# SLOVENSKI STANDARD
# SIST EN 10289:2003

**01-april-2003**

---

**Jeklene cevi in fitingi za cevovode v zemlji in pod vodo - Zunanja prevleka, izdelana iz tekoče epoksidne in modificirane epoksidne smole**

Steel tubes and fittings for onshore and offshore pipelines - External liquid applied epoxy and epoxy-modified coatings

Stahlrohre und Formstücke für On- und Offschoreverlegte Rohrleitungen - Umhüllung (Außenbeschichtung) mit Epoxi- und epoxi-modifizierten Materialien



Tubes et raccords en acier pour canalisations enterrées et immergées - Revetements externes en résine époxyde ou époxyde modifiée appliquée a l'état liquide



**Ta slovenski standard je istoveten z:** **EN 10289:2002**

---

**ICS:**

| | | |
|---|---|---|
| 25.220.60 | Organske prevleke | Organic coatings |
| 77.140.75 | Jeklene cevi in cevni profili za posebne namene | Steel pipes and tubes for specific use |

**SIST EN 10289:2003** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 10289

August 2002

ICS 23.040.99; 25.220.60

English version

# Steel tubes and fittings for onshore and offshore pipelines - External liquid applied epoxy and epoxy-modified coatings

Tubes et raccords en acier pour canalisations enterrées et immergées - Revêtements externes en résine époxyde ou époxyde modifiée appliquée à l'état liquide

Stahlrohre und Formstücke für On- und Offschoreverlegte Rohrleitungen - Umhüllung (Außenbeschichtung) mit Epoxi- und epoxi-modifizierten Materialien

This European Standard was approved by CEN on 11 April 2002.

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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

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



Ref. No. EN 10289:2002 E

# Contents

## Foreword

This document EN 10289:2002 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 February 2002, and conflicting national standards shall be withdrawn at the latest by February 2002.

The annexes A to K are normative.

Annex L is informative.

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, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies the reqiurements of liquid applied external coating, epoxy (EP) and epoxy-modified (EP-MOD), for the corrosion protection of steel tubes and pipeline fittings.

The coating in this standard can be applied to longitudinally or spirally welded and to seamless steel tubes and fittings used for the construction of pipelines for conveying liquids or gases.

If the component has to be cold bent the coating shall be applied after bending unless otherwise approved by the purchaser.

The coating shall consist normally of one layer of liquid product, applied by brush or by spray airless technique. Other application methods can be recommended by the product manufacturer, in accordance with the kind of product.

This coating can be used for the protection of buried or submerged steel tubes for service at the following temperatures and with three thickness classes A (400 µm), B (800 µm) and C(1 500 µm) based on the following combination:

— type 1 : - 20 °C to 40 °C, thickness class A or B or C

— type 2 : - 20 °C to 60 °C, thickness class B or C

— type 3 : - 20 °C to 80 °C, thickness class C



Other temperatures can be agreed ; in this case, tests shall be carried out at the required temperature.

In this standard the word components is used for tubes and fittings.



Frequencies of tests on fittings shall be agreed by the parties at the ordering stage.

Components coated with these types of coatings may be further protected by means of cathodic protection.

## 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 10021, *General technical delivery requirements for steel and iron products.*

EN 24624, *Paints and varnishes - Pull-off test (ISO 4624:1978).*

EN ISO 868, *Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness) (ISO 868:1985).*

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

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 8501-1:1998).*

ISO 2815, *Paints and varnishes - Buchholz indentation test.*

# 3 Terms, definitions and symbols

## 3.1 Terms and definitions

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

**3.1.1**
**product manufacturer**
supplier of the two pack materials in a condition suitable for application to the product to be coated

**3.1.2**
**coater**
responsible for applying the two pack materials to the components to be coated in accordance with the provisions of this European Standard or the special requirements given in the tender specification and in the order

**3.1.3**
**purchaser**
company that buys the coated products

## 3.2 Symbols

$R_Z$ : roughness parameter (the average roughness from five successive evaluation areas defined in accordance with ISO 4287-1), expressed in microns (µm) ;



$R_S$ : specific electrical insulation resistance of the coating, expressed in ohms square metres (Ω·m²).



# 4 Coating materials



## 4.1 General

The two-pack coating is generally composed of a base (epoxy resin) and a curing agent.

The base (epoxy resin) and curing agent should have different colours allowing the verification of the correct mixing and checking the uniformity of the colour of the mixed product.

The coating is considered cured when it has attained the hardness recommended by the product manufacturer (see Table 1).

This standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and in no way absolves the user from statutory obligations relating to health and safety at any range.

