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"General *EAN* Specifications"

EAN article numbering and symbol marking

Kit for the preparation of national guidelines

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CHAPTER 1 : INTRODUCTION AND GENERAL PRESENTATION OF THE DOCUMENT

1.1. GENERAL PURPOSE OF THIS DOCUMENT

This document furnishes all the basic technical information needed by all those involved in any way in the application of EAN item numbering structures.

* Manufacturers will find in it the necessary instructions for numbering their products and marking them at source.

* Retailers will find here described the various numbering and marking formulas which they may encounter or may use to meet their own needs.

* Finally, members of the various professions who take part in the marking operation by furnishing supplies or services (printers, filmmaster suppliers, manufacturers of scanning or marking equipment,...) will find in the document the basic information they need.

1.2. LEVEL OF APPLICATION

Every firm involved in the EAN numbering and symbol-marking must strictly comply with these requirements. They constitute an international standard, with the exception of the following sections :

* Section 3.9 which deals with the rules adopted by your Numbering Organization for numbering products in-store may be considered as presenting an optional national standard. A retailer is free to choose, for in-store marking, a different numbering structure from the one/or those proposed by his Numbering Organization.

* Section 4.3. which deals with the rules adopted by your Numbering Organization for numbering coupons, may be considered as presenting a national standard (these rules must comply with the international standards explained in Section 4.2.).

* Section 6.5, which deals with the EAN standard gauge, may be considered as presenting an optional international standard, since certain Numbering Organizations may substitute another gauge for this standard EAN gauge.

* Section 6.6, which deals with the gauge developed by your Numbering Organization (a gauge which must comply with the international standards explained in Section 6.5) may be considered as presenting an optional national standard, since printers or manufacturers may substitute another gauge (which must also comply with the international standards) for this one.

* Any firm that respects international or national standards, optional or binding, may refer to these standards, as such, in dealing with other persons or firms concerned (in particular, with equipment suppliers).

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.3. RESPONSIBILITY

* The International Article Numbering Association, EAN, is responsible for defining the parts of these requirements which are considered to be international standards.

  In addition, the International Association is responsible for ensuring the compatibility and proper harmonization, within the overall systems, of the definitions given by Numbering Organizations to the parts of these requirements which are considered to be national standards. But each Numbering Organization is solely responsible for the definition of these national standards.

* As for checking on the application of these overall requirements, each Numbering Organization is solely responsible for this task within its territory.

1.4. GUARANTEES

* Equipment suppliers may go completely by these requirements in drawing up specifications for their equipment.

* Manufacturers who comply with these requirements in source-marking their products may be sure of contributing satisfactorily to the operation, whatever be the territory where these products are distributed.

* Retailers who comply with these regulations, and in particular who use no other prefixes for in-store marking than those specified for this purpose, may be sure of having a complete and unambiguous system for identifiying the items they sell, whatever may be the territory where these items originated or the type of marking used (source-marking or in-store marking).

1.5. FUTURE DEVELOPMENT OF THESE REQUIREMENTS

These requirements may develop and be supplemented in the future, on the basis of experience acquired and possibly with a view to new fields of application.

These supplementary requirements may take the form of international or national standards, but they will always fit into the framework of international compatibility of the EAN system, to the extent that they apply, as EAN item source-marking does, to international trade.

1.6. GENERAL PRESENTATION OF THIS DOCUMENT

* Chapter 2 presents the principles and rules to be observed in the source-numbering of items.

* Chapter 3 deals with the EAN and UPC number series which will be used only in limited circulation.

* Chapter 4 deals with coupon numbering.

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* Chapter 5 presents the logical structure and ideal dimensions of the EAN-13 and EAN-8 symbols. Explanations given in this chapter are valid whatever be the stage at which the symbol is produced (at source or in-store).

* Chapter 6 describes the complete symbol production process when items are marked at source and when automated label printing machines are used.

* Chapter 7 deals with the aspects of colours, contrast and reflection.

* Chapter 8 presents the location guidelines for EAN symbols on consumer units and coupons.

* The Appendices have been drawn up in such a way that they contain the most important reference information of these specifications.

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CHAPTER 2 : SOURCE NUMBERING OF ARTICLES

2.1. GENERAL

Article numbers are simply unique identification numbers in a standard format. It is a principle of EAN that the system must be considered as a means of identification and not as a means of product classification. Therefore individual digits in the numbers are NOT vested with a particular significance and do not convey information about the product.

The source numbering systems are intended for use on articles which are put into general, unrestricted distribution. The number used for any one article must be totally unique against all others, and the structures described in Sections 2.2 to 2.7 are designed to achieve this.

2.2. STANDARD EAN NUMBERS

* The EAN identification is exclusively numerical and has the following general structure :

Prefix	Item Identification	Check-digit
P1 P2 P3	X X	C

Within this structure :

- P1 P2 P3 represents the prefix (3 digits) which identifies the Numbering Organization. Each Numbering Organization receives one or several P1 P2 P3 prefixes. EAN is responsable for assigning these prefixes.

  Note : Till 1981, EAN Numbering Organizations were granted one or several 2-digit prefixes (P1 P2). Note that countries allocated a 2-digit prefix by EAN may simply be regarded as having ten 3-digit prefixes. A list of currently assigned prefix values is given in Appendix 1.

- The item identification (X X .....) is structured entirely at the discretion of the Numbering Organization identified by the prefix used. However, the structure which is adopted must follow certain basic principles (see Section 2.3.).

- The check-digit is calculated according to the standard algorithm detailed in Section 2.6. below).

* There are two separate series of standard EAN numbers :

a. The most generally used version assigns 9 data characters to the "item identification" field. In this case, the complete item

number includes 13 numerical positions. It will henceforth be referred to as EAN-13.

b. A short-size version which assigns 4 data characters to the "item identification" field. In this case, the complete item number includes 8 numerical positions. It will henceforth be referred to as EAN-8.

FULL-SIZE VERSION EAN-13	P1	P2	P3	X	X	X	X	X	X	X	X	X	C
SHORT-SIZE VERSION EAN-8						P1	P2	P3	X	X	X	X	C

* In general, the short-size version is used only for items whose packaging does not include enough available space to permit the EAN-13 symbol to be printed. We shall see later on that, within the limits imposed by printing conditions, the EAN-13 symbol may require only a small surface, which means that, normally the use of the EAN-8 symbol will be an exceptional case.

  However, only the Numbering Organizations possess the criteria which make it possible to decide whether a given item may possibly be numbered (and marked) by using EAN-8.

* In scanning-equipment files, EAN-8 numbers must always be right justified by the insertion of five leading zeros to bring the number into a 13 digit field, so that it may be considered that item numbers always have 13 digits. Within the framework of this 13-digit structure, no ambiguity can arise between an EAN-13 and an EAN-8 number.

2.3. PRINCIPLES AND GENERAL RULES FOR ITEM-NUMBERING WHICH HAVE TO BE FOLLOWED BY THE NUMBERING ORGANIZATIONS

Each Numbering Organization is solely responsible for defining the precise rules for item-numbering, providing that they respect, the following six points :

1. An item identified under a Numbering Organization, in either the EAN-13 or the EAN-8 version, must have its identification preceded by the P1 P2 P3 prefix (or one of the P1 P2 P3 prefixes) assigned by EAN to this Numbering Organization.

2. Item identification must necessarily be numerical and fit into the format of the international structure (EAN-13 or EAN-8) defined above.

3. The two item identification sequences, EAN-13 and EAN-8, must be considered independent.

4. The numbering rules applied by Numbering Organizations must make it possible to guarantee that, in each of the two sequences (EAN-13 and EAN-8), two different items will necessarily receive two different numbers.

5. The item to be identified is the consumer unit, in other words, the unit which is intended to be sold to the final consumer through a retail check-out (1). Hence the consumer unit may be :

   - Either (and this is most often the case) a unit that cannot be divided or broken up. We shall call this the "basic consumer unit".

   - Or a unit made up of a group of several "basic consumer units" of the same different products. In this case the consumer unit is called a "multipack".

   A separate unique EAN-13 or EAN-8 number is required for every different consumer unit. The multipack receives a different EAN number from that of the basic unit which it contains.

6. Numbers allocated to items which have become absolete must not be re-used for another item until three years have elapsed from the date the original item was last supplied by the manufacturer (or marketer).

2.4. RULES ADOPTED BY THE NUMBERING ORGANIZATION FOR NUMBERING ITEMS IN EAN-13

To be drawn up by your Numbering Organization

Recommendations to Numbering Organizations regarding the structure of EAN-13 numbers are given in a separate document.

2.5. RULES ADOPTED BY THE NUMBERING ORGANIZATION FOR NUMBERING ITEMS IN EAN-8

To be drawn up by your Numbering Organization

Recommendations to Numbering Organizations regarding the structure and allocation of EAN-8 numbers are given in a separate document.

2.6. CHECK-DIGIT CALCULATION

This algorithm is identical for EAN-13 and EAN-8 numbers.

Important : Digit positions are numbered from right to left in this algorithm (the check-digit is in the first position : the P1 prefix is in the 13th position in EAN-13 and in the 8th position in EAN-8).

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1 The "EAN specifications for numbering and symbol-marking of despatch units" are described in Part II of this document.

STEP 1 : Starting from position 2 of the number, add up the values of the digits in even-numbered positions.

STEP 2 : Multiply by 3 the result of step 1 above.

STEP 3 : Starting from position 3 of the number, add up the values of the digits in odd-numbered positions.

STEP 4 : Add up the results of steps 2 and 3.

STEP 5 : The check-digit is the smallest number which, added to the results obtained through step 4, gives a number that is a multiple of 10.

For example, to calculate the check-digit for EAN -13 number 427622135746 C :

| 4 2 7 6 2 2 1 3 5 7 4 6 C |

STEP 1 : 2 + 6 + 2 + 3 + 7 + 6 = 26

STEP 2 : X 3 = 78

STEP 3 : 4 + 7 + 2 + 1 + 5 + 4 = 23

STEP 4 : Add STEP 2 + STEP 3 = 101

STEP 5 : C = 9

120

The complete number is therefore 4276221357469.

For example, to calculate the check-digit for EAN-8 number 3714274 C :

| 3 7 1 4 2 7 4 C |

STEP 1 : 3 + 1 + 2 + 4 = 10

STEP 2 : X 3 = 30

STEP 3 : 7 + 4 + 7 = 18

STEP 4 : Add STEP 2 + STEP 3 = 48

STEP 5 : C = 2

50

The complete number is therefore 37142742.

2.7. ASSOCIATED SOURCE NUMBERING SYSTEMS

2.7.1. UPC (Uniform Product Code)

The UPC numbering system used in the USA and in Canada for consumer units was the original system, with which the EAN system has been made retrospectively unambiguous. UPC numbers were originally conceived as consisting of 10 digits, plus a single prefix digit on the left and a single check digit on the right, total 12 digits. For purposes of compatibility in EAN 13-digit fields, UPC numbers should be considered as being right justified or as having an implied leading digit of value zero.

Thus :

Prefix	Code Number	Check
(0) P	X X X X X X X X X X	C

The values of Prefix P which have been assigned by UPC for source numbering of consumer units are :

0 : used for all items except as follows

2 : denoting variable weight items such as meat and produce

3 : denoting National Drug Code and National Health Related Items Code. These have variable internal structures.

4 : reserved for retailer in-house use

5 : reserved for coupon coding

UPC numbers for consumer units usually take the form :

Prefix	Manufacturer	Item	Check
(0) 0	M M M M M	I I I I I	C

The check digit in UPC numbers is calculated according to the same standard algorithm as described in Section 2.6.

Users of EAN systems whose point of sale files are consequently of 13-digit field length can equally accommodate UPC numbers in those files without ambiguity. But users of UPC numbers who have organized their files to a field of 12 digits only, will not be able to accommodate EAN numbers without increasing their field length.

In the UPC system, certain values of the 12-digit number can be

represented by a short version symbol. This is achieved by the suppression of zeros in the symbol. When the full-length number contains several zeros in a particular position, these zeros are omitted from the number, and the scanner is programmed to reinstate the zeros when reading the symbol. Full details of this "UPC-E symbol version" are given in Section 5.7.

2.7.2. ISBN Numbering

The International Standard Book Numbering system, based on International Standard ISO 2108/1972, is in use throughout the world for the numbering of published books. Agreement has been reached between the International Article Numbering Association EAN, and the International ISBN Agency for the co-ordination of the EAN and ISBN systems. This coordination enables the ISBN number to be represented on books, without ambiguity, by means of the EAN symbol.

For this purpose, the prefix digits 978 have been assigned to the ISBN Agency for the exclusive use of book coding throughout the world, and the prefix digits 979 have been reserved for any possible future extension. The standard EAN number then consists of :

3 digit prefix (978)

9 digits showing the ISBN number of the book (without check digit)

1 check digit calculated according to the standard algorithm described in Section 2.6.

The "EAN specifications for books and paperbacks, magazines and periodicals" are described in a separate document.

2.7.3. ISSN Numbering

The International Standard Serial Numbering system, based on International Standard ISO 3297/1975, is in use throughout the world for the numbering of serial publications. Agreement has been reached between the International Article Numbering Association EAN, and the International Centre for the Registration of Serial Publications (which administers ISSN) on the co-ordination of the EAN and ISSN systems. This co-ordination enables the ISSN number to be represented on serial publications, without ambiguity, by means of the EAN symbol.

For this purpose, the prefix digits 977 have been assigned to the ISSN agency for the exclusive use of periodical and journal coding throughout the world. The standard EAN number then consists of :

3 digits prefix (977)

7 digits showing the ISSN number of the periodical (without check digit)

2 spare digits

1 check digit calculated according to the standard algorithm described in Section 2.6.

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The "EAN specifications for books and paperbacks, magazines and periodicals" are described in a separate document.

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CHAPTER 3 : LIMITED CIRCULATION NUMBERING

3.1. GENERAL

In addition to the source numbering facilities described in Chapter 2, both the UPC and EAN systems provide for other number series which will be used only in limited circulation. Such numbers must be unique against source numbers, but may themselves be used non-uniquely. That is to say limited circulation numbers may be used several times over in separate environments, where they will not clash with source numbers. When such numbers are used, the originators assume responsibility for ensuring that circulation is in fact limited, and that numbered items cannot "escape" to cause ambiguity elsewhere.

The principal user situation is for the coding in-store of consumer units which have not been numbered at source (see Sections 3.2 to 3.9).

Note : The recommendations in Sections 3.2 to 3.5 referring to price equally apply to weight and number of units.

3.2. EAN IN-STORE NUMBER, LONG VERSION

In the EAN-13 digit number system the prefix 2 is reserved for in-store use. A total of 11 digits is therefore available for use in-store entirely at the discretion of the retailer. Thus :

PREFIX	IN-STORE USE	CHECK
2	X X X X X X X X X X X	C

The intention of this number series is that retailers should have the maximum flexibility to work out with their equipment suppliers any non-standard encodation they require. In particular, it can be used for variable quantity consumer units, ie items sold in random quantity against a fixed price per unit quantity - typically : fresh meat, fruit and vegetables, cheeses, delicatessen. The available 11 digits can be structured in a variety of ways to represent the product type, and either the net weight, or the calculated price, or the number of units. Equipment is commercially available for automatically weighing items, calculating an item price from the unit price, and printing the information in the form of a barcode label. The scanning equipment can then be programmed to use the prefix 2 as an instruction to decode the ensuing 11 digits according to the particular structure adopted.

Although each Numbering Organization and/or retailer is perfectly free to develop its in-store solution, EAN provides recommended standards aiming at some degree of standardization of equipment.

* It is recommended to locate the price to the right in the X field.

* If a supplementary check-digit is used to control the price, it is recommended to locate this check-digit immediately to the left of the price. The standard algorithm used to calculate this check digit is given in Section 3.4 for a 4 digit price field and in Section 3.5 for a 5 digit price field.

  Note : EAN does not express any recommendation to the Numbering Organizations and retailers, in favour or in disfavour of the introduction of this check-digit.

* It is recommended to use the left most digits of the X field to express the item number.

The recommended formats are :

Abbreviations :

I I .. : in-store number
V : price check-digit
P P .. : digits identifying the price
C : check-digit of the symbol.

FORMATS		PRE-FIX	11 digits	CD
without supplement. price check-digit	4 digit price	2	I I I I I I I P P P P	C
	5 digit price	2	I I I I I I P P P P P	C
with supplementary price check-digit	4 digit price	2	I I I I I I V P P P P	C
	5 digit price	2	I I I I I V P P P P P	C

Note : The price field may contain 0, 1 or 2 decimal places in function of the monetary unit used. The decimal point, which is not symbol marked, must nevertheless be taken into account by the marking equipment when editing the consumer label.

3.3. UPC IN-STORE NUMBER, LONG VERSION

In the UPC 12-digit number system the prefix 2 is reserved for in-store use. This becomes prefix (0)2 in the EAN-13 digit field. This format is also available for use in EAN member countries. Thus :

PREFIX	IN-STORE USE	CHECK
(0) 2	X X X X X X X X X X	C

The intention of this number series is that retailers should have the maximum flexibility to work out with their equipment suppliers any non-standard encodation they require. In particular, it can be used for variable quantity consumer units. The available 10 digits can be structured in a variety of ways to represent the product type, and either the net weight, or the calculated price, or the number of units. Equipment is commercially available for automatically weighing items, calculating an item price from the unit price, and printing the information in the form of a barcode label. The scanning equipment can then be programmed to use the prefix (0)2 as an instruction to decode the ensuing 10 digits according to the particular structure adopted.

Although each Numbering Organization and/or retailer is perfectly free to develop its in-store solution, EAN provides recommended standards aiming at some degree of standardization of equipment.

* It is recommended to locate the price to the right in the X field.

* If a supplementary check-digit is used to control the price, it is recommended to locate this check-digit immediately to the left of the price. The standard algorithm used to calculate this check digit is given in Section 3.4 for a 4 digit price field and in Section 3.5 for a 5 digit price field.

  Note : EAN does not express any recommendation to the Numbering Organizations and retailers, in favour or in disfavour of the introduction of this check-digit.

* It is recommended to use the left most digits of the X field to express the item number.

The recommended formats are :

Abbreviations :

I I .. : in-store number
V : price check-digit
P P .. : digits identifying the price
C : check-digit of the symbol.

FORMATS		PRE-FIX	10 digits	CD
without supplement. price check-digit	4 digit price	02	I I I I I I P P P P	C
	5 digit price	02	I I I I I P P P P P	C
with supplementary price check-digit	4 digit price	02	I I I I I V P P P P	C
	5 digit price	02	I I I I V P P P P P	C

Note: The price field may contain 0, 1 or 2 decimal places in function

of the monetary unit used. The decimal point, which is not symbol marked, must nevertheless be taken into account by the marking equipment when editing the consumer label.

3.4. ALGORITHM FOR A 4 DIGIT PRICE CHECK-DIGIT

The check-digit of a 4 digit price field is computed as follows :

STEP 1 : Compute the weighted product for each position in the 4-digit price field. Each of the 4 digit positions has a numerical coefficient or weighting factor assigned to it :

Price digit position 1 is weighted by 2-
2 is weighted by 2-
3 is weighted by 3
4 is weighted by 5-

* To obtain the 2 - weighted product of a digit, first multiply the digit by 2. Then the carry of that multiplication is substracted from the product. The units position of the difference is the weighted product. Thus :

TABLE 1

Digit	Calculation	Weight 2 - Product
0	0 X 2 = 0 - 0 = 0	0
1	1 X 2 = 2 - 0 = 2	2
2	2 X 2 = 4 - 0 = 4	4
3	3 x 2 = 6 - 0 = 6	6
4	4 x 2 = 8 - 0 = 8	8
5	5 x 2 = 10 - 1 = 9	9
6	6 x 2 = 12 - 1 = 11	1
7	7 x 2 = 14 - 1 = 13	3
8	8 x 2 = 16 - 1 = 15	5
9	9 x 2 = 18 - 1 = 17	7

* To obtain the 3 weighted product of a digit, multiply the digit by 3. The units position of this product is the weighted product. Thus :

TABLE 2

Digit	Calculation	Weight 3 Product
0	0 X 3 = 0	0
1	1 X 3 = 3	3
2	2 X 3 = 6	6
3	3 x 3 = 9	9
4	4 x 3 = 12	2
5	5 x 3 = 15	5
6	6 x 3 = 18	8
7	7 x 3 = 21	1
8	8 x 3 = 24	4
9	9 x 3 = 27	7

* To obtain the 5 - weighted product of a digit, first multiply the digit by 5. Then the carry of that multiplication is substracted from the product. The units position of the difference is the weighted product. Thus :

TABLE 3

Digit	Calculation	Weight 5 - Product
0	0 X 5 = 0 - 0 = 0	0
1	1 X 5 = 5 - 0 = 5	5
2	2 X 5 = 10 - 1 = 9	9
3	3 x 5 = 15 - 1 = 14	4
4	4 x 5 = 20 - 2 = 18	8
5	5 x 5 = 25 - 2 = 23	3
6	6 x 5 = 30 - 3 = 27	7
7	7 x 5 = 35 - 3 = 32	2
8	8 x 5 = 40 - 4 = 36	6
9	9 x 5 = 45 - 4 = 41	1

STEP 2 : Sum the weighted products found in STEP 1

STEP 3 : Multiply the sum found in STEP 2 by 3

STEP 4 : The price check-digit is the units position of the product found in STEP 3.

Example :

Given the 4-digit price field containing the number 1546 (1546 would represent e.g. £ 15.46), the price check-digit is calculated as follows :

Digit	Weight	Calculation	Weighted Product
1	2-	1 x 2 = 2 - 0 = 2	2
5	2-	5 x 2 = 10 - 1= 9	9
4	3	4 x 3 = 12	2
6	5-	6 x 5 = 30 - 3= 27	7
		(STEP 1)	20 (STEP 2)
			x3 (STEP 3)
			60

Price Check-Digit = 0 (STEP 4)

3.5. ALGORITHM FOR A 5 DIGIT PRICE CHECK-DIGIT

The check-digit of a 5 digit price field is computed as follows :

STEP 1: Compute the weighted product for each digit position in the 5 digit price field. Each position in the price field has a numerical coefficient or weighting factor assigned to it :

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Price digit position 1 is weighted by 5 +
2 is weighted by 2 -
3 is weighted by 5 -
4 is weighted by 5 +
5 is weighted by 2 -

* To obtain the 2 - weighted product of a digit, first multiply the digit by 2. Then the carry of that multiplication is substracted from the product. The units position of the difference is the weighted product. Thus :

TABLE 1

Digit	Calculation	Weight 2 - Product
0	0 X 2 = 0 - 0 = 0	0
1	1 X 2 = 2 - 0 = 2	2
2	2 X 2 = 4 - 0 = 4	4
3	3 x 2 = 6 - 0 = 6	6
4	4 x 2 = 8 - 0 = 8	8
5	5 x 2 = 10 - 1 = 9	9
6	6 x 2 = 12 - 1 = 11	1
7	7 x 2 = 14 - 1 = 13	3
8	8 x 2 = 16 - 1 = 15	5
9	9 x 2 = 18 - 1 = 17	7

* To obtain the 5 + weighted product of a digit, first multiply the digit by 5. The sum of the digits in the product yields the 5 + weighted product.

* To obtain the 5 - weighted product of a digit, take the ten's complement of the 5 + weighted product of that digit.

TABLE 2

Digit	Calculation	Weight 5 + Product	Weight 5 - Product
0	0 x 5 = 0	0	0
1	1 x 5 = 5	5	5
2	2 x 5 = 10; 1 + 0	1	9
3	3 x 5 = 15; 1 + 5	6	4
4	4 x 5 = 20; 2 + 0	2	8
5	5 x 5 = 25; 2 + 5	7	3
6	6 x 5 = 30; 3 + 0	3	7
7	7 x 5 = 35; 3 + 5	8	2
8	8 x 5 = 40; 4 + 0	4	6
9	9 x 5 = 45; 4 + 5	9	1

Example :

Given a 5 digit price field containing the number 31546, the check-digit is calculated as follows :

Digit	Weight	Weighted product
3	5+	6
1	2-	2
5	5-	3
4	5+	2
6	2-	1

STEP 2 : Sum the weighted products found in STEP 1 (in the example shown above, the result is 6 + 2 + 3 + 2 + 1 = 14).

STEP 3 : Take the ten's complement of the units position of the sum found in STEP 2 (in the example, the ten's complement of 4 is 6).

STEP 4 : Find from Table 2 the number whose 5-weighted product is the same as the result of STEP 3 (in the example, 6 is the 5-weighted product of 8).

The result of STEP 4 is the price check-digit.

3.6. EAN IN-STORE NUMBER, SHORT VERSION

In the EAN-8 number series, the prefix value 2 is reserved for in-store use. As explained previously, the EAN-8 number must be right justified in a 13-digit field. Therefore the format for in-store use is :

Prefix	In-Store Use	Check
(00000)2	X X X X X X	C

This gives a total of six significant digits available for structuring entirely at the retailer's discretion, in agreement with the equipment supplier. This form of number can be represented by the EAN-8 symbol.

3.7. EAN VELOCITY CODE

In the EAN-8 number series, the prefix value 0 is also reserved for in-store use. Thus :

Prefix	In-Store Use	Check
(00000)0	X X X X X X	C

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Numbers in this form can be represented by the EAN-8 symbol.

However, numbers in this form are also particularly suitable for key entry. The six significant digits for in-store use can be allocated to items according to their rate of sale, ie "velocity coding" in which the lowest number values are given to the fastest moving items. The field should then be zero filled to the left. Since the prefix is zero, only zeros appear on the left of the velocity code, which may itself be as little as one significant digit, plus the check-digit. The left-hand zeros need not to be keyed in. Thus a large volume of item movement may be captured with a minimum of key-entry strokes.

3.8. UPC-E LOCAL ASSIGNED CODES (LAC)

In the UPC system, certain values of the 12-digit number series can be represented by a short version symbol. This is achieved by the suppression of zeros in the number (see also Section ..).

Of the zero-suppressible numbers, certain particular values have been reserved for in-store use and are therefore available for this purpose to EAN members. In a 13 field these values are :

Prefix	In-Store Use			Check
(0) 0	from 01000 to 07999	0000	from 5 to 9	C

Note : The values 01000 to 07999 have been excluded from the issue of manufacturer numbers, and therefore will not be encountered on source marked articles.

It is essential that only these values should be used in the allocation of in-store numbers. In particular, if values other than 5 to 9 are used for the last digit, the short version symbol can not be used.

All numbers from this series can be encoded for in-store use by means of a short version symbol. In-store label-printing machines are commercially available, which produce short-version symbols using only the permissible numerical values. When zero-suppressed, these numerical values become :

010005 to 079995
9 9

When using such a system, it must be remembered that while the label shows only a short symbol and a short number, the scanner will reconstitute this to a full-length number. Therefore it is the

full-length form of the number which must be entered in the price look-up file. For example, a short form in-store symbol with the apparent numeric value : 012345 would have to be entered into a 13-digit price look-up file in the form :

000123400005(C)

The UPC-E LAC format provides a total of 35,000 item number combinations for use in-store.

Note that this version of short symbol is not available in EAN member countries for source numbering.

3.9. IN-STORE NUMBERING FORMATS RECOMMENDED BY THE NUMBERING ORGANIZATION

To be drawn up by your Numbering Organization.

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CHAPTER 4 : EAN COUPON NUMBERS

4.1. GENERAL

The purpose of coupon numbering and symbol-marking is to automate and speed up the coupon handling procedures at the point of sale. Moreover, coupon issuers and retailers will have the possibility to reduce the costs involved in sorting coupons, administering manufacturers' payments and producing reports on redemption.

All EAN coupon standards presented hereafter allow for "coupon validation", i.e. to check whether the item(s) covered by the coupon are within the customer's order.

If either validation or value look up is performed, manufacturers must advise their distributors and retailers of the impending issue of a coupon so that retailers' files can be updated to receive the information at the point of sale.

The coupon identification standards presented hereafter are available for use on manufacturers' and retailers' promotional coupons, but also on any tokens with monetary value such as : gift tokens, book tokens, foodstamps, record vouchers, luncheon vouchers, social security tokens, etc...

4.2. EAN COUPON NUMBERING STRUCTURES

EAN coupon numbering specifications are flexible and have been designed to cater for current as well as anticipated future requirements of EAN member countries.

Ideally, scanning equipment will be adapted in the near future to provide similar flexibility.

When adapting their National Specifications, Numbering Organizations are advised to include appropriate mention of all EAN recommended numbering structures, in the interest of consistency and to avoid misinterpretation by equipment vendors.

4.2.1. Prefixes

Prefix 05 within the UPC system and prefixes 98 and 99 within the EAN system have been reserved for use with coupon numbers.

In the EAN system, prefix 99 has been released to meet the present need for national coupon solutions.

Although each Numbering Organization is perfectly free to develop its national coupon solution, EAN provides four "recommended standards" aiming at some degree of standardization of equipment.

These recommended standards are :

a. P P Y Y Y Y R R R V V V C
b. P P Y Y Y R R R V V V V C
c. P P Y Y Y Y Y R R R T T C

where : Y = coupon issuer number
R = coupon reference number (allocated by coupon issuer)
V = redemption value
T = value code (standardized by the Numbering Organization)

d. In addition the coupon number could be defined with no value or value code. Example :

P P Y Y Y Y Y R R R R R C

Note : In the absence of N.O. prefix digits, national coupon solutions are not unique worldwide.

4.2.2. Prefixes 05, 98

Prefix 05 is reserved for exclusive use within the UPC system in North America and is currently not available for use within EAN member countries.

Prefix 98 has been reserved for future use within EAN member countries and will be released when a definite need has been identified.

4.2.3. Programmability of the 3rd digit of coupon numbers

Numbering Organizations or retailers may require that the third digit of the coupon numbers (980 to 989 and 990 to 999) be programmable, in order to cope with specific demands such as :
- taxable and non-taxable coupons
- different currencies
- shifting the decimal place - etc...

within the same system.

4.3. RULES FOR NUMBERING COUPONS ADOPTED BY THE NUMBERING ORGANIZATION

To be drawn up by your Numbering Organization.

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CHAPTER 5 : REPRESENTING A NUMBER BY A SYMBOL : LOGICAL STRUCTURE AND IDEAL DIMENSIONS OF THE EAN-13 AND EAN-8 SYMBOLS

5.1. STANDARD FEATURES OF EAN SYMBOLS

There are various versions of EAN symbols (including UPC). All versions have the following characteristics in common :

- The symbols are of overall rectangular shape, made up of a series of light and dark parallel bars, perpendicular to an imaginary base line or reference line, with a light margin on all sides.

- The light and dark bars are composed of modules of uniform width, light or dark. (In the following description of EAN symbols a dark module is represented by 1 and a light module by 0).

- Characters in the bar code representing numerical digits are made up of 7 modules, light or dark.

- In these characters the modules are grouped into bars, with each digit represented by 2 dark bars and 2 light spaces.

- A dark bar or a light space may comprise from 1 to 4 modules.

- In addition to the digit characters, there are auxiliary characters, comprising fewer modules, used as guard bars or centre bars for beginning, ending and separation.

- The symbol is designed to be read omni-directionally by a fixed-position scanner. It can also be read bi-directionally by hand held devices.

- The symbol size is variable between limits in magnification, to accommodate the ranges in quality achievable by the various printing processes.

- Dimensions are specified for one particular size of symbol, known as the nominal size. Magnification limits are from 0.8 to 2.0 times the nominal size.

5.2. NUMBER SETS

Digit values are represented in the bar code symbols by 7-module characters arranged in different number sets known as A, B and C, as follows :

Value of Digit	Representation in Set A	Representation in Set B	Representation in Set C
0	0 0 0 1 1 0 1	0 1 0 0 1 1 1	1 1 1 0 0 1 0
1	0 0 1 1 0 0 1	0 1 1 0 0 1 1	1 1 0 0 1 1 0
2	0 0 1 0 0 1 1	0 0 1 1 0 1 1	1 1 0 1 1 0 0
3	0 1 1 1 1 0 1	0 1 0 0 0 0 1	1 0 0 0 0 1 0
4	0 1 0 0 0 1 1	0 0 1 1 1 0 1	1 0 1 1 1 0 0
5	0 1 1 0 0 0 1	0 1 1 1 0 0 1	1 0 0 1 1 1 0
6	0 1 0 1 1 1 1	0 0 0 0 1 0 1	1 0 1 0 0 0 0
7	0 1 1 1 0 1 1	0 0 1 0 0 0 1	1 0 0 0 1 0 0
8	0 1 1 0 1 1 1	0 0 0 1 0 0 1	1 0 0 1 0 0 0
9	0 0 0 1 0 1 1	0 0 1 0 1 1 1	1 1 1 0 1 0 0

Characters in Number Set A comprise an odd number of dark modules. These are known as characters with odd parity.

Characters in Number Sets B and C comprise an even number of dark modules. These are shown as characters with even parity.

These characters are shown in enlarged schematic form in Appendix 2.

Characters in Number Sets A and B always begin on the left with a light module and end on the right with a dark module. Characters in Number Set C begin on the left with a dark module and end on the right with a light module. Taken in conjunction with the guard patterns and centre patterns, it will be seen later that every character in a symbol begins and ends with a different module, light or dark, from its neighbour on the left or right. This means that the boundary between two characters can always be visually distinguished, which is essential for unambiguous decoding.

5.3. AUXILIARY CHARACTERS

Auxiliary characters are composed as follows :

Auxiliary Character	Number of Modules	Module Set
Normal guard pattern	3	101
Centre pattern	5	01010
"E version stop guard pattern	6	010101

These characters are shown in enlarged schematic form in Appendix 3.

5.4. NOMINAL DIMENSIONS OF CHARACTERS

In the nominal size (ie, when the magnification = 1.0), the ideal theoretical width of a module is 0.33 mm.

The corresponding width of characters is :

- Digit characters	:	7 modules = 2.31 mm
- Auxiliary characters		
. Guard pattern	:	3 modules = 0.99 mm
. Centre pattern	:	5 modules = 1.65 mm
. "E" version stop guard	:	6 modules = 1.98 mm

The ideal theoretical dimensions of all characters in their nominal size are given in Appendix 6.

Note 1 : The internal dimensions for digit characters with the values 1, 2, 7 and 8 do not exactly correspond to multiples of the module width of 0.33 mm. This is not an error. For these characters, some of the bars and spaces are reduced or enlarged by 1/13 of a module to provide a uniform distribution of bar width tolerances and to improve scanning reliability.

Note 2 : The width of digit characters is measured from a visually indicated edge (comprising a dark bar) to the visually indicated edge of the adjacent character.

Note 3 : The width of guard bar patterns is measured from a visually indicated edge to the edge of the light margin surrounding the symbol.

Note 4 : All dimensions given are ideal, theoretical dimensions corresponding to the nominal size of symbols. These dimensions are not intended to be used directly in the preparation of symbols. Production aspects and tolerances are dealt with in Chapter 6.

5.5. FORMAT OF THE 13-DIGIT EAN SYMBOL (see diagram in Appendix 4)

EAN standard EAN-13 numbers and UPC-A series are all represented by the same symbol. This symbol is made up as follows, reading from left to right :

(i) a guard pattern

(ii) 6 digit characters from Number Sets A or B, comprising the "left half" of the symbol

(iii) a centre pattern

(iv) 6 digit characters from Number Set C, comprising the "right half" of the symbol

(v) a guard pattern.

The symbol itself comprises only 12 digit characters and therefore the 13th digit is not represented directly by a digit character. The 13th

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(iv) 6 digit characters from Number Set C, comprising the "right half" of the symbol

(v) a guard pattern.

The symbol itself comprises only 12 digit characters and therefore the 13th digit is not represented directly by a digit character. The 13th

digit which is not so represented is always the digit in the leftmost position of the 13-digit number. The remaining 12 digits in the number are represented by the digit characters in the symbol, in the same sequence left to right.

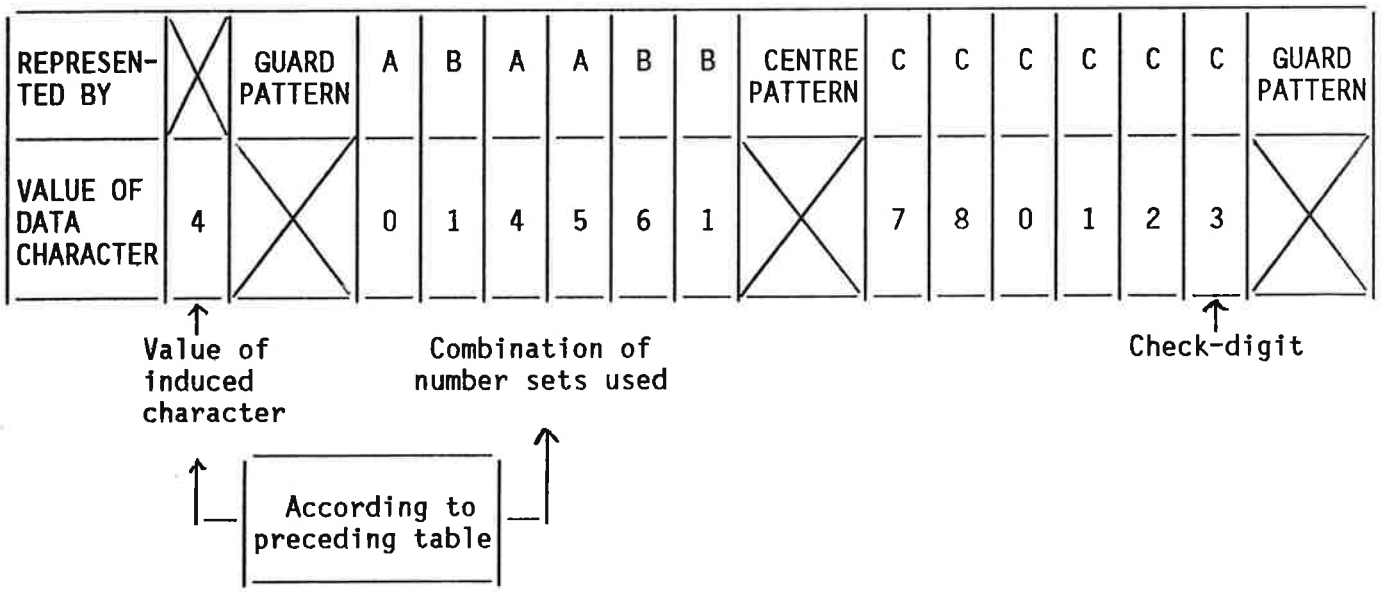
5.5.1. Variable parity coding of 13th digit

The value of the 13th digit is encoded by permutation in the use of Number Sets A and B for the 6 digit characters in the left half of the symbol. This is known as using variable parity in the left half : ie Number Set A is of odd parity, Number Set B is of even parity, and the left half is composed of a permutation of both odd and even parity digit characters.

The coding system for values of the 13th digit is as follows :

Value of 13th digit	Number Sets used for coding left half of symbol					
	1	2	3	4	5	6
0	A	A	A	A	A	A
1	A	A	B	A	B	B
2	A	A	B	B	A	B
3	A	A	B	B	B	A
4	A	B	A	A	B	B
5	A	B	B	A	A	B
6	A	B	B	B	A	A
7	A	B	A	B	A	B
8	A	B	A	B	B	A
9	A	B	B	A	B	A

Example : The EAN-13 symbol for : 4014561780123 is represented in the following manner :



5.5.2. Fixed parity of UPC codes

It will also be noticed that a value of 0 for the 13th digit is assigned to the permutation which consists of Number Set A for all 6 characters in the left half. As stated in Section 2.7.1. UPC codes were originally conceived as consisting of 12 digits only, with no need to encode a 13th digit. UPC symbols are specified simply as composed of Number Set A for the left half and Number Set C for the right half. This particular fixed parity sequence has therefore been used to represent the value of zero, and to give to UPC codes the implied 13th digit value of zero which is required for compatibility with EAN-13 series numbers.

5.5.3. Human readable characters

The numerical value of the code in human readable figures is printed underneath the symbol with each digit below the corresponding bar code digit character. The 13th digit encoded by variable parity is printed outside the start guard bars. OCR-B font is specified for the human readable characters. This font is adopted only as a convenient standard typeface and it is not intended that these characters should be machine read.

5.5.4. Nominal dimensions of the 13-digit symbol

The dimensions of the 13-digit symbol in the nominal size are shown diagrammatically in Appendix 7. These dimensions correspond to the nominal size module width of 0.33 mm.

12 digit characters x 7 modules = 84
2 guard patterns x 3 modules = 6
1 centre pattern x 5 modules = 5
95 modules

Width of printed bar code in nominal size :
95 modules x 0.33 mm = 31.35 mm

The height of the bars in the nominal size symbol is 22.85 mm. This dimension is not modular, but is an essential function of the width in order to ensure omni-directional scanning.

The light margin which must surround the bars (the printing zone) is indicated by the four corner marks (which need not themselves be printed).

The light margin area corresponds to a minimum of :
- 7 module widths to the right of the symbol
- 11 module widths to the left of the symbol
- 1 module width above the symbol
- 1 module width between the lower edge of the digit characters and the OCR-B figures placed below them.

The height of the OCR-B figures in the nominal size symbol is 2.75 mm.

The centre pattern and guard bars extend below the lower edge of the bars representing the digit characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

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5.5.5. UPC bar code differences

The bar code used for the source marking of UPC numbers is the same in all essentials as that described in Sections 5.5.3. and 5.5.4. with only the following minor differences :

- The 13th digit derived from the left hand parity (value 0 in this case) is not shown in human readable characters.
- The OCR-B digit corresponding to the last digit character (ie the check digit) is shown to the right of the bar code outside the clear margin.
- The first and last digit characters are extended indepth.

These differences are quite immaterial to the scanning process and are described merely for the guidance of users who may encounter UPC bar codes on imported merchandise.

5.6. FORMAT OF THE 8-DIGIT EAN SYMBOL (see diagram in Appendix 5)

This shorter version bar code is used to represent EAN-8 short version numbers. It is made up as follows, reading from left to right :

(i) a guard pattern

(ii) 4 digit characters from Number Sets A comprising the "left half" of the symbol

(iii) a centre pattern

(iv) 4 digit characters from Number Set C comprising the "right half" of the symbol

(v) a guard pattern.

The 8 digit characters in this bar code directly represent the 8 digits in the EAN-8 number series, in the same sequence left to right. There is no parity variation in either of the halves of the symbol.

Example : The EAN-8 symbol for : 40153476 is represented in the following manner.

REPRESENTED BY	GUARD PATTERN	A	A	A	A	CENTRE PATTERN	C	C	C	C	GUARD PATTERN
VALUE OF DATA CHARACTER	X	4	0	1	5	X	3	4	7	6	X

5.6.1. Human readable characters

The numerical value of the code in human readable figures is printed underneath the symbol, with each digit below the corresponding bar code digit character. ORC-B font is specified, the same as for the 13-digit code. Again, this font is adopted only as a convenient standard typeface and it is not intended that these characters should be machine read.

5.6.2. Nominal dimensions of the 8-digit symbol

The dimensions for the 8-digit symbol in the nominal size are shown diagrammatically in Appendix 8. These dimensions correspond to the nominal size module width of 0.33 mm.

8 digit characters x 7 modules = 56
2 guard patterns x 3 modules = 6
1 centre pattern x 5 modules = 5
67 modules

Width of printed bar code in nominal size :
67 modules x 0.33 mm = 22.11 mm

The height of the bars in the nominal size symbol is 18.23 mm. This dimension is not modular, but is an essential function of the width in order to ensure omni-directional scanning.

The light margin which must surround the bars (the printing zone) is indicated by the four corner marks (which need not themselves be printed).

The light margin area corresponds to a minimum of :
- 7 module widths to the right and left of the symbol
- 1 module width above the symbol
- 1 module width between the lower edge of the digit characters and the OCR-B figures placed below them.

The height of the OCR-B figures in the nominal size symbol is 2.75 mm.

The centre pattern and guard bars extend below the lower edge of the bars representing the digit characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

5.7. FORMAT OF THE UPC-E SYMBOL

This short version symbol consists of only six digit characters, and can be used only to represent zero suppression numbers in the UPC series. It is described here only for the guidance of retailers who may be concerned with it in two ways :

- it may be used for in-store symbol marking marking of articles (see Section 3.8.)

- it may be encountered on imported consumer units source-marked under the UPC system.

(The warning is repeated that this bar code cannot be used for source marking in the EAN system).

The UPC-E symbol is made up as follows, reading from left to right :

(i) a normal guard pattern

(ii) 6 digit characters from number sets A or B

(iii) an "E" version stop guard pattern

5.7.1. Variable parity coding of prefix and check-digit for UPC-E

In the UPC-E bar code only six digits are represented directly by digit characters. Two additional digits are encoded by permutation in the use of Number Sets A and B for the six digit characters. This is known as variable parity : ie Number Set A is of odd parity, Number Set B is of even parity, and the bar code is composed of a permutation of both odd and even parity digit characters.

