



The Global Language of Business

Source Marking Guideline for Raw Materials

How to identify and barcode raw materials

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Introduction

For processed food and raw material manufacturers and other businesses that handle foods, it is becoming increasingly more important in recent years to ensure food safety and security. One of the ways to do this efficiently is to use barcodes. By using barcodes to read information swiftly and accurately and make it computer-processable, we may be able to prevent careless mistakes and misunderstandings, which are difficult to eliminate entirely under manual handling of information.

Consumer products that are traded in supply chain between processed food manufacturers, wholesalers, and retailers, for instance, carry barcodes that encode the GTIN(Global Trade Item Number), an international standard that is widely used for receiving and shipping operations, merchandise control, and ensuring traceability. These standardized identification codes are also used in electronic data interchange (EDI) and product databases.

When it comes to raw materials that are traded between raw material manufacturers and processed food manufacturers in the upstream supply chain, in the meantime, barcodes are rarely used, nor is identification by standardized code.

In this field, volunteers among the members of the Study Group for Information System in Food, Beverage, and Alcohol Industry along with others developed the guideline on the system for tracing back history information on shipping and receiving of raw materials. While it was a pioneering undertaking, the guideline left a number of items voluntary, and is used only but a very small number of companies. Even among the processed food manufacturers that do use the guideline, some make their own set of requirements different from one another. This requires raw material manufacturers to generate barcodes of different types and formats for different trading partners, even when handling the same raw material. This imposes increased workload on raw material manufacturers, some of whom find it too much to handle. Meanwhile, it is common for processed food manufacturers to place barcodes on raw materials upon receiving them due to the low rate of products barcoded at source.

In order to have more raw materials carry barcodes to improve safety and security and ensure traceability in an efficient manner, it is essential that the identification scheme and barcodes to encode the information is established as a standard so that both raw material and processed food manufacturers can use them seamlessly.

In light of this background, the GS1 Japan has developed a new guideline on how to identify and barcode the raw material in cooperation with raw material manufacturers, processed food manufacturers, system vendors, and other experts. It is our hope that this guideline will encourage the use of barcodes with globally unique identification (i.e. no overlapping with others) anywhere in the world, helping make supply chains more efficient and improve food safety and security.

1 About this Document

1.1 Using this Guideline

This document recommends that raw materials, primarily those traded between a raw material manufacturer and a processed food manufacturer, carry barcodes that have a globally unique identifier GTIN¹, date information, and batch/lot number encoded in them, so that businesses may take advantage of them. It also discusses advantages of using AIDC technology and provides explanations on specific information required when barcoding items and using them.

This Guideline is roughly divided into the following parts. While it is recommended that you read it through, you may also turn to an individual chapter relevant to the uses or information you require.

Chapter 1: About this Guideline

This chapter outlines basic information such as why the Guideline was developed, advantages of using the Guideline, and types of raw materials covered by it. This chapter should be the first stop for anyone who intends to identify raw materials covered in this Guideline on a batch/lot basis and encode the information in a barcode, who is to use such barcodes, or who is to provide technical support to use the barcodes.

Chapter 2: Steps to barcode a raw material

This chapter describes how to allocate data items that to identify a raw material and to be encoded in a barcode, such as GTIN and batch/lot number. It also discusses the types of barcodes that may be used, and points of note when barcoding a product. This is intended for those who actually barcode their products, or those who request for barcodes to be placed on raw materials.

Chapter 3: Technical information concerning implementing and reading barcodes

This chapter provides in-depth descriptions of the AI (application identifier)² and technical information relevant to generating and reading a GS1 standard barcode. If you are with the systems department of a raw material or processed food manufacturer, or a system vendor, and wish to obtain technical requirements, please refer to this chapter.

Chapter 4: FAQs

Frequently asked questions and answers to them are provided.

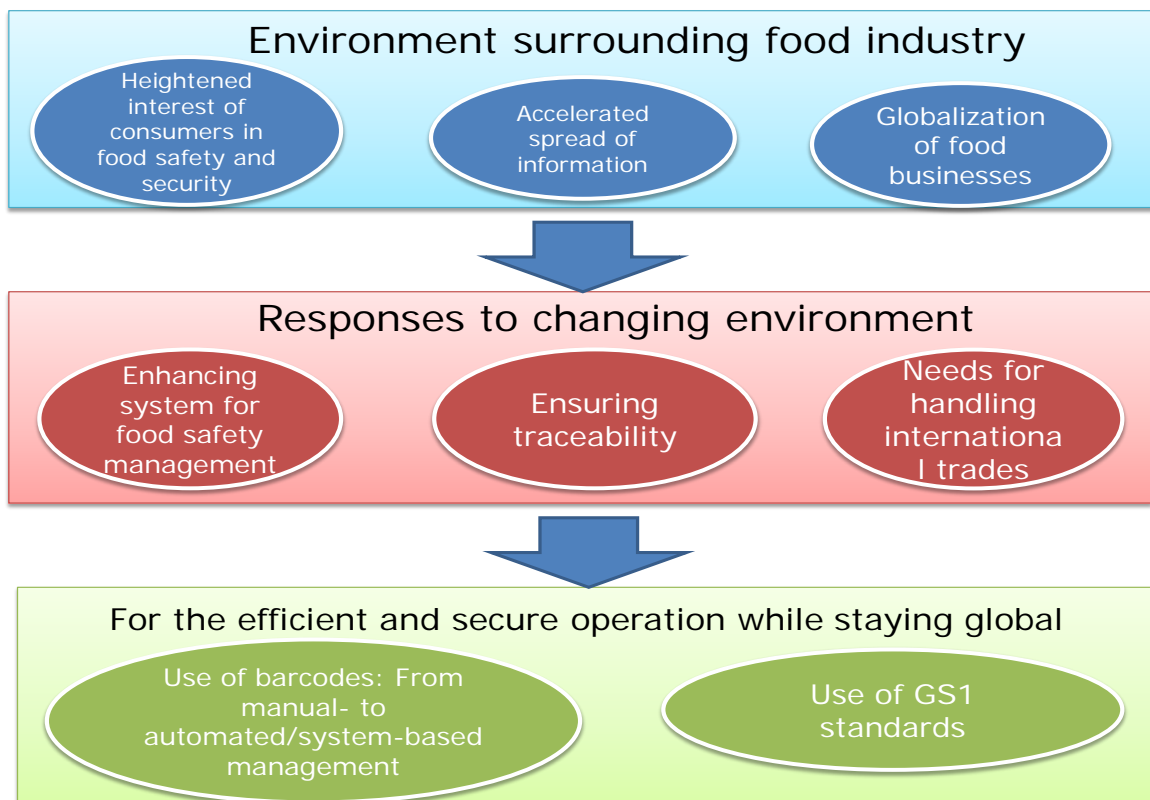
Chapter 5: Reference

¹ GTIN stands for Global Trade Item Number, which was developed by GS1 to allow for unique identification (without overlapping with any other) of a raw material (product) anywhere in the world.

² Application Identifiers, or AIs, are defined by GS1, and each is a two, three, or four digit numeric code that defines the meaning and format of data elements encoded in a barcode, such as the number of digits and types of characters that may be used.

1.2 Background to the development of the Guideline

1) Environment surrounding food industry



(1) Heightened interest of consumers in food safety and security

Consumers are highly interested in food safety and security. In recent years, for instance, incidents such as falsified labeling of origins of rice, inaccurate descriptions of menus, deliberate tempering, and illegal selling of waste became huge social issues.

According to a survey conducted by the Cabinet Office in 2014 that asked what consumer affairs they were interested in, the most common answer chosen by the respondents (81.7%) was "Food safety, such as food poisoning and additive problems," followed by "False labeling and other fictitious information on products/services provided by businesses" (66.8%) (Cabinet Office (2014) Public Opinion Survey on the Promotion of Consumer Policy).

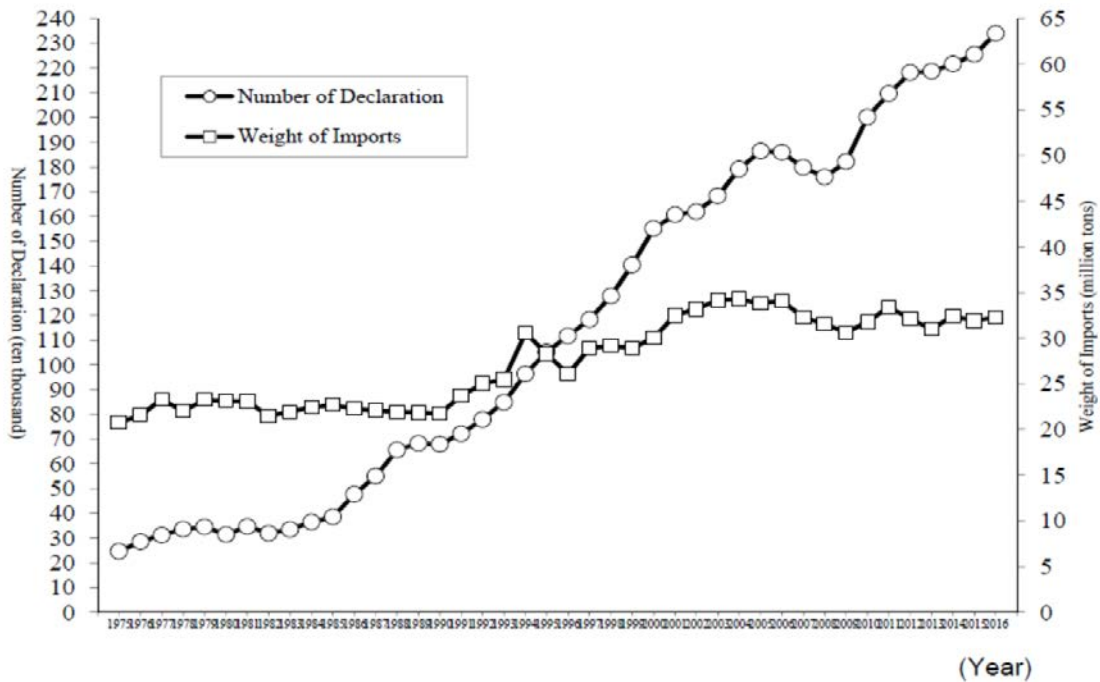
(2) Accelerated spread of information

Advancements in information technology helped a widespread use of the Internet, where information instantly spreads all over the world through social media such as Instagram, Facebook, Line, and Twitter. This has made it significantly easier for consumers to send out or receive information, which in turn resulted in an instant spread of information about a company or a product, whether it is good or bad. In other words, the opinions/voices that consumers send out now have far greater an influence

than ever before.

(3) Globalization of food businesses

According to the Statistics of Imported Food in Japan FY2016, imports of food to Japan are growing larger.

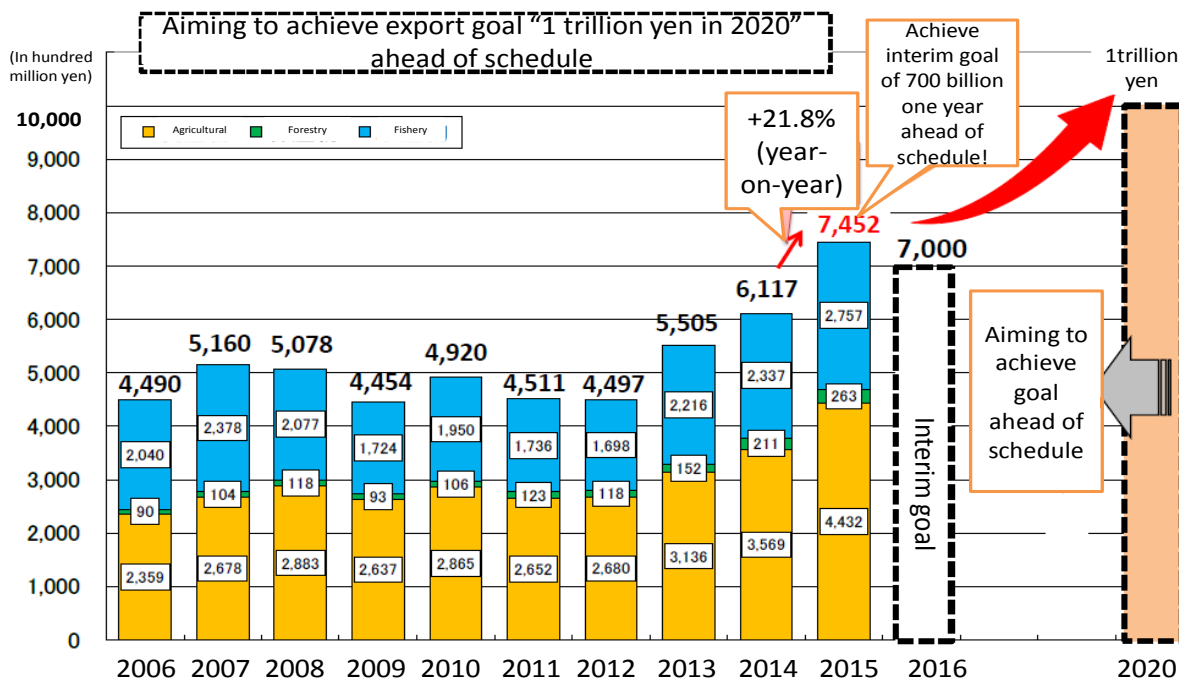


Source: Department of Food and Safety, Pharmaceutical and Food Safety Bureau (2015) Statistics of Imported Food in Japan FY2016.

<http://www.mhlw.go.jp/file/06-Seisakujouhou-11130500-Shokuhinanzendu/1219.pdf> (Reference: 2019-01-25)

Exports of food (including agricultural and fishery products," meanwhile, have also been growing larger, with three consecutive year-on-year increases from 2013, reaching approximately 750 billion yen in 2015. The national government has also announced its policy to aim for 1 trillion yen by 2020. These trends suggest that globalization of manufacture and distribution of food, including raw materials, is expected to continue.

Changes in exports of agricultural and fishery products/foods over time



Source: Export Promotion Division, Food Industry Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries (2016) Export Performance in Agricultural, Forestry, and Fishery Products/Foods

<http://www.maff.go.jp/j/press/shokusan/kaigai/160202.html> (Reference: 2016-07-23)

2) Responses to changing environment

In order to keep up with the environment that surrounds the food industry described above, raw material and processed food manufacturers are facing increasing needs to attend to the following matters.

