INFRABEL

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ASSET MANAGEMENT DIVISION

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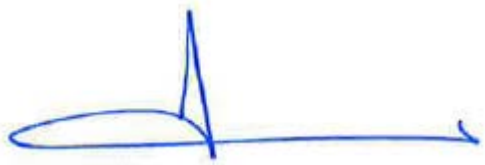
Uniform barcodes for the management of Infrabel equipment

Edition	New edition
Summary	Technical description of uniform barcodes to be used by Infrabel for logistical tracking of items managed by serial number (item number + serial number = 'equipment item').
Target group	- I-AM.1, 2, 3, 4, 5 - I-AM.A1, A2, A3, A4, A5 (Supply Coordinators, Logistic Managers) - I-FBA.5 - I-B.14 - I-ICT.31
Effective from	19 November 2014

Director-General



Version management

Subject: This document sets out the specifications for uniform barcodes for tracking *materials* and *equipment* within the Asset Management division (*equipment item = item number + serial number*).

Area: Supply & Production

Versions			
Number	**Date**	**Description**	**Author**
1.0	13/05/2014	Initial draft version	J. Smeets
1.1	09/09/2014	Validated by 'barcodes' working group	J. Smeets

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1. Introduction

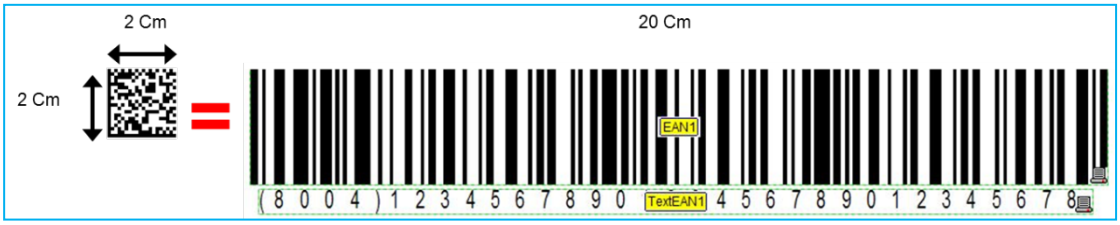
Infrabel uses a uniform type of barcode in **"data matrix"** (2D) format to supply the required data for all key parts and for their packaging with a view to uniform logistics. The data supplied in this code must be formatted according to the global standard **GS-1**, which guarantees that the data has the same form and the same meaning for all partners. Use of barcodes is **mandatory** for all parts managed with a **serial number**. The combination of item number (nomenclature number) and serial number is always unique and is also known as an 'equipment item'.

The instructions contained in this document must be complied with by both external suppliers and internal production divisions.

1.1 Choice of format

The data matrix format offers a number of advantages compared to other formats.

- It is more compact and more reliable than a 1D barcode with the same content.



- Improved readability compared to a 1D barcode (linear)
- Integrated automatic spell checker
- It is more compact and more reliable than a QR code with the same content.
- More cost-effective, more user-friendly and more reliable than RFID

1.2 Choice of coding

The GS-1 coding standard offers the following advantages:

- Approved at international level
- Flexible thanks to the use of application identifiers (AI), allowing multiple data to be combined in one code:

Further information about the GS-1 standard can be found online at:

- www.gs1.org

2. Content and dimensions

2.1 Barcodes

The content of barcodes is determined by the GS1 standard using application identifiers. Infrabel supports various application identifiers (**AI**). Certain AIs are mandatory, others are optional.

So as to ensure unique tracking of key products, use of the following AIs is **mandatory**.

AI	GS-1 Data content	Content	Format
241	Customer Part number	Infrabel item number (= nomenclature number)	12 numeric characters
21	Serial number	Item serial number	Max. 18 alphanumeric characters

The combination of item number and serial number must always be unique. The technical manager must ensure that the serial numbers are always unique.

Other AIs may contain relevant additional information and may be added to the code **on an optional basis**. This list is merely an indication and may be expanded to include other AIs officially supported in GS-1. Appendix B: Complete list of GS1 application identifiers gives a full list of available AIs.