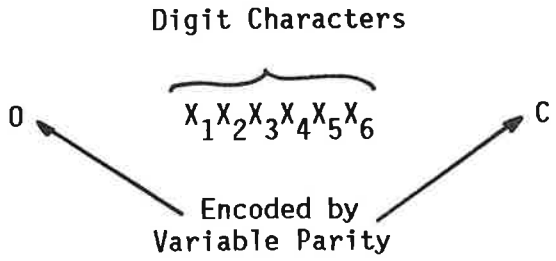
The two digits thus encoded by variable parity are used to supply a prefix digit and a check-digit respectively. The value of the prefix digit is always zero. The coding system for the two digit values is as follows :

Value of Prefix Digit	Value of Check Digit	Number Sets used for Digit Characters					
		1	2	3	4	5	6
0	0	B	B	B	A	A	A
0	1	B	B	A	B	A	A
0	2	B	B	A	A	B	A
0	3	B	B	A	A	A	B
0	4	B	A	B	B	A	A
0	5	B	A	A	B	B	A
0	6	B	A	A	A	B	B
0	7	B	A	B	A	B	A
0	8	B	A	B	A	A	B
0	9	B	A	A	B	A	B

Note that the variable parity coding systems for 13-digit symbols and for UPC-E symbols are different.

5.7.2. Decoding a zero-suppression symbol

The UPC-E symbol, on being scanned, yields 8 digit values : 6 values directly from the digit bar characters, and 2 values from the variable parity. Thus :



The value of the last bar code character X6 is then used to determine the way in which zeros are inserted in order to reconstitute a full length number, as shown in the following table :

SYMBOL	DECODED NUMBER		
Character Values	Manufacturer	Item	Remark
0 $X_1X_2X_3X_4X_5$ 0 C	0 X_1X_2 0 0 0	0 0 $X_3X_4X_5$ C	
0 $X_1X_2X_3X_4X_5$ 1 C	0 X_1X_2 1 0 0	0 0 $X_3X_4X_5$ C	
0 $X_1X_2X_3X_4X_5$ 2 C	0 X_1X_2 2 0 0	0 0 $X_3X_4X_5$ C	
0 $X_1X_2X_3X_4X_5$ 3 C	0 $X_1X_2X_3$ 0 0	0 0 0 X_4X_5 C	$X_3 \neq 0,1$ or 2
0 $X_1X_2X_3X_4X_5$ 4 C	0 $X_1X_2X_3X_4$ 0	0 0 0 0 X_5 C	$X_4 \neq 0$
0 $X_1X_2X_3X_4X_5$ 5 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 5 C	$X_5 \neq 0$
0 $X_1X_2X_3X_4X_5$ 6 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 6 C	$X_5 \neq 0$
0 $X_1X_2X_3X_4X_5$ 7 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 7 C	$X_5 \neq 0$
0 $X_1X_2X_3X_4X_5$ 8 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 8 C	$X_5 \neq 0$
0 $X_1X_2X_3X_4X_5$ 9 C	0 $X_1X_2X_3X_4X_5$	0 0 0 0 9 C	$X_5 \neq 0$

Note 1 : The check-digit is calculated over the full-length reconstituted number

Note 2 : The above table shows short codes reconstituted to full length numbers in the UPC series, ie 12 digits in length. All numbers are treated as right justified in a 13-digit field. Therefore these reconstituted numbers can be considered as 13-digit numbers with an implied leading zero.

Note 3 : All numbers reconstituted from the scanning of a UPC-E short symbol therefore commence with 2 zeros in a 13-digit field.

Note 4 : The UPC-E symbol can be used for in-store coding in EAN member countries only if composed from the restricted range of numbers assigned for this purpose. See section 3.8..

Scanning equipment which is available commercially will normally be programmed to decode the UPC-E symbol in accordance with the rules in this section.

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5.7.3. Human readable characters for UPC-E

The numerical values of the digit characters are printed underneath in OCR-B font. The prefix digit is shown to the left of the symbol and the check-digit is shown to the right of the symbol. The UPC-E symbol will therefore appear in this form on imported source marked merchandise.

5.7.4. Nominal dimensions of the UPC-E symbol

The dimensions of the UPC-E symbol in the nominal size are shown diagrammatically in Appendix 9. These dimensions correspond to the nominal size module width of 0.33 mm.

6 digit characters x 7 modules	= 42
1 normal guard pattern x 3 modules	= 3
1 "E" version stop guard pattern x 6 modules	= 6
	51 modules.

Width of printed symbol in nominal size :
51 modules x 0.33 mm = 16.83 mm

The height of the bars in the nominal size symbol is 22.85 mm. This dimension is the same as for the nominal size of the 13-digit symbol.

The light margin which must surround the bars (the printing zone) is indicated for the four corner marks (which need not themselves be printed).

The light margin corresponds to a minimum of :
- 5 module widths to the right of the symbol
- 11 module widths to the left of the symbol
- nil above the symbol
- 1 module width between the lower edge of the digit characters and the OCR-B figures places below them.

The height of the OCR-B figures in the nominal size symbol is 2.75 mm.

The guard bars extend below the lower edge of the bars representing the digit characters. This extension is equal to 1.65 mm which corresponds to 5 module widths.

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CHAPTER 6 : PRODUCTION OF EAN SYMBOLS

6.1. GENERAL

The production of an EAN symbol in its finished state on an article involves a number of separate processes, each of which contributes to the quality of the final result. This does not apply to automated label printing machines which convert numerical data into bar codes : see Section 6.9.

It is the intention of the EAN and UPC systems that the required dimensions and tolerances in the final printed symbol should not have to be directly specified as such. Instead the specification lays down the conditions to be fulfilled at each stage of the production process. Scanning equipment should then be capable of reading a symbol produced in accordance with these conditions. (But see Section 6.8)

Great care should be exercised in trying to check the correctness of a printed symbol by using any commercially available verification devices. The EAN Memorandum of Agreement specifically absolves manufacturers from any obligation to use checking equipment for this purpose. If, neverthelsess, it is wished to make a check that a symbol has been printed in accordance with the requirements of this Manual, it is essential that any verifying equipment used should itself respond exactly in accordance with these requirements. This is particularly vital in regard to the spectral range employed. Otherwise the results given by inappropriate verifiers can be seriously misleading in both over and under-estimating the acceptability of printed symbols.

The two main processes in the production of a source marked symbol are :

- The production of a film master representing the symbol
- The printing of the packaging from plates made from the film master

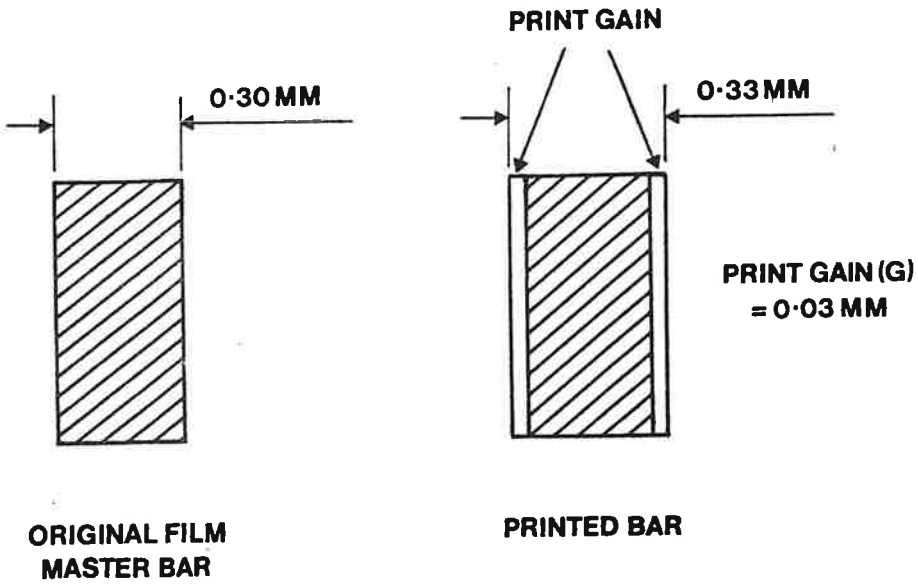
These processes will normally be undertaken by specialist concerns, who may employ techniques at their own discretion in order to produce symbols of acceptable reliability for scanning at an economic cost. In order to refine the standards required, the following sections outline the considerations which apply to the production processes, and give methods whereby acceptable quality can be achieved.

6.2. PRINT GAIN AND VARIATION

If a film master containing a symbol bar of nominal width is converted into a printing plate and printed on to a package, the bar as finally printed will usually be found to be wider than the original bar on the film master. This is due to many factors : plate making, print pressure, absorbent material, ink viscosity. and so on.

This increase in width is known as the Print Gain. It is shown diagrammatically in Fig. 6.1.

Fig. 6.1. : Print gain



In the course of a print run, it is to be expected that the extent of print gain will differ between individual impressions. This difference in the amount of print gain is known as Variation.

6.3. ASSESSMENT OF PRINTING CONDITIONS

In preparation for the printing of a symbol on a package, it is first necessary to assess the amount of print gain and variation normally encountered in the day to day printing of the packaging. The assessment should be made under the following conditions:

(i) Assessments can be made using either a film master of an actual symbol or a special film master which serves as a "gauge" (see Sections 6.5 and 6.6). The film must be integrated into the printing plates, using the standard procedure normally used in the particular operation.

(ii) Assessments should be carried out on actual production runs using qualities of inks and substrates in normal use.

(iii) The assessments should include both:

- bars printed parallel to the direction of printing
- bars printed at right angles to the direction of printing.

(iv) They should include all the variations likely to be encountered in practice in the factors affecting print quality so that the effect of extremes of printing conditions can be measured.

6.4. BASIC ASSESSMENT METHOD

A basic method of print quality assessment is to use proper sampling over a sufficient variety of production and measure directly the bars in printed test symbols to find:

- the average of extremes of Print Gain (G)
- The Variation about this average (V)

If the original bar width on the film master is N and the bar width as printed in L, then

$$L = N + G \pm V$$

6.4.1. Magnification factor

The extent of print gain Variation V determines the factor by which the entire symbol must be magnified (or may be reduced) in relation to the nominal size.

Appendix 10 gives two tables of values of the Magnification factor M for values of Variation V. The left hand table is based on a regular sequence of values of M. The right hand table is based on a regular sequence of values of V.

The continuous relationship between M and V is shown in a graph in Appendix 11. Any value of M between 0.8 and 2.0 may be adopted from interpolation of the tables or from the graph. Note that at Magnification factors of less than 1.0, the amount of variation which is acceptable rapidly becomes smaller.

6.4.2. Film Master Tolerances

The Magnification factor M compensates for the Variation V in print gain, and is the minimum magnification required. It does not take into account any further magnification which may be required to compensate for tolerances in the preparation of the film master itself, nor does it allow any additional safety margin. The permissible tolerances in the preparation of a film master of nominal size are given in Appendix 14. These tolerances are $\pm$ 0.005mm on any module of 0.33mm width and $\pm$ 0.013mm on any complete digit character or auxiliary character.

The supplier of the film master should be consulted regarding the variation in tolerance to be expected in practice in the film master. This amount should be added to the value of Variation V measured in respect of the print gain. In general, it may be prudent to add the amount of the modular tolerance (0.005mm) to V before looking up the required value of M.

6.4.3. Symbol Size

Once the value of M has been selected, the space required on the package for the printing of the symbol becomes known. This space will be from

0.8 to 2.0 times the nominal dimensions between corner marks given in Appendices 7, 8 and 9. If space on the package is not at a premium, reliability of scanning will always be enhanced by selecting a magnification factor higher than the theoretical minimum. In particular, reduction below the nominal dimensions, ie magnification factors of less than 1.0, may reduce reliability.

Note : The extent of magnification or reduction in the nominal symbol size is determined by the print quality. It is not possible to select an arbitrary symbol size to fit a predetermined space on the package.

Dimensions of modules and symbols at different levels of magnification factor are given in Appendix 12.

6.4.4. Bar Width Reduction

The extent of the average Print Gain G now has to be corrected for. This is done by reducing the width of each bar on the film master symmetrically (on both right and left) by a total amount of equal to G in each case. This reduction must be the same amount on each bar in the symbol, irrespective of the width of the bar, ie of the number of modules it contains.

The bar width reduction is applied after any magnification has been carried out, and not the reverse (except in the case of flexography, see Section 6.5.1; or any other process producing a print gain G in excess of 0.3mm).

The amount of bar width reduction required is equal to the average Print Gain G in all cases, and is not itself affected by magnification of the symbol. When the reduced width bars on the film master are printed, the average Print Gain will restore the bars to the ideal width. Variation in the average Gain has already been allowed for in the magnification process. The tolerance of bar width reduction is $\pm$ 0.008mm.

Note : No bar in a symbol must be reduced below an absolute minimum width of 0.13mm on the printing plate. If the effect of magnification factor and bar width reduction combined would go below this limit on a single module bar, the magnification must be increased again so as to comply. Nominal module width is 0.33mm, therefore :

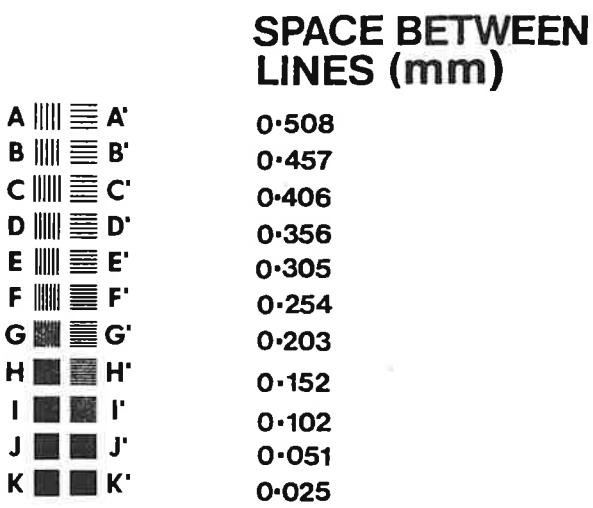
$$(0.33 \times M) - G \geqslant 0.13\text{mm}$$

6.5. PRINTABILITY GAUGE METHOD

Section 6.4 describes the theoretical method of determining the allowances to be made in the printing process. In practice, a simpler alternative operating method can be employed, using a specially calibrated "Printability Gauge".

This gauge is illustrated in Fig. 6.2. Supplies of the gauge are obtainable commercially. It consists of a very precise design in the form of a positive or negative film master. It is made up of eleven sections each of which includes two series of parallel lines perpendicular to each other. This enables print quality to be assessed both in the direction of the print run and at right angles to it.

Fig. 6.2 : Printability gauge



The spacing between the lines decreases in stages from the set marked A to the set marked K. The line spacing is set empirically and it is not necessary to know the dimensional values when using the method described in this Section (1). Printability gauges (or the parts likely to be relevant) are used to test print conditions by including them in actual production runs of the packaging on which symbols will eventually be printed, in locations similar to those likely to be used for symbols and using the same processing and printing methods.

The printability gauge is specially produced and must be used as supplied. It is essential for the gauge to be introduced into the same stage of the reproduction process and in the same way as eventually for the symbol film master itself. Any photographic enlargement or reduction of the gauge would defeat its purpose.

6.5.1. Evaluation of Printability Gauge Results

Samples of prints incorporating the gauge are taken throughout a number of production runs. These samples are individually examined under a magnifying glass to determine the finest gauge pattern where the lines first touch one another in each sample. Stray imperfections are disregarded for this purpose ; lines are considered to touch when 50% or more of the line is in contact. For example in a particular gauge, patterns A to D may be quite distinct ; patterns F to K might be

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1 The dimensions of the gauge have however been accurately specified and are shown in Fig. 6.2. The tolerances are 0.005 mm, as for symbol modules in Section 6.4.2. Using this data, the printability gauge can also be used for direct measurement as in Section 6.4.

completely filled in with ink and pattern E may have lines 50% or more touching. The rating for this gauge is then E. Note that if gauge patterns A to D were quite distinct and patterns E to K were completely filled in the rating would still be E.

Over the runs sampled the individual ratings may be found to vary say between E and F. The printability range of this printing production would then be classed as E-F.

If the sample of printed gauges shows that print quality is better in the direction of print than at right angles to it, the eventual symbol should be printed with its bars in the print direction. The printability range is determined only from the patterns with lines in this direction.

The printability range is then used in conjunction with the tables given in Appendix 13 to read off directly the magnification factor and bar width reduction to be applied to the symbol film master. Two tables are provided for use with different printing processes.

Table 1: Printing Techniques other than Flexography

This table shows for each printability range the magnification factor and the bar width reduction to be applied. Note that the magnification factor must be applied before the bar width reduction.

The magnification factors given in this table are subject to the rule in Section 6.4.4. regarding minimum final bar width. This applies particularly to the values given against Printability Ranges E-F, E-G, F-G and G-H.

Table 2: Printing by Flexography

This table shows for each printability range the bar width reduction and the magnification factor to be applied. In the case of flexography, the bar width reduction may need to be large, and difficult to achieve reliably. Hence in flexography the bar width reduction is often done first, then magnification is applied. The figures in Table 2 take this sequence into account. But if printability gauge data indicates for a particular flexographic operation that results are comparable with other printing processes, eg lithography, then Table 1 would be used.

Film Master manufacturers should be consulted before this alternative technique is used as modern methods of manufacture eliminate the requirement for this procedure even at large bar width reductions.

6.6. DESCRIPTION AND USE OF THE .....GAUGE

To be drawn up by your Numbering Organization.

EAN vademecum

6.7. PRINT QUALITY CHECKS

If allowances for printing quality have been properly made in the preparation of the film master, either by the theoretical method in Section 6.4, or the gauge method in Section 6.5 (and possibly Section 6.6), it should not be necessary to check the overall quality or performance of the symbol as actually printed. It should be sufficient merely to carry out spot checks in the course of the print run to ensure that print quality does not deteriorate below the levels which were recorded during the test runs.

In practice this can be done either directly by measurement of a particular bar in the printed symbol (eg the centre of guard pattern bars) ; or indirectly by means of the printability gauge. The appropriate part of the printability gauge can be incorporated in an inconspicuous part of the finished print, in addition to the symbol itself. Spot checks will then reveal whether the printability gauge pattern is still being reproduced to the same standard achieved during tests. The gauge thus inserted into the printing on packaging may not be used in any way by a third party to take exception to the quality of the printing.

6.8. ALTERNATIVE METHOD

In practice, some packaging manufacturers may prefer to determine dimensions and tolerances and by measurement ensure that printing is of acceptable quality. Appendix 14 shows in column D1 an acceptable bar width dimensional tolerance for a given minimum module width, for use with in-store marking equipment (see Section 6.9). These figures do not represent a standard for source marked symbols but can if desired be used as a reference.

6.9. LABEL PRINTING

The application of symbols to articles in-store requires the use of automated label printing machines which can convert numerical data directly into bar codes. Similar equipment might sometimes be used by wholesalers and manufacturers also. The processes for the production and control of source marked symbols, described in Section 6.1. to 6.7, clearly do not apply to these label printers.

In order to specify the performance of such label printers, and to control their output, it is necessary to stipulate the tolerances permitted in the symbol as printed.

The tolerances quoted in this connection are in no circumstances to be taken as establishing a standard for symbols printed by the process described in Sections 6.1 to 6.7.

Tolerances for bar code labels are defined for various module widths corresponding to magnification factors from 0.8 to 2.0 times the nominal width of module (0.33mm). Different tolerances apply to different types of dimension.

There are four different types of dimension in a symbol:

Type 1 : Measurement of a bar or space inside a character

Type 2 : Measurement of the width between corresponding edges of bars inside a character

Type 3 : Measurement between corresponding edges of corresponding bars of adjacent characters

Type 4 : Measurement of the space between the last and first bars of adjacent characters.

Appendix 14 shows these types of dimensions diagrammatically, and gives a table of tolerances for dimensions type 1, 2 and 3.

Type 4 dimensions are not subject to explicit tolerances but must not be less than 0.2mm.

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CHAPTER 7 : COLOURS, CONTRAST AND REFLECTANCE

Operation of the scanners depends on recognition of the contrast between dark and light areas of the symbol. This recognition can be affected by various factors, which are described in this chapter.

7.1. REFLECTANCE FACTOR AND REFLECTION DENSITY

The reflectance factor (R) is the ratio of the reflected flux ϕ to the reference reflected flux ϕrs. Reflected flux is the radiant power reflected by the sample and evaluated by a specified kind of receiver. Reference reflected flux is the radiant power reflected by a magnesium oxide or barium sulfate photometric standard (R = 100 %).

Reflection density (D) is equal to : $D = - \log_{10} R$

The reflection density required for the dark bars depends on the reflection density of the particular light background being used, in other words, of the light modules in the symbol. Appendices 15 and 16 show the minimum dark-bar density required for the permissible range of light background density.

All the measurements mentioned in this chapter must be made under the following conditions, and with equipment corresponding to the following specifications :

7.1.1. Geometric conditions for reflection measurements

The incident illumination should be centred at 45° to the normal to the sample and the reflected flux collected by a receiver subtending a solid angle centred on the normal to the sample. The sampling aperture should be a circular area 0,2 mm in diameter.

7.1.2. Spectral conditions for reflection measurements

The sample should be illuminated by light having a spectral power distribution which corresponds to the following specification :

CIE source A, obtained by using a gas-filled, coiled-tungsten filament lamp operating at a correlated color temperature of 2856 K.

The photometric receiver of reflected flux should have a relative spectral sensitivity corresponding to the following specification :

Photomultiplier with an S-4 response as specified by the American Joint Electronic Devices Engineering Council, used with a Wratten 26 filter, meeting nominal specifications.

7.2. PRINT CONTRAST

Print contrast (PCS) is defined by the relationship :

$$PCS = \frac{R_L - R_D}{R_L}$$

where R_L is the reflectance factor of the light background (light bars) and R_D is the reflectance factor of the dark bars.

Appendices 15 and 16 indicate the minimum PCS corresponding to the reflection density of the light background.

7.3. COLOUR

Any combination of colours that will yield the reflectance and print contrast specified in Sections 7.1 and 7.2 can be used to represent the "dark" bars and "light" background.

As a general guide to colour selection, it is the cyan content of a colour that yields the "dark" tone when viewed through the Wratten 26 filter ; magenta and yellow correspond to the "light" tone. Inks used in the background area must be sufficiently low gloss to enable the contrast requirements specified in Sections 7.1. and 7.2. to be met.

7.4. SPECIAL PROBLEMS

* Show through

In some packages the product, items or material inside may show through the packaging to the extent that light areas appear dark to the scanners. Accordingly, in situations with this potential problem, the finished, packed unit, not just the packaging, should be subjected to the procedures for measuring contrast given in Section 7.1.

Also it has been observed that certain materials reflect light differently according to the dimensions of the light and dark bars. This is especially evident on transparent and translucent packages where the light bars (background) are not printed. The symbol contrast specifications should be met when the package is in the form in which it will be scanned. Contrast measurements should be made within the part of the symbols where the light bars (background) and dark bars are both minimum width : for example in the centre pattern of an EAN symbol.

When there is the possibility of show-through it is preferable to print both the light bars (background of an EAN symbol) and the dark bars.

* Transparent wrapper

Transparent wrapper over the printed symbol tends to reduce contrast slightly. If transparent wrapping is used over a printed symbol, the transparent wraping must be considered to be an integral part of the

symbol, and reflectance measurements must be made with the wrapping in place.

* Specularly reflecting materials

The use of specularly reflecting materials directly to provide either light or dark areas of the symbol should be avoided. If such material is the substrate for a symbol, the symbol should be provided by overprinting the substrate with two inks with sufficiently different light-absorbing characteristics to meet the print contrast signal requirements of Section 7.2.

If the use of specularly reflecting materials is unavoidable, as with the two-piece can, and the symbol surface is rigid, the background should be printed in a light colour to nominal specifications and the bars provided by the specularly reflecting substrate, preferably by leaving bare substrate or by printing any portion of the bar area with a transparent ink that does not significantly change reflectance.

If the bars are not printed, it is preferred that the entire symbol surface be varnished.

Printing of the symbol in sizes below a 1.0 magnification is not recommended in these circumstances.

It is preferable that the human-readable number be highly visible.

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CHAPTER 8 : LOCATION OF EAN SYMBOLS ON CONSUMER UNITS AND COUPONS

8.1. GENERAL

The EAN symbol, printed in accordance with all the foregoing requirements, must be applied to consumer units such that it can be read by the point of sale scanner. There are certain rules which must be followed to ensure the scannability of symbols. These are given in Sections 8.1 to 8.8.

It is highly desirable that these rules are followed in order to increase checkout productivity. One factor which contributes to checkout productivity is the speed at which the cashier can scan the goods. This speed will decrease if the cashier cannot predict where the symbol will appear on any item.

If consistency in the location of EAN symbols can be achieved checkout productivity can be maximised. Ideally all consumer units with similar packaging will be symbol marked in the same position.

Recommendations on location of EAN symbols on coupons are detailed in Section 8.9.

8.2. CODE UNIQUENESS

EAN symbols representing different article numbers must never be visible on any one item. This is particularly relevant to multipacks such as banded items, hi-cone packs, sleeve packs and shrink wrapped items, where the individual inner units carry a different number from the number on the outer wrapper or container. The symbols on the inner units must be totally obscured so that they cannot be read by mistake by the scanner.

There is no objection to more than one of the same symbol appearing on any one pack. This may occur with so-called "random wrapped" or continuous wrapped items, where the wrapping is not registered to the item, and it may be necessary for more than one print of the symbol to appear on one item. All readings of the same symbol on any one package are recorded as one item only. There is no danger of one item being recorded as several items.

8.3. CURVED SURFACES

If an EAN symbol is printed on a curved surface of a consumer unit, it is preferable for the bars to be perpendicular to the "generating lines" of the surface of the container (see Fig. 8.1).

This preference may be subject to considerations of space and to the direction of printing. Better printing quality is normally obtained when the bars are parallel to the direction of printing (see Section 8.8 (e)).

This preference for orientation on curved surfaces becomes a mandatory rule on curves with small radii.

The rule is that the angle between the tangent to the centre of the curved symbol and the tangent to the extremity of the curved symbol (outer edge of the guard bars) must be less than 30°. If this angle is more than 30° the symbol must be orientated such that the bars are perpendicular to the generating lines of surface of the item.

This is explained diagrammatically in Figure 8.2. Appendix 17 shows the maximum magnification factors acceptable for items of different diameters and the minimum diameters acceptable for symbols of different magnification factors.

Fig. 8.1

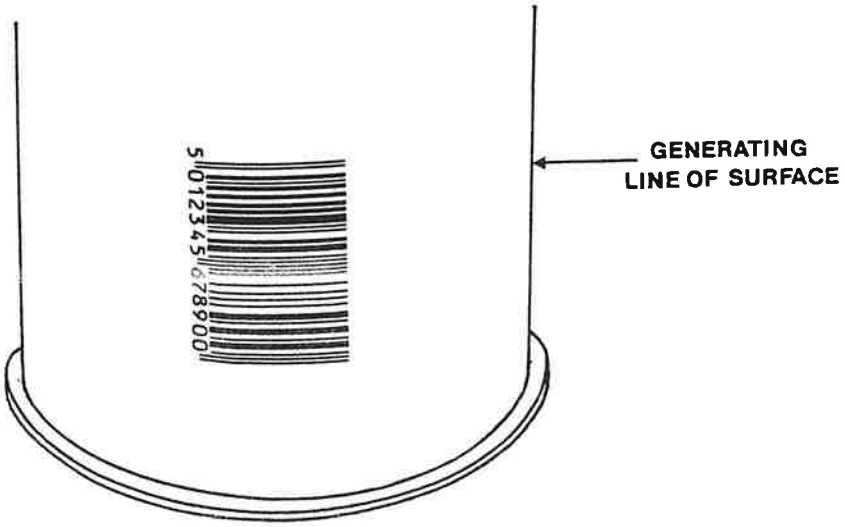
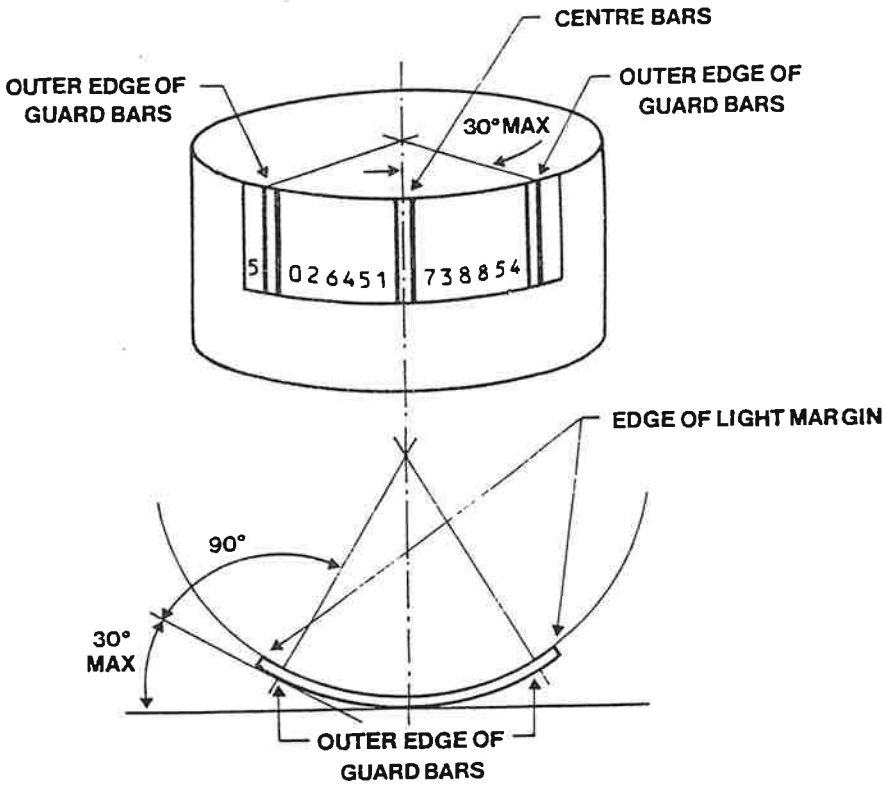


Fig. 8.2



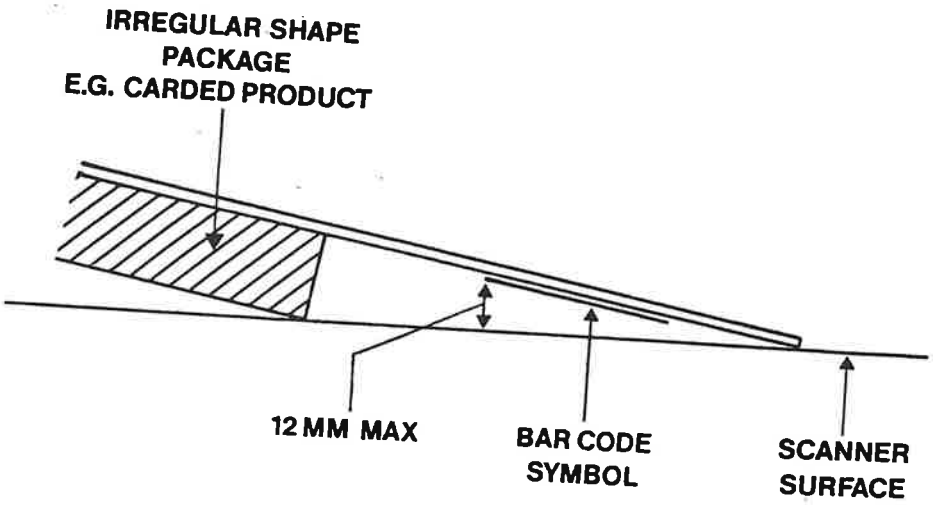
8.4. UNEVEN SURFACES

The bar code symbol must be printed on a reasonable smooth surface. Folds, creases, seams and other features likely to distort the symbol must be avoided.

8.5. SCANNING DISTANCE

If the shape of the consumer unit prevents the printed symbol from being brought into flat contact with the checkstand surface, the distance between the symbol area and the checkstand surface must not exceed 12mm. This applies particularly to carded items and concave items (see Fig. 8.3).

Fig. 8.3



8.6. TRUNCATED SYMBOLS

In certain exceptional cases, there may simply be insufficient space on a package or label to permit the printing of an EAN symbol in the size rendered necessary by the normal print quality.

If there is absolutely no possibility of printing a symbol in full size, it is a last resort preferable to print a symbol of normal length, but of reduced height. The effect of this is to lose the omni-directional scanning capability.

A reduced height symbol can only be scanned bi-directionally ; for a successful scan the symbol on the package must be orientated in the direction of the scanning beam. This will reduce retail checkout efficiency.

The more the heigth is reduced, the more critical this orientation becomes. A symbol with much heigth reduction may not therefore be of

any practical use at the checkout. Product manufacturers with this particular problem are advised to consult with their retail customers to see if an acceptable compromise can be reached.

8.7. LIGHT PEN SCANNING

In some retail environments it may be preferable to use light pens (or "wands") rather than fixed scanners at the point of sale. Therefore EAN symbols must be located such that there are no obstructions which would prevent a light pen from reading them.

8.8. GENERAL GUIDELINES ON LOCATION

The guidelines on location have been written bearing in mind the ergonomics of checkout operation and the practicalities of printing.

(a) Where possible the symbol should be printed on the natural design base of consumer units. The "design base" is the base as suggested by the package shape and its graphics.

(b) If the design base is not available for printing, the symbol should be located on the natural design reverse. This is the area opposite the primary face of the container. When printed on the design reverse, the symbol should be located towards the base.

(c) Symbols inclusive of the light margin and human-readable figures should, where possible, be printed so that they are clear from any edge, overlap, crease or tight curve by at least 5mm. This reduces problems caused by scuffing, damage or distorsions due to pack shape.

(d) If the product is "random wrapped" - ie the packaging is not registered - it may be necessary to have more than one symbol printed in order to ensure that one complete symbol is visible.

(e) In determining the orientation of the symbol, account must be taken of the print process involved ; for example when using a flexographic process it is essential that the bar lines run in the print direction (because of the problem of "spread") but with a process such as lithography this may not be so significant. In all instances the printer should be consulted. Where the print direction allows, it is generally desirable that if the pack is stood "on end" the lines of the symbol are horizontal. This takes account of the problems of curvature on cans, bottles, pouch packs and so on. (This orientation would be imperative for curved surfaces with small radii - see Section 8.3). In such cases the human-readable figures should be read from top to bottom.

8.9. LOCATION OF EAN SYMBOLS ON COUPONS

Various formats are used in couponing. Manufacturer's coupons are produced in several sizes. In newspapers and magazines, coupons may be printed over several column sizes.

Since the issuer needs to include information on the coupon, such as the value of the coupon, the expiry date, messages to dealers, etc.. , the coupon symbol must compete with this information for space. Even for retailers with private label coupons, space is also at a premium. Taking this into account and noting that the small size of a coupon makes choices for symbol location very limited, the following recommendations are offered for locating the symbol on coupons :

* The EAN symbol requires a minimum clear area on the left and right sides of the symbol. Care should be taken to ensure that this area is free of any wording or other graphics, closures, perforations or scores. The clear areas for an EAN coupon symbol are the same as for the standard EAN symbol. To provide additional security (coupons will be often cut or torn out by consumers), it is recommended to print the EAN symbol at least 10mm away from any side, and not adjacent to a corner.

* "On-pack" coupons :
  If possible symbols on coupons on packs should be located such that they are not visible. This might be achieved by locating the symbol on the back of the label carrying the coupon or on the inside of the pack provided print quality and contrast permit. Obscuring the symbol might also be achieved by extending the coupons from a pack face through to an inner flap and then locating the symbol on the flap.
  If the coupon symbol is visible then it should be placed on the opposite face to the pack product symbol.

* EAN product symbols should not be surrounded with coupon offer graphics. If cut off the package by the consumer, this could appear to be a coupon symbol which presented for redemption would scan as an item being sold.

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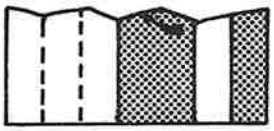
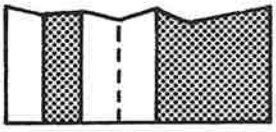
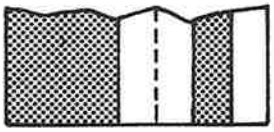
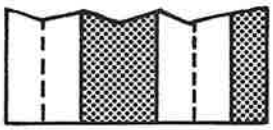
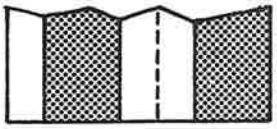
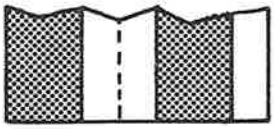
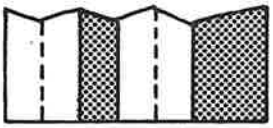
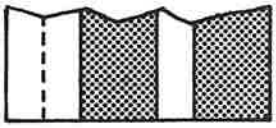
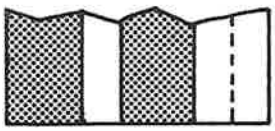
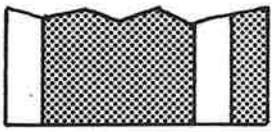
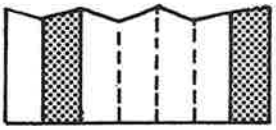
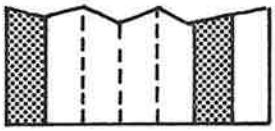
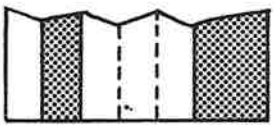
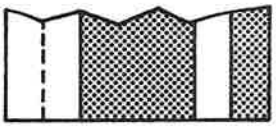
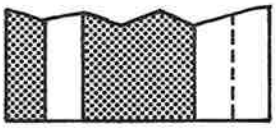
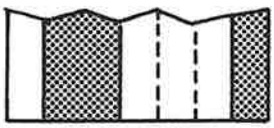
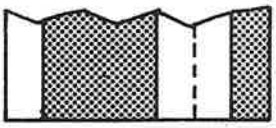
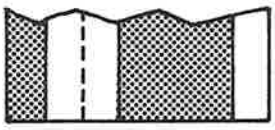
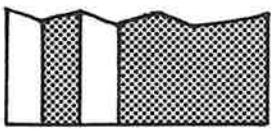
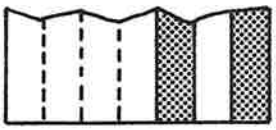
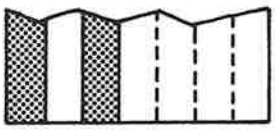
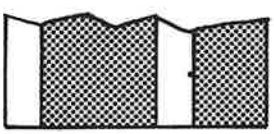
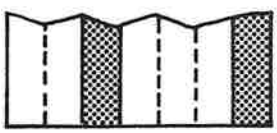
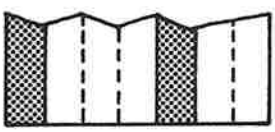
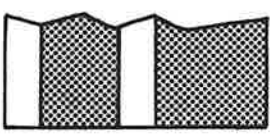
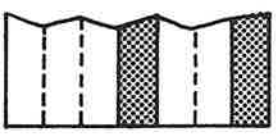
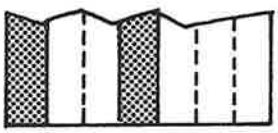
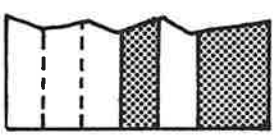
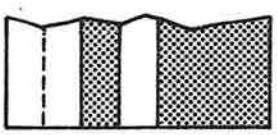
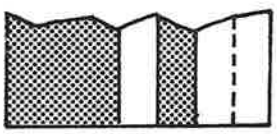
APPENDIX 1 : ASSIGNMENT OF PREFIX DIGITS BY EAN

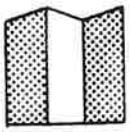
PREFIX VALUES	
00-09	UCC (U.S.A. + Canada)
20 to 29	In-store numbers
30 to 37	GENCOD (France)
40 to 43	CCG (Germany, the Federal Republic)
440	Kammer für Aussenhandel der DDR (Germany, the Democratic Republic)
460 to 469	USSR CCI (USSR)
471	ANC of ROC (Taiwan)
49	Distribution Code Center (Japan)
50	ANA Ltd (UK) and ANA of Ireland
520	HELLCAN (Greece)
529	Cyprus Chamber of Commerce and Industry (Cyprus)
54	ICODIF (Belgium + Grand Duchy of Luxemburg)
560	CODIPOR (Portugal)
569	Iceland EAN-Committee (Iceland)
57	Dansk Varekode Administration (Denmark)
599	Hungarian Chamber of Commerce (Hungary)
600 - 601	SAANA (South Africa)
64	Central Chamber of Commerce (Finland)
70	Norsk Varekodeforening (Norway)
729	Israel Coding Association (Israel)
73	Swedish EAN Committee (Sweden)
750	AMECOP (Mexico)
76	SACV (Switzerland)
779	CODIGO (Argentina)
789	ABAC (Brazil)
80 to 83	INDICOD (Italy)
84	AECOC (Spain)
859	Czechoslovak CCI (Czechoslovakia)
860	JANA (Yugoslavia)
87	STICHTING UAC (Netherlands)
888	SANC (Singapore)
90 - 91	EAN-AUSTRIA (Austria)
93	APNA Ltd (Australia)
94	NZPNA Ltd (New Zealand)
959	PNGPNA (Papua New Guinea)
977	Periodicals (ISSN)
978 - 979	Books (ISBN)
98 - 99	Coupon numbers

APPENDIX 2 : CODING OF DIGIT VALUES IN THE EAN SYMBOL

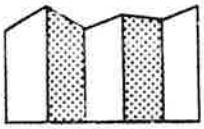
VALUE OF CHARACTER	NUMBER SET A (odd)	NUMBER SET B (even)	NUMBER SET C (even)
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			

APPENDIX 3 : CODING OF AUXILIARY CHARACTERS IN THE EAN SYMBOL

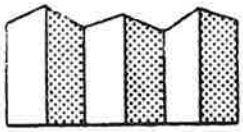
NORMAL GUARD PATTERN (RIGHT AND LEFT)



