ISO 15589-1:2026-07 (E)

Oil and gas industries including lower carbon energy - Cathodic protection of pipeline transportation systems - Part 1: On-land pipelines

Contents

Page

Foreword vi

Introduction vii

1 Scope 1

2 Normative references 1

3 Termsanddefinitions 2

4 Symbols and abbreviated terms 5
4.1 Symbols 5
4.2 Abbreviated terms 6

5 Competence 6

6 Cathodic protection criteria 7
6.1 General 7
6.2 Protection potentials 7
6.3 Alternative assessment methods 9
6.3.1 100 mV cathodic potential shift 9
6.3.2 Current density and reference potential consideration 9
6.3.3 Other assessment methods 9
6.4 Criteria in the presence of AC interference 9
6.5 Criteria in the presence of fluctuating DC interference 9

7 Prerequisites for the application of cathodic protection 9
7.1 General 9
7.2 Electrical continuity 10
7.3 Electrical isolation 10
7.3.1 General 10
7.3.2 Locations 11
7.3.3 Isolation joints 11
7.3.4 Internal corrosion risks at isolation joints and insulated flanges 12
7.3.5 Contacts between metallic structures 12
7.3.6 Electrical earthing systems 12
7.3.7 Lightning and overvoltage protection 13
7.3.8 Overvoltage protection devices for DC isolation 14
7.4 Coating 15
7.4.1 General 15
7.4.2 Factory-applied coatings 15
7.4.3 Field joint coatings 15
7.4.4 Coating for trenchless pipelines 16
7.4.5 Air to electrolyte interface 16
7.4.6 Compatibility of coatings and wraps with cathodic protection 16
7.4.7 Thermal insulation 16
7.4.8 Reinforced concrete weight coating 17
7.5 Selection of pipe trench backfill material 17
7.6 Buried casings for pipelines 17
7.6.1 General 17
7.6.2 Casings that shield cathodic protection current 18

7.6.3 Casings that pass cathodic protection current 18
7.7 Equipment for the reduction of AC interference 18
7.8 Equipment for the mitigation of DC interference 19

8 Basic requirements and guidance for cathodic protection design 19
8.1 General 19
8.2 Basic information for cathodic protection design 19
8.3 of cathodic protection design report 20
8.4 Cathodic protection current demand 21
8.4.1 Calculation of the theoretical total current demand 21

8.4.2 Current demand based on current density values for coated pipelines 22
8.5 Cathodic protection equipment 23
8.5.1 Cathodic protection cables 23
8.5.2 Cable connection to pipeline 24
8.5.3 Distribution boxes and test stations 25
8.6 Temporary protection 26
8.7 Specific case of existing pipelines 26
8.7.1 General 26
8.7.2 Parallel pipelines 26
8.7.3 Parallelism or crossing with AC power systems 27
8.8 Trenchless installation methods 27

9 Impressed current stations 28
9.1 General 28
9.2 Power supply 28
9.3 Ground beds 29
9.3.1 General 29
9.3.2 Deep-well ground beds 29
9.3.3 Shallow ground beds 30
9.3.4 Impressed-current anodes and conductive backfill 30
9.4 Output control 32
9.4.1 General 32
9.4.2 Current distribution for multiple pipelines 32
9.4.3 Potential control 32

10 Galvanic anode systems 33
10.1 General 33
10.2 Design requirements 33
10.3 Zinc anodes 34
10.4 Magnesium anodes 35
10.5 Design of the anode system 35
10.6 Anode backfill 37
10.7 Cables and cable connections 37
10.8 Anode installation 37

11 Monitoring facilities 37
11.1 General 37
11.2 Locations of test stations 37
11.3 Description of test stations 38
11.4 Use of probes and coupons 38
11.5 Bonding to other pipelines 39
11.6 Test facilities at metallic cased crossings 39
11.7 Test facilities at isolation joints 39
11.8 Line current monitoring test stations 39
11.9 Drain-point test facilities 39
11.10 Miscellaneous monitoring facilities 40

12 Commissioning 40
12.1 General 40
12.2 Preliminary tests 40
12.3 Start-up 41

12.3.1 Impressed current stations 41
12.3.2 Galvanic anodes 42
12.3.3 Drainage stations 42
12.3.4 Test stations 42
12.4 Verification of cathodic protection effectiveness 43
12.4.1 General 43
12.4.2 Measurements of DC potential and AC voltage 43
12.4.3 Current measurements 43
12.4.4 Adjustments 43
12.5 Commissioning report 44

12.5.1 Installation documentation 44
12.5.2 Commissioning data and information 44

13 Monitoring, inspection and maintenance 45
13.1 General 45
13.2 Implementation of inspection 45
13.3 Inspection intervals 46
13.4 Remote monitoring 48
13.5 Specialized surveys 48
13.6 Monitoring plan 48
13.7 Measuring equipment 49
13.8 Maintenance and repair 49

14 Documentation 50
14.1 Design documentation 50
14.1.1 General 50
14.1.2 Construction details and installation procedures 50
14.2 Commissioning documentation 51
14.3 Operating and maintenance documentation 51
14.3.1 General 51
14.3.2 Inspection and monitoring data 52
14.3.3 Maintenance records 52

Annex A (normative) Cathodic protection measurements 53

Annex B (normative) Electrical interference 61

Annex C (informative) Fault detection of impressed-current systems during operation 65

Annex D (informative) Description of specialized surveys 67

Annex E (informative) Calculation of the CP potential attenuation 74

Annex F (informative) Electrical tests for isolation joints before installation 79

Annex G (informative)Internalcorrosionatinsulatingflange 80

Bibliography 83