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

## Part 4: Traceability coding



*Tubes et raccords en matières plastiques — Appareillage pour l'assemblage par soudage des systèmes en polyéthylène — Partie 4: Codage de la traçabilité*



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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 12176-4 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*.



ISO 12176 consists of the following parts, under the general title *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems*:



- *Part 1: Butt fusion*
- *Part 2: Electrofusion*
- *Part 3: Operator's badge*
- *Part 4: Traceability coding*

# Introduction

Traceability in the construction and maintenance of a pipeline system is determined by the traceability of all relevant information on the system.

A complete traceability system can be built up from the following elements: fusion-jointing equipment data, fusion-jointing equipment operator data, site data (geographical location), data on fittings and pipes and fusion-jointing parameters, installation dates and assembly procedures.

The aim of this document is solely to define a system for encoding the characteristics of the pipes, fittings, fusion-jointing equipment, fusion-jointing equipment operators and fusion-jointing protocols. It is widely acknowledged that similar encoding systems can be used to monitor other aspects and applications of pipelines, relating to compatibility, for instance. Such systems may be subject to patent rights.

It is up to the user to create the link between the various elements in order to provide a complete traceability system. Care is necessary when determining which data are to be downloaded into the traceability system database and the minimum information to be stored in the database for later retrieval: the choice of data and the amount of data will strongly influence the performance of the database when it is used later.

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

# Part 4: Traceability coding

## 1 Scope

This part of ISO 12176 specifies an encoding system for data on components, assembly methods and jointing operations for polyethylene (PE) piping systems for gas supply, for use in a traceability system.

Reading of the codes can be carried out using alphanumeric or numeric data-recognition systems such as bar-code, magnetic-stripe card or microchip card readers.

Other data-recognition systems conforming to ISO/TR 13950 may be used in association with one of the specified recognition systems to obtain the required traceability.



This part of ISO 12176 is applicable to PE pipes, fittings and valves conforming to ISO standards for gas supply piping systems and also to the assembly operation utilizing methods such as fusion using a heating tool (butt, socket and saddle fusion), electrofusion (socket and saddle fusion), induction fusion and mechanical jointing.



## 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 1133, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO/IEC 7810:2003, *Identification cards — Physical characteristics*

ISO/IEC 7811-2:2001, *Identification cards — Recording technique — Part 2: Magnetic stripe — Low coercivity*

ISO/IEC 7811-4:1995, *Identification cards — Recording technique — Part 4: Location of read-only magnetic tracks — Tracks 1 and 2*

ISO 8601:2000, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 12176-3:2001 , *Plastics pipes and fittings — Equipment for fusion jointing polyethylene systems — Part 3: Operator's badge*

ISO/TR 13950:1997, *Plastics pipes and fittings — Automatic recognition systems for electrofusion*

ISO/IEC 15417:2000, *Information technology — Automatic identification and data capture techniques — Bar code symbology specification — Code 128*

ISO/IEC 16390:1999, *Information technology — Automatic identification and data capture techniques — Bar code symbology specifications — Interleaved 2 of 5*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**component**
item built into a gas network as a part of the piping system, such as a pipe, elbow, T-piece, reducer, saddle, socket fitting, valve or other element used for connecting pipes and/or accessories (e.g. electrofusion socket fitting, mechanical fitting)

**3.2**
**PE assembly**
combination of polyethylene (PE) pipes, a PE pipe and a fitting, a pipe or a fitting and a saddle, a valve, or another component, assembled by electrofusion, fusion using a heating tool, induction fusion or mechanical compression

**3.3**
**traceability**
ability to create a trace of the history, the purpose or the location of information, by means of records

NOTE 1 The term “traceability” may have one of three main meanings.



a) In a product sense, it may relate to:

   — the origin of materials and parts;

   — the product processing history;



   — the distribution and location of the product after delivery.

b) In a calibration sense, it relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials.

c) In a data-collection sense, it relates calculations and data generated through the quality loop to a user's quality requirements.

NOTE 2 Annex A gives an overview of the traceability system content with reference to relevant standards.

**3.4**
**fusion joint made using a heating tool**
joint made by heating the ends of two components, the surfaces of which match, by holding them against a heating tool until the PE material reaches fusion temperature, removing the heating tool quickly and pushing the two softened ends against one another, e.g. butt fusion joint, socket fusion joint or saddle fusion joint

**3.5**
**electrofusion joint**
joint made between a PE electrofusion socket or saddle fitting and a pipe or spigot end fitting, the jointing surfaces being heated by a current flowing through a heating element incorporated in each jointing surface (the Joule effect), causing the material adjacent to the heating elements to melt and the pipe and/or fitting surfaces to fuse together

**3.6**
**mechanical joint**
joint made by assembling a PE pipe with a fitting that generally includes a compression seal to ensure pressure integrity, leaktightness and resistance to end loads

NOTE A support sleeve inserted into the pipe bore may be used to provide a permanent support for the PE pipe to prevent creep in the pipe wall under radial compressive forces. The metallic part of the fitting can be jointed to a metal pipe by screw threads, compression joints, welded or brazed flanges or other means.

**3.7**
**induction fusion joint**
joint made between PE pipes and/or socket or saddle fittings using induction fusion techniques, the jointing surfaces being heated by a current flowing through a heating element incorporated in each jointing surface (the Joule effect), causing the material adjacent to the heating elements to melt and the pipe and/or fitting surfaces to fuse together

NOTE The heat energy supply source is an induction coil fitted in a manner designed to generate and transmit the heat flux necessary for melting to take place at the PE/PE interface.