CENTRE PATTERN

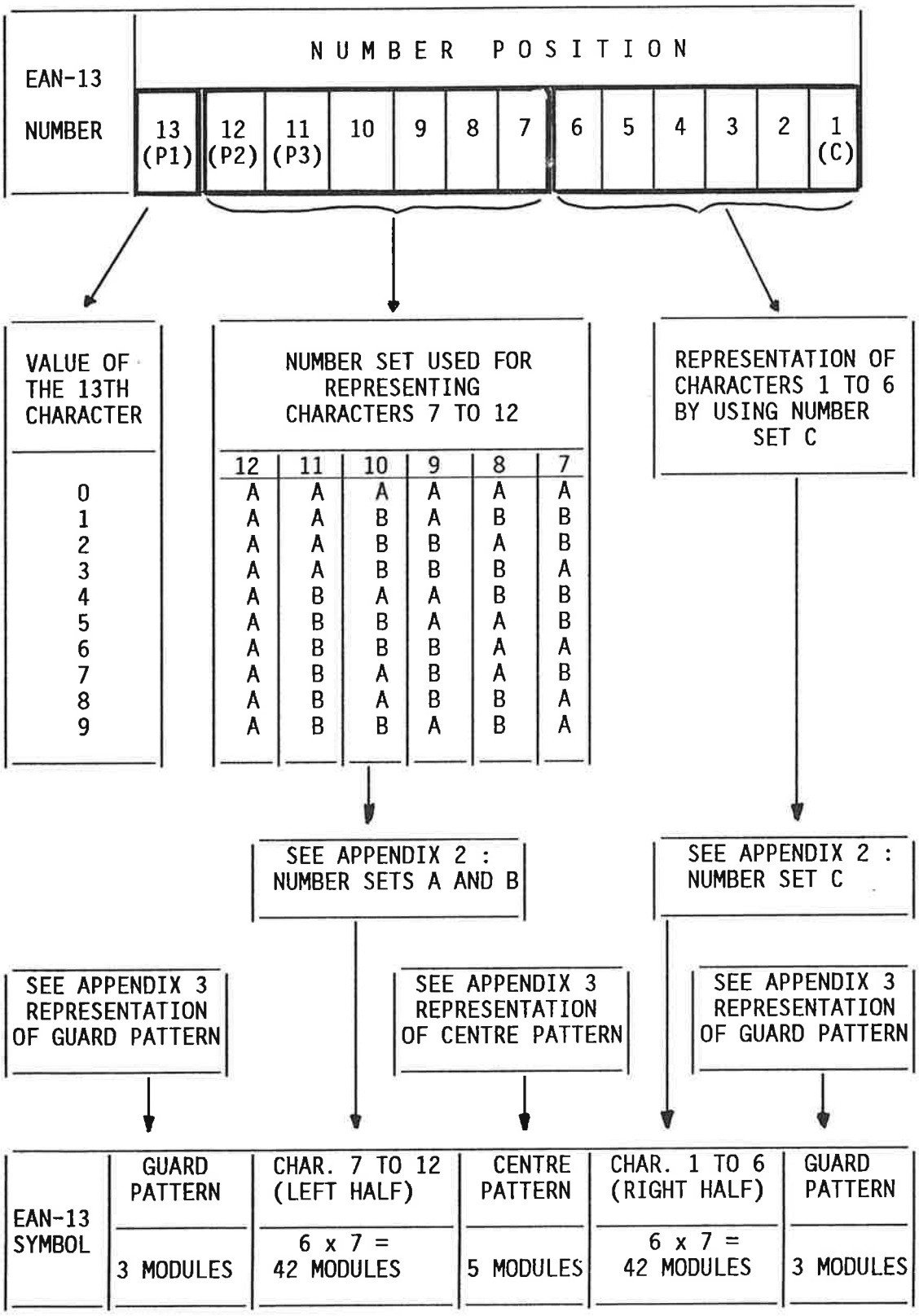


"E" VERSION RIGHT GUARD PATTERN



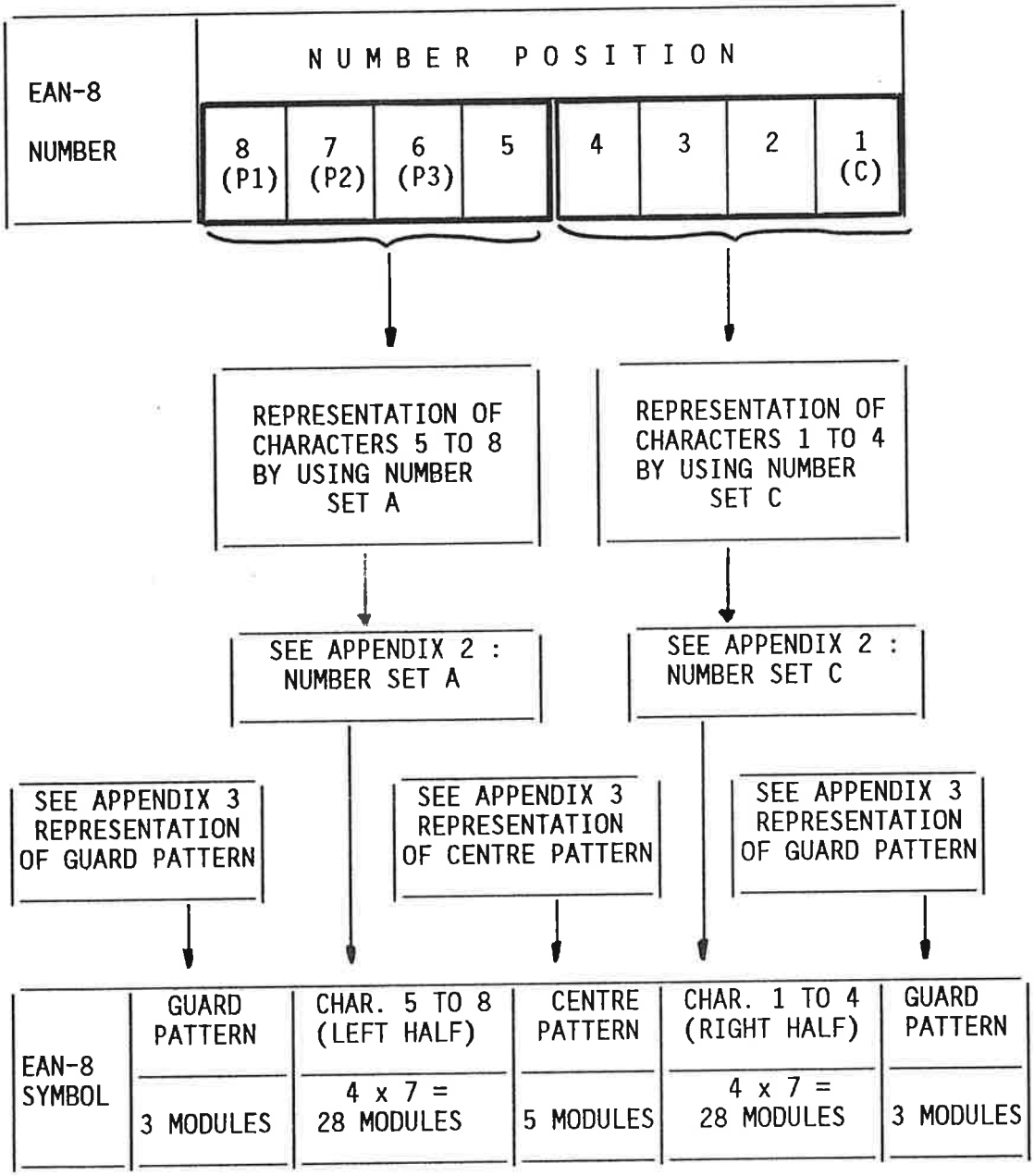
EAN vademecum

APPENDIX 4 : LOGICAL STRUCTURE OF THE EAN-13 SYMBOL



TOTAL NUMBER OF MODULES = 95

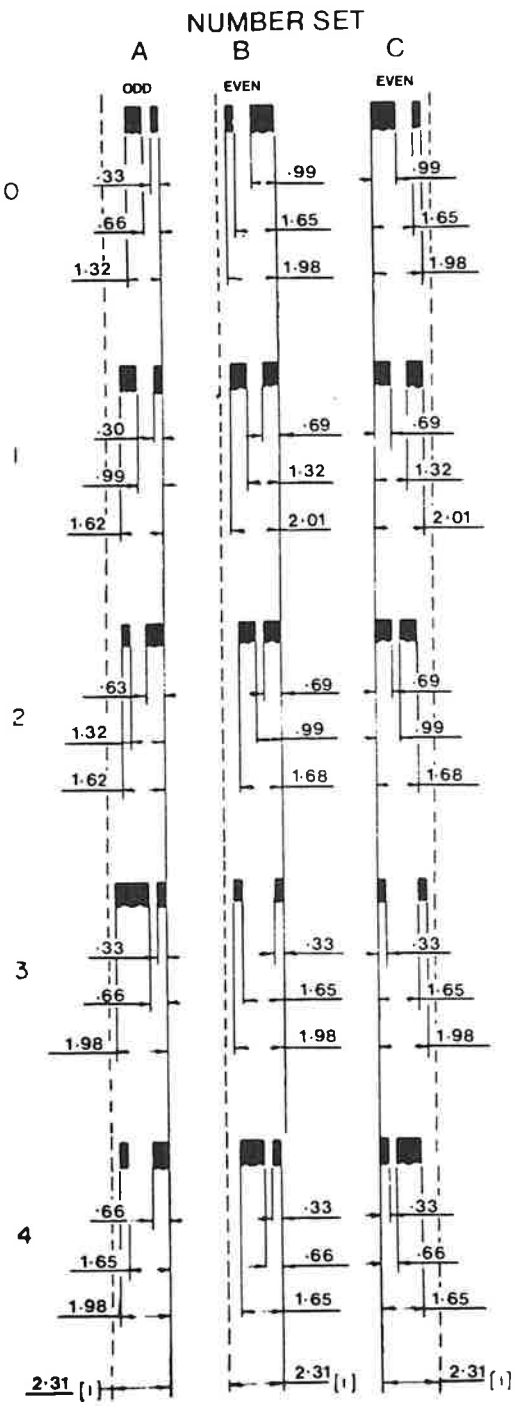
APPENDIX 5 : LOGICAL STRUCTURE OF THE EAN-8 SYMBOL

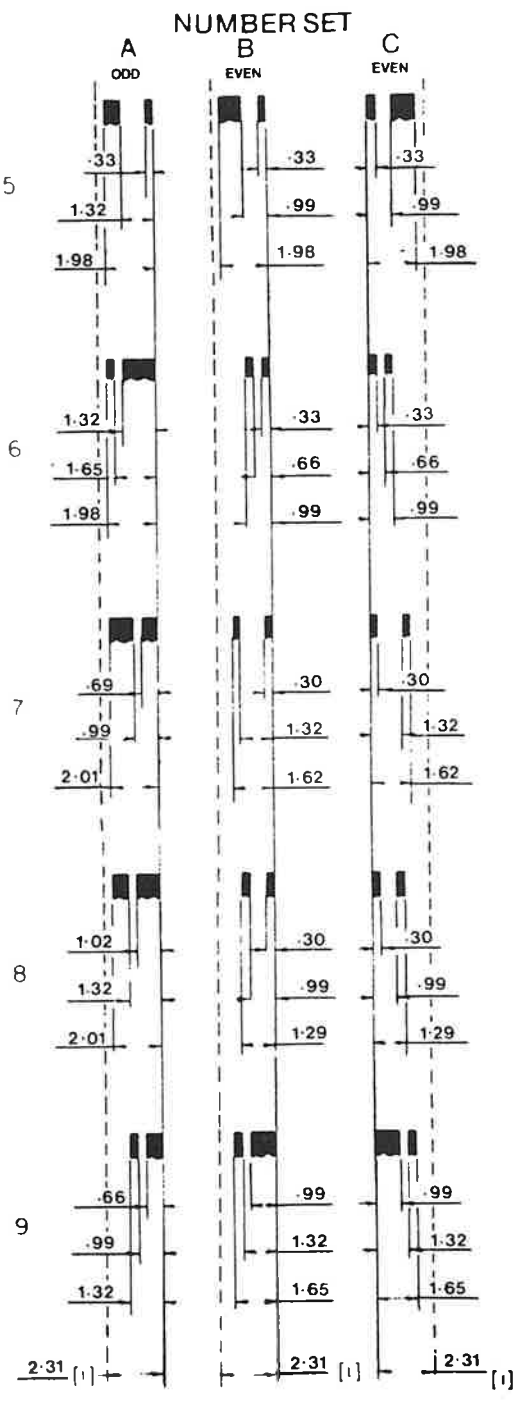


TOTAL NUMBER OF MODULES = 67

EAN vademecum

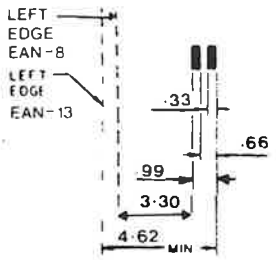
APPENDIX 6 : EAN SYMBOL BAR CODE CHARACTERS - NOMINAL DIMENSIONS



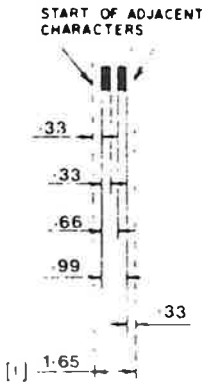


DO NOT SCALE
FILM MASTER TOLERANCES ±0·005
EXCEPT REFERENCE [1] WHERE
TOLERANCE IS ±0·013

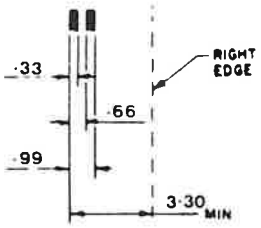
LEFT-HAND LIGHT MARGIN AND GUARD PATTERN



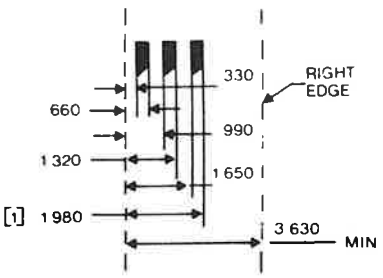
CENTRE PATTERN



RIGHT-HAND GUARD PATTERN AND LIGHT MARGIN

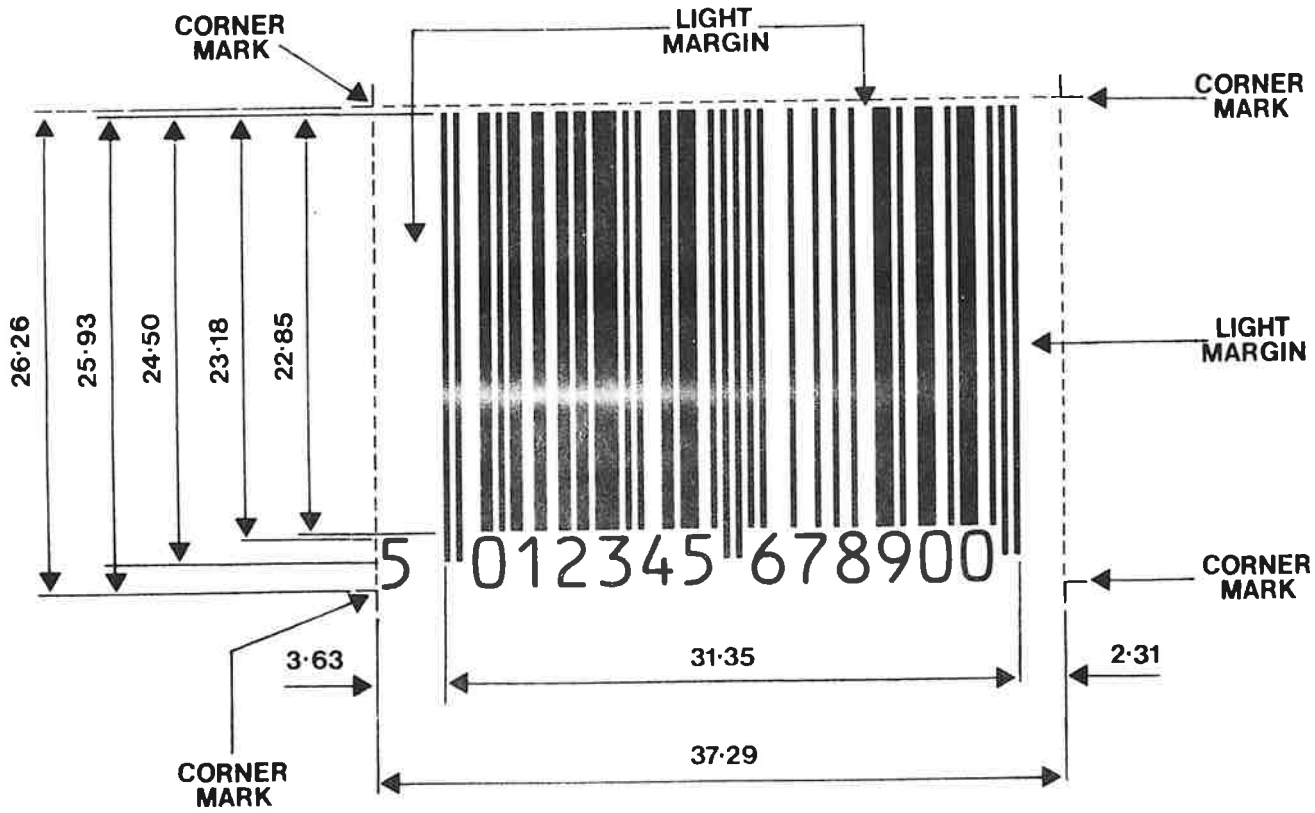


'E' VERSION RIGHT GUARD AND LIGHT MARGIN



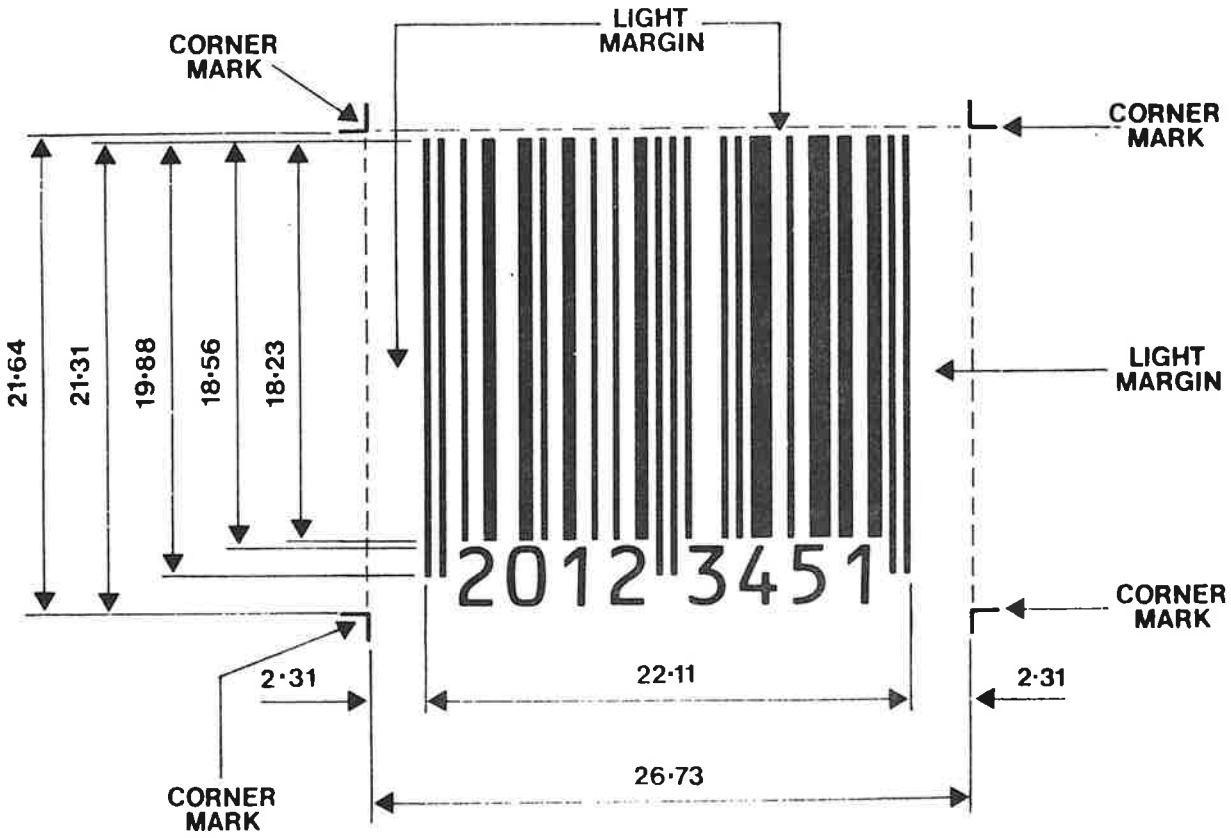
APPENDIX 7 : DIMENSIONS OF 13-DIGIT EAN SYMBOL - NOMINAL SIZE

in mm (1 module = 0.33 mm wide)



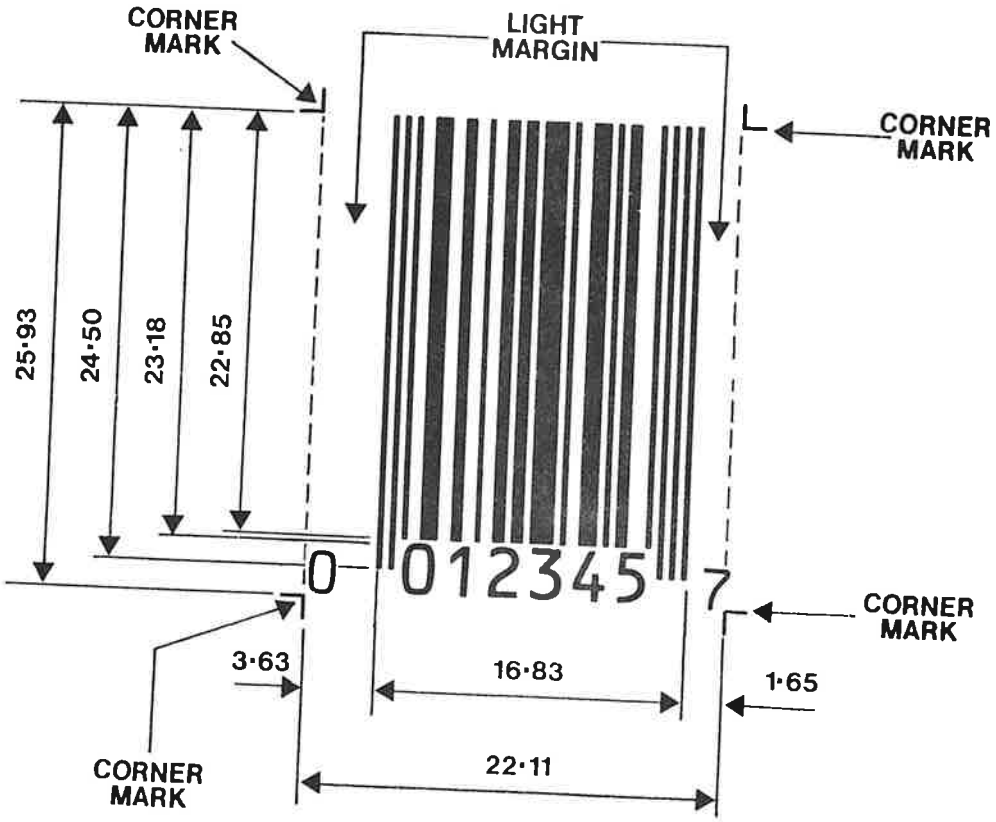
APPENDIX 8 : DIMENSIONS OF 8-DIGIT EAN SYMBOL - NOMINAL SIZE

in mm (1 module = 0.33 mm wide)



APPENDIX 9 : DIMENSIONS OF UPC-E SYMBOL - NOMINAL SIZE

in mm (1 module = 0.33mm wide)



APPENDIX 10 : CORRESPONDENCE TABLES SHOWING RELATION BETWEEN MAXIMUM PRINT GAIN VARIATION AND MINIMUM MAGNIFICATION FACTOR TO BE APPLIED FOR EAN SYMBOLS

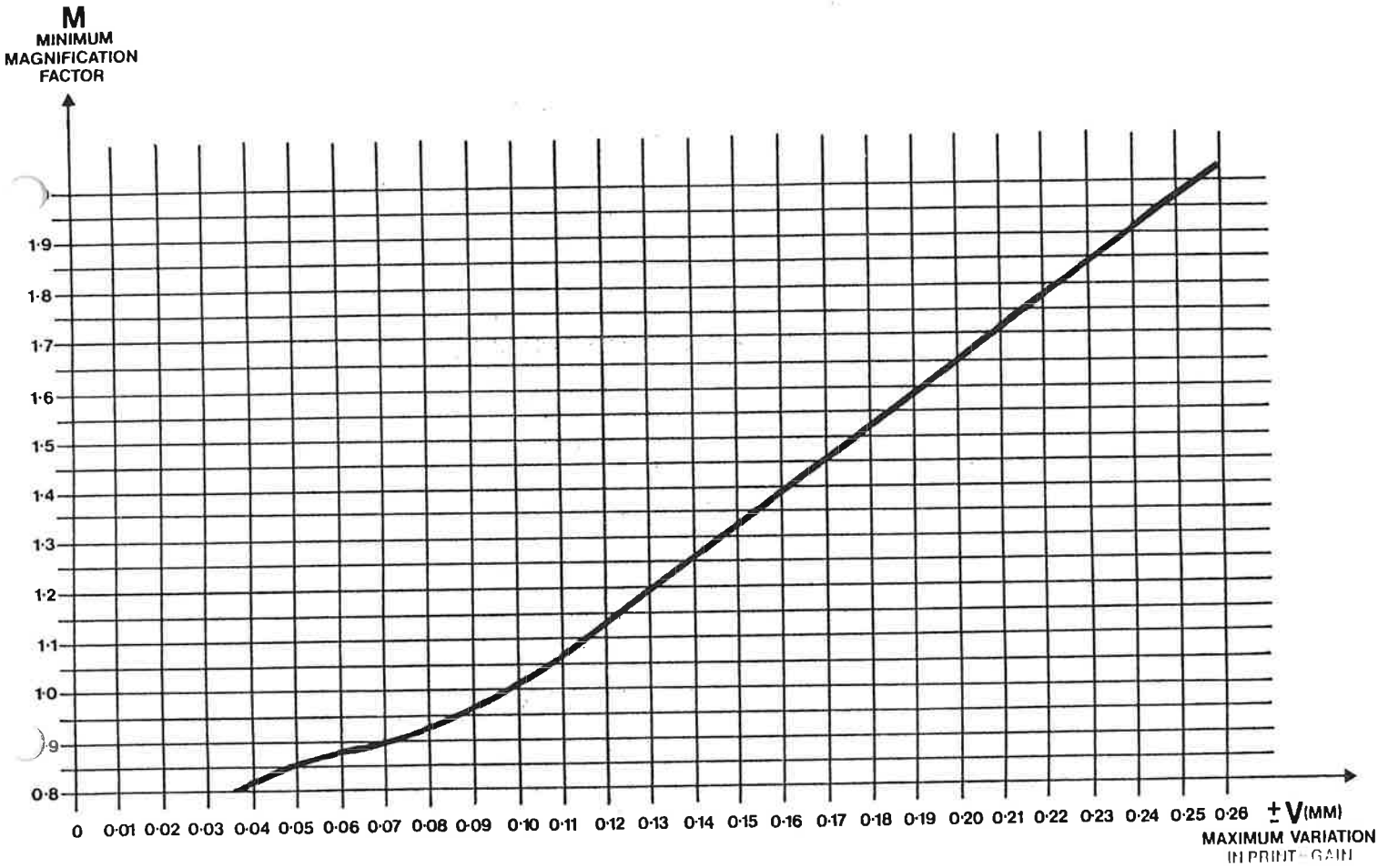
CONTINUOUS SEQUENCE VALUES OF M

V Maximum variation of print gain (mm)	M Minimum value of magnification factor to be applied
± 0·035	0·8
± 0·051	0·85
± 0·069	0·90
± 0·085	0·95
± 0·101	1
± 0·108	1·05
± 0·115	1·1
± 0·124	1·15
± 0·132	1·20
± 0·140	1·25
± 0·147	1·30
± 0·152	1·35
± 0·163	1·40
± 0·171	1·45
± 0·178	1·50
± 0 184	1·55
± 0·192	1·60
± 0·201	1·65
± 0·209	1·70
± 0·216	1·75
± 0·224	1·80
± 0·233	1·85
± 0·241	1·90
± 0·250	1·95
± 0·256	2

CONTINUOUS SEQUENCE VALUES OF V

V Maximum variation of print gain (mm)	M Minimum value of magnification factor to be applied
± 0·04	0·82
± 0·06	0·88
± 0·08	0·94
± 0·1	1·00
± 0·12	1·14
± 0·14	1·25
± 0·16	1·39
± 0·18	1·52
± 0·20	1·65
± 0·22	1·78
± 0·24	1·90
± 0·26	2·00

APPENDIX 11 : GRAPH SHOWING CORRESPONDANCE BETWEEN MAXIMUM PRINT-GAIN VARIATION AND MINIMUM MAGNIFICATION FACTOR TO BE APPLIED FOR EAN SYMBOLS



APPENDIX 12 : DIMENSIONS OF MODULES AND SYMBOLS AT DIFFERENT LEVELS OF MAGNIFICATION FACTOR (in mm)

MAGNIFICATION FACTOR	MODULE WIDTH (IDEAL) (mm)	DIMENSIONS OF SYMBOLS (mm)			
		EAN-13		EAN-8	
		Width (1)	Height (2)	Width (1)	Height (2)
0.8	0.264	29.83	20.74	21.38	17.05
0.85	0.281	31.70	22.04	22.72	18.11
0.9	0.297	33.56	23.34	24.06	19.18
0.95	0.313	35.43	24.63	25.39	20.24
1	0.330	37.29	25.93	26.73	21.31
1.05	0.346	39.15	27.23	28.07	22.38
1.1	0.363	41.02	28.52	29.40	23.44
1.15	0.379	42.88	29.82	30.74	24.51
1.20	0.396	44.75	31.12	32.08	25.57
1.25	0.412	46.61	32.41	33.41	26.64
1.30	0.429	48.48	33.71	34.75	27.70
1.35	0.445	50.34	35.01	36.09	28.77
1.40	0.462	52.21	36.30	37.42	29.83
1.45	0.478	54.07	37.60	38.76	30.90
1.50	0.495	55.94	38.90	40.10	31.97
1.55	0.511	57.80	40.19	41.43	33.03
1.60	0.528	59.66	41.49	42.77	34.10
1.65	0.544	61.53	42.78	44.10	35.16
1.70	0.561	63.39	44.08	45.44	36.23
1.75	0.577	65.26	45.38	46.78	37.29
1.80	0.594	67.12	46.67	48.11	38.36
1.85	0.610	68.99	47.97	49.45	39.42
1.90	0.627	70.85	49.27	50.79	40.49
1.95	0.643	72.72	50.56	52.12	41.55
2	0.660	74.58	51.86	53.46	42.62

1 Between corner-marks
2 Between the lower corner-mark and the upper top of the bars.

APPENDIX 13 : EAN PRINTABILITY GAUGE - DETERMINING THE MAGNIFICATION FACTOR AND BARWITH-REDUCTION ON THE BASIS OF THE PRINTABILITY RANGE

TABLE 1

PRINTING TECHNIQUES OTHER THAN FLEXOGRAPHY

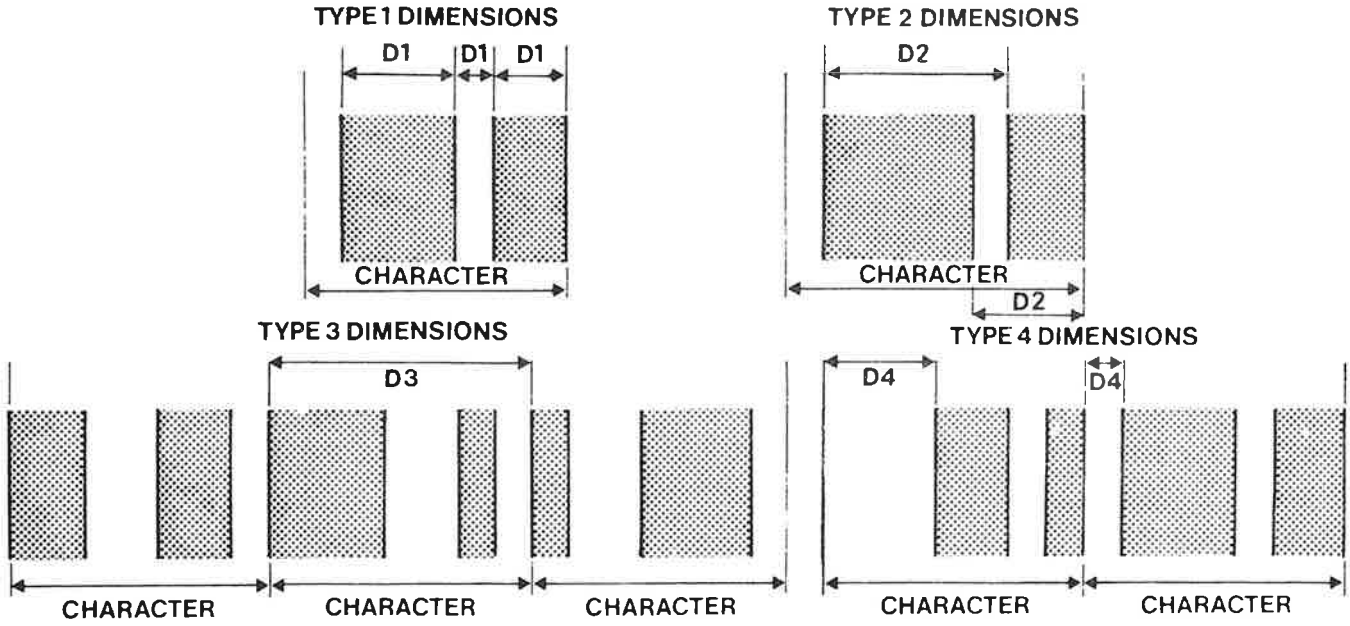
PRINTABILITY RANGE	MAGNIFICATION FACTOR	BAR-WIDTH REDUCTION mm
E – F	1·00	0·28 (+ 0 – 0·08)
E – G	1·00	0·25 (+ 0·02 – 0·05)
E – H	1·20	0·23 (+ 0·05 – 0·02)
E – I	1·30	0·2 (± 0·05)
E – J	1·40	0·18 (± 0·02)
E – K	1·50	0·16 (+ 0·05 – 0·02)
F – G	0·90	0·23 (+ 0·01 – 0·05)
F – H	1·00	0·2 (± 0·05)
F – I	1·20	0·18 (+ 0·05 – 0·02)
F – J	1·25	0·15 (± 0·02)
F – K	1·30	0·14 (± 0·02)
G – H	0·90	0·18 (+ 0·02 – 0·05)
G – I	1·00	0·15 (± 0·05)
G – J	1·10	0·13 (+ 0·02 – 0·05)
G – K	1·20	0·11 (+ 0·05 – 0·02)
H – I	0·90	0·13 (+ 0·02 – 0·05)
H – J	0·95	0·10 (± 0·02)
H – K	1·00	0·09 (± 0·02)
I – J	0·90	0·08 (+ 0·02)
I – K	0·90	0·06 (± 0·02)
J – K	0·80	0·04 (± 0·02)

TABLE 2

FLEXOGRAPHY

PRINTABILITY RANGE	BAR-WIDTH REDUCTION mm	MAGNIFICATION FACTOR
A – B	0·2 (± 0·05)	2·00
A – C	0·2 (± 0·05)	1·90
A – D	0·2 (± 0·05)	1·85
A – E	0·2 (± 0·05)	1·80
A – F	0·23 (± 0·02)	1·70
A – G	0·2 (± 0·02)	1·60
A – H	0·18 (± 0·02)	1·80
A – I	0·15 (± 0·02)	2·00
B – C	0·2 (± 0·05)	1·85
B – D	0·2 (± 0·05)	1·80
B – E	0·2 (± 0·05)	1·70
B – F	0·2 (± 0·02)	1·60
B – G	0·2 (± 0·02)	1·55
B – H	0·18 (± 0·02)	1·60
B – I	0·15 (± 0·02)	1·80
C – D	0·2 (± 0·05)	1·70
C – E	0·18 (± 0·05)	1·60
C – F	0·18 (± 0·05)	1·55
C – G	0·18 (± 0·05)	1·45
C – H	0·18 (± 0·02)	1·45
C – I	0·15 (± 0·02)	1·60
D – E	0·18 (± 0·05)	1.55
D – F	0·18 (± 0·05)	1.45
D – G	0·18 (± 0·05)	1.40
D – H	0·2 (± 0·02)	1.30
D – I	0·15 (± 0·02)	1.45
E – F	0·18 (± 0·05)	1·40
E – G	0·18 (± 0·05)	1·30
E – H	0·18 (± 0·02)	1·20
E – I	0·15 (± 0·02)	1·30
F – G	0·15 (± 0·05)	1·20
F – H	0·15 (± 0·05)	1·15
F – I	0·15 (± 0·02)	1·15
G – H	0·15 (± 0·05)	1·10
G – I	0·15 (± 0·05)	1·00
H – I	0·15 (± 0·02)	0·90

APPENDIX 14 : TOLERANCES TO BE RESPECTED BY IN-STORE MARKING EQUIPMENT FOR EAN SYMBOLS



EAN SYMBOL DIMENSION TOLERANCES — TYPES 1, 2 AND 3

MAGNIFICATION FACTOR	MODULE WIDTH (MM)	TOLERANCE D1 (MM)	TOLERANCE D2 (MM)	TOLERANCE D3 (MM)
0·80 0·85	0·26 0·28	± 0·032 ± 0·052	± 0·038 ± 0·041	± 0·075 ± 0·081
0·91 0·97	0·30 0·32	± 0·072 ± 0·092	± 0·044 ± 0·047	± 0·087 ± 0·093
1·00	0·33	± 0·101	± 0·049	± 0·096
1·03 1·09	0·34 0·36	± 0·105 ± 0·115	± 0·050 ± 0·053	± 0·099 ± 0·104
1·15 1·21	0·38 0·40	± 0·124 ± 0·134	± 0·056 ± 0·059	± 0·110 ± 0·116
1·27 1·33	0·42 0·44	± 0·143 ± 0·152	± 0·062 ± 0·065	± 0·122 ± 0·128
1·39 1·45	0·46 0·48	± 0·162 ± 0·171	± 0·068 ± 0·071	± 0·133 ± 0·139
1·51 1·58	0·50 0·52	± 0·181 ± 0·190	± 0·073 ± 0·076	± 0·145 ± 0·151
1·64 1·70	0·54 0·56	± 0·199 ± 0·209	± 0·079 ± 0·082	± 0·157 ± 0·162
1·76 1·81	0·58 0·60	± 0·218 ± 0·228	± 0·085 ± 0·088	± 0·168 ± 0·174
1·88 1·94	0·62 0·64	± 0·237 ± 0·246	± 0·091 ± 0·094	± 0·180 ± 0·186

Note: Type 4 dimensions are not subject to explicit tolerances but must not be less than 0.2 mm

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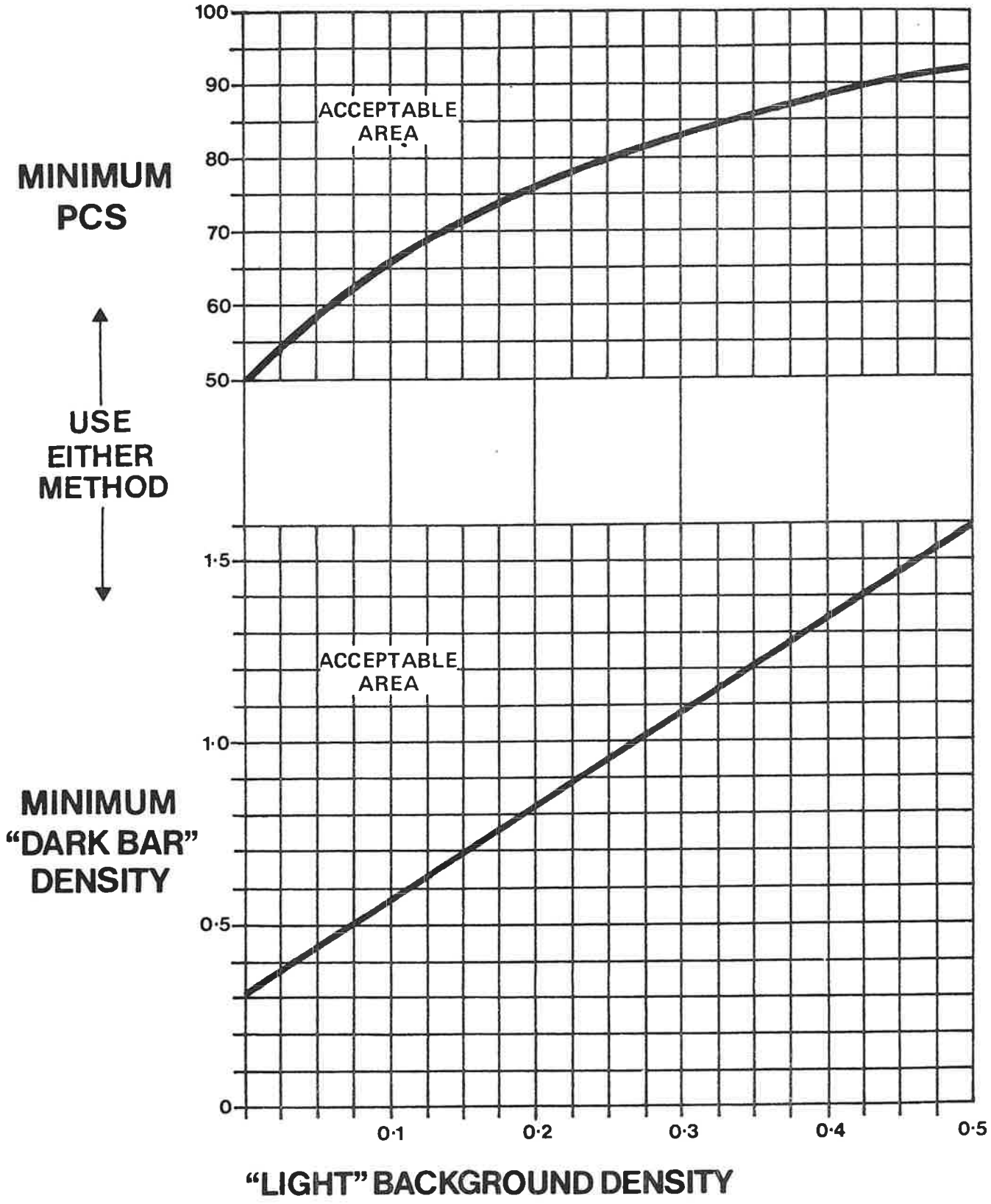
APPENDIX 15 : DENSITY AND PCS FOR EAN SYMBOLS



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APPENDIX 16 : DENSITY, REFLECTANCE FACTOR AND PCS FOR EAN SYMBOLS

LIGHT BARS		DARK BARS		MINIMUM PCS RL - RD / RL
D	RL	D	RD	
0	100.0	.300	50.1	.499
.025	94.4	.365	43.1	.543
.050	89.1	.430	37.1	.583
.075	84.1	.495	32.0	.619
.100	79.4	.560	27.6	.653
.125	74.9	.625	23.7	.683
.150	70.8	.690	20.4	.712
.175	66.8	.755	17.6	.737
.200	63.1	.820	15.1	.760
.250	56.2	.950	11.2	.801
.275	53.1	1.015	9.6	.818
.300	50.1	1.080	8.3	.834
.325	47.3	1.145	7.2	.849
.350	44.7	1.210	6.2	.862
.375	42.2	1.275	5.3	.874
.400	39.9	1.340	4.6	.886
.425	37.5	1.405	3.9	.896
.450	35.5	1.470	3.4	.904
.475	33.5	1.535	2.9	.914
.500	31.6	1.600	2.5	.921

APPENDIX 17 : POSITIONING THE EAN SYMBOL ON PACKAGES - CONSTRAINTS REGARDING CURVE DIAMETER

CURVE DIAMETER OF CONTAINER (CM)	MAXIMUM VALUE OF MAGNIFICATION FACTOR	
	EAN-13 SYMBOL	EAN-8 SYMBOL
3 cm and –	*	*
3.5	*	0.83
4.0	*	0.95
4.5	*	1.07
5.0	0.83	1.18
5.5	0.92	1.30
6.0	1.00	1.42
6.5	1.08	1.54
7.0	1.17	1.66
7.5	1.25	1.78
8.0	1.34	1.90
8.5	1.42	2.00
9.0	1.50	2.00
9.5	1.59	2.00
10.0	1.67	2.00
10.5	1.75	2.00
11.0	1.84	2.00
11.5	1.92	2.00
12 cm and +	2.00	2.00

MAGNIFICATION FACTOR	MINIMUM CURVE DIAMETER OF CONTAINER (CM)	
	EAN-13 SYMBOL	EAN-8 SYMBOL
0.80	4.8	3.4
0.90	5.4	3.8
1.00	6.0	4.2
1.10	6.6	4.7
1.20	7.2	5.1
1.30	7.8	5.5
1.40	8.4	5.9
1.50	9.0	6.4
1.60	9.6	6.8
1.70	10.2	7.2
1.80	10.8	7.6
1.90	11.4	8.0
2.00	12.0	8.5

* The magnification factor necessary for the 30° constraint to be respected is smaller than acceptable standards permit (less than 0.8). Hence the symbol will have to be pivoted through an angle of 90° or be printed in another location.

EAN specifications for numbering and symbol-marking Despatch units

A guide for drawing up national specifications

Original date of approval : May 1984
Edition 1987

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SUMMARY

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APPENDICES

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PRESENTATION AND UTILIZATION OF THIS DOCUMENT

PRELIMINARY

As the contents of this document show, the work done by EAN and UCC has led them to define various options for numbering and symbol-marking despatch units. These options have been tested to ensure their compatibility at international level. This compatibility means in particular :

. That the same scanner may be offered in the catalogues of equipment manufacturers under satisfactory economic conditions, and will be capable of decoding the different symbols.

. That the various approaches to numbering fall into a worldwide compatible framework which makes it possible to guarantee, in accordance with EAN's basic principles, an unambiguous identification of all the units identified by EAN systems (despatch units and consumer units).

This technical compatibility, completed by the terms of the EAN "Gentleman's Agreement" regarding the implementation of these specifications, makes it possible to fulfil the requirement of free circulation of goods which is a basic principle of the solutions promulgated by EAN.

Considering the existence of these various compatible solutions, it was imperative for EAN to set out their specifications in a complete, consistent and non-redundant document, while at the same time providing each Numbering Organization with an efficient means of drawing up its own specifications, by selecting from among the general EAN specifications only those parts corresponding to its own national choices. These objectives determined the form of this document, which is presented as a "KIT" made up of modules ready to be inserted in the national specifications.

Hence this document is especially intended for the Numbering Organizations. It is also intended for equipment manufacturers and international companies who need to know about the solutions utilized at international level.

PRESENTATION OF THIS DOCUMENT

This document includes all the modules necessary for drawing up national specifications.

These modules have been arranged in such a way that each one constitutes a homogeneous and "independent" specification unit. Thus each one can be inserted into sets of specifications which may vary according to the choices made by the Numbering Organizations.

