BSI Standards Publication

Product package labels for electronic components using bar code and two-dimensional symbologies (IEC 62090:2017)

bsi.

National foreword

This British Standard is the UK implementation of EN 62090:2017. It is identical to IEC 62090:2017. It supersedes BS EN 62090:2003, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/501, Electronic Assembly Technology.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Date   Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62090

July 2017

English Version

Product package labels for electronic components using bar code and two- dimensional symbologies (IEC 62090:2017)

Etiquettes d'emballage de produits pour composants électroniques, utilisant un code à barres et une symbologie bidimensionelle (IEC 62090:2017)

Etiketten für Verpackungen elektronischer Bauelemente unter Anwendung von Strichcodierung und zweidimensionaler Symbologien (IEC 62090:2017)

This European Standard was approved by CENELEC on 2017-05-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

The text of document 91/1394/CDV, future edition 2 of IEC 62090, prepared by IEC/TC 91 "Electronics assembly technology" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62090:2017.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement   (dop)   2018-02-16

- latest date by which the national standards conflicting with the document have to be withdrawn   (dow)   2020-05-16

This document supersedes EN 62090:2003.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62090:2017 was approved by CENELEC as a European Standard without any modification.

IEC 60194	NOTE	Harmonized as EN 60194.
IEC 60286-1	NOTE	Harmonized as EN 60286-1.
IEC 60286-2	NOTE	Harmonized as EN 60286-2.
IEC 60286-3	NOTE	Harmonized as EN 60286-3.
IEC 60286-4	NOTE	Harmonized as EN 60286-4.
IEC 60286-5	NOTE	Harmonized as EN 60286-5.
IEC 60286-6	NOTE	Harmonized as EN 60286-6.
IEC 61760-4	NOTE	Harmonized as EN 61760-4.
ISO/IEC 15416	NOTE	Harmonized as EN ISO/IEC 15416.
ISO/IEC 15438	NOTE	Harmonized as EN ISO/IEC 15438.
ISO 3166-1	NOTE	Harmonized as EN ISO 3166-1.

Annex ZA
(normative)
Normative references to international publications
with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
ISO 8601	-	Data elements and interchange formats - Information interchange - Representation of dates and times	-	-
ISO/IEC 15417	-	Information technology - Automatic identification and data capture techniques - Code 128 bar code symbology specification	-	-
ISO/IEC 15418	-	Information technology - Automatic identification and data capture techniques - GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance	-	-
ISO/IEC 15434	-	Information technology - Automatic identification and data capture techniques - Syntax for high-capacity ADC media	-	-
ISO/IEC 15459	series	Information technology - Automatic identification and data capture techniques - Unique identification	-	series
ISO/IEC 16022	-	Information technology - Automatic identification and data capture techniques - Data Matrix bar code symbology specification	-	-
ISO/IEC 16388	-	Information technology - Automatic identification and data capture techniques - Code 39 bar code symbology specification	-	-
ISO/IEC 18004	-	Information technology - Automatic identification and data capture techniques - QR Code bar code symbology specification	-	-
ISO/IEC 19762	-	Information technology - Automatic identification and data capture (AIDC) techniques - Harmonized vocabulary	-	-
ANSI MH 10.8.2	-	Data Identifier and Application Identifier Standard	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PRODUCT PACKAGE LABELS FOR ELECTRONIC COMPONENTS USING BAR CODE AND TWO-DIMENSIONAL SYMBOLOGIES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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International Standard IEC 62090 has been prepared by IEC technical committee 91: Electronics assembly technology.

This second edition cancels and replaces the first edition published in 2002. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Applicable data elements have been added. Data identifiers of those data elements are "10D", "14D", "2P", "25L", "18V", "V", "J", "3S", "13E", "33L" and "34L".

b) The following new informative annexes have been added:

   – Annex C, _URL_;

   – Annex D, _Examples of data element short titles_;

   – Annex E, _Package levels for component package labels_.

The text of this International Standard is based on the following documents:

CDV	Report on voting
91/1394/CDV	91/1430/RVC

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

PRODUCT PACKAGE LABELS FOR ELECTRONIC COMPONENTS USING BAR CODE AND TWO-DIMENSIONAL SYMBOLOGIES

1   Scope

This document applies to labels on the packaging of electronic components for automatic handling in B2B processes. These labels use linear bar code and two-dimensional (2D) symbols. Labels for direct product marking and shipping labels are excluded. Labels required on the packaging of electronic components that are intended for the retail channel of distribution in B2C processes are also excluded from this document.

Bar code and 2D symbol markings are used, in general, for automatic identification and automatic handling of components in electronics assembly lines. Intended applications include systems that automate the control of component packages during production, inventory and distribution.

2   Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 15417, *Information technology – Automatic identification and data capture techniques – Code 128 bar code symbology specification*

ISO/IEC 15418, *Information technology – Automatic identification and data capture techniques – GS1 Application Identifiers and ASC MH 10 Data Identifiers and maintenance*

ISO/IEC 15434, *Information technology – Automatic identification and data capture techniques – Syntax for high-capacity ADC media*

ISO/IEC 15459 (all parts), *Information technology – Automatic identification and data capture techniques – Unique identification*

ISO/IEC 16022, *Information technology – Automatic identification and data capture techniques – Data Matrix bar code symbology specification*

ISO/IEC 16388, *Information technology – Automatic identification and data capture techniques – Code 39 bar code symbology specification*

ISO/IEC 18004, *Information technology – Automatic identification and data capture techniques – QR Code bar code symbology specification*

ISO/IEC 19762, *Information technology – Automatic Identification and data capture (AIDC) techniques – Harmonized vocabulary*

ISO 8601, *Data elements and interchange formats – Information interchange – Representation of dates and times*

ANSI MH10.8.2, *Data Identifier and Application Identifier Standard*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
component
electronic or electrical parts (e.g. bare printed circuit boards, integrated circuits, capacitors, diodes, electronic modules, switches, heat sinks, resistors, electronic/electrical connectors, etc.) used in a first level assembly

3.2
component package
commercial unit of components defined by the supplier including, if applicable, their means for protection, structured alignment or for automated assembly

Note 1 to entry   Typical examples are shown in Figure 4.

Note 2 to entry   For the purposes of this document, the term "component package" includes a multiple of the elements depicted in Figure 4, e.g. four reels in one box.

3.3
country of origin
manufacturing country where the product obtained its present identity as a part, subassembly, or finished product

Note 1 to entry: The definition of "country of origin" should be in line with local regulations.

4 Label data content and requirements

4.1 Data elements – general

This document allows mutual agreements between the supplier and the customer to alter or enhance any of the specifications done in this document.

