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Insulation co-ordination - Part 14: Application procedures for AC/DC filters

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TITLE:

Insulation co-ordination - Part 14: Application procedures for AC/DC filters

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSULATION CO-ORDINATION –

Part 14: Application procedures for AC/DC filters

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IEC 60071-14 has been prepared by IEC technical committee 99: Insulation co-ordination and system engineering of high voltage electrical power installations above 1,0 kV AC and 1,5 kV DC. It is an International Standard.

On the basis of technical experience gained and the development of HVDC, sufficient consensus has emerged for establish a series insulation co-ordination standard for HVDC system. The series standard for HVDC system belongs to IEC 60071 series standard, and consists of the following parts:

- Part 11: Definitions, principles and rules for HVDC system
- Part 12: Application guidelines for LCC HVDC converter stations
- Part 13: Application guidelines for VSC HVDC converter stations
- Part 14: Application procedures for AC/DC filters.

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144 Pert 15: Insulation co-ordination for DC transmission lines

145 The aim of this part is evaluating the overvoltage stresses on AC/DC filters sub-system and
146 their components, and determining the specified withstand voltages for equipment.

147 The text of this document is based on the following documents:

Draft	Report on voting
99/XX/FDIS	99/XX/RVD

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

150 The language used for the development of this document is English.

151 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
152 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement,
153 available at www.iec.ch/members_experts/refdocs. The main document types developed by
154 IEC are described in greater detail at www.iec.ch/publications.

155 The committee has decided that the contents of this document will remain unchanged until the
156 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
157 specific document. At this date, the document will be

- 158 • reconfirmed,
- 159 • withdrawn, or
- 160 • revised.

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INSULATION CO-ORDINATION –

162

Part 14: Application procedures for AC/DC filters

163

1. Scope

165 This part of IEC 60071 applies guidelines on the procedures for insulation co-ordination of AC filters
 166 and DC filters for high-voltage direct current (HVDC) converter stations, whose aim is evaluating the
 167 overvoltage stresses, transient currents and energies on AC /DC filters sub-system, and determining
 168 the specified withstand voltages for their components.

169 This document applies only to metal-oxide surge arresters without gaps, which are used in AC /DC
 170 filters. This document involves the criteria for determining the protective levels of series and/or parallel
 171 combinations of surge arresters used to ensure optimal protection, typical arrester protection schemes
 172 and stresses of arresters.

173 This document only apply to AC/DC filters for HVDC converter stations.

2. Normative references

175 The following documents are referred to in the text in such a way that some or all of their
 176 content constitutes requirements of this document. For dated references, only the edition
 177 cited applies. For undated references, the latest edition of the referenced (including any
 178 amendments) applies.

179 IEC 60060-1:2025 *High-voltage test techniques - Part 1: General terminology and test*
 180 *requirements.*

181 IEC 60071-1:2019, *Insulation co-ordination – Part 1: Definitions, principles and rules*

182 IEC 60071-2:2023, *Insulation co-ordination – Part 2: Application guidelines*

183 IEC 60071-11:2022, *Insulation co-ordination – Part 11 : Definitions, principles and rules for*
 184 *HVDC system*

185 IEC 60071-12:2022, *Insulation co-ordination – Part 12 : Application guidelines for LCC HVDC*
 186 *converter stations*

187 IEC 60099-4:2014, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for AC*
 188 *system*

189 IEC 60633, *High-voltage direct current (HVDC) transmission – Vocabulary*

3. Terms and definitions

191 For the purposes of this document, the terms and definitions given in IEC 60071-11, IEC 60071-
 192 12 apply.

193 ISO and IEC maintain terminological databases for use in standardization at the following
 194 addresses:

- 195 ● IEC Electropedia: available at <http://www.electropedia.org/>
- 196 ● ISO Online browsing platform: available at <http://www.iso.org/obp>

197 4. Symbols and abbreviations

198 4.1 General

199 The list provided in 4.2 and 4.3 below covers only the most frequently used symbols and
 200 abbreviations, some of which are illustrated graphically in the single-line diagram of **Error!**
 201 **Reference source not found.** and **Error! Reference source not found.** For a more complete
 202 list of symbols which has been adopted for LCC-HVDC converter stations, and also for
 203 insulation co-ordination, refer to the standards listed in the normative references (Clause 2)
 204 and to the Bibliography.

205 4.2 Letter symbols

K_a	altitude correction factor
K_c	co-ordination factor
K_s	safety factor
U_{rp}	representative overvoltage
U_{cw}	co-ordination withstand voltage
U_{rw}	required withstand voltage
U_w	specified withstand voltage
U_{ref}	reference voltage of arresters

206 4.3 Abbreviations

AC	alternating current
CCOV	crest value of continuous operating voltage
DC	direct current
HV	high voltage
HVDC	high voltage direct current
LV	low voltage
LIPL	lightning impulse protective level
LIWV	specified lightning impulse withstand voltage
RFFO	representative fast-front overvoltage (maximum voltage stress value)
RSFO	representative slow-front overvoltage (maximum voltage stress value)
SIPL	switching impulse protective level
SIWV	specified switching impulse withstand voltage
VSC	voltage source converter

207 5. Principles of insulation co-ordination

208 5.1 General

209 The insulation coordination objective for AC and DC filters is:

210 – to determine the maximum steady state, temporary and transient overvoltage levels to which
 211 the various components of a system may be subjected in practice;

212 – to select the insulation strength and characteristics of equipment, including the protective
 213 devices, used to ensure a safe, economic and reliable installation in the event of overvoltages.