BS ISO 22742:2010

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Packaging — Linear bar code and two-dimensional symbols for product packaging

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National foreword

This British Standard is the UK implementation of ISO 22742:2010. It supersedes BS ISO 22742:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PKW/0, Packaging.

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

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INTERNATIONAL STANDARD

ISO 22742

Second edition
2010-12-15

Packaging — Linear bar code and two-dimensional symbols for product packaging

Emballages — Code-barres linéaire et symboles bidimensionnels pour emballage de produits

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 22742 was prepared by Technical Committee ISO/TC 122, *Packaging*.

This second edition cancels and replaces the first edition (ISO 22742:2005).

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Introduction

Bar code marked product package labels are in widespread use in global industries. A number of different standards exist, each designed to meet the requirements of that specific industry sector. For effective and economic use within and between industry sectors, one common multi-industry standard is a necessity.

A bar code marked product package label is designed to facilitate the automation of inventory, distribution, repair and point of purchase operations. The bar code information on the product package label can be used as a key to access the appropriate database, which contains detailed information about the product including information transmitted via electronic data interchange (EDI). In addition, a product package label can contain other information as agreed between the trading partners.

Two-dimensional symbols can be included to assist moving greater amounts of product data from sender to recipient.

Whereas ISO 15394 is intended to support the transportation function within the supply chain (e.g. from the shipping dock, through the transportation processes, and to the receiving dock), this International Standard is intended to support the logistic functions preceding and following transportation. At the origin point, this International Standard is designed for use from manufacture to storage, to picking and packing, to delivery to the shipping dock, and all associated inventory processes. At the destination point, it is designed for use from the receiving dock to order checking, to storage, to consumption, and to all associated inventory processes and reverse logistic processes.

This International Standard is based on ANS MH10.8.6, GS1 General Specifications, and standards on product packaging (e.g. IEC 62090).

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INTERNATIONAL STANDARD ISO 22742:2010(E)

Packaging — Linear bar code and two-dimensional symbols for product packaging

1 Scope

This International Standard

a) specifies the minimum requirements for the design of labels containing a linear bar code and two-dimensional symbols on product packages to convey data between trading partners,

b) provides guidance for the formatting on the label of data presented in a linear bar code, two-dimensional symbols or human-readable form,

c) provides specific recommendations regarding the choice of linear bar code and 2D symbologies, and specifies quality requirements and classes of bar code density,

d) provides specific recommendations regarding 2D symbologies, which allow a broad choice for general use of scanning hardware (e.g. area imagers, linear imagers, single-line laser scanners, and rastering laser scanners), and

e) makes recommendations as to label placement, size and the inclusion of free text and any appropriate graphics.

This International Standard supports item identification and supply chain processes, at the product package level, such as inventory control, picking, and point of use.

NOTE 1 ISO 15394 supports the distribution and transportation business processes, so aiding the tracing and tracking of unique shipments.

NOTE 2 ISO 28219 addresses the direct part marking.

The purpose of this International Standard is to establish the machine-readable (e.g. bar code) and human-readable data content of labels applied to product packages.

Intended applications include, but are not limited to, inventory, warehouse management, maintenance and point of purchase.

While guidance is provided, specific label dimensions or marking areas and the location of the information are not defined in this International Standard. Before implementing this specification, suppliers and manufacturers are advised to review and mutually agree on these details with their trading partners.

This International Standard does not supersede or replace any applicable safety or regulatory marking or labelling requirements. It is intended to satisfy the minimum product package requirements of numerous applications and industry groups. As such, its applicability is to a wide range of industries, each of which has specific implementation guidelines. This International Standard is also applicable to any other mandated labelling requirements.

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2 Normative references

The following referenced documents are indispensable for the application 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 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

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

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

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 15438, *Information technology — Automatic identification and data capture techniques — PDF417 bar code symbology specification*

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

ISO/IEC 18004, *Information technology — Automatic identification and data capture techniques — QR Code 2005 bar code symbology specification*

ISO/IEC 19762 (all parts), *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

ISO 21067, *Packaging — Vocabulary*

ANS MH10.8.2, *Data Application Identifier Standard*

GS1, *General Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762, ISO 21067, and the following apply.