The label format accommodates mandatory, optional and mutually agreed data elements. Examples of data element short titles are given in Annex D.

This document does not supersede or replace any applicable safety or regulatory marking or labelling requirements. This document is to be applied in addition to any other mandated labelling requirements. The labelling requirements of this document and other documents may be combined into one label or appear as separate labels.

Approval and conformity markings, branding elements and other information can be added when applicable. Typically, these are not relevant for automatic processing, and therefore not further outlined in this document.

The number included in the character count is exclusive of overhead characters such as start and stop characters, data identifiers and any other characters required by a standard symbology specification for properly encoded data.

All data elements encoded in a machine-readable medium shall be preceded by the appropriate ISO/IEC 15418 or ANSI MH10.8.2 Data Identifier.

The manufacturer may add any data on the label. Additional linear bar codes or data elements in the 2D symbol shall use the appropriate data identifiers.

If the optional data specified in 4.3 are indicated on the labels, they should be used as described below.

Any further additional data or specific formats or anything else may mutually be agreed between the supplier and the customer. Mutual agreements between trading partners are not restricted by this document.

Data elements where global uniqueness is relevant shall follow the ISO/IEC 15459 series' rules, or be combined with the ISO/IEC 15459 series' compliant company ID with data identifier "18V" and be unique within the scope in this company.

4.2   Mandatory data elements

4.2.1   Manufacturer item identification – DI "1P" and "25P"

The manufacturer-assigned item identification is mandatory.

If "1P" is used, the conformity to the ISO/IEC 15459 series is achieved by its combination with the globally unique company ID "18V".

4.2.2   Customer product code – DI "P"

The customer product code is the code assigned to the product by the customer, and may be transmitted together with the order.

NOTE   Customer product codes on component packages are relatively widely adopted. But when manufacturing on stock or selling via distributors, this information is not yet known.

Adding customer information on the label is subject to a purchase agreement between the supplier and the customer. If there is no specific purchase agreement, it is up to the manufacturer to add this information or not.

4.2.3   Manufacturer identification – DI "18V" and "21V"

The manufacturer identification shall uniquely identify the manufacturer to which the component is traceable.

"18V" is the default manufacturer identification.

In case the manufacturer's organizational sub unit is required, e.g. to indicate a manufacturing location, then DI "21V" is used in addition to "18V". In case of mutual agreement between trading partners, "21V" can be used instead of "18V".

In human-readable form, the manufacturer identification is the full manufacturer name or its logo. In machine-readable form, the manufacturer identification is assigned by a recognized body that assigns company identification according to the ISO/IEC 15459 series.

The human-readable manufacturer identification and the machine-readable manufacturer identification are different. It is recommended that there be a 1:1 relation between human-readable and machine-readable manufacturer identification.

4.2.4   Quantity – DI "Q" and "7Q"

The quantity shall be the quantity in the package or container to which the label is affixed. The default unit of measure for data identifier "Q" is "EACH" or "PIECES".

When a different unit of measure is required, as agreed between trading partners, data identifier "7Q" shall be used with the quantity followed by two alphanumeric characters representing the unit of measurement code defined in Annex D of ANSI MH10.8.2.

It is recommended to use the quantity with a unit of measure only if the unit is different from "piece".

Print only the significant digits for the human-readable quantity. Do not print leading zeros.

4.2.5 Traceability identification – DI "S" and "25S", "1T" and "25T"

4.2.5.1   General

The traceability identification shall be assigned by the manufacturer. This category of identification includes serial numbers and lot/batch numbers.

Traceability identification should be either a serial number (using data identifier "S" or "25S") or a lot/batch number (using data identifier "1T" or "25T").

In certain circumstances, both the serial number and the lot/batch number may be shown on the label. In this case, at least one of the two shall be encoded in a linear bar code and both shall be included in the 2D symbol.

4.2.5.2   Serial number – DI "S" and "25S"

A serial number is a unique code assigned by the supplier to an entity for its lifetime. The format for the serial number is to be defined by the manufacturer.

4.2.5.3   Lot/batch number – DI "1T" and "25T"

A lot/batch number is a code assigned by the supplier to identify or trace a unique group of entities (e.g. manufacturing lot, batch, inspection lot). The format for the lot/batch number is to be defined by the manufacturer.

4.2.6 Country of origin – DI "4L"

The country of origin shall be shown in human-readable information using the full country name.

This shall be in addition to the two-character country codes as per ISO 3166 data being encoded in a machine-readable symbol.

4.2.7 Production date – DI "16D"

Date code shall be in accordance with ISO 8601. When encoded in a machine-readable symbol, either the data identifiers "10D", "11D" or "16D" shall be used. Preference should be given to "16D".

The production date is determined by the manufacturer in an appropriate manner for the specific product.

NOTE   ISO 22742 recommends the format "16D" for the production date.

4.2.8 Package identification – DI "J" and "3S"

Unique package identification (i.e. licence plate) shall be in accordance with the ISO/IEC 15459 series.

A licence plate with data identifier "J" is the recommended format.

If there are several layers of packages with a 1:1 relation each, then the same package ID is to be used for the labels on the different levels of packaging. If there is more than one package in a package, then there shall be different package IDs.

EXAMPLE 1   A reel in a dry pack in a pizza box all have the same package ID on their respective labels.

EXAMPLE 2   Multiple reels in one pizza box each have different package IDs, and the pizza box itself has another ID, too.

NOTE 1   However, as there is also the unique company code according to the ISO/IEC 15459 series with data identifier "18V" as mandatory data element, global uniqueness can be achieved by the combination of this unique company ID and a package ID unique within the domain of this company with data identifier "3S".

NOTE 2   When using "3S", this element is not suited to be used as primary key in an RFID tag in case of future RFID marking of the component package.

4.3   Optional data elements

4.3.1   Expiration date – DI "14D"

An expiration date may be shown on a package label when the packaged items need to be consumed/processed (e.g. soldered) before a certain date, when stored under conditions defined by the manufacturer.

The data format of the expiration date is YYYYMMDD.

4.3.2   Revision level – DI "2P"

The revision level specifies the revision or version of an item, e.g. engineering change level, edition, or revision.

4.3.3   EIAJ ID – DI "3N"

Data identifier "3N" is a coding structure in accordance with the format defined by the Electronic Industries Association of Japan (EIAJ).

Refer to Electronic Commerce Alliance for Global Business Activity (ECALGA) Standards.

4.3.4   Manufacturer location – DI "25L"

The global unique location code according to the ISO/IEC 15459 series is structured as a sequence of three concatenated data elements: the issuing agency code (IAC), followed by the company identification number (CIN), followed by the physical internal location code that is unique within the CIN holder's domain, shall be used to identify a manufacturer's location.