(1) Enhancing system for food safety management

If company's product ever becomes a cause of a serious incident/accident that creates a health hazard to consumers, its impact on the company, including lost customer trust and difficulties of continuing the business, is incalculable. Businesses are urged to build and enhance their systems to ensure food safety in every setting and manage product information in an appropriate manner.

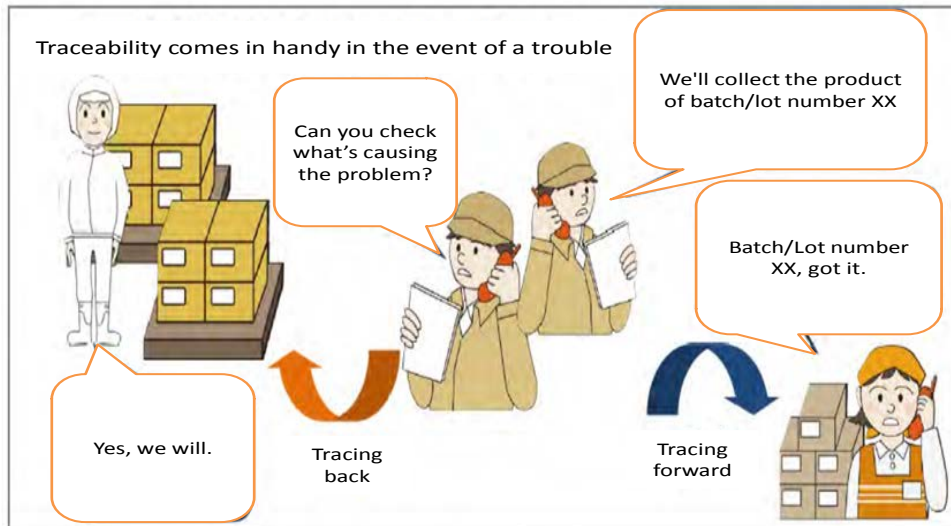
(2) Ensuring traceability

In the event of an issue stemming from a raw material, it is necessary to identify where the raw material comes from, which products it has been used in, and where such products have gone. For this purpose, traceability on a batch/lot basis is now more important than ever as it allows for tracing back and forward.

"Traceability" is the "capability to trace movements of food products"

When individual businesses keep and archive the records of their handling of food

products, in the case of an accident or violation of law that has health consequences, such as food poisoning, it enables them to investigate where the food products in question have gone (i.e. tracing forward) and where they came from (i.e. tracing back).



Source: Consumer Policy Division, Food Safety and Consumer Affairs Bureau, Ministry of Agriculture, Forestry and Fisheries (2015) FY2013 Food traceability promotion commission project: Food traceability; Practical Manual - General

<http://www.maff.go.jp/j/syouan/seisaku/trace/pdf/souron.pdf> (Reference: 2016-07-23)

For details about traceability and specific practices, please refer to the following guideline:

Ministry of Agriculture, Forestry and Fisheries Food traceability: Practical Manual

<http://www.maff.go.jp/j/syouan/seisaku/trace/index.html#1>

Revision Committee on the Handbook for Introduction of Food Traceability Systems "Handbook for Introduction of Food Traceability Systems (Guidelines for Food Traceability)

http://www.maff.go.jp/j/syouan/seisaku/trace/pdf/tebiki_rev.pdf

(3) Needs for handling international trades

Imports and exports of foods, including raw materials, are expected to continue increasing. It is therefore necessary for raw material and processed food manufacturers to take international trades into consideration when planning information exchange system.

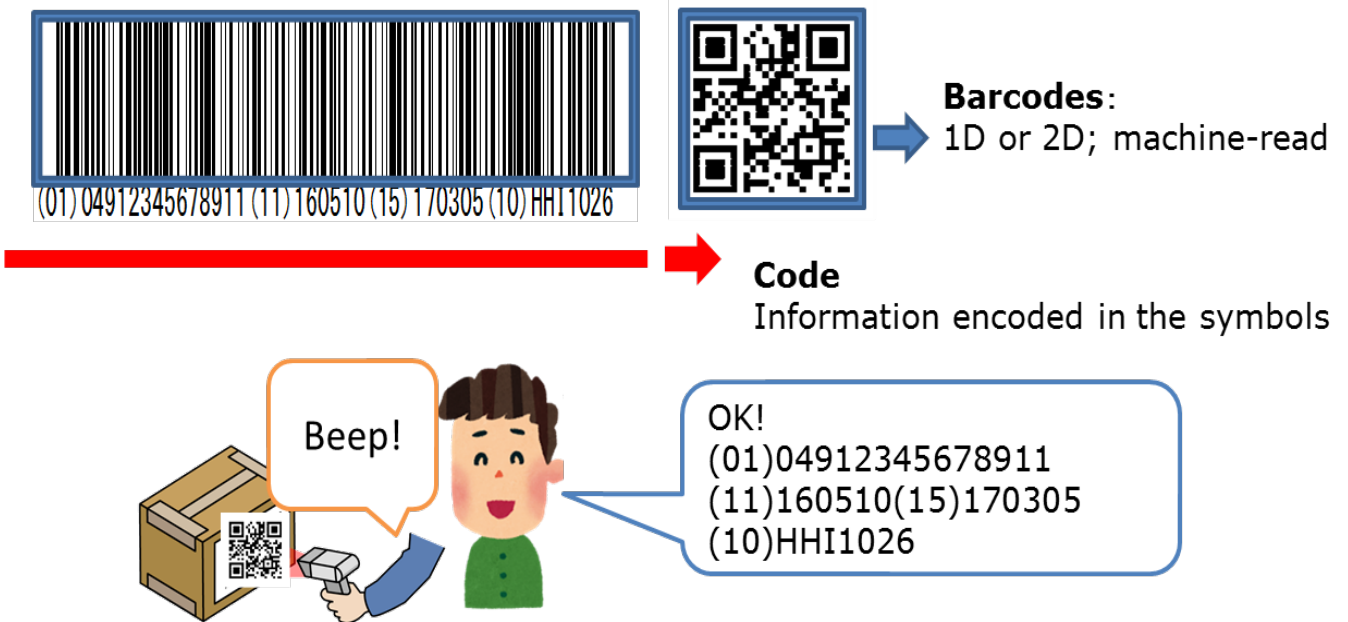
3) For the efficient and secure operation while staying global

Identifying raw materials on a batch/lot basis by using standardized codes and encoding the information in barcodes to be used in receiving and shipping of items and inventory control may help improve the accuracy, efficiency, and searchability of records. This is one of the most effective ways of helping secure safety management systems and ensure traceability.

(1) Use of barcodes: From human- to machine/system-based management

Barcode is a tool to enable quick and accurate data capture, which can then be processed quick and accurate machine reading of information which can then be processed by computer. When a raw material carries a barcode, one can check the information quickly and import it into their system.

(2) Use of GS1 standards



Given that barcodes are used for transactions between multiple raw material and processed food manufacturers, and that such transactions may potentially become international, we have chosen the global GS1 standard, as the barcode system to encode the codes and information to identify raw materials.

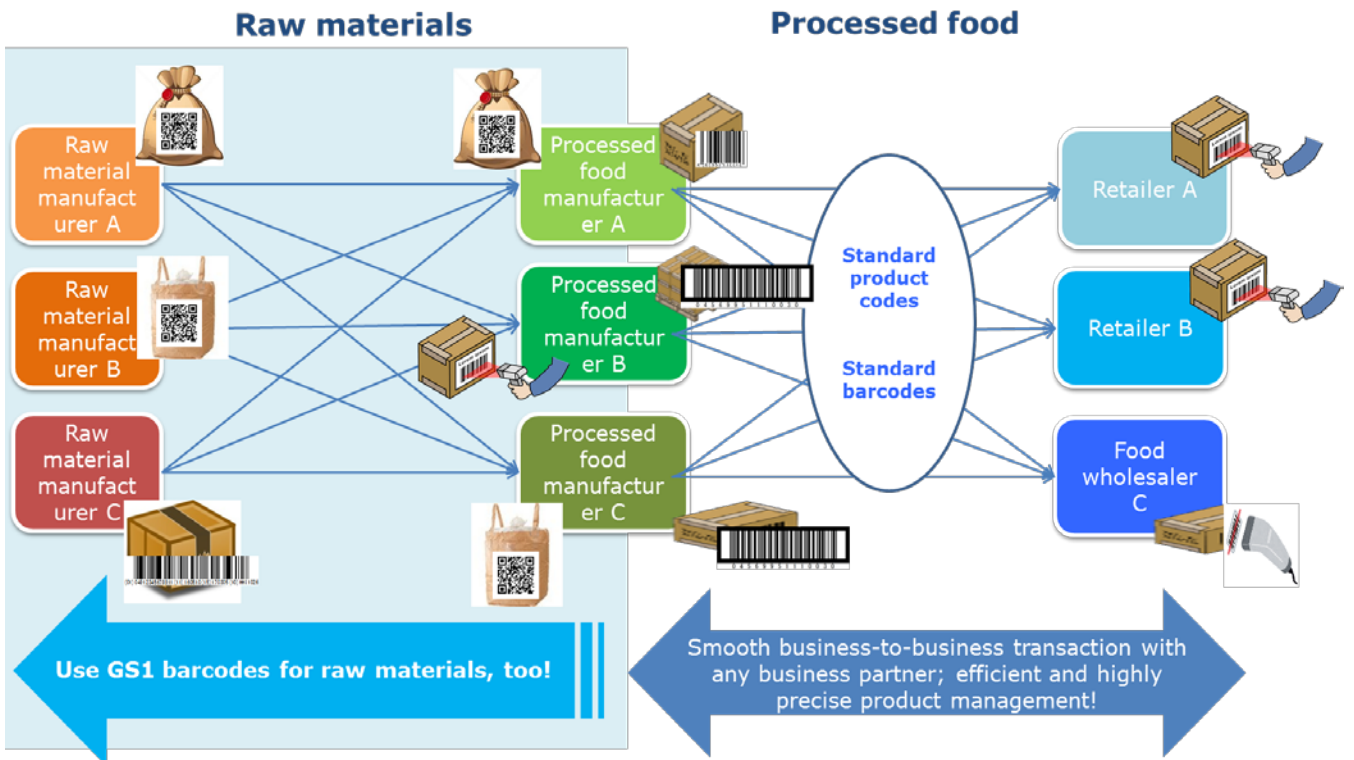
1.3 Purposes of the Guideline

As discussed in 1.2 above, raw material and processed food manufacturers are being required to enhance the system for food safety management and ensure traceability to allow for swift response to an accident, even if it is remotely likely to happen.

With the demand for fine-tuned management of raw materials now higher than ever, in order to ensure highly precise raw material management and efficient communication of information between businesses, it is desirable to establish a system in which raw materials, just as processed food (i.e. final products) do, carry barcodes that can be used by both raw material and processed food manufacturers. In doing so, we should take international trades into consideration to keep up with the growing exports and imports.

In light of this, this Guideline aims to ensure that the following three are carried out thereby creating environment where both raw material and processed food manufacturers can practice accurate and efficient management of raw materials as well as traceability:

- 1) Raw material manufacturers and processed food manufacturers identify raw materials by the GTIN as a global standard in their transactions.
- 2) Raw material manufacturer encodes GTIN, date information, and batch/lot number into a barcode for its raw material (Source marking by raw material manufacturer)
- 3) Computer systemization of work / record keeping that has traditionally been done by humans, by making use of barcodes placed by raw material manufacturer



1.4 Advantages of using the Guideline

The following benefits may be expected when a raw material manufacturer use barcodes that are compatible to an international standard and both raw material and processed food manufacturers make use of the barcodes:

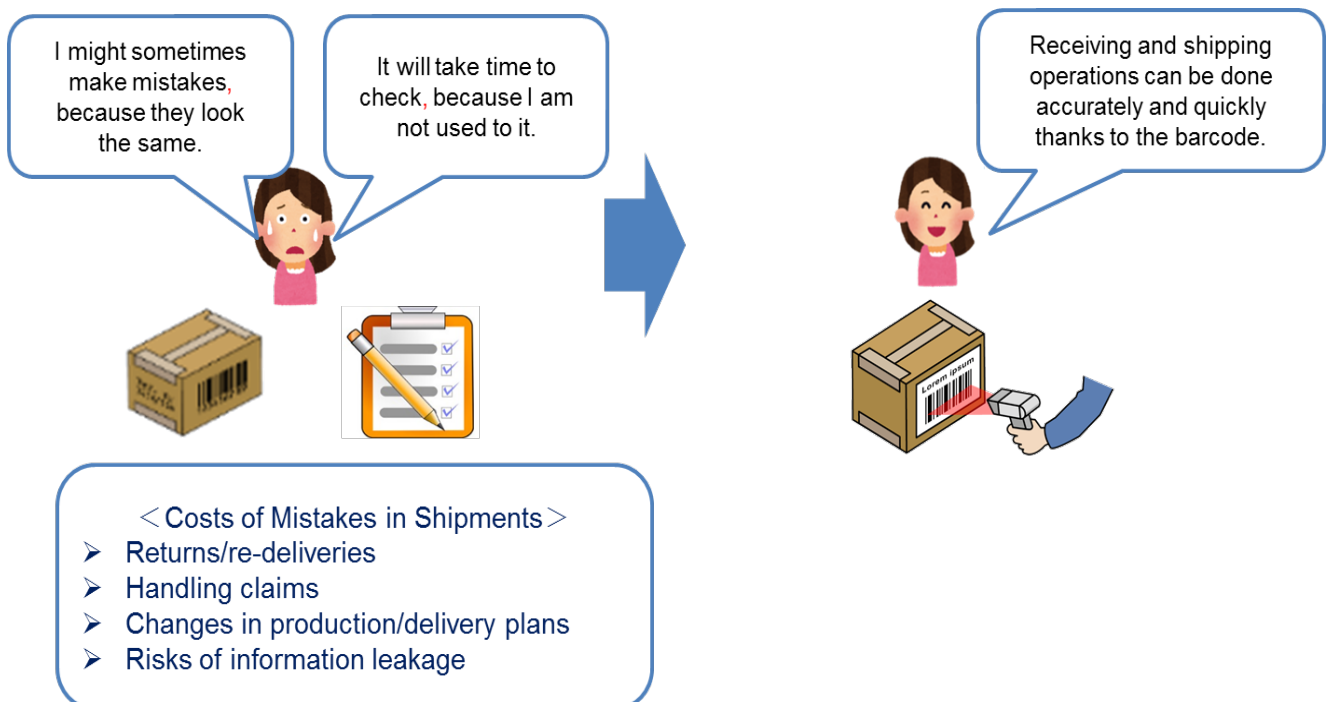
- 1) Efficiently ensuring highly precise receiving/shipping operation
- 2) Quick and accurate recording and archiving of receiving/shipping data
- 3) Prompt handling of inquiries about receiving/shipping records
- 4) Improved business credibility

1) Efficiently ensuring highly precise receiving/shipping operation

Standardizing information to be encoded in barcodes for raw materials can increase the percentage of items marked at the source by the raw material manufacturers. With the use of barcodes, visual inspection of items that has been carried out manually by human inspectors can now be automated.

