgical implants).
- High-speed ink jet printed parts and components where the marked dots cannot form a scannable linear symbol.
- Very small items that require a symbology with a square aspect ratio and/or cannot be marked within the allocated packaging space by existing GS1 DataBar and Composite symbols.

5.12.2.5 Packaging considerations

Once a scanning operational environment is determined and the allowable symbol characteristics are known, the package designer should be consulted to:

- Ensure the symbol will not be obstructed by other graphics or package design parameters (e.g., folds, creases, corner wraps, flaps, laminates, embossed logos/patterns, text).
- Ensure that only the symbol intended for scanning will be scanned (e.g., obscure all symbols on the individual units within larger trade items so that the individual units' symbols do not scan instead of the larger unit's symbol).

Section $\underline{\mathbf{6}}$ contains complete information on symbol placement criteria to meet quality and ergonomic needs.

5.12.2.6 GS1 system scanner functional operative bands

Symbol selection and specifications for AIDC application standards are centralised in the symbol specification tables. In establishing X-dimension specifications for symbol specification tables, the scanner functional operative bands below are normative as they illustrate X-dimension ranges deployed by industry based on GS1 standards. The twelve scanner functional bands that have evolved to meet user needs are illustrated in the figure below.





Figure 5.12.2.6-1. GS1 scanner functional operative bands

Note: Figure not to scale and target size for each functional band can be found in the symbol specification tables (see section <u>5.12.3</u>)

The scanner functional bands

- The omnidirectional scanners for general retail/POS band is primarily intended for general retail consumer trade items to provide orientation-free scanning in high-volume check-out lanes. Scanners are designed to read over-square symbols such as EAN/UPC and GS1 DataBar Retail POS family. The approximate average distance between scanner and symbol is 100 millimetres (4 inches).
- The linear barcodes for imaging scanners for retail pharmacies band is intended for regulated healthcare consumer trade items sold in a pharmacy or apothecary that is a separate retail store or a "controlled" area for distribution of healthcare trade items inside a larger retail operation. This band allows for the use of 2D symbols-barcodes but this functional band shows the X-dimension ranges used for linear barcodes. Over the counter trade items that are sold in retail pharmacy but also general retail are marked according to general retail scanning specifications.
- The fixed scanners in general distribution band is primarily intended to facilitate automated scanning of trade items packaged for transport and logistic units using fixed mount scanners. In this environment it is essential to maintain symbol height and location to achieve acceptable scan rates.

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5.12.3.1 Symbol specification table 1 - Trade items scanned in general retail POS and not general distribution

Main symbol(s) specified	X-dimension mm (inches)			(**) Minir	height for	Quiet	Zone	Minimum quality specification	
	(*) Minimum	Target	Maximum	For minimum X- dimension	For target X- dimension	For maximum X- dimension	Left		
EAN-13	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	11X	7X	1.5/06/660
EAN-8	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	14.58 (0.574")	18.23 (0.718")	36.46 (1.435")	7X	7 <i>X</i>	1.5/06/660
UPC-A	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	9 <i>X</i>	1.5/06/660
UPC-E	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	7 <i>X</i>	1.5/06/660
GS1 DataBar Omni- directional (****)	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	12.14 (0.478″)	15.19 (0.598″)	30.36 (1.195″)	None	None	1.5/06/660
GS1 DataBar Stacked Omni- directional (***) (****)	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	25.10 (0.988 ″)	31.37 (1.235″)	62.70 (2.469″)	None	None	1.5/06/660
GS1 DataBar Expanded	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	8.99 (0.354″)	11.23 (0.442″)	22.44 (0.883")	None	None	1.5/06/660
GS1 DataBar Expanded Stacked (*****)	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.75 (0.738″)	23.44 (0.923")	46.86 (1.845")	None	None	1.5/06/660

Figure 5.12.3.1-1. GS1 symbol specification table 1

Main symbol(s) Specified Plus Add-on 2 or 5	;	K-dimension mm (inches	n 5)	(**) Minimum symbol height for Qu given X mm (inches) Zo		Quiet Zone Symbols		Max separation between symbols	Quiet Zone	Min. Quality Spec.	
	(*) Minimum	Target	Maximum	For min. X- dimension	For target X- dimension	For max. X- dimension	Left		Right		
EAN-13 + 2	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	11X	7X	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660
EAN-13 + 5	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	11X	7 <i>X</i>	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660
UPC-A + 2	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	9 <i>X</i>	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660
UPC-A + 5	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	9 <i>X</i>	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660
UPC-E + 2	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	7 <i>X</i>	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660
UPC-E + 5	0.264 (0.0104")	0.330 (0.0130")	0.660 (0.0260")	18.28 (0.720")	22.85 (0.900")	45.70 (1.800")	9 <i>X</i>	7 <i>X</i>	12 <i>X</i>	5 <i>X</i>	1.5/06/ 660

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(*)	These barcodes may only be printed using an X-dimension below 0.264 millimetre (0.0104 inch) under the following conditions:
	 The allowance for X-dimensions between 0.249 millimetre (0.0098 inch) and 0.264 millimetre (0.0104 inch) is only applicable to on demand (e.g., thermal, laser) print processes. For all other printing processes, an X-dimension of 0.264 millimetre (0.0104 inch) is attainable and is the minimum allowable size.
	 When printing a minimum symbol with any method of printing, the area provided for printing the symbol and the required Quiet Zone SHOULD never be less than the area required for an X-dimension of 0.264 millimetre (0.0104 inch).
(**)	 The minimum symbol height dimensions listed for all symbologies including EAN/UPC symbols do not include the human readable interpretation.
	When printing a minimum symbol with any method of printing, the bar height SHALL never be truncated below the minimum as listed in the table above.
	Because of the operative scanning environment for EAN/UPC symbols, there is a direct relationship between the symbol's height and width. This means the minimum symbol height listed is tied to the minimum, target and maximum X-dimension listed. There is no maximum for the height, but if the maximum X-dimension is used, the symbol height must be equal to or greater than those listed in the Minimum Symbol Height column.
	 The minimum heights of EAN/UPC symbols do not include the extended bars: see section <u>5.2.3.2</u> for dimensions of the extended bars.
	 For GS1 DataBar Expanded Stacked symbols, the table reflects the minimum symbol height for symbols that are two rows in height.
(***)	In addition to the factors above related to digital printing, one other exception is permitted; For loose produce being weighed at the point-of-sale (POS) using GS1 DataBar Stacked Omnidirectional minimum X-dimension of 0.203 millimetre (0.0080 inch) is permitted but may produce scanning performance reduction. However, for POS, this performance drop off is not noticeable when the product must be weighed at the point-of-sale. Even with a slower scanning performance to conduct the transaction, the weighing process takes longer than the scanning process. For that reason, a lower minimum X-dimension should never be used on products crossing point-of-sale which are not weighed as loose produce during the scan event.
(****)	The current symbol specification for GS1 DataBar Omnidirectional (minimum height 33X) and GS1 DataBar Stacked Omnidirectional (minimum height 69X) indicate a square aspect ratio for the symbol segments. To enhance scanning performance, in an omnidirectional scanning environment, an over square aspect ratio SHALL be used following the example of the EAN/UPC symbology specification and rigorous field test of the GS1 DataBar symbology (46X or 95X).
(*****)	For North American coupon codes using GS1 DataBar Expanded Stacked in 2 row and 3 row configurations the X-dimension may be as low as 0.0080" (0.203mm) as long as a minimum overall bar height of 1.020" (25.91mm) is maintained. X-dimensions less than 0.0100" (.254mm) might not always be feasible for all GS1 DataBar coupon barcodes due to variables, such as printing process, symbol orientation and material. Due to the time sensitive nature of the coupon printing process, these variables should be considered during the design and barcode origination processes. Barcode verification should always be done from printing press proofs.