EXAMPLE 1   Using IAC LE (EDIFICE):   **25LLEIBMABCDE**

EXAMPLE 2   Using IAC UN (Dun&Bradstreet):   **25LUN123456789ABCDE**

NOTE   The extension to the DUNS # for different locations is not needed when each location has its own DUNS #.

4.3.5   Customer assigned supplier code – DI "V"

Some customers use their own assigned codes for suppliers, and require this information also on component packages.

It is to be considered that a customer-assigned vendor/supplier code is specific for this one customer. Labels with customer-specific content cause additional efforts and challenges, e.g. in case of production on stock, distribution via resellers or customer returns. Some distribution models may not work when customer data is required on labels. Returning packages with customer specific data usually will imply re-labelling. Therefore, using a customer-assigned vendor/supplier code is allowed but not recommended by this document.

4.3.6 Moisture sensitivity level – DI "13E"

The moisture sensitivity level is a class of time period in which a moisture-sensitive device can be exposed to ambient room conditions, according to IPC/JEDEC J-STD-020 and IEC 61760-4. This is important information, especially for components exposed to soldering processes. At least the moisture sensitivity level should be indicated for such components.

4.3.7 URL – DI "33L" and "34L"

A link to further information accessible via the internet for this specific package can be added in a dedicated data element using data identifier and corresponding data structure "33L", or using the data identifier and corresponding data structure "34L". See Annex C "URL" for details.

NOTE 1   These DIs are used upon agreement between the supplier and the customer.

NOTE 2   Whether additional data or information is provided, what kind of data and how data is provided, is at the discretion of the party owning the data.

4.4   Data semantics and formats defined by the data identifiers

Table 1 lists all the relevant data elements sorted by their respective data identifier.

Table 1 – Data identifiers

Data identifier	Mandatory (M)/optional (O)	Data field	Data characteristics type/length	Description
10D		Date	an3 + n4	Format YYWW
11D	M[a]	Date	an3 + n6	Format YYYYWW
16D		Production date	an3 + n8	Format YYYYMMDD
14D	O	Expiration date	an3 + n8	Format YYYYMMDD
4L	M	Country code	an2 + an2	two-character country code assigned by ISO. The country of origin is defined as the manufacturing country where the product obtained its present identity as a part, sub-assembly, or finished product. With the agreement of the trading partners and when the country of origin is mixed, country code "AA" shall be used. The country code is found in ISO 3166. EXAMPLE 4L US
1P	M[b]	Manufacturer part number		
25P		Product number	an3 + an...32	Combined IAC/CIN and item code assigned by the supplier
2P	O	Revision level		Code assigned to specify the revision level for an item
P	M	Customer product code	an1 + an...25	Code assigned to the product by the customer Mandatory only in case the customer product code is available to the manufacturer at the time of manufacturing. Subject to the purchase agreement between manufacturer and customer.

Data identifier	Mandatory (M)/optional (O)	Data field	Data characteristics type/length	Description
25L	O	Manufacturer location ID	an3 + an...25	Globally unique location ID, assigned by the manufacturer according to the rules of the ISO/IEC 15459 series
18V	M	Manufacturer ID	an3 + an...25	Default manufacturer ID according to the ISO/IEC 15459 series
21V	O	Organizational sub unit ID	an3 + an...25	Organizational Sub Unit according to the rules of the ISO/IEC 15459 series
V	O	Customer assigned vendor code	an1 + an...18	Code assigned to the supplier by the customer
J	M[c]	Licence plate, package ID	an2 + an...25	
3S		Package ID	an2 + an...25	
S	M[d]	Serial number	an1+ an...25	Serial number or code assigned by the supplier to an entity for its lifetime
25S		Serial number	an3 + an...32	Combined IAC/CIN and the serial number assigned by the supplier[c]
1T	M	Lot/batch number	an2 + an...25	Lot/batch number defined by the manufacturer
25T	M	Lot/batch number	an3 + an...32	Combined IAC/CIN and entity identification and lot/batch number assigned by the supplier
7Q	M[e]	Quantity with unit of measure	an2 + n..8 + an2	The quantity with qualifier[e] of products in the product package (CR = cubic metre) EXAMPLE 7Q1CR (This includes an encoded decimal point, if necessary)
Q		Quantity in package	an1 + n...8	The number of products (pcs) in the product package. EXAMPLE Q2000
13E	O	Moisture sensitivity level	an3 + an1...3	MSL indicator defined in IEC 61760-4 or IPC/JEDEC J-STD-020 should be used based on mutual agreement between trading partners. EXAMPLE 13E2a
33L	O	Uniform resource locator (URL)	Includes all characters that form a URL, including header data such as e.g. HTTP://. Character set as listed in RFC 1738.	Complete URL linking to an internet destination determined by the labeller. See Annex C: URL

Data identifier	Mandatory (M)/optional (O)	Data field	Data characteristics type/length	Description
34L	O	Pointer to process URL (P2P URL)	Includes all characters that form a URL, including header data such as e.g. HTTP://. Character set as listed in RFC 1738.	Pointer to process URL (P2P URL) is setting the rules for generating a URL out of item data in conjunction with a portal address encoded in AIDC media jointly with other data. The rules are described with ANSI MH10.8.2 (34L). See Annex C: URL

[a] One of the date formats "10D", "11D" or "16D" shall be used. Although format "16D" with "YYYYMMDD" is recommended, the manufacturer may choose one of the other date formats.

[b] One of the manufacturer assigned product code formats "1P" or "25P" shall be used.

[c] Either "J" or "3S" applies. If "3S" is used, global uniqueness is achieved by combining this element with the company ID "18V".

[d] One of the manufacturer assigned serial number formats "S" or "25S" shall be used.

[e] Either quantity in format "7Q" or "Q" applies. Refer to Annex D of ANSI MH10.8.2.

4.5   Data representation

4.5.1 General formatting

All data elements shall be represented on the label as human-readable text. Mandatory data shall be encoded in a 2D machine-readable symbol. In addition, some of the data should be encoded in linear bar codes. See Table 2.

Table 2 – Mandatory data elements and their representations

Data	Human readable	Linear bar code [a]	Two-dimensional symbol
Item identification code assigned by the manufacturer	M	M	M
Manufacturer	M	O	M
Quantity	M	M	M
Traceability information	M	M	M
Country of origin	M	O	M
Production date	M	O	M
Package ID	M	O	M

Key

M: mandatory

O: optional

Mandatory information of linear bar code in this table shall be encoded in linear bar code whenever there is enough free space on the label for these linear bar codes.