3.1
Code 39
3 of 9 Code (deprecated)
discrete, variable length, bar code symbology encoding the characters 0 to 9, A to Z, and the additional characters “-” (dash), “.” (period), space, “$” (dollar sign), “/” (slash), “+” (plus sign), and “%” (percent sign), as well as a special symbology character to denote the start and stop character, conventionally represented as an “*” (asterisk)

NOTE Each Code 39 symbol consists of a leading quiet zone, a start symbol pattern, symbol characters representing data, a stop pattern, and a trailing quiet zone. Each Code 39 character has three wide elements out of a total of nine elements. Each symbol consists of a series of symbol characters, each represented by five bars and four intervening spaces. Characters are separated by an intercharacter gap. Each element (bar or space) is one of two widths. The values of the X-dimension (3.13) and wide-to-narrow ratio remain constant throughout the symbol. The particular pattern of wide and narrow elements determines the character being encoded. The intercharacter gaps are spaces with a minimum nominal width of 1X. See ISO/IEC 16388 for the Code 39 symbology specification.

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3.2
Code 128
continuous, variable length, bar code symbology capable of encoding the full ASCII-128 character set, the 128 extended ASCII character set, and four non-data function characters

NOTE Code 128 allows numeric data to be represented in a compact double-density mode, with two data digits for every symbol character. Each Code 128 symbol uses two independent self-checking features, character self-checking via parity and a modulo 103 check character. Each Code 128 symbol consists of a leading quiet zone, a start pattern, characters representing data, a check character, a stop pattern, and a trailing quiet zone. Each Code 128 character consists of eleven 1X wide modules. Each symbol character is comprised of three bars alternating with three spaces, starting with a bar. Each element (bar or space) can consist of one to four modules. Code 128 has three unique character sets designated as code set A, B and C. Code set A includes all of the standard upper-case alphanumeric keyboard characters, the ASCII control characters having an ASCII value of 0 to 95, and seven special characters. Code set B includes all of the standard upper-case alphanumeric keyboard characters, lower-case alphabetic characters (specifically ASCII character values 32 to 127), and seven special characters. Code set C includes the set of 100 digit pairs from 00 to 99, inclusive, as well as three special characters. The FNC1 character in the first character position after the start code of Code 128 designates that the data that follow comply with the GS1-128 standards. See ISO/IEC 15417 for the Code 128 symbology specification.

3.3
component
part, assembly or raw material that is a constituent of a higher-level assembly

3.4
component packaging
commercial unit of **components** (3.3) defined by the supplier, including, if applicable, their means for protection, structured alignment, or automated assembly

NOTE Component packaging can include: leaded components taped on reels or in ammo boxes according to IEC 60286-1 and IEC 60286-2; surface mount devices (surface mount components), taped on reels according to IEC 60286-3 and in bulk case IEC 60286-6; integrated circuits (ICs) in stick magazines according to IEC 60286-4; or in matrix trays according to IEC 60286-5. Compare **product package** (3.32).

3.5
country of origin
manufacturing country wherein the product obtained its present identity as a part, subassembly or finished product

3.6
data element separator
specified character used to delimit discrete fields of data

3.7
data element title
part of the data area title for linear code that gives a brief description of the data element

EXAMPLES Part number and customer number.

NOTE The data element can contain abbreviations.

3.8
Data Matrix
error correcting two-dimensional matrix symbology, capable of encoding various character sets including strictly numeric data, alphanumeric data and all ISO/IEC 646 (ASCII) characters, as well as special character sets

NOTE 1 International Data Matrix developed Data Matrix in 1989 with finalized design in 1995.

NOTE 2 The symbology has **error detection** (3.16) and **error correction** (3.15) features. Each Data Matrix symbol consists of data regions that contain nominally square modules set out in a regular array. A dark module is a binary 1 and a light module is a binary 0. There is no specified minimum or maximum for the X or Y dimension. The data region is surrounded by a finder pattern that is surrounded by a quiet zone on all four sides of the symbol. The finder pattern is a

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perimeter to the data region and is one module wide. Two adjacent sides are solid dark lines used primarily to define physical size, orientation and symbol distortion. The two opposite sides are made up of alternating dark and light modules. These are used primarily to define the cell structure but can also assist in determining physical size and distortion. The intellectual property rights associated with Data Matrix have been committed to the public domain. See ISO/IEC 16022 for the Data Matrix symbology specification.