A barcode enables information to be scanned quickly and accurately by a machine and processed by a computer, and it may help:

- ▶ Prevent mistakes from occurring in receiving and shipping due to errors or confusion in human visual inspection
- ▶ Eliminate inconsistencies among individual workers in operation time and precision
- ▶ Make traded item check simpler and reduce workers' burden
- ▶ Save time and labor cost through systemization



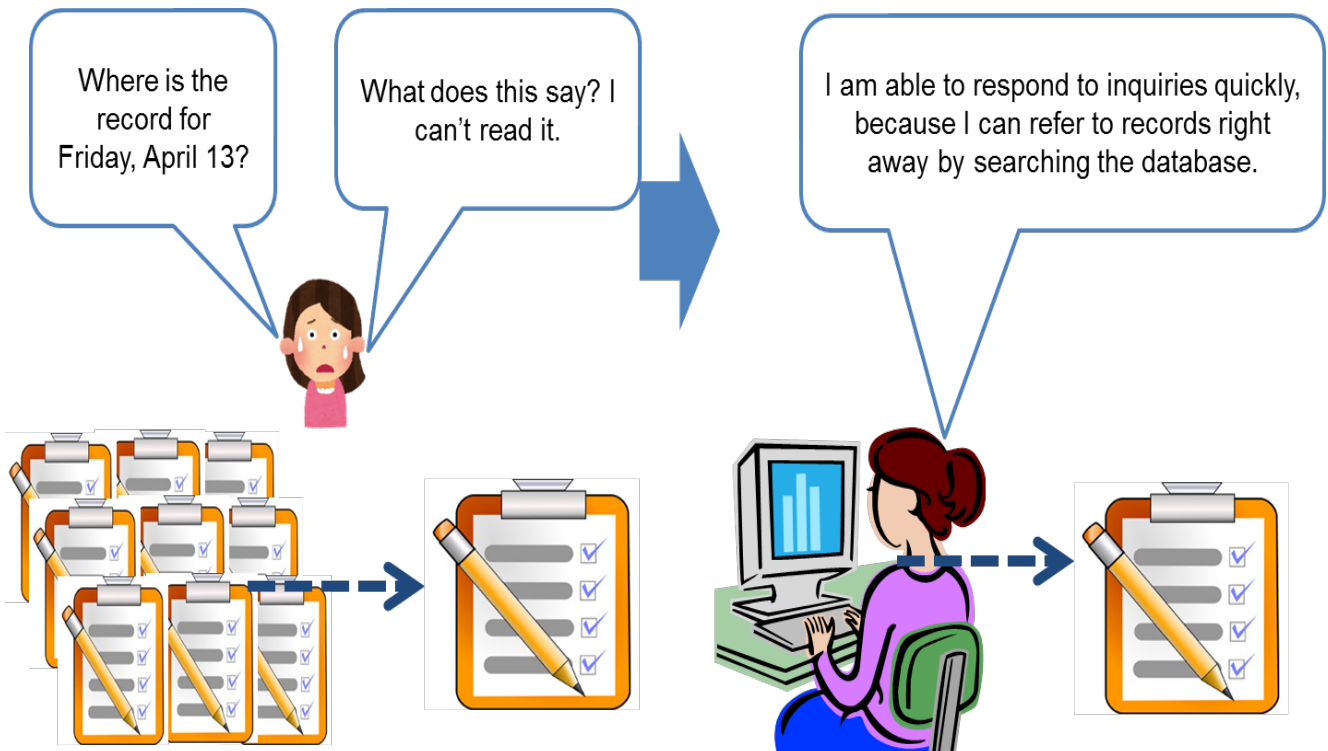
2) Quick and accurate recording and archiving of receiving/shipping data

As a precaution to any trouble to a traded item, it is necessary to keep and archive the record of information about raw materials on a batch/lot basis as to when (date shipped/received), where from (origin of shipment), and how many (quantities) in order to ensure traceability. While the record keeping/archiving work can be done manually, use of barcodes makes it faster to keep and archive records.



3) Prompt handling of inquiries about receiving/shipping records

When responding to an inquiry from a consumer or trading partner, or in the case of an issue with a traded item, a raw material manufacturer needs to refer to the receiving/shipping records for their products. Such records might be archived as hard copy, but archiving and managing them on an electronic system would make it possible to significantly shorten data referencing time, and to respond to inquiries promptly.



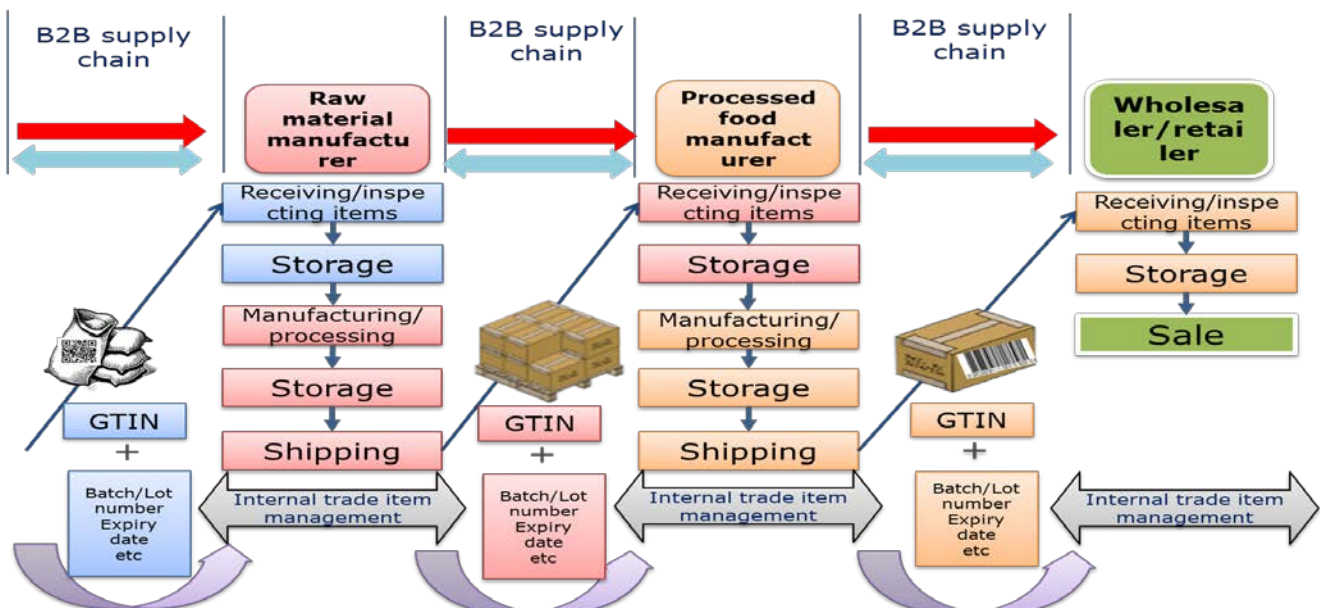
4) Improved business credibility

A number of businesses attach weight to efforts involved in ensuring food safety and security. Many of them share with the world such efforts of theirs on their websites and other public relations channels. Using this Guideline to improve raw material management and ensure traceability will help your efforts for food safety and security, which in turn may lead to improved business credibility with consumers and trading partners.

1.5 Scope of the Guideline

The aim of this Guideline is to make business-to-business supply chains (external supply chains) between raw material manufacturers and processed food manufacturers more efficient. It does not focus on the efficiency of manufacturing/process within a company (internal supply chains).

For an effective business-to-business supply chain



Different processed food manufacturers have different sets of manufacturing, processing, and other processes as well as systems to support them, and information required for each of these individual systems varies from one manufacturer to another. If individual processed food manufacturers request raw material manufacturers for information that varies among different businesses, it amounts to the former requesting for labelling for their exclusive use. This requires that the latter handle different requests individually, which is inefficient. As a solution, processed food manufacturers, if they are to barcode information required for a certain process on their own, may preferably use the barcode for their raw materials by reading the original barcode, supplementing it with any further information required for the internal process management, then applying it to their processed product.

1.6 Raw materials in scope

Raw materials in scope of this Guideline are cereals, legumes, eggs, edible fats and oils, condiments, spices, additives, and associated materials (such as packaging materials, cardboard, plastic wraps, and containers). Fresh foods such as meat, fresh produce (vegetables and fruits), and fisheries products and hygiene products) are out of the scope of this Guideline and refer to the other guidelines (Japanese only)³.

³ <http://www.ofsi.or.jp/>

2 Steps to barcode a raw material

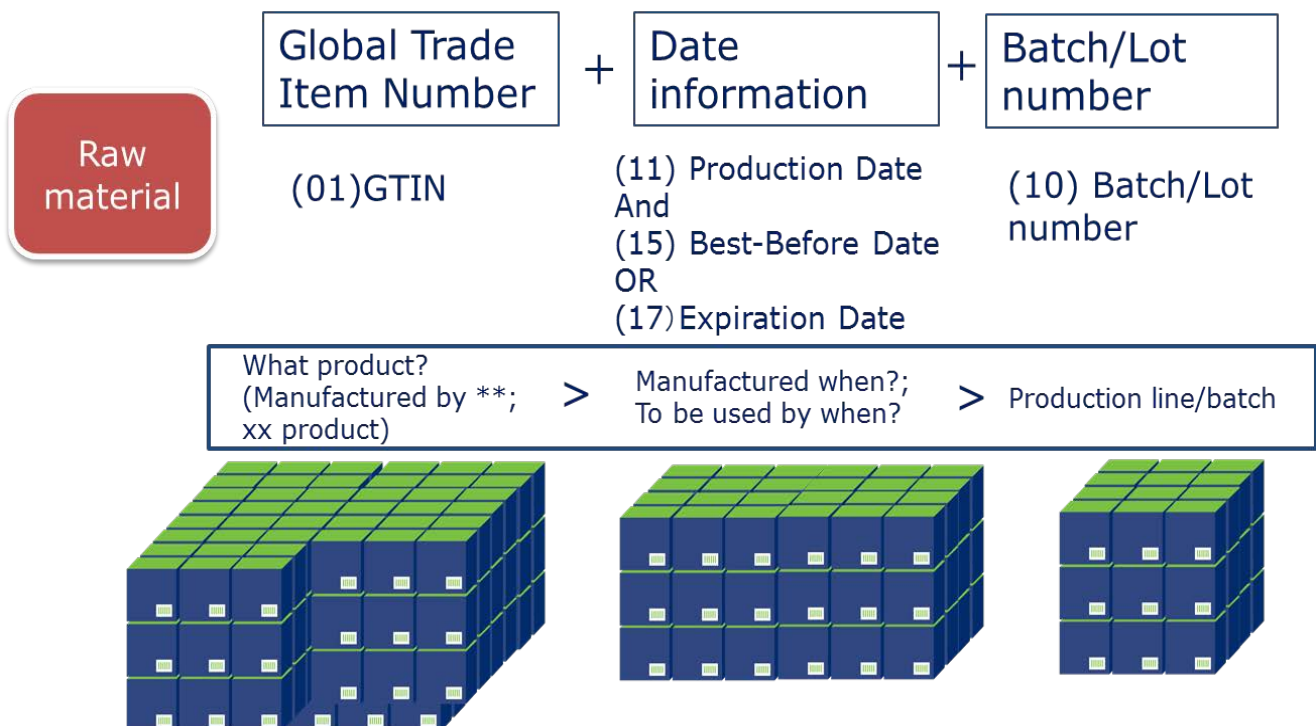
This chapter describes data items to be encoded into a barcode for the purpose of identifying raw materials on a batch/lot basis, and types of barcodes that are used.

2.1 Fundamental policies of data items to be barcoded

Data items to be barcoded for raw materials have been determined according to the basic principles below.

