Cathodic protection of buried or immersed metallic structures - General principles and application for pipelines

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EESTI STANDARDI EESSÕNA

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NATIONAL FOREWORD

Käsitlusala: This standard describes the general principles of the implementation of a system of cathodic protection against corrosive attacks on buried or immersed metal structures with and without the influence of external electrical sources.	**Scope:** This standard describes the general principles of the implementation of a system of cathodic protection against corrosive attacks on buried or immersed metal structures with and without the influence of external electrical sources.

ICS 23.040.99, 77.060

Võtmesõnad: organic, pipelines, pipes, plant, quality, quality assurance, rate of corrosion, reducing, sheathings, specification (approval), specifications, steel pipes, steels, testing, tubes, water, water pipes

EUROPEAN STANDARD
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English version

Cathodic protection of buried or immersed metallic structures

General principles and application for pipelines

Protection cathodique des structures métalliques enterrées ou immergées – Principes généraux et application pour les canalisations

Kathodischer Korrosionsschutz von metallischen Anlagen in Böden und Wässern – Grundlagen und Anwendung für Rohrleitungen

This European Standard was approved by CEN on 2000-12-01.

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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.

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CEN

European Committee for Standardization
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Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 219 "Cathodic protection", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Annex A is informative.

Introduction

This standard is applicable to the protection of all types of buried or immersed metallic structures especially pipelines. However, in order to allow for structures having specific features with regards to construction, commissioning or operation, provision has been made for complementary standards to be used in conjunction with this one to deal with the peculiarities of such structures.

Cathodic protection is a technique based on the application of electrochemical principles and covers a wide range of materials and equipment together with a variety of measurement techniques. In order to achieve effective and efficient cathodic protection, the design, installation, commissioning, inspection and maintenance should be performed by adequately trained, experienced and responsible personnel.

This standard aims to ensure effective cathodic protection and is therefore directed primarily to the above personnel.

1 Scope

This European Standard specifies the general principles for the implementation of a system of cathodic protection against corrosive attacks on buried or immersed metal structures with and without the influence of external electrical sources.

NOTE 1 The protection against stray current from direct current system influences is dealt in prEN 50162:2000.

This standard indicates conditions and parameters that should be met to achieve cathodic protection as well as rules and procedures that should be followed for design, installation, commissioning and maintenance of the protective systems.

NOTE 2 Clauses 5 to 10 deal mainly with the cathodic protection of pipelines but they are applicable to other structures

This standard is applicable to external surfaces of buried or immersed structures. It is not applicable to the protection of internal parts of structures containing corrosive liquids.

NOTE 3 This is covered by prEN 12499:1996.

When cathodic protection is necessary, this standard is applicable to structures covered with concrete which are then buried or immersed. It is not applicable to the protection of steel in reinforced concrete which is buried or immersed.

NOTE 4 This is covered by EN 12696

This standard is applicable only to those constructions in sea water for which the protective systems would be installed and can be inspected on land.

NOTE 5 Such constructions in sea water are generally of smaller length, whether or not they form a part of a larger underground network.

NOTE 6 Other constructions in sea water are dealt with in other standards, e.g. for submarine pipelines see EN 12473.

2 Normative references

This European Standard incorporates, by dated or undated references, 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 revision of any of these publications apply to this standard only when incorporated in this standard by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 50162:2000, *Protection against corrosion by stray current from DC systems*

EN 12696, *Cathodic protection of steel in concrete*

prEN 13509:1999, *Cathodic Protection Measurement Techniques*

EN 60079-10, *Electrical apparatus for explosive gas atmospheres - Part 10: Classification of hazardous areas* (IEC 60079-10:1995)

EN 60079-14, *Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines)* (IEC 60079-14:1996)

EN ISO 8044, *Corrosion of metals and alloys; vocabulary*

3 Symbols, terms and definitions

3.1 Symbols

I	Current
E	Potential
R	Resistance
J	Current density
U	Voltage
a.c.	Alternating current
d.c.	Direct current
E_{Ag}	Metal or structure to electrolyte potential with respect to a silver/silver chloride reference electrode
E_{Cu}	Metal or structure to electrolyte potential with respect to a copper/saturated copper sulphate reference electrode
$E_{IR\ free}$	*IR* free potential
E_{KCl}	Metal or structure to electrolyte potential with respect to a silver/silver chloride/saturated potassium chloride electrode
E_l	Limiting critical potential
E_n	Free corrosion potential
E_{off}	Off potential
E_{on}	On potential
E_p	Protection potential
E_{Hg}	Metal or structure to electrolyte potential with respect to a mercury/calomel/saturated potassium chloride electrode
E_H	Metal or structure to electrolyte potential with respect to a standard hydrogen electrode
E_{Zn}	Metal or structure to electrolyte potential with respect to a zinc electrode
I_a	Anode current output
I_p	Protection current
I_s	Stray current
$J_{a.c.}$	Alternating current density
J_p	Protection current density
R_{co}	Coating resistance or structure to soil resistance (Ω)
r_{co}	Average coating resistance or average structure to soil resistance ($\Omega \cdot m^2$)
T	Temperature
t	Time
ρ	Resistivity ($\Omega \cdot m$)

3.2 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.
For other terms and definitions related to corrosion refer to EN ISO 8044.

3.2.1
anaerobic
lack of free oxygen in the electrolyte adjacent to a metallic structure

3.2.2
anode backfill
material with a low resistivity, which may be moisture-retaining, immediately surrounding a buried anode for the purpose of decreasing the effective resistance of the anode to the electrolyte