3.9
dot
localized region with a reflectance that differs from that of the surrounding surface

3.10
dot misalignment within a cell
distance between the physical centre point of a **dot** (3.9) and the cell centre point

3.11
GS1 system
specifications, standards and guidelines administered by GS1

3.12
EAN/UPC
family of bar code symbols including EAN-8, EAN-13, UPC-A, and UPC-E bar code symbols, which are a fixed-length, numeric 8, 12, and 13-digit bar code symbol adopted by retail and some other industries, composed of a company prefix assigned by GS1 member organizations, a product code assigned by the manufacturer, and a modulo 10 check digit as the right-most digit

NOTE See ISO/IEC 15420 for the EAN/UPC symbology specification. See also **UPC-A** (3.43).

3.13
element width
X-dimension
thickness of an element, measured from the leading edge of an element to the trailing edge of the same element

3.14
erasure correction
use of the **error correction** (3.15) characters to correct data errors that have known locations

NOTE These locations can have insufficient contrast in the image, can fall outside of the image field, or can have incorrect parity for symbologies with symbol character parity. Only one error correction character is required to correct each erasure.

3.15
error correction
mathematical procedure that allows the detection and rectification of errors to take place

3.16
error detection
use of the **error correction** (3.15) characters to detect the fact that the number of errors in the symbol exceeds the error correction capacity

NOTE Error detection will keep the symbol from being decoded as erroneous data. The error correction algorithm can also provide error detection by detecting invalid error correction calculation results.

3.17
European Norm
EN
standard of the European Union

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3.18
first level assembly
manufactured item or a mechanical assembly of an item comprised of **components** (3.3)

3.19
format
high-capacity ADC medium comprising one or more **segments** (3.34)

NOTE A format contains one **format type** (3.24).

3.20
format envelope
that which delimits the start and end of data in a given **format** (3.19), consisting of a **format header** (3.21) and a **format trailer** (3.23)

3.21
format header
string of characters, including the **format indicator** (3.22), used to identify the start of a **format envelope** (3.20)

3.22
format indicator
two-digit numeric code used to identify the specific **format type** (3.24) of the application data

3.23
format trailer
character used to identify the end of a **format envelope** (3.20)

3.24
format type
rules under which a specific **format** (3.19) is encoded

3.25
GTIN
Global Trade Item Number
reference for all valid GS1 products or services

3.26
Interleaved Two of Five
ITF
bar code symbology where two characters are paired, using bars to represent the first character and the interleaved spaces to represent the second character, encoding the ten digits 0 to 9

NOTE Each character has two wide elements and three narrow elements for a total of five elements. This is most commonly represented in the GS1 ITF-14. See ISO/IEC 16390 for the Interleaved Two of Five symbology specification.

3.27
ITF-14
14-digit implementation of the GS1 **Global Trade Item Number** (3.25) when encoded in the **Interleaved Two of Five** (3.26) symbology

NOTE The 14-digit version of the GTIN was formerly known as the UPC Shipping Container Symbol (SCC-14).

3.28
message envelope
that which delimits the start and end of a data stream in a given message, consisting of **message header** (3.29) data and a **message trailer character** (3.30)

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3.29
message header
string of characters used to identify the start of a **message envelope** (3.28)

3.30
message trailer character
End of Transmission character, “EOT”, ", (ASCII/ISO/IEC 646 Decimal “04”) (ASCII/ISO/IEC 646 Hex “04”) which serves to define the end of a message

3.31
PDF417
error correcting two-dimensional multi-row symbol

NOTE 1 Developed in 1992 by Symbol Technologies, PDF417 symbols are constructed from 4 bars and 4 spaces over 17 modules.

NOTE 2 The symbol size is from 3 to 90 rows. There is no specified minimum or maximum for X or Y dimension. With at least the recommended minimum level of **error correction** (3.15), the recommended Y dimension is 3X. With less than the minimum recommended level of error correction, the recommended Y dimension is 4X. A quiet zone of 2X is specified on each side of a symbol. Because of delta decode techniques, the symbology is immune from uniform bar width growth. PDF417 supports cross-row scanning. The intellectual property rights associated with PDF417 have been committed to the public domain. See ISO/IEC 15438 for the PDF417 symbology specification.

3.32
product package
first tie, wrap or container of a single item or quantity thereof that constitutes a complete identifiable pack

NOTE A product package can be an item packaged singularly, multiple quantities of the same item packaged together, or a group of parts packaged together. For the purposes of this International Standard, the term “product package” includes component packages and packaging intended for storage and transport.

