

Next Generation Barcodes at Retail Point-of-Sale

A Retailers Implementation Guideline

November 2024

1. Background

By the end of 2027, the GS1 ambition is for all retailers worldwide to be able to scan the next generation of barcodes at checkouts.

There is a transition period to help brand owners and retailers gradually adapt to the next generation of barcodes. During this transition period, brand owners can include the next generation of barcode alongside their linear barcodes. This allows retailers to already enjoy the benefits of the next generation of barcodes without making it impossible for other retailers to simply scan the product at their checkout.

This transition period is temporary and, by the end of 2027, only one barcode may remain on the label. However, this next generation barcode is not mandatory for suppliers, so the traditional linear barcode can and certainly will continue to be used in some cases.



Before: linear barcode



Now until end 2027:
- linear barcode alone, or
- linear & next gen barcodes



As from 2028:
- linear barcode alone, or
- next gen barcode alone

The goal of this implementation guide is to provide guidance on what the next generation of barcodes means for retailers, which advantages it has and how they can prepare for the implementation. This implementation guide is a summary for retailers of the [detailed international Implementation Guide](#).

2. What's in it for you?

Of course, the GS1 ambition to enable the usage of Next Generation barcodes doesn't come from nowhere. Industries from different sectors have been pushing for these ambitious goals for a great variety of reasons, from increased process efficiencies to better label design possibilities, from answering government requests for more transparency to gaining more consumer engagement. Here are a few ways in which the Next Generation barcodes may help you.

Size and Scannability

The Next Generation barcodes are smaller than traditional barcodes, making them easier to fit smaller labels and leave more space for label design and consumer information.

They also contain 'Error Correction Algorithms', which can be calibrated with 4 different levels, making the barcodes more stable and less prone to scanning errors.

Data Efficiency

The Next Generation barcodes are able to contain thousands of characters. This makes it possible for them to not only contain the product identification, but also batch-numbers, expiration dates, net weight/price, links to websites, and much more.

This information can then be used to automate processes that will enable and improve:

- Food safety and product traceability
- More efficiencies for inventory management and forecasting for in-store production and/or online fulfilment
- Waste management, such as for expired stock and improving stock availability
- Different price points for the same trade item, where consumer or promotional variants exist (e.g., wine vintages)
- Facilitation of sustainability targets
- Addressing business efficiencies such as reduction of manual intervention, time/labour management and optimal scan rates
- Access to digital content for consumers such as traceability information, nutritional information, recycling instructions, product certification, country of origin information, ...
- and much more

3. Types of next generation barcodes

There are 2 barcode types that are GS1 compliant and are considered Next Generation barcodes:

- The GS1 DataMatrix

This is a smaller 2-dimensional barcode that is already being used in the FMCG sector of Belgium and Luxembourg for products of variable weight, as well as for many Healthcare products sold in pharmacies in Europe.

- The QR Code Powered by GS1

This is a standard QR Code, with the advantage of containing a GS1 Digital Link URI, which is scannable by both the retailer at their Point-of-Sale (POS), AND by the end-consumer with their smartphone. Note that contrary to the 'GS1 QR Code', here the barcode-type is the normal QR Code. The URL inside however is structured in a specific GS1 standardized format that enables scanning at retail POS. See below for more details.

4. How does it work?

The GS1 Datamatrix

The GS1 DataMatrix can contain the identification key (GTIN), as well as additional, dynamic information in a GS1 Element String Syntax. This is the same syntax that is used in the GS1 Databar Expanded or the GS1-128.

For instance, in a GS1 DataMatrix, we can encode the following information:

GTIN: 05400000123450 + Best Before Date: 31/12/2027

- Text under the barcode: (01)05400000123450(15)271231
- Encoding inside the barcode: 01054000001234515271231



(01)05400000123450(15)271231

The QR Code Powered by GS1

The QR Code Powered by GS1 contains the identification key (GTIN), as well as additional, dynamic information in a GS1 Digital Link URI Syntax. This means that the information is placed inside a weblink.

For instance, in a QR Code Powered by GS1, we can encode the following information thusly:

GTIN: 05400000123459 + Best Before Date: 31/12/2027 (+ website domain: <https://id.gs1.org/>)

- Text under the barcode: (01)05400000123459(15)271231
- Encoding inside the barcode:
<https://id.gs1.org/01/05400000123459?15=271231>



(01)05400000123459(15)271231

For more information on the GS1 Digital Link URI Syntax, please visit: <https://ref.gs1.org/standards/digital-link/uri-syntax/>

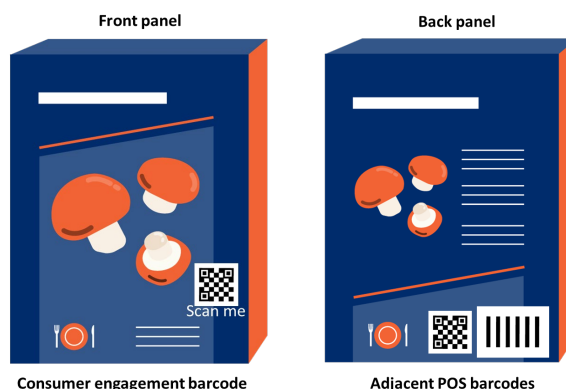
5. Considerations on their usage

What are Co-Located Barcodes, and what is their Impact?

