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**Plastics pipes and fittings —
Equipment for fusion jointing
polyethylene systems —**

**Part 5:
Two-dimensional data coding of
components and data exchange format
for PE piping systems**

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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 documents 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 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

A list of all parts in the ISO 12176 series can be found on the ISO website.

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

The use of two-dimensional codes is becoming more and more popular because of the quantity of information that is possible to group in a small space, and this may provide increased opportunities for manufacturers and customers. There are many benefits for the market, but the scope of this document is not to show all of them. The most important technical advantage of using a two-dimensional code is the possibility to apply a built-in correction level to the coding, so that, even with some scratches or missing parts, the operator can still use all information coded safely. Another important fact, for those that want to use the power of the whole traceability, is that any important information regarding the piping component can be stored in an electronic device, by reading only one code instead of two (ISO 12176-4 and ISO 13950) and thus avoiding overlapping information. This new part of ISO 12176 provides a means for coding all aspects not covered by ISO 12176-4 or ISO 13950, e.g. large diameters, big saddles, other imperial sizes. This document also aims to standardise the transfer of the data stored in the memories of the electronic units, to another electronic equipment (e.g. computer/data base), to encourage, at any level, the use of the traceability for a further development of the polyethylene piping systems.

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Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems —

Part 5:

Two-dimensional data coding of components and data exchange format for PE piping systems

1 Scope

This document specifies an encoding system for data of components, assembly methods and jointing operations for polyethylene (PE) piping systems for gas, water and other industrial applications. These data can be used in a traceability system and/or used to perform the fusion of components by using equipment as specified in ISO 12176-1 and in ISO 12176-2.

This encoding system is explained in ISO/IEC 16022, ISO/IEC 18004 and ISO/IEC 24778 which refer to established code types, e.g. QR code.

Data to be encoded are: fusion cycle(s), traceability of manufactured products, other manufacturer's information that may also be given on web-sites such as voluntary certificates of quality and approvals.

This document specifies the export of data (type, format and sequence) from a data retrieval system.

Provisions of this document are applicable to polyethylene components conforming to ISO 4427-2^[1], ISO 4427-3^[2], ISO 4437-2^[3], ISO 4437-3^[4], ISO 4437-4^[5] and ISO 15494^[6], and it can be applicable also to any other components used in PE systems.

ISO 13950 and ISO 12176-4, which partly cover the fields of application of this document, can be used in parallel.

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 10646, *Information technology — Universal Coded Character Set (UCS)*

ISO 12176-1, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 1: Butt fusion*

ISO 12176-2, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 2: Electrofusion*

ISO 12176-3, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 3: Operator's badge*

ISO 12176-4, *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 4: Traceability coding*

ISO 13950:2007, *Plastics pipes and fittings — Automatic recognition systems for electrofusion joints*

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

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

ISO 21307, *Plastics pipes and fittings — Butt fusion jointing procedures for polyethylene (PE) piping systems*

ISO/IEC 24778, *Information technology — Automatic identification and data capture techniques — Aztec Code bar code symbology specification*

ASTM F 2897-15a, *Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions 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 <https://www.iso.org/obp>

3.1 Terms and definitions

3.1.1

component ID

individual code assigned to each piping component in an “as built documentation” or similar document or data register system

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3.1.2

delimiter

character used to define a specific set of data

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Note 1 to entry: In this document, four different characters are used to represent a delimiter.

3.1.3

“]”

hexadecimal character code 5d

delimiter (3.1.2) of fields used in region data

3.1.4

“~”

hexadecimal character code 7e

delimiter (3.1.2) of sub-fields

3.1.5

“,”

hexadecimal character code 3b

data field delimiter (3.1.2) for csv files

3.1.6

“*”

hexadecimal character code 2a

delimiter (3.1.2) between data from ISO 13950 and from ISO 12176-4

3.1.7

jointing information object

JIO

data field

Note 1 to entry: This data field is generated by the jointing equipment or data recording equipment and used in the comma separated value format (CSV).