1) Minimum data items required to identify raw materials on a batch/lot basis

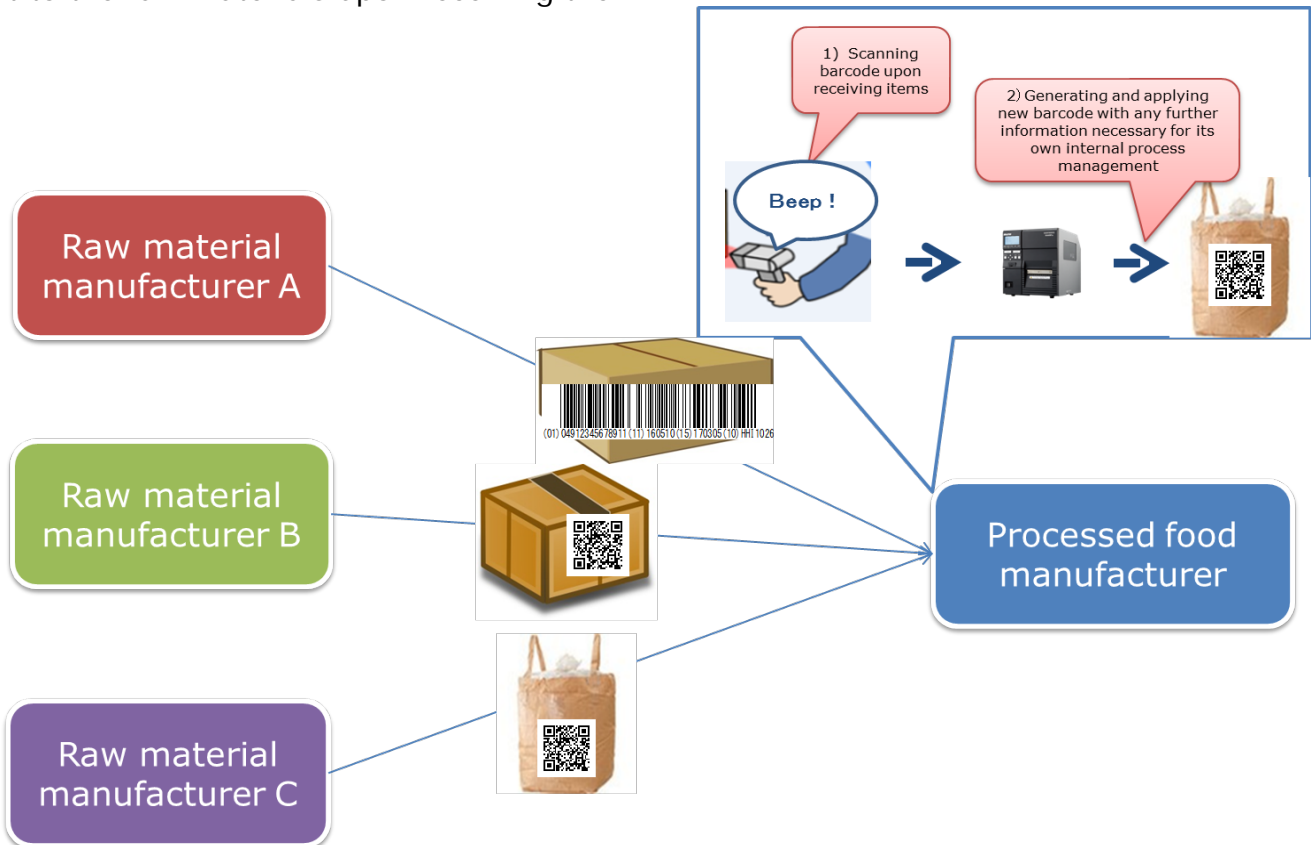
The basic data items to be barcoded are a minimum of items that are required for receiving/shipping management of raw materials and ensuring traceability. Information that is accessible in the product specifications or product information database (such as the name of raw material, product specification number, and the name of the manufacturing facilities) is not to be encoded in the barcode.



2) Data items required for business-to-business transactions

This Guideline narrows down a list of data items for batch/lot-basis raw material identification to those required for transactions between businesses. If processed food manufacturers request for information necessary for their own internal process management, it means a bar raised higher for raw material manufacturers in handling

such requests, which this Guideline does not recommend. When a business receiving raw materials requires any information necessary for their internal process management, the business should generate a new label that incorporates such information into it, and apply it to the raw materials upon receiving them.



3) GS1 standards compliant

This document has employed the GS1 standards taking into account global and diverse procurement and supply networks. Information for raw material identification has been decided referring to guidelines for foodservices or food traceability in Europe and North America. Efforts have also been made to ensure consistency with international standards wherever possible with respect to the types of barcodes that encode information in them.

2.2 Importance of compliance with basic Data Attributes: For the wide implementation of standard barcodes across the industry

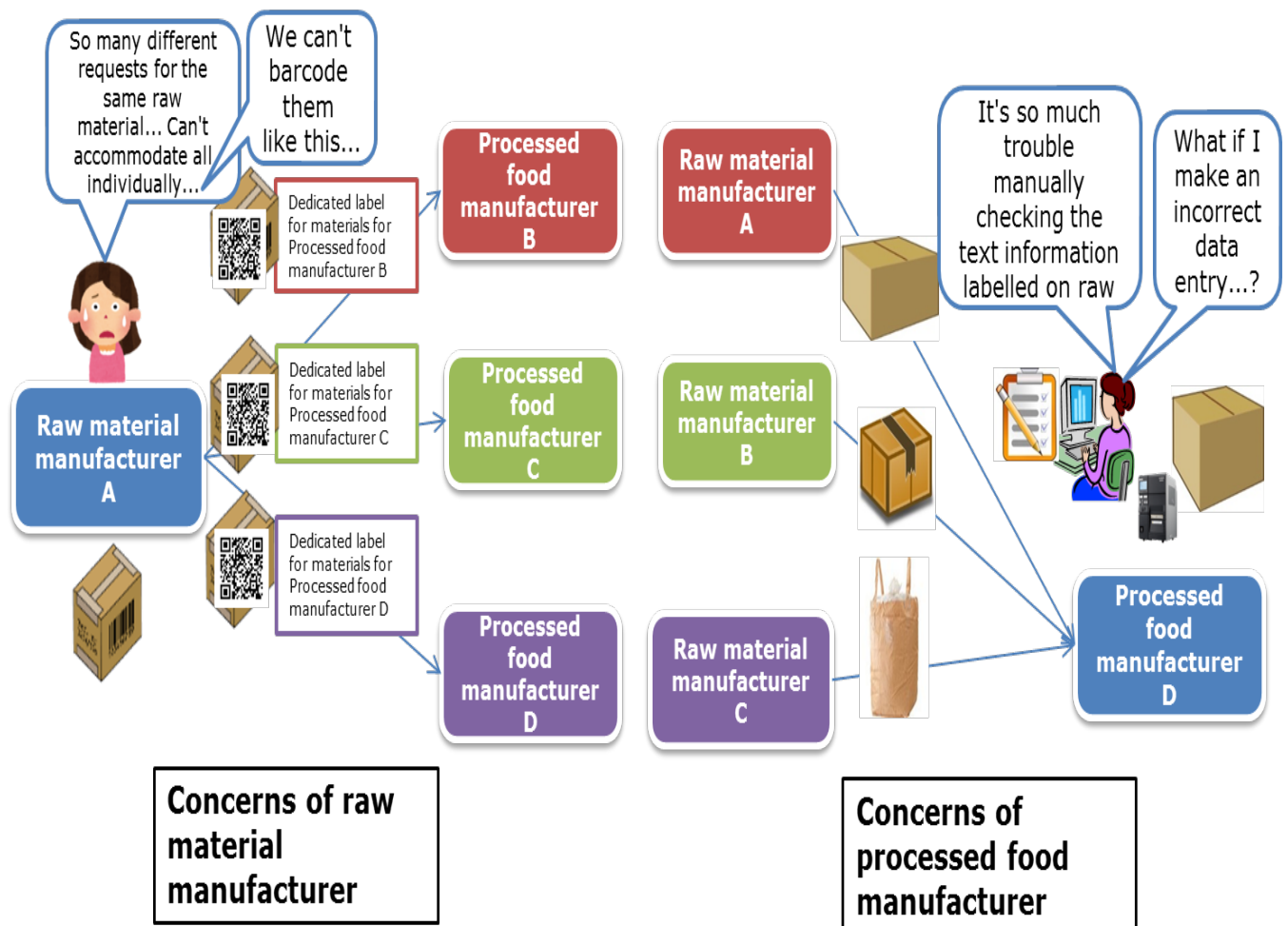
This document has established the “basic data items,” as presented earlier in Section 3.1, as a set of information to be encoded in barcodes and exchanged between businesses for the purpose of raw material identification. Lack of standardization of data items encoded in barcodes for raw materials causes both raw material and processed food manufacturers issues (disadvantages) such as follows:

<Raw material manufacturers>

- Required to apply different barcodes (items) to the same raw material for each trading partners individually (processed food manufacturers). Such individual handlings cause raw material manufacturers a lot of trouble, making their inventory management cumbersome. This, as a result, makes it hard for raw material manufacturers to implement barcodes.

<Processed food manufacturers>

- Unless it becomes common for raw materials to be barcoded by their manufacturers (i.e. source marking), processed food manufacturers need to manually check the information such as the product name, date information, batch/lot number, etc. that is provided as human readable text and manually input the data into the system. This not only makes the work cumbersome but is prone to typing errors or data mix-ups, which is both inefficient and costly.



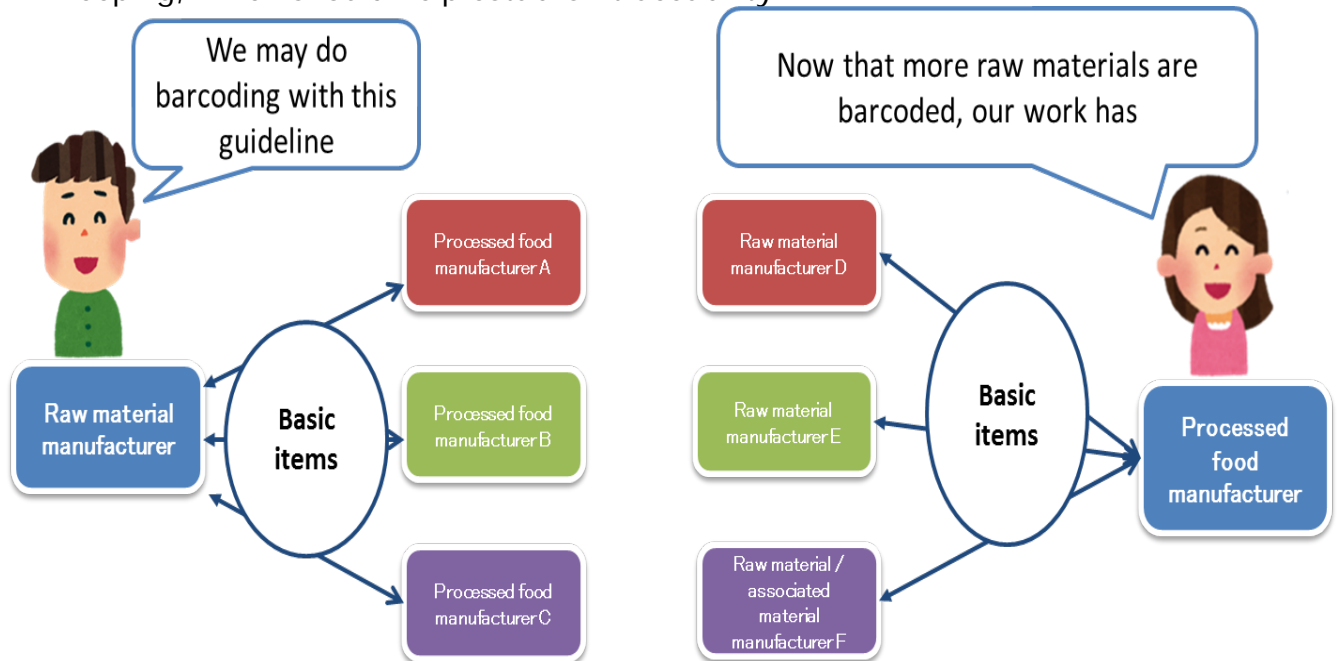
Instead, with a set of basic data items established for the information to be labelled on raw materials and both raw material and processed food manufacturers complying to them, the following advantages are expected:

<Raw material manufacturers>

- Not required to use different barcodes (items) for different trading partners (processed food manufacturers), but able to ship raw materials with a standard format barcode to different trading partners

<Processed food manufacturer>

- Increases of the percentage of barcoded raw materials at source (source marking rates) is expected. With the increases of barcoded raw materials, use of these barcodes enables accurate and efficient receiving/shipping management and record keeping, which should help establish traceability.



2.3 Data attributes to be barcoded

Data attributes to be barcoded for the identification of raw materials are as follows:

For fixed-measure trade item

Fixed-measure trade items are those whose weight or size is predetermined.

Item	AI	Descriptions	Format
Global Trade Item Number	01	GTIN: GS1 product identifier	2-digit (AI) + 14-digit (Global Trade Item Number)
Production Date	11	Production date of raw material	2-digit (AI) + 6-digit (Production Date in YYMMDD format)
Best-Before Date OR Expiration Date	15 or 17	Best-Before Date ⁵ OR Expiration Date ⁶ of raw material	2-digit (AI) + 6-digit (Best-Before Date or Expiration Date in YYMMDD format)
Batch/Lot number	10	Identifier to specify production lot/batch	2-digit (AI) + up to 20 alphanumeric characters (Batch/Lot number)

* YY to represent the last two digits of the year in the Gregorian calendar, according to the ISO format.

For variable-measure trade items of varying weights or sizes among different batches/lots

Variable-measure trade items are those whose weight, volume, or length (any unit of measure) varies per package/unit of trade.

Item	AI	Descriptions	Format
Global Trade Item Number	01	GTIN: GS1 product identifier	2-digit (AI) + 14-digit (Global Trade Item Number)
Weight/size	3nnn (Note: See Step 11 under 3.4.1 for AIs)	Unit of measure, followed by the weight, etc.	4-digit (AI) + 6-digit (Weight/size)
Production Date	11	Production Date of raw material	2-digit (AI) + 6-digit (Production Date in YYMMDD ⁴ format)
Best-Before Date OR Expiration Date	15 or 17	Best-Before Date ⁵ OR Expiration Date ⁶ of raw material	2-digit (AI) + 6-digit (Best-Before Date or Expiration Date in YYMMDD format)
Batch/Lot number	10	Identifier to specify production lot/batch	2-digit (AI) + up to 20 alphanumeric characters (Batch/Lot number)

Note: Date information

As a rule, encode the following two AIs for a raw material into its barcode:

- Production Date AI (11)
- Best-Before Date AI (15) OR Expiration Date AI (17)

Which of the two (Best-Before Date or Expiration Date) should be used, or whether or not such a date should be used, is determined according to the type of raw materials. The followings are typical examples.

⁴ YY to represent the last two digits of the year, according to the ISO format.

⁵ Date until which a foodstuff should retain all elements of its expected quality when it has been stored as specified.

⁶ Date up until which a food should be free of safety concerns due to spoilage, deterioration, or other quality losses when it has been stored as specified.

Examples of codes

Example 1) Raw material with a Best-Before Date specified

Global Trade Item Number: 04912345678911
Production Date: May 10, 2016
Best-Before Date: March 5, 2017
Batch/Lot Number: HHI1026
(01)04912345678911 (11)160510 (15)170305 (10)HHI1026

Example 2) Raw material with an Expiration Date

Global Trade Item Number: 04912345678911
Production Date: November 30, 2016
Expiration Date: December 5, 2016
Batch/Lot Number: HHI1026
(01)04912345678911 (11)161130 (17)161205 (10)HHI1026

Example 3) Raw material which does not have or require a Best-Before Date or Expiration Date

Label a raw material which does not have or require a Best-Before Date or Expiration Date with a Production Date only.