Figure 5.12.3.1-1 is used to determine the appropriate specifications for printing and quality control of the barcode used in the retail point-of-sale for products. In addition to the symbol used at general retail POS, an additional 2D symbol-barcode may be used to carry AI (8200). As AI (8200) has a mandatory association with GTIN, the GTIN within the symbol ensures compatibility with direct or indirect mode. GS1 DataMatrix is approved for all applications including regulated healthcare trade items covered by SSTs 6, 7, 8, 10 and 11, but for general retail consumer trade items, either GS1 QR Code or GS1 DataMatrix, QR Code with GS1 Digital Link URI and Data Matrix with GS1 Digital Link URI are GS1 approved-conformant options. When using 2D symbols-barcodes to carry AI (8200) on general retail trade items, the following specifications are required. For additional barcodes that carry GS1 Digital Link URIs (i.e. QR Code and Data Matrix), see figure 5.12.3.1-3 below.

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5.12.3.13 Symbol specification table 13 – Durable labelling and durable marking enabling long distance scanning

Symbol(s) specified	(*) X-dimension mm (inches)		Minimum symbol height for given X mm (inches)	Quiet Zone		Minimum quality specification
		Maximum		Left	Right	
GS1 DataMatrix (ECC 200)	0.495 (0.0195″)	3.50 (0.1378")	Height is determined by X-dimension and data that is encoded	1X on al	l four sides	1.5/(**)/660
GS1 QR Code	0.495 (0.0195″)	3.50 (0.1378")	Height is determined by X-dimension and data that is encoded	4X on al	l four sides	1.5/(**)/660
GS1-128 (****)	0.495 (0.0195")	0.940 (***) (0.0370")	12.70 (0.500")	10X on left and right side		1.5/(**)/660

Figure 5.12.3.13-1. GS1 symbol specification table 13

(*)	For optimal reader performance, a limited X-dimension range should be selected. For long distance scanning applications, X-dimensions greater than 1.75 mm (0.069") should be used.
(**)	For quality measurement of these GS1 symbols, the effective aperture should be 80% of the chosen X-dimension.
(***)	With an X-dimension at the upper end of the range, GS1-128 symbols have a limited data capacity because the maximum length is 165.10 mm (6.5"). See section <u>5.4.4.3</u> .
(****)	The GS1-128 symbol may not be readable at the same distance as the GS1 2D symbolsDataMatrix and GS1 QR Code.

Note: See section 2.7 to ensure the correct symbol specification table is used.



assess a given symbol as "Pass" whereas others could "Fail" it – a source of potential and, indeed, actual disagreements among suppliers and customers.

5.12.5.1.2 ISO/IEC verification

During the 1980s a group of experts from barcode and user industries working on all types of scanning systems determined the factors that most directly affect symbol-scanning performance and resulted in the analysis of the Scan Reflectance Profile (SRP). This methodology was originally known as ANSI verification because it was first described in the United States' standard ANSI X3.182, published in 1990 under the title *Bar Code Print Quality Guidelines*. The method was then defined in a European standard (*EN 1635*), originally published in 1995, and an International Standard (*ISO/IEC 15416*), originally published in 2000. *ISO/IEC 15416* is the definitive international specification of the ISO/IEC linear barcode verification methodology, and the numeric grading system is used.

The method, as described in the *ISO/IEC 15416* standard, is technically fully compatible with the ANSI X3.182 and *EN 1635* method, so verifiers based on these standards are not obsolete.

ISO/IEC 15415 is the equivalent definitive international standard for two-dimensional barcode symbols, with one methodology applicable to multi-row barcodes and the other to two-dimensional matrix symbols. In addition ISO/IEC TR 29158 Direct Part Mark (DPM) Quality Guideline is relevant when assessing the quality of symbols marked directly to the surface of an item.

In simple terms, an ISO/IEC verifier looks at the symbol in exactly the same way a scanner sees it. The ISO/IEC verifier reports its assessment of the symbol quality not as a single pass or fail decision, but as one of a range of four passing grades (from 4 to 1, in order of decreasing quality) or one failing grade (0). This enables an application to set the most appropriate minimum grade for acceptability. It may be noted that the ANSI standard uses the alphabetic scale A to D for passing grades and F for failing symbols, but the grade thresholds are identical.

The relationship between symbol grades measured in this way and the way the symbols behaved when they were scanned was so close that users rapidly came to accept the SRP assessment method for verifying symbols received from their trading partners. Users knew that as long as a symbol achieved grade 1.5 or better it would give them acceptable performance when they had to scan it to capture the encoded data.

Note: The GS1 system requires that the Quiet Zone be a measured parameter for EAN/UPC Symbology, GS1-128 symbols and ITF-14 symbols per the values expressed in *ISO/IEC 15416*, section 5. For GS1 DataMatrix it is equal to one X-dimension expressed in *ISO/IEC 16022* section 7 and for GS1 QR Code it is equal to four times the X-dimension expressed in *ISO/IEC 18004:2015*.

5.12.5.1.3 Types of verifiers

The *ISO/IEC 15426* standard, which is in two parts, defines the test methods and minimum accuracy criteria for verifiers using the methodologies of *ISO/IEC 15416* (for linear barcodes) and *ISO/IEC 15415* (for multi-row barcodes and two-dimensional matrix-barcode_symbols). *ISO/IEC 15426-1* relates to linear barcode verifiers and *ISO/IEC 15426-2* to two-dimensional barcode verifiers.

There are many types of verifier that meet the requirements of *ISO/IEC 15426*, some that are used in conjunction with a personal computer with special verification software for the symbol analysis and display/printing of results, while others are integrated stand-alone units. In addition, some verifiers may have interchangeable measuring apertures and light sources to enable measurement of symbols with a wide range of X-dimensions and to meet the illumination needs of differing application standards.

5.12.5.2 Measurement methodology

The symbol must be verified in its final configuration wherever possible (e.g., including overlaminate, package material, contents), but if this is not feasible, the following procedure is recommended to allow for the effects of show-through.

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Place the symbol to be verified on a flat surface. If the substrate is not opaque (allows light through), perform the verification procedure with the symbol on a dark surface and then repeat it on a light surface. Take the poorer set of results, unless it is known what type of material is likely to back the symbol in practice, in which case attempt to match it.

5.12.5.3 Symbol grading

Symbol Grading for linear symbols consisting of the following topics is found in section 6 of *ISO/IEC* 15416:

- Scan Reflectance Profile (SRP) grading (further explained in normative reference Annex B of *ISO/IEC 15416*).
- Decode.
- Reflectance parameter grading (including the Reflectance Parameter Grading figure).
- Decodability (including the Decodability Grades figure; also covered in normative reference Annex A of *ISO/IEC* 15416).
- Expression of symbol grade.
- Symbol grading process flowchart is available from normative reference Annex C of ISO/IEC 15416.
- Guidance on the verification report template is available in section <u>5.12.7</u> Barcode verification template.

Symbol Grading for two dimensional symbols consisting of the following topics can be found in section 5 of *ISO/IEC 15415*:

- Expression of quality grades.
- Overall Symbol Grade.
- Reporting of the Symbol Grade.
- Symbology-specific parameters and values for symbol grading (further explained in normative reference Annex A of *ISO/IEC 15415*).
- Symbology grading flowchart for two-dimensional matrix-barcode symbols (further explained in informative reference Annex B of *ISO/IEC 15415*).
- Guidance on selection of grading parameters in application specification available from informative reference Annex D of ISO/IEC 15415.