**3.8**
**fusion-jointing equipment operator**
person trained and authorized to carry out fusion jointing between PE pipes and/or fittings based on a written procedure agreed by the pipeline operator

NOTE The operator may be trained and authorized to carry out one or more fusion-jointing procedures, involving the operation of manual and/or automatic fusion-jointing equipment.



**3.9**
**fusion-jointing record**
record including information and data related to the fusion-jointing equipment, the fusion-jointing operation and traceability



**3.10**
**digit**
integer from zero to nine

**3.11**
**character**
integer from zero to nine or letter or other symbol

NOTE Letters and other symbols are represented by a two-digit number as given in Table B.1.

**3.12**
**virgin material**
thermoplastics material in a form such as granules or powder which has not been previously processed other than for compounding and to which no reprocessable or recycled materials have been added

**3.13**
**reprocessable material**
thermoplastics material prepared from clean unused rejected pipes, fittings or valves, produced in a manufacturer's plant by a process such as injection-moulding or extrusion, which will be reprocessed in the same plant

NOTE Such material may include trimmings from the production of such pipes, fittings and valves.

**3.14**
**standard dimension ratio**
**SDR**
numerical designation of a pipe series, which is a convenient round number approximately equal to the ratio of the nominal outside diameter $d_n$ to the nominal wall thickness $e_n$

**3.15**
**melt mass-flow rate**
**MFR**
value relating to the viscosity of a molten thermoplastic material when extruded at a specified temperature and load, expressed in grams per 10 min (g/10 min)

# 4 Coding-system design

## 4.1 General format

The encoding system is based on data to be provided by the component manufacturer(s)/supplier(s), the fusion-jointing equipment manufacturer and the fusion-jointing equipment operator. If the data are encoded in e.g. a bar code, a magnetic stripe or a microchip, they shall consist of a specified number of characters, i.e. the encoding system shall not be shortened.

The data are divided into different classes:

a) fusion-jointing equipment data;

b) traceability data:

— component data,

— component assembly operation data,

— joint identification data;

c) fusion-jointing operation data.



The data file shall contain at least the fusion-jointing equipment data and the traceability data.

## 4.2 Data description

### 4.2.1 Fusion-jointing equipment data

The length of the code used for the identification of the fusion-jointing equipment shall conform to the requirements of Table 1. These data shall be suitable for downloading into the traceability system database.

**Table 1 — Fusion-jointing equipment data**

| Data | Number of alphanumeric characters |
|---|---|
| Fusion-jointing equipment manufacturer [a] | 2 |
| Fusion-jointing unit number | 7 |
| [a] In the first position. | |

NOTE Information related to maintenance of the fusion-jointing equipment may be included as fusion-jointing operation status data or in the form of optional data.

The system for encoding fusion-jointing equipment data shall conform to 5.1.

#### 4.2.2 Traceability data

##### 4.2.2.1 General

Traceability data for a PE assembly are given by the traceability data for the different components in the assembly and the traceability data for the assembly operation.

The system for encoding traceability data shall conform to 5.2 and 5.3.

To allow assessment of the effectiveness of the traceability system in operation, provision shall be made for the following information to be downloaded and stored:

a) the size and type of component(s) identified by the system as having been installed;

b) the manufacturer/supplier of the component(s).

##### 4.2.2.2 Component data

Encoded information for components shall conform to the requirements of Table 2. These data shall be suitable for downloading into the database of the traceability system.

**Table 2 — Component data**

| Data | Number of digits |
|---|---|
| Component manufacturer/supplier | 4 |
| Component type | 2 |
| Component diameter(s) | 3/10 [a] |
| Component production batch | 8 [b] |
| Applicable pipe series (SDR) | 1 |
| Identification of PE compound | 7 [c] |

[a] Three digits for a bar code, 10 digits for a magnetic stripe.

[b] Including two digits for the production site.

[c] Including:

— one digit for the type of material;

— one digit for the designation of the PE;

— one digit for the MFR.



##### 4.2.2.3 Assembly operation and joint identification data

Encoded information on the assembly operation and joint identification shall conform to the requirements of Table 3. These data shall be suitable for downloading into the traceability system database.

**Table 3 — Assembly operation and joint identification data**

| Data | Number of alphanumeric characters |
|---|---|
| Type of jointing method | 1 |
| Assembly procedure | 1 |
| Status of fusion-jointing operation | 2 |
| Date of assembly | 6 |
| Time of assembly | 4 |
| Clamping | 1 |
| Scraping | 1 |
| Ambient temperature | |
| + or – | 1 |
| value | 3 |
| unit (°C, °F) | 1 |
| Jointing-equipment operator | 6 |
| Country which issued operator's badge | 3 |
| Organization which issued operator's badge | 2 |
| Job number/location | 16 |



#### 4.2.3 Fusion-jointing operation data



Information related to the fusion-jointing operation (e.g. complete butt fusion graph, details of voltage and current during the electrofusion-jointing operation) shall be defined in accordance with the user's requirements. These data shall be suitable for downloading into the traceability system database.

The level of detail of information related to the fusion-jointing operation directly influences the total amount of data contained in a fusion-jointing cycle record and therefore the number of cycles that can be stored in the memory of a fusion-jointing unit.

## 5 Encoding of data

### 5.1 Encoding of fusion-jointing equipment data

The fusion-jointing equipment shall be identified by a unique code, composed of nine alphanumeric characters. This code shall be given by the manufacturer of the fusion-jointing equipment in accordance with the relevant ISO standards. The first two characters shall identify the manufacturer of the fusion-jointing equipment.

### 5.2 Encoding of component data

#### 5.2.1 Identification of component manufacturer/supplier

Each component manufacturer/supplier shall be identified by one or more codes which can be used only by this component manufacturer/supplier. These codes shall be as given by the relevant list available on the web site <http://www.traccoding.com>.