Global Trade Item Number: 04912345678911
Production Date: May 10, 2016
Batch/Lot Number: HHI1026
(01)04912345678911 (11)160510 (10)HHI1026

Reference) Raw material for which a Best-Before Date is shown in a year-month format (Note)


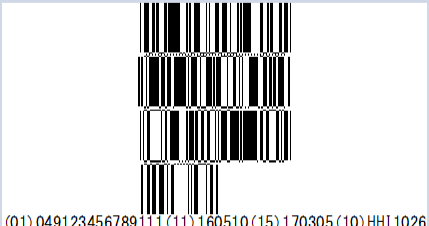


It is recommended that a Best-Before Date be specified in year, month, and date for a raw material. If it is to appear in year-month format, the portion of an AI assigned for the date should appear "00."

Global Trade Item Number: 04912345678911
Production Date: May 10, 2016
Best-Before Date: March 2017
Batch/Lot Number: HHI1026
(01)04912345678911 (11)160510 (15)170300 (10)HHI1026

* In year-month format, the date is understood as the last day of the month. In the example above, therefore, Best-Before Date is March 31, 2017.

2.4 Data carrier for raw materials

The guideline recommends GS1-128 symbol and GS1 QR code for raw materials.

	Recommended	Acceptable
1D symbol	GS1-128  (01)04912345678911(11)160510(15)170305(10)HHI1026	GS1 DataBar  (01)04912345678911(11)160510(15)170305(10)HHI1026
2D symbol	GS1 QR code  (01)04912345678911(11)160510(15)170305(10)HHI1026	GS1 DataMatrix  (01)04912345678911(11)160510(15)170305(10)HHI1026

Note: Select the type of barcode

As of 2018, GS1 standard 2D barcodes (GS1 QR Code and GS1 DataMatrix) are only available for use in limited application areas. GS1 QR Code is not yet a standardized barcode that can be used between raw material and processed food manufacturers.

GS1 2D barcodes are becoming available for use in increasingly various fields, however, and it is highly likely that the GS1 2D barcodes use will be endorsed also in this area as the wider deployment of image-based scanners. In Japan, meanwhile, QR Code is already used widely, and given its many advantages such as its ability to encode much information while taking up very little space and error correction capability, this Guideline recognizes it as a recommended symbol along with GS1-128 symbols.

When using GS1 QR Code outside of Japan, however, note the following:

- Raw material manufacturers:
 - (1) GS1 QR Code is as a rule intended for raw materials which are to be delivered to a Japanese company.
 - (2) Make sure in advance that the receiving company can use GS1 QR Code.
 - (3) For raw materials exported to a foreign country, linear barcodes such as GS1-128 or GS1 DataBar Expanded / Expanded Stacked barcodes may be required. (For details about these symbols, see FAQs in Chapter 4.)
- Processed food manufacturers:

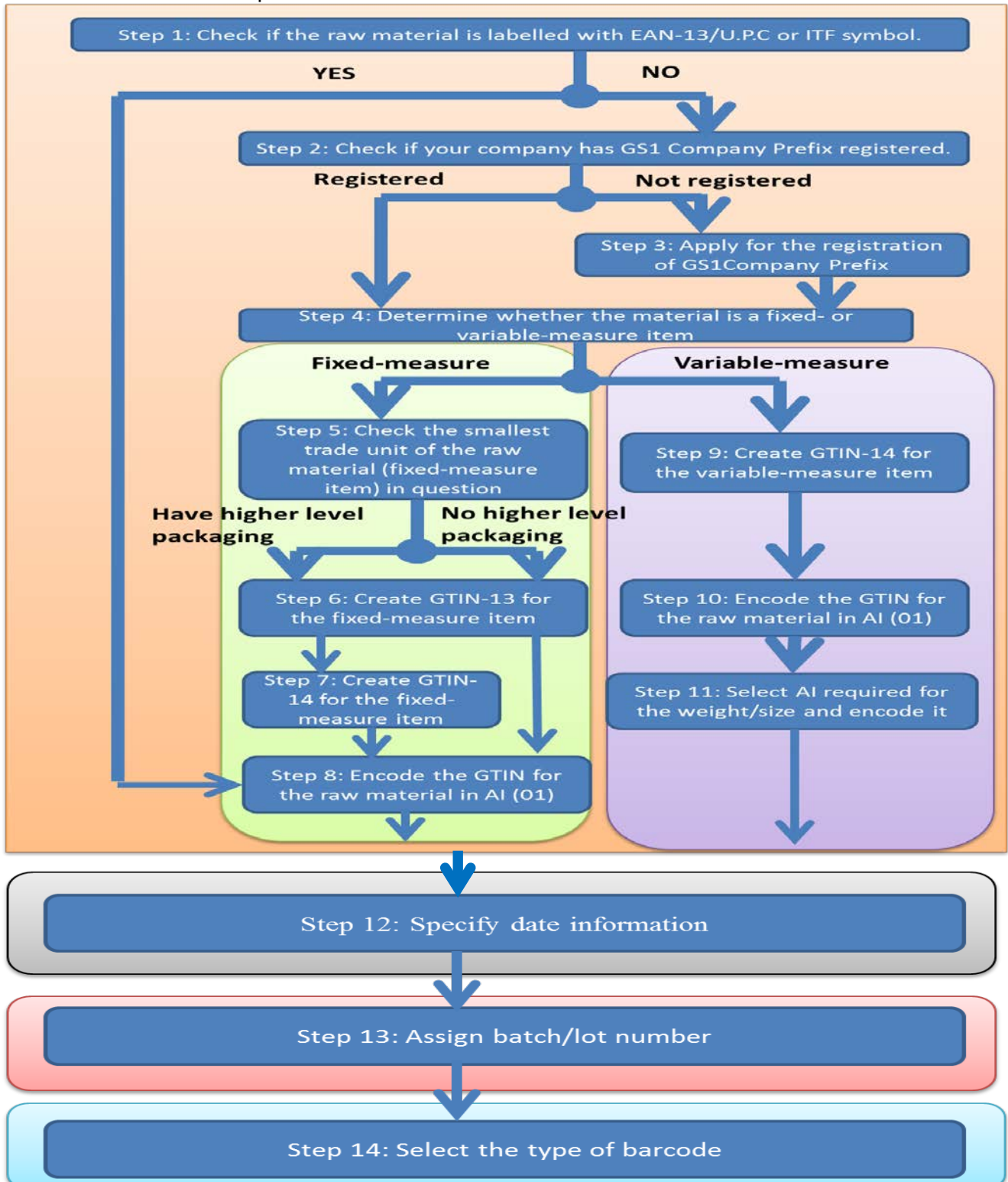


Make sure you can accept GS1 DataMatrix and GS1 DataBar Expanded / Expanded Stacked barcodes, in addition to GS1 QR Code or GS1-128 symbols. Avoid building a system on the assumption that you will only be receiving raw materials that carry one or two specific barcodes. Select a reader that is capable of reading all of these four types of barcodes and be ready to read any of them. Data are encoded using the same method for all of the four.

See FAQs in Chapter 4 for details about GS1 DataMatrix and GS1 DataBar Expanded / Expanded Stacked barcodes.

2.5 Steps to identify and barcode raw materials

Here is a flow chart to print the barcode to raw materials.



2.6 Points to consider printing quality barcodes

It is important that a barcode on a raw material is of quality that ensure it is readable not only by its manufacturer but by its relevant trading partners as well. This section sets out what raw material manufacturer should know when barcoding their products for identification.

2.6.1 Use of a barcode printer

In order to create quality barcodes for raw material identification, it is recommended that companies use industrial barcode printers.

1) Advantages of industrial barcode printers

A dedicated barcode printer has advantages that are not found with printers for home or office use, such as follows:

- Functions with a focus on the quality of barcodes, such as one to adjust bar widths
- Relative ease of creating layouts when a barcode is to be printed alongside other information
- Compatibility with international standard barcodes⁷

What You Need to Consider :

If you intend on developing a barcode printing system in-house, make sure you use commercially available barcode generation software that has gained support from industry users. Such software programs dedicated for printing barcodes is capable of adjusting bar widths according to the resolution of a printer, among other functions. on the other hand, with barcode generation software programs offered online for free of charge, printing quality is not guaranteed nor is user support available; it is therefore not recommended to use such programs.

2) Printing methods

Different barcode printers employ different printing methods, such as thermal, inkjet, and laser. Select a printer based on considerations of the raw materials' product size, mode of packaging, packaging materials, size of barcode, and other conditions. For details, consult printer manufacturers.

2.6.2 Appropriate size of barcode

It is important that you generate a barcode of an appropriate size so that it is readily scanned by standard barcode scanning devices. A barcode that is too small may pose such issues as that it is difficult to find, or it cannot be scanned fast, or not at all. Too

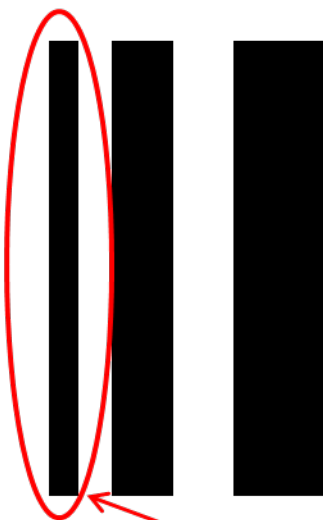
⁷ Both of the types of barcodes recommended in this Guideline, namely GS1 QR Code and GS1-128 symbols, are international standards and most of barcode printers are capable of printing them. Check with your printer suppliers when choosing printers.

large, it may also be difficult to scan in some environments.

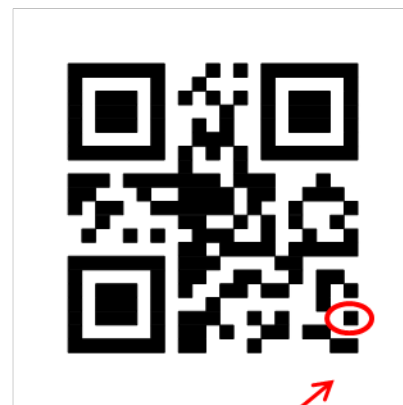
1) Size of the smallest element (module) that forms a barcode

The size of a barcode is based on the width of its smallest element (bars and spaces with a GS1-128 symbol; one black or light square with a GS1 QR Code). This smallest unit is called a "module." The width of this module is the first thing to determine when printing barcodes on a barcode printer. The ultimate size of a GS1 QR Code or GS1-128 symbol varies depending on the length and contents of data encoded in the barcode.

GS1-128 symbol



GS1 QR Code



Module (X) = the narrowest/smallest element that forms a barcode

2) Size of GS1 QR Code

In transactions of raw materials in Japan, barcodes are usually scanned using mobile terminals rather than on the automated distribution line. Given such an environment, the size of a GS1 QR Code used for raw material identification should meet the following requirements:

- X-dimension: 0.75 mm or greater is recommended, for the ease of scanning and location check
However, X-dimension of greater than 0.38 mm or greater is acceptable where the printable area is limited
- Height: Determined automatically based on the volume of data.

Example:

Where the X-dimension is 0.75 mm, a GS1 QR Code that encodes the data provided below in it measures approximately 23 x 23 mm (including a margin of 4x modules

around the symbol)

Data: (01)04912345678911 (11)160510 (15)170305 (10)160305



Note: As of 2018, GS1 QR Code and other 2D barcodes are not allowed for use in the supply chains for raw materials of food products under GS1 standards. There is therefore no standard size specified.

Given the growing use of QR codes in Japan, however, this Guideline recognizes the use of GS1 QR Code for the purpose of raw material identification so long as the receiving trading partner is a Japanese company and able to accept 2D barcodes.

3) Size of GS1-128 symbol

Considering that GS1-128 symbols can be scanned in a regular distribution environment (i.e. on the assumption that they are read with a fixed scanner as products are moved on the conveyor line), the size of a GS1-128 symbol should be as follows:

- X-dimension: 0.495 - 1.016 mm
- Height: 31.75 mm (excluding human readable interpretation)

Example: A GS1-128 symbol with a X-dimension of 0.49 mm that encodes the data provided below

(01)04912345678911 (11)160510 (15)170305 (10)160305

The overall width of the symbol is approximately 140 mm (including margin on either end).



The area inside dotted line represents margin required to the right and left of the barcode. With a GS1-128 symbol, a margin of 10x modules is required on both sides.

In most transactions of raw materials in Japan, barcodes placed on products are scanned using mobile terminals upon receiving them. Same goes with GS1-128 symbols which have already been introduced such as standard distribution barcodes for meat for human consumption. Given such an environment, the GS1-128 symbol may have the following measurements:

- X-dimension: 0.25 - 0.495 mm or greater
- Height: 12.7 mm or greater (excluding human readable interpretation)

Example: A GS1-128 symbol with a X-dimension of 0.34 mm that encodes the data provided below

(01)04912345678911 (11)160510 (15)170305 (10)160305

The overall width of the symbol is approximately 100 mm (including margin on either end).



2.6.3 Resolution of barcode printer

Check the resolution when choosing a printer to print barcodes. The printer resolution determines the width of a module of a barcode that may be printed on the printer.

1) What is printer resolution?

As a measure of resolution, “dpi” is used. It stands for “dots per inch,” and represents the number of dots (ink dots) placed in 1 inch (approx. 25.4 mm).

If a barcode printer has a resolution of 300 dpi, it means 300 dots in an inch. With a 300-dpi printer, the size of these dots is 25.4 mm divided by 300, i.e. approximately 0.085 mm. The larger the number of dpi, the smaller the diameter of these individual dots, resulting in clearer and more detailed output.

