



9.1 Printing Considerations

A bar code is a means of representing data in machine readable form. Once a GS1 Identification Key has been allocated by following the guidelines in chapter 1 Basics and Principles on page 1, the next step is to select the bar code type.

While factors such as printing and packaging constraints, scanning environment and item type may have been considered when selecting the correct GS1 ID Key, these factors, along with substrate, need to be considered when selecting the most appropriate bar code type.

As well as using the information provided in this manual, it is also important to consult your printer and packaging designer in regards to printing and packaging considerations that need to be taken into account.

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 the symbol of 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)

The packaging designer should be consulted to:

- Ensure the bar code 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 bar code 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 units' symbol)





9.1.1 Choosing the Correct Bar Code for a GTIN

The table below can be used as a guide to determine which type of linear bar code to use. For information on 2D bar codes refer to the GS1 Australia User Manual - Technical Details.

Symbol	Encoded GTIN	Application Areas	Page
EAN-13	GTIN-13	Retail Point-of-Sale and General Distribution Scanning	201
EAN-8	GTIN-8	Retail Point-of-Sale, small items only	203
UPC-A	GTIN-12	North America retail Point-of-Sale and General Distribution	205
UPC-E	Zero Suppressed GTIN-12	North America retail Point-of-Sale, small items only	208
ITF-14	GTIN-13*	General Distribution, ideal for printing on corrugate	212
	GTIN-14		
	GTIN-12*		
GS1-128	GTIN-13*	General Distribution, can encode attribute data, ideal for printing on labels	216
	GTIN-14		
	GTIN-12*		
GS1 DataBar Symbology	GTIN-8*	Retail Point-of-Sale (see note below table)	219
	GTIN-13		
	GTIN-12*		

* When encoding a GTIN-13 or GTIN-12 in an ITF-14, GS1-128 or GS1 DataBar Bar Code, one or two filler zero(s) respectively must be added in front of the GTIN

TABLE 132 Choosing the Correct Bar Code for a GTIN

Note: GS1 DataBar has been approved for bilateral agreement between trading partners from January 2010. In 2014 GS1 DataBar becomes an open symbology and all scanning environments must be able to read these symbols



9.1.2 Application Methods

There are three ways to apply the bar code to your trade item:

Pre-Printed Labels

A printer or label service can print labels carrying bar codes, or your company can print them on-site. Ask equipment suppliers for a demonstration of on-site bar code printing equipment. The equipment automatically generates the bar code directly from data.

On-Site Direct Printing on Packaging

On-site printing equipment is also available which allows you to print the bar code directly onto the package during the manufacturing, packaging, and distribution process.

Printing on Packaging at Source

Bar codes may be able to be incorporated into the artwork for your item, and printed directly onto the packaging. For more information regarding this application method you will need to contact your printer.



9.1.3 Bar Code Characteristics

When printing bar codes, there are various considerations to ensure the symbol is of sufficient quality to ensure consistent scanning.

Magnification (X-dimension)

The allowable magnification (X-dimension) range depends on the symbol type and the intended scanning environment. Reliability of scanning is always enhanced by selecting a magnification (X-dimension) higher than the minimum.

Your printer may recommend a magnification larger than the minimum allowable. This should not be taken as a reflection on the quality of your printer. To print an accurate and high quality bar code a number of factors, such as the printing process, ink quality, and substrate, must be taken into consideration.

The artwork designer must work closely with the printer to ensure that the space allowed for the bar code is sufficient. The designer will not be able to decide on the area required for the symbol prior to consultation with the printer.

Bar Code Size Gauges can be obtained from GS1 Australia to be used as a guide to show the sizes of various symbol types at different magnifications. The Size Gauges are not intended to be a precise measuring tool, but can be a handy tool during the artwork stage to determine the amount of space needed for the required/chosen magnification.

Bar Height

Once the magnification (X-dimension) of the bar code has been determined, for EAN/UPC Bar Codes it is important to ensure that the height remains in proportion to the magnification, and does not drop below the minimum specified.

For ITF-14 and GS1-128 Bar Codes the magnification (X-dimension) does not impact the height, rather the height is determined by the scanning environment.

Please note that truncation (height reduction) on any symbol will reduce scanning reliability, and where space permits the full height should always be printed.

Quiet Zones

The Quiet Zones of the bar code are the solid, light areas before the first bar and after the last bar. These areas are extremely important as they allow the scanner to recognise the beginning and end of the bar code. Any obstruction or reduction in the Quiet Zones will most likely result in scanning difficulties.

The minimum size required for the Quiet Zones depends on the magnification (X-dimension) of the bar code. It is recommended to allow slightly more than the minimum required Quiet Zones to allow for any possible ink spread or plate registration issues.

For EAN/UPC Bar codes a useful device to help maintain the Quiet Zone in some production processes is to include a less than (<) and/or greater than (>) character in the Human Readable Interpretation field, with its apex aligned with the edge of the Quiet Zone.





Colours

The colours and type of ink you choose for your bar codes is very important.

As a scanner reads a bar code using an infrared light source it sees the symbol differently to the human eye. As a result, some colour combinations and ink types are unsuitable for scanning because they do not provide sufficient contrast between the dark bars and the light background, or they provide a much too high reflectance value.

The most suitable and reliable colour combination is black bars on a white background. However, as a general rule, the background of the bar code can be a light, warm colour that does not contain any black (such as yellow or light orange), and the bar colour can be a dark, cool colour that has no, or low, red content (such as dark blue or dark green). It is also a recommendation to avoid high gloss inks as this can cause problems with the reflectance values.

Consult your printer or GS1 Australia if you are uncertain about colour choice/options.

The following colour chart shows a few examples of suitable and unsuitable colour combinations.



Figure 22 Colour Chart



9.1.4 Substrate

The substrate (the material the bar code is printed on) is very important. If unsuitable this can cause scanning difficulties. Different packaging materials reflect light differently, which can have an effect on the scanning ability of the bar code. This is especially evident on transparent and translucent packages where the background is not printed.

For printing bar codes it is recommended that you avoid the following:

- High gloss (highly specularly reflecting) substrates
- Transparent or semi-transparent backgrounds
- Transparent wrappers over the printed bar code

If necessary to print onto a highly reflective (flexible) substrate, we recommend the following:

- Increase the magnification (X-dimension) of the bar code to between 105% and 120% (X-dimension 0.35mm - 0.40mm)
- Increase the amount of Bar Width Reduction
- Make the background of the symbol as dense and less reflective as possible. To do this you may try the following:
 - If you are not using wet inks, print two background layers. This may be two layers of the one colour, or you may use all light colours in the print run (e.g. white and yellow)
 - Use a less viscous ink that will provide maximum coverage and density

9.1.5 Bar Widths and Print Quality

Always ensure that the print quality of the bar code is of a high standard. Ensure that the bars in the symbol are clearly defined, watch for voids or smudging, and avoid flecks in the background colour.

Maintaining acceptable print quality and consistent print gain (ink spread) requires regular ongoing checks.





9.1.6 Checklist for Generating and Printing Bar Codes

Below is a quick checklist of things to check during the bar code generation and printing processes. They represent common errors/problems seen by GS1 Australia.