5.12.5.4 Substrate characteristics

Substrate characteristics consisting of the following topics are found in the informative reference Annex D of *ISO/IEC 15416* and informative reference Annex E of *ISO/IEC 15415*

- Substrate opacity
- Gloss
- Over-laminate
- Static reflectance measurements
- Prediction of symbol contrast
- Prediction of minimum edge contrast (Ec_{min}) and modulation (MOD)
- Acceptability of measured and derived values

5.12.5.5 Interpretation of the scan reflectance profile and profile grades

Interpretation of the scan reflectance profile (SRP) and profile grades consisting of the following topics is found in the informative reference Annex E of *ISO/IEC 15416* and informative reference Annex C of *ISO/IEC 15415*:

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- Significance of SRPs
- Interpretation of results
- Matching grades to applications
- Alphabetic grading

5.12.5.6 Comparison with traditional methodologies

Comparison with traditional methodologies consisting of the following topics is found in the informative reference Annex I of *ISO/IEC 15416:*

- Traditional methodologies
- Correlation of print contrast signal with symbol contrast measurements
- Guidance on grading for applications also specifying print contrast signal (PCS)

5.12.5.7 Process control requirements

Process control requirement methodologies consisting of the following topics are found in the informative reference Annex J of *ISO/IEC 15416:*

- Process control for repetitive printing
- Number of scans
- Bar width deviation
- Two-width symbologies
- (n,k) symbologies
- Average bar gain/loss

Average bar error is not graded directly, but is used to calculate what fraction of a defined bar tolerance is consumed by the printing process. This traditional bar tolerance calculation differs by symbology and, in the case of the EAN/UPC symbology, it also differs by the X-dimension at which the symbol is printed. Generally, a smaller X-dimension yields a smaller tolerance.

5.12.5.8 Compliance statement

Verifiers that are suitable for use with the recommendations contained in these *GS1 General Specifications* will typically be supplied with a statement that associates the instrument with a calibration conformance test card.

5.12.5.9 Calibrated conformance standard test cards

The verifier operator may use a variety of tools and procedures to periodically ensure maintenance of the verifier's calibration. For example, the operator may follow the manufacturer's recommended procedure for set-up, programming (if necessary), normal operational calibration and use of the verifier prior to performing any tests. Indeed such procedures are considered essential to ensure the consistency of verification results over time.

Some verifier manufacturers may require the operator to utilise a calibration patch designed for use in maintaining instrument calibration. A common form of patch is often referred to as a "reflectance patch," which may be provided with the instrument. It is very important that the manufacturer's instructions are followed carefully and conscientiously to properly calibrate the instrument. An indication of "calibration complete" normally signals successful recalibration of the device. Other manufacturers may require periodic factory calibration of their verifier to maintain proper calibration.

With the increasing use of verifiers as communication tools, all verifiers must be periodically checked for their calibration conformance to a traceable standard (within accuracy and repeatability limits stated by the manufacturer). For this reason, Calibrated Conformance Standard Test Cards are available for the verifier user.

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Technical parameters to ensure systematic and stable interpretation of labels.

6.6.2 Concepts

6.6.2.1 Logistics information flow

As a logistic unit moves through the supply chain, a series of events occurs that defines the information related to the unit. The whole supply chain process of manufacturing, finished goods distribution, transportation and deployment into the marketplace adds layers of information related to the logistic unit.

For example, the physical content of the unit is typically defined at finished goods distribution. At that point in time the identification of the logistic unit as an entity is possible. Other elements of information, such as final destination or the composition of a multi-unit shipment, are not typically known until later in the supply chain process. In a trading relationship, different elements of information are generally known and applied by the supplier, carrier and customer.





6.6.2.2 Representation of information

The information included on a GS1 Logistic Label comes in two basic forms.

- 1. Information to be used by people: This is comprised of HRI, non-HRI text and graphics.
- 2. Information designed for data capture by a machine: Barcodes.

Barcodes are machine readable and are a secure and efficient method for conveying structured data, while HRI, non-HRI text and graphics allow people general access to basic information at any point in the supply chain. Both methods add value to GS1 Logistic Labels and often co-exist on the same label.

6.6.3 GS1 Logistic Label design

The GS1 Logistic Label information may be grouped into logical segments for the supplier, customer and carrier. Each label segment may be applied to the logistic unit at a different point in time as the relevant information becomes known.

In addition to this, on the GS1 Logistic Label a distinction can be made between the types of data communicated on the GS1 Logistic Label, in order to facilitate interpretation by machines and people. For this purpose the data can be expressed in three types of building blocks.

The SSCC is the single mandatory element for all GS1 Logistic Labels. Other information, when required, SHALL comply with the specifications in this document and with the proper use of GS1 Application Identifiers.

6.6.3.1 Building blocks

The GS1 Logistic Label comprises three building blocks:

- 1. The top building block may contain anything, e.g., text and graphics. This may include extra information about the logistic unit that is not encoded in the barcode(s).
- The middle building block contains non-HRI text reflecting the information represented in the barcode(s) using data titles rather than AIs and optionally additional information not represented in barcodes (preferably including data titles).

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 The bottom building block contains the barcode(s) including human readable interpretation (HRI).

Only the bottom building block is mandatory.

A GS1-2D symbolbarcode, if used, SHOULD be placed to the right of the non-HRI text including data titles within the middle building block. See option 2 in the figure below.

If there is enough space, the lower two building blocks may be placed side by side. See option 3 in figure below.



*Minimum requirement

6.6.3.2 Segments

A segment is a logical grouping of information that is generally known at a particular time. There may be up to three label segments on a GS1 Logistic Label, each representing a group of information. Generally, the order of the segments, from top to bottom, is: carrier (transport), customer and supplier. However, this order and top/down alignment may vary depending on the size of the logistic unit and the business process being served.

Each segment may contain a combination of the defined building blocks as determined by trading partners.

Segments may be printed as separate labels, in which case they must be placed vertically in close proximity of each other, with the segment containing the SSCC at the bottom. The carrier segment may be replaced during the journey of the logistic unit, in which case special care should be taken to ensure the customer and supplier segments are preserved.



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6.6.3.2.1 Supplier segment

The supplier segment of the label contains information that is generally known at the time of packaging by the supplier. The SSCC is applied here as the logistic unit identifier, along with the Global Trade Item Number (GTIN) if included on the label.

Other information that may be of interest to the supplier but might also be useful for customers and carriers can be applied. This includes product-related information such as product variant; dates such as production, packaging, expiration and best-before dates; and lot, batch and serial numbers.

6.6.3.2.2 Customer segment

The customer segment of the label contains information that is generally known at the time of order and order processing by the supplier. Typical information includes the ship to location, purchase order number and customer-specific routing and handling information. If several logistic units are assembled to be transported under one despatch advice or Bill of Lading (BOL) to one customer the GSIN, AI (402), may also be applied in this customer segment.

6.6.3.2.3 Carrier (transport) segment

The carrier (transport) segment of the label contains information that is generally known at the time of shipment and is typically related to transport. Typical information includes ship to postal codes, AI (420), Global Identification Number for Consignment, AI (401) and carrier-specific routing and handling information.

6.6.4 Technical specifications

6.6.4.1 Barcodes and HRI

6.6.4.1.1 Barcode orientation and placement

GS1-128 barcodes SHALL be placed in a picket fence orientation relative to the base of a logistic unit, this means, the bars and spaces are perpendicular to the base on which the logistic unit stands. In all cases, the GS1-128 barcode encoding the SSCC SHALL be placed in the lowest portion of the label.