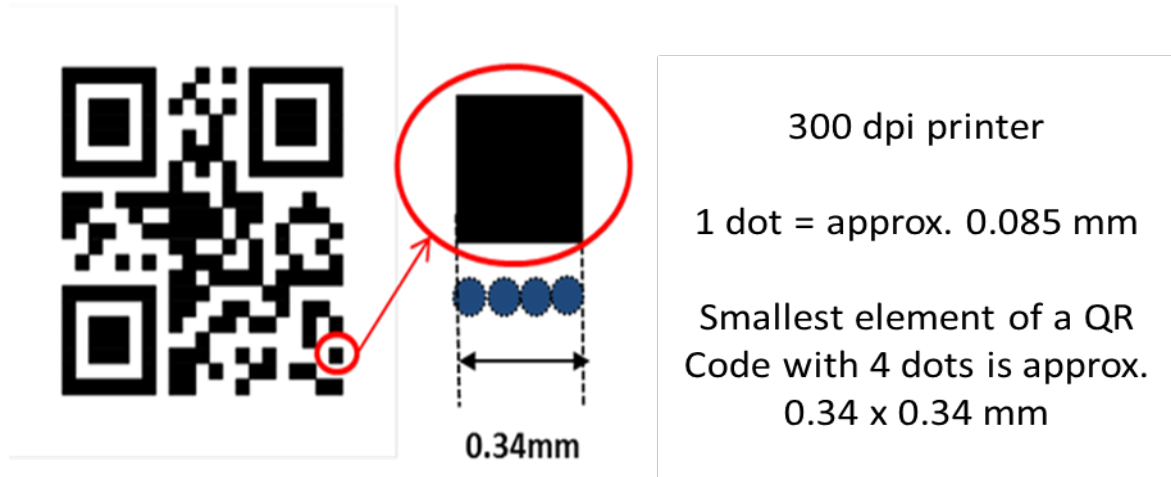
2) Relationship between printer resolution and barcode X-dimension

The resolution of the printer you use determines the width of the modules that can be printed, as the X-dimension is defined as a group of dots.

	1 dot	3 dots	4 dots	5 dots	6 dots
600 dpi	0.042 mm	—	—	—	0.254 mm
300 dpi	0.085 mm	0.254 mm	0.339 mm	0.423 mm	0.508 mm
200 dpi	0.127 mm	0.381 mm	0.508 mm	0.635 mm	0.762 mm
150 dpi	0.17 mm	0.508 mm	0.677 mm	0.847 mm	1.016 mm

Widths of a module that can be printed on a printer with a resolution of 300 dpi is calculated as approx. 0.085 mm for every dot multiplied by an integer. As the table above shows, X-dimension that can be printed on a 300-dpi printer include 0.254 mm, 0.339 mm, 0.423 mm, and so on. It cannot make a width such as 0.38 mm. To ensure the quality of barcodes, a module should have a width of at least 3 dots, but preferably 4 or more dots.

Printer resolution and smallest element of a barcode symbol



3) “Verification” of the “quality” of a barcode

It is not sufficient for a manufacturer to merely place any barcode on their products. It is important that the barcode is of good quality so that it is always readable by their trading partners. In order to objectively evaluate the quality of a barcode, procedures called “barcode verification” are used, for which there are international standards for evaluation scales and procedures. These verification procedures are performed using a dedicated barcode verification device called a barcode verifier.

As a result of barcode verification, the quality of barcode is graded on an A-F scale, with “A” being the highest. On this scale, barcodes of grade C or higher is regarded as having passed the verification, recognized as barcodes that are readable with regular scanners. It is necessary for products to carry barcodes of grade C or higher.

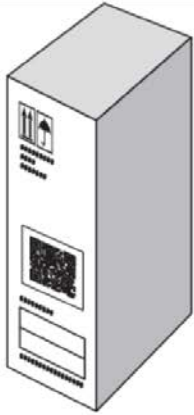
A raw material manufacturer does not necessarily need to purchase a barcode verifier. However, one should always perform barcode verification to check the quality when starting new printing. Consult printer manufacturers for details.

2.6.4 Barcode placement

You need to consider the following to ensure that a barcode placed on a product is readable. As a rule, the entire barcode should be located on a flat surface as much as possible, and its entirety should be visible without any part of it being covered. Find the best location by taking into account the shape of the product.

Good

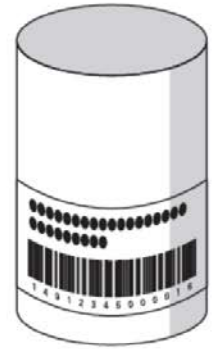
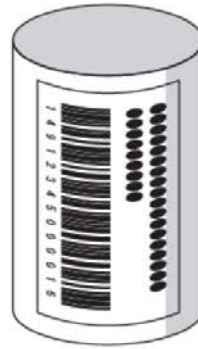
Avoid



Barcode area at the edge of the product and bent.

Good

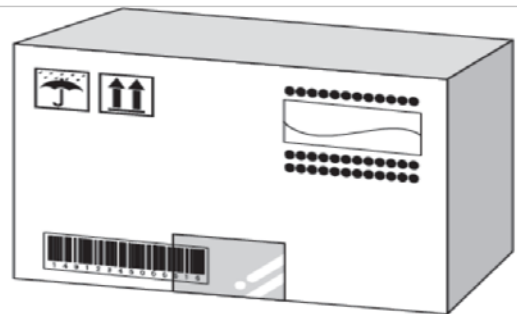
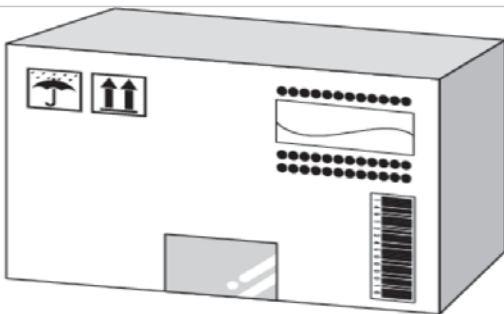
Avoid



Edges of barcode curved as it is placed in horizontal format

Good

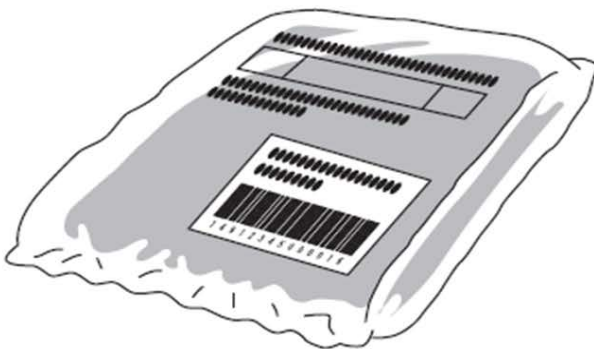
Avoid



Make sure the lid of packaging or other packaging components such as string and tape does not interfere with the barcode

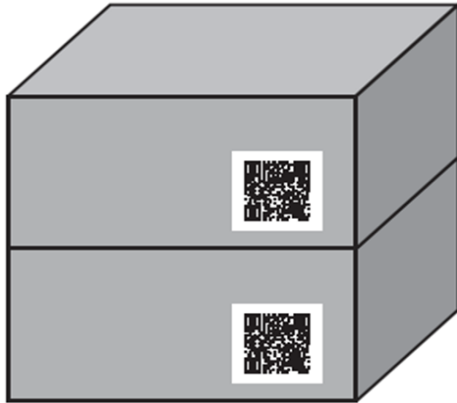
Good

Avoid

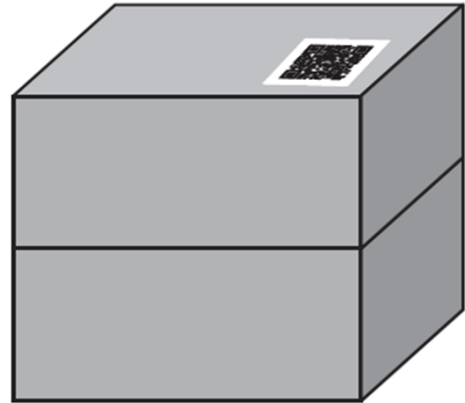


Avoid areas where it may cause creases to barcode

Good



Avoid



Barcodes visible even where items are placed in a stack

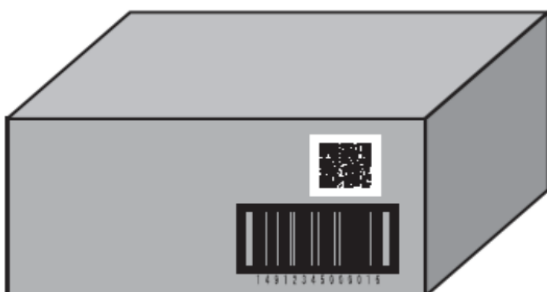
Where it is common to deliver multiple items of the same product in stacks, place barcode on each item so that each of the labels is visible, wherever possible.

Note: Combination with EAN-13/U.P.C-A or ITF symbol

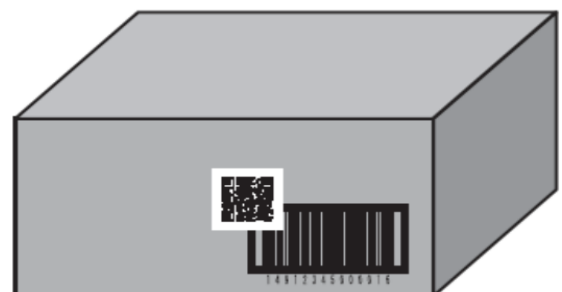
If a raw material already carries a barcode such as an EAN-13/UPC-A or ITF symbol on its packaging and you are to place a GS1-128 symbol or GS1 QR Code recommended in this Guideline in addition to such other barcode, make sure the original barcode and the new one do not overlap.

Make sure that your new barcode with additional information will not interfere with EAN/UPC or ITF as your trading partners may be scanning them today.

Good



Avoid



3 Technical information concerning printing and reading barcodes

This chapter provides further technical information to supplement that of the generation and reading of barcodes used for the identification of raw materials as discussed in Chapters 2. Information provided in this chapter should serve as a reference for those who are involved in system design at a raw material manufacturer that implement barcodes according to this Guideline or at a processed food manufacturer that scan these barcodes and use the information encoded in them, or solutions or system vendors that serve to support these manufacturers.

3.1 GS1 Application Identifier (AI)

When raw materials are to be identified on a batch/lot basis and barcoded with additional information such as Best-Before Date encoded, the data format should follow the Application Identifier (AI) standards. In addition to the information on the AI provided in GS1 General Specifications, the following should also be taken into consideration in the system designing.

3.1.1 "Predefined length" and "variable-length" AIs

The AI defines the data format of a barcode. In defining the length of the data, "Predefined length" and "variable-length" data are handled separately.

Predefined length AIs are "AIs that are defined as being Predefined length upon establishment of the AI rules," and they are limited to those that include the first two digits of AI (shown in yellow columns) of the table below. When designing an AI-based system, make sure you check the meaning of AIs with Predefined length data and their number of digits to extract data. All AIs other than those specified, even if they essentially have Predefined length data, are handled as being "variable-length."

Element strings with predefined length using GS1 Application Identifiers

First two digits of the GS1 Application Identifier	Number of characters (GS1 Application Identifier and data field)
00	20
01	16
02	16
(03)	16
(04)	18
11	8
12	8
13	8
(14)	8
15	8
16	8
17	8
(18)	8
(19)	8
20	4
31	10
32	10
33	10
34	10
35	10
36	10
41	16

* Figures shown in brackets () are AIs that are yet to be numbered

For instance, AI (7003) represents the “expiration year, month, day, hour, and minutes” in 10 digits. Here the data are encoded in 6 digits for “year, month, and day” plus 4 digits for “hour and minutes,” making it essentially a 10-digit fixed length AI. The first 2 digits of the AI, namely “70,” is not listed in the table above, however, and it is thus handled as a “variable-length AI” where the system is concerned. If AI (7003) is to be followed by other data elements, it should be delimited with a separator character, or it may result in a reading error on the scanner side.

3.1.2 Order of AI data elements

The order of different AI data elements that appear in a barcode should follow general rules.

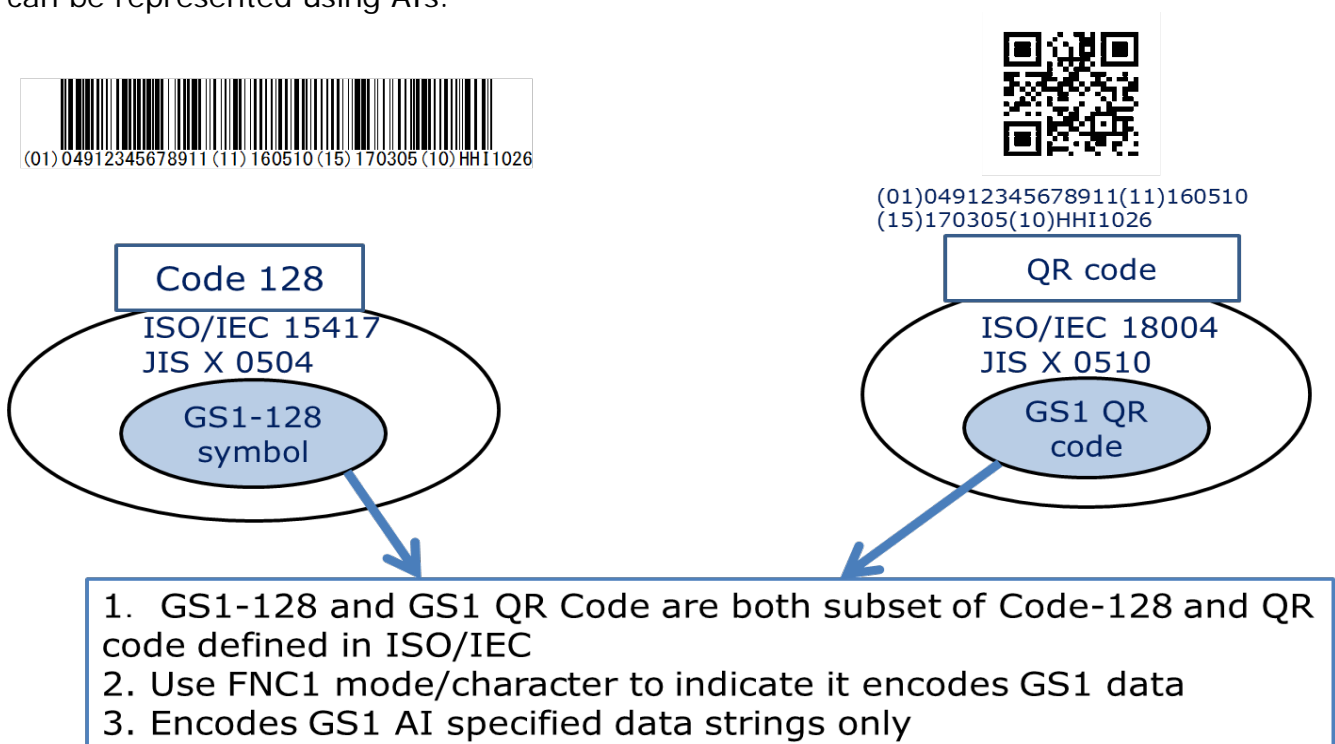
For the purpose of this Guideline, “batch/lot number” is the only variable-length data among the basic information items for the raw material identification, as described in 3.3. In other systems, however, two or more variable-length data elements may appear; if such is the case, place the FNC1 character at the end of the first variable-length data

elements as a separator character. See 3.2.2 for details about how the FNC1 works as a separator character.

