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**Steel tubes and fittings for onshore and offshore pipelines - Internal and external polyamide powder based coatings**

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Stahlrohre und -formstücke für erd- und wasserverlegte Rohrleitungen - Auskleidungen und Beschichtungen aus Polyamid-Pulver

Tubes et raccords en acier pour canalisations enterrées et immergées - Revêtements internes et externes à base de poudre polyamide

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**Steel tubes and fittings for onshore and offshore pipelines -  
Internal and external polyamide powder based coatings**

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immergées - Revêtements internes et externes à base de  
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Rohrleitungen - Auskleidungen und Beschichtungen aus  
Polyamid-Pulver

This European Standard was approved by CEN on 20 February 2003.

CEN 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 Management Centre or to any CEN 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 CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

**Management Centre: rue de Stassart, 36 B-1050 Brussels**

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**EN 10310:2003 (E)****Foreword**

This document (EN 10310:2003) has been prepared by Technical Committee ECISS/TC 29 "Steel tubes and fittings for steel tubes", the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

The annexes A, B, C, D, E, F, G, H and I are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This European Standard defines the internal and/or external polyamide powder coatings applied by dipping in a fluidised bed or by spraying, or by roto-coating. These coatings are intended for the protection the inner and outer surfaces of steel tubes and their fittings (components) used as component parts of pipelines. This standard may also be applied for accessories, such as valves, pumps, screens, etc.

This type of coating is used for the protection of buried, submerged or above ground pipelines conveying fluids at working temperatures between 0 °C and + 60 °C. Other working service temperatures can be used after agreement between the purchaser and the coater.

The coatings covered by this standard are applicable to longitudinally or spirally welded steel tubes and to seamless steel tubes and their fittings components used for the construction of pipelines conveying liquids.

The internal coating of tubes to be used for the transportation of water intended for human consumption should not affect the quality of that water to such an extent that it fails to comply with the requirements of the EU and EFTA regulations.

For this purpose, reference should be made to the relevant national regulations and standards, transposing EN standards when available, dealing with the influence of materials on water quality and to the requirements for coatings.

NOTE A European Acceptance Scheme (EAS) is in course of development in relation to the CPD and the DWD. Its requirements will be introduced in this standard when completed.

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## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 60, *Plastics – Determination of apparent density of material that can be poured from a specified funnel* (ISO 60:1977).

EN ISO 62, *Plastics – Determination of water absorption* (ISO 62:1999).

EN ISO 527-3, *Plastics – Determination of tensile properties – Part 3 : Test conditions for films and sheets* (ISO 527-3:1995).

EN ISO 868, *Plastics and ebonite – Determination of indentation hardness by means of a durometer (shore hardness)* (ISO 868:1995).

prEN ISO 1183-1<sup>1)</sup>, *Plastics – Methods for determining the density of non-cellular plastics - Part 1 : Immersion method, liquid pyknometer method and titration method* (ISO/DIS 1183-1:2002).

prEN ISO 1183-2<sup>1)</sup>, *Plastics – Methods for determining the density of non-cellular plastics - Part 2 : Density gradient column method* (ISO/DIS 1183-2:2002).

EN ISO 1183-3, *Plastics – Methods for determining the density of non-cellular plastics - Part 3 : Gas pyknometer method* (ISO 1183-3:1999).

EN ISO 2808, *Paints and varnishes – Determination of film thickness* (ISO 2808:1997).

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1) To be published.

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EN ISO 3146, *Plastics - Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods (ISO 3146:2000).*

EN ISO 4287, *Geometrical product specification (GPS) – Surface texture : Profile method – Terms, definitions and surface texture parameters (ISO 4287:1997).*

EN ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2 : Xenon-arc sources (ISO 4892-2:1994).*

EN ISO 6272, *Paints and varnishes – Falling-weight test (ISO 6272:1993).*

EN ISO 7253, *Paints and varnishes – Determination of resistance to neutral salt spray (fog) (ISO 7253:1996).*

EN ISO 8501-1, *Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1 : Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1:1988).*

ISO 3105, *Glass capillary kinematic viscometers – Specifications and operating instructions.*

ISO 6441, *Paints and varnishes – Indentation test (spherical or pyramidal).*

**3 Terms and definitions**

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

**3.1**  
**coating manufacturer**

supplier of the coating material in a condition suitable for application to the product to be coated

**3.2**  
**coater**

company responsible for applying the coating material to the components to be coated

**3.3**  
**purchaser**

company that buys the coated products

**4 Symbols**

$R_z$  roughness parameter (the average surface roughness from five successive evaluation areas measured according to EN ISO 4287);

$R_s$  specific electrical insulation resistance, expressed in ohms square metres ( $\Omega \cdot m^2$ );

$k$  correction factor;

$RT$  room temperature.

**5 Information to be supplied by the purchaser**

The following information shall be supplied to the coater by the purchaser.

**5.1 Mandatory**

In his enquiry and order the purchaser shall state the following minimum information:



- Identification of the tubes and components to be coated according to this European Standard. The designation shall include a reference to this standard and if applicable, a reference to the standard for the tube the coating has been applied to.;

Example : 5000 m of tube - EN 10224 of 406, 4-4, 0  
External and/or internal coating – EN 10310;

- the nature of the fluid being conveyed.

## 5.2 Options indicated by the purchaser

If applicable, the following options may be specified by the purchaser:

- cut back length;
- chemical treatment;
- type and location of the marking;
- maximum area and number of repairs;
- maximum thickness of the coating.

## 6 Description of the coating

The coating system shall consist of a primer film overcoated with a layer of a fully fused polyamide powder coating.