- Ensure that the correct symbol is used for the relevant product, application, and scanning environment
- Check that the bar code will remain readable in the environment in which the product will be stored, handled, and distributed
- Ensure that the Check Digit is correct
- Check the size of the bar code, both the magnification (X-dimension) and the bar height
- Ensure that there are adequate Quiet Zones, and that any optional Quiet Zone Indicators are correctly placed
- Check that the contrast between the bars and the background is adequate, and that the colours chosen will scan
- Make sure that the colour of the contents of the packaging will not unduly affect the contrast between the bars and spaces
- Check the position of the symbol on the final, formed product
- Ensure that no shrink-wrap, tape, or other printing will obscure the bar code on the finished product
- Ensure that no other bar codes will be visible or show through from the inside of the pack
- Carry out routine verification at all levels of packaging to ensure that the bar code complies with the required quality standard, and to identify any potential problems
- Check the print quality regularly throughout the print run by verifying the bar code quality
- Notify trading partners of the GTINs and the products they identify in good time
- Consider having GS1 Australia prepare a Bar Code Verification Report on the artwork for you prior to the final print to help detect any errors or areas for improvement





9.2 Introduction to Bar Code Specifications

After you have selected your GS1 Identification Key, selected the bar code type, and determined any printing considerations, the next step is to select dimensions for your chosen symbology.

In this section you will find specific requirements for the following bar code types:

- EAN/UPC Bar Code Symbology
 - EAN-13, UPC-A and UPC-E Bar Codes – all of which may be accompanied by an Add-On Symbol
 - EAN-8 Bar Codes
- ITF-14 Bar Code
- GS1-128 Bar Code
- GS1 DataBar Symbology
 - GS1 DataBar Omnidirectional
 - GS1 DataBar Truncated
 - GS1 DataBar Stacked
 - GS1 DataBar Stacked Omnidirectional
 - GS1 DataBar Limited
 - GS1 DataBar Expanded
 - GS1 DataBar Expanded Stacked

For information on the 2D Bar Codes GS1 DataMatrix and GS1 QR Code see the GS1 Australia User Manual - Bar Code Technical Details.

Please note that it is the print quality of the bar code that determines the minimum magnification factor (X-dimension) you must apply, not a predetermined space on the packaging. Always refer to your printer.





9.3 EAN-13 Symbol Specifications

The EAN-13 Bar Code is used to encode a GTIN-13, and can be scanned in both a retail POS and a General Distribution Scanning Environment.

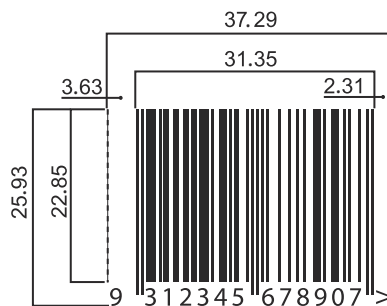


Figure 23 EAN-13 Bar Code at Nominal Size (100%)

Magnification (X-dimension)

The specified magnification (X-dimension) range for an EAN-13 Bar Code being scanned at retail POS is 80% - 200% (X-dimension 0.26mm - 0.66mm).

An allowable minimum magnification of 75% (X-dimension 0.25mm) is applicable only to on demand (e.g. thermal) print processes. In this case, the bar height should never be truncated below the minimum required height for an 80% magnification bar code. 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.

Where an item may also be scanned in a General Distribution Scanning environment (automated scanning), the allowable magnification range is 150% to 200% (X-dimension 0.50mm – 0.66mm).

Human Readable Interpretation

The Human Readable Interpretation should be printed beneath the bar code and must show all of the digits encoded in the bar code.

The recommended typeface for the Human Readable Interpretation is OCR-B at a height of 2.75mm at nominal size (100% magnification, X-dimension 0.33mm). This typeface is a recommendation only and alternative type fonts and character sizes are acceptable provided the digits are clearly legible.

Symbol Height

The dark bars forming the left, centre and right Guard Bar Patterns shall be extended downward by 5X (e.g. 1.65mm at X-dimension 0.33mm)

See Table 133 for height of bars at various X-dimensions.





EAN-13 Bar Code Dimensions

Magnification	X-dimension	Width	Bar Height	Left Quiet Zone	Right Quiet Zone
80%	0.26	25.08	18.28	2.90	1.85
85%	0.28	26.65	19.42	3.09	1.96
90%	0.30	28.22	20.57	3.27	2.08
95%	0.31	29.78	21.71	3.45	2.19
100%	0.33	31.35	22.85	3.63	2.31
105%	0.35	32.92	23.99	3.81	2.43
110%	0.36	34.49	25.14	3.99	2.54
115%	0.38	36.05	26.28	4.17	2.66
120%	0.40	37.62	27.42	4.36	2.77
125%	0.41	39.19	28.56	4.54	2.89
130%	0.43	40.76	29.71	4.72	3.00
135%	0.45	42.32	30.85	4.90	3.12
140%	0.46	43.89	31.99	5.08	3.23
145%	0.48	45.46	33.13	5.26	3.35
150%	0.50	47.03	34.28	5.45	3.47
155%	0.51	48.59	35.42	5.63	3.58
160%	0.53	50.16	36.56	5.81	3.70
165%	0.54	51.73	37.70	5.99	3.81
170%	0.56	53.30	38.85	6.17	3.93
175%	0.58	54.86	39.99	6.35	4.04
180%	0.59	56.43	41.13	6.53	4.16
185%	0.61	58.00	42.27	6.72	4.27
190%	0.63	59.57	43.42	6.90	4.39
195%	0.64	61.13	44.56	7.08	4.50
200%	0.66	62.70	45.70	7.26	4.62

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones, Bar Height = Bar Height excluding guard bar patterns. It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues. All measurements are in millimetres.

TABLE 133 EAN-13 Bar Code Dimensions

Note: For information regarding the differences between EAN-13 and UPC-A Bar Codes please refer to “Differences Between UPC-A and EAN-13 Bar Codes” on page 207





9.4 EAN-8 Symbol Specifications

The EAN-8 Bar Code is used to encode a GTIN-8, and is intended for scanning at retail POS only.

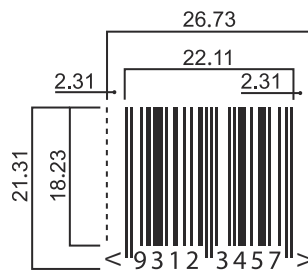


Figure 24 EAN-8 Bar Code at Nominal Size (100%)

Magnification (X-dimension)

The specified magnification (X-dimension) range for an EAN-8 Bar Code being scanned at retail POS is between 80% and 200% (X-dimension 0.26mm - 0.66mm).

An allowable minimum magnification of 75% (X-dimension 0.25mm) is applicable only to on demand (e.g. thermal) print processes. In this case, the bar height should never be truncated below the minimum required height for an 80% magnification bar code. 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.

Human Readable Interpretation

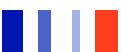
The Human Readable Interpretation should be printed beneath the bar code and must show all of the digits encoded in the bar code.