## 4.2 Technical specification

The technical specification drawn up by the product manufacturer shall contain as a minimum the information detailed in Table 1. Test methods shall be given for any test detailed in Table 1.

If required at the time of enquiry and/or order the following option can apply:

— Option 1 An infra-red scan obtained with a KBr standard disk or other method approved by the purchaser, shall be supplied as agreed for each pack (base, curing agent and cured product), so that the purchaser or the coater can compare it with the reference scan of the material supplied.

Other tests can be agreed between the parties at the time of enquiry and/or order.

**Table 1 - Contents of data sheets and certificates**

| Elements | | Technical data | Test certificate |
|---|---|---|---|
| Date of issue | | x | x |
| Name of manufacturer | | x | x |
| Name, use and type of product | | x | x |
| Type of base (epoxy resin) and extender modification | | x | x |
| Type of curing agent | | x | x |
| Factory of origin | | | x |
| Batch or production lot number | [a] | | x |
| Date of manufacture and use by date | [a] | | x |
| Colour | [a] | x | |
| Physical state of the delivered product | [a] | x | |
| Methods of application | | x | |
| Solids by volume | | x | |
| Solids by weight | | x | x |
| Theoretical coverage per m² for nominal thickness | | x | |
| Size of container | [a] | x | |
| Shelf life | [a] | x | |
| Storage conditions | | x | |
| Pot-life | | x | |
| Surface preparation | | x | |
| Recommended instructions for application | | x | |
| Recommended repair material(s) | | x | |
| Mixing instructions | | x | |
| Recommended dry film thickness | | x | |
| Typical thickness applicable in one layer | | x | |
| Minimum and maximum overcoating time | | x | |
| Range of tube service temperature | | x | |
| Range of application temperature (ambient, tube and product) and humidity | | x | |
| Specific curing - Requirements | | x | |
| Shore "D" hardness at (23 ± 2) °C | | x | |
| Time at (23 ± 2) °C to achieve Shore "D" hardness at curing | | x | |
| Time at (23 ± 2) °C at Shore "D" hardness before handling | | x | |
| Viscosity | [b] | x | x |
| Density | | x [b] | x [a] |
| Impact resistance | | x | |
| Pull-off test adhesion at (23 ± 2) °C | | x | |
| Cathodic disbonding at (23 ± 2) °C | | x | |
| Specific electrical insulation resistance | | x | |
| Thermal ageing | | x | |

Test methods described in the present standard shall be used. In any case test methods used shall be mentionned for any tests. The acceptable limits shall be mentionned in the test certificate.

[a] Required for the base (epoxy resin) and curing agents.

[b] Required for the base (epoxy resin), curing agent and for the mixed product.

### 4.3 Packaging

All materials supplied for coating operations shall be suitably marked giving, as a minimum, the following details:

— product manufacturer's name;

— name of material;

— application method;

— batch number;

— date of manufacture and use-by date;

— recommended storage conditions;

— colour of the material.

### 4.4 Quality assurance

The product manufacturer shall carry out quality inspection so that he guarantees the consistent quality of the products and maintains the properties listed in Table 1.



If the product manufacturer has a quality control service approved by the coater, he shall provide a test certificate, on the understanding that the record of the results of his inspection is made available to the coater for checking where necessary. The inspection shall be carried out on every batch of material.



For specific requirements the purchaser can ask for additional information at the time of enquiry and order.

## 5 Information to be supplied by the purchaser

### 5.1 Mandatory

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

— tubes and components coated in accordance with this European Standard shall be designated by reference to this standard followed by the base material, the thickness class and the service temperature of the coating. If applicable, the reference to the standard for the component to which the coating is applied shall be added to this designation;

EXAMPLE: 5 000 meters of tubes - EN 10224 of 406, 4-4, 0

external coating EN 10289, EP, class A, Type 3

— base material (EP or EP-MOD);

— thickness class of the coating A, B or C (see 7.2);

— service temperature Type (1, 2 or 3);

— cut back at the ends (for fittings);

— maximum number and dimension of repairs (not including repairs due to destructive tests).

The components coated in accordance with this European Standard shall be designated by:

— the reference to this standard;

— the base material (EP or EP-MOD);

— the thickness class of the coating (A, B or C);

— the service temperature Type (1, 2 or 3).

### 5.2 Options to be indicated by the purchaser

1 Infra-red scan (see 4.2) ;

2 Cut back at the ends for tubes (see 7.5);

3 Adhesion test - Pull-off method (see 7.9);

4 Cathodic disbondment (see 7.10);

5 Specific electrical insulation resistance (see 7.11);

6 Adhesion test after immersion in tap water (see 7.12);

7 Indentation resistance (see 7.13);

8 Thermal ageing (see 7.14);

9 Type of inspection documents required, if different to the ones in clause 8 (see 8.2.2);

10 Other scheme of procedure qualification (see Table 5).



## 6 Application of the coating

### 6.1 Surface preparation

**6.1.1** 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.

**6.1.2** Components shall be abrasive blast cleaned. The degree of cleanliness shall be Sa 2 ½ in accordance with EN ISO 8501-1.