AI	GS-1 Data content	Content	Format
10	Batch or Lot number	Item batch number (= batch/lot)	10 numeric characters
11	Production date	Date of production of the item	YYMMDD (6 characters) [1]
17	Expiration date	Expiry date of the item	YYMMDD (6 characters)

2.2 Label

The data used must be added to the label, preferably in a readable form, if the item format can accommodate a large enough label.

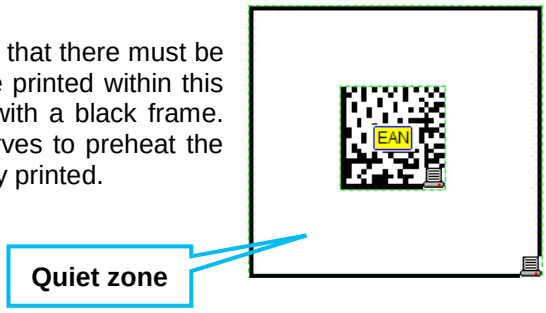
If there is enough space, the label should contain readable text or the 'INFRABEL' logo. If there is not enough space, the readable text can be left out.

2.2.1 Type of character and font size for readable text

Arial font, minimum size 10 point for readable text on the label.

2.2.2 Quiet zone

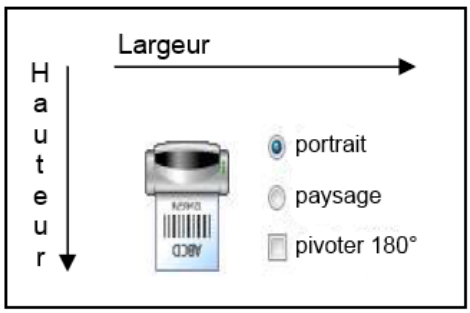
A 'quiet zone' must be left around barcodes. This means that there must be a 5 millimetre space around barcodes. Nothing must be printed within this space. The edges of this quiet zone must be marked with a black frame. The black frame not only marks the edges but also serves to preheat the print head, so that the first line of the barcode is not badly printed.



[1] If only the year (YY) and month (MM) are known, DD must be filled in with 2 zeros.

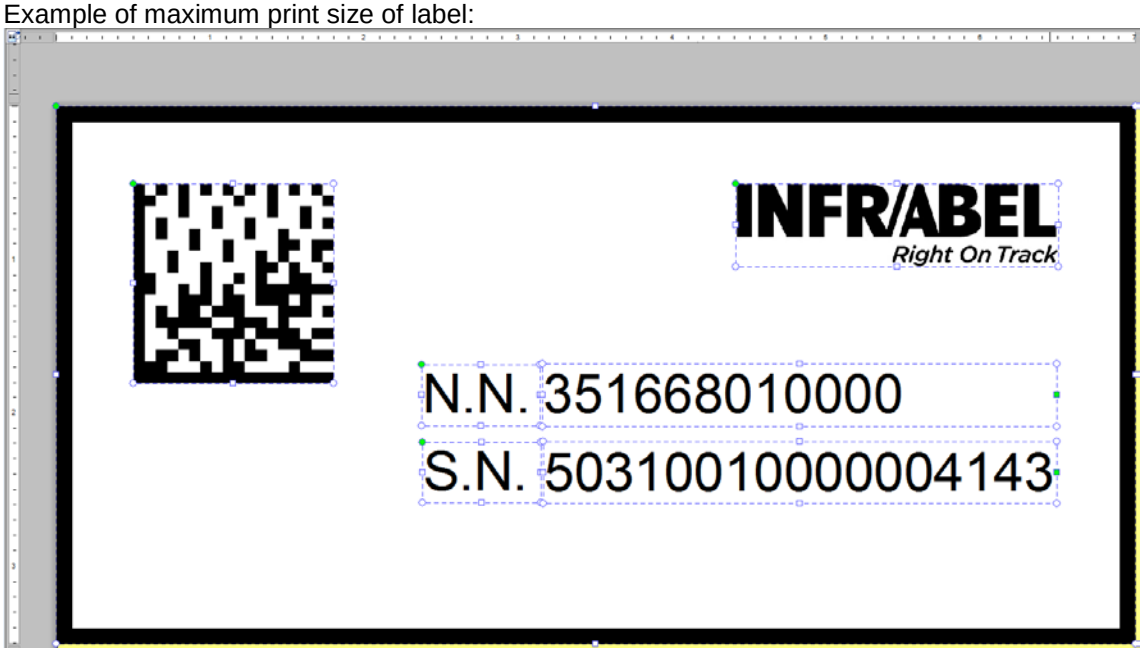
2.2.3 Authorised label formats

- The maximum dimensions of the label are: width 70 millimetres x height 35 millimetres. The width is horizontal and parallel to the print head (for a desktop printer).

