



BSI Standards Publication

Petroleum, petrochemical and natural gas industries – Cathodic protection of pipeline systems

Part 1: On-land pipelines (ISO 15589-1:2015)

This is a preview of "BS EN ISO 15589-1:20...". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN ISO 15589-1:2017. It is identical to ISO 15589-1:2015. It supersedes BS ISO 15589-1:2015, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee GEL/603, Cathodic protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2018
Published by BSI Standards Limited 2018

ISBN 978 0 580 92587 0

ICS 75.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2018.

Amendments/corrigenda issued since publication

Date	Text affected
31 January 2018	This corrigendum renumbers BS ISO 15589-1:2015 as BS EN ISO 15589-1:2017

This is a preview of "BS EN ISO 15589-1:20...". Click here to purchase the full version from the ANSI store.

EUROPÄISCHE NORM

September 2017

ICS 75.200

English Version

Petroleum, petrochemical and natural gas industries - Cathodic protection of pipeline systems - Part 1: On-land pipelines (ISO 15589-1:2015)

Industries du pétrole, de la pétrochimie et du gaz
naturel - Protection cathodique des systèmes de
transport par conduites - Partie 1: Conduites terrestres
(ISO 15589-1:2015)

Erdöl- und Erdgasindustrie - Kathodischer Schutz für
Transportleitungssysteme - Teil 1: On-land pipelines
(ISO 15589-1:2015)

This European Standard was approved by CEN on 23 August 2017.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

This is a preview of "BS EN ISO 15589-1:20...". [Click here to purchase the full version from the ANSI store.](#)

European foreword

The text of ISO 15589-1:2015 has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 15589-1:2017 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 March 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.

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

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Endorsement notice

The text of ISO 15589-1:2015 has been approved by CEN as EN ISO 15589-1:2017 without any modification.

This is a preview of "BS EN ISO 15589-1:20...". Click here to purchase the full version from the ANSI store.

Contents

	Page
Foreword	vi
Introduction	vii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Symbols and abbreviations	5
4.1 Symbols.....	5
4.2 Abbreviations.....	7
5 CP personnel competence	7
6 Cathodic protection criteria	8
6.1 General.....	8
6.2 Protection potentials.....	8
6.3 Alternative methods.....	10
6.3.1 100 mV cathodic potential shift.....	10
6.3.2 Other methods.....	10
6.4 Criteria in the presence of a.c.....	10
7 Pre-requisites for the application of cathodic protection	10
7.1 General.....	10
7.2 Electrical continuity.....	10
7.3 Electrical isolation.....	11
7.3.1 General.....	11
7.3.2 Locations.....	11
7.3.3 Isolating joints.....	11
7.3.4 Internal corrosion risks at isolating joints.....	12
7.3.5 Contacts between metallic structures.....	13
7.3.6 Electrical earthing system.....	13
7.4 Lightning and overvoltage protection.....	14
7.5 Coating.....	15
7.5.1 General.....	15
7.5.2 Factory-applied coatings.....	15
7.5.3 Field joint coatings.....	15
7.5.4 Coating for trenchless pipelines.....	15
7.5.5 Air to electrolyte interface.....	16
7.5.6 Compatibility of coatings and wraps with cathodic protection.....	16
7.5.7 Thermal insulation.....	16
7.5.8 Reinforced concrete weight coating.....	17
7.6 Selection of pipe trench backfill material.....	17
7.7 Buried casings for pipelines.....	17
7.7.1 General.....	17
7.7.2 Casings that shield cathodic protection current.....	17
7.7.3 Casings that pass cathodic protection current.....	18
7.8 Equipment for the reduction of a.c. interference.....	18
7.9 Equipment for the mitigation of d.c. interference.....	18

This is a preview of "BS EN ISO 15589-1:20...". [Click here to purchase the full version from the ANSI store.](#)

8	Basic requirements for cathodic protection design	18
8.1	General	18
8.2	Basic information for cathodic protection design	19
8.3	Contents of cathodic protection design report	20
8.4	Cathodic protection current demand	20
8.4.1	Calculation of the theoretical total current demand	20
8.4.2	Current demand based on coating breakdown factors	21
8.4.3	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	24
8.5.3	Precautions to respect for 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	27
8.7.3	Parallelism or crossing with a.c. 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	Groundbeds	29
9.3.1	General	29
9.3.2	Deep-well groundbeds	29
9.3.3	Shallow groundbeds	30
9.3.4	Impressed-current anodes and conductive backfill	31
9.4	Output control	32
9.4.1	General	32
9.4.2	Current distribution for multiple pipelines	32
9.4.3	Potential control	33
10	Galvanic anode systems	33
10.1	General	33
10.2	Design requirements	34
10.3	Zinc anodes	34
10.4	Magnesium anodes	35
10.5	Design of the anode system	37
10.6	Anode backfill	38
10.7	Cables and cable connections	39
10.8	Anode installation	39
11	Monitoring facilities	39
11.1	General	39
11.2	Locations of test stations	39
11.3	Description of test stations	40
11.4	Use of probes and coupons	40
11.5	Bonding to other pipelines	41
11.6	Test facilities at cased crossings	41
11.7	Test facilities at isolating joints	41
11.8	Line current monitoring test stations	41
11.9	Drain-point test facilities	41
11.10	Miscellaneous monitoring facilities	41

This is a preview of "BS EN ISO 15589-1:20...". Click here to purchase the full version from the ANSI store.