The blast cleaned surface shall have a roughness $R_z$ between 50 µm and 90 µm, as measured in accordance with ISO 4287-1.

**6.1.3** After blast cleaning, the surface of the components shall be inspected. All slivers, laminations, weld spatter and other surface imperfections made visible by the blast cleaning process shall be removed.

After removal of these defects, the residual thickness of components shall satisfy the minimum tolerance requirements specified by the relevant standard. All treated areas greater than 10 cm² shall be prepared to provide a profile to satisfy the provisions of 6.1.

**6.1.4** Components shall be maintained at least 3 °C above the dew point temperature prior to coating.

**6.1.5** Contaminants (e.g. residual abrasive dust) shall be removed prior to coating.

Chemical treatment of the steel may be used in addition to abrasive blast cleaning, by agreement between the purchaser and the coater.

**6.1.6** The temperature and holding time of the component prior to coating shall not result in oxidation of its surface, detrimental to the good quality and adhesion of the coating.

At the time of application, the temperature range on the surface of the component to be coated shall be determined in agreement with the manufacturer of the product.

The temperature of the components shall be monitored using suitable means in order to make sure that the application conditions are fully satisfied.

## 6.2 Composition of the coating

### 6.2.1 General

The coating shall be applied in accordance with the established procedure.

The constituent material data sheets shall contain the items required in Table 1.

### 6.2.2 Mixing

Base (epoxy resin) and curing agent shall be supplied in separate containers.

The contents of each container shall be stirred or agitated to an homogeneous state before any is withdrawn.



Base (epoxy resin) and curing agent shall be thoroughly mixed in the proportions specified by the product manufacturer.



When the two pack materials are supplied in different colours, evidence of complete mixing is indicated when a uniform colour is achieved without any "streaking".

For twin feed airless application, appropriate monitoring equipment shall be used to ensure correct metering of the two pack materials.

The quantity of material made up at one time shall not exceed that which can be used within the pot life stated by the product manufacturer or that necessary to ensure complete coverage of the area to be coated.

### 6.2.3 General application procedure

A layer of liquid applied coating shall be applied to the blast cleaned components using the method and equipment recommended by the product manufacturer.

The coating shall be uniform.

If a second layer is required to reach the prescribed thickness, this shall be applied in accordance with the overcoating time prescribed by the product manufacturer.

Particular attention shall be paid to the recommended dry film thickness.

The wet film thickness shall be measured in accordance with EN ISO 2808.

If pre-heating of the base (epoxy resin) and/or the curing agent is required prior to mixing and application, this shall be carried out in accordance with the product manufacturer's procedure.

If post-heating of the coating after application is required, this shall also be carried out in accordance with the product manufacturer's procedure.

No thinner shall be used unless recommended by the product manufacturer.Tools and equipment shall be cleaned using only such solvents as are recommended by the product manufacturer.

Particular care shall be taken in the handling of the components before the coating has reached the minimum value of hardness recommended by the manufacturer.

#### 6.2.4 Field and shop application procedure

In the field, coating shall not be applied during rain, fog or mist, or when there is free moisture on the prepared surface.

The coating operation shall be suspended when the metal temperature falls to within 3 °C of the dew point, or is less than 5 °C and/or when the relative humidity is higher than 90 %.

During adverse weather conditions, coating may still be carried out if the local environment is controlled to avoid the unacceptable conditions, above specified. This may be achieved by the erection of protective canopies and the use of heaters and dehumidifiers to the satisfaction of the purchaser.

Coating shall always be applied in accordance with the product manufacturer's instruction.

Components shall not be backfilled until the coating is cured in accordance with the hardness recommended by the product manufacturer (see Table 1).

## 7 Requirements of the applied coating



### 7.1 General

The required properties of the applied coatings are given below:



— minimum dry thickness of the coating system;

— hardness Shore "D";

— appearance and continuity;

— infra-red scan;

— cut back at the ends;

— holiday detection;

— impact resistance;

— adhesion test - resistance to removal;

— adhesion test - pull-off method;

— cathodic disbondment;

— specific electrical insulation resistance;

— adhesion test after immersion in tap water;

— indentation resistance;

— thermal ageing.

Other properties can be specified at the time of enquiry and order.

A summary of the required properties is given in Table 4.