[a] EIAJ has prescribed special data semantic rules and requirements for a linear bar code for component packages intended to meet EIAJ requirements.

If the optional elements are used, then they shall be at least human-readable. And if they are also machine-readable, then they shall be presented in a 2D symbol and optionally be presented in a linear bar code. See Table 3.

Table 3 – Valid combinations of representation of optional data elements

Optional data elements included	Human-readable	2D symbol	Linear bar code
No	Not applicable	Not applicable	Not applicable
Yes	Required	No	No
Yes	Required	Yes	No
Yes	Required	Yes	Yes

4.5.2 General formatting for machine-readable symbols

4.5.2.1 General

In this document, machine-readable symbols are linear bar code symbols or 2D symbols.

4.5.2.2 Maximum symbol length

The maximum symbol length of a linear bar code symbol should be no more than 8 cm.

NOTE   Depending on the choice of the scanning device: Only imagers can read 2D symbols and some imagers have issues with longer linear bar codes.

4.5.2.3 Syntax in linear bar code

If linear bar codes are used, it is strongly recommended not to concatenate them. Each bar code starts with the appropriate data identifier.

If concatenation is done, it shall be in accordance with ANSI MH10.8.2 (as referenced in ISO/IEC 15418).

4.5.2.4 Syntax in 2D symbols

The encoding shall be as described in ISO/IEC 15434. See also Annex B.

4.5.3 General formatting for human-readable information

4.5.3.1 General

Human-readable information can be human interpretation, human translation, data titles or free text and data.

4.5.3.2 Human-readable interpretation

A human-readable interpretation (HRI) of each linear bar code symbol shall be provided adjacent to the bar code. Such human-readable interpretation shall represent the encoded data. See Figure 1.

The HRI shall represent the encoded data, exclusive of the data identifier. The data identifier appears in parentheses as part of the data title, e.g. "(S) Serial #."

The HRI of the linear bar code symbol shall be printed above the bar code symbol.

For 2D symbols, human translation (see 4.5.3.3) should be used.

4.5.3.3 Human translation

In addition to the HRI, human translation of machine-readable data may be provided in a separate section of the label.

4.5.3.4   Data titles

Data titles for linear bar code symbols may be presented with a full data element title, e.g. "(S) Serial Number 123456", or an abbreviated data element title, e.g. "(S) Ser. No. 123456". The data element title is following the data identifier. It is recommended to put the data identifier in round brackets and have one or few space characters between the data identifier and the rest of the data area title.

If the real estate available for marking is insufficient to support the marking of the data element title and the data identifier, the data title may be abbreviated to only include the data identifier enclosed in parentheses, e.g. (S) 123456.

4.5.3.5   Free text and data

Human-readable information that is not a translation of machine-readable information may be added. These data titles should not include data identifiers.

4.6   Data carrier selection

4.6.1 Linear bar code symbols

The linear bar code symbologies to be used in this document are as follows:

- Code 39 (reference: ISO/IEC 16388);
- Code 128 (reference: ISO/IEC 15417).

Code 128 requires less space than Code 39, and supports a wider character set. The choice of any of the linear bar code symbologies above is up to the manufacturer.

Recommended symbol parameters of the bar code symbols are shown in Table 4 and Table 5 below.

For the Code 39 symbology, the optional check digit shall not be encoded.

This document recommends a minimum narrow element width of 0,25 mm, but in no case shall the minimum narrow element be less than 0,17 mm. If narrow element widths of less than 0,25 mm are used, trading partners shall acknowledge the need to use scanning equipment suitable to read this small narrow element width. Regardless of the narrow element width, the linear symbol shall meet the minimum print quality requirements (see Table 4 and Table 5).

Table 4 – Product package label symbol requirements – Code 39

Code 39		Recommended minimum	Recommended maximum
Dimensions (nominal)	Ratio of wide to narrow	2,25:1	3:1
	Narrow element width "X"	0,25 mm	
	Wide element width	refer to ISO/IEC 16388	
	Intercharacter gap	$1X$ to $5,3X$	
Height of bar code	5 mm or greater		
Minimum print quality	1,5 / 05 / 660[a]		
[a] reference: ISO/IEC 15416			

Table 5 – Product package label symbol requirements – Code 128

Code 128		Recommended minimum
Dimensions (nominal)	Module/element width	0,25 mm
Height of bar code	5 mm or greater	
Minimum print quality	1,5 / 05 / 660[a]	
[a] reference: ISO/IEC 15416		

4.6.2 Two-dimensional (2D) symbols

4.6.2.1   General

The 2D symbologies for use in this document are as follows:

- Data Matrix ECC 200 (reference: ISO/IEC 16022; includes also some rectangular formats);
- QR Code (reference: ISO/IEC 18004).

PDF417 is still used on packages, and shall be supported too. However, processing all labels according to this document does require imager readers. For imager readers, real matrix codes such as Data Matrix or QR Code are much better suited than PDF417 and require significantly less space. Therefore, this document does not recommend PDF417 for new applications.

The choice of any of the 2D symbologies above is up to the manufacturer.

4.6.2.2   "X" dimension

The recommended minimum "X" dimensions for each of the cell sizes for Data Matrix ECC 200 and QR Code are 0,17 mm.

The X dimension shall be determined by the printing capability of the manufacturer/printer of the label.

4.6.2.3   Print quality

Print quality shall be tested in accordance with ISO/IEC 16022 for the Data Matrix symbology and ISO/IEC 18004 for the QR Code symbology. The minimum symbol grade should be 1,5/5/660, where

- recommended print quality grade ≥ 2,5 (B) at the point of printing the symbol,
- measurement aperture = 0,125 mm (0,005 in),
- light source wavelength = 660 nm ± 10 nm.

4.6.2.4   Error correction level

Data Matrix ECC 200 uses the automatic error correction as specified in ISO/IEC 16022.

The QR Code shall use the error correction level "M" as specified in ISO/IEC 18004.

4.6.2.5   Syntax and semantics

Symbols compliant to this document shall use the data identifier semantics specified in ISO/IEC 15418 and ANSI MH10.8.2, and the syntax specified in ISO/IEC 15434 and ANSI MH10.8.3.

4.7 Label size, layout, and location

4.7.1 Label size

The dimension of the label should suit the dimensions of the package and may be dependent on the space needed for the required information.

4.7.2 Label layout

Label layout refers to the positioning of the fields on a label. Layout of linear bar code or 2D symbols will depend on the available space on a label, packaging techniques, and other factors.

