International Standard

ISO 28219

Packaging — Labelling and direct product marking with linear bar code and two-dimensional symbols

Emballages — Étiquetage et marquage direct sur le produit avec un code à barres linéaire et des symboles bidimensionnels

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 122, *Packaging*.

This third edition cancels and replaces the second edition (ISO 28219:2017), which has been technically revised.

The main changes are as follows:

— added URL formats (ISO/IEC 18975, IEC 61406-x);

— preference on formats with concatenated fields;

— preference on 2D symbologies, stacked symbologies removed.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Today, global industries widely use machine-readable markings on products for inventory control, quality control, and product life cycle management. Common technologies, data structures, conformance, and applications standards are necessary to enable all trading partners to use such markings internally and throughout the supply chain.

A number of different product labelling and marking standards exist, each designed to meet the requirements of the specific industry sector. For effective and economic use within and between industry sectors, one common multi-industry standard is a necessity.

A standard linear bar code or two-dimensional symbol marked on a product or part will facilitate the automation of inventory control, quality control, and product life cycle management. The linear bar code or two-dimensional symbol information on the product can be used as a key to access the appropriate database that contains detailed information about the product, including information transmitted via electronic data interchange (EDI). In addition, a product mark can contain other information as agreed between the trading partners.

This document does not supersede or replace any applicable safety or regulatory marking or labelling requirements. This document is meant to satisfy the minimum product marking requirements of numerous applications and industry groups. As such, its applicability is to a wide range of industries, each of which can have specific implementation guidelines for this document. This document is intended to be applied in addition to any other mandated labelling requirements.

Packaging — Labelling and direct product marking with linear bar code and two-dimensional symbols

1 Scope

The purpose of this document is to establish the machine-readable (linear, two-dimensional, and composite symbols) and human-readable content for direct marking and labelling of items, parts, and components.

This document provides a means for items, parts and components to be marked, and read in either fixtured or hand-held scanning environments at any manufacturer's facility and then read by customers purchasing items for subsequent manufacturing operations or for final end use. Intended applications include, but are not limited to, supply chain applications, e.g. inventory, distribution, manufacturing, quality control, acquisition, transportation, supply, repair and disposal.

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 646, *Information technology — ISO 7-bit coded character set for information interchange*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO/IEC 15415, *Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

ISO/IEC 29158, *Automatic identification and data capture techniques — Bar code symbol quality test specification — Direct part mark (DPM)*

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

ISO/IEC 15420, *Information technology — Automatic identification and data capture techniques — EAN/UPC bar code symbology specification*

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

ISO/IEC 15459-2, *Information technology — Automatic identification and data capture techniques — Unique identification — Part 2: Registration procedures*

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 18975, *Information technology — Automatic identification and data capture techniques — Encoding and resolving identifiers over HTTP*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Vocabulary*

IEC 61406-1, *Identification Link - Part 1: General requirements*

IEC 61406-2, *Identification link Part 2: Types/models, lots/batches, items and characteristics*

ISO/IEC 15418, *Information technology — Automatic identification and data capture techniques — GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance*

ANSI MH10.8.2, *Data Application Identifier Standard*

GS1, *GS1 General Specifications Standard*

DIN 16598, *Syntax keyboard and Web compatible encoding of data elements in machine readable symbols applied with ASC Data Identifiers*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
cell
single element of a two-dimensional matrix symbol

3.2
part marking
item marking
applying a mark to an item

Note 1 to entry: This document uses the terms “part marking” and “item marking” interchangeably. Unless otherwise stated, this document uses the term “item marking” to describe both the labelling and direct part marking (DPM) of an *item* (3.7), where DPM includes, but is not limited to, altering (e.g. dot peen, laser etch, chemical etch), as well as additive type processes (e.g. ink jet, vacuum deposition).

3.3
components
parts (bare printed circuit board, integrated circuits, capacitor, diodes, switch, valve, spring, bearing, bracket, bolt, etc.) of a first level/modular assembly

3.4
data element separator
specified character used to delimit discrete fields of data

3.5
DUNS®[1] Number
nine-digit number, issued by Dun & Bradstreet (D&B), assigned to each business location in the D&B database, having a unique, separate, and distinct operation for the purpose of identifying them

1) DUNS® Number is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

3.6
Global Trade Item Number
GTIN[2)]
GS1 identification key used to identify trade items

Note 1 to entry: The key comprises a GS1 Company Prefix, an item reference and a check digit.