A GS1 2D symbolbarcode, if used, SHOULD be placed immediately to the right of the middle building block. When a GS1-2D symbol-barcode is used, the symbol's quiet zone requirements must be respected.

6.6.4.1.2 HRI

As a back-up key entry and diagnostic aid, a human readable interpretation (HRI) of each barcode element string encoded in a GS1-128 SHALL be provided. For each element string included in a GS1 2D symbol-barcode that is not present in a GS1-128 symbol on the label either HRI associated with the GS1-2D symbolbarcode(s) or non-HRI text with data titles SHALL be provided. For more information see the general HRI rules for barcodes in section 4.14.

6.6.4.2 Non-HRI text including data titles

Text with data titles is non-HRI text designed to support manual operations and to facilitate key entry in menu driven systems. It may be used to specify the text equivalent of the data elements represented in barcodes and is comprised of data titles and data content. The data content SHOULD be at least 7 millimetres/0.275 inches in height. If there is no other language agreed between trading partners, data titles must be printed in English. As an option left at the discretion of the labeller, a second language can be added.

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6.6.4.3 Data titles

Data titles are the standard abbreviated descriptions of element strings, used to support the manual interpretation of encoded data. Data titles SHOULD be used adjacent to all data fields included in the middle building block. Data titles may also be used adjacent to barcodes and HRI.

All data titles are shown in section 3.2.

6.6.4.4 Free format

Free format information may be comprised of non-HRI text and graphics. The name and address of the sender and receiver are typical examples of non-HRI text. Company logos and instruction pictograms are examples of graphics. All non-HRI text included in the top building block SHALL be clearly legible and no less than 3 millimetres/0.118 inches high.

6.6.4.5 Label dimensions

The physical dimensions of the label are determined by the labeller, but the size of the label should be consistent with the data requirements of the label. Factors influencing label dimensions include the amount of data required, the content and X-dimension of the barcodes used and the dimensions of the logistic unit to be labelled. The business requirements for most users of GS1 Logistic Labels are met by using one of following:

- A6 (105 mm x 148 mm), which is particularly suitable when only the SSCC, or the SSCC and limited additional data, is encoded.
- 4 x 6 inch, which is particularly suitable when only the SSCC, or the SSCC and limited additional data, is encoded.

-or-

- A5 (148 mm x 210 mm).
- 6 x 8 inch.

6.6.4.6 Label location

Label placement specifications are maintained in section 6.7.

6.6.5 Label examples

Figure 6.6.5-1. The basic label: an SSCC



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Notes:

This example shows a label containing only an SSCC. Such labels can be applied at production time, but also during transport or receipt in case no label is present on the logistic unit.

Building blocks (top-down):

- Middle block (Text with data titles): SSCC.
- Bottom block (Barcodes + HRI): AI (00).

Figure 6.6.5-2. Label with combined supplier and carrier information



Notes:

This example shows a pallet label that may be applied at the time of transport. Besides information on the logistic unit it contains information on the route and destination.

Building blocks (top-down):

- Top block: Von/From; An/To.
- Middle block (text with data titles): SSCC; ROUTE; Dimensions/Weight; Billing No.

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Bottom block (barcodes and HRI): AI (403); AI (401); AI (00).



Figure 6.6.5-3. Label with supplier and carrier segments

Notes:

This example shows a case label that may be applied at the time of transport. Besides the SSCC it contains information on the route and destination.

Segments and building blocks (top-down):

- Carrier segment (middle block and bottom block side by side):
 - Top block: FROM; TO.
 - Middle block (text with data titles): CARRIER; B/L; PRO.
 - Bottom block (barcodes and HRI): SHIP TO POST.
- Supplier segment:
 - Bottom block (barcodes and HRI): SSCC; AI (00).



Figure 6.6.5-4. Label with supplier information



Notes:

This example shows a pallet label that may be applied at the time of production. It contains information on the supplier and the trade item, but no information on the transport and customer.

Building blocks (top-down):

- Top block: SUPPLIER NAME.
- Middle block (text with data titles): SSCC; CONTENT; COUNT; BEST BEFORE; BATCH.
- Bottom block (barcodes and HRI): AI (02); AI (15); AI (10); AI (37); AI (00).

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Figure 6.6.5-5. Label with supplier, customer and carrier segments

Notes:

This example shows a case label that may be applied in a cross-docking scenario. Besides the SSCC it contains transport information and information on the final customer destination.

Segments and building blocks (top-down):

- Carrier segment (middle block and bottom block side by side):
 - Top block: FROM; TO.
 - Middle block (text with data titles): Carrier; B/L; PRO.
 - Bottom block (barcodes and HRI): SHIP TO POST.
- Customer segment:
 - Top block: PO; DEPT.
 - Middle block (text with data titles): Customer.
 - Bottom block (barcodes and HRI): Store Number.
- Supplier segment:
 - Bottom block (barcodes and HRI): SSCC; AI (00).



Figure 6.6.5-6. Label with GS1-128 and GS1 DataMatrix symbols

FJP CARRIERS				
FROM	GS1 Avenue Louise 326 1050 BE BRUXELLES BE - Belgique GLN: 9501101100015			
то	TO Hr. F. van den Bim Kerkstraat 319 1500 KM Wormerveer NL - Nederland			
X	k			
ROUTE	SSCC 39501101 001300012 9 ROUTE 123+1021JK+0320+12 SHIP TO POST 528 1500KM			
SSCC	(00) 3 9501101 001300012 9			

Notes:

This example shows a label that may be applied in a parcel delivery scenario. Building blocks (top down):

- Top block: Transport Carrier, From address with phone number, To address
- Middle block (text with data titles): SSCC, Routing Code, Ship to Deliver to postal code with country code

GS1 2D symbol (GS1 DataMatrix): AI (00), AI(403), AI(421)

Bottom block (barcodes and HRI): AI(00)



MINCHINBURY ABC Transport NSW Service: EXPRESS Depot: MEL VOLUME GROSS WEIGHT ITEM 55.0 kg 2.72 m3 6 OF 12 From: SHIPPING COMPANY MULGRAVE VIC 3170 [™]Wolescash DC A.T.L Huntingwood Rd **MINCHINBURY NSW 2770** SSCC:(00)09312345000000012

Figure 6.6.5-7. Label with GS1 DataMatrix and GS1-128 symbols

Notes:

This example shows a label created specifically for transport purposes. No product information is included.

Building blocks (top-down):

- Top block: Transport Company, Weight, Volume, Item count, Service class
- Middle block:
 - GS1 approved 2D Symbol (GS1 DataMatrix): AI (00), AI(421), AI(401), AI(403),
- Bottom block (barcodes and HRI): AI (401); AI (00)



Figure 6.6.5-8 Label GS1 DataMatrix encoding transport process information



Notes:

This example shows a label that may be applied in a parcel delivery scenario with transport process information encoded in a 2D symbolbarcode.

- Top block Transport carrier, From address with phone number, To address
- Middle Block (text with data title) SSCC, Routing Code, Ship-to / Deliver-to postal code with country code, GS1 DataMatrix with transport process information
- Bottom block (barcode and HRI)- AI (00)

6.7 Symbol placement used in general distribution

General distribution scanning items include any item handled as a single unit in the transport and distribution process. This definition covers a wide variety of package types, such as pallets, cartons, cases, bins and totes. These items can be trade items and/or logistic units.

Barcode scanning may be carried out manually or automatically and the recommended symbol location cannot be optimised for one or the other in an open supply chain scenario. These guidelines have been prepared with the objective to reduce overall supply chain cost but in the full knowledge that implementation will only be driven by a proven (supply chain) business-case.

