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Visokonapetostne stikalne in krmilne naprave - 201. del: Izolacijsko obdane izmenične stikalne in krmilne naprave za napetosti nad 1 kV in do vključno 52 kV

High-voltage switchgear and controlgear - Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

Hochspannungs-Schaltgeräte und -Schaltanlagen - Teil 201: Isolierstoffgekapselte Wechselstrom-Schaltanlagen für Bemessungsspannungen über 1 kV bis einschließlich 52 kV

Appareillage à haute tension - Partie 201: Appareillage sous enveloppe isolante solide pour courant alternatif de tensions assignées supérieures à 1 kV et inférieures ou égales à 52 kV

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TITLE:

High-voltage switchgear and controlgear - Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

PROPOSED STABILITY DATE: 2032

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

**Part 201: AC solid-insulation enclosed switchgear
and controlgear for rated voltages above 1 kV
and up to and including 52 kV**

FOREWORD

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International Standard IEC 62271-201 has been prepared by subcommittee 17C: High-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This third edition cancels and replaces second edition, published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) aligned with the third edition of IEC 62271-200 (issued in 2021) and its CDV of AMD1, for structure, definitions, classifications, ratings and testing procedures, where appropriate;
- b) clause numbering aligned with IEC 62271-1:2017, including the adoption of the subclause names of Clause 3;
- c) in Clause 3 specific definitions are added for; "in service", "normal operating condition" and "normal use";
- d) earthing circuit is more precisely described, including ratings and test requirements;

- 245 e) number of mechanical tests on interlocks is reduced for type testing; forces to apply
246 during type testing are better prescribed (refer to 7.102);
- 247 f) resistance measuring on main circuit is only needed before continuous current tests (as
248 reference for routine tests) and not anymore needed after this continuous current test.
249 Rationale for this deletion is that this measured resistance does not mean anything; as the
250 temperature rise test was just finished, a new temperature rise test will not give new
251 information;
- 252 g) IEC 62271-100:2017/AMD2:2018 has been taken into account in 7.101.2;
- 253 h) IEC 62271-107:2019 and IEC IEEE 62271-37-013:2021 are also considered in 7.101.2;
- 254 i) LSC category is more precisely described, including an explaining flowchart (Annex G);
- 255 j) examples not covered by the IAC test are transferred from Clause 6 to 9.103;
- 256 k) the term “assembly” is defined in Clause 3 and used as synonym for “solid-insulation
257 enclosed switchgear and controlgear” in this document;
- 258 l) “metallic” is replaced by “metal” where applicable;
- 259 m) a 1 s rule was introduced for Criterion 4 during IAC tests regarding hot gases versus
260 glowing particles as cause of ignition;
- 261 n) internal arc tests for switchgear with protrusions are more precisely described in Annex A.

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

FDIS	Report on voting
17C/594/FDIS	17C/597/RVD

263 Full information on the voting for the approval of this document can be found in the report on
264 voting indicated in the above table.
265

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

267 This document should be read in conjunction with IEC 62271-1:2017 and its
268 Amendment 1:2021, to which it refers and which is applicable, unless otherwise specified. In
269 order to simplify the indication of corresponding requirements, the same numbering of clauses
270 and subclauses is used as in IEC 62271-1. Amendments to these clauses and subclauses are
271 given under the same numbering, whilst additional subclauses are numbered from 101.

272 The reader's attention is drawn to the fact that Annex C lists all of the “in-some-country” clauses on
273 differing practices of a less permanent nature relating to the subject of this document.

274 A list of all parts in the IEC 62271 series, published under the general title *High-voltage*
275 *switchgear and controlgear*, can be found on the IEC website.

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

- 279 • reconfirmed,
- 280 • withdrawn,
- 281 • replaced by a revised edition, or
- 282 • amended.

283

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287

INTRODUCTION

288 High-voltage (IEC 60050-601:1985 [1], 601-01-27) switchgear refers to rated voltages above
289 1 kV. However, medium-voltage is commonly used for distribution systems with rated voltages
290 above 1 kV and generally applied up to and including 52 kV; refer to IEC 60050-601:1985 [1]¹,
291 601-01-28.

292 Although primarily dedicated to three-phase systems, this document can also be applied to
293 single-phase and two-phase systems.

294 Switchgear and controlgear assemblies having a metal enclosure are covered by
295 IEC 62271-200 [2].

296 Gas-filled medium-voltage designs use to have design pressures below 500 kPa, as
297 mentioned for example in the introduction of EN 50187.

298

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¹ Numbers in square brackets refer to the Bibliography.