When multiple bar code symbols or 2D symbols are to be placed in line or in continuous fields, layouts that inhibit scanning the individual data elements shall be avoided. The layout of the label should be designed to accommodate the package size and should facilitate scanning of the bar codes.

Examples of label layout formats (Figure 1, Figure 2 and Figure 3) are shown in 4.7.3.

4.7.3 Examples of label and label layout
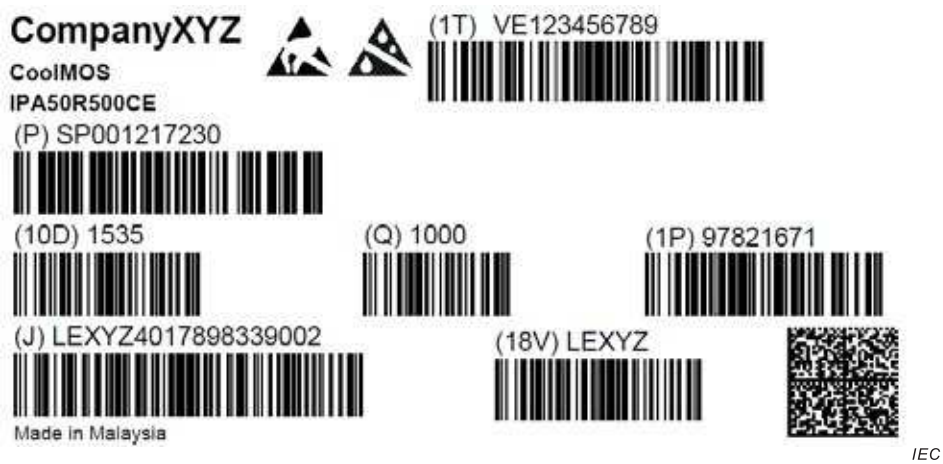

Figure 1 – Label with a linear bar code, Data Matrix symbol and human-readable information
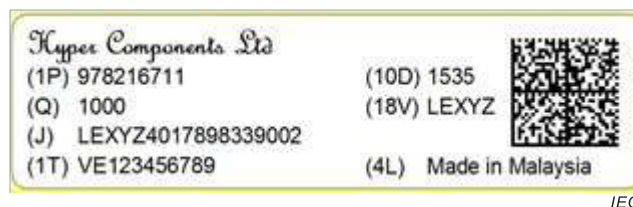

Figure 2 – Label with minimum content, Data Matrix and human-readable information
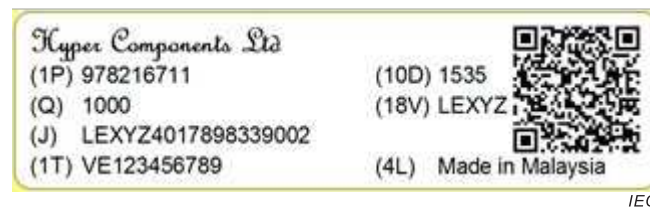
Figure 3 – Label with minimum content, QR Code and
human-readable information

4.7.4 Label location

Label location refers to the positioning of the label on the package. Quality aspects of labels are shown in Annex A.

Each label should be located in a position that facilitates scanning.

Label placement shall be in accordance with relevant IEC packaging standards.

The same label layout and content can be used on several layers of a package, e.g. on a reel, on the moisture bag around the reel, and on the carton around the moisture bag. Package levels for component package labels are shown in Annex E.

Examples of label locations for reel, bulk case, fan-fold container, bag, stick magazine, and matrix tray are shown in Figure 4.
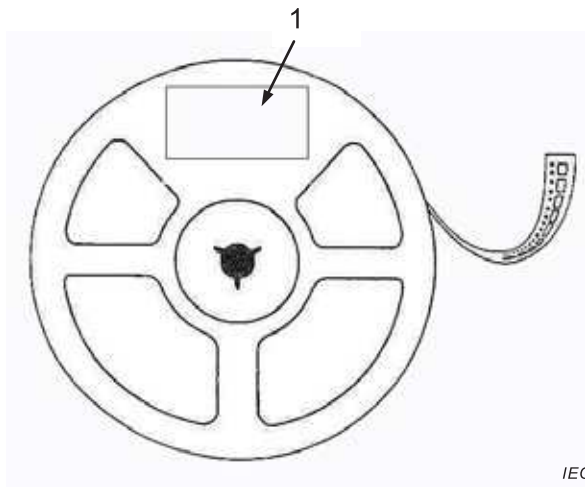
a) Reel
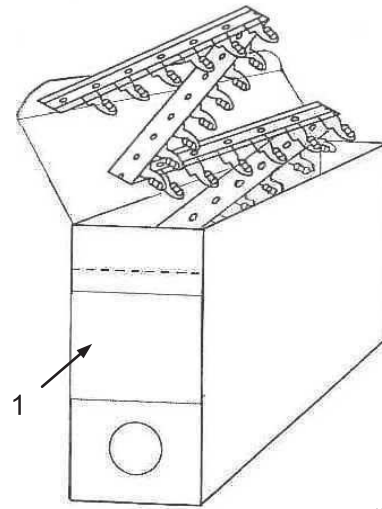
b) Fan-fold container

c) Bulkcase

d) Bag

e) Stick magazine

f) Matrix tray

Key

1   Package label

Figure 4 – Typical label locations

Annex A
(informative)

Quality aspects of labels –
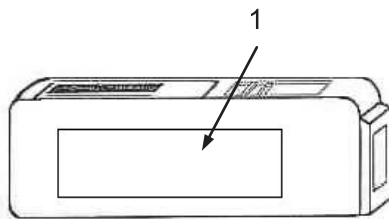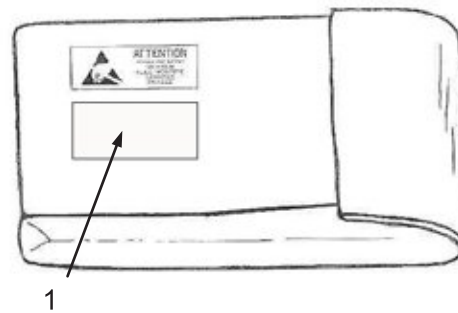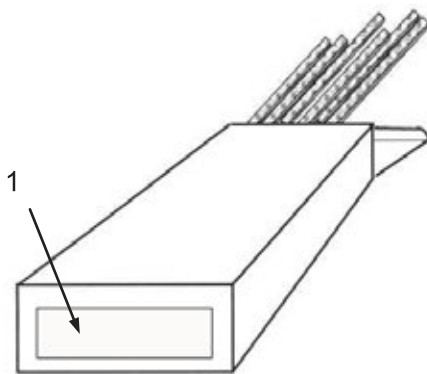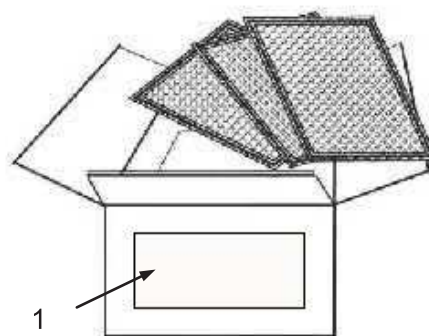## Adhesive characteristics and durability of marking

A.1   General

The following recommendations and tests are intended to ensure that labels and marks can withstand extended long term exposure to a variety of indoor environments, remain affixed to products and are scannable for the intended life of the product.