The recommended typeface for the Human Readable Interpretation is OCR-B at a height of 2.75mm at nominal size (100% magnification, X-dimension 0.33mm). This typeface is a recommendation only and alternative type fonts and character sizes are acceptable provided the digits are clearly legible.

Symbol Height

The dark bars forming the left, centre and right Guard Bar Patterns shall be extended downward by 5X (e.g. 1.65mm at X-dimension 0.33mm)

See Table 134 for height of bars at various X-dimensions.





EAN-8 Bar Code Dimensions

Magnification	X-dimension	Width	Bar Height	Left Quiet Zone	Right Quiet Zone
80%	0.26	17.69	14.58	1.85	1.85
85%	0.28	18.79	15.50	1.96	1.96
90%	0.30	19.90	16.41	2.08	2.08
95%	0.31	21.00	17.32	2.19	2.19
100%	0.33	22.11	18.23	2.31	2.31
105%	0.34	23.22	19.14	2.43	2.43
110%	0.36	24.32	20.05	2.54	2.54
115%	0.38	25.43	20.96	2.66	2.66
120%	0.40	26.53	21.88	2.77	2.77
125%	0.41	27.64	22.79	2.89	2.89
130%	0.43	28.74	23.70	3.00	3.00
135%	0.45	29.85	24.61	3.12	3.12
140%	0.46	30.95	25.52	3.23	3.23
145%	0.48	32.06	26.43	3.35	3.35
150%	0.50	33.17	27.35	3.47	3.47
155%	0.51	34.27	28.26	3.58	3.58
160%	0.53	35.38	29.17	3.70	3.70
165%	0.54	36.48	30.08	3.81	3.81
170%	0.56	37.59	30.99	3.93	3.93
175%	0.58	38.69	31.90	4.04	4.04
180%	0.59	39.80	32.81	4.16	4.16
185%	0.61	40.90	33.73	4.27	4.27
190%	0.63	42.01	34.64	4.39	4.39
195%	0.64	43.11	35.55	4.50	4.50
200%	0.66	44.22	36.46	4.62	4.62

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones,
 Bar Height = Bar Height excluding guard bars.
 It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
 All measurements are in millimetres.

TABLE 134 EAN-8 Bar Code Dimensions





9.5 UPC-A Symbol Specifications

The UPC-A Bar Code is used to encode a GTIN-12 and can be scanned in both a retail POS and a General Distribution Scanning Environment.

Note: In regards to dimensions, the only difference between the EAN-13 and UPC-A Bar Codes is the minimum required Quiet Zones.

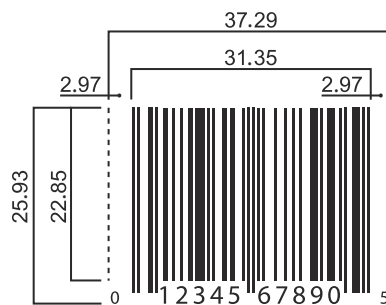


Figure 25 UPC-A Bar Code at Nominal Size (100%)

Magnification (X-dimension)

The specified magnification (X-dimension) range for a UPC-A Bar Code being scanned at retail POS is between 80% and 200% (X-dimension 0.26mm - 0.66mm).

An allowable minimum magnification of 75% (X-dimension 0.25mm) is applicable only to on demand (e.g. thermal) print processes. In this case, the bar height should never be truncated below the minimum required height for an 80% magnification bar code. 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.

Where an item may also be scanned in a General Distribution Scanning environment (automated scanning), the allowable magnification range is 150% to 200% (X-dimension 0.50mm – 0.66mm).

Human Readable Interpretation

The Human Readable Interpretation should be printed beneath the bar code and must show all of the digits encoded in the bar code.

With a UPC-A Symbol the first and last human readable digits are smaller than the other digits. Reduce the U.P.C. Prefix (first digit) and the Check Digit (last digit) to a maximum character width of 1.32mm, four module widths, at nominal size (100% magnification, X-dimension 0.33mm), and a height that is proportional to the modified width.

Locate the human readable number system character 1.65mm, five module widths, at nominal size (100% magnification, X-dimension 0.33mm) to the left of the guard bar pattern. Locate the human readable Check Digit 1.65mm, five module widths, at nominal size (100% magnification, X-dimension 0.33mm) to the right of the guard bar pattern.

Ensure that only the twelve digits encoded in the bar code are printed below it in the Human Readable Interpretation.





Symbol Height

The dark bars forming the left, centre and right Guard Bar Patterns shall be extended downward by 5X (e.g. 1.65mm at X-dimension 0.33mm). This shall also apply to the bars of the first and last symbol characters.

See Table 135 for height of bars at various X-dimensions.

UPC-A Bar Code Dimensions

Magnification	X-dimension	Width	Bar Height	Left Quiet Zone	Right Quiet Zone
80%	0.26	25.08	18.28	2.38	2.38
85%	0.28	26.65	19.42	2.52	2.52
90%	0.30	28.22	20.57	2.67	2.67
95%	0.31	29.78	21.71	2.82	2.82
100%	0.33	31.35	22.85	2.97	2.97
105%	0.36	32.92	23.99	3.12	3.12
110%	0.36	34.49	25.14	3.27	3.27
115%	0.38	36.05	26.28	3.42	3.42
120%	0.40	37.62	27.42	3.56	3.56
125%	0.41	39.19	28.56	3.71	3.71
130%	0.43	40.76	29.71	3.86	3.86
135%	0.45	42.32	30.85	4.01	4.01
140%	0.46	43.89	31.99	4.16	4.16
145%	0.48	45.46	33.13	4.31	4.31
150%	0.50	47.03	34.28	4.46	4.46
155%	0.51	48.59	35.42	4.60	4.60
160%	0.53	50.16	36.56	4.75	4.75
165%	0.54	51.73	37.70	4.90	4.90
170%	0.56	53.30	38.85	5.05	5.05
175%	0.58	54.86	39.99	5.20	5.20
180%	0.59	56.43	41.13	5.35	5.35
185%	0.61	58.00	42.27	5.49	5.49
190%	0.63	59.57	43.42	5.64	5.64
195%	0.64	61.13	44.56	5.79	5.79
200%	0.66	62.70	45.70	5.94	5.94

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones,
 Bar Height = Bar Height excluding guard bar patterns
 It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
 All measurements are in millimetres.

TABLE 135 UPC-A Bar Code Dimensions





9.5.1 Differences Between UPC-A and EAN-13 Bar Codes

UPC-A and EAN-13 Bar Codes are identical except for the following:

Quiet Zones: In the UPC-A Bar Code both the right and left Quiet Zones are 9X, where X = X-dimension. In the EAN-13 Bar Code the left Quiet Zone is 11X and the right Quiet Zone is 9X.

First and Last Human Readable Digits: With UPC-A Bar Codes the first and last human readable digits are smaller than the other digits. For more information on the human readable digits in a UPC-A Bar Code refer to “Human Readable Interpretation” on page 205.

Extended Bars: The start bars and the end bars of the UPC-A Symbol characters, representing the first and last digits, extend down to the same level as the guard bar patterns.

Variable Parity: With UPC-A Bar Codes there is no variable parity. For more information refer to Variable Parity Encoding of the 13th Digit in the GS1 Australia User Manual – Bar Code Technical Details.