The numbering and symbol-marking aspects have been dealt with in different modules, and the various solutions proposed in these two realms are also the subject of different modules.

Certain modules deal with the application to despatch units of the same rules for identification and symbol-marking as those already drawn up by EAN for consumer units. These modules do not repeat the details of these rules and specifications (Numbering Organizations may insert these details if they wish to do so).

Finally, it should be noted that for each module appendices have been drawn up, which include diagrams, tables and summaries of rules. These appendices form a permanent reference tool for any reader who has already read the text of the specifications.

HOW TO USE THIS DOCUMENT

The use of this document for drawing up national specifications is the responsibility of each Numbering Organization. The latter must submit the draft of these specifications to EAN so that the normal checks for consistency be made before the specifications are circulated.

The following rules or recommendations must be taken into account in working out national specifications :

1. The presentation of the national specifications may include all the information or explanations necessary or desirable for the sake of clarity provided that this information or these explanations are not in contradiction with the EAN specifications.

2. Module 1 of the presentation of the national specifications may be expanded to adapt its contents fully to the national context. However, the contents of this module must be taken into account and its meaning clearly conveyed, for it represents the link between all the national specifications and situates each of them within the international EAN framework.

3. If, in its specifications, any Numbering Organization proposes several of the solutions for numbering and/or symbol-marking that are offered here, it must clearly explain the rules enabling the user to know which solution should be applied to which case.

4. Modules 2, 3, 10 and 11 may be completed by specific national rules. These rules must be defined within the framework described in these modules.

5. Module 12 may also be completed by specific national rules, especially those resulting from national or international regulations concerning the marking of particular information on despatch units (best before date, inflammable nature of the product, etc...).

A document stipulating the numbering and symbol-marking solutions chosen by each EAN member country from among those proposed in the general EAN specifications may be obtained from the Numbering Organizations.

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MODULE 1 : INTRODUCTION AND GENERAL PRESENTATION OF THE SPECIFICATIONS (NATIONAL LEVEL)

1. ORIGIN AND GENERAL OBJECTIVE OF THESE SPECIFICATIONS

* The joint efforts of EAN and UCC enabled to show that a worldwide-compatible system for numbering and symbol-marking consumer units could make possible the automation of checkout operations in retail stores.

  This success naturally led EAN and UCC to seek for comparable solutions which would be applicable upstream, in the operations involved in production management, warehousing, shipping, taking inventories, receiving, etc.., whether these operations were carried out by manufacturers, wholesalers or retailers.

  New factors and conditions were to be taken into account, such as the following :

  - Printing conditions, and the quality and contrast of the materials and colours used for despatch units, sometimes seem incompatible with the characteristics and constraints of the EAN symbol used on consumer units as now specified (such as the magnification factor).

  - The conditions and constraints of symbol scanning in an industrial environment or warehouse are quite different from those which apply to items crossing a retail check-out.

  - To identify not only the consumer unit, but also the various despatch units in which it is handled, raises rather complex questions which affect the options chosen in the system of supplier-retailer communication.

  These various factors led different complementary types of work to be undertaken, on which the development of these specifications is based :

  - Joint efforts by EAN and UCC (in the "Despatch Units Working Party").

  - Specific tasks carried out by UCC on this subject

  - Work done by the DSSG and FEFCO groups with the aim of defining an appropriate symbol-marking technology

  - Etc...

* This work highlighted the fact that various approaches to the numbering and symbol-marking of despatch units could be considered and should be taken account of. All were perfectly compatible on the technical level. This technical compatibility means, in particular :

  - That the same scanner may be offered in the catalogues of equipment

manufacturers under satisfactory economic conditions, and will be capable of decoding the different symbols.

- That the various approaches to numbering fall into a worldwide compatible framework which makes it possible to guarantee, in accordance with EAN's basic principles, an unambiguous identification of all the units identified by EAN systems (despatch units and consumer units).

* The technical specifications relating to these different solutions were defined by EAN in a document entitled "EAN Specifications for Numbering and Symbol-Marking Despatch Units : a guide for drawing up national specifications". EAN makes this document available to all Numbering Organizations. It is also intended for equipment manufacturers and international companies in order to make them aware of the offered solutions and needs at international level.

* The national specifications, subject of the present document were set up :

  - By including the modules of the general EAN specifications which correspond to the solutions adopted by the Numbering Organization.

  - By introducing those identification rules which, in the framework of the EAN system, are left at the discretion of each Numbering Organization.

* Note on terminology

  - EAN Consumer Unit Specifications (abbreviated : EAN-CU specifications) refers to the General EAN specifications dealing with the numbering and the symbol-marking of consumer units.

  - EAN General Despatch Unit Specifications (abbreviated : general EAN-DU specifications) refers to the document entitled : "EAN Specifications for Numbering and Symbol-marking Despatch Units : A guide for drawing up national specifications".

  - National EAN Despatch Unit Specifications (abbreviated : national EAN-DU specifications) refers to the present specifications, released by the EAN Numbering Organization.

2. DEFINITION OF THE FIELD COVERED BY THESE SPECIFICATIONS

* Preliminary

When a Numbering Organization applies to despatch units the same numbering and symbol-marking specifications as to consumer units, the distinction between a despatch unit and a consumer unit is useless. On the other hand, as soon as there is a difference, at either the numbering or the symbol-marking level, between the solutions adopted for these two different types of units, the distinction must be made, in particular to avoid having consumer units marked in ways that would not allow them to be processed at a retail check-out. The following definitions should enable these difficulties to be avoided.

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* A reminder of the definition of the consumer unit of a product, a unit which comes exclusively under the EAN-CU specifications.

The consumer unit of a product is the unit which is intended to be sold to the final consumer through a retail check-out. Hence the consumer unit may be :

- Either (and this is most often the case) a unit that cannot be divided or broken up. We shall call this the "basic consumer unit".

- Or a unit made up of a group of several "basic consumer units" of the same or different products. In this case the consumer unit is called a "multipack".

The consumer unit (basic unit or multipack) always carries on its packaging or label all the customary information (brand, contents, etc...) and any other information that may be legally required in order for it to be offered for sale to the final consumer.

In accordance with the EAN-CU specifications, a separate unique EAN-13 or EAN-8 number is required for every different consumer unit. The multipack receives a different number from that of the basic consumer unit which it contains.

The multipack, as defined here, comes under the EAN-CU specifications exclusively.

Note : Certain consumer units (multipacks in particular) have their packaging made of corrugated or relatively rough material. This characteristic can in no way make them an exception to the application of the EAN-CU specifications. Furthermore, it may be noted in such cases that the fact that the unit is intended to be sold at retail requires printing conditions which are entirely compatible with the EAN-CU symbol-marking.

* Despatch units, the subject of the present EAN-DU specifications

Any standard and stable grouping of several consumer units, made up to facilitate the operations of handling, storing, order preparation, shipping, etc..., comes within the framework of the EAN-DU specifications and is called a despatch unit.

A despatch unit may be presented in a wide variety of physical forms :
- a fibreboard case
- a covered or banded pallet
- a group of consumer units under shrink film
- a film wrapped tray
- etc...

In addition, it may :
- Either (and this is most often the case) contain a single type of consumer unit (a single EAN-13 or EAN-8),
- or, sometimes, contain different types of consumer units (hence several EAN-13 or EAN-8) ; this type of despatch unit is known as "mixed case" or "assorted case".

Important note : These items which are both despatch units and consumer units (eg a box of 12 bottles mineral water can be a despatch unit for trade between companies but may also be offered for sale to the final consumer at a retail check-out), are subject to all the rules which apply only to consumer units.

Additional proposed definitions are given in Appendix 1.

3. BRIEF DESCRIPTION OF THE NUMBERING AND SYMBOL-MARKING OPTIONS OFFERED IN THE GENERAL SPECIFICATIONS

3.1. Numbering Options

Two main options are offered for numbering despatch units. Their detailed structures are presented in Appendix 4.

1st option :

Application to despatch units of the EAN rules for identifying consumer units. Here each despatch unit is given an EAN-13 (or exceptionally an EAN-8) number. This number is different from the EAN number of the consumer unit within the despatch unit.

2nd option :

The EAN-13 number of the consumer unit is the basis for the identification of the despatch unit (1). This number is completed by a Logistical Variant (VL) which makes it possible to distinguish the various despatch units in which the consumer unit is packed. The VL may have one or two digits.

- The first standard format consists of a total of 14 digits as follows :
  1 digit VL
  12 digits of the article number of the consumer unit within the despatch unit without the check-digit.
  1 check-digit calculated on the preceding 13 digits.
  This format is called DUN-14 (DUN : Distribution Unit Number).

- The second standard format consists of a total of 16 digits as follows :
  1 spare digit
  2 digit VL
  12 digits of the article number of the consumer unit within the despatch unit without the check-digit.
  1 check-digit calculated on the preceding 15 digits.
  This format is called DUN-16.

As shown in Appendix 4, the different numbering options may coexist and still permit an unambiguous identification of any physical unit, whether the latter is a consumer unit or a despatch unit.

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1 In the special case of an EAN-8 number, this latter must always be right justified and is considered as having five implied zeroes in the left hand positions.

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Note : The structures presented in Appendix 4 do not necessarily correspond to the structures used in computer files.

3.2. Symbol marking options

The EAN symbol-marking technology used on consumer units can also be used on despatch units if printing conditions permit it.

In addition, another barcode symbol-marking technology, the Interleaved Two of Five (abbreviated ITF) is proposed, which may be better suited to the printing conditions and materials encountered on despatch units, particularly on fibreboard cases. This technology, described in these specifications, requires an even number of digits. Two versions are proposed, to accommodate the different numbering options :

- ITF-14, to represent 14 digits
- ITF-16, to represent 16 digits. (Note : The use of this version is restricted to use in national trade. Products which are exported must not bear ITF-16 symbols - see Appendix 4).

3.3. The intersection of the numbering and symbol-marking options

Appendix 5 describes the symbol-marking options available for representing the various numbering options, and determines the set of solutions available for processing despatch units.

4. USAGE OF IN-STORE NUMBERS ON DESPATCH UNITS

In-store numbers (prefixes 02, 20 to 29 and velocity numbers) are under the control only within a given closed environment, thus not guaranteeing uniqueness outside this area. Therefore, in-store numbers must not be used for numbering despatch units (unless they always remain strictly in the sphere of control of a single company).

5. EVOLUTION OF THESE SPECIFICATIONS

* These specifications may be completed in future, to take account of the experience acquired by the Numbering Organizations.

  In addition, after a period of experiment by the various countries in applying the different solutions presented in these specifications, it might be advisable to strengthen the emphasis placed on one or another of these solutions.

* Furthermore, GUIDELINES aiming at facilitating the application of these specifications, especially by printers, will be issued at a later stage.

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MODULE 2 : EAN-13 (OR EAN-8) NUMBERING OF DESPATCH UNITS

* In this option, all EAN rules for numbering consumer units apply to despatch units. Details are to be found in the EAN-CU specifications.

  Hence despatch units are identified :
  - normally, by means of an EAN-13 number
  - in exceptional cases, by means of an EAN-8 number (see note 3 below).

  Along with the application of a single set of rules for identifying consumer units and despatch units goes the obligation to assign separate unique EAN-13 (or EAN-8) numbers to despatch units from those assigned to consumer units (1).
  More generally, two separate unique numbers must be assigned to two different units, whether the latter are consumer units or despatch units.

* We recall that a despatch unit is characterized by :
  - a given content (one type of consumer unit) (2).
  - in a given quantity (or given mixture)
  - presented in a given structure of packaging
  - presented in a given type of packaging knowing that a different type of packaging only requires another number if it is necessary to distinguish between two types (3).

  Any difference between two despatch units, where any of these parameters is concerned, requires a different identification for each of these units.

* Numbers allocated to despatch units which have become obsolete must not be re-used for another unit until 36 months have elapsed from the date the original item was last supplied by the manufacturer (or marketer).

NOTES

1. UPC is included in this Module as a sub-system of EAN (see also Appendix 4).

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1 This obligation may possibly be expressed in less restrictive terms by saying that there should never be, in a given system (managed by any of the partners involved) two different physical units (eg. one consumer unit and one despatch unit) that are identified by the same number. Although this latter formulation is acceptable, the more "systematic" and restrictive formulation given in the text is preferred, which provides a better guarantee of consistency in practice.

2 Or possibly several, in the case of multipacks and mixed or assorted cases.

3 Minor changes in packaging, which do not significantly affect the partners in the distribution circuit, do not require a separate number (eg. changes related to the packaging materials used).

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2. Suppliers of despatch units numbered according to this EAN option should provide their trade partners with lists of EAN numbers of despatch units together with the number and arrangement of consumer units in the package.

3. An EAN-13 number assigned to a despatch unit can be represented by either an EAN-13 symbol or an ITF-14 symbol (see Appendix 5). As the ITF-14 symbol represents fourteen digits, it is necessary to add a "filler character" to the article number. This filler character is always a leading zero, that is a zero placed in the left most position. It need not be retained in the record control field of computer files. This leading zero does not affect the check-digit.

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MODULE 3 : DUN-14 AND DUN-16 NUMBERING OF DESPATCH UNITS

1. GENERAL

For each consumer unit identified by the manufacturer with an EAN-13 number (1), the various homogeneous despatch units in which it is contained are identified by the manufacturer by means of a non-significant code called LOGISTICAL VARIANT, abbreviated VL. The VL may have one or two digits.

Different despatch units (2) containing the same consumer unit should be allocated different values of logistical variant.

NOTES

1. UPC is included in this Module as a sub-system of EAN (see also Appendix 4).

2. Since a VL is always followed by the EAN number of the CU, a given VL may correspond to quite different sizes or constructions of despatch unit when associated to different consumer units.
   Example : for a given consumer unit, VL = 01 may mean "box of 24 CU" whereas this same VL = 01 may mean "pallet of 1000 CU" for another consumer unit.

3. Suppliers of despatch units numbered according to the DUN option should provide their trade partners with lists for each consumer unit of the different values of logistical variant and their description.

2. 14-DIGIT DISTRIBUTION UNIT NUMBER (DUN-14)

In the case of a 1-digit VL, the complete numbering structure identifying the despatch unit consists of 14 digits as follows :

1 digit VL
12 digits of the article number of the consumer unit within the despatch unit without the check-digit
1 check-digit calculated on the preceding 13 digits, according to the standard EAN algorithm described in Appendix 2.

Thus :

LOGISTICAL VARIANT	CONSUMER UNIT NUMBER WITHOUT CHECK	CHECK
VL	X X X X X X X X X X X X	C

1 Or EAN-8 number (see Section 4).
2 Two despatch units are considered to be different when they differ in content and/or in the nature and structure of their packaging.

This number will henceforth be called DUN-14. It will be marked with an ITF-14 symbol.

The VL must have a value other than zero. Value 9 indicates the presence of an add-on and must only be used for variable quantity despatch units.

3. 16-DIGIT DISTRIBUTION UNIT NUMBER (DUN-16)

In the case of a 2-digit VL, the complete numbering structure identifying the despatch unit consists of 16 digits as follows :

1 spare digit
2 digit VL
12 digits of the article number of the consumer unit within the despatch unit without the check-digit
1 check-digit calculated on the preceding 15 digits, according to the standard EAN algorithm described in Appendix 2.

Thus :

SPARE	LOGISTICAL VARIANT	CONSUMER UNIT NUMBER WITHOUT CHECK	CHECK
S	VL1 VL2	X X X X X X X X X X X X	C

This number will henceforth be called DUN-16. It will be marked with an ITF-16 symbol.

The VL must have a value other than 00. Value 9 in position VL2 indicates the presence of an add-on and must only be used for variable quantity despatch units. The leading digit S provides a spare capacity for future use. Its value is fixed to zero.

4. THE SPECIAL CASE OF CONSUMER UNITS IDENTIFIED IN EAN-8

The solutions presented in sections 2 and 3 are applicable if we consider that, in the preceding patterns, the 12 digits of the EAN-13 number without the check digit are made up in the following way :

EAN-13 CONSUMER UNIT NUMBER WITHOUT CHECK	
0 0 0 0 0	EAN-8 CONSUMER UNIT NUMBER WITHOUT CHECK
12 DIGITS	

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5. THE SPECIAL PROBLEM OF MIXED OR ASSORTED CASES

The solution described in sections 2 and 3 cannot be applied to mixed or assorted cases (see definition in Appendix 1), since such despatch units contain several different consumer units (several different EAN numbers).

In this particular case, the despatch unit receives a separate EAN-13 number.

The VL which precedes the EAN-13 number is used according to the rules defined in section 1 : it is defined by the manufacturer in such a way to guarantee the unambiguous identification of despatch units and the stability of the EAN-13 portion of the number for the various despatch units containing the same mixed or assorted case.

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MODULE 4 : RECOMMENDED METHOD FOR LOCATING ITF AND EAN SYMBOLS ON DESPATCH UNITS

1. PRELIMINARY

Correct location and orientation of symbols, whether EAN or ITF, is more critical on despatch units than on consumer units :

* Despatch units will sometimes be scanned by fixed scanners next to conveyer belts without manual intervention.

* Despatch units will be scanned when stocked in storage when not all faces of the unit will be visible.

* Despatch units may be of extremely varied types (fibreboard cases, covered pallets, etc...).

* It is occasionally difficult to achieve consistency in the location of symbols on despatch units, particularly when adhesive labels are applied in line or when the surface of the unit is irregular, or when slight crushing of the unit occurs during distribution.

* Sometimes, other information will be printed at the same time such as the manufacturer's brand name, legally required information, add-on symbols (see Modules 10 and 11), the contents of the despatch unit (see Module 12).

However every possible effort should be made to meet the following recommendations, otherwise the use of fixed scanners next to conveyer belts will be impossible.

2. THE RECOMMENDATIONS

Recommendation 1

If possible, the symbol should appear on all four vertical sides of the despatch unit. Technical or commercial factors may make this impossible and then applying symbols to two adjacent vertical sides is the next preference, and to one vertical side is acceptable. If only one symbol is applied, it should be located on the side which is most likely to face outwards when the despatch unit is moved on a conveyer belt.

Recommendation 2

The lower edge of the bars of the symbol should be, if technically possible, 32 mm $\pm$ 3 mm from the lower edge of the side on which the symbol is printed. For EAN symbols this refers to the bars representing characters, not guard bars (1).

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1 However if the configuration of the unit or the need to meet the contrast specification dictate, the symbol may be located higher or lower on the side of the unit (but as close as possible to the recommendation of 32 mm).

Recommendation 3

Within the horizontal band, defined by Recommendation 2, the symbol may be placed anywhere along the side except that the outer edges of the first and last bars should not be closer than 34 mm and must not be closer than 19 mm to a vertical edge of the unit.

If the symbol is printed with a bearer bar, the outer edges of the bearer bar should not be closer than 19 mm to a vertical edge of the unit.

These various recommendations for locating the symbol are summarized in Appendix 6.

Note : These recommendations are defined more particularly for fibre-board cases. They have an indicative value for large units, such as eg. covered pallets. In the light of further practical experience, these recommendations will be completed in the future to include appropriate recommendations for large units.

3. SHALLOW DESPATCH UNITS

If the height of the despatch unit is less than the height of the symbol in the magnification factor required, than :

(a) First, the symbol should be printed at full height with the top of the bars located at the top of despatch unit's side.

(b) Second, when the height of the despatch unit is less than the height of the symbol including human readable digits, the human readable digits should be separated and placed to the left of the bars of the symbol (1).

(c) Third, when the height of the despatch unit is less than the bar height, the bars should run from top to bottom of the despatch unit's side, again with the human readable digits leading.

4. FILM WRAPPED UNITS

If a film wrapped (shrink wrapped or stretch-wrapped) unit is symbol marked, and the items it contains are also symbol-marked, there is a danger that the symbols on the units inside will be read in mistake for the symbol on the film wrapped item.

Every possible effort must be made to obscure the symbols on the items within the film wrapped item.

Suppliers of units which have two different symbols in visible positions must inform their trade customers that this is the case. Users of scanning will then be able to programme their equipment to avoid problems if symbols are read in error.

A more practical solution to this problem of symbols showing through film-wrapping is currently being investigated.

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1 Filmmasters with the human readable digits leading the barcode are available.

5. LOCATION OF HUMAN READABLE CHARACTERS

The EAN and ITF symbol specifications require that the human readable characters appear beneath the bars of the symbol (except when the despatch unit is shallow in which case they may be separated).

When it is not possible to apply the full symbol height, it is acceptable for the human readable characters to be located to the left of, and aligned with, the bars of the symbol. When this configuration is used, the light margins must still be respected.

If this configuration is used for variable quantity despatch units (see Module 11), the human readable characters of the add-on symbol must be located to the right of, and aligned with, the bars of the add-on symbol, again respecting the light margin.

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MODULE 5 : CONTRAST SPECIFICATIONS FOR EAN AND ITF SYMBOLS

Operation of scanning systems depends on recognition of the contrast between light and dark bars. This reccgnition may be affected by various factors, which we propose to describe in this Module.

1. REFLECTANCE FACTOR AND REFLECTION DENSITY ; CONDITIONS OF MEASUREMENT

The reflectance factor (R) is the ratio of reflected flux Φ to the reference reflected flux Φ. Reflected flux is the radiant power reflected by the sample and evaluated by a specified kind of receiver. Reference relected flux is the radiant power reflected by magnesium oxide or barium sulphate photometric standard (R = 100%).

Reflection density (D) is equal to $D = - \log_{10} R$

The minimum reflection density required for the dark bars depends on the reflection density of the light bars (or light background) being used.

All the measurements mentioned in this section must be made under the following conditions, and with equipment corresponding to the following specifications :

* **Geometric conditions for reflection measurements**

  The incident illumination should be centred at 45° to the normal to the sample and the reflected flux collected by a receiver subtending a solid angle centred on the normal to the sample. The sampling aperture should be a circular area of minimum 0.2 mm and maximum 0.56 mm in diameter.

* **Spectral conditions for reflection measurements**

  The sample should be illuminated by light having a spectral power distribution which corresponds to the following specification : CIE source A, obtained by using a tungsten filament lamp operating at a correlated colour temperature of 2856°K.

  The photometric receiver of reflected flux should have a relative spectral sensitivity corresponding to the following specification :

  Photomultiplier with an S-4 response as specified by the AMERICAN JOINT ELECTRON DEVICES ENGINEERING COUNCIL, used with a Wratten 26 filter, meeting nominal specifications.

* **Practical conditions for measurements**

  Considering the variability of reflection density on materials of heterogeneous texture, it is recommended that a number of measurements be made in order to obtain a reliable evaluation :

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- of the highest density (lowest reflection) for the light bars,
- of the lowest density (highest reflection) for the dark bars.

2. PRINT CONTRAST

Print contrast signal (PCS) is defined by the relationship :

$$PCS = \frac{R_L - R_D}{R_L}$$

where R_L is the reflectance factor of the light bars and R_D is the reflectance factor of the dark bars.

Appendix 7 indicates the minimum PCS corresponding to the reflection density of the light bars for EAN symbols.

Appendix 8 shows the maximum dark bar reflectance for the range of light bars reflectance for ITF symbols. The minimum value of PCS is always 75 %.

Important note : For most values of the R_L the contrast required in ITF symbols is less than that required in EAN symbols. However for R_L values greater than 65 the specifications are more stringent for ITF than for EAN.

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MODULE 6 : THE USE OF EAN-13 SYMBOL-MARKING ON DESPATCH UNITS

All the requirements and recommendations defined in the EAN-CU specifications are applicable, with the exception of the following :

- The specifications for locating the symbol (see Module 4), which are common to EAN and ITF symbol-marking of despatch units.

- The magnification factor : the magnification factor must be between 0.8 and 2, according to the EAN-CU specifications. The value actually chosen must be defined on the basis of printing tests (see EAN-CU specifications) which indicate a minimum magnification factor. It is recommended that the magnification factor of EAN symbols on despatch units be as large as possible, e.g. between 1.5 and 2.

In addition, the use of EAN symbol-marking on despatch units can be facilitated by following specific supplementary recommendations at the stages of assessing print quality conditions, photoengraving and print quality control. Since in practice these recommendations are common to the EAN and ITF symbol-marking technologies, they will be defined in guidelines completing these specifications.

Remark

When certain printing processes or materials are used, the EAN symbol marking technology might not be successfully used on despatch units. In such cases it is recommended to try to use the ITF symbol-marking technology (see Modules 7 and 8).

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MODULE 7 : GENERAL SPECIFICATION FOR ITF SYMBOL-MARKING

1. PRELIMINARY

The symbol-marking technology known as the Interleaved Two of Five (abbreviated ITF) has been found to be well adapted to the materials and printing conditions frequently used in despatch units (particularly fibreboard cases).

ITF symbols have the following characteristics :

* The symbols are of overall rectangular shape, made up of a series of light and dark parallel bars perpendicular to an imaginary base line or reference line, with light margins to the right and left.

* Only two widths of light and dark bar are used - wide and narrow (in the following descriptions of ITF symbols a wide bar is represented by 1 and a narrow bar by 0). The bars are not modular.

* A pair of digits is represented by five dark bars and five light bars (spaces). One of the pair is represented by the dark bars, the other by the light bars, and the dark and light bars are interleaved. As the digits are represented in pairs, the symbol can only encode even numbers of digits.

* In addition to the digit characters there are two auxiliary characters used as guard bars at the beginning and the end of the digit representation.

* The symbol is designed to be read bi-directionally by fixed or portable scanners. Scanners designed to read ITF symbols will also be capable of reading EAN symbols (but not vice versa).

* The symbol size is variable between limits in magnification, to accommodate the ranges in quality achievable by the various printing processes. Magnification limits are from 0.625 to 1.2 times the nominal size.

* The symbol is surrounded by a "bearer bar", the purpose of which is to provide a support which equalises the pressure over the entire surface of the symbol and is particularly needed when flexible printing plates are used. Furthermore it increases reading reliability.

This module will describe the general logic of the construction of an ITF-symbol, whatever the number of characters may be. Appendices 13 and 14 provide further information which applies specifically to the ITF-14 and ITF-16 symbols. Module 9 furnishes the specifications for the production of ITF symbols.

2. LOGICAL STRUCTURE OF ITF SYMBOLS

2.1. Digit representation

Digit values are represented by five bars (which may be light or dark depending on the position of the digit in the number). The five bars are always made up from two wide bars and three narrow bars. The digits 0 through 9 are represented by narrow and wide bars as follows :

VALUE OF DIGIT	COMBINATION OF WIDE (1) AND NARROW BARS (0)
0	0 0 1 1 0
1	1 0 0 0 1
2	0 1 0 0 1
3	1 1 0 0 0
4	0 0 1 0 1
5	1 0 1 0 0
6	0 1 1 0 0
7	0 0 0 1 1
8	1 0 0 1 0
9	0 1 0 1 0

The symbol is constructed in digit pairs as follows :

Step 1 : Number the digits, from right to left, from 1 to n (n must be even).

Step 2 : Form digit pairs (each time the right-hand digit is in an odd position and the left hand digit is in an even position).

Step 3 : In each digit pair :
- the right-hand digit is represented by a series of light bars.
- the left-hand digit is represented by a series of dark bars.
according to the pattern of wide and narrow bars given in the table above.

The representation of the first digit pair follows the start guard pattern immediately, each subsequent representation of a digit pair follows the previous one immediately and the stop guard pattern follows the representation of the last digit pair immediately.

2.2. Auxiliary characters

In ITF symbology there are two auxiliary characters - the start guard and the stop guard. They are composed as follows :

Start guard
One narrow dark bar
One narrow light bar
One narrow dark bar
One narrow light bar

Stop guard
One wide dark bar
One narrow light bar
One narrow dark bar

These rules are summarized and illustrated in Appendices 9 and 9 (continued).

3. GENERAL CONSTRUCTION AND NOMINAL DIMENSIONS OF ITF SYMBOLS

3.1. General construction of an ITF symbol.

An ITF symbol is made up as follows, reading from left to right :

A light margin
A start guard pattern
A representation of the digit pairs
A stop guard pattern
A light margin

The article number represented by the symbol is shown in human readable characters underneath the symbol.

The symbol is surrounded by a bearer bar.

3.2. Nominal dimensions of characters.

In the nominal size (ie when the magnification = 1.0) the theoretical widths of the bars (light or dark) are :

Narrow bar	1.016 mm
Wide bar	2.540 mm

Note that the width of the wide bars is 2.5 times the width of the narrow bars.

The corresponding widths of characters are :

Digit Pair	= 16.256 mm (4 x 2.540 mm + 6 x 1.016 mm)
Start Guard	= 4.064 mm
Stop Guard	= 4.572 mm

Note : All dimensions given are ideal, theoretical dimensions corresponding to the nominal size of symbols. These dimensions are not intended to be used directly in the preparation of symbols. Production aspects and tolerances are dealt with in Module 9.

3.3. Human readable characters.

The human readable characters printed underneath the ITF symbol should be in OCR-B font. This font is adopted only as a convenient standard typeface and it is not intended that these characters should be machine readable. The human readable marking includes the check-digit and possible "filler characters" at the left necessary to make up an even number of digits.

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The dimensions of the characters are :

Height : 5.72 mm
Typical width : 3.65 mm
Line width : 0.74 mm
Pitch : 4.57 mm
(Pitch = space between centre lines of adjacent characters).

3.4. Bearer bar.

The purpose of the bearer bar is to equalise the pressure exerted by the printing plate over the entire surface of the symbol and to enhance the reading reliability by assisting in the reduction of the probability of misreads or short scans which may occur when a skewed scanning beam enters or exits the symbol through the top or bottom edge.

The bearer bar is mandatory unless it is not technically feasible to apply it (in which case reading reliability will be reduced).

The bearer bar has a constant thickness of 4.8 mm and must completely surround the symbol, butting directly against the top and bottom of the bars of the symbol.

Moreover, the length of the horizontal bearer bars is extended by 3 mm right and left (i.e. total extension of 6 mm) in order to permit the inclusion of the quality control H-marks (see also Module 9 - § 2.5.).

Note : This particular point introduces an evolution with regard to the original EAN specifications (1983) where it was specified that the bearer bar should surround the bars of the symbol and the human readable characters. This evolution of the specifications was approved to provide a better printing plate support in the lower part of the symbol.

The former use of the bearer bar remains valid but should progressively be replaced by the new specification where the bearer bar buts directly against the top and the bottom of the symbol bars.

All symbol dimensions in the present specifications are given according to the new specification.

Both versions are presented in Appendix 10.

For printing methods which do not require printing plates, the bearer bar should be a minimum of two times the width of a narrow bar and need only to appear at the top and bottom of the symbol (butting directly against the top and bottom of the symbol bars). The bearer bar need not to extend into the clear area nor is it necessary to print the vertical portion of the bearer bar. Example :

3.5. Clear areas.

The light margins to the right and left of the symbol are compulsory, whether or not there is a bearer bar. Both light margins have nominal widths of 10.9 mm (1). A minimum clear area of 1 mm between the bottom line of the bearer bar and the top of the human readable characters is to be observed.

3.6. Symbol height.

The minimum barheight specifications are given in Appendix 12.

Note : When, for practical reasons it is not possible to apply the full symbol height, even when the human readable characters have been moved to the left of the bars, it is permissible at a last resort and provided symbol location is very accurate for the height of the symbol to be truncated. The maximum bar height in the circumstances must then be used.

3.7. Nominal dimensions of the ITF symbol.

The ideal, theoretical dimensions of the ITF symbol, are shown diagrammatically in Appendix 11.

The width of the symbol corresponds to :

One start guard pattern	: 4.064 mm
n pairs of number characters	: n x 16.256 mm
One stop guard pattern	: 4.572 mm

As an indication, the total width of an ITF-14 symbol is 122.428 mm (including light margins : 150.228 mm) while the total width of an ITF-16 symbol is 138.684 mm (including light margins : 166.484 mm).

The height of the bars in the nominal size symbol is 31.8 mm.

4. APPLICATION OF THE MAGNIFICATION FACTOR TO THE VARIOUS DIMENSIONS

* The symbol size is variable between limits in magnification, to accommodate the ranges in quality achievable by the various printing processes (see Module 9)

  Magnification limits are from 0.625 to 1.2 times the nominal size.

  For magnification factors other than 0.625 - 0.7 - 0.8 - 0.9 - 1 - 1.1 or 1.2 the dimensions and tolerances may be interpolated from the values given in Appendices 12, 13, 14 and 19.

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1 The minimum value of the light margins is 10.2 mm and must imperatively be respected.

The following dimensions are not affected by the application of the magnification factor :

- the bearer bar (it has a constant tickness of 4.8 mm).
- the height and format of the human readable characters (their height is constant and equal to 5.72 mm).

* The following dimensions are affected by the application of the magnification factor :

- the width of all light and dark bars in the symbol.
- the width of the light margins.
- the height of the bars.

Appendix 12 summarizes these rules and gives the main dimensions at various magnification factors.

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MODULE 8 : SPECIFICATIONS OF THE ITF-14 AND ITF-16 SYMBOLS

The ITF-14 and ITF-16 symbols are made up in accordance with the specifications defined in Module 7.

Appendix 13 gives a diagram of the ITF-14 symbol in nominal size, and its dimensions at various magnification factors.

Appendix 14 gives a diagram of the ITF-16 symbol in nominal size, and its dimensions at various magnification factors.

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MODULE 9 : PRODUCTION OF ITF SYMBOLS

1. PRELIMINARIES

The ITF symbol-marking may be implemented according to one of the following procedures :

1. Printing at the source : the symbol is applied as part of the art-work of the packaging of the despatch unit.
2. Direct printing of the symbol on the packaging line : A printing device is used at the stage where the package is usually shaped up and filled.
3. Label printing.

The production of an ITF symbol in its finished state on an article involves a number of separate processes, each of which contributes to the quality of the final result. This does not apply to automated label printing machines which convert numerical data directly into symbols, see Section 3.

It is the intention of the EAN system that the required dimensions and tolerances in the final printed symbol should not have to be directly specified as such. Instead, the specification lays down the conditions to be fulfilled at each stage of the production process. Scanning equipment should then be capable of reading a symbol produced in accordance with these conditions.

The production processes will normally be undertaken by specialist concerns, who may employ techniques at their own discretion in order to produce symbols of acceptable reliability for scanning at economic cost. In order to define the standards required, the following sections outline the considerations which apply to the production processes, and give methods whereby acceptable quality can be achieved.

2. PRODUCTION OF A SOURCE MARKED ITF SYMBOL

2.1. General description

The processes in the production of a source-marked ITF symbol are :

* Assessment of printing conditions and deduction from these of :
  - the magnification factor
  - the bar width reduction.
* Production of a film master representing the symbol.
* Making the printing plates
* Printing of the packaging from the plates and print quality checks.

2.2. Assessment of printing conditions

In preparation for the printing of a symbol on a package, it is first necessary to assess the average print gain (1) and extent of variation

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1 Print gain = the amount by which a printed bar is wider than the same bar on the filmmaster.

(1) normally encountered in the day to day printing of the packaging.

The assessment should be made under the following conditions :

* Assessments can be made using either a film master of an actual symbol (eg. an ITF symbol representing a standard value 999 ... reserved for this use) or a special film master which serves as a gauge (see Section 2.4.). The film must be integrated into the printing plates, using the standard procedure normally used in the particular operation.

* Assessments should be carried out on actual production runs, using qualities of inks and substrate in normal use.

* The assessment should include both :
  - bars printed parallel to the direction of printing
  - bars printed at right angles to the direction of printing.

* They should include all the variations likely to be encountered in practice in the factors affecting print quality so that the effects of extremes of printing conditions can be measured.

2.3. Basic assessment method

A basic method of print quality assessment is to use proper sampling over a sufficient variety of production runs and measure directly the bars in printed symbols to find :

- the average of extremes of print gain
- the variation in print gain.

Compensation for both these factors must be made when the film master is prepared.

The extent of variation in print gain determines the magnification factor, i.e. the factor by which the entire symbol must be magnified or may be reduced) in relation to the nominal size.

The extent of average print gain determines the bar width reduction (BWR). This is the amount by which the bars on the film master must be reduced, in width, to correct for the print gain.

The space required on the package will be from 0.625 to 1.2 times the nominal dimensions for overall length and height. Examples are given in the tables in Appendices 13 and 14.

Reliability is always enhanced by selecting a magnification factor higher than the minimum, and if space on the package is not at a premium, larger magnification factors should be used. Reduction below nominal size, ie magnification factors less than 1, may reduce reliability.

Note that the minimum magnification factor is always determined by the print quality. It is not possible to select an arbitrary symbol size to fit a predetermined space on the package. The bars on the film master

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1 Variation = the difference in the amount of print gain throughout a full print run.

are corrected to allow for print gain by reducing the width of each bar on the film master, symmetrically (on both left and right) by a total equal to the average print gain in each case. The BWR applied is the same for each bar, irrespective of the width of the bar.

Appendix 17 gives a table of printability ranges rounded to 0.1 mm to read off directly the magnification factor and BWR to be applied to the filmmaster.

The amount of BWR required is equal to the average print gain in all cases, and is not itself affected by the magnification factor of the symbol. Thus the BWR is applied after any magnification has been carried out and not the reverse. The figures in Appendix 17 reflect this.

2.4. Printability Gauge Method

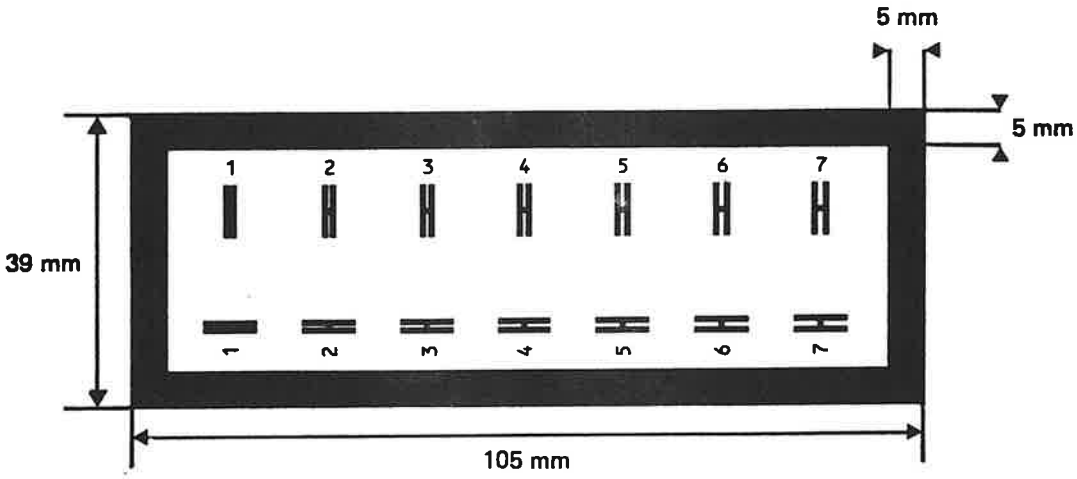
Section 2.3. describes the theoretical method of determining the allowances to be made in the printing process. In practice, a simpler alternative operating method can be employed, using a specially calibrated "Printability Gauge".

* Description of the ITF printability gauge

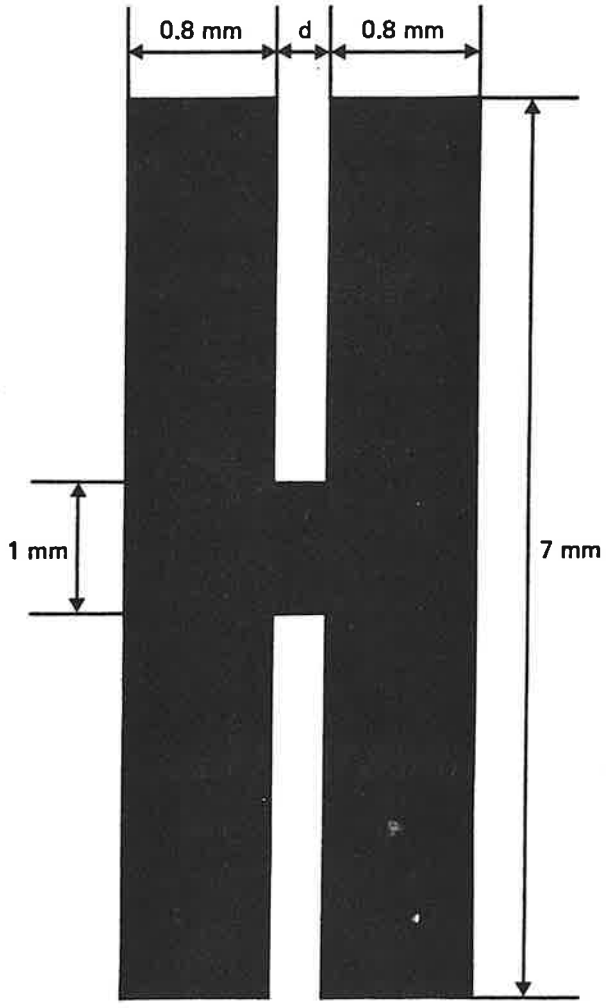
This gauge is illustrated in Fig. 1. Supplies of the gauge are obtainable commercially. It consists of a very precise design in the form of a positive or negative film master. It is made up of seven sections each of which includes two H marks perpendicular to each other. This enables print quality to be assessed both in the direction of the print run and at right angles to it.

Fig 1 : ITF STANDARD GAUGE

GENERAL DESCRIPTION



GAUGE SECTION DESCRIPTION



d = 0.1 mm x S
It is therefore
between 0.1 and 0.7 mm

The spacing between the arms of the H increases from the set marked 1 to the set marked 7. It is not necessary to know the dimensional values when using the method described in this section (1).
Printability gauges (or the parts likely to be relevant) are used to assess print conditions by including them in actual production runs of the packaging on which symbols will eventually be printed, in locations similar to those likely to be used for symbols, and using the same processing and printing methods.

The printability gauge is specially produced and must be used as supplied. It is essential for the gauge to be introduced into the same stage of the reproduction process and in the same way as eventually for the symbol film master itself. Any photographic enlargement or reduction of the gauge would defeat its purpose.

* Evaluation of printability gauge results.

Samples of prints incorporating the gauge are taken throughout a number of production runs. These samples are individually examined under a magnifying glass to determine the finest gauge pattern where the arms first touch one another in each sample. Stray imperfections are disregarded for this purpose; arms are considered to touch when 50 % or more of the arm is in contact. For example in a particular gauge the arms in H5 to H7 might be quite distinct, H1, H2 and H3 completely filled in with ink; and H4 with the arms touching 50 % or more. The rating for this gauge is then H4. Note that if the arms in H5 and H7 were quite distinct and, H1, H2, H3 and H4 completely filled in the rating would still be H4.

Over the runs sampled the individual ratings may be found to vary say between H3 and H4. The printability range of this printing production would then be classed as H3 to H4 (or 3-4).

The printability range is then used in conjunction with the tables given in Appendix 17 to read off directly the magnification factor and bar width reduction to be applied to the symbol film master.

Note : Tests on the extension of the ITF printability gauge and the Table in Appendix 17 are currently being conducted, in order to include magnification factors ranging from 0.625 to 0.8.

2.5. Print Quality Checks

If allowances for printing quality have been properly made in the preparation of the film master, either by the theoretical method in Section 2.3., or by the gauge method in Section 2.4., it should not be necessary to check the overall quality or performance of the symbol as actually printed. It should be sufficient merely to carry out spot checks in the course of the print run to ensure that print quality does not deteriorate below the levels which were recorded during the test run.

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1 The dimensions of the gauge have however been accurately specified and are shown in Fig. 1. The tolerances are 0.02 mm. Using this data the printability gauge can also be used for direct measurement as in Section 2.3.

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In practice this can be done either directly by measurement of a particular bar in the printed symbol or indirectly by means of the printability gauge. The indirect method, as follows, is recommended.

Appropriate H marks are printed to the right and the left of the symbol. The H mark to be used on the left side is numbered one greater than the highest number in the printability range (eg. section 5 if the range is 2-4). The H mark to be used on the right side is the lowest number in the printability range (Section 2 in the example). The printer should then check regularly whether the arms of the left H mark do not begin to touch one another and whether the arms of the right H mark are not open. If the left H mark closes up the printer should investigate, but should not necessarily reject the production run.

Important notes :

* The H-mark serves as a quality control guide, which interpretation is reserved to the printer. It must therefore not be used as a rejection criterion of the printing work by printers and distributors.

* The quality control H-marks are located within the box formed by the bearer bar aligned with the centre of the bars of the symbol and outside the light margins, right and left (see Appendix 18).

2.6. Alternative Method

In practice, some packaging manufacturers may prefer to determine dimensions and tolerances and by measurement ensure that printing is of acceptable quality. Appendix 19 shows an acceptable bar width dimensional tolerance for a given bar width, for use with label printing equipment (see Section 3). These figures do not represent a standard for source marked symbols but can if desired be used as a reference.

2.7. General position of EAN as regards the various methods of assessing print quality conditions and print quality checks.

* EAN expresses no preference for the adoption of one approach or the other, as long as the method followed is in accordance with the present EAN specifications.

