

---

---

**Petroleum and natural gas industries —  
Cathodic protection of pipeline  
transportation systems —**

Part 1:  
**On-land pipelines**

*Industries du pétrole et du gaz naturel — Protection cathodique des  
systèmes de transport par conduites —*

*Partie 1: Conduites terrestres*



**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

This document is a preview generated by EVS

© ISO 2003

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	2
4 Symbols and abbreviations.....	4
5 Design requirements.....	4
5.1 General.....	4
5.2 Design information.....	4
5.3 Criteria for CP.....	5
5.4 Predesign investigations.....	6
5.5 Electrical isolation.....	7
5.6 Electrical earthing.....	8
5.7 Electrical continuity.....	8
5.8 Current requirements.....	8
5.9 Type of CP system and selection of sites.....	9
6 Impressed-current systems.....	10
6.1 Power supply.....	10
6.2 Groundbeds.....	11
6.3 Current output control and distribution.....	13
7 Galvanic-anode systems.....	14
7.1 General.....	14
7.2 Zinc anodes.....	14
7.3 Magnesium anodes.....	15
7.4 Anode backfill.....	16
7.5 Cables and cable connections.....	16
8 Monitoring facilities.....	16
8.1 General.....	16
8.2 Monitoring stations (test posts).....	16
8.3 Bonding to other pipelines.....	17
8.4 Test facilities at cased crossings.....	17
8.5 Test facilities at isolating joints.....	17
8.6 Drain-point test facilities.....	17
8.7 Miscellaneous monitoring facilities.....	17
9 Special facilities.....	17
9.1 Temporary protection.....	17
9.2 Protective casings.....	17
9.3 Parallel power lines or a.c. traction systems.....	18
9.4 Lightning protection.....	18
9.5 Surge arrestors.....	18
9.6 CP cables and cable connections.....	18
9.7 Monitoring stations and distribution boxes.....	19
10 Commissioning.....	20
10.1 General.....	20
10.2 Equipment tests.....	20
10.3 System tests.....	21

<b>11</b>	<b>Inspection and monitoring</b> .....	<b>21</b>
<b>11.1</b>	<b>General</b> .....	<b>21</b>
<b>11.2</b>	<b>Frequencies of inspection</b> .....	<b>21</b>
<b>11.3</b>	<b>Monitoring plan</b> .....	<b>22</b>
<b>11.4</b>	<b>Monitoring equipment</b> .....	<b>23</b>
<b>11.5</b>	<b>Specialized surveys</b> .....	<b>23</b>
<b>12</b>	<b>Maintenance and repair</b> .....	<b>23</b>
<b>13</b>	<b>Documentation</b> .....	<b>24</b>
<b>13.1</b>	<b>Design documentation</b> .....	<b>24</b>
<b>13.2</b>	<b>Commissioning documentation</b> .....	<b>25</b>
<b>13.3</b>	<b>Inspection and monitoring documentation</b> .....	<b>25</b>
<b>13.4</b>	<b>Operating and maintenance documentation</b> .....	<b>25</b>
<b>13.5</b>	<b>Maintenance records</b> .....	<b>26</b>
<b>Annex A</b>	<b>(normative) CP measurements</b> .....	<b>27</b>
<b>Annex B</b>	<b>(normative) Electrical interference</b> .....	<b>31</b>
<b>Annex C</b>	<b>(informative) Fault detection of impressed-current systems during operation</b> .....	<b>35</b>
<b>Annex D</b>	<b>(informative) Description of specialized surveys</b> .....	<b>37</b>
<b>Bibliography</b>	.....	<b>40</b>

This document is a preview generated by EVS

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 15589-1 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*.

ISO 15589 consists of the following parts, under the general title *Petroleum and natural gas industries — Cathodic protection of pipeline transportation systems*:

- *Part 1: On-land pipelines*
- *Part 2: Offshore pipelines*

## Introduction

Pipeline cathodic protection is achieved by the supply of sufficient direct current to the external pipe surface, so that the steel-to-electrolyte potential is lowered to values at which external corrosion is reduced to an insignificant rate.

Cathodic protection is normally used in combination with a suitable protective coating system to protect the external surfaces of steel pipelines from corrosion.

External corrosion control in general is covered by ISO 13623.

Users of this part of ISO 15589 should be aware that further or differing requirements may be needed for individual applications. This part of ISO 15589 is not intended to inhibit alternative equipment or engineering solutions to be used for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, any variations from this part of ISO 15589 should be identified.

This document is a preview generated by EVS

# Petroleum and natural gas industries — Cathodic protection of pipeline transportation systems —

## Part 1: On-land pipelines

### 1 Scope

This part of ISO 15589 specifies requirements and gives recommendations for the pre-installation surveys, design, materials, equipment, fabrication, installation, commissioning, operation, inspection and maintenance of cathodic protection systems for on-land pipelines, as defined in ISO 13623, for the petroleum and natural gas industries.

This part of ISO 15589 is applicable to buried carbon steel and stainless steel pipelines on land. It can also apply to landfalls of offshore pipeline sections protected by onshore-based cathodic protection installations.

This part of ISO 15589 is also applicable to retrofits, modifications and repairs made to existing pipeline systems.

**NOTE** Special conditions sometimes exist where cathodic protection is ineffective or only partially effective. Such conditions can include elevated temperatures, disbanded coatings, thermal-insulating coatings, shielding, bacterial attack and unusual contaminants in the electrolyte.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

ISO 13623, *Petroleum and natural gas industries — Pipeline transportation systems*

ISO 13847, *Petroleum and natural gas industries — Pipeline transportation systems — Welding of pipelines*

ASTM G 97<sup>1)</sup>, *Standard test method for laboratory evaluation of magnesium sacrificial anode test specimens for underground applications*

---

1) American Society for Testing and Materials, 100 Barr Harbour Drive, West Conshohocken, PA 19428-2959, USA