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14. In some cases, all four can be used, but in other cases, only one, two, or three formats are permitted.

- Mandatory attribute(s): An identifier is always required and in some applications an attribute is mandatory. For example, variable measure trade items with a GTIN also require an attribute for weight or measure.
- Optional attribute(s): Section <u>3.2</u> provides a list of all GS1 Application Identifiers and data that is defined by GS1 for use in barcodes. All attributes that support the GS1 identification key in use are optional if not listed as mandatory. The party responsible for labelling the object is responsible for determining if optional attributes are needed.
- Data carrier choices: There are various data carriers approved within GS1 AIDC application standard. Each AIDC application standard records which data carriers are conformant. In some cases, there may also be one required data carrier and another that can be used in addition to the first.
- Barcode size and quality specifications: Each AIDC application standard that includes a barcode has specifications for size and print quality minimums. Conformity to these specifications and proper placement ensures the barcode has a high likelihood of scanning successfully in the required scan environment.
- GS1 syntax: GS1 AIDC data carriers support four different syntaxes. Each syntax defines a
 structured approach to representing data when it is encoded so that it can be correctly
 interpreted and processed when it is decoded.

8.2 ASP 1: Fixed measure trade items scanned at retail POS

ASP 1 applies to trade items that are intended for scanning at retail point-of-sale, are fixed measure (i.e., not sold based on variable weight or variable measure) and are not intended for general distribution scanning. Examples include trade items such as milk, soup cans, a hat, a lamp, a tennis racket, a battery pack, or a toy.

Note: ASP 1 does not apply to products sold or dispensed in a controlled environment (e.g., pharmacy, hospital) nor does it apply to books and serial publications where additional identification, data carrier, specifications and/or rules apply.

Conformance requirements	General retail products		
Basis of conformance requirements	Section $2.1.3.1$ Fixed measure trade items scanned at retail POS using GTIN-12 or GTIN-13		
	Section 2.1.3.2 Fixed measure trade items scanned at retail POS using GTIN-12 carried by a UPC-E barcode		
	Section 2.1.3.3 Fixed measure trade items scanned at retail POS using GTIN-8		
	Section $2.1.3.6$ Fixed measure fresh food trade items scanned at retail POS		
Identifier choices	GTIN-8, GTIN-12, GTIN-13		
Mandatory attribute(s)	N/A		
Optional attribute(s)	See section 3.2 for the list of GS1 Application Identifiers that may be used with the identifier		
Mandatory choices for a data carrier	EAN-8, EAN-13, UPC-A, UPC-E, GS1 DataBar Omnidirectional, GS1 DataBar Stacked Omnidirectional, GS1 DataBar Expanded, GS1 DataBar Expanded Stacked		

Figure 8.2.1 ASP 1 conformance requirements

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Conformance requirements	General retail products
Agreement on conformant data carriers in the future	Any one of the mandatory data carriers or any one of the data carriers below will be conformant in the future once POS system support for these three 2D data carriersbarcodes below reached pervasive adoption and becomes part of the global application standards. In the migration period, one of the data carriers below may be used in addition to the mandatory data carrier selected. GS1 DataMatrix Data Matrix (GS1 Digital Link URI)
	QR Code (GS1 Digital Link URI)
Barcode size and quality specifications	Figure <u>5.12.3.1-1</u> Symbol specification table 1 contains barcode quality and size specifications for trade items scanned in general retail POS and not general distribution
	Figure $5.12.3.1-3$ Symbol specification table 1 addendum 2 for 2D barcodes
Mandatory choices for GS1 syntax	Plain, GS1 element string
Agreement on conformant syntax in the future	Any one of the mandatory GS1 syntaxes or the uncompressed form of GS1 Digital Link URI syntax SHALL be conformant in the future once the POS system support for interoperability between all three GS1 syntaxes has reached pervasive adoption and becomes part of the global application standards.

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Note: A data carrier with GS1 Digital Link URI to support consumer mobile devices may be used in addition to the mandatory POS data carriers selected.

Figure 8.2.2 ASP 1 cross-application rules

Cross-application rules	Description	Section
GTIN rules	Rules for GTIN management of uniqueness and allocation, and responsibility for allocation.	<u>4.2</u>
	Rules that apply when a company changes legal status as a result of an acquisition, merger, partial purchase, split, or "spin-off."	Error! Reference source not found.Error! Reference source not found.1.6
Data relationships	Rules for allowed combinations of element strings on the same physical entity, irrespective of the data carrier(s) applied to the entity.	4.13
Human readable interpretation	Human readable interpretation (HRI) rules used to standardise printing requirements and facilitate training of staff on how to deal with GS1 AIDC data carriers that fail to scan or read.	4.14
Multiple barcode management	Rules for implementing multiple barcodes on the same trade item.	<u>4.15</u>
Symbol placement	Rules for barcode placement on trade items that will be scanned at point-of-sale.	<u>6.3</u>



Figure 8.2.3 ASP 1 related technical specifications

Related technical specifications	Description	Section
GS1 Application Identifiers in numerical order	Descriptions of the meaning, structure and function of the GS1 system element strings so they can be correctly processed in users' application programmes. An element string is the combination of a GS1 Application Identifier and a GS1 Application Identifier data field. Also see <u>GS1 Application Identifiers browser</u>	<u>3.2</u>
Data carrier specifications	EAN/UPC family technical specifications	<u>5.2</u>
	GS1 DataBar family technical specifications	<u>5.5</u>
Check digit calculations	The algorithm used for check digit calculations	<u>7.9</u>
The GS1 subset of International Standard ISO/IEC 646	Lists all characters allowed for use in GS1 Application Identifier (AI) element strings.	7.11

8.3 ASP 2: Fixed measure trade items scanned at retail POS and in general distribution

ASP 2 applies to trade items that are intended for scanning at retail point-of-sale and are fixed measure (i.e., not sold based on variable weight or variable measure). Unlike ASP 1 they are also intended for general distribution scanning. Examples of these products might be a microwave oven or large bag of animal feed.

Conformance requirements	Fixed Measure POS and General Distribution
Basis of conformance requirements	Section $2.1.4$ Fixed measure trade items scanned in general distribution and at retail POS
Identifier choices	GTIN-8, GTIN-12, GTIN-13
Mandatory attribute(s)	N/A
Optional attribute(s)	See section 3.2 for the list of GS1 Application Identifiers that may be used with the identifier
Mandatory choices for a data carrier	EAN-8, EAN-13, UPC-A, UPC-E, GS1 DataBar Omnidirectional, GS1 DataBar Stacked Omnidirectional, GS1 DataBar Expanded, GS1 DataBar Expanded Stacked
Agreement on conformant data carriers in the future	Any one of the mandatory data carriers or any one of the data carriers below will be conformant in the future once POS and general distribution system support for these three 2D data-carriersbarcodes below reaches pervasive adoption and becomes part of the global application standards. In the migration period, one of the data carriers below may be used in addition to the mandatory data carrier selected.
	GS1 DataMatrix
	 Data Matrix (GS1 Digital Link URI)
	 QR Code (GS1 Digital Link URI)
Barcode size and quality specifications	Figure 5.12.3.3-1. Symbol specification table 3 Figure 5.12.3.3-2 Symbol specification table 3 addendum 1 for 2D barcodes
Mandatory choices for GS1 syntax	Plain, GS1 element string

Figure 8.3.1 ASP 2 conformance requirements

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Conformance requirements	Fixed Measure POS and General Distribution
Agreement on conformant syntax in the future	Any one of the mandatory GS1 syntaxes or the uncompressed form of GS1 Digital Link URI syntax SHALL be conformant in the future once the POS system support for interoperability between all three GS1 syntaxes has reached pervasive adoption and becomes part of the global application standards.