* Great care should be exercised in trying to check the correctness of a printed symbol by using any commercially available verification devices. The EAN Memorandum of Agreement specifically absolves manufacturers from any obligation to use checking equipment for this purpose. If, nevertheless, it is wished to make a check that a symbol has been printed in accordance with the requirements of these specifications, it is essential that any verifying equipment used should itself respond exactly in accordance with these requirements. This is particularly vital in regard to the spectral range employed. Otherwise the results given by inappropriate verifiers can be seriously misleading in both over- and under-estimating the acceptability of printed symbols.

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3. LABEL PRINTING

In some circumstances it is desirable to use automated label printing machines which can convert numerical data directly into symbols. The processes described in Sections 1 and 2 are then not applicable. In order to specify the performance of such label printers and to control their output, it is necessary to stipulate the tolerances permitted in the symbol as printed. The tolerances quoted in this connection are not to be taken as establishing a standard for symbols printed at source by the processes described in Sections 1 and 2.

The tolerances on widths of wide bars, narrow bars, character pairs and guard patterns are given in Appendix 19.

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MODULE 10 : ADDITIONAL ENCODATIONS

Two principal types of additional encodations have been recognized :

1. ADD-ONS

Add-ons contain data forming a specific part of the identification of the item concerned. They are linked to the main symbol either by a specific architecture for the add-on symbol or by a logical identifier in the numeric data of the main symbol.

The only add-ons officially released by EAN are :
- the 2-digit and 5-digit add-on currently used on books and periodicals.
- the ITF-6 add-on for variable quantity despatch units (see Module 11).

2. SUPPLEMENTARY ENCODATIONS

All other information to be expressed in the form of a symbol is called supplementary encodation. It has no logical link to the main symbol.

Specifications on supplementary encodations are being developed by EAN and will be incorporated as soon as possible. Pending the establishment of these specifications, users are requested not to apply symbol-marked supplementary encodations on their despatch units.

Two different numbers represented in any of the following symbologies must never appear on one despatch unit : ITF-14, ITF-16, ITF-6, EAN-8, EAN-13, UPC-A, UPC-E.

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MODULE 11 : VARIABLE QUANTITY DESPATCH UNITS

1. DESPATCH UNITS CONCERNED

Despatch Units may be of variable quantity either because the 'production process' does not guarantee consistency in weight, size or length (carcasses of meat, whole cheeses etc.) or because the articles are created to meet a special order which states a quantity (eg. textiles ordered by the metre, glass ordered by the square metre). Only despatch units which are ordered or produced in quantities which can vary continuously are included. Despatch units which are sold in discrete and predefined bands (eg. as a nominal weight) are treated as fixed quantity under the normal despatch units identification rules.

Therefore this module concerns items whose price varies continuously as a function of their quantity. For example if a fixed number of variable weight consumer units are ordered, and the despatch unit is priced according to the total weight (not the number of individual consumer units) then the variable quantity despatch units rules apply.

In the case of variable quantity units, the quantity contained (expressed in area, volume, or weight or length ... units) must necessarily be considered as being part of the despatch unit identification, to allow for their recognition and handling at the different levels in the distribution cycle.

Examples : These despatch units may be :
- either units, which will be divided before they are sold at retail (example : meat carcasses)
- or units grouping consumer units which are themselves of variable quantity (example : products which are prepacked during production or during an intermediate process).
- or units containing variable quantities of loose goods which may be prepacked or not (example : salads).

2. GENERAL PRINCIPLES OF THE OPTIONS ADOPTED

* The options adopted contain two parts :

  - the identification of the contents of the despatch unit
  - the quantity contained in the despatch unit.

  This quantity is expressed in the form of an additional encodation, called an add-on, placed on the right hand side of the main symbol which identifies the contents. The two parts of the symbol are linked by the presence in the main symbol of a logic indicator announcing the presence of the add-on.

* The numbering and symbol-marking options for fixed quantity despatch units are in the following matrix :

Symbol-marking \ Numbering	EAN-13	DUN-14	DUN-16
EAN-13	YES	NO	NO
ITF-14	YES (EAN-13 number preceded by a zero)	YES	NO
ITF-16	NO	NO	YES

Thus there is a choice between EAN and ITF symbologies.

* As far as the variable quantity despatch units are concerned, the present symbol-marking resources allow an add-on solution in ITF symbol-marking, but not in EAN symbol-marking.

  In addition, the only logic indicator which at present has been formally adopted by EAN to announce the variable quantity add-on is - as in the UPC specifications - a 9 in position 14 (numbered from the right in the main symbol).

  Consequently, the only solution presented in these specifications is the DUN-14 (or DUN-16) solution symbol-marked in ITF-14 (or ITF-16) and associated with an ITF-6 add-on for the quantity.

  The solution making use of an EAN-6 add-on and logically identified by a specific prefix in the EAN-13 symbol (yet to be specified) should however be investigated as soon as possible; this would complete these specifications at a later stage.

3. DESCRIPTION OF THE IDENTIFICATION SOLUTION FOR VARIABLE QUANTITY DESPATCH UNITS.

* EAN makes two identification structures available to the Numbering Organizations. These structures are presented in Appendix 20 :
  - a solution based on the ITF-14 symbol (1)
  - a solution based on the ITF-16 symbol (1), which can be used by Numbering Organizations under the same conditions as ITF-16 for fixed quantity despatch units.

  The appendix also gives the solution adopted by UPC, which is actually a special case of the ITF-14 solution proposed by EAN.

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1 symbol followed by the ITF-6 add-on.

* Both solutions have following elements in common :
  - a value 9 in position 14, which is a specific logic indicator for variable quantity units and which announces the systematic presence of an ITF-6 add-on.
  - identification structures with the same logic
  - a common add-on format (ITF-6)

* The structure of the number I1 I2... identifying a given despatch unit under the national prefixes has to meet the principles and rules specified in Appendix 21. In addition it should be noted that :
  - Every Numbering Organization is responsible for defining the options for structuring these identification digits to be included in its national specifications.
  - It is always the company that symbol-marks the despatch unit (1) that defines the contents of its identification, in the framework defined by the Numbering Organization.
  - This structure will usually be the same (manufacturer number + DU number with the manufacturer) as that for fixed quantity despatch units.

* When the consumer units in the despatch unit are marked with an EAN-13 symbol (product number + price), this product number may possibly be used in the construction of the DU number if it is a standard number or a number defined by the manufacturer (or processor company).

  This solution is not recommended by EAN, but may be considered if the Numbering Organization wants to introduce it and if the operators wish to use it. Guidelines which guarantee that these numbers are unambiguous, are given in Appendix 21 bis.

* The rules for the use of the quantity add-on are specified in Appendix 22. The following points are to be emphasized :
  - this add-on must not contain a price
  - the unit of measurement is implicit (file data)
  - the location of the decimal point is floating. The company source-marking the goods must define the unit of measurement related to each product and the decimal point if used. This information will be communicated to the distributors together with the product information.
  - the DU identification must be changed when another measurement unit is used.

4. SYMBOL-MARKING OF THE ITF-6 ADD-ON.

* The general description of this add-on is presented in Appendix 23. The same principles as for the ITF-14 (or ITF-16) symbol-marking apply.

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1 manufacturer or processor company ; possibly the distributor strictly for internal use.

The following should be noted :
- Human readable marking : the choice of the type of character is free.
- Use of the bearer bar : When both symbols are printed at the same time, either directly on the despatch unit or on a single label, it is possible to use one common bearer bar surrounding both symbols. In this case, the minimum distance between both symbols is equal to the clear area which is specified for the main symbol. When the main symbol and the add-on are printed at different times (eg main symbol pre-printed and add-on added later), and both symbols are printed with a bearer bar, the distance between bearer bars may be minimal (no specified distance).

* The specification of dimensions, tolerances and location are presented in Appendix 24. The 6 digit variable quantity add-on is printed on the right hand side of the main symbol, with the bars parallel to the bars of the main symbol. Again the same rules and principles as for the ITF-14 (or ITF-16) specification apply.

However :
- the precise location of the human readable characters below the symbol is not specified.
- the magnification factor of the add-on may be different from the one applied to the main symbol.

- o O o -

MODULE 12 : SPECIFICATIONS CONCERNING THE HUMAN-READABLE MARKING OF DESPATCH UNITS

If technically feasible, the following specifications and recommendations apply :

1. SPECIFICATION OF CONTENT OF HUMAN-READABLE MARKING

The human-readable marking is intended to facilitate manual checking operations. It completes but never replaces the human-readable characters below the symbol of the despatch unit.

The following information in human readable characters should be included :

* The number identifying the despatch unit, i.e. the number which is symbol-marked.

* The EAN number of the consumer unit together with multipliers showing how many of these consumer units there are within the despatch unit. If the consumer units are packed with no intermediate packaging, the multiplier N will indicate the number of consumer units within the despatch unit. If the consumer units are packed in intermediate packaging, the multiplier M will indicate the number of despatch units of lower level contained in the considered despatch unit, while N will indicate the number of despatch units of lower level. The value of the product M x N then produces the total number of consumer units within the despatch unit.

  Thus :

NUMBER IDENTIFYING THE DESPATCH UNIT
M x N x CONSUMER UNIT NUMBER

Note : Numbering Organizations may decide to place the multipliers behind the consumer unit number, in the following order :

CONSUMER UNIT NUMBER x N x M

2. RECOMMENDATIONS ON THE PRESENTATION OF THE HUMAN READABLE MARKING

The number identifying the despatch unit and the consumer unit number must be printed in dimensions best facilitating bare-eye reading. As an additional facility the item reference digits of the despatch unit number may be highlighted on the unit, away from the symbol. This enables manual checking to be carried out more simply.

It is recommended to surround the human readable information by a printed frame so that it will easily be located and not confused with other information printed on the package.

3. RECOMMENDED LOCATION OF THE HUMAN READABLE MARKING

The human readable information block should, if possible, appear on each vertical side of the despatch unit on which the symbol is printed.

If possible, this block should be printed close to the symbol identifying the despatch unit, so that all standard EAN information on the package be easily recognized in one "window".

- o 0 o -

APPENDIX 1 : EXPLANATORY NOTES RELATING TO THE VARIOUS TYPES OF DESPATCH UNITS

PRELIMINARY

The concepts and words defined here are intended merely to make these specifications easy to understand. The Numbering Organizations are completely free to define their own terminology. They are urged to do so precisely in their national specifications.

Note : The definition of a multipack is not given here, since the multipack is not a despatch unit but a consumer unit and falls under the EAN-CU specifications exclusively.

*** SHIPPING UNIT**

A shipping unit is a unit intended to be turned over by the supplier to the carrier, and hence also to be received by the consignee of the goods. In order for a despatch unit to be a shipping unit, it must be inviolable, which means that it must be made up in such a way that any deterioration or any shortage of goods can be immediately detected.

*** DISTRIBUTION UNIT (DU)**

The distribution unit of a product is the lowest level of homogeneous packaging of this product (1) that can serve as a shipping unit from the supplier to his customer.

*** OVERPACKING**

A level of packaging of several distribution units made up of one or several products, designed to permit easier manual or mechanical handling.

*** UNDERPACKING**

An intermediate level of packaging (which may exist) between the consumer unit and the distribution unit ; underpacking is normally used by distributors in their warehouses (wholesalers, chain stores) or stores (shelf-stock).

*** MIXED CASE OR ASSORTED CASE**

The mixed case, or assorted case, is a special type of distribution unit because it is heterogeneous : it contains a stable selection of several different consumer units (several EAN numbers), eg different flavours or colours.

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1 See, below, the exception constituted by the mixed case or assorted case.

APPENDIX 2 : ALGORITHM FOR CALCULATING THE CHECK-DIGIT

Important : Digit positions are numbered from right to left (the check-digit is in the first position).

The check-digit is calculated from all the other digits in the number through the following steps :

STEP 1 Starting from position 2 of the number, sum all the digit values in even-numbered positions.

STEP 2 Multiply the result of step 1 by 3.

STEP 3 Starting from position 3 of the number, sum all the digit values in odd-numbered positions.

STEP 4 Add the result of step 2 to the result of step 3.

STEP 5 The check-digit is the smallest number which, when added to the result of step 4, produces a multiple of 10.

EXAMPLE OF APPLICATION TO A NUMBER CONTAINING A TOTAL OF 16 DIGITS

	IDENTIFICATION OF THE DESPATCH UNIT															C	
DIGIT POSITION	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
EXAMPLE OF NUMBER	3	2	4	4	2	7	6	2	2	1	3	5	7	4	6	6	STEP 2
ADDITION OF EVEN POSITIONS	3	+	4	+	2	+	6	+	2	+	3	+	7	+	6		= 33 x 3= 99
ADDITION OF ODD POSITIONS		2	+	4	+	7	+	2	+	1	+	5	+	4			+ = 25
																	STEP 4 124

130 - 124 = 6

STEP 1

STEP 3

STEP 5

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APPENDIX 3 : BRIEF REMINDER OF THE EAN RULES FOR IDENTIFYING CONSUMER UNITS

(Complete and precise rules are to be found in the EAN-CU specifications)

* EAN identification is exclusively numerical. Its general structure is :

Prefix	Item identification	Check digit
P1P2P3	X X X ...	C

Within this structure :

- The prefix denotes the Numbering Organization administering the remainder of the number. EAN assigns one or several prefixes to each Numbering Organization.
- The "item identification field" is structured at the discretion of the Numbering Organization. The structure must follow certain basic principles.
- The check-digit is calculated according to the standard algorithm described in Appendix 2.

* This general structure includes two different versions :

a. The standard version has a field length of 13 digits and is called EAN-13.

b. A shorter version used in exceptional cases (see the EAN-CU specifications) has a field length of 8 digits and is called EAN-8.

* The item identified in EAN-13 or EAN-8 is the consumer unit, i.e. the unit which is intended to be sold to the final consumer through a retail check-out. A separate unique EAN number is required for every different consumer unit. Every variant of an item must be allocated a separate number whenever the variation is, in any way, apparent and significant to any partner in the trading chain or to the retail customer. The multipack receives a different number from that of the basic consumer unit it contains.

APPENDIX 4 : THE IDENTIFICATION OPTIONS FOR DESPATCH UNITS / HOW THEY FIT INTO A WORLDWIDE-COMPATIBLE FRAMEWORK

Important note = THE STRUCTURES BELOW DO NOT NECESSARILY CORRESPOND TO THE STRUCTURES USED IN COMPUTER FILES

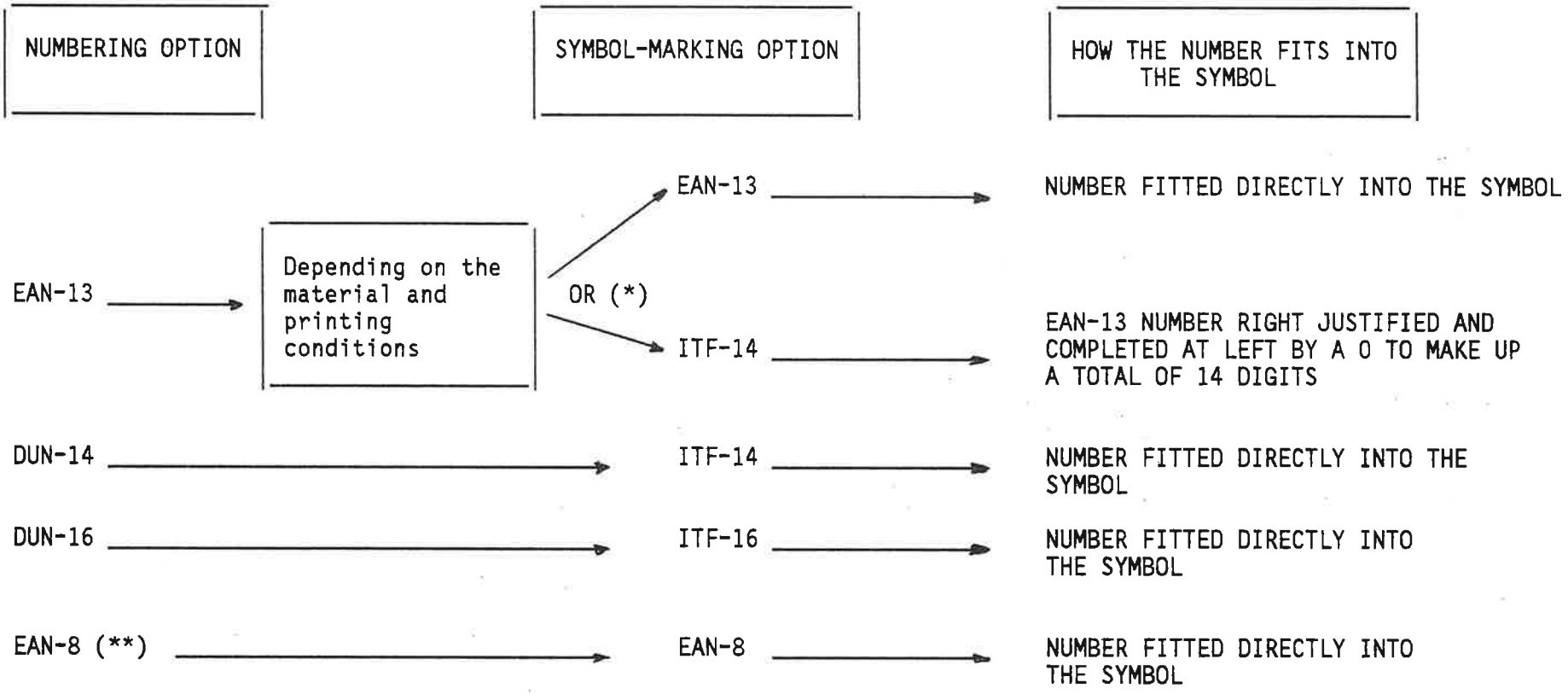
THE OPTIONS AND THEIR VARIOUS APPLICATIONS			16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1st Option : APPLICATION OF THE EAN RULES FOR IDENTIFYING CONSUMER UNITS (EAN NUMBER OF EACH DU DIFFERENT FROM THAT OF THE CU)		GENERAL CASE OF EAN	(0)	(0)	(0)	p1	p2	p3				EAN-13 (1)						C
		SPECIAL CASE OF UPC(2)	(0)	(0)	(0)	p1 =0	p2 =NS	p3				UPC						C
2nd Option: THE EAN NUMBER IDENTIFYING THE CONSUMER UNIT IS PRECEDED BY A LOGISTICAL VARIANT (VL) WHICH IDENTIFIES THE VARIOUS DESPATCH UNITS FOR EACH CONSUMER UNIT	1-digit VL	DUN-14	(0)	(0)	VL	p1	p2	p3			EAN-13 of CU(1) without check-digit							C*
		SPECIAL CASE OF UPC	(0)	(0)	VL	p1 =0	p2 =NS	p3			UPC of CU without check-digit							C*
	2-digit VL	DUN-16	S	VL	VL	p1	p2	p3			EAN-13 of CU(1) without check-digit							C*
		SPECIAL CASE OF UPC(2)	S	VL	VL	p1 =0	p2 =NS	p3			UPC of CU without check-digit							C*

ABBREVIATIONS : p1p2p3 = prefix digits assigned by EAN to Numbering Organizations
C = check digit calculated from all other digits in the number according to the standard EAN algorithm (see Appendix 2)
NS = UPC Number System, in p2 position (NS = 0 for grocery products)
VL = Logistical variant (1 or 2 digits)
S = Spare digit available in the solution including a 2-digit VL
* = Means that the check-digit does not have the same value as that of the EAN or UPC consumer unit number since digits are added at the left.

SPECIAL RULE: The 1 or 2 digit VL must have a value other than 0. Value 9 in position 14 indicates the presence of an add-on and must only be used for variable quantity despatch units.

NOTES: 1) or EAN-8, right-justified in the EAN field and completed at the left by zeroes (Caution : the check-digit must take account of the VL)
2) assuming that UCC would adopt this solution.
3) the use of this version is restricted to use in national trade. Products which are exported must not bear ITF-16 symbols.

APPENDIX 5 : INTERSECTION OF THE IDENTIFICATION AND SYMBOL-MARKING OPTIONS FOR DESPATCH UNITS



(*) this choice is open only if the unit concerned is a despatch unit in the sense defined in section 2 of Module 1 ; if it is a consumer unit, only EAN-13 symbol-marking may be considered.

(**) the use of the EAN-8 on despatch units is justified only when the surface necessary for printing EAN-13 or ITF-14 is not available, and when the EAN-8 symbol can be printed under the proper conditions ; hence this is exceptional (if not theoretical).

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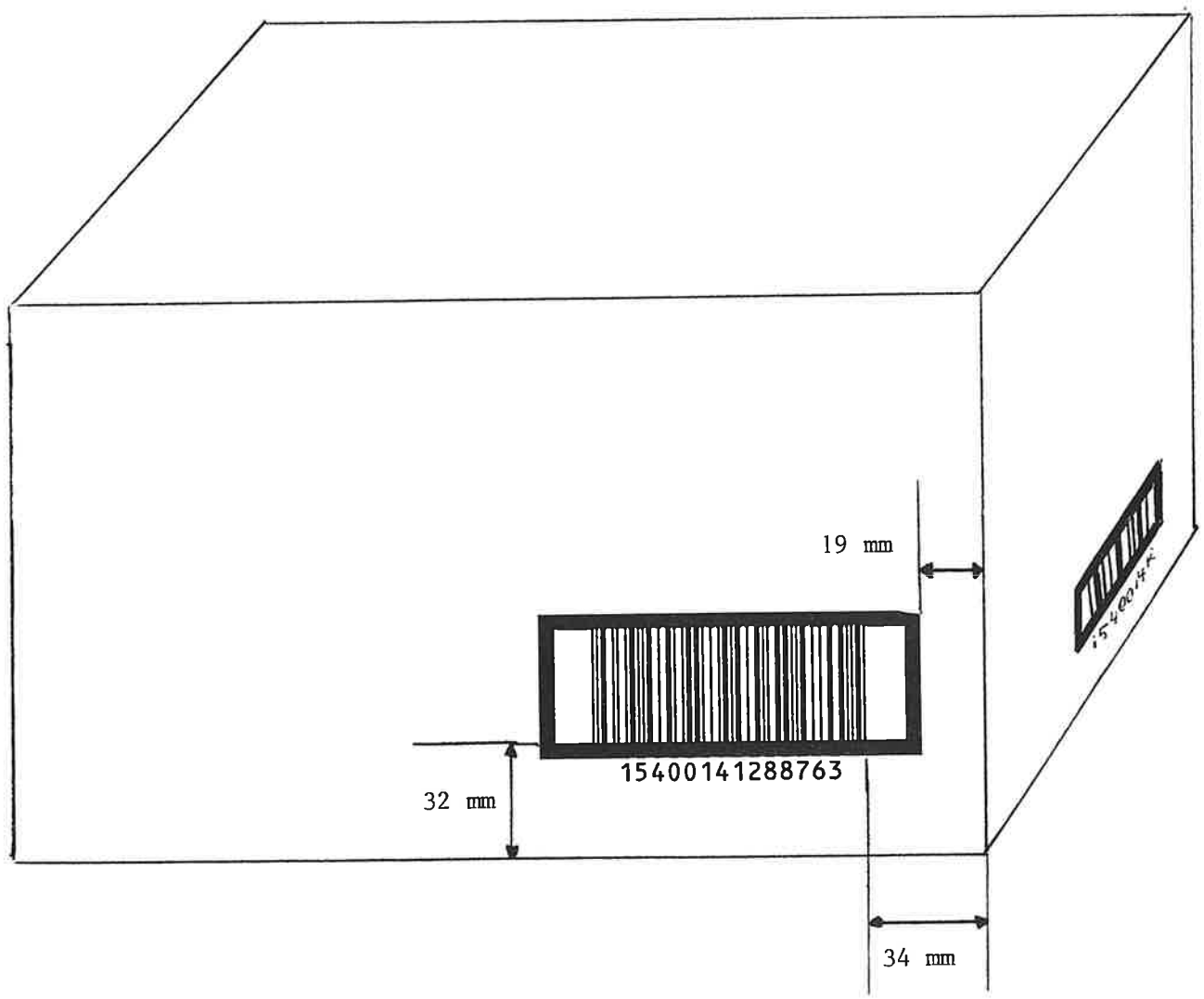
APPENDIX 6 : RECOMMENDATIONS FOR LOCATING THE SYMBOL (EAN OR ITF) ON DESPATCH UNITS

* IF POSSIBLE SYMBOL PRINTED ON ALL 4 VERTICAL SIDES ; OTHERWISE ON TWO ADJACENT VERTICAL SIDES ; IF ONLY ONE SYMBOL CAN BE APPLIED THE SIDE SHOULD BE CHOSEN TAKING INTO ACCOUNT THE CONVEYER CONSTRAINTS AND THE LIKELYHOOD THAT THE SIDE WILL BE VISIBLE IN WAREHOUSES AND IN DISTRIBUTION.

* THE LOWER EDGE OF THE BARS OF THE SYMBOL MUST BE LOCATED AT A GIVEN DISTANCE FROM THE LOWER EDGE OF THE SIDE (SEE DIAGRAM BELOW).

* THE OUTER EDGES OF THE FIRST AND LAST BARS OF THE SYMBOL MUST NECESSARILY BE LOCATED AT A MINIMUM DISTANCE FROM THE VERTICAL EDGES OF THE SIDE (SEE DIAGRAM BELOW).



APPENDIX 7 : DENSITY, REFLECTANCE FACTOR AND PCS FOR EAN SYMBOLS

LIGHT BARS		DARK BARS		MINIMUM PCS RL - RD / RL
D	RL	D	RD	
0	100.0	.300	50.1	.499
.025	94.4	.365	43.1	.543
.050	89.1	.430	37.1	.583
.075	84.1	.495	32.0	.619
.100	79.4	.560	27.6	.653
.125	74.9	.625	23.7	.683
.150	70.8	.690	20.4	.712
.175	66.8	.755	17.6	.737
.200	63.1	.820	15.1	.760
.250	56.2	.950	11.2	.801
.275	53.1	1.015	9.6	.818
.300	50.1	1.080	8.3	.834
.325	47.3	1.145	7.2	.849
.350	44.7	1.210	6.2	.862
.375	42.2	1.275	5.3	.874
.400	39.9	1.340	4.6	.886
.425	37.5	1.405	3.9	.896
.450	35.5	1.470	3.4	.904
.475	33.5	1.535	2.9	.914
.500	31.6	1.600	2.5	.921

APPENDIX 8 : DENSITY AND REFLECTANCE FACTOR FOR ITF SYMBOLS

LIGHT BARS		DARK BARS		MINIMUM PCS RL - RD / RL
D	MINIMUM RL	D	MAXIMUM RD	
.097	≥ 80	.699	20.00	.75
.125	75	.727	18.75	.75
.155	70	.757	17.50	.75
.187	65	.789	16.25	.75
.222	60	.824	15.00	.75
.260	55	.861	13.75	.75
.301	50	.903	12.50	.75
.347	45	.949	11.25	.75
.398	40	1.000	10.00	.75
.456	35	1.058	8.75	.75
.523	30	1.125	7.50	.75
.602	25	1.204	6.25	.75

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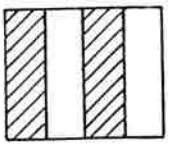
APPENDIX 9 : ITF SYMBOL-MARKING - LOGICAL STRUCTURE OF THE CHARACTERS AND THE SYMBOL

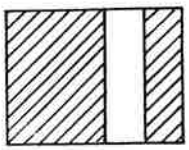
* IN THIS APPENDIX : 0 = narrow segment (bar or space)
1 = wide segment (bar or space) (2.5. times the width of the narrow segment)

* PATTERN OF THE START GUARD :
(left-hand side of symbol)



= 4 narrow segments

* PATTERN OF THE STOP GUARD :
(right-hand side of symbol)



1 wide segment followed by 2 = narrow segments

* TABLE FOR DIGIT REPRESENTATION :

1 CHARACTER = 2 WIDE SEGMENTS AND 3 NARROW SEGMENTS

VALUE OF DIGIT	COMBINATION OF WIDE (1) AND NARROW BARS (0)				
0	0	0	1	1	0
1	1	0	0	0	1
2	0	1	0	0	1
3	1	1	0	0	0
4	0	0	1	0	1
5	1	0	1	0	0
6	0	1	1	0	0
7	0	0	0	1	1
8	1	0	0	1	0
9	0	1	0	1	0

* METHOD OF SYMBOL-MARKING DATA CHARACTERS :

Step 1 : Number the digits from right to left (necessarily an even number)

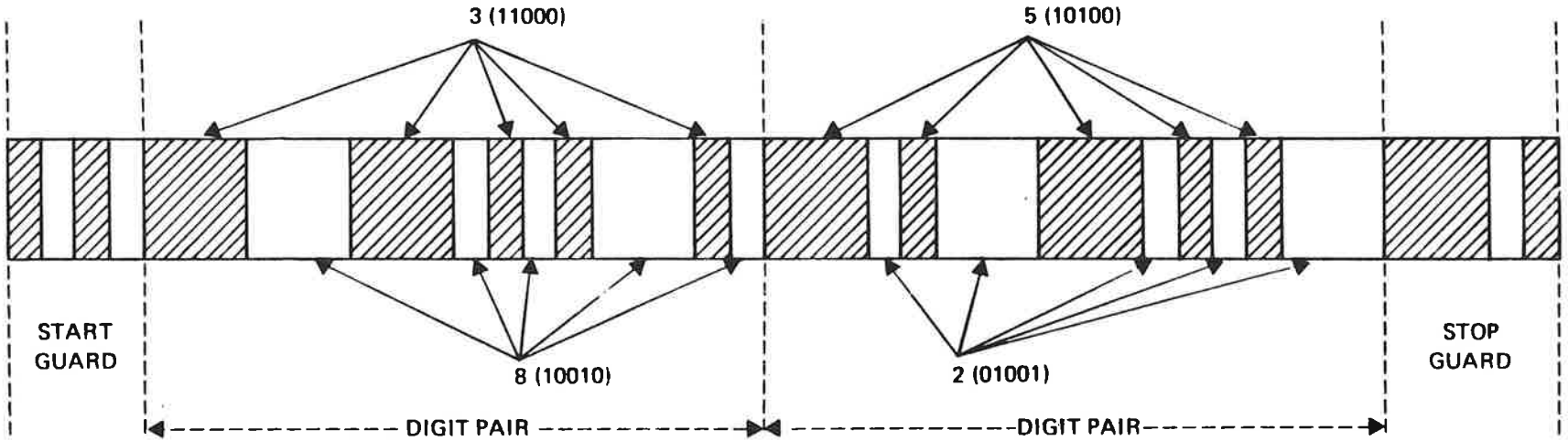
Step 2 : Form digit pairs

Step 3 : In each digit pair :
- the left-hand character is represented by bars and the right-hand character is represented by spaces.
- these bars and spaces are placed alternatively, beginning on the left with the first bar of the left-hand character.

* SEE EXAMPLE ON THE FOLLOWING PAGE

APPENDIX 9 (CONTINUED) : ITF SYMBOL-MARKING - EXAMPLE OF ITF SYMBOL-MARKING

EXAMPLE : SYMBOL-MARKING THE NUMBER 3852



NOTE ON THE LENGTH OF THE ITF-14 AND ITF-16 SYMBOLS

START GUARD	4 NARROW SEGMENTS
STOP GUARD	1 WIDE SEGMENT + 2 NARROW SEGMENTS
SYMBOL-MARKING 14 DIGITS	14 (2 WIDE SEGMENTS + 3 NARROW SEGMENTS)
SYMBOL-MARKING 16 DIGITS	16 (2 WIDE SEGMENTS + 3 NARROW SEGMENTS)

HENCE, IN ALL :

14 DIGIT SYMBOL :	48 NARROW SEGMENTS + 29 WIDE SEGMENTS ; IN TOTAL LENGTH, EQUIVALENT TO 120.5 NARROW SEGMENTS.
16 DIGIT SYMBOL :	54 NARROW SEGMENTS + 33 WIDE SEGMENTS ; IN TOTAL LENGTH, EQUIVALENT TO 136.5 NARROW SEGMENTS.

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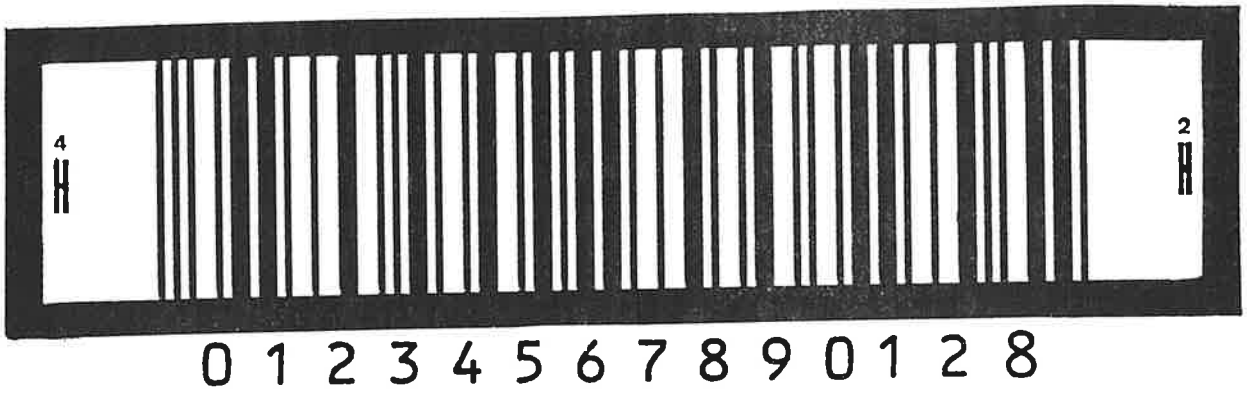
APPENDIX 10 : ITF SYMBOL-MARKING - GENERAL CONSTRUCTION OF THE SYMBOL

A. According to the present specification.



B. According to the former specification.

(This presentation which is still valid should be progressively replaced by the symbol presentation given under A).

APPENDIX 11 : NOMINAL DIMENSIONS OF ITF SYMBOLS

(this diagram is not intended to be used as a basis for measurement)

* NOMINAL VALUE OF A NARROW SEGMENT : 1.016 mm,
  OF A WIDE SEGMENT : 2.540 mm
* NOMINAL WIDTH OF A DIGIT PAIR : 4 x 2.54 + 6 x 1.016 = 16.256 mm
* THE SPACE BETWEEN CENTRE LINES OF ADJACENT HUMAN READABLE CHARACTERS IS 4.57 mm.

(*) Required minimum value : 10.2 mm

$$d1 = \underbrace{\frac{n \times 16.256\ mm}{2}}_{\text{width of the bars representing the data characters}} + \underbrace{8.636\ mm}_{\text{width of the start and stop guards}} \quad (n = \text{number of digits})$$

$$d2 = d1 + \underbrace{(2 \times 10.9\ mm)}_{\text{width of light margins}} + \underbrace{(2 \times 3\ mm)}_{\text{width of H-marks}} + \underbrace{(2 \times 4.8\ mm)}_{\text{width of bearer bar}}$$

APPENDIX 12 : ITF SYMBOL-MARKING ; RULES FOR APPLYING THE MAGNIFICATION FACTOR TO THE NOMINAL DIMENSIONS ; MAIN DIMENSIONS AT VARIOUS MAGNIFICATION FACTORS

DIMENSIONS NOT AFFECTED BY THE APPLICATION OF A MAGNIFICATION FACTOR	DIMENSIONS DIRECTLY AFFECTED BY THE APPLICATION OF A MAGNIFICATION FACTOR
- BEARER BAR - HEIGHT AND FORMAT OF THE HUMAN READABLE CHARACTERS	- ALL BARS AND SPACES IN THE SYMBOL - THE LIGHT MARGINS SITUATED TO THE RIGHT AND LEFT OF THE SYMBOL - HEIGHT OF THE BARS

MAIN DIMENSIONS OF THE ITF SYMBOLS (in millimeters)

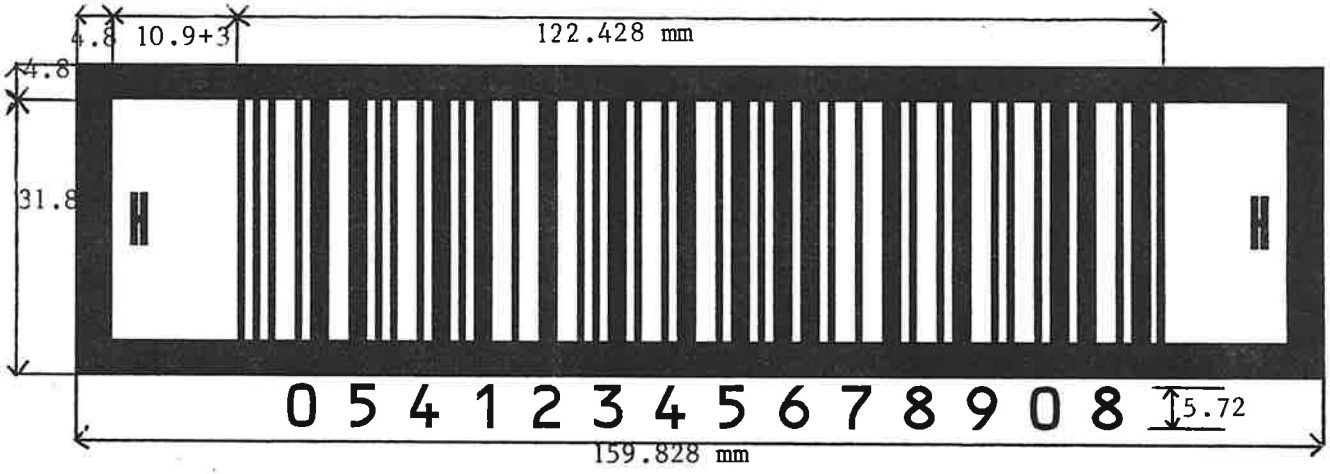
MAGNIFI-CATION FACTOR	THICKNESS NARROW SEGMENT	THICKNESS WIDE SEGMENT	WIDTH LIGHT MARGINS		MINIMUM HEIGHT OF BARS OF THE SYMBOL	DIMENSIONS EXCLUDING THE BEARER BAR		DIMENSIONS INCLUDING THE BEARER BAR	
			RECOMMENDED	MINIMUM		Width	Height	Width	Height
1.2	1.219	3.048	13.1	12.2	38.2		38.2		
1.1	1.118	2.794	12	11.2	35.0	width = (M x 1)	35.0	Internal width	Internal
1	1.016	2.540	10.9	10.2	31.8	+ 6 mm	31.8	+ 9.6 mm	height
0.9	0.914	2.286	9.8	9.1	28.7	When :	28.7		+ 9.6 mm
0.8	0.813	2.032	8.7	8.1	25.4	$l = \frac{n \times 16.256}{2}$	25.4		
0.7	0.711	1.778	7.1	7.1	22.3		22.3		
0.625	0.635	1.588	6.4	6.4	19.8	+ 30.436 mm	19.8		

The internal and external dimensions of the bearer bar presented in this table are calculated on the basis of the recommended width of the light margins.

APPENDIX 13 : ITF-14 SYMBOL : MAIN DIMENSIONS AT VARIOUS MAGNIFICATION FACTORS

* NOMINAL VALUE OF A NARROW SEGMENT : 1.016 mm
  OF A WIDE SEGMENT : 2.540 mm.
* NOMINAL WIDTH OF A DIGIT PAIR : 4 x 2.54 + 6 x 1.016 = 16.256 mm
* THE SPACE BETWEEN CENTRE LINES OF ADJACENT HUMAN READABLE CHARACTERS IS 4.57 mm.

ITF-14 SYMBOL



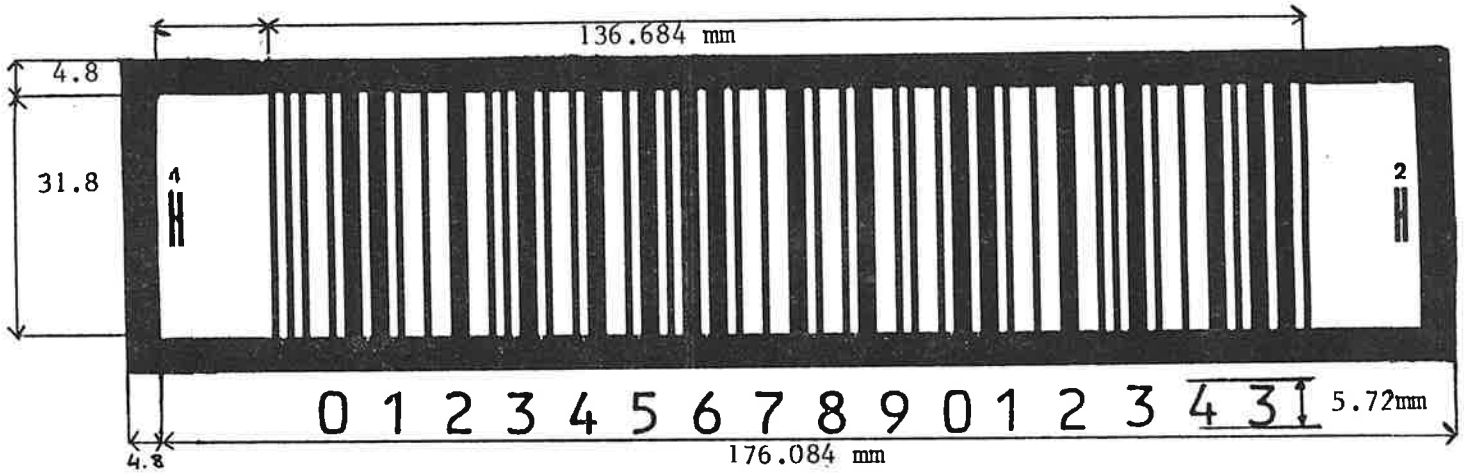
MAGNIFICATION FACTOR	THICKNESS NARROW SEGMENT	THICKNESS WIDE SEGMENT	WIDTH LIGHT MARGINS		MINIMUM HEIGHT OF BARS OF THE SYMBOL	DIMENSIONS EXCLUDING THE BEARER BAR		DIMENSIONS INCLUDING THE BEARER BAR	
			RECOMMENDED	MINIMUM		Width	Height	Width	Height
1.2	1.219	3.048	13.1	12.2	38.2	179.114	38.2	188.714	47.8
1.1	1.118	2.794	12	11.2	35.0	164.671	35.0	174.271	44.6
1	1.016	2.540	10.9	10.2	31.8	150.228	31.8	159.828	41.4
0.9	0.914	2.286	9.8	9.1	28.7	135.785	28.7	145.385	38.3
0.8	0.813	2.032	8.7	8.1	25.4	121.342	25.4	130.942	35.0
0.7	0.711	1.778	7.1	7.1	22.3	105.900	22.3	115.500	31.9
0.625	0.635	1.588	6.4	6.4	19.8	95.318	19.8	104.918	29.4

The internal and external dimensions of the bearer bar presented in this table are calculated on the basis of the recommended width of the light margins.

APPENDIX 14 : ITF-16 SYMBOL : MAIN DIMENSIONS AT VARIOUS MAGNIFICATION FACTORS

* NOMINAL VALUE OF A NARROW SEGMENT : 1.016 mm
  OF A WIDE SEGMENT : 2.540 mm.
* NOMINAL WIDTH OF A DIGIT PAIR : 4 x 2.54 + 6 x 1.016 = 16.256 mm
* THE SPACE BETWEEN CENTRE LINES OF ADJACENT HUMAN READABLE CHARACTERS IS 4.57 mm.

ITF-16 SYMBOL



MAGNIFICATION FACTOR	THICKNESS NARROW SEGMENT	THICKNESS WIDE SEGMENT	WIDTH LIGHT MARGINS		MINIMUM HEIGHT OF BARS OF THE SYMBOL	DIMENSIONS EXCLUDING THE BEARER BAR		DIMENSIONS INCLUDING THE BEARER BAR	
			RECOMMENDED	MINIMUM		Width	Height	Width	Height
1.2	1.219	3.048	13.1	12.2	38.2	198.621	38.2	208.221	47.8
1.1	1.118	2.794	12	11.2	35.0	182.552	35.0	192.152	44.6
1	1.016	2.540	10.9	10.2	31.8	166.484	31.8	176.084	41.4
0.9	0.914	2.286	9.8	9.1	28.7	150.416	28.7	160.016	38.3
0.8	0.813	2.032	8.7	8.1	25.4	134.347	25.4	143.947	35.0
0.7	0.711	1.778	7.1	7.1	22.3	117.279	22.3	126.879	31.9
0.625	0.635	1.588	6.4	6.4	19.8	105.478	19.8	115.078	29.4

The internal and external dimensions of the bearer bar presented in this table are calculated on the basis of the recommended width of the light margins.

APPENDIX 15 : CORRESPONDENCE TABLE SHOWING RELATION BETWEEN MAXIMUM PRINT-GAIN VARIATION AND MINIMUM MAGNIFICATION FACTOR TO BE APPLIED FOR ITF SYMBOLS.