3.1.8**jointing process**

act of jointing separate parts of a plastic piping system

Note 1 to entry: For the purpose of this document the jointing process can be either a mechanical or fusion process.

Note 2 to entry: A mechanical jointing process may be carried out by using a mechanical joint as defined in ISO 17885.

Note 3 to entry: For the purpose of this document a fusion process can be either electro-fusion or butt fusion.

3.1.9**multilevel fusion**

sequence of more than one fusion phase on the same electro fusion fitting, i.e. pre-heating, heat soak and fusion

3.1.10**nominal target heating energy**

heating energy to be reached at 20 °C before correction in conjunction with the ambient temperature

3.1.11**nominal target heating time**

heating time to be reached at 20 °C before correction in conjunction with the ambient temperature

3.1.12**PDF file**

human readable file format^{[Z][8]} (independent platform)

Note 1 to entry: It is recommended to protect the PDF against manipulation.

3.1.13**signed value**

value defined by the fusion operator for which they are responsible

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3.2 Abbreviated terms

Classification of pipes not in the International System of Units (SI)

CTS	copper tube size (dimensions in inches)
DIPS	ductile iron pipe size (dimensions in inches)
IPS	iron pipe size (dimensions in inches)

4 Barcode type, structure and contents**4.1 General**

This data encoding system shall use alternatively a code type according to ISO/IEC 16022 (Data Matrix code), ISO/IEC 18004 (QR code), and ISO/IEC 24778 (Aztec code). A maximum of 1 024 characters can be included in the two-dimensional code.

When the two-dimensional code conforms to ISO/IEC 18004 (QR code), the two-dimensional code shall be of the following characteristics:

- minimum module width 0,253 mm (valid for all versions);
- minimum resolution: 300 dpi (valid for all versions);
- correction level M (for codes smaller or equal to type 14, level L correction level may be used).

Examples of two-dimensional codes are in [Annex C](#).

In the case that the resulting code size is too large (e.g. to be stuck on small fittings or components), the code symbols may be appended in a structured format.

4.2 Contents

Data are coded in fields as defined hereafter. Fields are identified and delimited by the use of the symbol “]” at the end of any field. All data are grouped in homogeneous regions. There are five regions:

- Region 1: identification components type (subclause [4.2.1](#))
- Region 2: fusion data (subclause [4.2.2](#))
- Region 3: traceability (subclause [4.2.3](#))
- Region 4: additional factory information (subclause [4.2.4](#))
- Region 5: checksum (subclause [4.2.5](#))

Each field consists of a defined number of characters (see subclause [4.2.1](#) and the following). Each character is an alphanumerical digit or one special character.

4.2.1 Identification components type (characters of region 1)

Field n°1: type component is identified as per [Table 1](#).

Table 1 — Characters for field n°1 and meaning

Character	ISO/FDIS Meaning
0	Other component
1	Pipe
2	Electrofusion fitting
3	Spigot fitting

A total of a maximum of two characters is used comprising the delimiter “]”.

Field n°2: dimensional unit systems used to manufacture the component, is identified as per [Table 2](#).

Table 2 — Characters for field n°2 and meaning

Character	Meaning
0	Metric system (mm)
1	IPS
2	DIPS
3	CTS

A combination between characters in [Table 2](#) is allowed with a maximum of two characters. The order of the characters shall represent the actual joint figure and is important for a good interpretation of diameters as indicated in field n°6.

EXAMPLE 1 Metric by IPS→ 01, IPS by metric→ 10.

In case of components with equal dimensions the coding is reduced to only one character.

EXAMPLE 2 Metric by metric→ 0.

In field n°2 a total of a maximum of three characters is used comprising the delimiter “]”.

Field n°3: manufacturer name or trade mark. A total of a maximum of 21 characters is used comprising the delimiter “]”.

NOTE 1 Manufacturer name can be coded. For a better comprehension of the coding of the manufacturer more information can be found at www.traccoding.com.

Field n° 4: component type is identified as per [Table 3](#).