Note: A data carrier with GS1 Digital Link URI to support consumer mobile devices may be used in addition to the mandatory POS data carriers selected.

Figure 8.3.2 ASP 2 cross-application rules

Cross-application rules	Description	Section
GTIN rules	Rules for GTIN management of uniqueness and allocation, and responsibility for allocation.	<u>4.2</u>
	Rules that apply when a company changes legal status as a result of an acquisition, merger, partial purchase, split, or "spin-off."	Error! Reference source not found.Error! Reference source not found.1.6
Data relationships	Rules for allowed combinations of element strings on the same physical entity, irrespective of the data carrier(s) applied to the entity.	4.13
Human readable interpretation	Human readable interpretation (HRI) rules are provided to standardise printing requirements and facilitate training of staff on how to deal with GS1 AIDC data carriers that fail to scan or read.	4.14
Multiple barcode management	Rules for implementing multiple barcodes on the same trade item.	<u>4.15</u>
Symbol placement	Rules for barcode placement on trade items that will be scanned at point-of-sale.	<u>6.3</u>
	Rules for barcode placement on trade items that will be scanned in general distribution environments.	<u>6.7</u>

Figure 8.3.3 ASP 2 related technical specifications

Related technical specifications	Description	Section
GS1 Application Identifiers in numerical order	This section describes the meaning, structure and function of the GS1 system element strings so they can be correctly processed in users' application programmes. An element string is the combination of a GS1 Application Identifier and a GS1 Application Identifier data field. Also see <u>GS1 Application</u> <u>Identifiers browser</u>	<u>3.2</u>
Data carrier specifications	EAN/UPC family technical specifications	<u>5.2</u>
	GS1 DataBar family technical specifications	<u>5.5</u>
Check digit calculations	The algorithm used for check digit calculations	<u>7.9</u>

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Related technical specifications	Description	Section
The GS1 subset of International Standard ISO/IEC 646	Lists all characters allowed for use in GS1 Application Identifier (AI) element strings.	7.11

8.4 ASP 3: Variable measure trade items scanned at retail POS

ASP 3 applies to trade items that are intended for scanning at retail point-of-sale, are variable measure (i.e., are sold based on variable weight or variable measure) and are not intended for general distribution scanning. Examples include fruits, vegetables, dairy items, bakery items, meat and poultry sold by weight or measure.

Figure 8.4.1 ASP 3 conformance requirements		
Conformance requirements	Variable measure fresh food using GTIN + count/weight	Variable measure fresh food using restricted circulation number (RCN)
Basis of conformance requirements	Section $\underline{2.1.12.1}$ Variable measure fresh food trade items scanned at retail POS using GTIN	Section 2.1.12.2 Variable measure fresh food trade items scanned at retail POS using RCN
Identifier choices	GTIN-12, GTIN-13	RCN-12, RCN-13
Mandatory attribute(s)	SHALL have at least one of the following GS1 Application Identifiers: AI(30)/AI(31nn)/AI(32nn)/AI(35nn)/AI(36nn)	N/A
Optional attribute(s)	See section <u>3.2</u> for the list of GS1 Application Identifiers that may be used with the identifier	N/A
Mandatory choices for a data carrier	GS1 DataBar Expanded, GS1 DataBar Expanded Stacked	EAN-13, UPC-A
Agreement on conformant data carriers in the future	Any one of the mandatory data carriers or any one of the data carriers below will be conformant in the future once POS system support for these three 2D data carriers barcodes below reaches pervasive adoption and becomes part of the global application standards. In the migration period, one of the data carriers below may be used in addition to the mandatory data carrier selected. GS1 DataMatrix Data Matrix (GS1 Digital Link URI)	N/A
	QR Code (GS1 Digital Link URI)	
Barcode size and quality specifications	Figure 5.12.3.1-1 Symbol specification table 1 contains barcode quality and size specifications for trade items scanned in general retail POS and not general distribution Figure 5.12.3.1-3 Symbol specification table 1 addendum 2 for 2D barcodes	Figure 5.12.3.1-1 Symbol specification table 1 contains barcode quality and size specifications for trade items scanned in general retail POS and not general distribution
Mandatory choices for GS1 syntax	GS1 element string	Plain

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9 GS1 Standards glossary of terms

9.1 GS1 glossary of terms and definitions

The glossary lists the terms and definitions that are applied in this document. Please refer to the $\underline{www.gs1.org/glossary}$ for the online version.

renn	Deminion		
acceptance criteria	An allowance for a small measurement variation between commercial verifiers or operators during barcode verification testing.]	
add-on symbol	A barcode used to encode information supplementary to that in the main EAN/UPC barcode.	1	
aggregated packaging (per EU 2018/574)	Any packaging containing more than one unit packet of tobacco products. For GS1, this may be either a trade item grouping or logistics unit.		
AIDC media	The specific form of object/entity where a GS1 AIDC data carrier is displayed.		
AIDC media type	The code list for objects/entities (e.g., patient wristband or staff ID card) that displays or carries a GS1 AIDC data carrier.		
AIDC media type value	A predefined tow-digit numeric code list value used to signify the AIDC media type (e.g., ID = 10, patient wristband = 01)		Commented [DM27]: WR22-
AIM DotCode	A two-dimensional barcode symbology rendered by printing dots per the AIM DotCode Specification.		
allocation	The association of an issued GS1 Prefix, GS1 Company Prefix, or GS1 identification key to its corresponding entity or object in accordance with the GS1 rules and policies.]	
alphanumeric	A character set that contains alphabetic characters (letters), numeric digits (numbers) and other characters, such as punctuation marks.]	
aperture	A physical opening that is part of the optical path in a device such as a scanner, photometer, or camera. Most apertures are circular, but they may be rectangular or elliptical.]	
Application Standard Profile	A template that records conformance requirements of existing and any future AIDC application standards, the normative decisions (MSWG, ISO, Regulation,), maintains centralisation of cross-application rules and related technical specifications.		
asset type	A component of the Global Returnable Asset Identifier (GRAI), assigned by the asset owner or manager, in order to create a unique GRAI.	1	
attribute	Additional information about an entity identified with a GS1 identification key.	1	
autodiscrimination	The capability of a reader to automatically recognise and decode multiple barcode symbologies.]	
automatic identification and data capture (AIDC)	A technology used to automatically capture data. AIDC technologies include barcodes, smart cards, biometrics and RFID.]	
auxiliary patterns	Components of the EAN/UPC symbology. The centre guard bar pattern, the left guard bar pattern and the right guard bar pattern are examples of these.]	
bar gain/loss	The increase/decrease in bar width due to effects of the reproduction and printing processes.		
barcode	A symbol that encodes data into a machine readable pattern of adjacent, varying width, parallel, rectangular or square dark and light spaces. <u>The term barcode is inclusive of all linear</u> and two-dimensional (2D) versions.		
barcode verification	The assessment of the printed quality of a barcode based on ISO/IEC standards using ISO/IEC compliant barcode verifiers.	1	
base unit	In a hierarchy of trade item groupings, the consumer trade item level or unit of use.		
Basic Unique Device Identifier – Device Identifier (UDI-DI)	The Basic UDI - DI is a unique identifier specific to a medical device product family. It is represented by GS1's Global Model Number (GMN).		
batch/lot	Associates an item with information the manufacturer considers relevant for traceability of the trade item.	1	
bearer bars	Bar abutting the tops and bottoms of the bars in a barcode or a frame surrounding the entire symbol, intended to equalise the pressure exerted by the printing plate over the entire surface of the symbol and/or to prevent a partial scan by the barcode reader.		
brand owner	The organisation that owns the specifications of a trade item, regardless of where and by whom it is manufactured. The brand owner is normally responsible for the management of the Global Trade Item Number (GTIN).		

