



**SLOVENSKI STANDARD**  
**oSIST prEN IEC 61936-2:2022**

**01-oktober-2022**

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**Elektroenergetski postroji za izmenične napetosti nad 1 kV in enosmerne napetosti nad 1,5 kV - 2. del: Enosmerna napetost**

Power installations exceeding 1 kV AC and 1,5 kV DC - Part 2: DC

iTeh STANDARD PREVIEW

Installations électriques de puissance de tension supérieure à 1 kV en courant alternatif et 1,5 kV en courant continu - Partie 2: Courant continu

**Ta slovenski standard je istoveten z: prEN IEC 61936-2:2022**

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**ICS:**

29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general
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**oSIST prEN IEC 61936-2:2022**

**en**





99/364/CDV

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IEC TC 99 : INSULATION CO-ORDINATION AND SYSTEM ENGINEERING OF HIGH VOLTAGE ELECTRICAL POWER INSTALLATIONS ABOVE 1,0 kV AC AND 1,5 kV DC

SECRETARIAT:

Australia

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OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 22F, TC 115

PROPOSED HORIZONTAL STANDARD:

Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

 EMC ENVIRONMENT QUALITY ASSURANCE SAFETY SUBMITTED FOR CENELEC PARALLEL VOTING NOT SUBMITTED FOR CENELEC PARALLEL VOTING**Attention IEC-CENELEC parallel voting**

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TITLE:

**Power installations exceeding 1 kV AC and 1,5 kV DC - Part 2: DC**

PROPOSED STABILITY DATE: 2027

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**POWER INSTALLATIONS EXCEEDING 1 kV AC and 1,5 kV DC –**

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**Part 2: DC**

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**FOREWORD**

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 156 all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international  
 157 co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and  
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186 International Standard IEC 61936-2 has been prepared by technical committee 99: Insulation  
 187 co-ordination and system engineering and erection of electrical power installations above 1 kV  
 188 AC and 1,5 kV DC.

189 The text of this International Standard is based on the following documents:

Enquiry draft	Report on voting
99/XX/XX	99/XX/XX

190

191 Full information on the voting for the approval of this International Standard can be found in the  
 192 report on voting indicated in the above table.

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

194 A list of all parts in the IEC 61936 series, published under the general title *Power installations*  
 195 *exceeding 1 kV AC and 1,5 kV DC*, can be found on the IEC website.

196 Notes concerning particular conditions in certain countries are provided in Annex G of IEC  
197 61936-1: 2021.

198 The committee has decided that the contents of this publication will remain unchanged until  
199 the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data  
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- 201 • reconfirmed,
- 202 • withdrawn,
- 203 • replaced by a revised edition, or
- 204 • amended.

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208

## INTRODUCTION

209 There are few national laws, standards and internal rules dealing with the matter coming within  
210 the scope of this standard, and these practices have been taken as a basis for this work.

211 This part of IEC 61936 contains the minimum requirements and some additional information  
212 which ensures an acceptable reliability of an installation and its safe operation.

213 The publication of this International Standard is believed to be a decisive step towards the  
214 gradual alignment all over the world of the practices concerning the design and erection of high  
215 voltage power installations.

216 Particular requirements for transmission and distribution installations as well as particular  
217 requirements for power generation and industrial installations are included in this standard.

218 The relevant laws or regulations of an authority having jurisdiction takes precedence.

219

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## 221 POWER INSTALLATIONS EXCEEDING 1 kV AC and 1,5 kV DC –

222

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### 224 Part 2: DC

225

## 226 1 Scope

227 This part of IEC 61936 provides, in a convenient form, requirements for the design and the  
228 erection of DC installations in systems with nominal voltages above 1,5 kV DC, so as to provide  
229 safety and proper functioning for the use intended.

230 For the purpose of interpreting this standard, a DC installation is considered to be one of the  
231 following:

- 232 a) A converter station or DC switching station;
- 233 b) one (or more) DC generating or storage unit(s), such as solar farms or battery storage units,  
234 located on a single site, the DC installation includes DC equipment and cables with all  
235 associated power electronics, controlgear, switchgear and all electrical auxiliary systems.  
236 Connections between DC generating or storage units located on different sites are excluded;
- 237 c) DC installation erected on offshore facilities for the purpose of generation, transmission,  
238 distribution and/or storage of electricity; or
- 239 d) DC transition station (between overhead lines and underground cable or between different  
240 sections of underground cables).

