SLOVENSKI STANDARD
SIST EN 60071-5:2015

01-september-2015

Koordinacija izolacije - 5. del: Postopki za visokonapetostne enosmerne presmerniške postaje

Insulation co-ordination - Part 5: Procedures for high-voltage direct current (HVDC) converter stations

Isolationskoordination - Teil 5: Verfahren für Hochspannungs-Gleichstrom-Stromrichterstationen (HGÜ-Stromrichterstationen)

Coordination de l'isolement - Partie 5: Procédures pour les stations de conversion à courant continu haute tension (CCHT)

Ta slovenski standard je istoveten z: EN 60071-5:2015

ICS:

29.080.01	Električna izolacija na splošno	Electrical insulation in general

SIST EN 60071-5:2015 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60071-5

January 2015

ICS 29.080.30

English Version

Insulation co-ordination - Part 5: Procedures for high-voltage direct current (HVDC) converter stations (IEC 60071-5:2014)

Coordination de l'isolement -
Partie 5: Procédures pour les stations de conversion à courant continu haute tension (CCHT)
(IEC 60071-5:2014)

Isolationskoordination -
Teil 5: Verfahren für Hochspannungs-Gleichstrom-Stromrichterstationen (HGÜ-Stromrichterstationen)
(IEC 60071-5:2014)

This European Standard was approved by CENELEC on 2014-11-28. CENELEC 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 CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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

Ref. No. EN 60071-5:2015 E

Foreword

The text of document 28/218/FDIS, future edition 1 of IEC 60071-5, prepared by IEC/TC 28 "Insulation co-ordination" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60071-5:2015.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-08-28
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-11-28

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Endorsement notice

The text of the International Standard IEC 60071-5:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60099-5:1996	NOTE	Harmonized as EN 60099-5:1996 [1] (modified).
IEC 60505:2011	NOTE	Harmonized as EN 60505:2011 (not modified).
IEC 60721-3-0:1984	NOTE	Harmonized as EN 60721-3-0:1993 (not modified).
IEC/TR 60919-2:2008	NOTE	Harmonized as CLC/TR 60919-2:2010 (not modified).
IEC 60700-1:1998	NOTE	Harmonized as EN 60700-1:1998 (not modified).
IEC 60700-1:1998/A1:2003	NOTE	Harmonized as EN 60700-1:1998/A1:2003 (not modified).
IEC 60700-1:1998/A2:2008	NOTE	Harmonized as EN 60700-1:1998/A2:2008 (not modified).

[1] Superseded by EN 60099-5:2013 (IEC 60099-5:2013) - DOW = 2016-06-26.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu

Publication	Year	Title	EN/HD	Year
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60071-1	2006	Insulation co-ordination - Part 1: Definitions, principles and rules	EN 60071-1	2006
IEC 60071-2	1996	Insulation co-ordination - Part 2: Application guide	EN 60071-2	1997
IEC 60099-4 (mod)	2004	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4	2004
IEC 60633	-	Terminology for high-voltage direct current (HVDC) transmission	EN 60633	-
IEC/TS 60815-1	2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles		
IEC/TS 60815-2	2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 2: Ceramic and glass insulators for a.c. systems	-	-
IEC/TS 60815-3	2008	Selection and dimensioning of high-voltage insulators intended for use in polluted conditions - Part 3: Polymer insulators for a.c. systems	-	-

IEC 60071-5

Edition 1.0 2014-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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Part 5: Procedures for high-voltage direct current (HVDC) converter stations

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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX XD

ICS 29.080.30

ISBN 978-2-8322-1887-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION CO-ORDINATION –

Part 5: Procedures for high-voltage direct current (HVDC) converter stations

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

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International Standard IEC 60071-5 has been prepared by IEC technical committee 28: Insulation co-ordination.

This International Standard cancels and replaces IEC TS 60071-5 published in 2002. On the basis of technical experience gained since the Technical Specification was published, sufficient consensus has emerged for transformation of the Technical Specification into an International Standard.

The technical content is essentially the same as that contained in the Technical Specification with amendments mainly for user convenience. The structure of the document has been changed to allow division and subdivision into complete integral parts to facilitate comprehension and ease of referencing.

In addition to the high level revisions above, the following main technical changes have been made with respect to the previous edition:

– arresters have been added to several locations to reflect some recent 800 kV HVDC scheme practice, along with their justifications, expected voltages, overvoltages and arrester stresses in service;

– significant changes have been made in Clause 8 – all subclauses on the characteristics, schemes, stresses and specification of arresters have been consolidated into a single entity, Clause 8;

– the implications of a smoothing reactor and of a neutral blocking filter located on the neutral bus (as on some recent 800 kV schemes), on coordination of arresters connected to the neutral end have been added;

– possible use of sacrificial arresters on the neutral bus is introduced to cater for excessive arrester energy in the rather unlikely event of a particular rare fault;

– all subclauses dealing with study tools and modelling details have been consolidated into Clause 10;

– creepage distances and clearances have been consolidated into Clauses 11 and 12, respectively, with more details added.

The text of this standard is based on the following documents:

FDIS	Report on voting
28/218/FDIS	28/221/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 600071 series, published under the general title *Insulation co-ordination* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The IEC 60071 series consists of the following parts under the general title *Insulation co-ordination:*

Part 1: Definitions, principles and rules

Part 2: Application guide

Part 4: Computational guide to insulation co-ordination and modelling of electrical networks

Part 5: Procedures for high-voltage direct current (HVDC) converter stations

INSULATION CO-ORDINATION –

Part 5: Procedures for high-voltage direct current (HVDC) converter stations

1 General

1.1 Scope

This part of IEC 60071 provides guidance on the procedures for insulation co-ordination of high-voltage direct current (HVDC) converter stations, without prescribing standardized insulation levels.

This standard applies only for HVDC applications in high-voltage a.c. power systems and not for industrial conversion equipment. Principles and guidance given are for insulation co-ordination purposes only. The requirements for human safety are not covered by this standard.

1.2 Additional background

The use of power electronic thyristor valves in a series and/or parallel arrangement, along with the unique control and protection strategies employed in the conversion process, has ramifications requiring particular consideration of overvoltage protection of equipment in converter stations compared with substations in a.c. systems. This standard outlines the procedures for evaluating the overvoltage stresses on the converter station equipment subjected to combined d.c., a.c. power frequency, harmonic and impulse voltages. The criteria for determining the protective levels of series and/or parallel combinations of surge arresters used to ensure optimal protection are also presented.

The basic principles and design objectives of insulation co-ordination of converter stations, in so far as they differ from normal a.c. system practice, are described.

Concerning surge arrester protection, this standard deals only with metal-oxide surge arresters, without gaps, which are used in modern HVDC converter stations. The basic arrester characteristics, requirements for these arresters and the process of evaluating the maximum overvoltages to which they may be exposed in service, are presented. Typical arrester protection schemes and stresses of arresters are presented, along with methods to be applied for determining these stresses.

This standard includes insulation co-ordination of equipment connected between the converter a.c. bus (including the a.c. harmonic filters, the converter transformer, the circuit breakers) and the d.c. line side of the smoothing reactor. The line and cable terminations in so far as they influence the insulation co-ordination of converter station equipment are also covered.

Although the main focus of the standard is on conventional HVDC systems where the commutation voltage bus is at the a.c. filter bus, outlines of insulation co-ordination for the capacitor commutated converter (CCC) as well as the controlled series compensated converter (CSCC) and some other special converter configurations are covered in the annexes.

This standard discusses insulation co-ordination related to line commutated converter (LCC) stations. The insulation coordination of voltage sourced converters (VSC) is not part of this standard.