CONTINUOUS SEQUENCE VALUES OF M

V Maximum variation of print gain (mm)	M Minimum value of magnific. factor to be applied
± 0.127	0.625
± 0.203	0.70
± 0.244	0.80
± 0.274	0.90
± 0.305	1.00
± 0.335	1.10
± 0.366	1.20

CONTINUOUS SEQUENCE VALUES OF V

V Maximum variation of print gain (mm)	M Minimum value of magnific. factor to be applied
± 0.15	0.65
± 0.18	0.68
± 0.21	0.71
± 0.24	0.79
± 0.27	0.89
± 0.30	0.99
± 0.33	1.08
± 0.36	1.18

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APPENDIX 16 : SPECIFICATIONS FOR MANUFACTURING THE FILMMASTER

* WHEN THE FILMMASTER IS ORDERED, THE FOLLOWING POINTS MUST BE SPECIFIED

A. - POSITIVE OR NEGATIVE
B. - EMULSION UP OR DOWN
C. - VALUE OF THE NUMBER TO BE SYMBOL-MARKED
D. - VALUE OF M (MAGNIFICATION FACTOR)
E. - VALUE OF BWR (BAR-WIDTH REDUCTION)

* THE SPECIFICATIONS FOR THE DIMENSIONS OF THE FILMMASTER ARE AS FOLLOWS :

M : MAGNIFICATION FACTOR
BWR : BAR WIDTH REDUCTION

	VALUES OF THE DIMENSIONS	TOLERANCES
° WIDTH OF A WIDE OR NARROW SEGMENT OF THE SYMBOL	- IDEAL NOMINAL DIMENSIONS : WIDE SEGMENT : 2.540 mm NARROW SEGMENT : 1.016 mm - TO BE CORRECTED ACCORDING TO M AND BWR	± M x 0.013 mm
° WIDTH OF EACH PAIR OF DATA CHARACTERS	- IDEAL NOMINAL DIMENSIONS : 16.256 mm - TO BE CORRECTED ACCORDING TO M	± M x 0.025 mm
° WIDTH OF THE START AND STOP GUARD CHARACTERS	- IDEAL NOMINAL DIMENSIONS : START GUARD AND STOP GUARD CHARACTERS : 4.064 mm - TO BE CORRECTED ACCORDING TO M AND BWR	± M x 0.017 mm
° HEIGHT OF BARS, THICKNESS OF BEARER BAR, MINIMUM WIDTH OF LIGHT MARGIN	SEE APPENDICES 12, 13 AND 14	± 0.127 mm
° OTHER DIMENSIONS OF THE SYMBOL	SEE APPENDIX 12	± 0.254 mm

EAN vademecum

APPENDIX 17 : ITF SYMBOL MARKING DETERMINING THE MAGNIFICATION FACTOR AND BAR-WIDTH REDUCTION ON THE BASIS OF THE PRINTABILITY RANGE

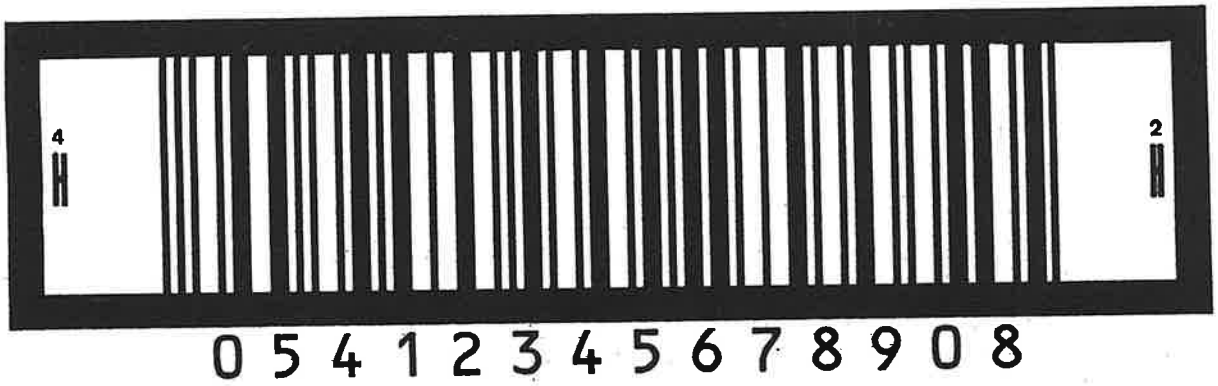
PRINT RANGE	MAGNIFICATION FACTOR	BAR WIDTH REDUCTION (MM)
0 - 0	0.8	0
0 - 1	0.9	0.10
1 - 1	0.9	0.10
0 - 2	0.9	0.10
1 - 2	0.9	0.10
2 - 2	0.9	0.10
0 - 3	1.0	0.20
1 - 3	1.0	0.20
2 - 3	1.0	0.20
3 - 3	1.0	0.20
0 - 4	1.0	0.20
1 - 4	1.0	0.20
2 - 4	1.0	0.20
3 - 4	1.0	0.20
4 - 4	1.0	0.20
0 - 5	1.1	0.30
1 - 5	1.1	0.30
2 - 5	1.1	0.30
3 - 5	1.1	0.30
4 - 5	1.1	0.30
5 - 5	1.1	0.30
0 - 6	1.2	0.35
1 - 6	1.2	0.40
2 - 6	1.2	0.40
3 - 6	1.2	0.40
4 - 6	1.2	0.40
5 - 6	1.2	0.40
6 - 6	1.2	0.40
0 - 7	1.2	0.35
1 - 7	1.2	0.40
2 - 7	1.2	0.40
3 - 7	1.2	0.40
4 - 7	1.2	0.40
5 - 7	1.2	0.40
6 - 7	1.2	0.40
7 - 7	1.2	0.40

APPENDIX 18 : ITF SYMBOL-MARKING : RECOMMENDATION FOR THE INSERTION OF A GAUGE SECTION FOR ROUTINE PRINT QUALITY CHECKS

Left H : Section selected with the next level up from the highest reading obtained during printability gauge tests

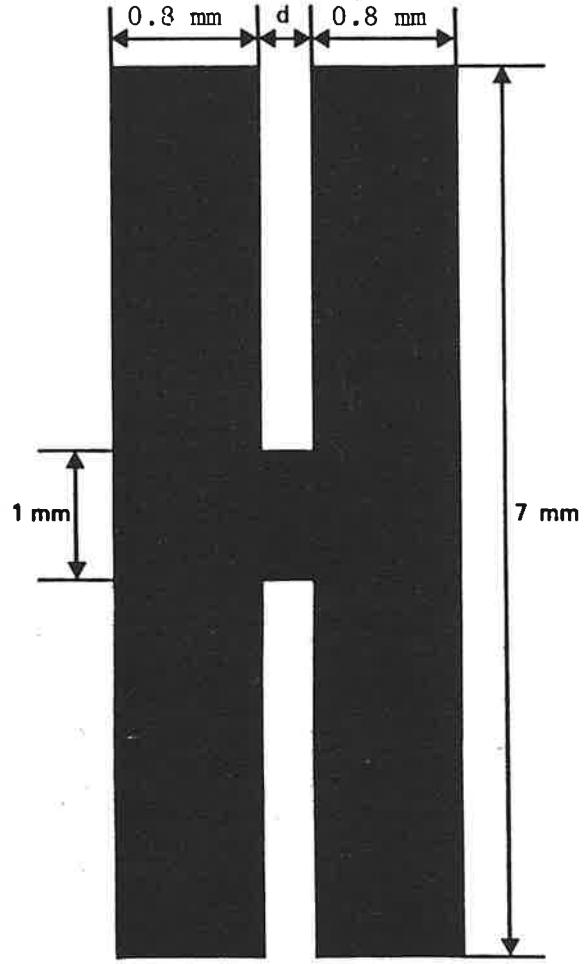
Right H : Section selected with the lowest reading obtained during printability gauge tests.

LOCATION OF H-SECTIONS



(H section number "1-7" to be printed as shown above)

DIMENSIONS OF THE GAUGE SECTION PRINTED WITH THE SYMBOL



Left H : d = (0.1 mm x SH) + 0.1 mm
Right H : d = 0.1 mm x SL
SH : Highest printability range number
SL : Lowest printability range number
Note : If P.G. reading is 0, then gauge section d = 0.1 mm

APPENDIX 19 : SPECIFICATIONS FOR THE DIMENSIONS AND TOLERANCES IN THE PRINTED SYMBOL

THESE SPECIFICATIONS DO NOT REQUIRE THE USE OF VERIFIERS ; GAUGES, WHICH MUST BE CONSTRUCTED ON THE BASIS OF THE TOLERANCES GIVEN BELOW FOR THE DIMENSIONS OF THE WIDE AND NARROW BARS MAY BE USED

	WIDTH AND TOLERANCE WIDE AND NARROW SEGMENTS			WIDTH AND TOLERANCE DIGIT PAIR (*)		WIDTH AND TOLERANCE SYMBOL START AND STOP GUARD (*)		
MAGNIFICATION FACTOR (M)	IDEAL WIDTH NARROW BAR	IDEAL WIDTH WIDE BAR	TOLERANCE NARROW AND WIDE BARS	IDEAL WIDTH DIGIT PAIR	TOLERANCE WIDTH DIGIT PAIR	IDEAL WIDTH START GUARD	IDEAL WIDTH STOP GUARD	TOLERANCE START & STOP GUARD (*)
1.2	1.219	3.048	± 0.36 mm	19.506	± 0.70 mm	4.876	5.486	± 0.47 mm
1.1	1.118	2.794	± 0.33 mm	17.884	± 0.64 mm	4.472	5.030	± 0.43 mm
1	1.016	2.540	± 0.30 mm	16.256	± 0.58 mm	4.064	4.572	± 0.39 mm
0.9	0.914	2.286	± 0.27 mm	14.628	± 0.52 mm	3.656	4.114	± 0.35 mm
0.8	0.813	2.032	± 0.24 mm	13.006	± 0.46 mm	3.252	3.658	± 0.31 mm
0.7	0.711	1.778	± 0.20 mm	11.378	± 0.41 mm	2.844	3.20	± 0.27 mm
0.625	0.635	1.588	± 0.13 mm	10.162	± 0.36 mm	2.540	2.858	± 0.24 mm

NOTE THESE TOLERANCES MAY BE INTERPOLATED TO OBTAIN INTERMEDIATE VALUES OF M GREATER THAN 0.714. NOTE THAT FOR VALUES OF M LESS THAN 0.714 THE TOLERANCE IS LIMITED BY THE REQUIREMENT THAT THE ABSOLUTE MINIMUM BAR OR SPACE WIDTH BE 0.508 MM.

- THE RECOMMENDED WIDTH AND THE IMPERATIVE MINIMUM WIDTH OF THE LIGHT MARGINS TO THE RIGHT AND LEFT OF THE SYMBOL ARE PRESENTED IN APPENDIX 12.
- FOR THE HEIGHT OF THE BARS AND THE HEIGHT AND LOCATION OF THE HUMAN READABLE CHARACTERS (SEE APPENDIXES 12, 13 AND 14 FOR THE NOMINAL DIMENSIONS) A TOLERANCE OF ± 0.5 mm IS ALLOWED.

(*)THE TOLERANCES ARE DEFINED FOR LABEL PRINTING EQUIPMENT ; IN SOURCE-MARKING, THE TOLERANCES WILL BE MET PROVIDED THE FILMMASTER MANUFACTURER RESPECTS THE TOLERANCES ALLOWED HIM AND THE PRINTER RESPECTS THE SPECIFIED PROCEDURES.

APPENDIX 20 : IDENTIFICATION STRUCTURES OF VARIABLE QUANTITY DESPATCH UNITS

SOLUTION	SYMBOL-MARKING TYPE	CONTENTS OF THE MAIN SYMBOL																CONTENTS OF THE ADD-ON					
		16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	6	5	4	3	2	1
1) EAN for international exchanges	ITF-14 + ITF-6 ADD-ON	(0)	(0)	LI =9	P1	P2	P3 I1	I1 I2	I2 I3	I3 I4	I4 I5	I5 I6	I6 I7	I7 I8	I8 I9	I9 I10	C1	Q1	Q2 [1]	Q3 [1]	Q4	Q5	C2
2) EAN for strictly national uses (1)	ITF-16 + ITF-6 ADD-ON	S	VL	LI =9	P1	P2	P3 I1	I1 I2	I2 I3	I3 I4	I4 I5	I5 I6	I6 I7	I7 I8	I8 I9	I9 I10	C1	Q1	Q2	Q3	Q4	Q5	C2
3) UPC	ITF-14 + ITF-6 ADD-ON	(0)	(0	LI =9	P1 =0	NS =2	M1	M2	M3	M4	M5	I1	I2	I3	I4	I5	C1	Q1	Q2	Q3	Q4	Q5	C2

NS : UPC Number System (NS = 2 for random weight)
M1-M5 : Manufacturer number in the UPC structure
I1....: Identification of the despatch unit
C1 : Check-digit of the main symbol
Q1-Q5 : Number of units (kilos, pounds, meters, etc...) contained in the despatch unit
C2 : Check-digit of the add-on
P1P2P3: Prefix digits assigned by EAN to Numbering Organizations
S : Spare digit available in the ITF-16 solution
LI : Logic indicator, which takes value 9 in position 14.
VL : Logistical variant.

Remarks :
a) Value 9 in position 14 is strictly reserved as logic indicator to announce the presence of the ITF-6 add-on of variable quantity despatch units
b) The identification I1... of the despatch unit should be defined according to rules guaranteeing that the numbers are unambiguous (see Appendix 21)
c) The C1 and C2 check-digits are calculated according to the standard EAN algorithm in Appendix 2.
d) The rules to be applied in the case of change in the measurement unit are given in Appendix 22.

1 Same implementation conditions of this solution as for ITF-16 in its application to fixed quantity despatch units (See EAN Gentleman's Agreement).

APPENDIX 21 : RULES FOR IDENTIFICATION OF VARIABLE QUANTITY DESPATCH UNITS

* Every Numbering Organization is responsible for defining the rules applied to the identification digits I1 I2... to be included in its national specifications (see Appendix 20) : these rules must guarantee that the numbers are unambiguous.

* Choice of the I1 I2... structure is the responsibility of the company symbol-marking the despatch unit. This may be a manufacturer, a processor company or even a retailer for a strictly internal use of this symbol-marking.

* Generally this structure is the same as that for fixed quantity despatch units : manufacturer number, followed by a number identifying the despatch unit within the manufacturer's range (see modules 2 and 3 of the specifications).

Remark :

If the despatch unit contains consumer units which are themselves marked with an EAN-13 symbol under prefix 02 or 20 to 29, the product number contained in this symbol may possibly be used in the construction of the DU identification, if the Numbering Organization and the operators so wish. EAN does not recommend this practice. Guidelines to avoid the introduction of ambiguities in the numbers in the case this practice is implemented are given in Appendix 21 bis.

APPENDIX 21 BIS : GUIDELINES FOR THE POSSIBLE USE OF THE CONSUMER UNIT PRODUCT NUMBER IN THE CONSTRUCTION OF THE DESPATCH UNIT IDENTIFICATION

If the despatch unit contains consumer units which are themselves marked with an EAN-13 symbol under prefix 02 or 20 to 29, the product number used in this EAN-13 symbol may in certain cases be used in the ITF-14 DU identification. Three distinct cases are to be considered :

1st case : The EAN-13 number of the CU contains a number specific to the distributor. In this case, it can not be used by the manufacturer or the processor company to construct the DU number. Nevertheless it may be used by the distributor to symbol-mark his DU's provided it has a strictly internal use.

2nd case : The EAN-13 number of the CU is based on a nationally standardized number, which provides for a precise identification of the nature of the product, but not of its origin. This number may be used in the DU identification only if it is preceded by the manufacturer number. Example :

		Standard number	Price of the CU	Check Digit
EAN-13 of the CU =	02	S1 S2 S3 S4 S5	V1 V2 V3 V4 V5	C

ITF-14 of the DU =	9	P1 P2 P3	M1 M2 M3 M4	S1 S2 S3 S4 S5	C
		Prefix of the Numbering Organization	Manufacturer Number	Standard number	Check Digit

3rd case : The EAN-13 number of the CU includes a number structured into "manufacturer number + article number". This number may be used in the DU identification provided some precautions are taken. Example :

		Short Manufacturer Number	Article Number	Price of the CU	Check Digit
EAN-13 of the CU =	02	M1 M2 M3	I1 I2	V1 V2 V3 V4 V5	C

ITF-14 of the DU =	9	P1 P2 P3	X1 X2 X3 X4	M1 M2 M3 I1 I2	C
		Prefix of the Numbering Organization	"Dummy" manufacturer number	Short product number	Check Digit

The fixed dummy manufacturer number (e.g. 9999) avoids any ambiguity with other DU numbers. It is predefined by the Numbering Organization.

Remark : If a Numbering Organization includes these guidelines in its specifications, it should take into consideration the specific options which it has taken to deal with the variable quantity consumer units.

APPENDIX 22 : RULES REGARDING THE QUANTITY ADD-ON OF VARIABLE QUANTITY DESPATCH UNITS

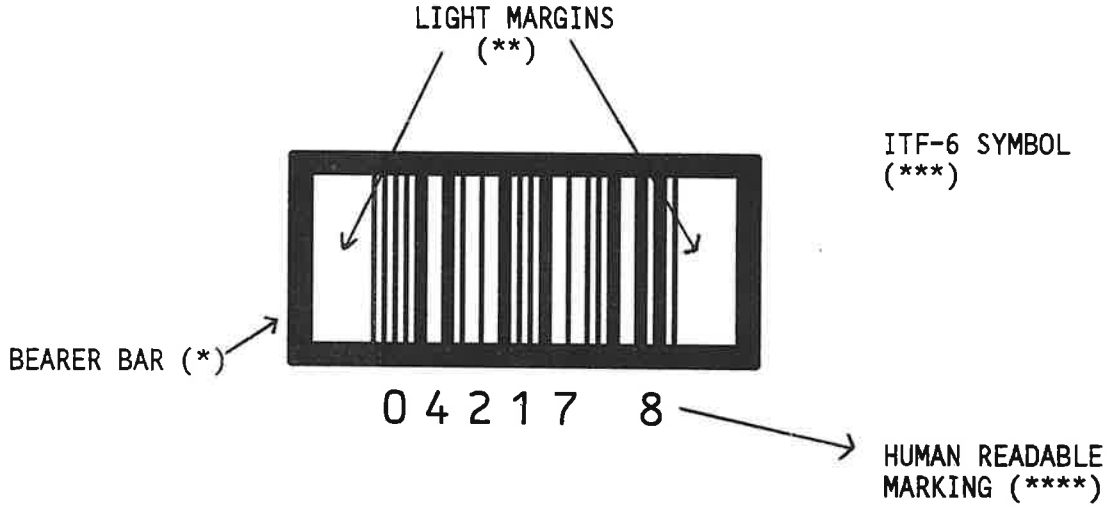
* This add-on containing 5 digits and a check-digit, expresses the **quantity** of products contained in the Despatch Unit. Any indication of **value** is excluded from this add-on.

* The unit of measurement is implicit information (contained in the files), which must be communicated by the manufacturer or processor company to their clients together with the identificication number and the characteristics of the despatch unit.

* The decimal point in the 5 digits field is floating. The company source-marking the goods must define the unit of measurement related to each product and the decimal point if used. This information will be communicated to the distributors together with the product information.

* When a despatch unit is sold in different units of measurement (to express the quantity in the add-on), separate DUN-14 (or DUN-16) numbers must be allocated to each different unit of measurement.

APPENDIX 23 : ITF-6 ADD-ON - GENERAL CONSTRUCTION OF THE SYMBOL



(*) The bearer bar is mandatory in techniques that do require printing plates. On labels, it should be printed, whenever technically feasible.
The bearer bar has a constant thickness of 4.8 mm and must completely surround the symbol, butting directly against the top and bottom of the bars of the symbol.
When the main symbol (ITF-14 or ITF-16) and the ITF-6 add-on are printed at the same time, it is permissible to print one bearer bar surrounding both symbols.

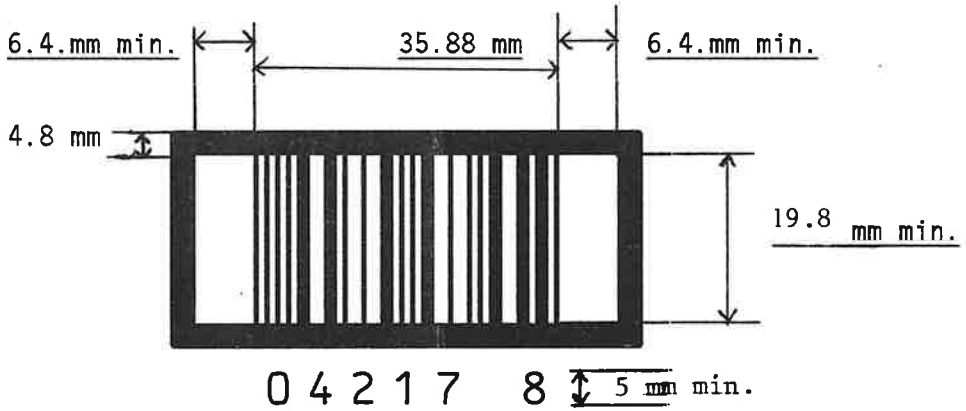
(**) The light margins are compulsory, whether or not there is a bearer bar.

(***) The logical construction of the symbol meets the specifications in Appendices 9 and 9 (cont.) (start guard - 3 digit pairs - stop guard).

(****) The human readable characters must represent the 6 digits encoded in the symbol. The choice of the type of characters is free. The minimum character height is set at 5 mm.

APPENDIX 24 : ITF-6 ADD-ON - SYMBOL DIMENSIONS AT THE MINIMUM MAGNIFICATION FACTOR (0.625) - TOLERANCES - LOCATION OF THE SYMBOL

Important note : The dimensions which are underlined are directly affected by the application of the magnification factor. The other dimensions are independent of the magnification factor.



DIMENSIONS AT THE MINIMUM MAGNIFICATION FACTOR : 0.625

Magnification factor and tolerances of the printed symbol : The magnification factor is free (between 0.625 and 1.2) provided the tolerances of Appendix 19 are respected. This factor may be different from the one applied to the main symbol.

Location of the symbol : The specifications of Appendix 6 apply however considering that :

a) the minimum distance of 19 mm to a vertical edge of the unit applies to the right hand edge of the bearer bar which contains the ITF-6 add-on ; if there is no bearer bar the outer edge of the last bar of the ITF-6 add-on should not be closer than 34 mm to a vertical edge of the unit.

b) if the main symbol and the add-on symbol both have a bearer bar, the distance between bearer bars may be minimal (no specified distance) ; if there is only one bearer bar surrounding both the main symbol and the add-on, the minimum distance between both symbols is equal to the clear area which is specified for the main symbol.

c) variable quantity units may be marked on only one side, but this should always be a vertical side.

GENTLEMAN'S AGREEMENT ON THE IMPLEMENTATION OF SPECIFICATIONS ON NUMBERING AND SYMBOL-MARKING DESPATCH UNITS

PRELIMINARY REMARKS

According to the general principles agreed upon when EAN was constituted - and more particularly under the terms of the Memorandum of Agreement on the formation of EAN - the General Assembly of EAN can decide to enlarge its scope to fields which were excluded when signing the agreement in 1977.

The General Assembly has approved - on May 7th, 1982 - the specifications concerning identification and marking of the despatch units that the members of EAN are bound to respect.

The Memorandum of Agreement, signed on February 3rd, 1977, must in consequence be completed, more particularly part II which states only the principles of coding of consumer units adopted at this time.

The points underneath, should apparently be included in the complement of the Memorandum of Agreement of 1977.

FIRST POINT

The member countries of the International Article Numbering Association (EAN) have decided to proceed to standardising the identification and symbol marking of despatch units. The specifications of these standards are issued together with this Gentleman's Agreement.

SECOND POINT

Each country can take into account one or a combination of the several solutions described in the specifications.

As soon as the respective decision by the Numbering Organizations is taken, each Numbering Organization shall inform the EAN secretariat of the chosen solution. After completion of the national specifications and before publishing them, the Numbering Organizations have to submit the draft to the EAN secretariat for examination.

Each Numbering Organization must make its members aware of the existence of all the solutions described in the EAN specifications. The EAN secretariat will constantly inform the Numbering Organizations of the solutions adopted by the several member-countries.

THIRD POINT

The equipment manufacturers, in designing hardware and software, must take into account all the solutions described in the specifications. The specifications constitute a unique and exclusive standard.

FOURTH POINT

To facilitate implementation of the EAN specifications, countries which wish to use the ITF-16 solution nationally undertake to use ITF-14 in international exchange of goods and related information for a period of three years.

FIFTH POINT

EAN member countries accept that for three years from the date of this agreement the solutions are considered to be experimental. After this period the technical and economic effects of the solutions will be studied. This applies especially to the location recommendations and to the symbol marking of film wrapped items.

SIXTH POINT

The Numbering Organizations undertake to do all in their power to assure the acceptance of imported despatch units of branded goods marked in the system of the country of origin.

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LIST OF NUMBERING AND SYMBOL-MARKING SOLUTIONS FOR DESPATCH UNITS ADOPTED IN THE VARIOUS EAN MEMBER-COUNTRIES - NATIONAL LEVEL (MARCH 1987)

COUNTRY / NUMBERING ORGANIZATION	NUMBERING				SYMBOL-MARKING			
	EAN-13	DUN-14	DUN-16	COMMENTS	EAN-13	ITF-14	ITF-16	COMMENTS
ARGENTINA (CODIGO)	(not yet decided)				(not yet decided)			
AUSTRALIA (APNA)	X	X			X	X		
AUSTRIA (EAN-AUSTRIA)	X				X			
BELGIUM + GRAND DUCHY OF LUXEMBURG (ICODIF)	X	X	X		X	X	X	
BRAZIL (ABAC)	(not yet decided)				(not yet decided)			
CYPRUS (CYPRUS CCI)	X				X			
CZECHOSLOVAKIA (CCCI)	X				X			
DENMARK (DVA)		X				X		
FINLAND (CCC)		X				X		
FRANCE (GENCOD)		X	X			X	X	
GERMANY (CCG)	X				X			
GREECE (HELLCAN)	X				X			
HUNGARY (HCC)		X				X		
ICELAND (IC.EAN CMT)	(not yet decided)				(not yet decided)			
ISRAEL (ICA)	(not yet decided)				(not yet decided)			
ITALY (INDICOD)	X					X		
JAPAN (DCC)		X	X			X	X	
NETHERLANDS (UAC)	X				X	(X)		ITF : not yet included in manual
NEW ZEALAND (NZPNA)	X	X			X	X		
NORWAY (NORSK VAREK.)		X				X		
PAPUA NEW GUINEA (PNGPNA)	X				X			
PORTUGAL (CODIPOR)	(not yet decided)				(not yet decided)			
SOUTH AFRICA (SAANA)	X	X			X	X		
SPAIN (AECOC)		X				X		
SWEDEN (SWEDISH EAN CMT.)		X	X			X	X	
SWITZERLAND (SACV)	X			Provisional decision	X	(X)		ITF : provisional
TAIWAN (ANC OF ROC)	(not yet decided)				(not yet decided)			
UK + IRELAND (ANA)	X				X	X		
USSR (USSR CCI)	(not yet decided)				(not yet decided)			
YUGOSLAVIA (JANA)	(not yet decided)				(not yet decided)			

(1) Application to despatch units of the EAN rules for identifying consumer units.
(2) 1 digit VL.
(3) 2 digit VL - In national exchanges only.
(4) In national exchanges only.

EAN specifications for books and paperbacks magazines and periodicals

Original date of approval : March 1980
Edition 1987

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1. INTRODUCTION

1.1. The need of particular specifications

Published material (newspapers, magazines and books) require special consideration in the application of a number and symbol, among which are :

. The marking of the objects of press should provide a solution not only to the problem of retailers' checkouts but also to that of processing returns (sorting and counting) to wholesalers and publishers. This last aspect implies the reading of a supplementary identification number, which is not required for checkout purposes.

. The numbering of publications and books is already handled by the international systems, ISSN and ISBN, whose nature and level of use imply that, if their rules and principles permit, they should be offered as an alternative within the EAN requirements.

. Although it is essential that a different article number be assigned for each title (or other ISBN or ISSN defined variant), it is accepted that all items might not be subject to the normal procedure for price look-up, i.e. where the article number causes the price to be abstracted from some computer record. Because of the large number of titles involved and the problems of creating and updating price look-up files, price may be encoded within the EAN symbol. The whole EAN however must enable the item to be identified unambiguously.

. Etc...

As in the UNITED STATES, these various reasons have led to the development of particular specifications to deal with these items within the framework of EAN requirements.

1.2. General principles adopted in the solutions provided

*** Introduction of alternatives based on existing international systems**

The solutions adopted in each of these two sectors (press and books) introduce an alternative between an application incorporating the existing international numbering system (ISSN or ISBN) on the one hand and the application of an "EAN-type" solution on the other hand.

It should be stressed that the decision to introduce the ISSN and ISBN systems into the framework of the EAN numbering structure does not stem in any way from consideration for a specific sector of products but from the sole consideration of international systems whose specific characteristics justified their inclusion.

It should be emphasized that EAN reserves the right to modify these specifications at some future date in particular with reference to functional and technical development of these specific systems where

they appear to be incompatible with the objectives pursued by EAN and with the constraints inherent in the applied technologies.

*** Very broad initiative left to the different countries in the choice of solutions**

EAN makes available, through these specifications, a general framework of solutions which can be considered by the EAN Numbering Organizations, working in liaison with firms and Trade Associations concerned.
Options remain open to the following levels :

. A choice by firms and associations concerned with the particular sector (press or books) between the application of a system incorporating the specific international system (ISSN or ISBN) and the application of the "EAN-type" solution.

. For the "EAN-type" solution, the EAN Numbering Organizations define their own numbering rules, with respect of course for the general rules and principles defined in the EAN requirements.

EAN does not intervene in any way in this choice, which therefore is completely delegated to the EAN Numbering Organizations and to the firms and associations themselves, and are implemented under the sole responsibility of the EAN Numbering Organizations.

Remark :
The specifications established by the EAN Numbering Organizations for the publishers have to express clearly that the "EAN-type" solution :
. has been developed on national level to provide a unique solution for national needs.
. at the same time is in accordance with the general rules of EAN, guaranteeing international compatibility.

*** Absolute adherance to the basic principles governing the EAN system**

. The framework defined guarantees the free circulation of goods, whichever solution is adopted within this framework. And, in particular, an EAN-13 number (and symbol) always represents an unambiguous international identification of the item (1 item = 1 title in a given presentation <=> 1 number).

. The solutions defined create no discrimination, a priori between the various publishing or distribution firms concerned by these products and therefore likely to be concerned by these solutions.

. The application of the solutions defined implies no constraint or exclusion as to the marking on the objects of numbers other than the EAN (1), whether these are represented in normal graphic form or in a form that can be read automatically (OCR-A, for example).

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1 Circulation number, publisher's own number, ISSN or ISBN number, etc.

1.3. Definitions

*** Serial publications**

A serial is defined as any publication issued under a constant title in successive parts, usually bearing numerical or chronological designations. Serials include periodicals, yearbooks and monographic series.

*** Books**

This term will be used to designate all printed books and pamphlets, micro-form publications and other specialized printed forms of publications.

2. SOLUTIONS FOR BOOKS AND PAPERBACKS

2.1. Alternative for the numbering of books

1st solution : Application of the "normal" rules for product numbering.

P1 P2 P3	X1 X2 X3 X4 X5 X6 X7 X8 X9	C
Prefix of the Numbering Organization	Number identifying the book in an unambiguous manner and according to the rules defined by the Numbering Organization	Check-digit of the EAN-13 symbol (1)

Note: The definition of the structure of the book number (X1 to X9) is left to each EAN Numbering Organization.

This number may, for example, have a structure in which the manufacturer's number is followed by the product number, or a structure in which the collection number (centrally assigned) is followed by the title number within the collection (for books which may be considered to belong to a collection), or a structure in which the publication number centrally assigned is followed by the price.

2nd solution : Application of the ISBN system.

The general conditions of use of this solution are defined in a contract signed between EAN and ISBN. Publishers wishing to make use of this ISBN solution have to observe the conditions stated by this contract.

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1 Check-digit algorithm : see general EAN specifications.

9 7 8	X1 X2 X3 X4 X5 X6 X7 X8 X9	C
Specific prefix assigned by EAN for the use of ISBN (2)	ISBN number (not including its check digit) identifying the book in a non ambiguous manner	Check-digit of the EAN-13 symbol (1)

Comment : The check digit of the ISBN number is not included in the symbol because it is alphanumerical (modulo 11)

2.2 Technique for applying the symbol to books

2.2.1. The symbol-marking of the book number

The book number is marked with the EAN-13 symbol, to comply with the general EAN specifications concerning the tolerances of the symbols at the production stage of the film master, the process of determining printing conditions (3) and assessing print quality, and the constraints concerning colours, contrast and reflectance.

In addition, this marking is subject to the following constraints or recommendations as to its location :

a. The EAN-13 symbol must not be reduced in height.

b. The symbol must appear on the outside cover of the book, to facilitate payment operations (see Appendix 1), and, possibly, inside the cover as well, for books which are subject to return (see Appendix 2).

2.2.2. Additional capacity for the numbering and symbol-marking

. Generalities

Some publishers may wish to express additional information to the title under a symbolised form in order to meet their internal requirements; e.g. it can be an edition variant (i.e. unchanged reprint, price increase, etc...), which is not distinguished by the ISBN system nor by an EAN type of number. These EAN specifications introduce the possibility to express a number with two or five digits, symbolised by means of an additional part of symbol, called

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1 Check-digit algorithm : see general EAN specifications.
2 The prefix 979 is henceforth reserved for future developments of ISBN.
3 The magnification factor is usually between 0.8 and 1.

"add-on" and located to the right of the EAN-13 symbol and parallel to it. The conditions and clauses of this utilization are the following :

- The add-on should in no way contain information which should properly appear in the main EAN-13 number which identifies the product unambiguously (the EAN-13 number has to be a supplying number and not only an "encashment" number).

- It is reminded that the reading of the add-on by the distributor's cash registers is optional.

- The use of the add-on on books is done under the responsibility of each publisher and to ends which are peculiar to him; this use is of course optional.

- Finally, it is stressed that the prescriptions concerning the use of add-on on books are susceptible to be revised with particular reference to keep pace with the developments in the area of equipment dealing with returns and published material.

. See Appendix 3 for a description of the logical structure of the add-on.

. See Appendix 4 for dimensions, tolerances and location of the add-on relative to the main symbol.

3. SOLUTIONS FOR SERIAL PUBLICATIONS

3.1. Alternative for the numbering of serial publications

1st solution : Application of the "normal" rules for product numbering

P1 P2 P3	X1 X2 X3 X4 X5 X6 X7 X8 X9	C	S1 S2
Prefix of the Numbering Organization	Number identifying the publication in an unambiguous manner and according to the rules defined by the Numbering Organization	Check-digit of the EAN-13 symbol (1)	"Add-on" representing the serial number (2)

* The definition of the internal structure of the publication (X1 to X9) is left to each EAN Numbering Organization.

* The publication number could include the price of the publication

---

1 Check-digit algorithm : See general EAN specifications.
2 The definition of the serial number, which is common to both the solutions presented, will be described further on.

provided that the national legislation allows it. In this case, the price is placed in clearly defined positions in the X1 to X10 field, and is directly usable in the country of publication. On the other hand, as soon as the item leaves the country, the price has no direct significance, and the X1 to X9 area must be interpreted in a general way, without being broken down internally.

2nd solution : Application of the ISSN system.

The general conditions of use of this solution are defined in a contract signed between EAN and ISDS.

9 7 7	X1 X2 X3 X4 X5 X6 X7	Q1 Q2	C	S1 S2
Specific prefix assigned by EAN for the use of ISSN	ISSN number not including its check-digit identifying the publication title	Extra digits to express variants of the same title for special issues with a different standard price or possibly to identify different issues of a daily within one week (see (3) and hereafter : "dailies"). Normal title takes value 00	check-digit of the EAN-13 symbol (1)	"Add-on" representing the serial number (2)

Comment : The check-digit of the ISSN number is not included in the symbol because it is alphanumerical (modulo 11).

Numbering the serial number :

In either solution, the system for numbering the serial number is left to the initiative of each EAN Numbering Organization. (4)

EAN nevertheless recommends the use of the following solution, which is similar to the one adopted by UPC :

---

1 Check-digit algorithm : See general EAN specifications.
2 The definition of the serial number, which is common to both the solutions presented, will be described further on.
3 The Q1 Q2 positions apply whereever title alone cannot identify the article in an unambiguous way. Example : to identify a larger and more expensive seasonal issue. Such variants of the same title must always be dealt with within the EAN-13 and not within the add-on. The Q1 Q2 positions must not be used to express a regular increase of cover price.
4 The serial number will always be composed of 2 numerical characters to ensure that it may be symbolised in the add-on.

- Dailies (or more generally publications with several numbers a week) : The publications of each day of the week are considered as separate articles and must be given a different identifier within the main EAN-13 symbol. In the EAN-type solution, each different issue within one week will require a separate number in fields X1 to X9, while in the ISSN solution, each different issue within one week will require a separate number within fields Q1 Q2. The add-on is only to be used to represent the chronological sequence of weeks and these are numbered like weeklies.

- Weeklies : number from 01 to 53 (N° of week in year)

- Bi-weeklies : number 02,04,06,...52 (N° of week in year)
  or 01,03,05,...53 (N° of week in year)

- Monthlies : number from 01 to 12 (N° of month in year)

- Bi-monthlies : number 02,04,06... 12 (N° of month in year)
  or 01,03,05... 11 (N° of month in year)
  The number adopted is the number of the first month of the period covered.

- Quarterlies : same rules as for bi-monthlies.

- Seasonal periods :
  1st digit of the number = last digit of the year
  2nd digit of the number = N° of the season of the year
  (spring = 1 - summer = 2
  autumn = 3 - winter = 4)

- Bi-seasonal period : Same rules as in the preceding case, using, as the season number, the first season covered.

- Annuals : 1st digit of the number = last digit of the year
  2nd digit of the number = always equal to 5

- Special intervals : identified by a number from 01 to 99.

3.2. Technique for applying the symbol to serial publications

3.2.1. Generalities

In both the proposed solutions, the title identification number, followed by the check-digit, is marked with an EAN-13 symbol.

The two-digit serial number is marked with an additional symbol or "add-on", which is placed to the right of the main EAN-13 symbol and parallel to it.

The logical structure of this add-on and its location with relation to the EAN-13 symbol are described in Appendices 3 and 4.

The constraints and recommendations for the symbol location (EAN-13 + add-on) on the cover of publications are described in Paragraph 3.2.2. and Appendix 5.

It should be emphasized that the add-on must comply with all the general EAN specifications : the tolerances of the symbols at production stage of the film-master, the process of determining printing conditions and assessing print quality, the constraints concerning colour contrast and reflectance. In other words, the presence of the add-on does not change the general process in any way (1).

In particular, it should be noted that the magnification factor (theoretically between 0.8 and 2) must be applied to the add-on at the same time as to the main symbol. In practice, it will be observed that this factor is generally between 0.8 to 1, considering the techniques used and the print quality obtained in serial publications.

3.2.2. Constraints and recommendations as to the location of the symbol on the cover of serial publications

The elements hereafter are important since they must be respected if the symbol is to be read by equipment for sorting and counting returns.

a. The EAN-13 symbol and its add-on must not be reduced in height.

b. The recommended location is presented in Appendix 5.
Diagram 2 must be applied only if, for any reason, the application of Diagram 1 would create serious inconveniences for the printability or readability of the symbol.