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Term	Definition	
Character Set 39	A subset of characters found in ISO 646: Unique Graphic Character Allocations which includes numeric, alphabetic upper-case, plus the characters "#", "-" and "/".	
Character Set 64 (file- safe / URI-safe base64)	A subset of characters found in ISO 646: Unique Graphic Character Allocations and defined by section 5 of RFC4648 as a URI and filename safe base64 alphabet, which includes numeric, alphabetic upper-case and lower-case, plus the characters "-", " ". The "=" character is used as a special pad character and has no assigned value. The file-safe URI-safe base64 alphabet is used to represent binary data as compact alphanumeric strings, each character corresponding to a 6-bit value in the range 0-63.	Commented [DM28]: WR21-307 DigSig
Character Set 82	A subset of characters found in ISO 646: Unique Graphic Character Allocations which includes numeric, alphabetic upper-case and lower-case, plus twenty special characters but excluding "space".	
check character pair	A final character pair calculated from the other characters of the Global Model Number. These characters are used to check that the data has been correctly composed and transmitted.	
check digit	Numeric character calculated from data and appended as part of the data string to ensure that the data is correctly composed and transmitted.	
codeword	A symbol character value. An intermediate level of coding between source data and the graphical encodation in the symbol.	
component/part	An item that is intended to undergo at least one further transformation process to create finished goods for the purpose of downstream consumption.	
Component/Part Identifier (CPID)	The unique identifier for a component/part, comprising a GS1 Company Prefix and a component/part reference.	
Composite Component	The 2D-symbol-stacked linear barcode component of a GS1 composite symbol.	
concatenation	The representation of several element strings in one barcode.	
Conformant	The state in which a system meets a specified standard.	
consignment	A grouping of logistic or transport units assembled by a freight forwarder or carrier to be transported under one transport document (e.g., waybill).	
consumer product variant (CPV)	An alphanumeric attribute of a GTIN assigned to a retail consumer trade item variant for its lifetime.	
country subdivision	Principle administrative divisions, or similar areas, of a country included in <i>ISO 3166-1</i> . Examples are a state in the US, a region in France, a canton in Swiss.	
coupon	A voucher that can be redeemed at the point-of-sale for a cash value or free item.	
coupon issuer	Party issuing the coupons, bearing the commercial and financial responsibility for the coupons.	
customer	The party that receives, buys, or consumes an item or service.	
data character	A single numeric digit, alphabetic character or punctuation mark, or control character, which represents meaningful information.	
data field	A field that contains a GS1 identification key, an RCN, or attribute information.	
Data Matrix (GS1 Digital Link URI)	Data Matrix encoding data using the uncompressed form of GS1 Digital Link URI syntax.	
Data Matrix symbology	A standalone, two-dimensional <u>barcode matrix</u> symbology that is made up of square modules arranged within a perimeter finder pattern. Data Matrix using ECC 200 error correction is the only version that supports GS1 system identification keys, including the Function 1 Symbol Character (FNC1). Data Matrix symbols are read by two-dimensional imaging scanners or vision systems.	
data titles	Data titles are the abbreviated descriptions of element strings which are used to support manual interpretation of barcodes.	
digital coupon	A digital coupon is an electronic presentation, that is distributed and presented without manifesting as "paper" or in other hard-copy form, and that can be exchanged for a financial saving or for loyalty points when making a purchase.	
<u>Digital Signature</u> (DigSig)	ISO/IEC 20248 defines a data construct for encoding a digital signature within a data carrier, providing a method to authenticate barcode and RFID data. It also provides a method to link the barcode and RFID data to the labelled/tagged object. The ISO/IEC 20248 data construct which contains a X.509 digital signature is known as a DigSig. "digital signature" in lower case refers to digital signatures in general, whilst "Digital Signature" with capitals, is a named thing with the specific meaning of "DigSig".	Commented [DM29]: WR21-307 DigSig

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Term	Definition
National Trade Item Number (NTIN)	A coding scheme, administered in the healthcare sector by a national organisation for which a GS1 Prefix has been issued to permit its uniqueness within the GTIN pool but without assurance of full compatibility with GTIN functionality. The result is a product identification number assigned by a third party (not the brand owner or manufacturer). Example: the CIP (Club Inter Pharmaceutique) in France administered by the French Health Products Safety Agency (AFSSAPS).
non-human readable interpretation text (non- HRI)	Characters such as letters and numbers that can be read by persons and may or may not be encoded in GS1 AIDC data carriers and are not confined to a structure and format based on GS1 standards (e.g., a date code expressed in a national format that could be used to encode a date field in a GS1 AIDC data carrier, brand owner name, consumer declarations).
odd parity	A characteristic of the encodation of a symbol character whereby the symbol character contains an odd number of dark modules.
omnidirectional linear barcode	A linear barcode symbology designed to be read in segments by suitably programmed laser point-of-sale (POS) scanners.
packaging component	Objects such as bottles, caps and labels to package a consumer trade item.
packaging component number	Global Trade Item Number (GTIN) attribute used to establish a relationship between a finished consumer trade item and packaging components.
payment slip	The end customer's notification of a demand for payment for a billable service (e.g., utility bill) comprising an amount payable and payment conditions.
physical trade item assortment/bundle	A combination of different trade items that are physically combined into a single trade item, thus creating a new trade item.
plain syntax	GS1 data structure containing GS1 identification key with no additional characters or syntactic features.
point-of-care (POC)	Location where dispensing or use of a non-retail, regulated healthcare pharmaceutical or medical device to or for a patient occurs.
point-of-sale (POS)	Refers to the retail checkout where omnidirectional linear barcodes must be used to support high-volume laser-based scanning or low volume checkout where linear barcodes (or for regulated healthcare trade items, GS1 DataMatrix) are used with image-based scanners.
predefined assortments	A trade item that comprises a fixed composition of two or more different trade items, each identified with a GTIN.
price verifier digit	A digit calculated from the price element in a Restricted Circulation Number (RCN) that is used to check that the data has been correctly composed.
product model	A base product design or specification from which a trade item is derived.
QR Code (GS1 Digital Link URI)	QR Code encoding data using the uncompressed form of GS1 Digital Link URI syntax.
QR Code symbology	A two-dimensional <u>matrix-barcode</u> symbology consisting of square modules arranged in a square pattern. The symbology is characterised by a unique finder pattern located at three corners of the symbol. QR Code symbols are read by two-dimensional imaging scanners or vision systems.
Quiet Zone	A clear space which precedes the start character and follows the stop character of a linear barcode or surrounds a 2D symbolbarcode.
Quiet Zone Indicator	A greater than (>) or less than (<) character, printed in the human readable field of the barcode, with the tip aligned with the outer edge of the Quiet Zone.
radio frequency	Any frequency within the electromagnetic spectrum associated with radio wave propagation. When radio frequency power is supplied to an antenna, an electromagnetic field is created that then is able to propagate through space. A radio frequency signal that can be processed by a radio frequency receiver. Many wireless technologies are based on radio frequency field propagation.
radio frequency identification (RFID)	A technology that uses radio frequency electromagnetic fields or waves to automatically identify and track tags attached to objects. An RFID system consists of RFID tags and readers. When triggered by a radio frequency electromagnetic interrogation signal from a nearby RFID reader, the RFID tag transmits digital data, usually a unique identifier like an EPC, back to the reader.
RCN-12	A 12-digit Restricted Circulation Number (see Restricted Circulation Number).
RCN-13	A 13-digit Restricted Circulation Number (see Restricted Circulation Number).
RCN-8	An 8-digit Restricted Circulation Number (see Restricted Circulation Number)