241 This International Standard does not apply to the design and erection of any of the following:

- 242 – overhead and underground lines between separate installations;
- 243 – electric railways;
- 244 – mining equipment and installations;
- 245 – installations on ships according to IEC 60092 series and offshore units according to IEC  
246 61892 series, which are used in the offshore petroleum industry for drilling, processing and  
247 storage purposes;
- 248 – electrostatic equipment (e.g. electrostatic precipitators, spray-painting units);
- 249 – test sites;
- 250 – medical equipment, e.g. medical X-ray equipment;
- 251 – valve hall or converter hall.

252 This International Standard does not apply to the requirements for carrying out live working on  
253 electrical installations.

254 This International Standard does not apply to the design of factory-built, type-tested thyristor  
255 valves, VSC valves and switchgear for which separate IEC standards exist.

## 256 2 Normative references

257 The following documents, in whole or in part, are normatively referenced in this document and  
258 are indispensable for its application. For dated references, only the edition cited applies. For  
259 undated references, the latest edition of the referenced document (including any amendments)  
260 applies.

261 IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

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

- 263 IEC 60071-2:2018, *Insulation co-ordination – Part 2: Application guidelines*
- 264 IEC 60071-5, *Insulation co-ordination – Part 5: Procedures for high voltage direct current*  
265 *(HVDC) converter stations*
- 266 IEC 60071-11, *Insulation co-ordination for HVDC system — Part 11 : Definitions, principles and*  
267 *rules*
- 268 IEC/IEEE 60076-57-129, *Power transformers - Part 57-129: Transformers for HVDC*  
269 *applications*
- 270 IEC 60079-10-1, *Explosive atmospheres – Part 10-1: Classification of areas – Explosive gas*  
271 *atmospheres*
- 272 IEC 60079-10-2, *Explosive atmospheres – Part 10-2: Classification of areas – Combustible*  
273 *dust atmospheres*
- 274 IEC TS 60479-1:2018, *Effects of current on human beings and livestock – Part 1: General*  
275 *aspects*
- 276 IEC 60529, *Degrees of protection provided by enclosures (IP Code)*
- 277 IEC 60664-1, *Insulation coordination for equipment within low-voltage supply systems Part 1:*  
278 *Principles, requirements and tests*
- 279 IEC TR 61000-5-2, *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation*  
280 *guidelines – Section 2: Earthing and cabling*
- 281 IEC 61000-6-5:2015, *Electromagnetic compatibility (EMC) - Part 6-5: Generic standards -*  
282 *Immunity for equipment used in power station and substation environment*
- 283 IEC 61936-1:2021, *Power installations exceeding 1 kV AC – Part 1: Common rules*
- 284 IEC 61975:2010 – *High-voltage direct current (HVDC) installations – System tests*
- 285 IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications*  
286 *for alternating current switchgear and controlgear*
- 287 IEC TR 62757, *Fire prevention measures on converters for high-voltage direct current (HVDC)*  
288 *systems, static var compensators (SVC) and flexible AC transmission systems (FACTS) and*  
289 *their valve halls*
- 290 IEC TR 63065:2017, *Guidelines for operation and maintenance of line commutated converters*  
291 *(LCC) HVDC converter station*

### 292 **3 Terms and definitions**

293 For the purposes of this document, the terms and definitions given in IEC 61936-1 and the  
294 following apply.

#### 295 **3.1**

##### 296 **electronic valve device**

297 indivisible electronic device for electronic power conversion or electronic power switching,  
298 comprising a single non-controllable or bistably controlled unidirectionally conducting current  
299 path.

300 NOTE 1 to entry: Typical electronic valve devices are thyristors, power rectifier diodes, power switching bipolar and  
301 field effect transistors and insulated-gate bipolar transistors (IGBT).

302 NOTE 2 to entry: Two or more electronic valve devices may be integrated on a common semiconductor chip  
303 (examples: a thyristor and a rectifier diode in a reverse conducting thyristor, a power switching field effect transistor  
304 with its inverse diode) or packaged in a common case (semiconductor power module). These combinations are to be  
305 considered as separate electronic valve devices.