Observed or calculated values obtained from analysis, measurement, or testing should be rounded off in accordance with the Rounding-Off Method as per ASTM E29-93a to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

Where reference is made to an ASTM designation in this document, the issue listed in the latest published ASTM index to standards should apply unless otherwise specified.

A.2   Recommendations

A.2.1 General

The labels should be capable of meeting the symbology requirements as defined within these guidelines and A.2 when tested in accordance with Clause A.3.

A.2.2 Adhesion characteristics

The labels should show no evidence of delamination, bubbles, adhesive migration or degraded image quality for either the text or the bar code symbol. When a release liner is used, the label adhesive should also enable the label to be easily removed from the release liner to the back of a page, where pages are stacked, or to the underside of the release liner for roll form labels.

The minimum initial adhesion strength two hours after application should be 0,23 N/mm (25,0 oz/in).

The minimum adhesion strength after test panel application and conditioning should be 0,44 N/mm (40,0 oz/in).

The label base material should be capable of resisting tearing during the adhesion testing specified in Clause A.3. The bar code symbols on the label should withstand damage from 50 passes with a contact type scanner over a path no wider than 0,76 mm (0,03 in) across the bar code symbol. When contact scanning, contact should be maintained between scanner and label at all times, but firm pressure, which could damage the label, should be avoided.

The labels should show no evidence of delamination, bubbles, adhesive migration or degraded image quality for either the text or the bar code symbol.

A.2.3 Use and protection

Label protection against moisture, weathering, abrasion, etc., may be required in harsh environments and is encouraged wherever practicable. Laminates, sprays, window envelopes, and clear plastic pouches are examples of possible protection methods.

In choosing any protection method, however, care should be taken to assure that labels meet print quality requirements of this annex and 4.6 when the label or tag is in its final configuration affixed to the package.

A.2.4 Storage conditions

Labels affixed to packages that are to be stored for prolonged periods, and which are intended to be subsequently scanned, should not be stored, without being protected, in areas that consistently have temperatures above 49 °C (120 °F).

A.2.5 Durability

Labels should continue to be scannable on the package and meet the print quality requirements of this document for a minimum period of six months in a protected environment.

A.2.6 Blank label stock contamination

Blank label stock purchased for the use of on-site printing should be free of dust and particulate contamination.

A.3   Method of test

A.3.1 Adhesive strength

A.3.1.1   General

Obtain a rubber-covered steel roller and prepare at least two stainless steel panels as per ASTM D1000, method A.

A.3.1.2   Label test panel preparation

Remove labels from the release liner and apply at least four labels to an ASTM stainless steel test panel, and roll as per ASTM D1000 taking care to leave approximately 3 mm (0,125 in) of release liner on each label for clamping purposes.

A.3.1.3   Initial adhesion strength

Remove at least three labels from the release liner, apply them to one or more stainless steel panels, and roll as per ASTM D1000 taking care to leave approximately 3 mm (0,125 in) of release liner on each label for clamping purposes. After (120 ± 10) min, measure the adhesion strength to determine the conformity with the requirements of A.2.2 using a crosshead tensile tester to make a 90° peel (see Figure A.1) at a rate of 50 mm/min (2 in/min) using a wire length of approximately 762 mm (30 in). Calculate the average value of adhesion.

A.3.1.4   Short term 49 °C, 95 % RH – temperature/humidity

Place the panel in an oven maintained at 49 °C (120 °F) and a controlled relative humidity of 95 % non-condensing. After 96 h, remove the panel and allow it to cool to room temperature. Within 1 h to 3 h of removing the panel from the conditioning chamber, measure the bar code print quality of the labels on one panel as defined within these guidelines as appropriate and the adhesion strength of the labels on the other panel in accordance with A.3.1 to determine conformance with the requirements of A.2. Determine the adhesion strength by measuring the adhesive strength of at least three test labels and averaging the results for the overall value. The labels should show no evidence of self-lifting, delaminating, smudging, or discolouring after conditioning.

A.3.2 Blank label stock contamination

Prior to installing the roll of blank label stock into an on-site printer, a minimum of 50 consecutive labels should be visually inspected for evidence of dust or particulate

contamination. Use either a piece of black cloth or velvet and wipe lightly over the face of the 50 labels. Examine the cloth or the velvet for particles of paper, dust or other foreign material. If any particulate is evident to the unaided eye, the test has failed and the blank label stock should be considered as nonconforming. Nonconforming stock should not be used.

A.3.3 Recyclability

When possible, the label material should be compatible with the substrate material to which it is attached for recyclability.

In addition to the requirements of this document, further requirements related to recyclability issues may be provided in the relevant inner package or reel standard.
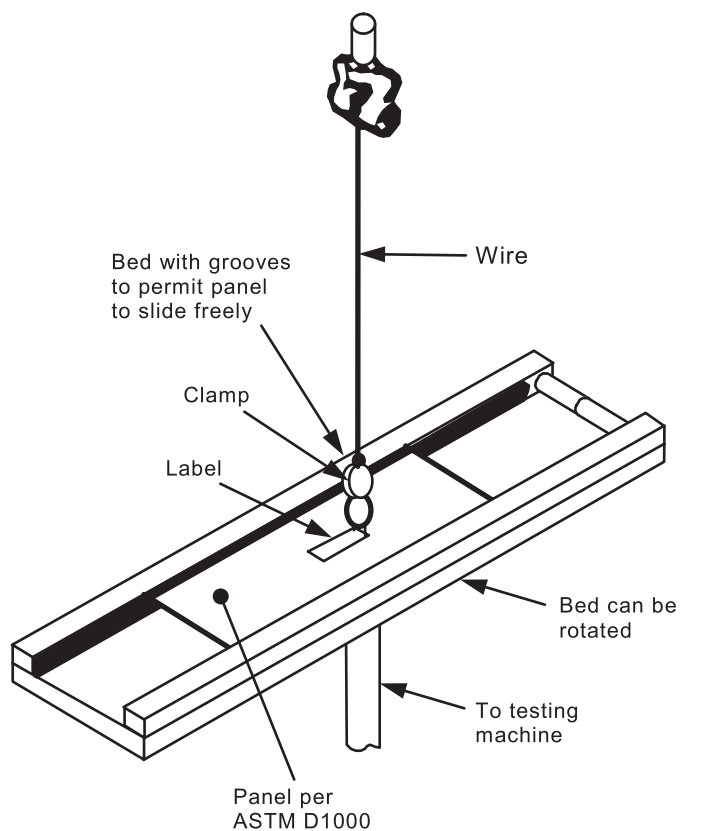