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Term	Definition
refund receipt	A voucher produced by equipment handling empty containers (i.e., bottles and crates).
regular expression	A sequence of characters that specifies a search pattern that is usually used by string- searching algorithms for search / find-and-replace operations on strings or for validation of string input.
regulated healthcare non-retail consumer trade item	A regulated healthcare trade item not intended for scanning at POS and identified with a GTIN-14, GTIN-13, GTIN-12 or GTIN-8 utilising linear or 2D matrix barcodes that can be scanned by image-based scanners.
regulated healthcare retail consumer trade item	A regulated healthcare trade item to be sold to the end consumer at a regulated healthcare retail point-of-sale (pharmacy). They are identified with a GTIN-13, GTIN-12 or GTIN-8 utilising linear or 2D matrix barcodes that can be scanned by image-based scanners.
regulated healthcare trade item	Pharmaceuticals or medical devices that are sold or dispensed in a controlled environment (e.g., retail pharmacy, hospital pharmacy).
responsible entity	The party responsible for the safety and effectiveness of the medical product at a moment in time in its life cycle, according to the approved regulatory file (including labelling) and regulatory/legal/professional obligations associated with the medical product. (e.g., brand owner, repackager, hospital pharmacy, etc.)
Restricted Circulation Number (RCN)	Signifies an identification number used for special applications in restricted environments, either defined by local GS1 Member Organisations (for regional applications such as variable measure product identification and, couponing) or by a company (for internal applications).
retail consumer trade item variant	A variation of change to a retail consumer trade item (which may itself be a homogeneous or predefined assortment of other retail consumer trade items) which does not require a new GTIN, but where identification of the variation may be required.
returnable asset	A reusable entity owned by a company that is used for transport and storage of goods. It is identified with a GRAI.
separator character	Special character(s) that are defined as part of GS1 symbologies and used to separate concatenated element strings, based on their positioning in the GS1 barcodes.
serial number	A code, numeric or alphanumeric, assigned to an individual instance of an entity for its lifetime. Example: a unique individual item may be identified with the combined Global Trade Item Number (GTIN) and serial number.
serial reference	A component of the Serial Shipping Container Code (SSCC) assigned by the physical builder or brand owner of the logistic unit to create a unique SSCC.
Serial Shipping Container Code (SSCC)	The GS1 identification key used to identify logistics units. The key comprises an extension digit, GS1 Company Prefix, serial reference and check digit.
service reference	A component of the Global Service Relation Number (GSRN) assigned by the issuing organisation to create a unique GSRN.
service relation instance number (SRIN)	An attribute to the GSRN which allows to distinguish different encounters during a service relationship.
shipment	A grouping of logistic and transport units assembled and identified by the seller (sender) of the goods travelling under one despatch advice and/or Bill of Lading to one customer (recipient).
short life items	An item, preparation or reconstituted product with limited use/shelf life.
single unit package/blister	A healthcare primary package that contains one discrete pharmaceutical dosage form, i.e. a tablet, a certain volume of a liquid or that is the immediate package for a medical device like a syringe. A number of single units attached to each other, but are easily separated through a perforation would be included.
sterile packaging system	A combination of the sterile barrier system (the minimum package that prevents ingress of microorganisms and allows aseptic presentation of the product at the point of use) and the protective packaging (configuration of materials designed to prevent damage to the sterile barrier system and its contents until the point of use).
subject of care	Any person who uses or is a potential user of a healthcare service, subjects of care may also be referred to as patients or healthcare consumers.
substrate	The material on which a barcode is printed or otherwise applied.
Supplemental symbol	A GS1-128 barcode used in combination with EAN/UPC, ITF-14 or GS1-128 where additional information is required beyond the barcode that carries the GS1 key (main symbol).
supplier	The party that produces, provides, or furnishes an item or service.

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Term	Definition
symbol character	A group of bars and spaces in a symbol that is decoded as a single unit. It may represent an individual digit, letter, punctuation mark, control indicator, or multiple data characters (see also codeword).
symbol check character	A symbol character or set of bar/space patterns included within a GS1-128 or GS1 DataBar symbol, the value of which is used by the barcode reader for the purpose of performing a mathematical check to ensure the accuracy of the scanned data. It is not shown in human readable interpretation. It is not input to the barcode printer and is not transmitted by the barcode reader.
symbol contrast	An ISO/IEC 15416 parameter that measures the difference between the largest and smallest reflectance values in a Scan Reflectance Profile (SRP).
symbology	A defined method of representing numeric or alphabetic characters in a barcode; a type of barcode.
symbology identifier	A sequence of characters generated by the decoder (and prefixed to the decoded data transmitted by the decoder) that identifies the symbology from which the data has been decoded.
trade item	Any item (product or service) upon which there is a need to retrieve predefined information and that may be priced, or ordered, or invoiced at any point in any supply chain.
trade item declarations	The set of all information about a trade item (e.g., manufacturer warranty, ingredients, instructions for use, specifications, contents, certifications, predefined characteristics, and other information). For a trade item, this is all of the information that is on the label and in the original packaging. It also includes relevant aspects of the extended packaging.
trade item grouping	A predefined composition of trade item(s) that is not intended for point-of-sale scanning. It is identified with a GTIN-14, GTIN-13, or GTIN-12.
trade measures	Net measures of variable measure trade items as used for invoicing (billing) the trade item.
transport process information	A set of information relevant to the processing, delivery or return of a transport unit. For example, transport process information would include address details.
transport unit	A logistic unit within the context of transport processes.
truncation	Printing a symbol shorter than the symbology specification's minimum height recommendations. Truncation can make the symbol difficult for an operator to scan.
two-dimensional (2D) <u>barcode</u> symbology	Optically readable symbols that must be examined both vertically and horizontally to read the entire message. Two-dimensional2D symbols-barcodes may be one of two types: matrix symbols and multi-row symbols. Two-dimensional symbols2D barcodes have error detection and may include error correction features.
U.P.C. Company Prefix	A GS1 Company Prefix starting with a zero ('0') becomes a U.P.C. Company Prefix by removing the leading zero. A U.P.C. Company Prefix is used to issue and allocate GTIN-12.
U.P.C. Prefix	A GS1 Prefix starting with a zero ('0') becomes a U.P.C. Prefix by removing the leading zero. A U.P.C. Prefix is used to issue U.P.C. Company Prefixes or allocated to other specific areas.
Unique Device Identifier - Device Identifier (UDI-DI)	A unique identifier specific to a medical device trade item represented by a Global Trade Item Number (GTIN).
Unique Device Identifier – Production Identifier (UDI-PI)	A numeric or alphanumeric code that identifies the unit of device production. The different types of UDI-PIs include serial number, lot number, software identification and manufacturing or expiry date or both types of date.
Unique Device Identifier (UDI)	A series of numeric or alphanumeric characters that is created through a globally accepted device identification and coding standard. It allows the unambiguous identification of a specific medical device on the market. The UDI is comprised of the UDI-DI and the UDI-PI. The word 'Unique' does not imply serialisation of individual production units.
Unique Identification Code (UIC) (per EU 2018/574)	Identifier of an EU 2018/574 ID Issuer that begins with an ISO 15459 Issuing Agency Code.
unit of use	Refers to an individual unit package that is prescribed for or administered to a patient regardless whether it is packaged individually or, on the contrary, the smallest package contains more than one unit. May coincide with the single unit and the base unit.

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