3.33
QR Code
error correcting matrix symbology, consisting of an array of nominally square modules arranged in an overall square pattern, including a unique finder pattern located at three corners of the symbol and intended to assist in easy location of its position, size and inclination

NOTE 1 Introduced in 1994 by Denso Corporation.

NOTE 2 A wide range of sizes of symbol is provided for together with four levels of **error correction** (3.15). Module dimensions are user specified to enable symbol production by a wide variety of techniques. The symbol size (not including the quiet zone) is 21 by 21 modules to 177 by 177 modules. The symbology efficiently encodes kanji and kana as well as encoding numeric, alphanumeric, and 8-bit byte data. See ISO/IEC 18004 for the QR Code symbology specification.

NOTE 3 The 2005 revision of the QR Code specification can be found in ISO/IEC 18004.

3.34
segment
logical group of data elements, specifically a logical portion of an electronic data interchange (EDI) or high-capacity ADC message

3.35
segment terminator
single character used to separate **segments** (3.34)

3.36
semantics
means by which the purpose of a field of data is identified

NOTE Semantic examples used in automatic data capture include ISO/IEC 15418/ASC MH10 Data Identifiers, GS1 Applications Identifiers, EDI (X12/EDIFACT/CII) Data Element Qualifiers.

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3.37
serial number
code assigned by the **supplier** (3.39) to an entity for its lifetime

EXAMPLES Computer serial number, traceability number and contract tool identification.

3.38
structure
order of data elements in a message

3.39
supplier
party that produces, provides or furnishes an item or service

3.40
syntax
way in which data are put together to form messages

NOTE Syntax also includes rules governing the use of appropriate identifiers, delimiters, separator character(s), and other non-data characters within the message. Syntax is the equivalent to grammar in spoken language. The syntactic example used in automatic data capture includes ISO/IEC 15434/ANS MH10.8.3.

3.41
traceability identification
code assigned to identify or trace a unique group of entities (e.g. lot, batch, item, revision/version or serial number)

3.42
traceability number
code assigned by the **supplier** (3.39) to identify/trace a unique group of entities (e.g. lot, batch)

3.43
UPC-A
Universal Product Code
fixed-length, numeric 12-digit bar code symbol adopted by the retail industries, composed of a company prefix assigned by GS1, a product code assigned by the manufacturer, and a modulo 10 check digit as the right-most digit

NOTE For international compatibility with EAN-13, a 13th digit can be represented as a derived 0 in the left-most position. See ISO/IEC 15420 for the EAN/UPC symbology specification.

4 Data content and requirements

4.1 General

Before implementing this specification, suppliers and manufacturers should review and mutually agree on specific labelling details with their trading partners. The labelling requirements of this International Standard and other standards may be combined into one label or appear as separate labels.

The label format accommodates both mandatory and optional data elements.

The number included in the character count is exclusive of overhead characters such as start and stop characters, Data Identifiers (DIs) or Application Identifiers (AIs) and any other characters required by a standard symbology specification to properly encode data.

All data elements encoded in a machine-readable medium shall be preceded by the appropriate Data Identifier defined in ISO/IEC 15418 and ASC MH10 Data Identifiers, or the appropriate Application Identifier defined in ISO/IEC 15418 and the GS1 General Specifications.

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The choice between GS1 Applications Identifiers or Data Identifiers for any user will normally be defined in the applicable industry convention being followed.

Other industries developing product or shipment identification conventions should consider business practices, information requirements and systems capabilities of the trading partners in choosing between Data Identifiers and GS1 Applications Identifiers. The user may also consider the following guidelines.

a) GS1 Applications Identifiers

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

2) The GS1 item identification system and related encodation standard are complemented by the GS1-maintained Application Identifiers, hereafter referred to as “GS1 Applications Identifiers” (GS1 AIs). This standard comprises two principal elements that are the key to any encoding system: the data content and the data carrier.

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

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

5) Each GS1 AI consists of two or more characters. The first two digits determine the length of the AI. A list of two-digit codes indicating the predefined length of existing and future AIs and their data fields are contained within the GS1 General Specifications.

b) Data Identifiers

1) The descriptions in the Data Identifier list are general in nature and are used in industrial and international applications. Specific application guidelines provide the detailed definition used amongst trading partners.