Figure A.1 – Adhesion tester

Annex B
(informative)

ISO/IEC 15434 Data Transfer Syntax

The encoding shall be as described in ISO/IEC 15434. The message and format header, the first seven characters "[)>^R_S06^G_S", and the message and format trailer, the last two characters "^R_S^{E}O$_T$", are fixed for this application (with format indicator "06" for data identifier structure).

When data elements are combined within a 2D symbol, the "^G_S" (ASCII/ISO 646 Decimal "29", Hex "1D") character and the appropriate data identifier shall be used to identify each of the combined fields.

The example in Figure B.1 is comprised of data identifiers, other overhead characters, and some of the mandatory fields (item identification, quantity, and traceability identification (e.g. lot/batch number)).
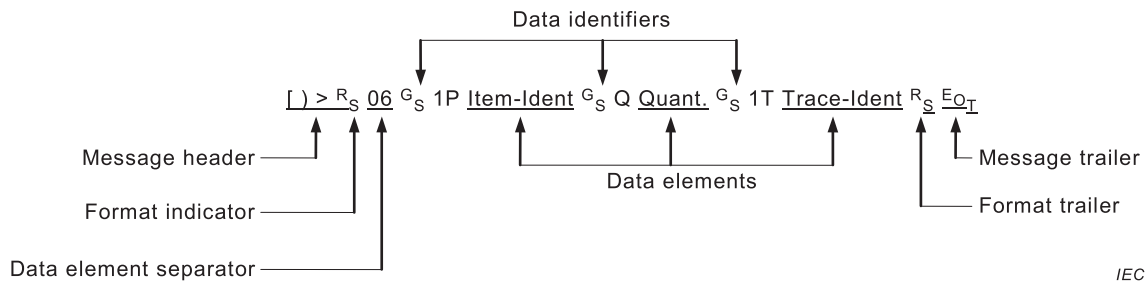
Figure B.1 – Example of encoding data elements in a 2D symbol

Thus, the character string (without blank spaces) is represented as follows:

[ ) > ^R_S 06 ^G_S 1P Item-Ident ^G_S Q Quant. ^G_S 1T Trace-Ident ^R_S ^{E}O$_T$

Annex C
(informative)

URL

C.1   General

URLs embedded in the data encoded in the 2D symbol enable access to related information via the internet. Such information can, for example, be a folder containing datasheets for the components. The specific URL gets a specific data identifier defining the function. There are two DIs available for accessing the internet, the URL DI "33L" and the pointer to process (P2P) URL DI "34L".

Where the URL DI (33L) is just flagging a URL which is added to other data elements in the data string, the P2P URL DI (34L) is designed for double use of the encoded data:

a) for regular data capture of the item/package data;

b) for generating a target URL out of the item data.

Data security and data privacy aspects should be considered with the use of 33L and 34L. When providing data and access via the internet, it is the responsibility of the owner of the data and the system to take measures to ensure an adequate level of protection and privacy.

"Adequate level" depends, among other things, on the confidentiality of data and whether information is to be accessed by authorized parties only.

Typical methods for protection can include the use of https, passwords, certificates, encryption and digital signatures. This applies to both DIs 33L and 34L.

C.2   Principle of using the URL DI "33L"

Table C.1 – How to use the URL DI "33L".

Encoding with DI "33L" ▼	Decoding and linking to the internet ▼
Add URL to item data	Decode and strip off URL and use URL for initiating the internet communication process ▼ URL ►►►►►►INTERNET◄◄◄◄◄◄SOURCE

The DI 33L designates a complete URL linking to an internet destination determined by the labeller. To use the URL embedded in an item code, the URL is to be stripped from the other data elements after scanning. Then an internet communication process can be started. See Table C.1.

C.3 Principle of using the P2P URL DI "34L"

Table C.2 – How to use the P2P URL DI "34L"

Encoding with DI "34L" ▼	Decoding and linking to the internet ▼
Add P2P URL to item/package data	Decode and convert item data and P2P URL (Portal URL) to the sequence: P2P URL (without DI) first, followed by the item data forming the target URL pointing to the source of specific item information. Decode: ITEM/PACKAGE DATA + P2P Convert: Transmit P2P+ITEM/PACKAGE DATA ►►►►►INTERNET◄◄◄◄◄SOURCE of item specific data

Pointer to process URL (P2P URL) is setting the rules for generating a URL out of item data in conjunction with a portal address encoded in AIDC media jointly with other data. The rules are described in ANSI MH10.8.2 (34L).

Scan the code and initiate the URL starting with the P2P URL string, omitting DI 34L and ISO/IEC 15434 envelope syntax (prefix and postfix) and append all other data elements that have been scanned in the same sequence as encoded in the media, including DIs and data element separators. Convert special characters in the appended data into RFC 1738 format (e.g. Group Separator "$^G{}_S$" translated into RFC 1738 sequence %1D). Note that this does not apply to the P2P URL itself. See Table C.2.

EXAMPLE   Encoded data string (using ISO/IEC 15434):

[)>$^R{}_S$06$^G{}_S$25SUN123456789PA12345$^G{}_S$4LUS$^G{}_S$16D20131108$^G{}_S$34LHTTP://WWW.SECUREUID.COM/ITEMDATA/?SCAN=$^R{}_S$$^E{}_O{}_T$

results in the following URL with the transmitted data:

HTTP://WWW.SECUREUID.COM/ITEMDATA/?SCAN=25SUN123456789PA12345%1D4LUS%1D16D20131108

C.4 Implementation of product to internet communication by help of P2P data identifier "34L"

The rules for converting a P2P code to a P2P target URL after scan:

a) extract the data elements from header and terminator of AIDC syntax ISO/IEC 15434;

b) search for P2P-URL and put P2P-URL (without DI 34L) prior to the elements of the item data;

c) prepare this data string as "Target URL" for transmission to the internet by conversion of special characters in the field of the item data in RFC 1738 format (e.g. Group Separator "$^G{}_S$" to be converted to RFC 1738 sequence "%1D").

