DIN EN 12473:2014-07 (E)

General principles of cathodic protection in seawater

Contents

Page

Foreword 4

1 Scope 5

2 Normative references 5

3 Terms, definitions, abbreviations and symbols 5

4 Application of cathodic protection in seawater 9
4.1 General 9
4.2 Galvanic anode method 9
4.3 Impressed current method 10
4.4 Hybrid systems 10

5 Determination of level of cathodic protection 12
5.1 Measurement of protection level 12
5.2 Reference electrodes 12
5.3 Potentials of reference electrodes 12
5.4 Verification of reference electrodes 12
5.5 Potential measurement 12

6 Cathodic protection potential criteria 13
6.1 General 13
6.2 Carbon-manganese and low alloy steels 13
6.3 Other metallic materials 15
6.3.1 General 15
6.3.2 Stainless steels 15
6.3.3 Nickel alloys 16
6.3.4 Aluminium alloys 16
6.3.5 Copper alloys 17

7 Design considerations 17
7.1 Introduction 17
7.2 Technical and operating data 17
7.2.1 Design life 17
7.2.2 Materials of construction 17
7.3 Surfaces to be protected 18
7.4 Protective coatings 18
7.5 Availability of electrical power 18
7.6 Weight limitations 18
7.7 Adjacent structures 18
7.8 Installation considerations 18
7.9 Current demand 19

8 Effect of environmental factors on current demand 19
8.1 Introduction 19
8.2 Dissolved oxygen 19
8.3 Sea currents 19
8.4 Calcareous deposits 19
8.5 Temperature 20
8.6 Salinity 20
8.7 pH 21

8.8 Marine fouling 21
8.9 Effect of depth 21
8.10 Seasonal variations and storms 21

9 Secondary effects of cathodic protection 21
9.1 General 21
9.2 Alkalinity 22
9.3 Environmentally-assisted cracking 22
9.3.1 General 22
9.3.2 Hydrogen embrittlement 22
9.3.3 Corrosion fatigue 22
9.4 Chlorine 23
9.5 Stray currents and interference effects 23

10 Use of cathodic protection in association with coatings 24
10.1 Introduction 24
10.2 Coating selection 24
10.3 Coating breakdown 25

Annex A (informative) Corrosion of carbon-manganese and low-alloy steels 26

A.1 Nature of metallic corrosion 26
A.2 Polarization 27

Annex B (informative) Principles of cathodic protection 30

Annex C (informative) Reference electrodes 33

C.1 General 33
C.2 Silver/silver chloride/seawater electrode 33
C.3 The zinc/seawater electrode 35
C.4 Verification of reference electrodes 35

Annex D (informative) Corrosion of metallic materials other than carbon-manganese and low- alloy steels typically subject to cathodic protection in seawater 37

D.1 Stainless steels 37
D.2 Nickel alloys 37
D.3 Aluminium alloys 37
D.4 Copper alloys 38

Bibliography 39