306 [SOURCE: IEC 60050-551:1998, 551-14-02]

### 307 **3.2**

308 **nominal DC voltage**, <of a system>

309  $U_{dn}$

310 suitable approximate value of DC voltage used to designate or identify a system, expressed as  
311 the absolute value of the pole to earth voltage.

### 312 **3.3**

313 **highest DC voltage**, <of a DC system>

314  $U_{dm}$

315 highest mean or average pole DC voltage to earth, excluding harmonics, commutation and  
316 dynamic overshoots, for which the installation is designed in respect of its insulation.

### 317 **3.4**

318 **DC neutral point**

319 common point of two monopoles forming a bipole converter or the earthed point of a monopole  
320 converter.

### 321 **3.5**

322 **DC electrode line**

323 electrical connection between a DC earth electrode and the DC installation.

### 324 **3.6**

325 **DC system**

326 for the purposes of this standard is defined to be all interconnected parts of a power system  
327 installation that is installed between and including the DC side windings of the  
328 interface/converter transformers at each terminal except for the valve hall or converter hall.

329 NOTE Components connected to the AC side windings of the converter/interface transformers including the AC  
330 windings themselves are not considered to be part of the DC system as defined for this standard.

### 331 **3.7**

332 **high voltage**

333 DC voltage exceeding 1 500V DC.

### 334 **3.8**

335 **low voltage**

336 DC voltage not exceeding 1 500V DC.

### 337 **3.9**

338 **converter unit**

339 indivisible operative unit comprising all equipment between the point of connection on the AC  
340 side (or DC side for DC/DC converters) and the point of connection on the DC side, essentially  
341 one or more converters, together with converter transformers, control equipment, essential  
342 protective and switching devices and auxiliaries, if any, used for conversion.

### 343 **3.10**

344 **converter station**

345 part of an DC system which consists of one or more converter units including DC switchgear,  
346 DC fault current controlling devices, if any, installed in a single location together with buildings,  
347 reactors, filters, reactive power supply, control, monitoring, protective, measuring and auxiliary  
348 equipment.

349 **3.11**350 **DC earth electrode**

351

352 array of conductive elements placed in the earth, or the sea, which provides a low resistance  
353 path between a point in the DC system and the earth and are capable of carrying continuous  
354 current for some extended period.

355 NOTE 1 to entry: An earth electrode may be located at a point some distance from the HVDC substation.

356 NOTE 2 to entry: Where the electrode is placed in the sea it may be termed as sea electrode.

357 [SOURCE: IEC 60633:1998, 8.14, modified – The indication "DC" has been added to the term  
358 and a synonym, DC earth electrode, has been added.]

359 **3.12**360 **pole**

361 part of an DC system consisting of all the equipment in the HVDC substations and  
362 interconnecting transmission lines, if any, which during normal operation, exhibit a common  
363 direct voltage polarity with respect to earth.

364 [SOURCE: IEC 60633:1998, 8.5]

365 **3.13 protective level**

366 for each voltage class, residual voltage that appears between the terminals of an arrester during  
367 the passage of a discharge current corresponding to the co-ordination current.

368 [SOURCE: IEC 60071-5:2014, 3.16]

369

370 **3.14**371 **lightning impulse protective level, <of a protective device>**372  $U_{pl}$ 

373 maximum permissible peak voltage value, on the terminals of a protective device subjected to  
374 lightning impulses under specific conditions.

375 [SOURCE: IEC 614-03-56]

376 **3.15**377 **switching impulse protective level, <of a protective device>**378  $U_{ps}$ 

379 maximum permissible peak voltage value, on the terminals of a protective device subjected to  
380 switching impulses under specific conditions.

381 [SOURCE: IEC 614-03-57]

382 **Symbols and abbreviations**

383 LCC Line commutated converter

384 N Minimum clearance of danger zone as defined in IEC 61936-1:2021

385 POI Point of Interconnection

386  $U_{dm}$  highest DC voltage

387  $U_{pl}$  lightning impulse protective level

388  $U_{ps}$  switching impulse protective level

389 VSC Voltage source converter