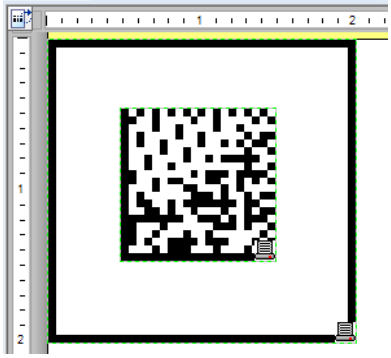


French	English translation
Largeur	Width
Hauteur	Height
portrait	portrait
paysage	landscape
Pivoter 180°	Rotate 180°

- The minimum dimensions of the label are: width 20 millimetres x height 20 millimetres.
- The minimum dimensions of the actual barcode are: 10 millimetres x 10 millimetres.
- Labels should preferably have a white background.
- Example of maximum print size of label:



- Example of minimum print size of label:



3. Technical specifications

Different packaging materials (cardboard, wood, plastic, metal, etc.) each have their own specific features, making one type of packaging more suitable than another for ensuring lasting adhesion and readability. Certain items and certain types of packaging require special treatment, such as degreasing. It must always be ensured that the right labels, adhesives and inks are chosen. This applies in particular to items that heat up or are exposed to extreme variations in temperature (weather, wind, frost, etc.). The general principle here is that labelling must be able to be used for 10 years in the conditions in which the item is kept or used. For certain specific applications, an additional detailed specification may be drawn up.

3.1 Printing materials

Labels made of synthetic material or polyester are preferable. These two materials are long-lasting and resistant to humidity and fluctuations in temperature. They are capable of preserving the printing permanently using a thermal transfer printing ribbon. A matt background and the ink ensure the most consistent readability. A label in the form of a metal plate is also acceptable.

3.2 Type of adhesive

The type of adhesive to be used depends on the background to which the labels are affixed.

- For equipment, a permanent adhesive capable of holding the label for 10 years in the conditions of use of the equipment should be used.
- For equipment producing heat, both the label and the adhesive must be capable of withstanding certain temperatures. This may be specified in advance in a detailed specification.
- Equipment/items that are kept outdoors must be labelled using frost-resistant adhesive.
- Certain equipment will require degreasing before labels are affixed to ensure lasting adhesion.

3.3 Type of ink

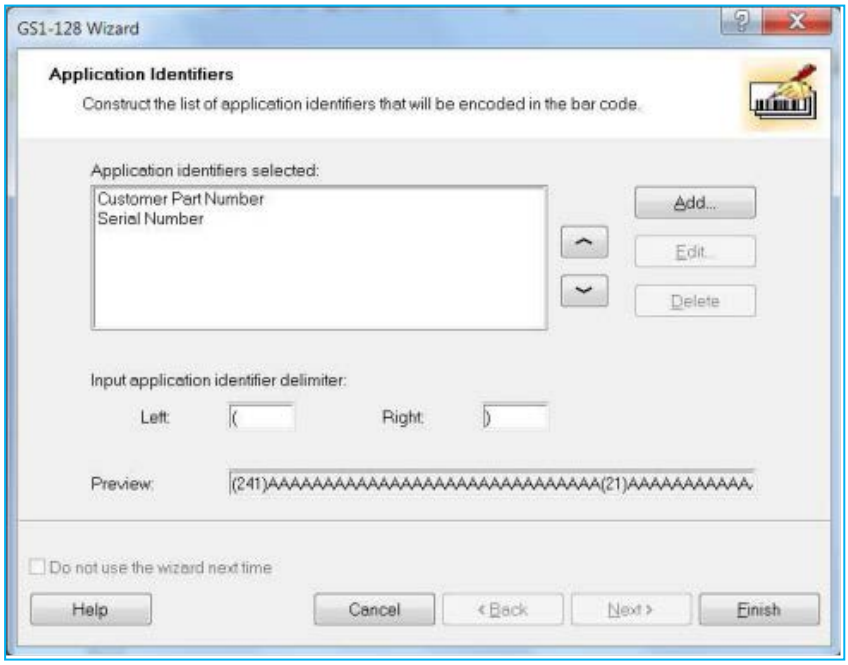
The ink must be able to withstand external influences (wear and tear) and be resistant to UV rays. The ink must not be erasable and must be resistant to rubbing. The printing must remain legible for at least 10 years.