9.6 UPC-E Symbol Specifications

The UPC-E Bar Code is used to encode a Zero Suppressed GTIN-12 and is intended for scanning in a retail POS environment only.

Note: GS1 US is no longer allocating GTIN-12s that are able to be zero suppressed.

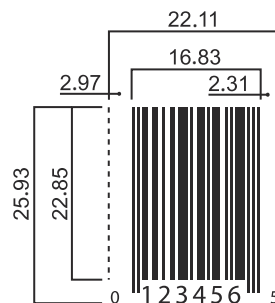


Figure 26 UPC-E Bar Code at Nominal Size (100%)

Magnification (X-dimension)

The specified magnification (X-dimension) range for a UPC-E Bar Code being scanned at retail POS is between 80% and 200% (X-dimension 0.26mm - 0.66mm).

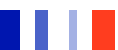
An allowable minimum magnification of 75% (X-dimension 0.25mm) is applicable only to on demand (e.g. thermal) print processes. In this case, the bar height should never be truncated below the minimum required height for an 80% magnification bar code. When printing a minimum symbol with any method of 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.

Human Readable Interpretation

The Human Readable Interpretation should be printed beneath the bar code and must show all of the digits encoded in the bar code. The U.P.C. Prefix and Check Digit, encoded by variable parity, are shown outside the guard bar patterns, to the left and right respectively, and within the Quiet Zones. These two human readable digits are aligned with the other six digits.

The U.P.C. Prefix and the Check Digit are reduced in size to a maximum character width of 1.32mm, four module widths, at nominal size (100% magnification, X-dimension 0.33mm), with a proportional height. The U.P.C. Prefix should be located 1.65mm, five module widths, at nominal size (100% magnification, X-dimension 0.33mm) to the left of the left guard bar pattern, and the Check Digit should be a minimum of 0.99mm, three module widths at nominal size (100% magnification, X-dimension 0.33mm) to the right of the right guard bar pattern.

Previous specifications have suggested that the U.P.C. Prefix and Check Digits be shown in Human Readable Interpretation half way up the bar code to the left and right, or that the Check Digit be omitted altogether. While it is not the current recommendation, UPC-E Bar Codes in this format may continue to appear.





Symbol Height

The dark bars forming the left, centre and right Guard Bar Patterns shall be extended downward by 5X (e.g. 1.65mm at X-dimension 0.33mm)

See Table 136 for height of bars at various X-dimensions.

Format of the UPC-E Bar Code

The UPC-E Bar Code is made up as follows:

- a left guard bar pattern
- six digit characters - from number sets A or B
- a special right guard bar pattern comprising six modules made up from module set 010101, where 0 is a light module and 1 is a dark module. The X-dimension (module width) is 0.33 mm. The total width of the special guard bar pattern is 1.98 mm.

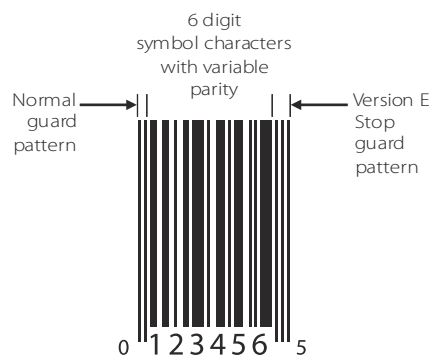


Figure 27 UPC-E Bar Code Format

UPC-E Bar Code Dimensions

Magnification	X-dimension	Width	Bar Height	Left Quiet Zone	Right Quiet Zone
80%	0.26	13.47	18.28	2.38	1.85
85%	0.28	14.31	19.42	2.52	1.96

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones, Bar Height = Bar Height excluding guard bar patterns
It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
All measurements are in millimetres.

TABLE 136 UPC-E Bar Code Dimensions



Magnification	X-dimension	Width	Bar Height	Left Quiet Zone	Right Quiet Zone
90%	0.30	15.15	20.57	2.67	2.08
95%	0.31	15.99	21.71	2.82	2.19
100%	0.33	16.83	22.85	2.97	2.31
105%	0.35	17.67	23.99	3.12	2.43
110%	0.36	15.51	25.14	3.27	2.54
115%	0.38	19.36	26.28	3.42	2.66
120%	0.40	20.20	27.42	3.56	2.77
125%	0.41	21.04	28.56	3.71	2.89
130%	0.43	21.88	29.71	3.86	3.00
135%	0.45	22.72	30.85	4.01	3.12
140%	0.46	23.56	31.99	4.16	3.23
145%	0.48	24.40	33.13	4.31	3.35
150%	0.50	25.25	34.28	4.46	3.47
155%	0.51	26.09	35.42	4.60	3.58
160%	0.53	26.93	36.56	4.75	3.70
165%	0.54	27.77	37.70	4.90	3.81
170%	0.56	28.61	38.85	5.05	3.93
175%	0.58	29.45	39.99	5.20	4.04
180%	0.59	30.29	41.13	5.35	4.16
185%	0.61	31.14	42.27	5.49	4.27
190%	0.63	31.98	43.42	5.64	4.39
195%	0.64	32.82	44.56	5.79	4.50
200%	0.66	33.66	45.70	5.94	4.62

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones,
 Bar Height = Bar Height excluding guard bar patterns
 It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
 All measurements are in millimetres.

TABLE 136 UPC-E Bar Code Dimensions



9.7 Add-On Symbol Specifications

The two-digit and five-digit Add-On Symbols were designed to encode information supplementary to that in the main bar code on serials and paperback books.

For information on the use of Add-On Symbols for books please refer to chapter 2, section 2.2.4 Books on page 31 and for serial publications refer to chapter 2, Two-Digit Add-On Symbol on page 36 and chapter 2, Five-Digit Add-On Symbol on page 36.

Magnification (X-dimension)

The magnification (X-dimension) of an Add-On Symbol shall be the same as the magnification of its associated main bar code.

Height

The height of any two-digit or five-digit Add-On Symbol used must be the same height as the primary symbol. The height including the Human Readable Interpretation must not extend outside the symbol height dimensions of the main symbol.

Human Readable Interpretation

The Human Readable Interpretation should be printed above the Add-On Symbol. The digits should be the same height as those of the main symbol, and the upper edges of the digits should be aligned with the upper edges of the bars of the main symbol.

Positioning of the Add-On Symbol

The Add-On Symbol shall not encroach on the right Quiet Zone of the main bar code. The bottom edge of the bars in the Add-On Symbol shall be horizontally aligned with the bottom edge of the guard bar patterns of the main symbol.





9.8 ITF-14 (Interleaved 2-of-5) Symbol Specifications

The ITF-14 Bar Code is used to encode a GTIN-14, a GTIN-13 or a GTIN-12. It is intended for scanning in a General Distribution Scanning environment.

Note: An ITF-14 Bar Code encodes a fixed length data string of 14 digits therefore when encoding a GTIN-13 or GTIN-12 in an ITF-14 Bar Code, one or two filler zero(s) respectively must be added in front of the GTIN.

The diagram below is of a GTIN-13 with a filler zero encoded in an ITF-14 Bar Code.