By December 2027, not all retailers will be able to read the Next Generation barcodes. However, this does not mean that brand owners should delay their implementation before using them. They can already be used, but need to be co-located to a linear barcode, to ensure that the retailer has a reliable backup option.

Of course, if a Next Generation barcode and a linear barcode are both placed on a label, we don't want retailers, who are already able to read both, to scan the products twice. We therefore need to take some precautions:

- Retailers need to not only be able to read Next Generation barcodes, but also to scan multiple co-located barcodes as a single product.
- To enable this at the scanner level, co-located barcodes need to be either within 5 cm. of each other, or on separate sides of the product label, or both.



Which data can and should be read?

For products with a fixed quantity, the GTIN is the only information mandatory in a Next Generation barcode.

For products with variable quantity, either the net weight or the price needs to be encoded (along with the GTIN) and be read at the point of sale as well. Encoding and reading both the net weight and the price in a single barcode is also possible. Internal and National trade item identifiers (starting with '2' or '02') however, which are often used for variable quantity trade items, are not accepted in Next Generation Barcodes – only the GTIN is accepted as identifier.

Optionally, other dynamic information can be encoded and read, depending on the use case.

For instance, Batch/lot Number (10), Serial Number (21), Best Before Date (15) and/or Expiry Date (17) can be added in order to gain all or most of the advantages mentioned in section 2 of this brochure.

6. How to scan Next Generation Barcodes at the Point-Of-Sale

What is needed?

To be able to scan Next Generation Barcodes, you will need scanners which enables reading Next Generation barcodes.

In other words, you will need imaging scanners with GS1 Digital Links interpreting features, able to extract the product information from possibly multiple co-located barcodes, as well as from a weblink, for the Point of Sale System.

Wondering if your barcode scanner is 'Next Generation ready'?

Don't hesitate to take a look at our list:

<https://www.gs1.org/industries/retail/solution-provider-2d-readiness>

Optionally, you might want to update your POS-system to use the extra information that can be encoded in the barcode, like the batch number and the expiration date.

I already invested in a Point-Of-Sale capable of interpreting the GS1 DataMatrix. Was this a waste of time?

Not at all. You're already mostly there. Once you have the imaging scanners and are able to interpret the extra information in the barcode, only 2 steps remain: Adding the GS1 Digital Links interpreting features, and adding the ability to prioritize between co-located barcodes. Those upgrades are part of the scanner software, and could be resolved a lot more quickly than if you had to start from nothing.

Please contact your scanner-manufacturer for more details on whether your scanner software can be upgraded with the above mentioned features.

What are the 3 Scanning Modes for Data Extraction?

There are 3 scanning modes that scanners can have to read Next Generation Barcodes:

- Mode 1: Extract only the GTIN from one of the barcodes (if multiple co-located barcodes are present)
- Mode 2: Extract the GTIN + dynamic information like batch/lot number from one of the barcodes (if multiple co-located barcodes are present)
- Mode 3: Extract the GTIN + dynamic information from all the barcodes, together with a unique scan-id telling the Point-of-Sale System that the barcodes are co-located and scanned together.

Which Scanning Mode should I use?

This will depend on your use case.

Mode 1 is perfect for the smaller retailers who do not need to read dynamic information at their Point-Of-Sale. In other words, it is for retailers who do not sell variable weight products and do not wish to read a batch/lot number, for example.

Mode 2 is for middle-sized retailers who either wish or need to be able to read dynamic information at their Point-Of-Sale. Here, the prioritisation of product information is left to the scanner, and the Next-Generation barcode is prioritised automatically.

Mode 3 is for the bigger retailers who wish to retrieve all the barcode information possible and want to customize their approach to data-prioritisation at the POS-system level.

Please note that the scanning mode can also be changed, and nothing stops you from starting on Mode 1 and gradually upgrade to the following modes when the need for reading dynamic information arises.

7. More documentation

Looking for more information?

Here are some valuable resources to support you on your journey to Next Generation Barcode:

- 2D Barcodes at Retail Point-of-Sale Implementation Guideline:
<https://ref.gs1.org/guidelines/2d-in-retail/>
- 2D Barcode Implementation Journey: A Practical Guide for Retailers and Brand Owners:
<https://www.gs1.org/sites/gs1/files/2024-07/practical-guide-start-your-2d-barcode-journey.pdf>
- 2D Barcodes introductory information:
<https://www.gs1.org/standards/barcodes/2d>
- Next generation barcodes: opportunities for retailers (video):
<https://www.youtube.com/watch?v=qb8mHGdS8YQ>