3.4 Printing method

- Printing must be carried out by thermal transfer. Direct thermal printing is not allowed. The printing colour is black.
- The label must be printed using a label printer with internal barcode functionality. Barcodes must not be printed using laser or inkjet desktop printers. Barcodes must not be printed as graphics or as copies in order to avoid problems with distortion and readability.

3.5 Barcode generator software

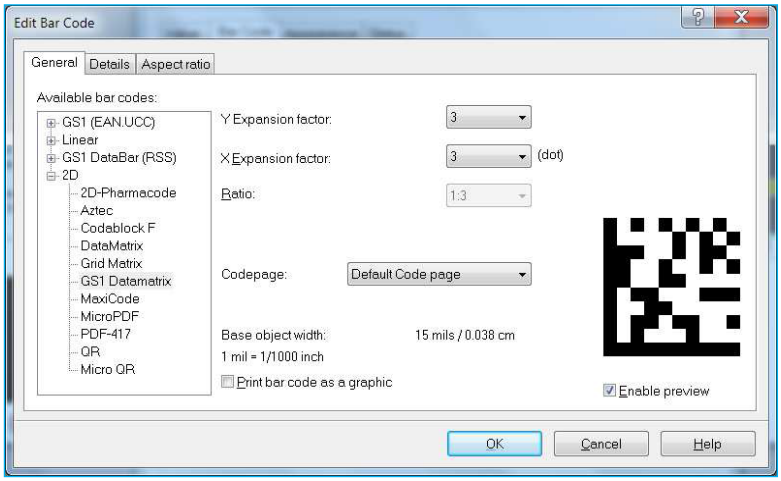
Barcode layouts must be designed using authorised barcode software and must not be produced using (graphic) design programs or barcode fonts. It is essential that the software supports correct coding in accordance with the GS1 standard. In particular, this involves support for the FNC1 delimiter (Function 1 Symbol). It is also important not to use spaces when coding barcodes.



3.6 Resolution and expansion factor

- With **203 dpi** printers, expansion factors 3 to 5 (15 to 25 Mils)
- With **300 dpi** printers, expansion factors 4 to 7 (17 to 23 Mils)
- With **600 dpi** printers, expansion factors 10 to 15 (16 to 25 Mils)

- These barcodes are scannable at distances ranging from 10 cm to one metre depending on the scanner used.



3.7 Affixing

In the case of multiple boxes, affix the barcodes so that when stacked on pallets the barcodes always remain accessible for scanning. If necessary, affix multiple labels.

3.8 Quality control

- The supplier must supply a printing sample produced by the equipment that will print the barcodes for deliveries. They will be assessed for readability and print quality and then approved by INFRABEL. If the type of label printer, computer hardware or software changes (except in the case of replacement with the same type), the barcodes must be re-submitted for approval.

- Barcodes must obtain at least a 'grade B' rating when checked by a barcode verifier. Following approval, the barcode must maintain consistent quality. Periodic checks will be carried out on deliveries.

3.9 Accompanying list of goods for pallets

- Pallets must be accompanied by a list of goods showing the same barcodes for each item or package present on the pallet. The barcodes must comply with the same conditions as set out here, except for those that can be printed on a desktop printer.

- These barcodes are also subject to prior quality checks.