Figure 28 ITF-14 Bar Code at 100%



Bearer Bars

Bearer Bars are bars abutting the tops and bottom of the symbol bars in a bar code, or a frame surrounding the entire symbol. The purpose of the Bearer Bar is:

- To equalise the pressure exerted by the printing plate over the entire surface of the bar code
- To enhance the reading reliability assisting in the reduction of the probability of misreads or short scans which may occur when a skewed scanning beam enters or exits the bar code through the top or bottom edge
- To possibly provide a visible check that all the print head elements are working if using a thermal print process



Figure 29 Example of a Skewed Scanning Beam

The top and bottom Bearer Bars are mandatory unless it is not technically feasible to apply it, in which case reading reliability is reduced. The vertical Bearer Bars are optional when using printing methods not requiring printing plates.

For printing methods requiring printing plates, the nominal Bearer Bar has a constant thickness of 4.8mm and must completely surround the bar code, including its Quiet Zones and butt directly against the top and bottom of the symbol bars.

For printing methods that do not require printing plates, the Bearer Bar only needs to be applied to the top and bottom of the bar code butting directly against the top and bottom of the symbol bars. The Bearer Bar may extend above and below the Quiet Zones. Make the Bearer Bar a minimum of two times the X-dimension (width of the narrow bar), which at X-dimension of 1.02mm (100% magnification) is:

$$X\text{-dimension} \times 2 = 1.02 \times 2 = 2.04 \text{ mm.}$$



Magnification (X-dimension)

The specified magnification (X-dimension) range for ITF-14 Bar Codes that are to be scanned in a General Distribution Scanning environment (automated scanning) is between 48.7% and 100% (X-dimension 0.495mm – 1.02mm). For Healthcare see Section 4 Regulated Healthcare Items on page 81. For other scanning environments the allowable magnification range is between 25% and 48.7% (X-dimension 0.250mm and 0.495mm).

For all scanning environments printing at the higher end of the magnification range is recommended.

Regardless of the scanning environment, ITF-14 Bar Codes with a magnification less than 62.5% (X-dimension 0.64mm) should not be printed directly onto corrugate fibreboard.

Magnifications between 100% and 120% (X-dimension between 1.02mm and 1.22mm) are acceptable based on historical specifications, but a migration to the 100% maximum magnification should be made on new artwork.

Mathematically, when W is width, 48 is the total number of narrow elements, 29 is total the number of wide elements, BWR is the Bar Width Ratio which is nominally 2.5, and X is X-dimension (module width), which is 1.02mm at 100% magnification.

$W = (48X) + (29X)BWR$ (excluding Quiet Zones and Bearer Bars)

Height of Bars

For scanning in a General Distribution Scanning environment (automated scanning), the minimum recommended bar height for an ITF-14 Bar Code is 32mm.

For all other scanning environments the bar height should be printed as high as possible. In no case shall the bar height be less than 13mm. While 13mm is the minimum height for bar codes not being scanned in an automated scanning environment, every effort should be made to increase the bar height to as close to 32mm as possible.

Human Readable Interpretation

For Human-Readable Interpretation Rules see Section 9.12 Human Readable Interpretation (HRI) Rules on page 227. For HRI Rules specific to Regulated Healthcare Retail Consumer Trade Items, see Section 4.3.1 Human Readable Interpretation (HRI) on page 85.

Bar Width Ratio

Bar width ratio is the comparison in bar widths between the wide modules and the narrow modules in an ITF-14 Bar Code.

The target bar width ratio is 2.5:1, meaning that the wide bars are 2.5 times the width of the narrow bars.

While the preferred bar width ratio is 2.5:1, the acceptable range is 2.25:1 to 3:1.





ITF-14 Bar Code Dimensions

Magnification	X-Dimension	Width	Bar Height	Quiet Zones
25%	0.25	30.62	13.00	2.54
30%	0.30	36.73	13.00	3.05
35%	0.36	42.85	13.00	3.56
40%	0.41	48.97	13.00	4.06
45%	0.46	55.09	13.00	4.57
50%	0.51	61.21	32.00	5.08
55%	0.56	67.34	32.00	5.59
60%	0.61	73.46	32.00	6.10
62.5%	0.64	76.52	32.00	6.35
65%	0.66	79.58	32.00	6.60
70%	0.71	85.70	32.00	7.11
75%	0.76	91.82	32.00	7.62
80%	0.81	97.94	32.00	8.13
85%	0.86	104.06	32.00	8.64
90%	0.91	110.19	32.00	9.14
95%	0.97	116.31	32.00	9.65
100%	1.02	122.43	32.00	10.16

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones and Bearer Bars and assumes a Bar Width Ratio of 2.5:1, Bar Height = Bar Height excluding Bearer Bars.
 It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
 All measurements are in millimetres correct to two decimal places

TABLE 137 ITF-14 Bar Code Dimensions



9.9 GS1-128 Symbol Specifications

The GS1-128 Bar Code is used to encode a GTIN-14, a GTIN-13 or a GTIN-12, and may also encode attribute data using Application Identifiers (AIs). The GS1-128 Bar Code is intended for scanning in a General Distribution Scanning environment.

Note: When encoding a GTIN-13 or GTIN-12 in a GS1-128 Bar Code, one or two filler zero(s) respectively must be added in front of the GTIN.

The diagram below is of a GTIN-13 with a filler zero encoded in a GS1-128 Bar Code



Figure 30 GS1-128 Bar Code at 100%

Concatenation

Concatenation (stringing data elements together) is an effective means for presenting multiple element strings in a single GS1-128 Bar Code and should be used to conserve label space and optimise scanning operations.

Maximum Length

The length of the GS1-128 Bar Code must never exceed 165mm in length, including the Quiet Zones.

When concatenating data strings the maximum number of characters in the GS1-128 Bar Code must not exceed 48 characters. This includes Function 1 Symbol Character (FNC1) when used as a field separator, but excludes auxiliary characters, see table below, and the Symbol Check Character (Modulo 103).

Auxiliary Characters		
Start A	Code A	Shift
Start B	Code B	Stop
Start C	Code C	FNC1

Note: When counting the number of characters in a GS1-128 Symbol the FNC1 is only included when used as a field separator

TABLE 138 GS1-128 Auxiliary Characters



Magnification (X-dimension)

The size of the GS1-128 Bar Code depends on:

- the X-dimension (module width) chosen
- the number of characters encoded
- the number of non-numeric characters in the data

For GS1-128 Bar Codes that are to be scanned in a General Distribution Scanning environment (automated scanning), the X-dimension range is 0.495mm to 1.02mm (magnifications between 48.7% and 100%).

For Healthcare see Section 4 Regulated Healthcare Items on page 81.

For information on the size specifications for Serial Shipping Container Codes (SSCCs) and other GS1-128 Bar Code on logistics labels refer to chapter 3, section 3.5.1 Bar Code on page 70.

For other scanning environments, the X-dimension range is 0.25mm to 0.495mm (magnifications between 48.7% and 100%).