3.2 Barcode

3.2.1 Basics to GS1 standard barcodes

Of the GS1-defined standard barcodes, those that encode Application Identifier data are all parts (subsets) of the entirety of barcodes defined under the ISO/IEC standards (see figure below). They use the FNC1 (Function 1 Symbol Character; A symbology character used in some GS1 data carriers for specific purposes.)⁸, and represent information that can be represented using AIs.



3.2.2 Basic structure of GS1 standard barcode

As explained in 4.2.1 above, standard barcodes containing data defined by GS1 AIs all use the FNC1, a control character that indicates that the data are encoded according to the GS1 AI rules. With a GS1-128 symbol, for instance, Function 1 Symbol Character, or FNC1⁹, is inserted to a position that follows the start character¹⁰. This declares that the data elements that follow are in accordance with the AI rules, allowing GS1 and non-GS1

⁸ Each symbol has different settings for FNC1 character and mode, which are specified following individual specifications.

⁹ Represents a data character, using a combination of bars and spaces

¹⁰ Represents the start of a barcode, using a combination of bars and spaces

barcodes to be distinguished from one another and the data be interpreted according to the rules. The FNC1 does not appear in human readable interpretation and is not usually recognized by users, but it serves an integral role to ensure that a GS1 standard symbol is encoded correctly and accurate data are scanned into the system.

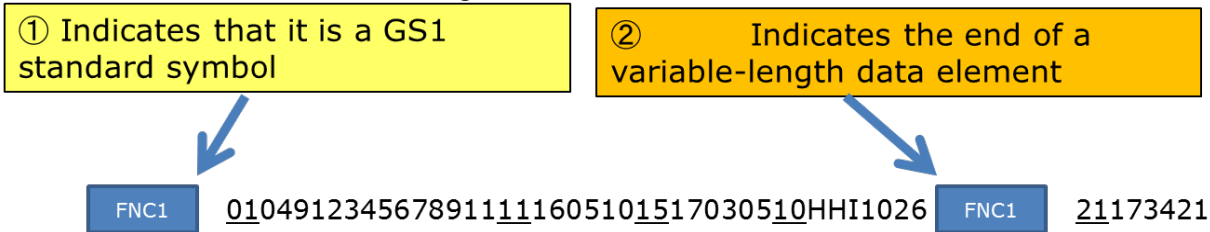
The FNC1 serves two roles, and works differently depending on the position it is used in:
 (1) At the start of a symbol: Indicates that the data represented by the symbol are GS1 standard data; used with data in a unique format or to distinguish the data from other standard data.
 (2) Between symbols: Indicates the end of the variable-length data elements directly preceding the FNC1 (separation); used to separate variable-length data items where a variable-length data element is followed by another data element.

The following is practical discussions about how to encode data generated using this Guideline in a GS1-128 symbol and GS1 QR Code, from a technical point of view.

Data items and contents used as examples are as follows:

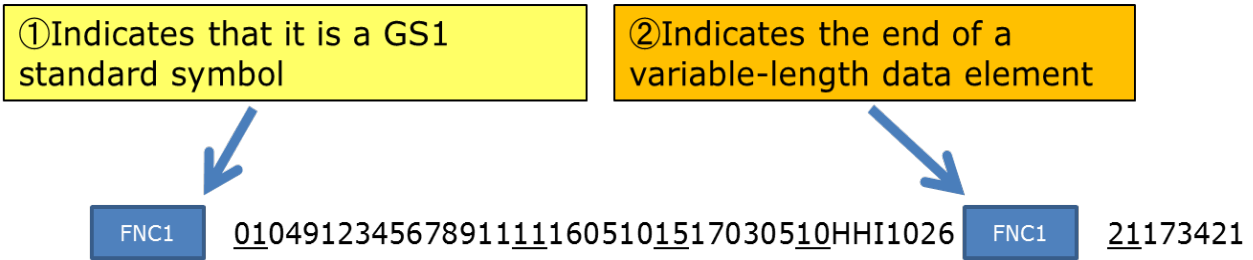
Data item	AI	Data example
Global Trade Item Number (GTIN)	01	04912345678911
Production Date	11	160510
Best-Before Date	15	170305
Batch/Lot Number	10	HHI1026
Serial Number	21	173421

Data structure of GS1-128 symbol



Note: Descriptions of the FNC1 vary among different types of barcodes. GS1-128 symbols have the bar patterns for the FNC1 specified; please note that simply adding a string of characters “FNC1” to a barcode does not make it a GS1 standard barcode.

Data structure of GS1 QR Code



(01) 04912345678911(11)160510(15)170305(10)HHI1026(21)173421

Note: Descriptions of the FNC1 vary among different types of barcodes. With GS1 QR Code, a “mode indicator” that indicates it follows the GS1 standards (i.e. it is an FNC1 mode) is added at the start of the data string encoded in a barcode. As with GS1-128 symbols, adding a string of characters “FNC1” to a barcode does not make it a GS1 standard barcode. The FNC1 that indicates the end of a variable-length data element is “%” in the alphanumeric mode, and “IS3 (1dhex)” in the 8-bit byte mode.

In practice, a user does not need to pay attention to the above when generating a GS1-128 symbol or GS1 QR Code using a barcode printer or barcode generation software. Specifying the generation of a GS1 standard barcode on a barcode generation software program should automatically add to the appropriate position the FNC1 that indicates it is GS1 standard data; the rest is a simple matter of entering a data string of “01049.....” With the FNC1 that indicates the end of a variable-length data element, however, the barcode generation software is not able to determine if the data element has ended, which necessitates the insertion of the FNC1 using the method specified for the software. The FNC1 that indicates it is GS1 standard data have varying settings for characters and modes. For reference, examples of data structures for a GS1-128 symbol and a GS1 QR Code are shown below.

GS1-128 symbol

Start character A, B, or C	FNC1 (symbol character value 102)	Data string (Predefined length)		Data string (variable-length)		FNC1 (symbol character value 102)	Data string (variable-length)		Symbol check character	Stop character
		AI	Data field	AI	Data field		AI	Data field		

Indicates that it is a GS1 standard symbol

Indicates the end of a variable-length data element

GS1 QRコード*

FNC1 (mode indicator 0101)	Data string										
	Mode indicator (numeric mode)	Chara cter count indicat or	AI	Data field (Predefin ed length)	AI	Mode indicator (alphanumeri c mode)	Chara cter count indicat or	Data field (variable- length)	% (FNC1)	AI	Data field (variable- length)

3.2.3 Human readable interpretation(HRI)

Human readable interpretation are characters to represent the letters and numbers contained in the data encoded in the barcode, placed below, to the left or right of, or above the barcode in case the barcode itself cannot be scanned due to damage or other reasons.



1) Where to place the HRI (human readable interpretation)

As a rule, the human readable interpretation should be grouped together and placed below the barcode. In case where the human readable interpretation must be printed above, to the left, or to the right of the symbol due to packaging or space constraints, it should always be placed adjacent to (obviously associated with) the barcode while protecting Quiet Zones.

If GTIN, Date Information, and batch/lot number are split due to space constraints, the GTIN should be placed below the barcode.

(Example of human readable interpretation text)

(1) To the left/right of the barcode



(01)04912345678911
(11)160510(15)170305
(10)160510

(2) Information split between above and below the barcode

(11)160510(15)170305
(10)160510



(01)04912345678911

2) Other HRI related rules

- The order in which the human readable interpretation appears should follow the encoding sequencing of the barcode.
- Parentheses should surround the AIs for the ease of distinguishing information items by humans. These parentheses are not encoded in the barcode, however.
- A single AI data element should be shown in a single line. For instance, GTIN data would always appear on one line of the human readable interpretation.
- Even if printing space constraint does not allow all the codes encoded in a barcode to appear, GTIN should always appear.

3) Font for printing the human readable interpretation

Use a clearly legible font (such as OCR-B as defined in ISO 1073-2). It does not necessarily have to be OCR-B provided the interpretation is clearly legible.

3.2.4 GS1 QR Code

GS1 QR code is a Subset of the QR Code defined in ISO/IEC 18004, designed so that GS1 Application Identifiers may be used.

1) Barcode features

GS1 QR Code is a type of 2D matrix barcode. It represents information not only in the width direction but also in the height direction, and able to encode more information in a smaller area compared to linear barcodes. It has an error correction feature which helps the original data be read correctly even with small damage or losses.

While it has functions that are almost the same as those of the QR Code, GS1 QR Code

has limited character sets available for use, in accordance with the GS1 specifications.

2) GS1 QR Code size characteristics

GS1 QR Code has a total of 40 sizes across its square formats, with the smallest being 21 x 21 modules and the largest 177 x 177 modules, plus 4-module Quiet Zones that surround the square. While a GS1 QR Code is capable of encoding up to 7,087 numeric characters or 4,295 alphanumeric characters by specification, the actual length of data is determined by the application that is used.

For details of the specifications of GS1 QR Code, please see ISO/IEC 18004.

3.2.5 GS1-128 symbol

GS1-128 symbol is a subset of the Code 128 symbol defined in ISO/IEC 15417 and designed use GS1 Application Identifier (AI).. A FNC1 in the first position following the start character of a Code-128 symbol indicates that it is a GS1-128 barcode that represents GS1 standard data.

1) Barcode features

GS1-128 symbol has limited character sets available for use, in accordance with the GS1 General Specifications.

GS1-128 symbol has six elements per symbol character comprising three bars (dark elements) and three spaces (light elements), each of which varies from one to four modules in width.. The stop character is made up of seven elements comprising four bars (dark bars) and three spaces (light bars).

2) GS1-128 symbol size characteristics

The maximum physical length is 165.10 mm (6.500 inch) including Quiet Zones. The maximum number of data characters in a single symbol is 48.

For details of the specifications of GS1-128 symbol, please see ISO/IEC 15417.

3.3 Processing of data following barcode reading (Informative)

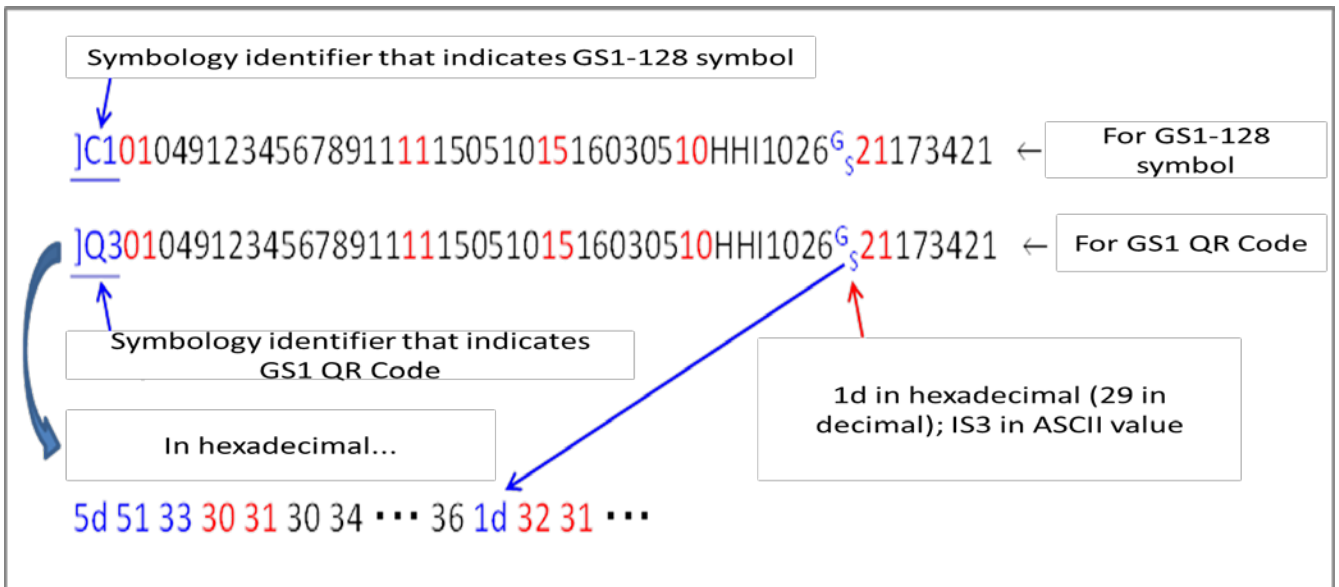
3.3.1 From barcode scanning to data transmission

The followings are an overview of data processing once a barcode scanner has scanned a barcode. While the main target audience of this information is system vendors, it may serve as a reference when selecting a barcode scanner or designing a system for the party that receives scanned data.

Same data are encoded into both of the GS1-128 symbol and the GS1 QR Code below.



Figures shown in the parentheses () are the human readable interpretation and not encoded in the barcodes. The data strings that are transmitted by the barcode scanner once it has scanned each of the barcodes above are as shown below (see “Supplements” about symbology identifier s). Since the data element that follows this symbology identifier is the same with both the GS1-128 symbol and the GS1QR Code, they can be handled in the same manner on the receiving system.



Note:

GS1 standard barcodes allow for the use of symbology identifiers. While not encoded in a barcode, a symbology identifier is generated within the barcode scanner once the barcode has been read, and added to the data message at the beginning before being transmitted. With GS1 QR Code, “] Q3”, and GS1-128 symbol “]C1” are used as an symbology identifier to indicate that it is a GS1 standard symbol

3.3.2 Processing of data received from the barcode scanner

The receiving system extracts data items from the data strings sent from the barcode scanner, using the AI and according to the GS1 standards.