Table 3 — Components and identify character for field n° 4

Component	Character
Other components	00
Pipe, straight	01
Pipe, coiled	02
Socket	03
Tapping saddle	04
Branching saddle	05
Elbow, 90°	06
Elbow, 45°	07
Elbow, undefined	08
Tee	09
End cap	10
Reducer	11
Swept bend	12
Flange adapter	13
Mechanical fitting	14
PE-body valve, quarter-turn (QT)	15
PE-body valve, multi-turn (MT)	16
Non-PE-body valve, QT	17
Non-PE-body valve, MT	18
Repair fitting	19
Transition fitting	20
Wall channel, rigid	21
Wall channel, flexible	22
Pressure tapping valve	23
Ventilation end cap	24
Stop-off saddle	25
Cap for tapping saddle	26
PE/steel transition fitting	27
PE/brass transition fitting	28
Excess-flow valve	29
Cross	30
Manhole	31
Filter	32
Wall plate	33
Gas excess flow valve integrated in a socket	34
Anchoring bracket	35

NOTE 2 Components and characters are coded with reference to www.traccoding.com.

A total of a maximum of three characters is used comprising the delimiter “]”.

Field n° 5: component’s particularity. If the component is a pipe, then [Table 4](#) applies.

Table 4 — Characters for field n° 5 and meaning

Character	Meaning
0	Other
1	Multilayer
2	Solid wall
3	Peelable external layer

If the component is other than a pipe, then [Table 5](#) applies.

Table 5 — Characters for field n° 5 and meaning

Character	Meaning
0	Other
4	Monofilar
5	Bifilar
6	Single socket
7	Multi socket

A combination of two characters is acceptable.

A total of a maximum of three characters is used comprising the delimiter “]”.

Field n° 6: component diameter.

Number characters ‘0,1...,9’, the fraction indicated by “/” and the character ‘x’, as a separator for two diameters, are allowed only.

For examples of component diameter and units and characters to be used, see [Table 6](#).

Table 6 — Examples of component diameter and units and characters to be used

Component diameter and units (mm) or (inches)	Characters	
	Field n° 2	Field n° 6
1 200 mm	0	1 200
250 mm × 110 mm	0	250 × 110
12” IPS × 10”IPS	1	12 × 10
12” IPS × 110 mm	10	12 × 110
400 mm × 10”IPS	01	400 × 10
1”1/4 CTS × 4”IPS	31	11/4 × 4

A total of a maximum of 11 characters is used comprising the delimiter “]”.

Field n° 7: component design SDR.

Number characters ‘0,1...,9’ and the decimal dot ‘.’ are allowed only.

A total of a maximum of five characters is used comprising the delimiter “]”.

EXAMPLE SDR13,6 → 13.6].

Field n° 8: materials used for manufacturing components are identified by using characters as per [Table 7](#).

Table 7 — List of relevant materials and characters

Material	Characters
Other material	00
PE 80	01
PE 100	02
PE 100 RC	03
PE 100 RT Type 1	04
PE 100 RT Type 2	05
PE 3710	06
PE 4608	07
PE 4708	08
PE 4710	09
Copper	10
Copper alloys	11
Spheroidal graphite cast iron	12
Malleable cast iron	13
Steel	14
Stainless steel	15

A combination of four characters is acceptable.

A total of a maximum of five characters is used comprising the delimiter “]”.

Example of data in region 1, total characters used 42 out of 53 available in this region:

Field	1	2	3
Data	2]	0]	a n y t r a d e m a r k]

Field	4	5	6	7	8
Data	0 3]	5]	1 2 0 0 X 1 0 0 0]	1 3 . 6]	0 2]

4.2.2 Jointing process information (characters of region 2)

In region 2 the jointing process information, e.g. for controlling an electro fusion process, is encoded.

Region 2 consists of only one field with a flexible number of characters including the delimiter.

Data field 1 of region 1 determines the contents of region 2 as given in [Table 8](#).

Table 8 — Cross-reference between field 1 of region 1 and fusion data

Value of field 1 of region 1	Type of jointing process information	Number of characters	Reference
0	No information given	1	
1	No information given	1	
2	Electro fusion process information	min. 22 to max. 121	Annex A
3	No information given	1	