Note 2 to entry: GS1 identification key is issued under GS1 identification licensee and comprises a GS1 Company Prefix (GCP), an item reference and check digit. GCP is a unique string of four to twelve digits issued by GS1 Member Organisations and used to issue GS1 identification keys under GS1 identification licensee.

3.7
item
product
first level or higher assembly that is sold in a complete end-usable configuration

3.8
label
media capable of being marked with information in machine-readable and human-readable form attached to an *item* (3.7)

3.9
manufacturer
actual producer or fabricator of an *item* (3.7), not necessarily the *supplier* (3.10) in a transaction

3.10
supplier
party that produces, provides, or furnishes an *item* (3.7) or service

3.11
traceability identification
string of characters assigned to identify or trace an entity or a unique group of entities (e.g. lot, batch, *item* (3.7), production date or serial number)

3.12
Global Location Number
GLN
GS1 identification key identifying locations or parties

Note 1 to entry: The key comprises a GS1 Company Prefix, location reference and check digit.

3.13
labelling
set of methods for the application of a mark onto the label or directly on the *item* (3.7)

4 Requirements

4.1 Identification

4.1.1 General

Enterprises can choose to assign uniqueness to items at the individual, group, or product level. Individual uniqueness requires serialization or one-of-a-kind production, see 4.1.2 and 4.2.3.3. A lot or batch number captures group uniqueness, see 4.1.3 and 4.2.3.3. A product code is an example of item uniqueness, see 4.2.3.4.

2) GTIN is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

4.1.2 Unique item identification

Items can be assigned a unique item identification code to each instance of the item, i.e. serialization. Serial numbers shall be unique either within an enterprise ID or within enterprise ID + part number. When using unique identification, the encoded symbol shall contain only one enterprise identifier, serial number, original part number, or both of the last, to avoid confusion and ensure uniqueness.

4.1.3 Lot or batch identification

Items can have group uniqueness applied by an enterprise. Some items are assigned group identification, e.g. lot or batch number.

4.2 Data format common requirements

4.2.1 General

Those implementing this document should refer to the guidelines for their particular industries. For a partial list of industry guidelines, see the Bibliography.

4.2.2 General format

4.2.2.1 Overview

Labels accommodate both mandatory and optional data fields. The maximum length of each discrete data field shall be 25 data characters unless otherwise specified in the following clauses. This character count is exclusive of overhead characters.

See Reference [14] for information on serialization of some electronic products.

All data elements encoded in a machine-readable medium shall be preceded by the appropriate qualifier following ISO/IEC 15418, in particular an appropriate Data Identifier (DI) as defined in ANSI MH10.8.2 DI, or the appropriate Application Identifier (AI) as defined in the GS1 General Specifications Standard. The exceptions to this rule are the UPC-A, UPC-E, EAN-8, and EAN-13 symbologies.

The choice between DIs and GS1 AIs, for any user, is determined in the applicable industry convention being followed.

Other industries developing item identification conventions should consider business practices, information requirements and systems capabilities of the trading partners in choosing between DIs and GS1 AIs. See Annex B for a list of commonly used DIs and the equivalent AIs.

The character set shall conform to ANSI MH10.8.2 for DI or to the GS1 General Specifications Standard for AI. Alphanumerical fields assigned to DI's shall use all upper case alphabetic characters (A to Z), numeric digits (0 to 9), and the four characters [dash (–), period (.) and solidus (/)]. Alphanumeric fields assigned to AI's shall comply to GS1 AI encodable character set 82, which contains most of the printable ASCII characters excluding the space and a few other characters.

The "+" character is defined to be used as separator within a data field and shall be used for that purpose only in case it appears in a data field to avoid misinterpretations.

For field separators, record separators, segment terminators and compliance indicator contained in ISO/IEC 15434 shall be used in their function as separator but never in any data field. A table of these characters and their hexadecimal and decimal equivalent is given in Annex C. The actual character set employed conforming to this document shall be the character set permitted by the data field and not the symbology. The resultant data stream from scanning a 2D symbol shall follow the syntax described in ISO/IEC 15434, ISO/IEC 18975, IEC 61406-1 or IEC 61406-2. See Annex D for guidance on the implementation of the ISO/IEC 15434 data syntax.

The format of values is described by a sequence of character set and character count range. The character set is described as follows:

— a: alphabet;

— n:digit;

— an: alphanumeric.