Appendix A: Examples of correct barcodes

(241)351669000000(21)123456		(21)212254-152(241)351669000000
Item number: 351669000000 (Prefix 241)		Item number: 351669000000 (Prefix 241)
Serial number: 123456 (Prefix 21)		Serial number: 212254-152 (Prefix 21)

Appendix B: Complete list of GS1 application identifiers

AI	Data Content	Format*
00	SSCC (Serial Shipping Container Code)	n2+n18
01	Global Trade Item Number (GTIN)	n2+n14
02	GTIN of Contained Trade Items	n2+n14
10	Batch or Lot Number	n2+X..20
11 (**)	Production Date (YYMMDD)	n2+n6
12 (**)	Due Date (YYMMDD)	n2+n6
13 (**)	Packaging Date (YYMMDD)	n2+n6
15 (**)	Best Before Date (YYMMDD)	n2+n6
17 (**)	Expiration Date (YYMMDD)	n2+n6
20	Variant Number	n2+n2
21	Serial Number	n2+X..20
22	Secondary Data Fields	n2+X..29
240	Additional Item Identification	n3+X..30
241	Customer Part Number	n3+X..30
242	Made-to-Order Variation Number	n2+n…6
250	Secondary Serial Number	n3+X..30
251	Reference to Source Entity	n3+X..30
253	Global Document Type Identifier (GDTI)	n3+n13+n..17
254	GLN Extension Component	n3+X..20
30	Count of Items (Variable Measure Trade Item)	n2+n..8
310 (***)	Net weight, kilograms (Variable Measure Trade Item)	n4+n6
311 (***)	Length of first dimension, metres (Variable Measure Trade Item)	n4+n6
312 (***)	Width, diametre, or second dimension, metres (Variable Measure Trade Item)	n4+n6
313 (***)	Depth, thickness, height, or third dimension, metres (Variable Measure Trade Item)	n4+n6
314 (***)	Area, square metres (Variable Measure Trade Item)	n4+n6
315 (***)	Net volume, litres (Variable Measure Trade Item)	n4+n6
316 (***)	Net volume, cubic metres (Variable Measure Trade Item)	n4+n6
320 (***)	Net weight, pounds (Variable Measure Trade Item)	n4+n6

AI	Data Content	Format*
321 (***)	Length or first dimension, inches (Variable Measure Trade Item)	n4+n6
322 (***)	Length or first dimension, feet (Variable Measure Trade Item)	n4+n6
323 (***)	Length or first dimension, yards (Variable Measure Trade Item)	n4+n6
324 (***)	Width, diametre, or second dimension, inches (Variable Measure Trade Item)	n4+n6
325 (***)	Width, diametre, or second dimension, feet (Variable Measure Trade Item)	n4+n6
326 (***)	Width, diametre, or second dimension, yards (Variable Measure Trade Item	n4+n6
327 (***)	Depth, thickness, height, or third dimension, inches (Variable Measure Trade Item)	n4+n6
328 (***)	Depth, thickness, height, or third dimension, feet (Variable Measure Trade Item)	n4+n6
329 (***)	Depth, thickness, height, or third dimension, yards (Variable Measure Trade Item)	n4+n6
330 (***)	Logistic weight, kilograms	n4+n6
331 (***)	Length or first dimension, metres	n4+n6
332 (***)	Width, diametre, or second dimension, metres	n4+n6
333 (***)	Depth, thickness, height, or third dimension, metres	n4+n6
334 (***)	Area, square metres	n4+n6
335 (***)	Logistic volume, litres	n4+n6
336 (***)	Logistic volume, cubic litres	n4+n6
337 (***)	Kilograms per square metre	n4+n6
340 (***)	Logistic weight, pounds	n4+n6
341 (***)	Length or first dimension, inches	n4+n6
342 (***)	Length or first dimension, feet	n4+n6
343 (***)	Length or first dimension, yards	n4+n6
344 (***)	Width, diametre, or second dimension	n4+n6
345 (***)	Width, diametre, or second dimension	n4+n6
346 (***)	Width, diametre, or second dimension	n4+n6
347 (***)	Depth, thickness, height, or third dimension	n4+n6
348 (***)	Depth, thickness, height, or third dimension	n4+n6
349 (***)	Depth, thickness, height, or third dimension	n4+n6
350 (***)	Area, square inches (Variable Measure Trade Item)	n4+n6
351 (***)	Area, square feet (Variable Measure Trade Item)	n4+n6
352 (***)	Area, square yards (Variable Measure Trade Item)	n4+n6
353 (***)	Area, square inches	n4+n6