2) The full list of registered Data Identifiers and the full specification for their use are found in ANS MH10.8.2.

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

4) DIs have a format of one alphabetic character alone, or one alphabetic character prefixed by one, two or three numeric characters. Further in specific cases certain punctuation and communication control characters (System Identifiers) can have the same functionality as a Data Identifier. See ANS MH10.8.2 Category “0” and Annex K.

It is recommended that data structures used to identify products or the traceability of products include identification of the organization providing the coding as well as the specific coding structure. Such data structures include 25P, 22S, 25S, and 25T.

In the GS1 General Specifications, this coding structure is the company prefix portion of the GTIN (Global Trade Item Number) or GLN (Global Location Number).

When using Data Identifiers, this coding structure uses the Issuing Agency Code (IAC) established in ISO/IEC 15459-2 and the Company Identification Number (CIN) assigned by the issuing agency.

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4.2 Rules for encoding of mandatory and optional data elements in machine-readable symbols and human-readable information

4.2.1 General rules

The choice to encode in linear bar code, 2D symbol, or both shall be agreed between trading partners.

The appropriate Data Identifier or Application Identifier shall precede all machine-readable data elements. The Data or Application Identifiers should be selected from the options given in 4.1 and shall be in accordance with ISO/IEC 15418.

4.2.2 Rules for mandatory data elements

4.2.2.1 Encoding mandatory elements in machine-readable symbols

Mandatory data elements shall be encoded in a machine-readable symbol, as follows.

a) If only a linear bar code is used, the mandatory data shall be in the linear bar code.

b) If both a linear bar code and 2D symbol are used on the label, the mandatory data shall be in the linear bar code and the 2D symbol.

c) If only a 2D symbol is used, the mandatory data shall be in the 2D symbol.

4.2.2.2 Human-readable information for encoded data elements

Human-readable information for mandatory data elements shall be on the label in all cases, as follows.

a) For linear symbols, the human-readable shall be human-readable interpretation.

b) For 2D symbols, the human-readable shall be human translation.

When mandatory data are only in the 2D symbol, the mandatory human-readable shall be human translation.

4.2.3 Rules for additional data elements[1)]

4.2.3.1 Encoding in machine-readable symbols

Additional data elements should be encoded in a machine-readable symbol, as follows.

a) If only linear bar codes are used, the data should be in the linear bar code.

b) If both linear bar codes and the 2D symbol are used

— data should be in the linear bar code and should be included in 2D,

— if the data are included in the linear bar code, the data shall also be included in the 2D symbol.

c) If only a 2D symbol is used, the data should be in the 2D symbol. The use of a 2D symbol shall be accompanied by the linear bar code of the mandatory data fields unless mutually agreed between trading partners.

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1) Additional data elements are defined in 4.3.

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4.2.3.2 Human-readable information for encoded data elements

Human-readable information for optional data elements encoded in a linear symbol shall be on the label in all cases. In this case, human-readable interpretation shall be present and human translation may be added.

For data elements encoded in 2D symbols, the human-readable information should be on the label and it shall be human translation.

4.2.3.3 Human-readable information for data elements not encoded

Human-readable information for additional data elements that are not encoded in machine-readable symbols may be shown in human-readable information only.

4.2.4 Rules for data elements not specified in this International Standard

4.2.4.1 Encoding additional data elements in machine-readable symbols

a) If only linear bar codes are used, the data may be in the linear bar code.

b) If both linear bar codes and 2D symbols are used:

   1) Data may be in linear bar code and should be included in 2D;

   2) If the data are included in the linear bar code, the data shall also be included in the 2D symbol.

c) If only a 2D symbol is used, the data should be in the 2D symbol. The use of a 2D symbol shall be accompanied by the linear bar code of the mandatory data fields unless mutually agreed between trading partners.

4.2.4.2 Human-readable information for encoded data elements

For data elements encoded in a linear symbol, the human-readable information shall be on the label in all cases. See Table 1. In this case, human-readable interpretation shall be present and human-readable translation may be added.

For data elements encoded in 2D symbols, the human-readable information may be on the label and it shall be printed as human translation.

4.2.4.3 Human-readable information for data elements not encoded

Other data elements may be shown in free text only.

EXAMPLES Product description and parametric values.

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