The character count may be defined by:

— number: field of given fix length;

— number...number: character count is between the given count. If one number is omitted, the minimum/maximum applies, e.g. "...5" describes 0 to 5 characters, "3..." describes minimum 3 characters.

Multiple encoded fields are represented by a plus sign („+“). The plus sign is not encoded in the data.

NOTE Data fields for e.g. DI 20V use the "+" character in the data field to concatenate two or more data parts in one field. This use of the "+" character is not meant by the definition of the format in this clause (see Table 2).

EXAMPLE "an3+n...3" describes 3 alphanumeric characters directly followed by up to 3 digits. A data string in conformance with this example is "A3B45". "A3B" is the three-character alphanumeric string. "45" are two digits, which is in conformance to the specification of up to three digits.

Other data structures with a scope on a limited application field are not covered by this document. One example is the Health Industry Business Code (HIBC) for medical devices[4].

See Annex A for label adhesive characteristics.

4.2.2.2 Data Identifiers (DIs)

The descriptions in the DI list are general in nature and are used in industrial and international applications. Specific application guidelines provide the detailed definition used among trading partners.

The full list of registered DIs and the full specification for their use are found in the American national standard ANSI MH10.8.2.

DIs may be used with any alphanumeric data carrier and are designed to ensure cross-industry commonality of DIs used in automatic identification technologies.

DIs have a format of one alphabetic character alone or one alphabetic character prefixed by one, two or three numeric characters.

4.2.2.3 GS1 Application Identifiers (AIs)

The definitions of the GS1 AIs are supported by application guidelines. The GS1 AIs, and associated guidelines, have been designed for international and multi-sector trading purposes.

The GS1 identification system and related encoding standard are complemented by the GS1 maintained AIs. This document comprises two principal elements, which are the key to any encoding system: the data content and the data carrier.

The use of GS1 AIs is subject to the rules established by GS1.

GS1 AIs identify generic and simple data fields for use in cross-sector and international supply chain applications. The GS1 General Specifications Standard provides rules for the definition, format and structure of the data fields.

Each GS1 AI consists of two, three or four numerical characters.

4.2.2.4 Organization inclusion in coding

To create item identification incorporating the organization providing the identification the pure item identification is preceded by an issuing agency code (IAC) and a company identification number (CIN) assigned by the issuing agency. IAC's shall be assigned to organisations according to the rules defined by ISO/IEC 15459-2.

IA's are registered by the registration authority AIM Global. AIM Global provides a list of all, more than 40, IA's and document describing of how to get an IA.

GS1 is one Issuing Agency (IA). GS1 defines the numbers for local GS1 organisation and these provide the CIN to their customers which includes the IAC and the number of the local GS1 organisation. The company identified by the CIN then adds the pure item number. The complete data is then the Global Trade Item Number (GTIN).

Other IA's like Dun & Bradstreet are identified by one, two or three capital alphabet characters. Most of them use DI's. The item identification then builds up by the sequence of IAC, CIN and the pure item identification. In case of Dun & Bradstreet the IAC is "UN". The general rules for this system are defined by ISO/IEC 15459-3[1].

See Annex E for information about the register of issuing agency codes (IACs) for ISO/IEC 15459.

4.2.3 Mandatory data fields

4.2.3.1 General

Mandatory data fields are given in Table 1.

Table 1 — Item identification code type

Item identification type	Mandatory fields
1. Commodity	Item identification code (example nails)
2. Non-traceable	Enterprise identification code Item identification code
3. Group traceability	Enterprise identification code Item identification code Product version number, Lot number or production date or Enterprise identification code Unambiguous lot number
4. Unique serialization within item identification code	Enterprise identification code Item identification code Unique individual item identification code
5. Unique serialization within enterprise	Enterprise identification code Unique item traceability code within enterprise identification code

The enterprise identification code and item identification code may be combined in a single data field, see 4.2.3.4.

4.2.3.2 Enterprise identification code

The enterprise identification code shall use formats contained in Table 2. The use of more than one enterprise identification code preceded by DI 20V is permitted on an item. The choice of enterprise identification code(s) should be mutually agreed upon between trading partners. The appropriate DI shall precede the enterprise identification when separate data fields are used to identify the supplier and the item identification.

Within the GS1 system, an enterprise is identified by a GLN. The GLN is used as a part of a data element for uniqueness but not encoded as a separate field.