- o O o -

1 Except as regards location.

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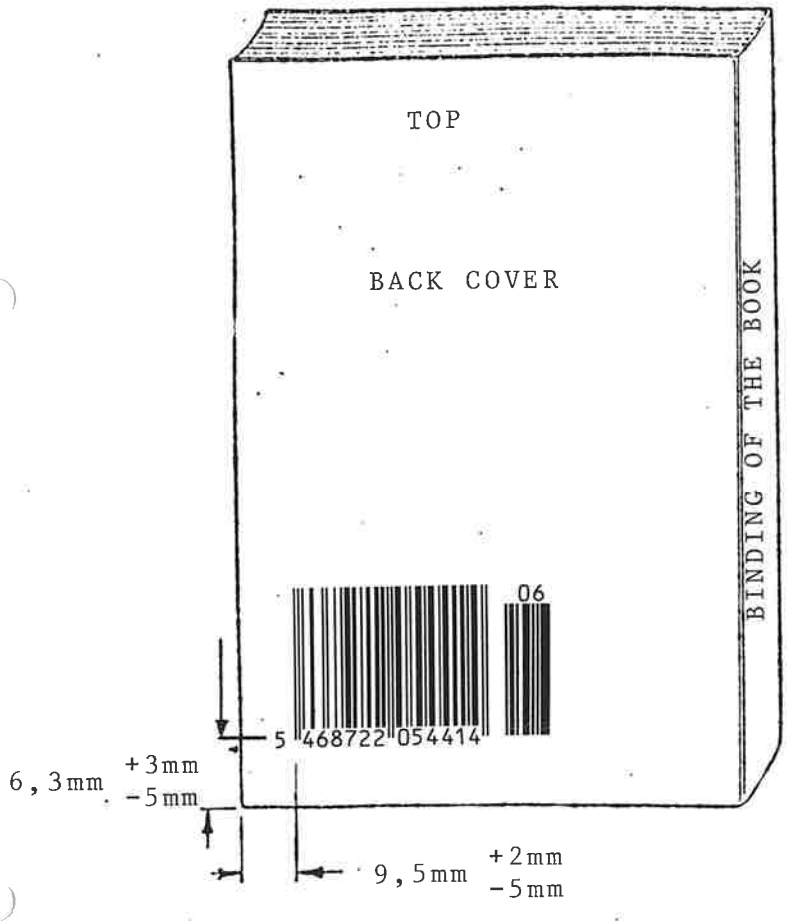
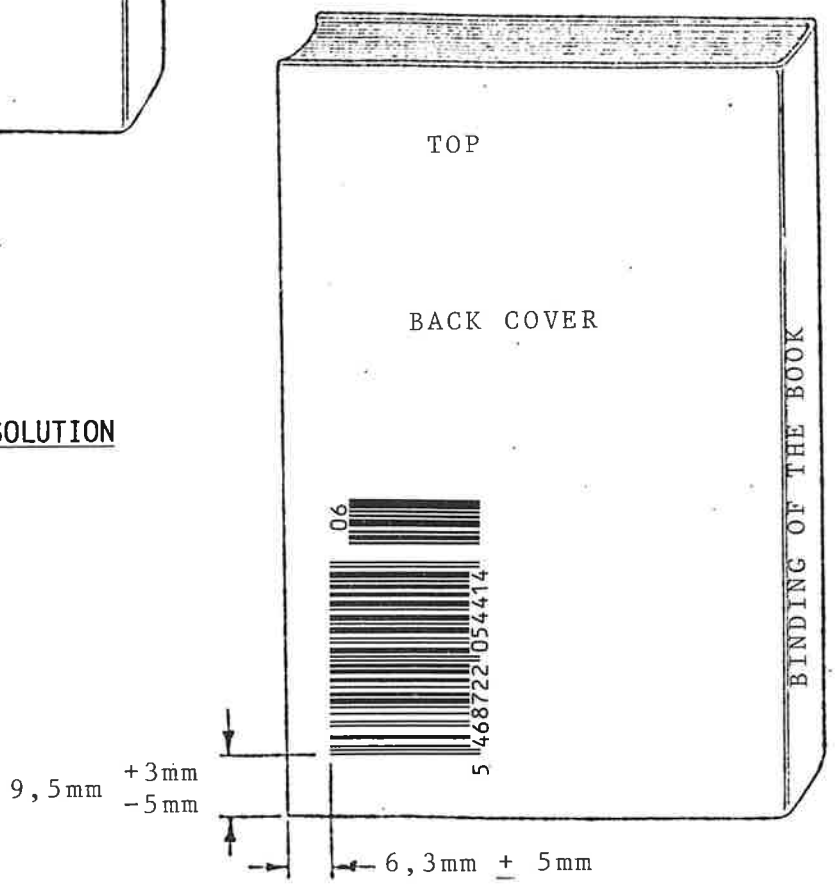
APPENDIX 1 : RECOMMENDED LOCATION OF THE SYMBOL ON THE OUTSIDE COVER OF BOOKS

. DIAGRAM 1 : PREFERRED LOCATION

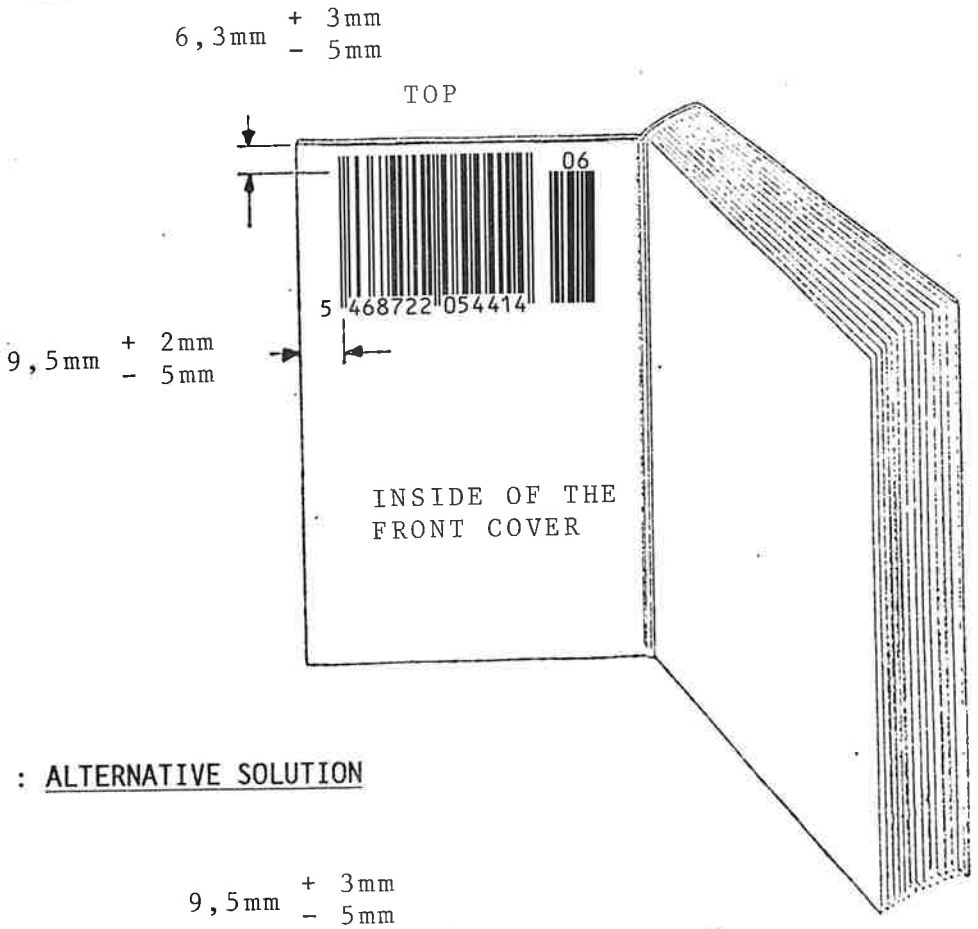


. DIAGRAM 2 : ALTERNATIVE SOLUTION

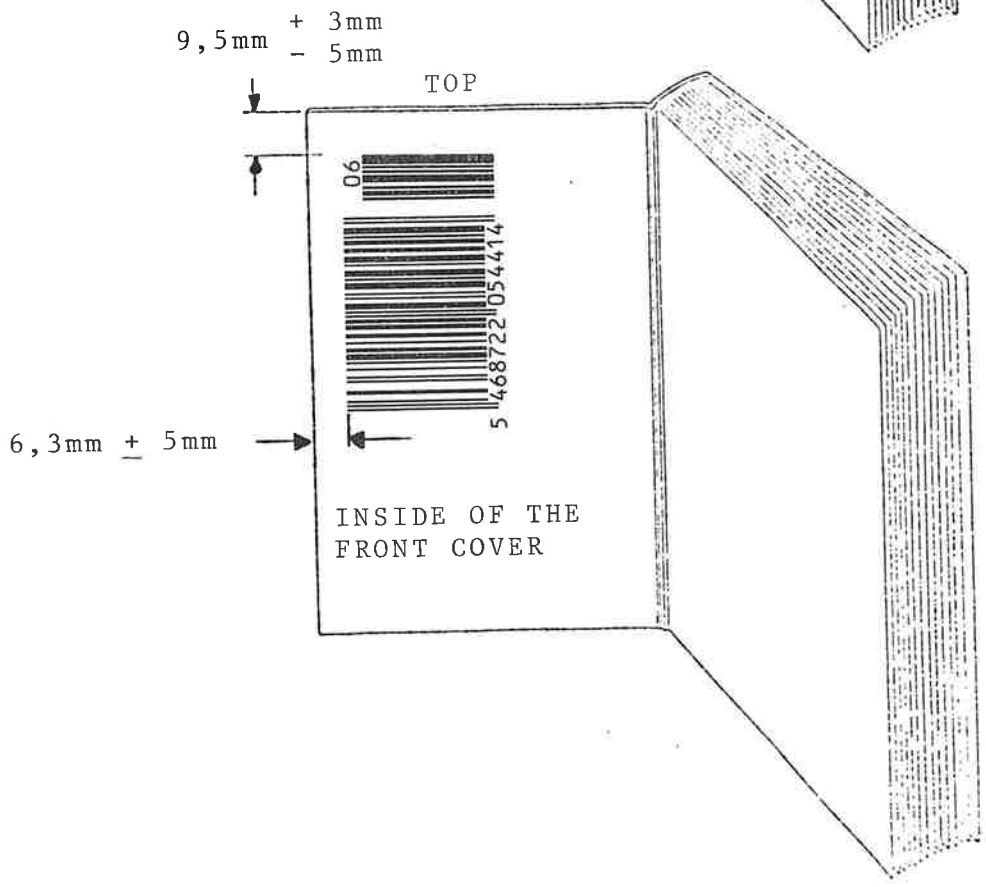


APPENDIX 2 : RECOMMENDED LOCATION OF THE SYMBOL ON THE INSIDE OF BOOK COVERS (MANAGEMENT OF RETURNS)

. DIAGRAM 1 : PREFERRED LOCATION



. DIAGRAM 2 : ALTERNATIVE SOLUTION



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APPENDIX 3 A : LOGICAL STRUCTURE OF THE 2 DIGIT ADD-ON

The 2-digit add-on is made up of the following series, described from left to right :

- Left-hand guard pattern, whose structure, expressed in modules 0,33 mm wide (nominal dimensions), is :

  | 1 0 1 1 |

- First digit of the add-on number, symbolised in number set A or B (See General EAN Specifications). It will be shown later what determines the choice of the number set to be used.

- Delineator between the digits, whose structure, expressed in modules 0,33 mm wide (nominal dimensions) is :

  | 0 1 |

- Second digit of the add-on number, symbolised in number set A or B.

The add-on has no right-hand guard pattern. Nor does it have an explicit check digit. Checking is done, however, through the choice of the number set (A or B) used for the two digits. This choice is linked to the value of the add-on number in the way shown by the following table :

VALUE OF THE ADD-ON NUMBER	NUMBER SET	
	Left-hand digit	Right-hand digit
Multiple of 4, i.e. : 00, 04, 08 96	A	A
(Multiple of 4) + 1, i.e. : 01, 05, 09 97	A	B
(Multiple of 4) + 2, i.e. : 02, 06, 10 98	B	A
(Multiple of 4) + 3, i.e. : 03, 07, 11 99	B	B

APPENDIX 3 B : LOGICAL STRUCTURE OF THE 5 DIGIT ADD-ON

The 5-digit add-on is made up of the following series, described from left to right :

- Left-hand guard pattern, whose structure, expressed in modules 0,33 mm wide (1), is : |1 0 1 1|

- First digit of the add-on number, symbolised in number set A or B (See General EAN Specifications). It will be shown later what determines the choice of the number set to be used.

- Delineator between the digits, whose structure, expressed in modules 0,33 mm wide (1) is : |0 1|

- Second digit of the add-on number, symbolised in number set A or B.

- Delineator between the digits, whose structure, expressed in modules 0,33 mm wide (1) is : |0 1|

- Third digit of the add-on number, symbolised in number set A or B.

- Delineator between the digits, whose structure, expressed in modules 0,33 mm wide (1) is : |0 1|

- Fourth digit of the add-on number, symbolised in number set A or B.

- Delineator between the digits, whose structure, expressed in modules 0,33 mm wide (1) is : |0 1|

- Fifth digit of the add-on number, symbolised in number set A or B.

To determine the value of the number set for a 5 digit add-on, a value X is calculated in a manner similar to that used in calculating the EAN modulo check digit.

For example, the add-on number is 86104.

Step 1 : Starting at the left, sum positions 1, 3 and 5 of the number (8 + 1 + 4 = 13).

Step 2 : Multiply the sum obtained by 3 (13 X 3 = 39).

Step 3 : Sum positions 2 and 4 of the number and multiply the sum by 9 (6 + 0 = 6 ; 6 X 9 = 54).

Step 4 : The value for X is the units position of the sum of steps 2 and 3 (39 + 54 = 93 ; X = 3).

---

1 Nominal dimensions

The Number set can now be determined by using the following table :

Value of X	Number set				
	DIGIT 1	DIGIT 2	DIGIT 3	DIGIT 4	DIGIT 5
0	B	B	A	A	A
1	B	A	B	A	A
2	B	A	A	B	A
3	B	A	A	A	B
4	A	B	B	A	A
5	A	A	B	B	A
6	A	A	A	B	B
7	A	B	A	B	A
8	A	B	A	A	B
9	A	A	B	A	B

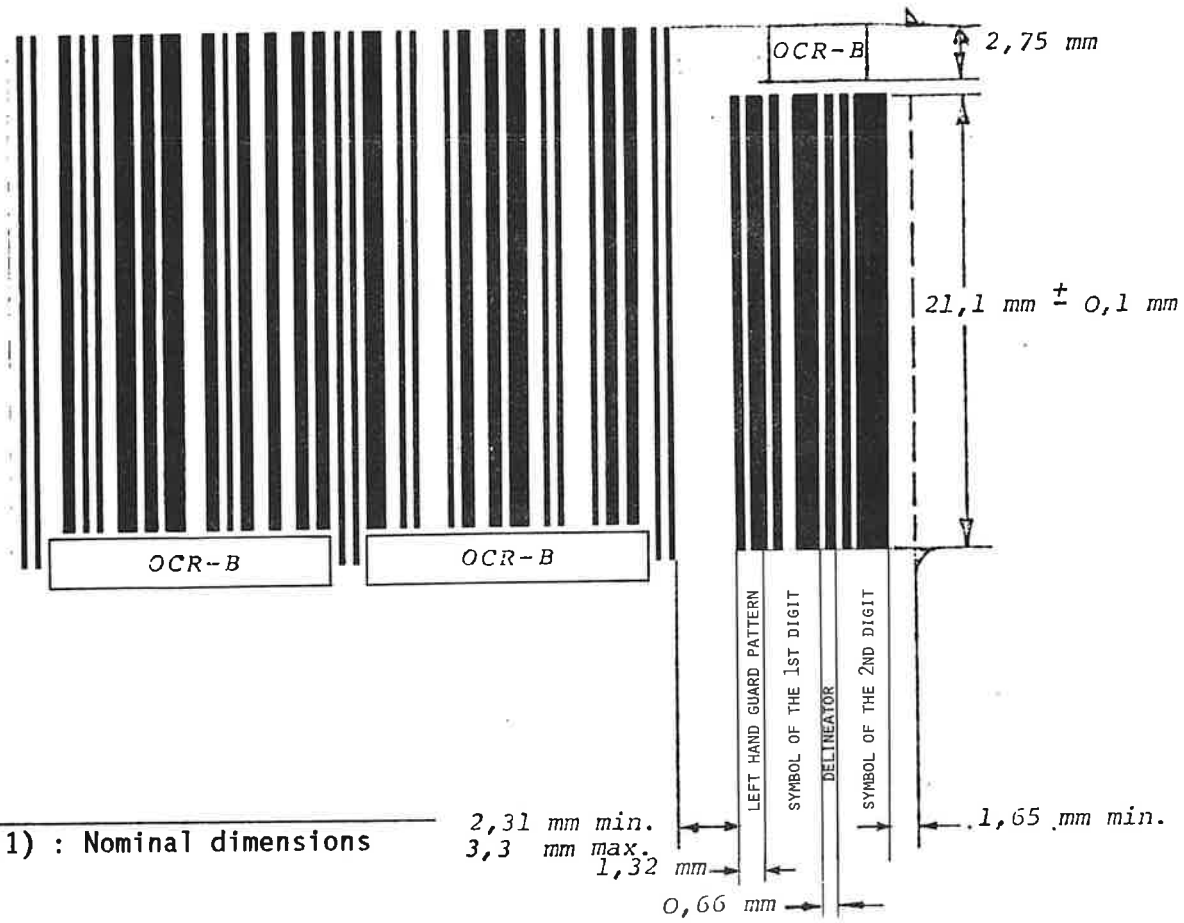
For the example, since X = 3, the number set is B A A A B.

APPENDIX 4 : SYMBOL MARKING AND LOCATION OF THE 2 AND 5 DIGIT ADD-ON

The location of the add-on with relation to the EAN-13 symbol corresponds to the diagrams hereafter :

- The lower edge of the bars is aligned with the lower edges of the guard patterns and center pattern of the main symbol.
- The bars of the add-on have a height of 21,1 mm ± 0,1 mm (1).
- The human-readable translation of the add-on is written in OCR-B characters above it :
  . These characters have the same height as those of the EAN-13 symbol (2,75 mm) and are placed in vertical correspondence with the bars.
  . The upper edges of the OCR-B characters are aligned with the upper edges of the bars of the EAN-13 symbol.
- The add-on is placed at a minimum distance of 2,31 mm (1) and a maximum of 3,3 mm (1) to the right of the right-hand guard pattern of the EAN-13 symbol.
- The "protected" area, bounded to the right of the add-on by the corner marks, has a minimum width of 1,65 mm (1).

2 DIGIT ADD-ON



(1) : Nominal dimensions

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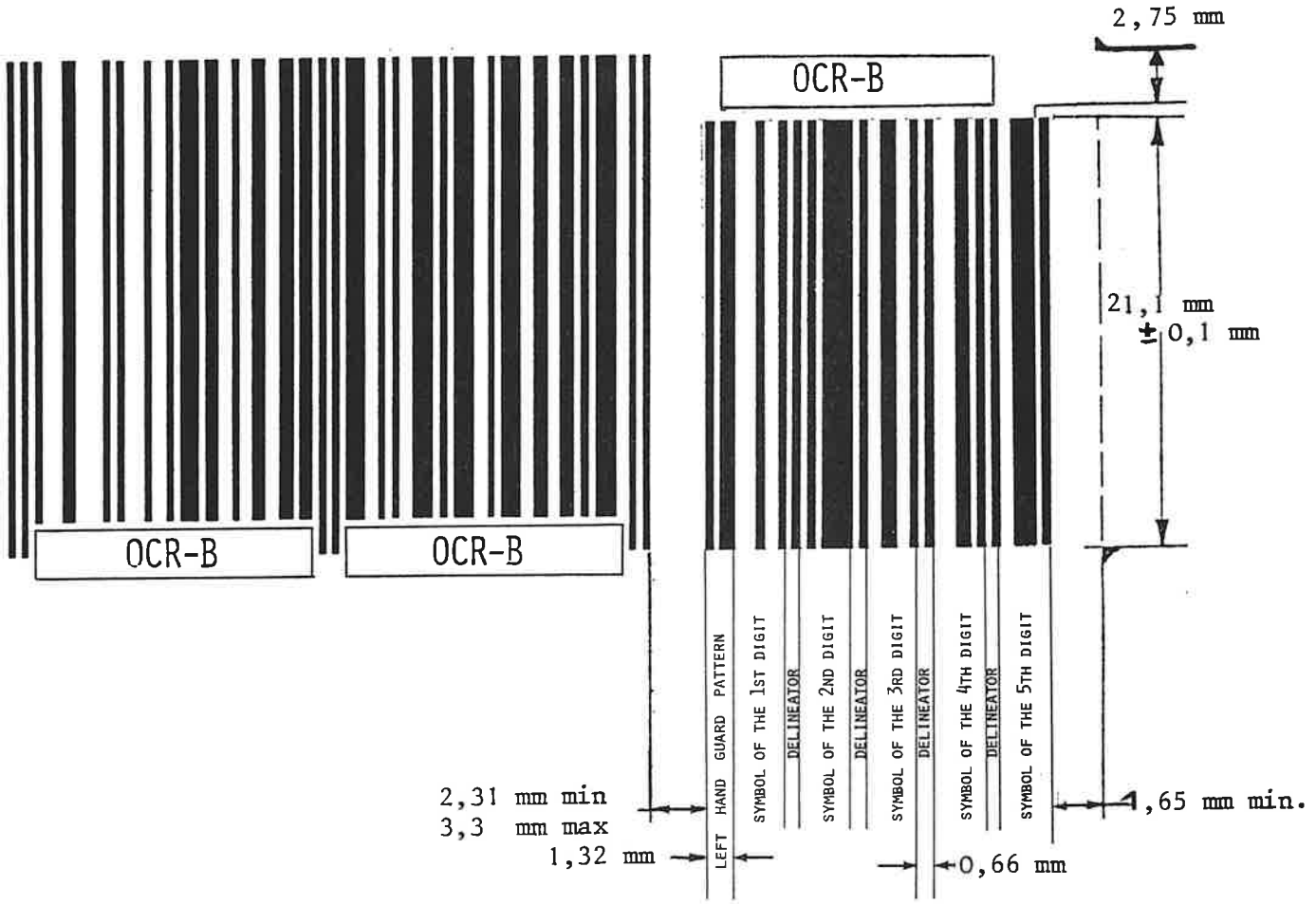
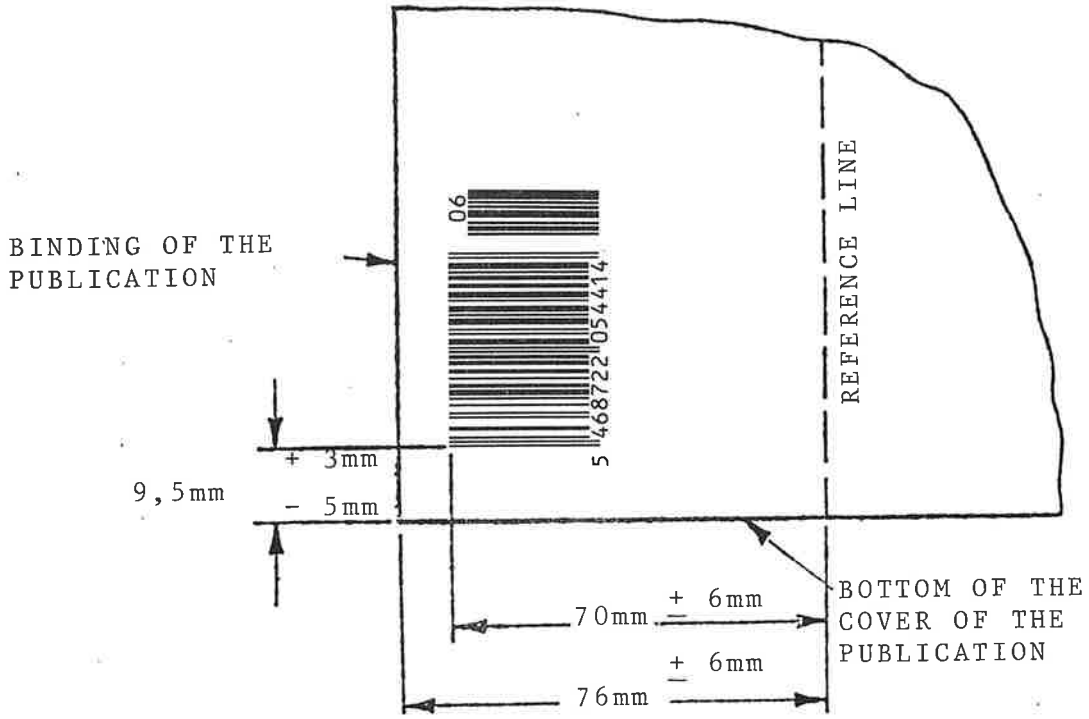
5 DIGIT
ADD-ON :

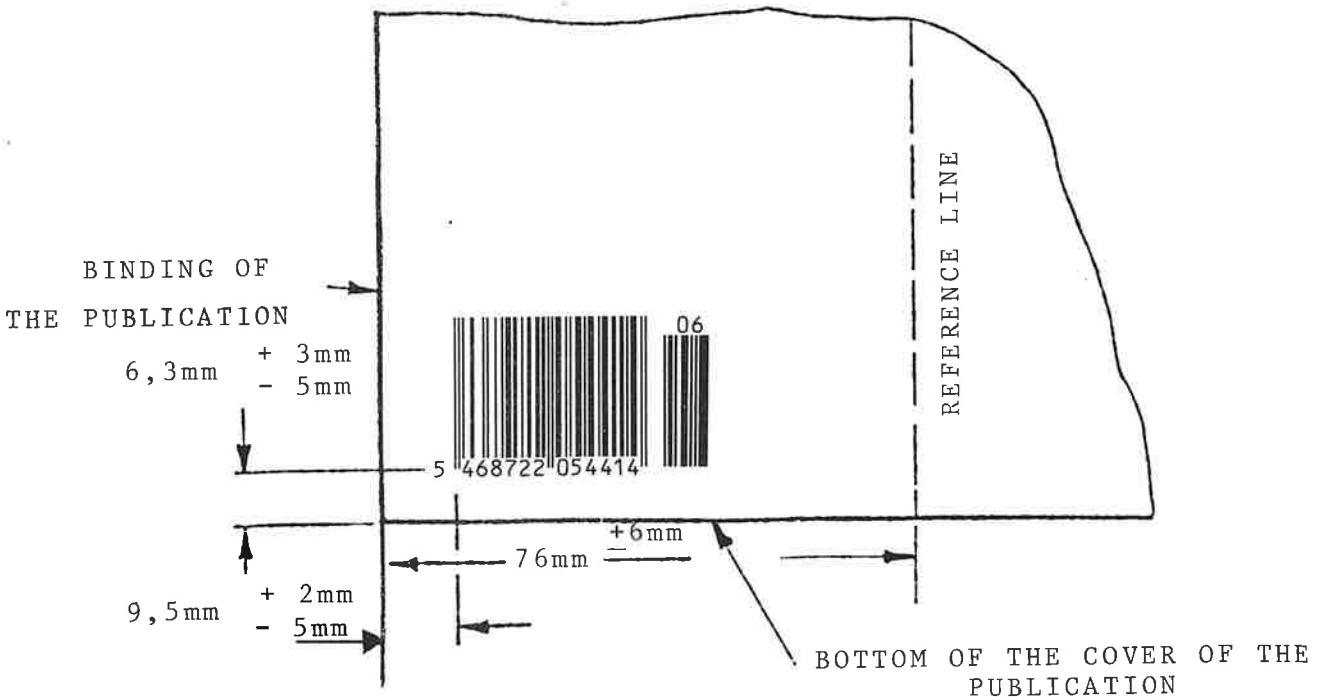


APPENDIX 5 : RECOMMENDED LOCATION OF THE SYMBOL ON SERIAL PUBLICATIONS

. DIAGRAM 1 : PREFERRED LOCATION



. DIAGRAM 2 : ALTERNATIVE SOLUTION



EAN recommendations to numbering organizations

I. Structure of EAN-13 source-numbers
II. Allocation of EAN-8 numbers

I. STRUCTURE OF EAN-13 SOURCE NUMBERS

The structure of the item identification field in the EAN-13 source-numbering format is left at the discretion of every EAN Numbering Organization. The main method is :

Prefix	Manufacturer number				Item number					Check
P1 P2 P3	M1	M2	M3	M4	I1	I2	I3	I4	I5	C

This means that 10,000 manufacturers have the possibility to each number 100,000 different items.

Notes :

* When a manufacturer's assortment exceeds 100,000 different items, EAN recommends that this manufacturer be granted 2 or more manufacturer numbers according to his needs.

* The term "manufacturer" number does not necessarily refer to the actual producer of the item which is identified. In general, the "manufacturer" number will be required by the company which effectively puts the product on the market under its own name or brand, and which therefore controls the packaging or labelling process. Example : the manufacturer number may refer to the importer or the dealer of the product.

* For his own label products, a retailer may use EAN numbers with the manufacturer number of the actual producer of the article. However, if he does not wish to reveal the identity of the actual producer, he will require an own "manufacturer" number for this purpose. If the articles are sold only in his own stores, the retailer may use in-store numbers instead.

* Multinational companies may adopt various approaches in their EAN numbering :
  - the centralized approach : the parent company (or one subsidiary company) identifies the whole range of articles of the company according to the EAN numbering rules of the country in which it is located. This solution offers the advantages of centralization but does not always offer the necessary flexibility for the allocation of items numbers.
  - the decentralized approach : every subsidiary company joins the Numbering Organization of its country and identifies the product range of its national market. This solution offers flexibility but leads to the same product being identified internationally under different EAN numbers.
  - the recommended approach : the several subsidiaries of the company consult together to decide which products will be identified in a centralized way (eg. when production units located in different countries manufacture the same product) and which products will be numbered on a national basis.

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II. ALLOCATION OF EAN-8 NUMBERS

1. GENERAL

The EAN-8 number has the following general form :

(0 0 0 0 0) P1 P2 P3 I1 I2 I3 I4 C

It is right justified in a 13 digit field and has five implied zeros to the left.

It is the responsibility of EAN Numbering Organization to govern the issue of the EAN-8 numbers. The recommended method is the direct assignment of single EAN-8 numbers to each separate product requiring a short version number. Any other method of allocating short numbers would render a Numbering Organization ineligible for allocation of further EAN-8 number banks.

When EAN-8 marked products are discontinued, their numbers should revert to the control of the Numbering Organization, which can re-allocate these numbers, after the necessary pause.

2. GUIDELINES FOR USE OF EAN-8 NUMBERS

The total availability of short numbers for source marking is limited, and their use must be restricted to articles whose pack or label genuiny and reasonably precludes the printing of a standard EAN-13 symbol. The following guidelines are proposed to define what is considered to be reasonable use of an EAN-8 number, and to govern the issue of such numbers.

2.1. Alternative options to be explored

Before deciding to use an EAN-8 number, the manufacturer should consider - usually jointly with his printer - all available options for using EAN-13. They may include :

(i) Whether the symbol can be reduced in size, ie printed at a lower magnification. However, the size of the symbol must not be reduced below that established from extensive printability gauge studies. Excessive reduction in size will result in a significant reduction in scanning efficiency.

(ii) Whether the label can reasonably be changed (label = the total printed design surface, whether or not affixed separately) enabling the printer's recommended size of standard EAN-13 symbol to be included. For example :
- by redesigning the label
- by increasing the label, especially where the existing one is small in comparison with the area pack.
- by the use of an additional label.

2.2. Pack size constraints

It is recommended to Numbering Organizations to adopt strict rules for pack size constraints.

Possible options in this respect are :

- The use of an EAN-8 number is authorized when the EAN-13 symbol, in the size required as a result of printability gauge studies, exceeds
  either : 25 % of the largest size of the printed label area
  or : 12.5 % of the total printable area.
- The use of an EAN-8 number is authorized when
  either : the largest side of the printed label < 40 cm²
  or : the total printable area < 80 cm²
- The use of an EAN-8 number is authorized on cylindrical products with diameter < 3cm.

2.3. Additional recommendations

It is strongly recommended to Numbering Organization to :

. Ask for product/package samples both at the time of application and after the EAN-8 symbol has been printed or labelled.

. Follow up the correct use of the EAN-8 numbers, eg. by requesting samples, by random checking in stores and by special measures when misuses are notified.

2.4. Transfer of EAN-8 number banks

If a Numbering Organization has spare EAN-8 capacity and wants to transfer EAN-8 number blocks to another Numbering Organization, it may only do so via the EAN General Secretariat and the Executive Committee.

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It is suggested that the EAN Numbering Organizations implement these new EAN-8 rules and guidelines by 1 January 1988 at the latest.

GLOSSARY of TERMS

EAN SPECIFICATIONS FOR NUMBERING

AND SYMBOL-MARKING

SUPPLEMENTARY ENCODATIONS

Original date of approval : February 1989

EDITION 1989

CONTENTS

Chapter

- o O o -

APPENDICES

- o O o -

CHAPTER 1 : SUPPLEMENTARY CODES

1.1. DEFINITION

Section D, Parts I, II and III of this Manual, have described the standard article numbering and bar coding system as it relates to the identification of items at all levels, moving in inter-company trade. The success of this system in practice led to a growing demand to show further information, in addition to item identity, in the form of bar code symbols.

The standard article numbering system, as explained in Parts I, II and III of this Manual, is a non-significant numbering system. It is used to identify the units being traded and not to classify or carry information about them. Fixed information about the goods is entered by the users into their product files and retrieved by reference to the article number.

This is the logical and efficient approach because it prevents codes from being cumbersome, cluttered with a variety of information which may or may not be relevant to individual users, and it allows changing needs for information and classification to be met without constraints being imposed by the code structure itself.

However some information varies from time to time for one type of item. This variable information often cannot be entered into computer files and retrieved by reference to the article number. It is this kind of information - such as date codes, batch numbers and serial numbers - that many companies want to encode as a supplement to the identity given in the article number.

This Chapter describes the EAN/UCC supplementary code standards designed to carry information over and above the product identity given by the article number.

Supplementary codes are standardized within the EAN/UCC system for two principal reasons :

- To ensure that supplementary codes used by one company do not disrupt, or in any way interfere with, the standard EAN/UCC article numbers and bar codes, nor with supplementary codes applied by any other company in the trading chain.

- To provide the potential for information in the supplementary codes to be used by any other companies in the trading chain if they choose.

Supplementary codes are not to be used as an alternative to changing the article number of a product when the product is changed significantly or when significant variants of the product are supplied.

1.2. GENERAL DESCRIPTION OF SUPPLEMENTARY CODES

The standard EAN/UCC supplementary code provides :

- A standard format for the data to be encoded, consisting of a two digit application identifier followed by the relevant data.

- A unique symbol architecture which distinguishes standard supplementary codes from the standard symbols used to represent article numbers and from non-standard symbols.

This combination of a standard data content and unique symbol architecture gives compatibility of supplementary codes amongst different companies, whilst enabling those companies which are not interested in particular types of supplementary data, or not interested in supplementary codes at all, to program their equipment to ignore them.

There is no limit on the number of supplementary codes with different application identifiers which may appear on one unit (see Section 1.5).

1.3. DATA CONTENT

Standard supplementary codes begin with a two-digit numeric prefix called the application identifier. These two digits are followed by the data which, in terms of the capabilities of the standard in general, may be in alphabetic and/or numeric characters and may be of any length up to thirty characters.

However specific standard supplementary codes, identified by particular application identifiers, are restricted in the type of characters to be encoded, the length of the code and the sequence of information in the code. This is done to ease programming in users' systems and to allow some validation of the data.

The data to be encoded, the structure to be used and the restrictions on characters encoded are described for each application identifier in Section 1.4. below.

Table 1.1. summarises these.

Application Identifier	Data	Character Type & Max. Length (Excl. of Appl. Ident.)
10	Batch number	an..20
11	Production date/batch number	an..20
12	Month of production/batch number	an..18
13	Packaging date/batch number	an..20
14	Month of packaging/batch number	an..18
15	"Best before" date/ batch number	an..20
16	"Best before end of month"/batch no	an..18
17	"Sell by" date/batch number	an..20
18	"Sell by" date (short life)/batch no	an..18
20	Product variant	n2
90 to 99	Internal use	an..30
00	Serial shipping container code	n18

Data Value representation :

a	alphabetic characters
n	numeric characters
an	alpha-numeric characters
a3	3 alphabetic characters, fixed length
n3	3 numeric characters, fixed length
an3	3 alpha-numeric characters, fixed length
a..3	up to 3 alphabetic characters
n..3	up to 3 numeric characters
an..3	up to 3 alpha-numeric characters

Other values of application identifier remain to be allocated. Industry sectors that need a further format should contact their EAN Numbering Organization so that their proposal may be put to the International Article Numbering Association, EAN.

There is no general prescription on the use of check digits for the data (as opposed to the symbol) in supplementary codes. Particular application identifiers may, however, require use of a check digit on the data and this is specified, as appropriate, in the individual data format descriptions in Sections 1.4.1. to 1.4.5. Individual users may also choose to use check digits, for their own purposes, in any portion of the data content that is chosen at their own discretion (for example in their own batch numbers).

Maximum lengths specified in this Chapter do not take into account possible auxiliary characters (see Chapter 2) which will be required in the codes.

1.4. SPECIFIC APPLICATIONS

This Section defines the specific applications within the various application identifiers.

1.4.1. Batch number

Application identifier 10 shows that the supplementary code is a batch number only.

The code structure is :

Application Identifier	Data	Character Type and Maximum Length (excl. of Appl. Ident.)
10	Batch number	an..20

Production line numbers, shift numbers, time of production and so on, used singly or in combination to form what is, in effect, a batch number, may be encoded in this standard. Any internal structure need not necessarily be used by a company other than that creating the batch number, but it must be possible for other companies to use the complete supplementary code to identify the batch unambiguously (for example for the purposes of product recall).

Batch numbers in this format may be formed using alphabetic characters and/or numeric characters and may have any length up to a maximum of twenty characters (exclusive of the application identifier).

It is recommended that batch numbers encoded in standard supplementary codes do not repeat within a period of twelve months, or within a longer period depending on the shelf life of the product.

1.4.2. Dates and Batch Number

Application identifiers 11 through 18 show that the supplementary code is a date, optionally in combination with a batch number. The specific kind of date is identified by the particular data identifier, as shown in Table 1.2.

Table 1.2.

Application Id.	Data	Character Type & Max. Length (excl. of Appl. Ident.)	Format of the date (numeric-fixed)	Format of the batch nr. (alpha-num. - fixed)
11	Production date/Batch number	an..20	6 : YYMMDD	up to 14
12	Month of production/Batch no.	an..18	4 : YYMM	up to 14
13	Packaging date/Batch no.	an..20	6 : YYMMDD	up to 14
14	Month of packaging/Batch no.	an..18	4 : YYMM	up to 14
15	"Best before" date/Batch no.	an..20	6 : YYMMDD	up to 14
16	"Best before" end of month/ Batch number	an..18	4 : YYMM	up to 14
17	"Sell by" date/Batch no.	an..20	6 : YYMMDD	up to 14
18	"Sell by" date (short life)/ Batch number	an..18	4 : MMDD	up to 14

All dates are expressed in numeric characters only, and always immediately follow the application identifier.

Within each application identifier the date has a fixed length of either four or six digits. Years are shown (where relevant) as the last two digits of the appropriate calendar year. Two digits are used to show the month from January with the value 01 through December with the value 12. The day of the month (where relevant) is always shown as two digits.

Any of these dates may, at the discretion of the company coding the goods, be followed by a batch number. Batch numbers formed from production line numbers, shift numbers, production time and so on, singly or in combination, may be used in this part of the supplementary code.

This kind of structure need only be significant or useful to the company creating the batch number but the batch number used must enable other companies to use the complete supplementary code to identify the batch unambiguously (for example for the purpose of product recall).

Batch numbers in combination with dates may be formed using alphabetic and/or numeric characters and may have any length up to a maximum of fourteen digits.

It is recommended that batch numbers encoded in standard supplementary codes do not repeat within a period of twelve months, or within a longer period depending on the shelf life of the product.

Note : EAN supplementary codes with application identifiers 11 to 18 always begin with Start character C.

1.4.3. Product Variant

Preliminary note : Inclusion of this Section is left at the discretion of each EAN Numbering Organization.

A supplementary code with application identifier 20 denotes a variant of the standard product. This method of differentiating variants from standard products must only be used when the variation is not sufficiently significant to require a change in the article number encoded in the main symbol.

The code structure is :

Application Identifier	Data	Character Type and Length (excl. of Appl. Ident.)
20	Product Variant	n2

The two digits following the application identifier are used to differentiate different variants. The digit values chosen are at the discretion of the company applying the supplementary codes, except that any particular value may only be used for one particular variant of a unit with a particular article number during any period of twelve months.

The data has a fixed length of two characters and only numeric characters may be used.

This supplementary code is designed to minimize the number of different article numbers used to identify consumer units and despatch units whilst enabling companies automatically to differentiate product variants, such as promotions.

Note : EAN supplementary codes with application identifier 20 always begin with start character C.

1.4.4. Free Formats for Internal Use

Application identifiers 90 through 99 have been reserved by UCC and EAN for internal use.

The code structure is :

Application Identifiers	Data	Character Type and Maximum Length (excl. of Appl. Ident.)
90-99	Any information for internal use	an..30

Companies may devise their own internal code structures for their own purposes and encode them together with these application identifiers at their own discretion.

The data may have any length up to thirty characters and may be formed from alphabetic and/or numeric characters.

Because supplementary codes may be applied at various points in the trading chain some care is needed in using application identifiers if confusion is to be avoided. Users should check whether supplementary codes have been applied, by their suppliers, to the units they handle and, if so, choose application identifiers different from those already appearing.

It is suggested that the following split of application identifiers be observed to provide additional security against ambiguity :

91 and 92 : For use by suppliers of raw materials, packaging materials and components.

93 and 94 : For use by product manufacturers.

95 and 96 : For use by carriers.

97 and 98 : For use by wholesalers and retailers.

90 and 99 : Other internal applications.

1.4.5. Serial Shipping Container Code

Application identifier 00 is assigned to the serial coding of shipping containers.

The code structure is :

Application Identifier	Data	Character Type and Length (excl. of Appl. Ident.)	Format (Numeric-fixed)
00	Serial shipping container code	n18	3 XXXXXXXXXXXXXXXX C PI Pref/man.nr.+ser.nr CD

This standard is designed to identify uniquely individual transport packages.

It enables merchandise that is packed differently from one transport package to another, for example where products are picked and packed to meet individual orders, to be identified. This can support operations such as despatch, distribution and receiving of non-standardized packages.

It is important to note that this "supplementary" code is designed to stand-alone in that, unlike any other standard supplementary code, it is not used in conjunction with a standard identifying article number.

It is important to note that this "supplementary" code is designed to stand-alone in that, unlike any other standard supplementary code, it is not used in conjunction with a standard identifying article number.

The single digit following the application identifier is a packaging indicator. It is recommended, for simplicity, that in the EAN community the packaging indicator should always have a value equal to 3 which means undefined packaging type. Packaging indicators are used by some sectors of USA industry. The full list of indicators used in the USA is as follows :

0 = case or carton
1 = pallet (larger than case)
2 = container (larger than pallet)
3 = undefined
4 = internal (intra-company) use
5 = bilateral (supplier/customer) defined

The sixteen digits following the packaging indicator are composed as follows :
- the EAN prefix/manufacturer number, as allocated by the EAN Numbering Organization. UCC prefix/manufacturer numbers are filled by adding a leading zero.
- The remaining digits following the UCC/EAN prefix/manufacturer number up to sixteen digits are the serial number, used to identify uniquely each transport package packed by a supplier for a minimum of one year.

The method used to allocate serial numbers is at the discretion of the company coding the package. However the serial number must remain unique for a period of at least twelve months for each prefix/ manufacturer number.

The digit following the serial number is a check digit calculated from the preceding nineteen digits according to the standard algorithm in Section D - Part I - Section 2.6. of this manual.

Note : EAN supplementary codes with application identifier 00 always begin with start character C.

1.5. MULTIPLE SUPPLEMENTARY CODES

There is no limit on the number of different supplementary codes, that is supplementary codes with different application identifiers, which may appear on one unit.

Users may screen out supplementary codes with application identifiers identifying applications not relevant to them.

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CHAPTER 2 : EAN-128 BAR CODE SYMBOL SPECIFICATIONS

2.1. INTRODUCTION

The EAN/UCC standard supplementary codes described in Chapter 1 are capable of being represented in the form of a barcode symbol. The bar code symbol to be used for this purpose is known as UCC/EAN-128 (hereafter called EAN-128).

This Chapter describes the EAN-128 bar code symbol. This is the only symbol that can be used to represent UCC/EAN standard supplementary codes.

The EAN-128 bar code symbol has been carefully designed through joint co-operation between the International Article Numbering Association, EAN, the Uniform Code Council, Inc. (UCC) and Automatic Identification Manufacturers (AIM) governing bodies. Use of EAN-128 symbols provides a high degree of security and distinguishes EAN/UCC standard supplementary codes from other standard article numbers and from extraneous non-standard symbols.

The USS Code-128 symbology specification now states that function character 1 is reserved exclusively for EAN/UCC use. By agreement between AIM and the EAN/UCC authorities in 1988 all other uses of function character 1 are prohibited, with the exception that it may need to be used as a symbol check character.

2.2. GENERAL DESCRIPTION OF EAN-128 SYMBOLS

EAN-128 symbols have the following characteristics :

- The symbols are of overall rectangular shape, made up of a series of light and dark parallel bars perpendicular to an imaginary base line with light margins to the right and the left.

- The light and dark bars are composed of modules of uniform width, light or dark.

- Characters in the bar code are made up of 11 modules, except the stop character which is made up of 13 modules.

- In these characters the modules are grouped into bars, with each character represented by three dark bars and three light bars, except the stop character which is made up of four dark bars and three light bars.

- A dark or light bar may comprise from one to four modules.

- The symbol has a special double character start pattern, consisting of the appropriate start character and immediately followed by function character 1.

- The symbol always incorporates a symbol check digit which is not part of the data and is additional to any check digits used in the data.

- The symbol is designed to be read bi-directionally by fixed or portable scanners.

- The symbol size depends on the number of characters encoded which is between 3 and 32 characters including the application identifier.

- For a given length of data, the symbol size is variable between limits in magnification, to accommodate the ranges in quality achievable by the various printing processes.

- Dimensions are specified for one particular size of symbol, known as the nominal size. Magnification limits are from 0.25 to 1.2 times the nominal size.

2.3. CHARACTER REPRESENTATION

EAN-128 has three character sets shown in Appendix 1 as A, B and C. Character set A includes all of the standard upper case alpha-numeric characters plus control and special characters. Character set B includes all of the standard upper case and lower case characters plus special characters. Character set C includes the set of 100 digit pairs from 00 through 99 as well as special characters. Character set C enables numeric only data to be encoded with twice the density (two digits per data character) of the other character sets.

The start character (see Section 2.4. below) determines which character set is being used. The character set can be changed within the symbol by use of code A, code B, code C or the shift character.

2.4. AUXILIARY CHARACTERS

In EAN-128 there are nine auxiliary characters :

Start A	Code A	Shift
Start B	Code B	Stop
Start C	Code C	FNC 1

Their composition is shown in Appendix 1.

The EAN-128 symbology has special double character start patterns consisting of :

Start (A or B or C), FNC 1.

It is these special start characters which differentiate EAN-128 symbols from the more generalised Code 128 symbols specified by AIM.

In other words a Code 128 symbol which begins with one of the EAN-128 double character start patterns is always a UCC/EAN standard

supplementary code ; a Code 128 symbol which does not begin with such a start pattern is never a UCC/EAN supplementary code.

Function Character 1 (FNC 1) may be the symbol check character (in less than 1% of cases). With the exception of this additional special use, it must never be used elsewhere in the symbol; its purpose is solely to be part of the double character start patterns which are unique to EAN-128 and to be (if appropriate) the symbol check character.

Start A begins the EAN-128 data encodation according to character set A.

Start B begins the EAN-128 data encodation according to character set B.

Start C begins the EAN-128 data encodation according to character set C. Start C should always be used when the data inclusive of the application identifier begins with four or more numeric characters.

Further advice on the choice of start patterns is given in Appendix 2.

The Code A, Code B and Code C characters allow a change in character set to be effected within the symbol. All characters following the code (A, B or C) character are encoded according to the corresponding character set unless another code character of shift character is encountered. This is akin to the "shift lock" key on a typewriter.

Code A changes the encodation to character set A. Code B changes the encodation to character set B. Code C changes the encodation to character set C.

Advice on the use of code A, code B and code C is given in Appendix 2.

The shift character allows a character set change for the one character which immediately follows it in the symbol. Subsequent characters revert to the character set active prior to the shift character. The shift character operates only between character sets A and B ; it is not possible to shift into or out of character set C. The shift character is akin to the shift key on a typewriter.

Advice on the use of the shift character is given in Appendix 2.

The stop character always terminates the EAN-128 symbol. Its length is two modules greater than the other characters.

2.5. NOMINAL DIMENSION OF CHARACTERS

In the nominal size (when the magnification factor = 1.0) the ideal theoretical width of a module is 1.0 mm.

The corresponding widths of characters are :

- Stop character : 13.0 mm
- All other characters : 11.0 mm

Note 1 : Pairs of digits are represented in one data character when using character set C.

Note 2 : The dimensions given are ideal theoretical dimensions corresponding to the nominal size of symbols. Production aspects and tolerances are dealt with in Chapter 3.

Note 3 : The widths of characters is measured from the visually indicated edge (comprising a dark bar) to the visually indicated edge of the adjacent character, except in the case of the stop character which is measured between its extreme visually indicated edges.