12	Commissioning	41
12.1	General.....	41
12.2	Preliminary tests.....	42
12.3	Start up.....	43
12.3.1	Impressed current stations.....	43
12.3.2	Galvanic anodes.....	43
12.3.3	Drainage stations.....	44
12.3.4	Test stations.....	44
12.4	Verification of cathodic protection effectiveness.....	44
12.4.1	General.....	44
12.4.2	Measurements of d.c. potential and a.c. voltage.....	44
12.4.3	Current measurements.....	45
12.4.4	Adjustments.....	45
12.5	Commissioning report.....	45
12.5.1	Installation documentation.....	45
12.5.2	Commissioning measurements.....	45
13	Monitoring, inspection, and maintenance	46
13.1	General.....	46
13.2	Implementation of inspection.....	47
13.3	Periodicities of inspection.....	47
13.4	Remote monitoring.....	50
13.5	Specialized surveys.....	50
13.6	Monitoring plan.....	50
13.7	Monitoring equipment.....	50
13.8	Maintenance and repair.....	51
14	Documentation	51
14.1	Design documentation.....	51
14.1.1	General.....	51
14.1.2	Construction details and installation procedures.....	52
14.2	Commissioning documentation.....	53
14.3	Operating and maintenance documentation.....	53
14.3.1	General.....	53
14.3.2	Inspection and monitoring data.....	54
14.3.3	Maintenance records.....	54
	Annex A (normative) Cathodic protection measurements	55
	Annex B (normative) Electrical interference	63
	Annex C (informative) Fault detection of impressed-current systems during operation	67
	Annex D (informative) Description of specialized surveys	69
	Annex E (informative) Attenuation of protection	76
	Annex F (informative) Electrical tests for isolating joints before installation	79
	Bibliography	80

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 2, *Pipeline transportation systems*.

This second edition cancels and replaces the first edition (ISO 15589-1:2003), which has been technically revised with the following changes:

- cathodic protection criteria have been extended with further clarification on the application of the criteria;
- requirements for design have been more detailed and periodicities for inspection of cathodic equipment have been enlarged, and the option for remote monitoring added;
- requirements for measurements and testing during commissioning have been further detailed.

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

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

This is a preview of "BS EN ISO 15589-1:20...". [Click here to purchase the full version from the ANSI store.](#)

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.

It is necessary that users of this part of ISO 15589 be aware that further or differing requirements can be needed for individual applications. This part of ISO 15589 is not intended to inhibit the use of alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. It is necessary that, where an alternative is offered, any variations from this part of ISO 15589 be identified and documented.

This is a preview of "BS EN ISO 15589-1:20...". [Click here to purchase the full version from the ANSI store.](#)

Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline 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, installation, commissioning, operation, inspection, and maintenance of cathodic protection systems for on-land pipelines, as defined in ISO 13623 or EN 14161 for the petroleum, petrochemical, and natural gas industries, and in EN 1594 or EN 12007-1 and EN 12007-3 used by gas supply industries in Europe.

All contents of this part of ISO 15589 are applicable to on-land pipelines and piping systems used in other industries and transporting other media such as industrial gases, waters, or slurries.

This part of ISO 15589 applies to buried pipelines, landfalls of offshore pipeline sections protected by on-shore based cathodic protection installations, and to immersed sections of on-land pipelines such as river or lake crossings.

This part of ISO 15589 specifies requirements for pipelines of carbon steel, stainless steel, cast iron, galvanized steel, or copper. If other pipeline materials are used, the criteria to apply are defined under the responsibility of the pipeline operator.

This part of ISO 15589 does not apply to pipelines made of reinforced concrete for which EN 12696 can be applied.

NOTE Special conditions sometimes exist where cathodic protection is ineffective or only partially effective. Such conditions can include shielding (e.g. disbanded coatings, thermal-insulating coatings, rocky soil, etc.) and unusual contaminants in the electrolyte.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 10012, *Measurement management systems — Requirements for measurement processes and measuring equipment*

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

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

ISO 21809 (all parts), *Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

EN 1594, *Gas infrastructure — Pipelines for maximum operating pressure over 16 bar — Functional requirements*