AI	Data Content	Format*
354 (***)	Area, square feet	n4+n6
355 (***)	Area, square yards	n4+n6
356 (***)	Net weight, troy ounces (Variable Measure Trade Item)	n4+n6
357 (***)	Net weight (or volume), ounces (Variable Measure Trade Item)	n4+n6
360 (***)	Net volume, quarts (Variable Measure Trade Item)	n4+n6
361 (***)	Net volume, gallons U.S. (Variable Measure Trade Item)	n4+n6
362 (***)	Logistic volume, quarts	n4+n6
363 (***)	Logistic volume, gallons U.S.	n4+n6
364 (***)	Net volume, cubic inches (Variable Measure Trade Item)	n4+n6
365 (***)	Net volume, cubic feet (Variable Measure Trade Item)	n4+n6
366 (***)	Net volume, cubic yards (Variable Measure Trade Item)	n4+n6
367 (***)	Logistic volume, cubic inches	n4+n6
368 (***)	Logistic volume, cubic feet	n4+n6
369 (***)	Logistic volume, cubic yards	n4+n6
37	Count of Trade Items	n2+n..8
390 (***)	Applicable Amount Payable, local currency	n4+n..15
391 (***)	Applicable Amount Payable with ISO Currency Code	n4+n3+n..15
392 (***)	Applicable Amount Payable, single monetary area (Variable Measure Trade Item)	n4+n..15
393 (***)	Applicable Amount Payable with ISO Currency Code (Variable Measure Trade Item)	n4+n3+n..15
400	Customer's Purchase Order Number	n3+x..30
401	Global Identification Number for Consignment (GINC)	n3+x..30
402	Global Shipment Identification Number (GSIN)	n3+n17
403	Routing Code	n3+x..30
410	Ship to - Deliver to Global Location Number	n3+n13
411	Bill to - Invoice to Global Location Number	n3+n13
412	Purchased from Global Location Number	n3+n13
413	Ship for - Deliver for - Forward to Global Location Number	n3+n13
414	Identification of a Physical Location - Global Location Number	n3+n13
415	Global Location Number of the Invoicing Party	n3+n13
420	Ship to - Deliver to Postal Code Within a Single Postal Authority	n3+X..20
421	Ship to - Deliver to Postal Code with ISO Country Code	n3+n3+X..9
422	Country of Origin of a Trade Item	n3+n3
423	Country of Initial Processing	n3+n3+n..12
424	Country of Processing	n3+n3

AI	Data Content	Format*
425	Country of Disassembly	n3+n3
426	Country Covering full Process Chain	n3+n3
7001	NATO Stock Number (NSN)	n4+n13
7002	UN/ECE Meat Carcasses and Cuts Classification	n4+X..30
7003	Expiration Date and Time	n4+n10
7004	Active Potency	n4+n..4
703s	Approval Number of Processor with ISO Country Code	n4+n3+X..27
8001	Roll Products (Width, Length, Core Diametre, Direction, Splices)	n4+n14
8002	Cellular Mobile Telephone Identifier	n4+X..20
8003	Global Returnable Asset Identifier (GRAI)	n4+n14+X..16
8004	Global Individual Asset Identifier (GIAI)	n4+X..30
8005	Price Per Unit of Measure	n4+n6
8006	Identification of the Components of a Trade Item	n4+n14+n2+n2
8007	International Bank Account Number (IBAN)	n4+X..30
8008	Date and Time of Production	n4+n8+n..4
8018	Global Service Relation Number (GSRN)	n4+n18
8020	Payment Slip Reference Number	n4+X..25
8100	GS1-128 Coupon Extended Code	n4+n6
8101	GS1-128 Coupon Extended Code	n4+n1+n5+n4
8102	GS1-128 Coupon Extended Code	n4+n1+n1
8110	Coupon Code Identification for Use in North America	n4+an..30
90	Information Mutually Agreed Between Trading Partners	n2+X..30
91 to 99	Company Internal Information	n2+X..30

Notes:

(*) The first position indicates the length (number of digits) of the GS1 Application Identifier. The following value refers to the format of the data content.
(**) If only year and month are available, DD must be filled with two zeroes.
(***) The fourth digit of this GS1 Application Identifier indicates the implied decimal point position.

Example:

- 3100 Net weight in kg without a decimal point
- 3102 Net weight in kg with two decimal points