Mathematically, when W is width, 11 is the number of modules per symbol character, N is the number of symbol characters encoded (excluding the Start and Stop Characters and Symbol Check Character), 66 is the auxiliary characters and X is X-dimension (module width), which at 100% magnification is 1.02mm.

$W = (11N + 66)X$ (including Quiet Zones)

Height of Bars

For scanning in a General Distribution Scanning (automated scanning) environment, the minimum bar height for a GS1-128 Bar Code is 32mm.

For all other scanning environments the bar height should be printed as high as possible. In no cases shall the bar height be less than 13mm. While 13mm is the minimum height for GS1-128 Bar Codes not being scanned in an automated scanning environment, every effort should be made to increase the bar height to as close to 32mm as possible.

Human Readable Interpretation

For Human-Readable Interpretation Rules see Section 9.12 Human Readable Interpretation (HRI) Rules on page 227. For HRI Rules specific to Regulated Healthcare Retail Consumer Trade Items, see Section 4.3.1 Human Readable Interpretation (HRI) on page 85.

For information on printing Human Readable Interpretation on Logistics Labels, refer to chapter 3, section 3.5.1.4 Human Readable Interpretation on page 71.





GS1-128 Bar Code Dimensions

Magnification	X-dimension	Width	Bar Height	Quiet Zones
25%	0.25	34.04	13.00	2.54
30%	0.30	40.84	13.00	3.05
35%	0.36	47.65	13.00	3.56
40%	0.41	54.46	13.00	4.06
45%	0.46	61.26	13.00	4.57
50%	0.51	68.07	32.00	5.08
55%	0.56	74.88	32.00	5.59
60%	0.61	81.68	32.00	6.10
65%	0.66	88.49	32.00	6.60
70%	0.71	95.30	32.00	7.11
75%	0.76	102.11	32.00	7.62
80%	0.81	108.91	32.00	8.13
85%	0.86	115.72	32.00	8.64
90%	0.91	122.53	32.00	9.14
95%	0.97	129.33	32.00	9.65
100%	1.02	136.14	32.00	10.16

Note: In the heading of this table, Width = Width of bar code excluding Quiet Zones, It is recommended to always allow slightly more than the minimum required Quiet Zone to allow for any possible ink spread or registration issues.
All measurements are in millimetres correct to two decimal places

These dimensions are only indicative of a GS1-128 Bar Code with one Application Identifier and a GTIN without any attribute data, e.g. (01)09312345678907.

TABLE 139 GS1-128 Bar Code Dimensions

9.9.1 Mixing GS1-128 Symbology with other Symbologies

When a Global Trade Item Number (GTIN) is carried in either an EAN/UPC, ITF-14 or GS1-128 Bar Code, any required additional data can be carried in a GS1-128 Symbol.





9.10 GS1 DataBar Symbol Specifications

GS1 DataBar™ is a family of linear symbologies previously used within the GS1 System for Very Small Healthcare items. There are three groups of GS1 DataBar symbols, two of which have a number of versions optimised for different application requirements. GS1 DataBar is now set to become more widely used as GS1 has announced that;

- From January 1, 2010 GS1 DataBar standards will be available for bilateral agreement between trading partners for all trade items. **The specific focus will be on Fresh Products scanned at Point-of-Sale.**
- January 1, 2014 is the global sunrise date for all trade item bar code scanning systems to be capable of reading GS1 DataBar Bar Codes.

GS1 DataBar Bar Codes can carry the same data in less space or more data in the same space as the current EAN/UPC Bar Codes. They will not necessarily replace EAN/UPC Bar Codes but may be chosen for hard-to-mark products like jewellery and cosmetics, individual doses of medication in the pharmaceutical industry, small packaged food items in the grocery trade and in situations where GS1 Application Identifiers such as serial numbers, lot numbers, and expiration dates are required.

The first group of GS1 DataBar Symbols

The first group of GS1 DataBar Symbols includes:

- GS1 DataBar Omnidirectional
- GS1 DataBar Truncated
- GS1 DataBar Stacked
- GS1 DataBar Stacked Omnidirectional

These GS1 DataBar Symbols can encode a GTIN-14, GTIN-13, GTIN-12 and a GTIN-8. If encoding a GTIN-13, GTIN-12 or a GTIN-8, one, two or five filler zeros(s) respectively must be added in front of the GTIN. As the majority of retail POS systems can only hold up to 13 digits, a GTIN-14 should not be used for trade items scanned at POS. GS1 DataBar Symbols do not require Quiet Zones.

9.10.1 GS1 DataBar Omnidirectional

The GS1 DataBar Omnidirectional Bar Code is designed to be read by an omnidirectional scanner, such as a retail slot scanner. Its dimensions are 96X wide, starting with a 1X space and ending with a 1X bar, by 33X high (where X is the width of a module). For example, a GS1 DataBar Omnidirectional Symbol with an X-dimension of 0.25 mm would be 24 mm





wide and 8.25 mm high. 33X is the minimum height of the symbol but the actual height of the symbol used depends on the specific application requirements.



Figure 31 GS1 DataBar Omnidirectional Bar Code

9.10.2 GS1 DataBar Stacked Omnidirectional

The GS1 DataBar Stacked Omnidirectional Bar Code is a full height two-row version of the GS1 DataBar Omnidirectional Bar Code that is designed to be read by an omnidirectional scanner, such as a retail slot scanner. Its dimensions are 50X wide by 69X high (where X is the width of a module). For example, a GS1 DataBar Stacked Omnidirectional Symbol with an X-dimension of 0.25 mm would be 12.5 mm wide by 17.25 mm high. 69X is the minimum height of the symbol but the actual height of the symbol used depends on the specific application requirements. The height of 69X includes a 3X high separator pattern between two rows of 33X each.

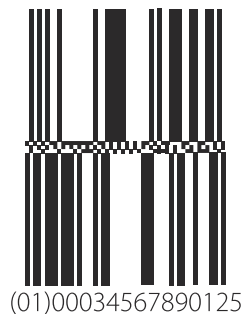


Figure 32 GS1 DataBar Omnidirectional Bar Code

9.10.3 GS1 DataBar Truncated

The GS1 DataBar Truncated Bar Code is a reduced height version of the GS1 DataBar Omnidirectional Bar Code that is designed for small items that will not need to be read by omnidirectional scanners. Its dimensions are 96X wide by 13X high (where X is the width of a module). For example, a GS1 DataBar Truncated Symbol with an X-dimension of 0.25 mm would be 24 mm wide by 3.25 mm high.



**Figure 33 GS1 DataBar Truncated Bar Code**

9.10.4 GS1 DataBar Stacked

The GS1 DataBar Stacked Bar Code is a reduced height two-row version of the GS1 DataBar Omnidirectional Bar Code that is designed for small items that will not need to be read by omnidirectional scanners. Its dimensions are 50X wide by 13X high (where X is the width of a module). For example, a GS1 DataBar Stacked Symbol with an X-dimension of 0.25 mm would be 12.5 mm wide by 3.25 mm high. Its structure includes a 1X high separator pattern between the two rows

**Figure 34 GS1 DataBar Stacked Bar Code**

The Second Group of GS1 DataBar Symbols

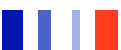
The second group of GS1 DataBar Symbols includes only one symbol type:

- GS1 DataBar Limited

9.10.5 GS1 DataBar Limited

This GS1 DataBar Symbol can encode a GTIN-14 with Indicator 1 only, a GTIN-13 with a filler zero, a GTIN-12 with two filler zeros and a GTIN-8 with five filler zeros. The symbols do not require Quiet Zones.