NOTE   This does not apply to the P2P URL put on front.

EXAMPLE   A P2P code encoded in Data Matrix and conversion into a Target URL (see Table C.3 explanation for DIs used in the EXAMPLE):

[)>$^R{}_S$06$^G{}_S$25SUN123456789PA12345$^G{}_S$4LUS$^G{}_S$16D20141108$^G{}_S$34LHTTP://WWW.SECUREUID.COM/ITEMDATA/?SCAN=$^R{}_S$$^E{}_O{}_T$

HTTP://WWW.SECUREUID.COM/ITEMDATA/?SCAN=25SUN123456789PA12345%1D4LUS%1D16D20141108
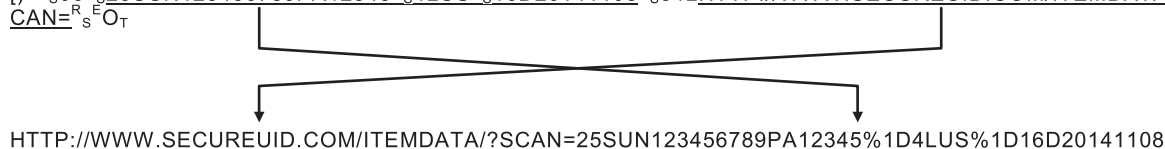
**Table C.3 –ASC DIs used for
the P2P code example:**

ASC DI	Explanation
25S	Unique serial number
4L	Country of origin (US)
34L	P2P DI

For generating target URLs from scanned P2P codes, software tools can be installed in workstations, computers or mobile devices. If a mobile device such as a smartphone is used, an app supporting the "P2P" functionality is to be used to read the 2D symbol and to generate the target URL. The overall system shall be designed in such a way that appropriate information and functionality is accessible via the target URL. Figure C.1 illustrates how a smartphone with P2P App accesses P2P information:

a) scan P2P code;

b) convert to P2P target URL (by P2P App);

c) start of internet dialog.
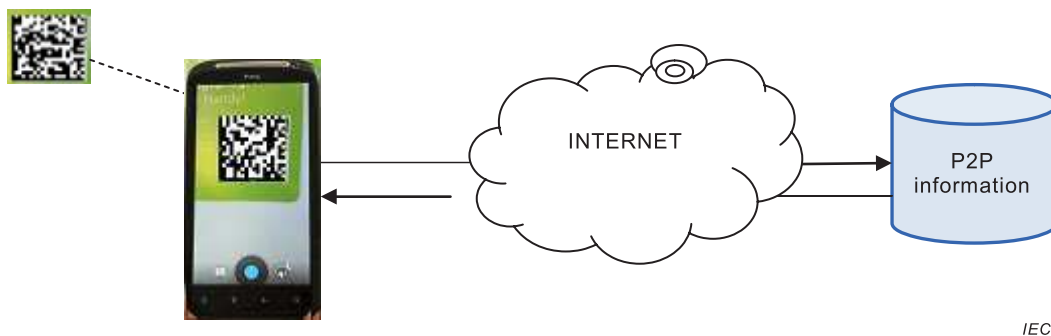
IEC

Figure C.1 – Smartphone with P2P App for access to P2P information

Annex D
(informative)

Examples of data element short titles

Table D.1 shows some examples for possible data element short titles. Depending on available space, language of target market, manufacturer history, etc., short titles other than the ones shown below may be more adequate.

It should make no difference if uppercase or lowercase characters are used. Both are possible.

The selection of short titles is up to the manufacturer, unless specific short titles are subject to a purchase agreement between the supplier and the customer.

"Code", "Number", "No" or "ID" can also be represented with a hash sign ("#").

Table D.1 – Examples of data element short titles

Data identifier	Data field	Examples of data element short titles
10D, 11D	Production Date	Prod Date, Prod
14D	Expiration date	Expir Date, Expir, Exp, Exp Date
16D	Production date	Prod Date, Prod
4L	Country code	Made in, Origin
33L	Uniform resource locator	URL
34L	Pointer to process URL	P2P URL
1P	Manufacturer part number	Prod No, Prod, Manuf Code, PN, P/N
2P	Revision level	Version, Revision, Vers, Rev
25P	Product number	Manuf Prod No, Prod Code, Prod No, PN, P/N
P	Customer product code	Cust Prod No, Cust Prod, Cust PN, Cust P/N
25L	Manufacturer location ID	Manuf Loc, Loc
18V	Manufacturer ID	Manuf ID
21V	Organizational sub unit ID	Manuf Unit
V	Customer assigned vendor code	Vendor
J, 3S	Licence plate, package ID	Lic Plate, Lic, Pack ID, Package No, PKG No
S, 25S	Serial number	Serial No, Ser No, Ser, SN, S/N
1T, 25T	Lot/batch number	Lot No, Lot, Batch, Insp No
7Q	Quantity with unit of measure	Quantity, Quant, QTY
Q	Quantity in package	Quantity, Quant, QTY
13E	Moisture sensitivity level	MSL

Annex E
(informative)

Package levels for component package labels

E.1   Inner and outer product packages

Subclause 4.7.4 shows the labels attached on component packages. Due to the diversity of components and their packages, there is no common method of packing the components, and no common nomenclature.

Roughly, there can be "intimate" or "inner" packages and "outer" packages, and cascades of inner and outer packages, and transport packages (see Figure E.1 and Figure E.2).

"Intimate" or "inner" packages and "outer" packages are relevant for component package labels within the scope of this document. These component packages have in common that:

d) they contain only like items;

e) they typically are put in another package for any transport across location or company borders.

Figure E.1 – Examples for intimate/inner packages

**Figure E.2 – Example for outer package with
more than one inner package.**

Outer boxes with more than one inner package normally have a different package ID (4.2.8) than the inner packages. Outer boxes containing only one inner package may have the same package ID as the inner package.

E.2   "Unit load packages" / "handling units" / "overpacks"

For handling and transportation, the component packages are typically put in bigger packages, which may contain the same or different items (see Figure E.3).

IEC

Figure E.3 – Example of "unit loads" or "handling units" or "overpacks"

When the same items are packed in such an "overpack", then the component package label can apply. For different items, the component package label does not fit.

See EDIFICE guideline "Overpack Labeling Guideline" for good practice on how to mark handling unit packages.

E.3   "Shipping units" / "transport packages"

"Transport packages (see Figure E 4)" are used for shipping. Their labels are described in ISO 15394 and do contain transport-related information, such as the sender and the receiver. Transport package labels are not within the scope of this document.

IEC

Figure E 4 – Examples of transport packages

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