]Q30104912345678911111505101516030510HHI1026^G_S21173421 ← GS1QR code



(01)GTIN:	04912345678911
(11) Production Date:	150510
(15) Best Before Date:	160305
(10) Batch/Lot Number:	HHI1026
(21) Serial Number:	173421

4 Frequently Asked Questions

GS1 standards

Q-1.

We are currently using EAN-13/U.P.C.. Do we have to file a new application or registration in order to use GTINs?

A-1.

No. As EAN-13 is same as GTIN-13 and U.P.C same as GTIN-12, no new application is required.

Q-2.

Our raw materials currently carry ITF symbols on their outer packaging. Is it unnecessary to place the ITF symbols if we use the barcode recommended in this Guideline (GS1-128 symbol or GS1 QR Code)?

A-2.

No, please place both the ITF symbol and the barcode for raw material identification. We assume that the ITF symbols that are currently in place are already being used by your trading partners. ITF symbols are necessary because not all trading partners develop a system for scanning GS1-128 symbols or GS1 QR Codes.

Barcodes and data items encoded

Q-3.

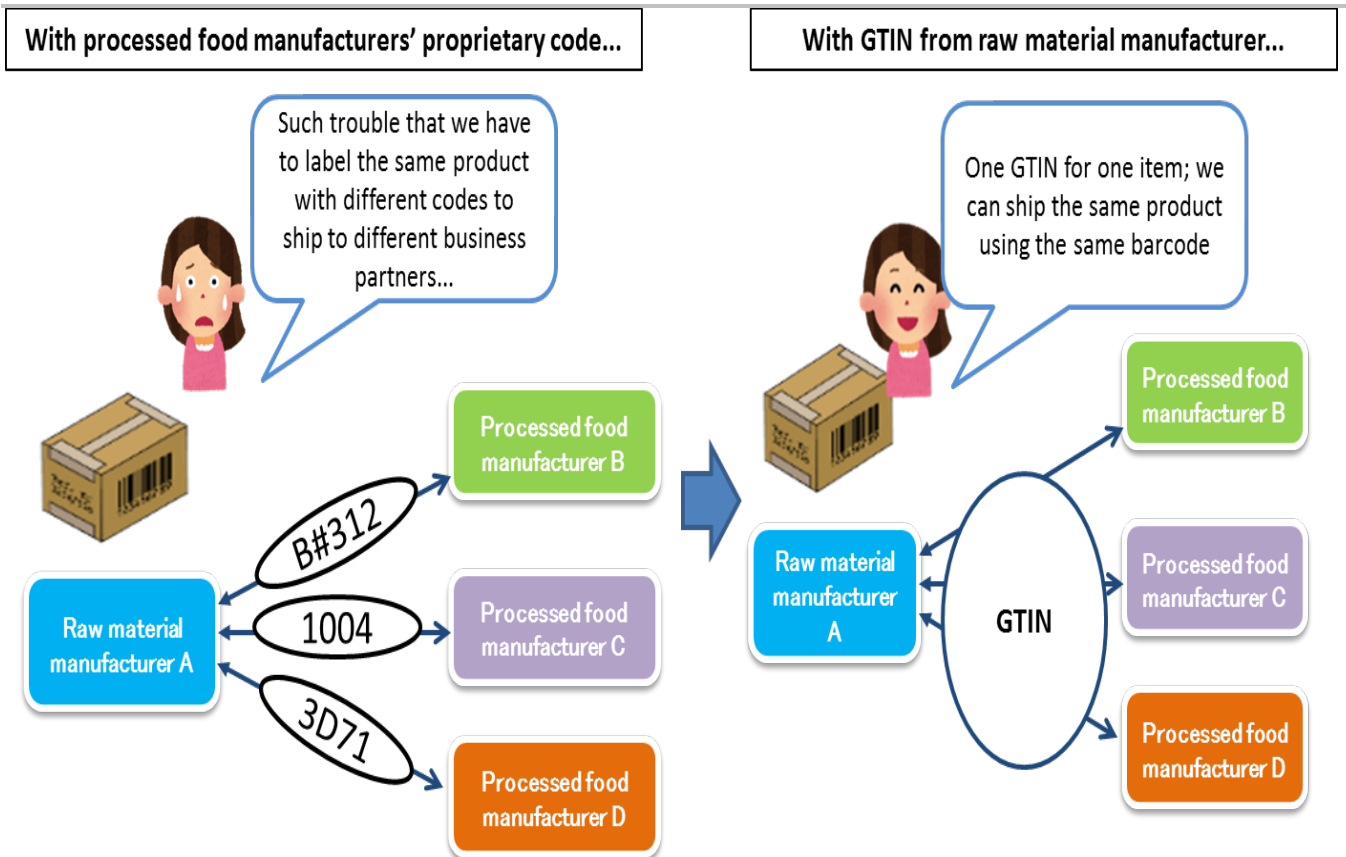
We are a processed food manufacturer. We are currently asking our raw material suppliers to ship products that carry barcodes encoding our internal raw material item codes. Are we going to need to use GTINs?

A-3.

We recommend you use GTINs allocated by raw material manufacturers for their products as codes to identify raw materials.

If raw material codes specified by processed food manufacturers are to be used, raw material manufacturers are required to use different codes for different trading partners even for the same product, which makes it necessary for the raw material manufacturers to use different barcodes. Such handlings cause a lot of trouble and may create a risk of shipping items with the wrong code. For raw material manufacturers, the more trading partners they do business with, the more trouble and cost it takes them to handle the cases, as a result of which they may find themselves unable to keep up with the demand for the use of barcodes.

If, on the other hand, they can ship the same products using the same GTIN to ALL trading partners, it may lead to increase of source marking of raw materials.. We recommend that you accept GTINs used by raw materials and convert it into your internal codes where necessary.



Q-4.

We are a raw material manufacturer. We are currently shipping our products to our trading partners using our own internal codes. Do we need to change to GTINs?

A-4.

We recommend you to allocate your company GTINs and start using them.

If processed food manufacturers are to accept raw material manufacturers' internal codes, it means that they need to accept a large number of product identification codes of varying number of digits and formats, which makes code management, conversions, and linkage with internal system difficult. In some cases, the product identification codes that have been independently allocated up by a large number of raw material manufacturers may overlap on the side of a processed food manufacturer that receive them.

With GTIN, the format of codes that indicate "Product X by Company A," for instance, is standardized according to digit (i.e. "14 digits or shorter, numeric characters only") and they will not overlap with some other product codes from another company, saving processed food manufacturers a lot of trouble in managing them.

Please note that you need to be allocated GS1 Company Prefix to generate a GTIN.

Q-5.

We are a raw material manufacturer. Can we barcode a product using information other than that represented in the basic items under this Guideline?

A-5.

Yes, information other than that represented in the basic items (3.3 Data items to be encoded in barcodes) may be encoded in a barcode using GS1 Application Identifiers (AIs).

For instance, if you wish to manage raw materials by individual instance rather than a batch/lot, you can allocate Serial (unique) Number and label with AI (21). A Serial (unique) Number is used to individually identify each of the items of the same type of raw material. For information such as specific data formats for individual information items, please refer to the latest version of GS1 General Specifications on the GS1 website. <https://www.gs1.org/barcodes-epcrfid-id-keys/gs1-general-specifications>

<Example>

Adding AI (21) Serial Number

Global Trade Item Number:	04912345678911
Production Date:	May 10, 2016
Best Before Date:	March 5, 2017
Batch/Lot Number:	HHI1026
Serial (unique) Number:	YHT1976

(01)04912345678911 (11)160510 (15)170305 (10)HHI1026 (21)YHT1976

When encoding additional information in a barcode, take the following into consideration:

(1) Make sure the basic attributes always appear; do not omit them

Encoding additional information SHALL NOT result in an omission of batch/lot number or Global Trade Item Number.

(2) More information to encode means larger barcode size

With a large amount of additional information to be encoded, a larger area is required to place a barcode. With GS1-128 symbol, in particular, a single barcode can represent a maximum of 48 data characters, and anything above it needs to be shown in two barcodes.

Q-6.

We are a processed food manufacturer. Can we barcode a product using information other than that represented in the basic items under this Guideline?

A-6.

You are advised not to request a raw material manufacturer barcode their products with additional information.

If a raw material manufacturer is required to label their products with additional information, they will have to use different barcodes for different processed food manufacturers even with the same raw material, which means the raw material

manufacturer cannot barcode raw materials until it has been determined that where they are shipped to. If they are to barcode raw materials only after their recipient has been decided, time constraints and complicated work may pose a large burden on them, which may slow down the process of barcoding raw materials.

The basic items specified in this Guideline are a minimum of items required to manage raw materials on a batch/lot basis. They are narrowed down to such items that allow raw material manufacturers to “ship the same raw material to any processed food manufacturer.”

For any additional information that may be required by an individual processed food manufacturer for their “internal process”, it is advised that they create a barcode by supplementing with any such additional information by themselves

Q-7.

I understand that GS1 QR Code is not recognized in GS1 standards for the use in general distribution between raw material and processed food manufacturers; which barcode should we use when exporting products?

A-7.

At present we recommend you use GS1-128 symbol which is used globally. Please refer to 3.4.4 for details.

Q-8.

Is it necessary for a processed food manufacture to be able to accept other barcodes than GS1 QR Code and GS1-128 symbol?

A-8.

When procuring raw materials from overseas sources, it is recommended that processed food manufacturers prepare to read GS1 DataBar Expanded and GS1 DataMatrix, in addition to the two mentioned above.

While many of overseas companies use GS1-128 symbol recommended in this Guideline, the GS1 standards also allow GS1 DataBar Expanded to be used for the labeling of general distribution units, and overseas manufacturers may use it.

In addition, this Guideline has GS1 QR Code as a recommended symbol among 2D barcodes, given the increases in use of QR codes in Japan. In GS1 standards, either GS1 DataMatrix or GS1 QR Code may be used in the fields where 2D barcodes are used.

Considering the widespread use of GS1 Data Matrix as a 2D barcode in Europe and North America, some raw material manufacturers may be ready to use GS1 DataMatrix. These four types of barcodes are all GS1 standards and use a common method of encoding data in barcodes. For this reason, if a scanner is capable of reading 2D barcodes such as GS1 QR Code, it can read all four of these barcodes.

Q-9.

Are laser scanners and image scanners intended to handle different types of barcodes?

A-9.

Yes, they handle different types of barcodes.

A laser scanner is capable of reading linear barcodes such as GS1-128 symbols and GS1 DataBar Expanded, but not GS1 QR Code or GS1 DataMatrix, which are both 2D barcodes.

An image scanner, meanwhile, is capable of handling both linear and 2D barcodes. In other words, an image scanner can handle both of the barcodes recommended in this Guideline, namely GS1-128 symbol and GS1 QR Code.

Q-10.

I understand that a single GS1-128 symbol can represent up to 48 data characters. We have fairly long batch/lot numbers and the data exceeds 48 in total. What should we keep in mind when encoding them?

A-10.

As discussed in Chapter 3, a single GS1-128 barcode may represent a maximum of 48 data characters.

For instance, if the following raw material data is to be encoded in GS1-128 symbol, the number of the data characters is 52 in total, which should be shown in two GS1-128 symbols.

Global Trade Item Number (GTIN): 04912345678911
 Production Date: May 10, 2016
 Best-Before Date: March 5, 2017
 Batch or Lot Number: A123456789C012345

In such a case, separate the two symbols into AI data groups.

For instance, the first symbol should encode the data for Global Trade Item Number, Production Date, and Best-Before Date. and the second, batch/lot number (note that an AI data string cannot be separated in the middle). It is preferable that two symbols be printed as close to one another as possible.

Example:



Q-11.

What kind of barcode is GS1 DataBar Expanded?

A-11.

GS1 DataBar Expanded is a family of linear symbol used within the GS1 system. It can represent up to 74 numeric characters or 41 alphanumeric characters.

GS1 DataBar Expanded has another subset that can be shown in multi-row format (up to 11 rows) called GS1 DataBar Expanded Stacked.

Examples of barcodes that encode the same data are shown below.

<Data to be encoded>

Global Trade Item Number: 04912345678911
Production Date: May 10 2016
Best Before Date: March 5 2017
Batch or Lot Number: HHI1026

<GS1 DataBar Expanded>



Sample symbol is not shown in real size

<GS1 DataBar Expanded Stacked>



(01) 04912345678911 (11) 160510 (15) 170305 (10) HHI1026

Sample symbol is not shown in real size

For details of the barcode specifications, please refer to ISO/IEC 24724.

Q-12.

Are there other 2D barcodes than GS1 QR Code?

A-12.

The GS1 standards have GS1 DataMatrix.

<Example of GS1 DataMatrix that encode the following data>

Global Trade Item Number:	04912345678911
Production Date:	May 10 2016
Best Before Date:	March 5 2017
Batch or Lot Number:	HHI1026



(01)04912345678911(11)160510(15)170305(10)HHI1026

Sample symbol is not shown in real size

For details of the barcode specifications, please refer to ISO/IEC 16022 .

5 Relevant guidelines

1) Food Traceability “Practical Manual” (Japanese only)

This manual illustrates how to address the food traceability issues in a clear, user-friendly manner. It is available to view on the Ministry of Agriculture, Forestry and Fisheries website (www.maff.go.jp/). Its target audience includes those who at small- and medium-sized businesses responsible for the development and management of traceability-related work procedures and record-keeping forms.

2) Handbook for Introduction of Food Traceability Systems

Intended for those with organizations and associations that plan to introduce traceability systems, this handbook provides basics and shows how to introduce them. It is available to view on the Food Marketing Research and Information Center website (www.fmric.or.jp/).

3) North American Industry Guidance for Standard Case Code Labeling

Developed jointly by GS1 US and GS1 Canada, this guideline is intended for the printing of barcodes on trade items by the case (e.g. cardboard case), by encoding trade item information AI (01), date information AI (11), AI (15), batch or lot number AI (10), etc.

4) European Industry Guidance for Standard Case Code Labeling including Extended Product Attributes

This guideline was developed by GS1 Member Organizations in European countries and relevant parties. Similar to the North American guideline listed above, it is intended for the printing of barcodes on trade items by the case (e.g. cardboard case), by encoding trade item information AI (01), date information AI (11), AI (15), batch or lot number AI (10), etc.