The GS1 DataBar Limited Bar Code is designed for small items that will not need to be read by omnidirectional Point-of-Sale (POS) scanners. Its dimensions are 74X wide, starting with a 1X space and ending with a 1X bar, by 10X high (where X is the width of a module). For example, a GS1 DataBar Limited Bar Code with an X-dimension of 0.25 mm would be 18.5 mm wide by 2.5 mm high.

**Figure 35 GS1 DataBar Limited Bar Code**



The Third Group of GS1 DataBar Symbols

The third group of GS1 DataBar Symbols includes:

- GS1 DataBar Expanded
- GS1 DataBar Expanded Stacked

GS1 DataBar Expanded versions are variable in length and capable of encoding up to 74 numeric or 41 alphabetic characters in a linear symbol that can be scanned omnidirectionally by suitably programmed slot scanners. The two versions, GS1 DataBar Expanded and GS1 DataBar Expanded Stacked are designed to encode primary and supplementary data on items for Point-of-Sale and other applications. These GS1 DataBar Symbols can encode a GTIN-14, a GTIN-13 with a filler zero, GTIN-12 with two filler zeros and GTIN-8 with five filler zeros in addition to supplementary AI Element Strings such as weight and best before date. As the majority of retail POS systems can only hold up to 13 digits, a GTIN-14 should not be used for trade items scanned at POS.

GS1 DataBar Expanded versions do not require Quiet Zones.

9.10.6 GS1 DataBar Expanded

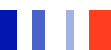
The GS1 DataBar Expanded Bar Code has a variable width (from 4 to 22 symbol characters, or a minimum of 102X wide and a maximum of 534X wide) and is 34X high (where X is the width of a module). The symbol starts with a 1X space and ends with either a 1X bar or space. For example, the GS1 DataBar Expanded Symbol shown below with an X-dimension of 0.25 mm would be 37.75 mm wide by 8.5 mm high.



Figure 36 GS1 DataBar Expanded Bar Code

9.10.7 GS1 DataBar Expanded Stacked

The GS1 DataBar Expanded Stacked Bar Code is a multi-row stacked version of GS1 DataBar Expanded. It can be printed in widths of 2 to 20 segments and can have from 2 to 11 rows. Its structure includes a 3X high separator pattern between rows. It is designed to be read by an omnidirectional scanner such as a retail slot scanner. The GS1 DataBar Expanded Stacked Symbol shown below with an X-dimension of 0.25 mm would be 25.5 mm wide by 17.75 mm high.





The white space at the end of the second row of the symbol shown in the figure below is not part of the symbol and can be used for other purposes, such as text.



Figure 37 GS1 DataBar Expanded Stacked Bar Code

GS1 DataBar Expanded Stacked is used when the symbol area or print mechanism is not wide enough to accommodate the full single-row GS1 DataBar Expanded Symbol. It is designed for variable weight products, perishable products, traceable retail products, and coupons.

9.10.8 GS1 DataBar Symbol Specifications

GS1 DataBar Symbol Specifications for Point-of Sale

The following table gives the minimum, target and maximum X-dimensions permissible for the different versions of GS1 DataBar for trade items scanned at Point-of-Sale together with the minimum height corresponding to each of these X-dimensions.

Symbol(s) Specified	*X-Dimension mm			**Minimum Symbol Height for Given X mm			Quiet Zone	
	Minimum	Target	Maximum	For Minimum X-dimension	For Target X-dimension	For Maximum X-dimension	Left	Right
GS1 DataBar Omnidirectional	0.264	0.330	0.410	12.14	15.18	18.86	NA	NA
GS1 DataBar Stacked Omnidirectional *	0.264	0.330	0.410	25.08	31.35	38.95	NA	NA
GS1 DataBar Expanded	0.264	0.330	0.410	8.98	11.22	13.94	NA	NA
GS1 DataBar Expanded Stacked	0.264	0.330	0.410	18.74	23.43	29.11	NA	NA

Figure 38 Symbol Specifications for GS1 DataBar at Point-of-Sale



Note: The heights of the bar codes do not include the Human Readable Interpretation.

* For loose produce marked with GS1 DataBar Stacked Omnidirectional and being weighed at Point-of-Sale a minimum X-dimension of 0.203 mm is permitted but may produce scanning performance reduction. As the weighing process takes longer than the scanning process, the performance drop off is not noticeable when the product must be weighed.

For symbol specifications for Regulated Healthcare, see chapter 4 Regulated Healthcare Items on page 81.

Human Readable Interpretation in GS1 DataBar Symbols

For Human-Readable Interpretation Rules see Section 9.12 Human Readable Interpretation (HRI) Rules on page 227. For HRI Rules specific to Regulated Healthcare Retail Consumer Trade Items, see Section 4.3.1 Human Readable Interpretation (HRI) on page 85.

As a Non-HRI text option, the data title may be associated with the data instead of using the AI numbers. Figure 39 shows the weight and price identified with text



Figure 39 Human Readable Interpretation

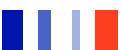
Advice for Selecting the Symbology

Any use of GS1 DataBar should comply with GS1 System global application guidelines. GS1 DataBar is not meant to replace other GS1 System Symbologies. Existing applications that are satisfactorily utilising EAN/UPC Symbols, ITF-14 Symbols, or GS1-128 Symbols should continue to use them.

Note: Scanning systems that need to read GS1 DataBar Symbols must be appropriately programmed.

If GS1 DataBar is used on items that will be read by omnidirectional slot scanners, then GS1 DataBar Omnidirectional, GS1 DataBar Stacked Omnidirectional, GS1 DataBar Expanded, or GS1 DataBar Expanded Stacked should be used. If only the AI (01) is to be encoded, then GS1 DataBar Omnidirectional or GS1 DataBar Stacked Omnidirectional should be used.

If supplementary AI Element Strings are required or the primary identification has an AI other than AI (01), then GS1 DataBar Expanded or GS1 DataBar Expanded Stacked must be used. The selection of one or the other depends on the width of the print head or the area available for the symbol.





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 Truncated or GS1 DataBar Limited (provided that the Indicator is not greater than one) should 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 constrained, 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.



9.11 Bar Codes for Extended Packaging

In addition to the symbol used at general retail POS, an additional 2D symbol may be used to carry AI (8200) (the Application Identifier for Extended Packaging URL). 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 of Extended Packaging including regulated healthcare trade items but for general retail consumer trade items, either GS1 QR Code or GS1 DataMatrix are GS1 approved options.

For details of GS1 QR Code and GS1 DataMatrix Symbologies, see the GS1 Australia User Manual - Bar Code Technical Details.

When using 2D symbols to carry AI (8200) on general retail trade items, the specifications in Figure 40 are required. For the specifications for GS1 DataMatrix Symbols on regulated healthcare trade items see the Symbol Specification Tables in chapter 4 Regulated Healthcare Items on page 81.