## 7 Application of the coating

The polyamide coating shall be applied by dipping in a fluidised bed, spraying or roto-coating according to established procedures and the recommendations of the coating manufacturer.

The data sheets of the coating manufacturer shall contain the items required in Table 1.

### 7.1 Surface preparation

**7.1.1** All tubes and components shall be abrasive blast cleaned. The degree of cleanliness shall be at least Sa 2<sub>1/2</sub> as defined in EN ISO 8501-1.

**7.1.2** Prior to abrasive blast cleaning, the steel surface shall be dry and free from contamination (oil, grease, temporary corrosion protection, etc.) and surface defects (slivers, laminations, etc.) detrimental to the surface or to the adhesion of the coating.

The blast-cleaned surface shall have a roughness  $R_z$  between 40 µm and 90 µm, when measured according to EN ISO 4287.

**7.1.3** After abrasive blast cleaning, the surface of the tube or component shall be inspected and any slivers, laminations, weld spots and other surface imperfections that may have become visible shall be removed using suitable method..

After removal of these defects, the residual thickness of tubes and components shall satisfy the minimum tolerance requirements specified by the relevant standard. All treated areas greater than 10 cm<sup>2</sup> shall be prepared to provide a profile to satisfy the provisions of 7.1.2.

**7.1.4** Prior to the application of the coating, the temperature of the tubes and components shall be maintained at least 3°C above the dew point.

**7.1.5** Surface contaminants (e.g. residual abrasive dust) shall be removed prior to coating.

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**7.1.6** By agreement between the interested parties, chemical pre-treatment of the steel may be used in addition to abrasive blast cleaning

**7.2 Primer application**

Immediately after surface preparation, the primer coat shall be applied to give a dry film thickness that complies with the product technical data sheet (see Table 1).

**7.3 Polyamide application**

The coating system shall be completed by the application of polyamide powder coat.

**7.4 Coating fusion**

The polyamide coating may be applied to either on a hot or a cold substrate depending on the final thickness to be obtained.

**7.4.1 Pre-heating**

At the time of coating application, the temperature range on the steel surface shall comply with the coating manufacturer's recommendations.

The temperature of the steel component shall be monitored using a suitable means in order to ensure that the application conditions are being met.

The time the tube or component is held at temperature shall not result in oxidation of it's the steel surface, thermal damage of the primer coat or be detrimental to the quality and adhesion of the coating system.

**7.4.2 Post-heating**

After application of the polyamide layer to the substrate, post heating may be conducted. The fusion temperature and the temperature holding time shall be according to the coating manufacturer's recommendations and shall not be detrimental to the good quality and adhesion of the coating.

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Table 1 — Content of data sheets

Items	Standard test reference	Layer 1 primer		Layer 2 polyamide
		Liquid	Powder	
Date of issue		+	+	+
Name of manufacturer		+	+	+
Name and type of product		+	+	+
Shelf life according to recommended storage condition		+	+	+
Pot-life at ambient temperature and mixing temperature		+		
Physical state of the delivered product		+	+	+
Type and size of container		+	+	+
Storage conditions		+	+	+
Colour		+		+
Method of application		+	+	+
Bulk density	EN ISO 60			+
Density	prEN ISO 1183-1, prEN ISO 1183-2 and EN ISO 1183-3			+
Solid by volume		+		
Solid by weight		+		
Particle size distribution				+
Viscosity	ISO 3105	+		+
Theoretical coverage per m <sup>2</sup> per mm thickness		+		+
Processing temperature		+	+	+
Service temperature range of coating				+
Product preparation		+	+	+
Dry thickness range	EN ISO 2808	+	+	
Melting temperature	EN ISO 3146			+
Flash point		+		
Water absorption	EN ISO 62			+
Shore D hardness	EN ISO 868			+
Elongation at break	EN ISO 527-3			+
Impact resistance	EN ISO 6272			+
Adhesion test				+
Electrical insulation resistance				+
Safety data sheet reference		+	+	+
+ requires the specified information to be provided				

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## 8 Requirements of the applied coating

By agreement, at the time of enquiry and order, between the purchaser, the coater and the coating manufacturer the applied coating shall be checked against the following requirements.

### 8.1 General

The required properties of the applied coatings are given in Table 2. The electrical insulation resistance test and cathodic disbondment test apply to external coatings only; the other tests apply equally to internal and external coatings.

**Table 2 — Properties of the applied coatings**

Property	Coater			Coating manufacturer		
	0°C	RT	+ 60°C	0°C	RT	+ 60°C
Appearance and continuity of layer 2		+				
Thickness of the coating system		+				
Cut back length		+				
Holiday detection		+				
Impact resistance		+		+		
Adhesion		+		+		+
Indentation resistance					+	+
Electrical insulation resistance					+	
Elongation at break					+	
Resistance to ultraviolet radiation					+	
Cathodic disbondment					+	+
Salt spray resistance					+	
Demineralized water immersion					+	+
Flexibility				+	+	
Waste water resistance					+	
+ requires the specified information to be provided						

If other properties or working service temperatures (see clause 1) are required, alternative testing shall be agreed between the coater, the coating manufacturer and the purchaser.

The above properties are determined for the general usage of the coating in potable and waste water application. For other applications, the chemical resistance to the fluid to be conveyed shall be checked with the coating manufacturer.

### 8.2 Appearance and continuity

The appearance and continuity of the coating system shall be inspected visually over the whole surface of all the components.

The coating shall be of uniform colour, have a smooth appearance and be free of laminations.

### 8.3 Thickness of the coating system

The coating thickness shall be measured according to EN ISO 2808 – Method 6A.