2.6. FORMAT OF THE EAN-128 BAR CODE

The EAN-128 bar code is made up as follows, reading from left to right :

A light margin
A start character (A,B or C) { the double character
The FNC 1 character { start pattern
Data (including the Application Identifier represented in character sub-set A, B or C)
A symbol check character
The stop character
A light margin

The data characters represented in the symbol are shown in human readable characters underneath or above the symbol.

The general format of the symbol is shown in Figure 2.1.

Figure 2.1.

2.6.1. Symbol check character

In EAN-128 a symbol check character is always included in the bar code immediately preceding the stop character. It is calculated according to the Modulo 103 algorithm which is described below.

The symbol check character is calculated by the Modulo 103 algorithm from all the characters in the symbol except the stop code (but including the start character) through the following steps :

Step 1 : Weight the characters in the symbol by multiplying the value of the start character by 1, the value of FNC 1 by 1, the value of the first data character by 2 and each remaining data and auxiliary character with ascending weights : 3, 4, 5 and so on. The values of the characters are given in Appendix 1.

Step 2 : Sum all the weighted values.

Step 3 : Divide the result of step 2 by 103.

Step 4 : The check character is the character whose value (in Appendix 1) is equal to the remainder from the division in step 4.

Notes :
1. If the remainder = 102, then the check character is equivalent to FNC1.
2. Application identifiers are data characters.

Example 1 : the check character for the code : Start C
FNC1 128812 is calculated as follows :

Step 1 :
Start C	: Value	105	x	1	= 105
FNC1	: Value	102	x	1	= 102
12	: Value	12	x	2	= 24
88	: Value	88	x	3	= 264
12	: Value	12	x	4	= 48

Step 2 : 543

Step 3 : divided by 103 = 5 remainder 28

The value of the check character is 28.

Example 2 : the check character for the code : Start C
FNC1 128902X341

Step 1 :
Start C	: Value	105	x	1	= 105
FNC1	: Value	102	x	1	= 102
12	: Value	12	x	2	= 24
89	: Value	89	x	3	= 267
02	: Value	2	x	4	= 8
Code B	: Value	100	x	5	= 500
X	: Value	56	x	6	= 336
3	: Value	19	x	7	= 133
4	: Value	20	x	8	= 160
1	: Value	17	x	9	= 153

Step 2 : 1,788

Step 3 : divided by 103 = 17 remainder 37

The value of the check character is 37.

Example 3 : the check character for the code : Start A
FNC1 URZ3+

Step 1 :
Start A : Value 103 x 1 = 103
FNC1 : Value 102 x 1 = 102
U : Value 53 x 2 = 106
R : Value 50 x 3 = 150
Z : Value 58 x 4 = 232
3 : Value 19 x 5 = 95
+ : Value 11 x 6 = 66

Step 2 : 854

Step 3 : divided by 103 = 8 remainder 30

The value of the check character is 30.

2.6.2. Human Readable Characters

The human readable translation of the data in the bar code must be shown above or below the bar code symbol. The symbol check character is not part of the data and is not shown in human readable format.

The precise location of the human readable characters and the font used to represent them are not specified for the EAN-128 symbol. However, the characters should be clearly legible and must be obviously associated with the symbol.

2.6.3. Nominal dimensions of the EAN-128 symbol

The dimensions of the EAN-128 symbol, in nominal size, depend on the number of characters encoded :

1 start character	x 11 modules	=	11
FNC1	x 11 modules	=	11
1 symbol check character	x 11 modules	=	11
1 stop character	x 13 modules	=	13
N data characters	x 11 modules	=	11N
			11N + 46 modules

Where N is the number of data characters plus the number of any auxiliary characters (shift and code characters) embedded in the data.

In character set C two digits are encoded in one data character so that numeric data can be encoded with twice the density of other data when character set C is used.

In addition the light margins to the right and left of the bar code are compulsory and both have widths of 10 modules.

In nominal size the module width is equal to 1.0 mm.

Thus total width (including light margins) in millimetres is:

11N + 66

The height of the bars in nominal size is 31.8 mm. The symbol height is dependent on magnification, with a minimum height of 20 mm.

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CHAPTER 3 : PRODUCTION OF EAN-128 SYMBOLS

3.1. INTRODUCTION

EAN-128 bar code symbols will sometimes be incorporated into a package design by the packaging supplier. In these circumstances the symbol can be produced using printing plates prepared from a film master as described in Section D :
- Part I - Chapter 6 concerning EAN bar code symbols, and
- Part II - Module 9 concerning ITF bar code symbols.

Frequently, however, the supplementary code represented by the EAN-128 bar code symbol will be applied by the product manufacturer in a production/packaging plant or a warehouse. In these circumstances the EAN-128 bar code symbol may be printed onto a label or directly onto the packaging using equipment which converts key-entered data directly into bar code format.

3.2. PRODUCTION OF EAN-128 SYMBOLS FROM FILM MASTERS

If the EAN-128 symbol is produced from plates prepared from a film master it is necessary to assess the amount of print gain and variation normally encountered in the day to day printing of the packaging (see Section D - Part I - Chapter 6 - Sections 6.2. and 6.3.).

The average print gain determines the amount of bar width reduction to be applied to the film master and the variation in print gain determines the minimum magnification factor to be used.

The amount of bar width reduction to be applied is equal to the average print gain. Values of magnification factor for various values of variation are given in tabular form in Appendix 3. The continuous relationship between magnification factor and variation is shown in Appendix 4.

A printability gauge can be used to assess the print quality. Either the EAN printability gauge (for lower values of print gain variation) or the ITF printability gauge (for higher values of print gain variation) may be used. These are described in Section D :
- Part I - Chapter 6 - Section 6.5. for the EAN gauge, and
- Part II - Module 9 - Section 2.4. for the ITF gauge (also called H-gauge).

The tables for interpreting the results of these tests for EAN-128 bar codes are given in Appendices 5 and 6.

3.3. PRODUCTION OF EAN-128 SYMBOLS WITHOUT FILM MASTERS OR PRINTING PLATES

Often the EAN-128 will be produced from equipment which produces bar code symbols directly from the input of numerical data. In order to specify the performance of such printers and to control their output, it is necessary to stipulate the tolerances permitted in the printed symbol.

Tolerances are defined for various module widths corresponding to magnification factors from 0.25 to 1.2 times the nominal width of a module (1.0 mm). Different tolerances apply to different types of dimension.

There are three different types of dimension in the symbol :

Type 1 Measurement of a bar or space inside a symbol.

Type 2 Measurement of the width between corresponding edges of bars within a character.

Type 3 Measurement from character to character.

Appendix 7 shows these types of dimension diagrammatically and gives a table of tolerances for dimension types 1, 2 and 3.

3.4. SYMBOL SIZE

The size of the EAN-128 bar code symbol depends on three factors :

(i) The magnification factor chosen. This will be between 0.25 and 1.2 depending on the print quality.

(ii) The number of characters encoded.

(iii) The number of non-numeric characters in the data.

The formula for calculating the symbol width is :

$$W = (11N + 66)\ M$$

Where :

N = the number of data characters including code A, code B, code C and shift characters but excluding the start and stop characters and the symbol check character. In character set C, two digits are encoded in <u>one</u> data character.

M = the magnification factor.

Examples of the symbol sizes are given in Appendices 8, 9, 10 and 11.

The <u>minimum</u> magnification factor to be used depends on the print quality and is derived from measuring the variation in print gain (see Section 3.2.) or from the tolerances allowed (see Section 3.3.)

However, the <u>actual</u> magnification factor chosen must take account of the size of the EAN-13 bar code or the ITF bar code that the EAN-128 bar code supplements.

The module width used in the EAN-128 must not be less than 75% of the ideal width of the narrowest bar in the EAN-13 or ITF main bar code symbol. The minimum magnification factors implied by this stipulation, for various EAN-13 and ITF symbol sizes, are given in Tables 3.1. and 3.2.

Table 3.1.

EAN-13 Magnification Factor	Minimum EAN-128 Magnification Factor
0.8	0.25
0.9	0.25
1.0	0.25
1.2	0.30
1.4	0.35
1.6	0.40
1.8	0.45
2.0	0.50

Table 3.2.

ITF Magnification Factor	Minimum EAN-128 Magnification Factor
0.625	0.50
0.7	0.55
0.8	0.65
0.9	0.70
1.0	0.80
1.1	0.85
1.2	0.95

For the standard supplementary code with application identifier 00, the serial shipping container code, the minimum magnification factor is 0.50 and the maximum magnification factor is 0.80.

3.5. COLOUR CONTRAST

See Section D - Part II - Appendix 8 "Density, reflectance factor and PCS for ITF symbols". The minimum value of PCS is always 75 %.

3.6. SYMBOL LOCATION

The preferred location for the EAN-128 supplementary bar code is aligned with and to the right of the EAN-13 or ITF main symbol. It should be as close as possible to the main symbol whilst respecting the light margins.

If this location cannot be used or in case of multiple supplementary codes the supplementary symbol(s) should be as close as possible to the main symbol, respecting the light margins, and clearly associated with it.

For the serial shipping container code the location is as follows :

- On cases, shrink wrapped trays, etc., : the lower edge of the bars should be 32 mm from the lower edge of the side on which the symbol is applied, no closer than 19 mm from a vertical edge.

- On pallets : the lower edge of the bars should be 70 cm above the surface on which the pallet stands, no closer than 50 mm to a vertical edge.

Supplementary symbols should be orientated such that the bars are vertical when the unit is placed in its normal storage position.

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APPENDIX 1: CODE 128 CHARACTER SET

VALUE	CODE A	CODE B	CODE C	BAR PATTERN B	S	B	S	B	S
0	SP	SP	00	2	1	2	2	2	2
1	!	!	01	2	2	2	1	2	2
2	"	"	02	2	2	2	2	2	1
3	#	#	03	1	2	1	2	2	3
4	$	$	04	1	2	1	3	2	2
5	%	%	05	1	3	1	2	2	2
6	&	&	06	1	2	2	2	1	3
7	'	'	07	1	2	2	3	1	2
8	(	(	08	1	3	2	2	1	2
9	)	)	09	2	2	1	2	1	3
10	*	*	10	2	2	1	3	1	2
11	+	+	11	2	3	1	2	1	2
12	,	,	12	1	1	2	2	3	2
13	—	—	13	1	2	2	1	3	2
14	.	.	14	1	2	2	2	3	1
15	/	/	15	1	1	3	2	2	2
16	0	0	16	1	2	3	1	2	2
17	1	1	17	1	2	3	2	2	1
18	2	2	18	2	2	3	2	1	1
19	3	3	19	2	2	1	1	3	2
20	4	4	20	2	2	1	2	3	1
21	5	5	21	2	1	3	2	1	2
22	6	6	22	2	2	3	1	1	2
23	7	7	23	3	1	2	1	3	1
24	8	8	24	3	1	1	2	2	2
25	9	9	25	3	2	1	1	2	2
26	:	:	26	3	2	1	2	2	1
27	;	;	27	3	1	2	2	1	2
28	<	<	28	3	2	2	1	1	2
29	=	=	29	3	2	2	2	1	1
30	>	>	30	2	1	2	1	2	3
31	?	?	31	2	1	2	3	2	1
32	@	@	32	2	3	2	1	2	1
33	A	A	33	1	1	1	3	2	3
34	B	B	34	1	3	1	1	2	3
35	C	C	35	1	3	1	3	2	1
36	D	D	36	1	1	2	3	1	3
37	E	E	37	1	3	2	1	1	3
38	F	F	38	1	3	2	3	1	1
39	G	G	39	2	1	1	3	1	3
40	H	H	40	2	3	1	1	1	3
41	I	I	41	2	3	1	3	1	1
42	J	J	42	1	1	2	1	3	3
43	K	K	43	1	1	2	3	3	1
44	L	L	44	1	3	2	1	3	1
45	M	M	45	1	1	3	1	2	3
46	N	N	46	1	1	3	3	2	1
47	O	O	47	1	3	3	1	2	1
48	P	P	48	3	1	3	1	2	1
49	Q	Q	49	2	1	1	3	3	1
50	R	R	50	2	3	1	1	3	1
51	S	S	51	2	1	3	1	1	3
52	T	T	52	2	1	3	3	1	1
53	U	U	53	2	1	3	1	3	1
54	V	V	54	3	1	1	1	2	3
55	W	W	55	3	1	1	3	2	1
56	X	X	56	3	3	1	1	2	1
57	Y	Y	57	3	1	2	1	1	3
58	Z	Z	58	3	1	2	3	1	1
59	[	[	59	3	3	2	1	1	1

VALUE	CODE A	CODE B	CODE C	BAR PATTERN B	S	B	S	B	S
60	\	\	60	3	1	4	1	1	1
61	]	]	61	2	2	1	4	1	1
62	^	^	62	4	3	1	1	1	1
63	_	_	63	1	1	1	2	2	4
64	NUL	`	64	1	1	1	4	2	2
65	SOH	a	65	1	2	1	1	2	4
66	STX	b	66	1	2	1	4	2	1
67	ETX	c	67	1	4	1	1	2	2
68	EOT	d	68	1	4	1	2	2	1
69	ENQ	e	69	1	1	2	2	1	4
70	ACK	f	70	1	1	2	4	1	2
71	BEL	g	71	1	2	2	1	1	4
72	BS	h	72	1	2	2	4	1	1
73	HT	i	73	1	4	2	1	1	2
74	LF	j	74	1	4	2	2	1	1
75	VT	k	75	2	4	1	2	1	1
76	FF	l	76	2	2	1	1	1	4
77	CR	m	77	4	1	3	1	1	1
78	SO	n	78	2	4	1	1	1	2
79	SI	o	79	1	3	4	1	1	1
80	DLE	p	80	1	1	1	2	4	2
81	DC1	q	81	1	2	1	1	4	2
82	DC2	r	82	1	2	1	2	4	1
83	DC3	s	83	1	1	4	2	1	2
84	DC4	t	84	1	2	4	1	1	2
85	NAK	u	85	1	2	4	2	1	1
86	SYN	v	86	4	1	1	2	1	2
87	ETB	w	87	4	2	1	1	1	2
88	CAN	x	88	4	2	1	2	1	1
89	EM	y	89	2	1	2	1	4	1
90	SUB	z	90	2	1	4	1	2	1
91	ESC	{	91	4	1	2	1	2	1
92	FS	|	92	1	1	1	1	4	3
93	GS	}	93	1	1	1	3	4	1
94	RS	~	94	1	3	1	1	4	1
95	US	DEL	95	1	1	4	1	1	3
96	FNC 3	FNC 3	96	1	1	4	3	1	1
97	FNC 2	FNC 2	97	4	1	1	1	1	3
98	SHIFT	SHIFT	98	4	1	1	3	1	1
99	CODE C	CODE C	99	1	1	3	1	4	1
100	CODE B	FNC 4	CODE B	1	1	4	1	3	1
101	FNC 4	CODE A	CODE A	3	1	1	1	4	1
102	FNC 1	FNC 1	FNC 1	4	1	1	1	3	1

			B	S	B	S	B	S
103	START (CODE A)		2	1	1	4	1	2
104	START (CODE B)		2	1	1	2	1	4
105	START (CODE C)		2	1	1	2	3	2

		B	S	B	S	B	S	B
STOP		2	3	3	1	1	1	2

Where : B = Bar and S = Space
For definitions of FNC2 - FNC3 - FNC4 : see USS-128 Specifications.

APPENDIX 2: GUIDANCE ON THE USE OF START, CODE AND SHIFT CHARACTERS

The following guidance should be followed to minimize the symbol length. (Note : in this Appendix "data" always includes the application identifier).

1. (a) If the data begins with four or more digits use start character C.

   (b) Otherwise, if a control character occurs in the data before any lower case character, use start character A. (Control characters are those listed in Appendix 1 in character set A with values from 64 to 95).

   (c) Otherwise use start character B.

2. If start character C is used and an odd number of digits begins the data insert code A or code B before the last digit, using guidelines 1b and 1c above to choose between code A and Code B.

3. If four or more digits occur together when in character sets A or B :

   (a) If there is an even number of digits in the group insert code C before the first digit.

   (b) If there is an odd number of digits in the group insert code C immediately after the first digit.

4. When in character set B and a control character appears in the data :

   (a) If following the control character there is a lower case character before another control character appears insert the shift character before the control character.

   (b) Otherwise insert code A before the control character.

5. When in character set A and a lower case character appears in the data :

   (a) If following the lower case character there is a control character before another lower case character insert the shift character before the lower case character.

   (b) Otherwise insert code B before the lower case character.

6. When in character set C and a non-numeric character occurs in the data insert code A or B before the non-numeric character using guidelines 1b and 1c above to choose between code A and code B.

APPENDIX 3 : RELATION BETWEEN MAXIMUM PRINT GAIN VARIATION AND MINIMUM MAGNIFICATION FACTOR TO BE APPLIED FOR EAN-128 SYMBOLS

CONTINUOUS SEQUENCE OF VALUES OF M

V	M
0.02	0.25
0.07	0.3
0.14	0.4
0.18	0.5
0.22	0.6
0.26	0.7
0.30	0.8
0.34	0.9
0.38	1.0
0.42	1.1
0.46	1.2

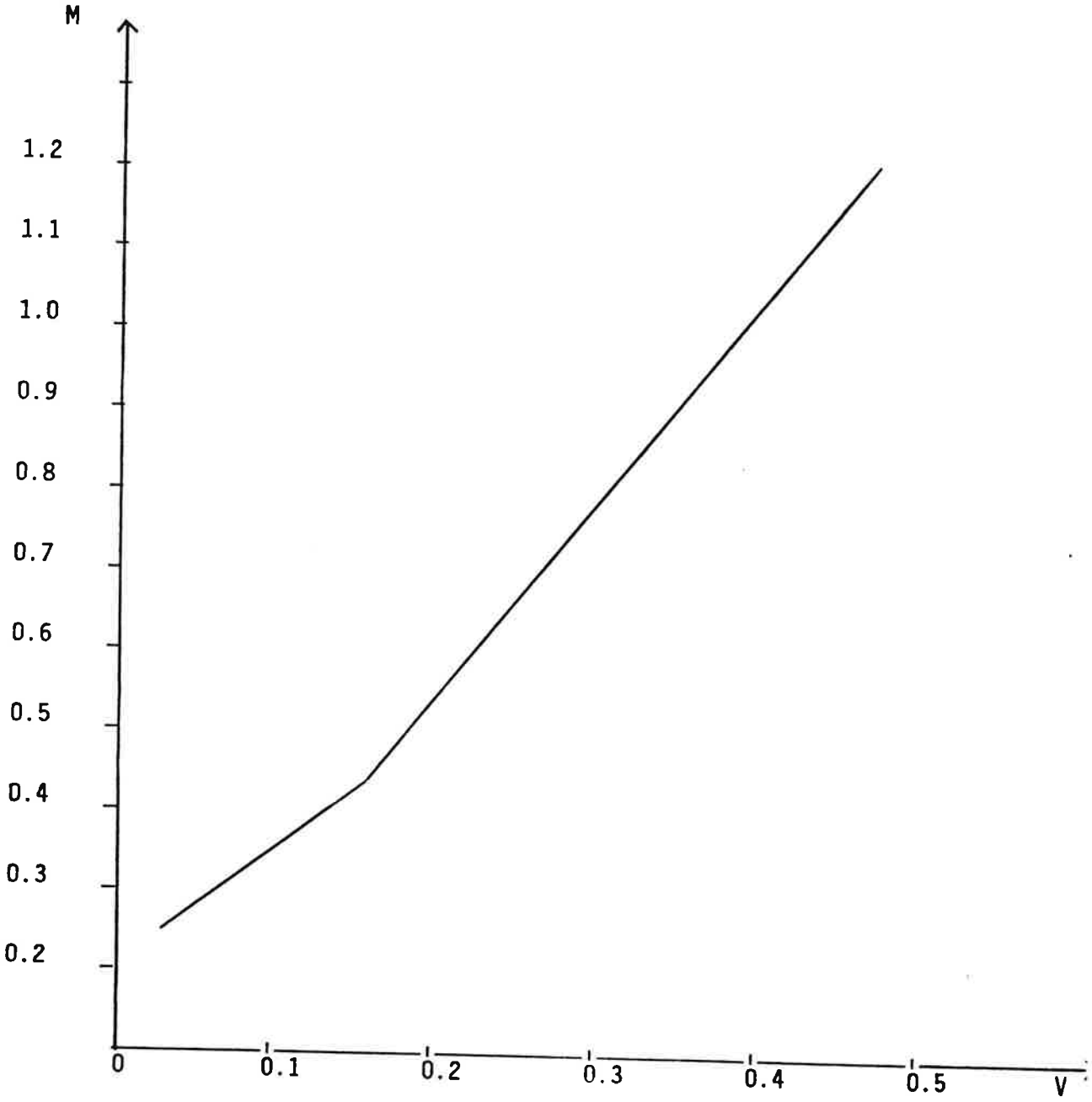
CONTINUOUS SEQUENCE OF VALUES OF V

V	M
0.05	0.28
0.10	0.33
0.15	0.41
0.20	0.54
0.25	0.66
0.30	0.79
0.35	0.91
0.40	1.04
0.45	1.16

Notes : 1) These values respect the condition that no printed bar shall be less than 0.23 mm in width.

2) Print gain variation values are expressed in millimeters.

APPENDIX 4: GRAPH SHOWING CORRESPONDANCE BETWEEN MAXIMUM PRINT-GAIN VARIATION AND MINIMUM MAGNIFICATION FACTOR TO BE APPLIED TO EAN-128 SYMBOLS



APPENDIX 5: DETERMINING THE MAGNIFICATION FACTOR AND THE BARWIDTH REDUCTION ON THE BASIS OF THE PRINTABILITY RANGE - EAN PRINTABILITY GAUGE - CONVERSION TO EAN-128

Range	Magnification	BWR
A-B	0.70	0.51
A-C	0.70	0.48
A-D	0.65	0.46
A-E	0.65	0.43
A-F	0.60	0.41
A-G	0.60	0.38
A-H	0.60	0.36
A-I	0.65	0.33
A-J	0.75	0.30
A-K	0.80	0.28
B-C	0.65	0.46
B-D	0.65	0.43
B-E	0.60	0.41
B-F	0.60	0.38
B-G	0.55	0.36
B-H	0.55	0.33
B-I	0.60	0.30
B-J	0.65	0.28
B-K	0.75	0.25
C-D	0.60	0.41
C-E	0.60	0.38
C-F	0.55	0.36
C-G	0.55	0.33
C-H	0.50	0.30
C-I	0.55	0.28
C-J	0.60	0.25
C-K	0.70	0.23
D-E	0.55	0.36
D-F	0.55	0.33
D-G	0.50	0.30
D-H	0.50	0.28
D-I	0.50	0.25
D-J	0.55	0.23
D-K	0.60	0.20
E-F	0.50	0.30
E-G	0.50	0.28
E-H	0.45	0.25
E-I	0.45	0.23
E-J	0.50	0.20
E-K	0.55	0.18
F-G	0.45	0.25
F-H	0.45	0.23
F-I	0.40	0.20
F-J	0.45	0.18
F-K	0.50	0.15
G-H	0.40	0.20
G-I	0.40	0.18
G-J	0.40	0.15
G-K	0.45	0.13
H-I	0.35	0.15
H-J	0.40	0.13
H-K	0.45	0.10
I-J	0.35	0.10
I-K	0.40	0.08
J-K	0.35	0.05

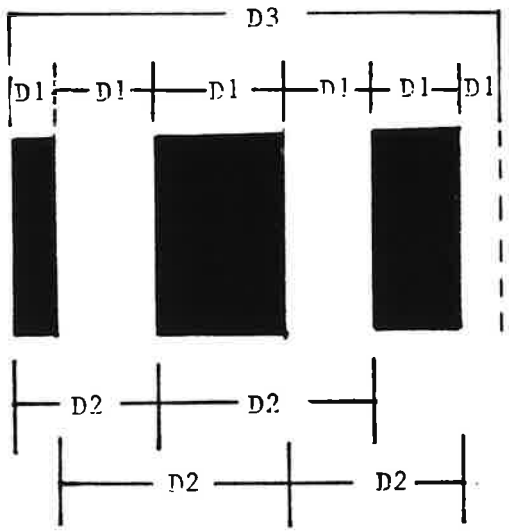
(*) This table was set up according to the theoretical formulas and might be adapted later on in function of practical experience.

APPENDIX 6: DETERMINING THE MAGNIFICATION FACTOR AND THE BARWIDTH REDUCTION ON THE BASIS OF THE PRINTABILITY RANGE - H-GAUGE - CONVERSION TO EAN-128 (*)

Range	Magnification	BWR
0-0	0.35	0.05
0-1	0.40	0.10
0-2	0.50	0.15
0-3	0.60	0.20
0-4	0.75	0.25
0-5	0.85	0.30
0-6	1.00	0.35
0-7	1.10	0.40
1-1	0.35	0.15
1-2	0.40	0.20
1-3	0.50	0.25
1-4	0.60	0.30
1-5	0.75	0.35
1-6	0.85	0.40
1-7	1.00	0.45
2-2	0.45	0.25
2-3	0.50	0.30
2-4	0.55	0.35
2-5	0.60	0.40
2-6	0.75	0.45
2-7	0.85	0.50
3-3	0.55	0.35
3-4	0.60	0.40
3-5	0.65	0.45
3-6	0.70	0.50
3-7	0.75	0.55
4-4	0.65	0.45
4-5	0.70	0.50
4-6	0.75	0.55
4-7	0.80	0.60
5-5	0.75	0.55
5-6	0.80	0.60
5-7	0.85	0.65
6-6	0.85	0.65
6-7	0.90	0.70
7-7	0.95	0.75

(*) This table was set up according to the theoretical formulas and might be adapted later on in function of pratical experience.

APPENDIX 7 : TOLERANCES TO BE RESPECTED BY ON-SITE PRINTING EQUIPMENT FOR EAN-128 SYMBOLS



EAN-128 SYMBOL DIMENSIONS TOLERANCES - TYPES 1, 2, 3.

MAGNIFICATION FACTOR	TOLERANCE D1 (MM)	TOLERANCE D2 (MM)	TOLERANCE D3 (MM)
0.25	0.020(*)	0.050	0.050
0.3	0.070(*)	0.060	0.060
0.35	0.127	0.070	0.070
0.4	0.147	0.080	0.080
0.45	0.167	0.091	0.091
0.5	0.187	0.100	0.100
0.55	0.207	0.110	0.110
0.6	0.227	0.120	0.120
0.65	0.247	0.130	0.130
0.7	0.267	0.140	0.140
0.75	0.287	0.150	0.150
0.8	0.307	0.160	0.160
0.85	0.327	0.170	0.170
0.9	0.347	0.180	0.180
0.95	0.367	0.190	0.190
1	0.387	0.200	0.200
1.05	0.407	0.210	0.210
1.1	0.427	0.220	0.220
1.15	0.447	0.230	0.230
1.2	0.467	0.240	0.240

(*) These values respect the condition that no printed bar shall be less than 0.23 mm in width.

APPENDIX 8 : EAN 128 BAR CODE DIMENSIONS FOR NUMERIC DATA

No of Digits Including Identifier	Dimensions (in mm) including light margins					
	MF 0.25	MF 0.4	MF 0.6	MF 0.8	MF 1.0	MF 1.2
4	22.0	35.2	52.8	70.4	88.0	105.6
6	24.8	39.6	59.4	79.2	99.0	118.8
8	27.5	44.0	66.0	88.0	110.0	132.0
10	30.3	48.4	72.6	96.8	121.0	145.2
12	33.0	52.8	79.2	105.6	132.0	158.4
16	38.5	61.6	92.4	123.2	154.0	184.8
20	44.0	70.4	105.6	140.8	176.0	211.2
30	57.8	92.4	138.6	184.8	231.0	277.2
Symbol Height	20.0	20.0	20.0	25.4	31.8	38.2

Note 1 : Four digits are used in the product variant application (identifier 20).

Six digits are used for application identifiers 12, 14, 16 and 18 when no batch number is included with the data.

Eight digits are used for application identifiers 11, 13, 15 and 17 when no batch number is included with the data.

Twenty digits are used in the serial shipping container application (Application Identifier 00).

Note 2 : Widths for other numbers of encoded digits can be calculated using the formula in Section 3.4.

APPENDIX 9 : EAN 128 BAR CODE DIMENSIONS FOR ALPHABETIC DATA AND SIX NUMERIC CHARACTERS (including application identifier)

No of Alpha Characters	Dimensions (in mm) including light margins					
	MF 0.25	MF 0.4	MF 0.6	MF 0.8	MF 1.0	MF 1.2
4	38.5	61.6	92.4	123.2	154.0	184.8
6	44.0	70.4	105.6	140.8	176.0	211.2
8	49.5	79.2	118.8	158.4	198.0	237.6
10	55.0	88.0	132.0	176.0	220.0	264.0
12	60.5	96.8	145.2	193.6	242.0	290.4
16	71.5	114.4	171.6	228.8	286.0	343.2
20	82.5	132.0	198.0	264.0	330.0	396.0
Symbol Height	20.0	20.0	20.0	25.4	31.8	38.2

Note 1 : One code A or Code B character has been included in these calculations. If more code A, code B, code C or shift characters are used, the symbol width will be larger.

Note 2 : Six numeric characters are used for application identifiers 12, 14, 16 and 18.

Note 3 : Widths for other numbers of encoded characters can be calculated using the formula in Section 3.4.

APPENDIX 10 : EAN 128 BAR CODE DIMENSIONS FOR ALPHABETIC DATA AND EIGHT NUMERIC CHARACTERS (including application identifier)

No of Alpha Characters	Dimensions (in mm) including light margins					
	MF 0.25	MF 0.4	MF 0.6	MF 0.8	MF 1.0	MF 1.2
4	41.3	66.0	99.0	132.0	165.0	198.0
6	46.8	74.8	112.2	149.6	187.0	224.4
8	52.3	83.6	125.4	167.2	209.0	250.8
10	57.8	92.4	138.6	184.8	231.0	277.2
12	63.3	101.2	151.8	202.4	253.0	303.6
16	74.3	118.8	178.2	237.6	297.0	356.4
20	85.3	136.4	204.6	272.8	341.0	409.2
Symbol Height	20.0	20.0	20.0	25.4	31.8	38.2

Note 1 : One code A or Code B character has been included in these calculations. If more code A, code B, code C or shift characters are used the symbol width will be larger.

Note 2 : Eight numeric characters are used for application identifiers 11, 13, 15 and 17.

Note 3 : Widths for other numbers of encoded characters can be calculated using the formula in Section 3.4.

APPENDIX 11 : EAN 128 BAR CODE DIMENSIONS FOR ALPHABETIC DATA

No of Digits Including Identifier	Dimensions (in mm) including light margins					
	MF 0.25	MF 0.4	MF 0.6	MF 0.8	MF 1.0	MF 1.2
4	27.5	44.0	66.0	88.0	110.0	132.0
6	33.0	52.8	79.2	105.6	132.0	158.4
8	38.5	61.6	92.4	123.2	154.0	184.8
10	44.0	70.4	105.6	140.8	176.0	211.2
12	49.5	79.2	118.8	158.4	198.0	237.6
16	60.5	96.8	145.2	193.6	242.0	290.4
20	71.5	114.4	171.6	228.8	286.0	343.2
30	99.0	158.4	237.6	316.8	396.0	475.2
Symbol Height	20.0	20.0	20.0	25.4	31.8	38.2

Note 1 : One code A or Code B character has been included in these calculations. If more code A, code B, code C or shift characters are used the symbol width will be larger.

Note 2 : Widths for other numbers of encoded characters can be calculated using the formula in Section 3.4.

GLOSSARY OF TERMS

(Terms shown in bold are defined elsewhere in the glossary)

ADD-ON. A **bar code** used to encode information additional to that in the main code.

ALGORITHM. A set of steps to be taken to effect a desired calculation.

ARTICLE. Anything with a pre-defined existence which can be identified by code. This will normally be a **consumer unit** or a **despatch unit**.

ARTICLE NUMBER. Standard identifying code number.

AUXILIARY CHARACTER. A representation in dark bars and light bars (spaces) of data other than digits -viz a **stop guard, start guard, centre pattern** or **delineator pattern**.

BAR CODE/ BAR CODE SYMBOL. A representation of an **article number** in a form suitable for reading by machines.

BAR WIDTH REDUCTION. The extent by which the bars on the **film master** are reduced in order to correct for **print gain**.

BEARER BAR. A bar around a **bar code symbol** in order to equalise the pressure exerted by the printing plate over the entire surface of the **symbol**.

BI-DIRECTIONALLY. In two directions - viz backwards and forwards.

CENTRE PATTERN. A pattern of dark bars and light bars (spaces) which separates two halves of a **bar code symbol**.

CHECK DIGIT. A digit calculated from other digits in a code used to check that the code is correctly composed.

CONSUMER UNIT. An item intended for sale to the consumer in a **retail outlet**.

CORNER MARKS. Marks which indicate the four corners of the **symbol** including the **light margin**. Corner marks need not be printed.

DELINEATOR PATTERN. An **auxiliary character** used between digits in certain **add-on bar codes**.

DESPATCH UNIT. Any stable and standard grouping of several **consumer units** made up to facilitate the operations of handling, storing, order preparation, shipping, etc...

DIGIT CHARACTER. A representation in dark bars and light bars (spaces) of digit values.

DIRECTION OF PRINTING. The direction in which the printing plate moves across the substrate.

EAN vademecum

DIRECTLY ASSIGNED SHORT CODE. An eight digit **article number** allocated by **a Numbering Organization** for a specific product.

DISK STORAGE. A magnetic medium for the storage of data, frequently used to store the product file in a **POS** system.

DISTRIBUTION UNIT NUMBER. One of the two international standard codes for the identification of **despatch units**.

DUN-14. The fourteen digit version of the **distribution unit number**.

DUN-16. The sixteen digit version of the **distribution unit number**.

EAN. Originally **European Article Number** and also used to denote **European Article Numbering Association**. These are now the **International Article Number** and the **International Article Numbering Association**, but the abbreviation is maintained.

EAN-8. The eight-digit version of the international **article number**, also used to denote the standard **symbol** representing the eight digit number.

EAN-13. The thirteen digit version of the **international article number**, also used to denote the original standard (viz not ITF) **symbol** representing the thirteen digit number.

ECR. **Electronic Cash Register**.

ELECTRONIC CASH REGISTER (ECR). A cash register with some processing capability but not a **scanning** system.

ELECTONIC POINT OF SALE (EPOS). All electronic equipment used at the **point of sale** including **scanning** equipment, electronic scales, credit card readers etc.

ENCODE. Put into the form of a code.

EPOS. **Electronic Point of sale**.

EUROPEAN ARTICLE NUMBER. Former name of the **International Article Number**.

FIELD. An area in a computer **file** designated for one item of data.

FIELD LENGTH. The size of the **field**. In the context of **article numbering** this is measured in number of digits.

FILE. A set of data stored in a computer.

FILLER CHARACTER. A character inserted to extend an item of data to achieve a desired **field length**.

FILM MASTER. The original film for a **bar code symbol**.

FIXED PARITY. In a **bar code** a section of the symbol between two **auxiliary characters** has fixed parity if the representation of every digit has even **parity** or the representation of every digit has odd **parity**.

FLEXOGRAPHY. A printing process using flexible relief polymer or rubber plates and spirit based inks, common in the production of food packaging.

GUARD BARS. A pattern of dark bars and light bars (spaces) which indicates the beginning or end of a **bar code symbol**.

H MARK. The character used in the **printability gauge** for the **interleaved two of five symbol** and in routine quality control for that **symbol**.

IMPLIED ZEROS. Leading zeros used as **filler characters** which are not directly encoded in the **bar code symbol** nor shown in **human readable digits** beneath the symbol.

IN-STORE. Used in this manual to denote any closed trading environment of which the overwhelmingly most common example is within any particular chain of stores.

IN-STORE CODE (In-house code). A code which is unique and unambiguous within a specific closed environment and therefore may only be used in such an environment.

INTERLEAVED TWO OF FIVE (ITF). A **symbol** defined for use on **despatch units**. **Distribution Unit Numbers** are always encoded in ITF symbology.

INTERNATIONAL ARTICLE NUMBER. The standard identifying code number.

INTERNATIONAL ARTICLE NUMBERING ASSOCIATION. The international body responsible for co-ordinating, developing and promoting article numbering worldwide.

INTERNATIONAL STANDARD BOOK NUMBER (ISBN). The ten digit code used internationally by publishers to identify their books.

INTERNATIONAL STANDARD SERIAL NUMBER (ISSN). The eight digit code used internationally to identify periodicals and journals.

ISBN. **International Standard Book Number**

ISSN. **International Standard Serial Number**.

ITEM REFERENCE DIGITS. The digits allocated by the company responsible for numbering its articles which together with the **prefix, manufacturer number** and **check digit** constitute the standard **article number**.

ITF. **Interleaved two of five.**

KEY ENTRY. The manual input of data through a keyboard.

LABEL PRINTING MACHINE. In the context of **article numbering** a device for producing **barcoded** labels directly from numerical data.

LAC. **Local Assigned Code.**

LASER SCANNER. An electronic **barcode** reading device which uses a low power laser as the light source.

LEADING ZEROS. Zeros at the left of a number.

LIGHT MARGIN. The clear area which must surround a **barcode symbol.**

LIGHT PEN. A hand-held **barcode** reading device which must be passed across the **symbol** in order to decode it.

LIMITED CIRCULATION NUMBER. Number which is used on an article in restricted distribution eg **in-store code**, coupon code.

LOCAL ASSIGNED CODE. The American term for **in-store code.**

LOGISTICAL VARIANT. The first digit of the **DUN-14** code (or the second and third digits of the DUN-16 code) which is changed to identify different **despatch units** of the same **consumer units.**

MACHINE READABLE. Capable of being read by **scanning** devices.

MAGNIFICATION FACTOR. The factor used to multiply the **nominal dimensions** to obtain the actual dimensions at which the **film master** must be produced and at which the **symbol** must appear on the packaging.

MANUFACTURER NUMBER. The digits allocated by an **EAN** Numbering Organization to the company responsible for numbering its **articles** which together with the **prefix, item reference digits** and **check digit** constitute the standard **article number.**

MODULE. In the **EAN symbol** each digit of the **article number** is represented by seven modules of uniform width. The modules may be light or dark.

MODULO-10. The **algorithm** used to calculate the **check digit** in standard **article numbers.**

MULTIPACK. A number of **consumer units** packaged together to form a larger **consumer unit.**

NOMINAL DIMENSIONS. The reference dimensions of a **bar code** symbol. The nominal dimensions must be multiplied by the **magnification factor** to obtain the actual dimensions.

NOMINAL SIZE. **Nominal dimensions.**

NUMBER CHARACTER. A representation in dark bars and light bars (spaces) of digit values.

NUMBERING ORGANIZATION. National or multinational body, member of the **International Article Numbering Association**, responsible for administering, developing and promoting article numbering.

NUMBER SET. A series of ten arrangements of **modules** to represent each digit 0 through 9. Three different number sets are used in **EAN**.

OCR. **Optical Character Recognition**.

OMNIDIRECTIONAL. In all directions. **EAN symbols** are capable of omnidirectional **scanning**, viz they can be scanned in any orientation across the scanner.

OPTICAL CHARACTER RECOGNITION (OCR). A stylised form of characters capable of being read by machines in certain defined circumstances.

OVERPRINTING. Printing onto pre-printed material.

OWN LABEL. Used in this context to mean a product branded by a retailer or wholesaler.

PACKAGING INDICATOR. The American term for **logistical variant**.

PARITY. The property of being odd or even. In **EAN** symbols the representation of a digit has odd parity if it has an odd number of dark **modules**, and even parity if it has an even number of dark **modules**.

PLU. **Price Look-Up**.

POINT OF SALE (POS). The point at which goods are purchased either in a retail or cash and carry outlet.

POS. **Point of Sale**.

PRICE LOOK-UP (PLU). The retrieval of a price from a computer **file** as opposed to **key entry** of the price.

PRINTABILITY GAUGE. A series of specially calibrated marks printed on to packaging to test the quality of printing.

PRINTABILITY RANGE. The range of marks in a **printability gauge** found to have lost resolution when printed over a series of print runs.

PRINTABILITY TEST. A test of print quality.

PRINT CONTRAST SIGNAL (PCS). A measure of the relative difference between the **reflectances** of dark bars and light bars.

PRINT DIRECTION. The direction in which the printing plate moves across the substrate.

PRINT GAIN. The amount by which a printed bar is wider than the same bar on the **film master**.

QUIET ZONE. Alternative name for **light margin**.

RANDOM WRAPPING. Packaging which is not registered on the product, so that a particular part of the design will not always appear in the same place.

REFERENCE REFLECTED FLUX. The radiant power reflected by a magnesium oxide or barium sulphate photometric standard.

REFLECTANCE FACTOR. The ratio of **reflected flux** to the **reference reflected flux**.

REFLECTED FLUX. The radiant power reflected by the sample.

RETAIL OUTLET. An outlet selling goods direct to the consumer.

RETAIL SALE. A purchase made by the final consumer in a **retail outlet**.

RIGHT JUSTIFIED. An item of data is right justified when it is stored such that it occupies consecutive positions starting from the right hand side of the **field**. If an EAN code contains less characters than allowed by the **field length** the left-most positions can be zero filled.

SCANNING. Reading a code by machine. Originally used to mean **laser scanning** but now more generally used to mean any machine reading of codes including **wanding**.

SHIPPING CONTAINER. American term for **despatch unit**.

SHORT IDENTIFIER NUMBER. The five digits allocated either wholly by a Numbering Organization, or partially by a Numbering Organization and partially by the company responsible for coding its **articles** which together with the **prefix** and **check digit** make up the standard **short number**.

SHORT NUMBER. **EAN-8**.

SHORT VERSION SYMBOL. The **symbol** representing **EAN-8**.

SHOW THROUGH. The reduction of **reflectance factor** of packaging materials which occurs when they are wrapped around a dark product.

SIGNIFICANT DIGITS. The digits of a code number excluding **leading zeros** and trailing **check digits**.

SKU. **Stock Keeping Unit**.

SLOT SCANNER. Fixed scanner capable of reading a **symbol** omni-directionally.

SOURCE MARKING/ SOURCE SYMBOL MARKING. Applying a **symbol** to the packaging either as part of the artwork of the packaging or at the packaging line.

SPECULAR REFLECTION. Reflection from a polished surface in which the angle of reflection to normal equals the angle of incidence to normal.

STANDARD NUMBER. An **article number** conforming to the standards of the **International Article Numbering Association**.

START GUARD. A pattern of dark bars and light bars (spaces) which indicates the beginning (left hand side) of a **bar code symbol**.

STOCK KEEPING UNIT (SKU). The smallest unit of a particular product in which transactions may occur eg by size/colour/flavour/perfume variant.

STOP GUARD. A pattern of dark bars and light bars (spaces) which indicates the end (right hand side) of a **bar code symbol**.

SUPPLEMENTARY ENCODATION. A code added to the **EAN** identification code to provide additional specialised information.

SYMBOL. In the context of standard **article numbering** symbol always means **barcode symbol**.

TRUNCATION. A **symbol** which is printed with normal length but reduced height. Truncated **symbols** cannot be **scanned omni-directionally**

UNIFORM PRODUCT CODE (UPC). The American standard **article number**.

UNIFORM CODE COUNCIL (UCC). The body in North-America responsible for administering **article numbering**.

UNIT PRICE. Price per unit of variable measure.

UPC. **Uniform Product Code**.

UPC-A. The twelve digit version of the **UPC** number. Also used to denote the standard **symbol** representing the twelve digit number.

UPC-D. A version of the **UPC** number and **symbol** which allows for encodation of 14 to 32 characters.

UPC-E. The short **(zero suppression) symbol** in the **UPC** standards. Six digits are directly represented in the **symbol** but when decoded the number is reconstituted to twelve digits.

VARIABLE MEASURE DESPATCH UNIT. A **despatch unit** whose price varies continuously as a function of its weight, length, area or volume. Units priced at a nominal value of these measures or which are priced in discontinuous bands are not variable measure units.

VARIABLE PARITY. The technique of **encoding** additional data in a **bar code symbol** through choosing particular arrangements of **odd parity** and **even parity** representations of the digits in the code (or part of the code).

VARIABLE WEIGHT ITEM. A **consumer unit** whose retail price varies continuously as a function of its weight.

VARIATION. The difference in the amount of **print gain** throughout a full print run.

VELOCITY CODE. A system of coding, particularly suitable for **key entry** in which the lowest number values are given to the fastest moving items.

VERIFIER/VERIFICATION DEVICE. An instrument designed to measure the bar widths in a printed **symbol**.

VERIFIER DIGIT. A **check digit** applied to the price digits in standard codes for **variable weight items**.

VL. **Logistical Variant**.

WAND. **Light pen**.

ZERO SUPPRESSION. A technique in which zeros in specified positions in an **article number** are removed when the number is represented by a **bar code symbol**.

- o 0 o -