Symbol(s) Specified	X-dimension(mm)			Height(mm)			Quiet Zone Surrounding Symbol	Minimum Quality Specification
	Minimum	Target	Maximum	For Min. X-Dimension	For Target X-Dimension	For Max. X-Dimension		
GS1 DataMatrix (ECC 200) **	0.396	0.495	0.743	Height is determined by X-Dimension for Data that is encoded			1X *	1.5/***/670
GS1 QRCode	0.396	0.495	0.743	Height is determined by X-Dimension for Data that is encoded			4X *	1.5/***/670

Figure 40 Symbol Specifications

- 2D X-dimension - Optical effects in the image capture process require that the GS1 DataMatrix and GS1 QR Code Symbols be printed at 1.5 times the equivalent printing density allowed for linear symbols.
- 2D Quality Measurement - The effective aperture for GS1 DataMatrix and GS1 QR Code quality measurements should be taken at 80% of the printing density.
- Where a linear symbol appears on the package, reverse and mirror-image representation of GS1 2D symbols shall not be permitted.



9.12 Human Readable Interpretation (HRI) Rules

Human Readable Interpretation rules are provided to standardize requirements for brand owners and users to facilitate common training for operators who encounter GS1 AIDC data carriers that fail to scan or read. There are two categories of rules:

- General Rules that apply independent of sector, product category, or region
- Sector Specific Rules which must be aligned with the General Rules

For the purposes of interpreting this standard, there are two types of text that appear on a label, package, or item; Human-Readable Interpretation (HRI) and Non-HRI Text.

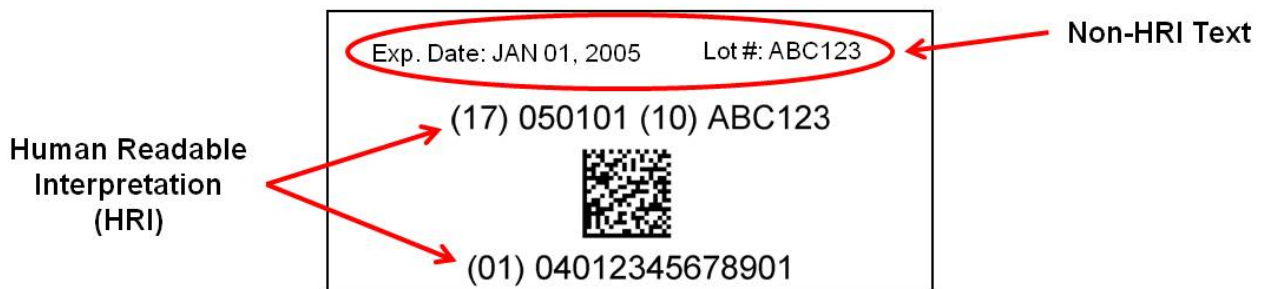


Figure 41 HRI and Non-HRI Text

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 bar codes as rules for EPCglobal RFID tags are under development.

HRI Rules

- Whether a GS1 AIDC data carrier encodes a GS1 Identification Key, GS1 Key Attributes, or a combination of both, the HRI should be placed below the bar code and grouped together wherever physically possible while maintaining the HRI legibility and minimum bar code height.
 - In cases where the HRI must be printed above, to the left, or to the right of the symbol due to packaging or space constraints, HRI shall always be printed adjacent to (obviously associated with) the GS1 AIDC data carrier while protecting Quiet Zones.
 - If the HRI for GS1 Identification Keys and GS1 Key Attributes is split (for example GS1 Key HRI is below the bar code and GS1 Key attributes HRI is above the bar code), the preference for GS1 Key HRI placement is always below the bar code.
 - When HRI is grouped together (for example, all HRI data is grouped below the bar code or all HRI data is grouped above the bar code), HRI shall always follow the encoding sequencing of the GS1 AIDC data carrier.



- 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.
- Parentheses shall surround AIs in HRI but are not encoded in the GS1 AIDC data carrier.
- A clearly legible font shall be used (e.g., OCR-B). Reasonable alternative type fonts and character sizes are acceptable provided the interpretation is clearly legible.
- HRI shall be limited to element strings and will not include GS1 AIDC data carrier overhead such as FNC1 characters.
- If the required bar code and associated HRI is marked directly on the part, then both satisfy the requirements for Healthcare Primary Package marking (see page 100) if the bar code can be scanned and the HRI is legible through a panel in the primary packaging.
- 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.
- If the bar code is printed in ladder orientation on the product, the HRI should remain clearly associated with the bar code and may appear below, to the left, or to the right of the symbol respecting Quiet Zones. See Figure 42.

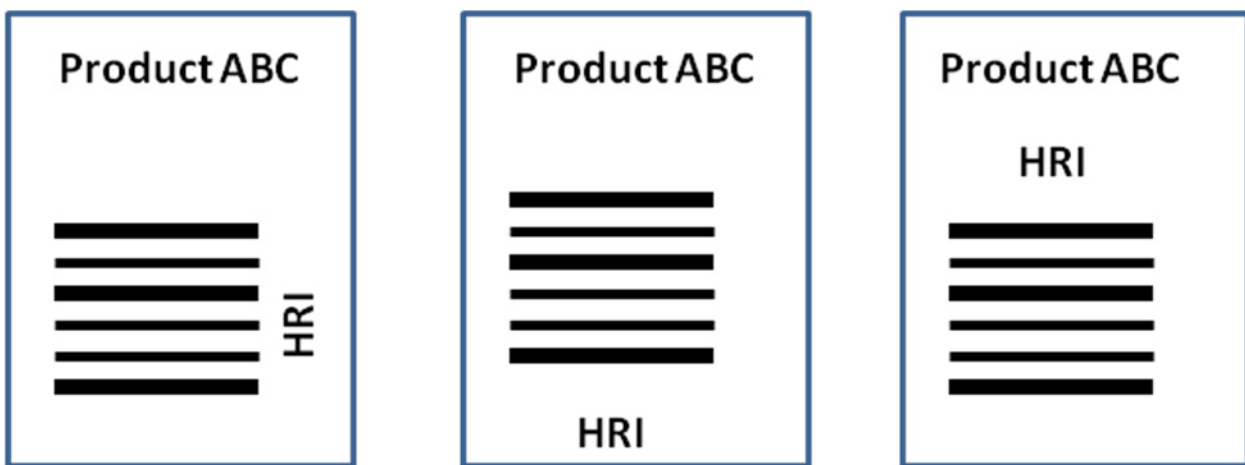


Figure 42 Bar Code Ladder Orientation and HRI Placement

Note: There may be local variants for Non-HRI text on the label (e.g., dates, prices) which are formatted based on local practice rather than the way the data is encoded in GS1 AIDC data carriers. In this case, the HRI associated with AIDC shall still be expressed as it is encoded in the GS1 AIDC data carrier encodation (per Application Identifier definition).

- When AI (8200) appears on the label, the expression of the URL shall not appear in HRI. If it appears in Non-HRI text, it shall be expressed as:

<http://brandownerassignedURL.com/GTIN> where GTIN is expressed as 14 digits.