299

300

HIGH-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

301

302

Part 201: AC solid-insulation enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV

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304

305

306

307

1 Scope

309 This part of IEC 62271 is applicable to prefabricated solid-insulation enclosed switchgear and
310 controlgear assemblies designed for:

- 311 – alternating current;
- 312 – rated voltages above 1 kV and up to and including 52 kV;
- 313 – service frequencies up to and including 60 Hz;
- 314 – indoor installation;
- 315 – areas limited to authorized personnel;

316 The assembly can include air-insulated and/or fluid-filled compartments.

317 For components installed in a solid-insulation enclosed switchgear and controlgear, this
318 document supplements or even replaces in some cases, the requirements as stated by the
319 individual product standards.

320 The list of components which may be inside the solid-insulation enclosed switchgear and
321 controlgear is not limited to the ones explicitly cited in this document.

2 Normative references

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

327 IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at
328 www.electropedia.org)

329 IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test*
330 *requirements*

331 IEC 60270, *High-voltage test techniques – Partial discharge measurements*

332 IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

333 IEC 60529:1989/AMD 1:1999

334 IEC 60529:1989/AMD 2:2013

335 IEC 62262:2002, *Degrees of protection provided by enclosures for electrical equipment*
336 *against external mechanical impacts (IK code)*

337 IEC 62271-1:2017, *High-voltage switchgear and controlgear – Part 1: Common specifications*
338 *for alternating current switchgear and controlgear*

339 IEC 62271-1:2017/AMD1: 2021

340 IEC 62271-100:2021, *High-voltage switchgear and controlgear – Part 100: Alternating current*
341 *circuit-breakers*

342 IEC 62271-102:2018, *High-voltage switchgear and controlgear – Part 102: Alternating current*
 343 *disconnectors and earthing switches*

344 IEC 62271-103:2021, *High-voltage switchgear and controlgear – Part 103: Alternating current*
 345 *switches for rated voltages above 1 kV up to and including 52 kV*

346 IEC 62271-105:2021, *High-voltage switchgear and controlgear – Part 105: Alternating current*
 347 *switch-fuse combinations for rated voltages above 1 kV up to and including 52 kV*

348 IEC 62271-106:2021, *High-voltage switchgear and controlgear – Part 106: Alternating current*
 349 *contactors, contactor-based controllers and motor-starters*

350 IEC 62271-107:2019, *High-voltage switchgear and controlgear – Part 107: Alternating current*
 351 *fused circuit-switchers for rated voltages above 1 kV up to and including 52 kV*

352 IEC/IEEE 62271-37-013:2021, *High-voltage switchgear and controlgear – Part 37-013:*
 353 *Alternating current generator circuit-breakers*

354 ISO 4126-2, *Safety devices for protection against excessive pressure – Part 2: Bursting disc*
 355 *safety devices*

356 **3 Terms and definitions**

357 For the purposes of this document, the terms and definitions given in IEC 62271-1,
 358 IEC 60050-151 and IEC 60050-441, and the following apply

359 NOTE The classification system for definitions of IEC 62271-1:2017 is followed. Terms and definitions are
 360 referenced and prioritized in the following order:

361 – Clause 3 of this document;

362 – IEC 62271-1:2017;

363 – IEC 60050-441;

364 – IEC 60050-151.

365 ISO and IEC maintain terminological databases for use in standardization at the following
 366 addresses:

- 367 • IEC Electropedia: available at <http://www.electropedia.org/>
- 368 • ISO Online browsing platform: available at <http://www.iso.org/obp>

369 **3.1 General terms and definitions**

370 The definitions in 3.1 of IEC 62271-1:2017 are applicable, with the following additions:

371 **3.1.101**

372 **ambient air temperature**

373 <of an assembly> temperature, determined under specified conditions, of the air surrounding
 374 the enclosure of an assembly

375 [SOURCE: IEC 60050-441:1984, 441-11-13, modified – "prescribed" has been replaced by
 376 "specified", "complete switching device or fuse" by "enclosure of an assembly" and the note
 377 has been removed.]

378 **3.1.102**

379 **disruptive discharge**

380 phenomenon associated with the failure of insulation under electric stress, in which the
 381 discharge completely bridges the insulation under test, reducing the voltage between the
 382 electrodes to zero or nearly to zero

383 Note 1 to entry: The term applies to discharges in solid, liquid and gaseous dielectrics and to combinations of
384 these.

385 Note 2 to entry: A disruptive discharge in a solid dielectric produces permanent loss of dielectric strength (non-self-
386 restoring insulation); in a liquid or gaseous dielectric, the loss may be only temporary (self-restoring insulation).

387 Note 3 to entry: The term "sparkover" is used when a disruptive discharge occurs in a gaseous or liquid dielectric.
388 The term "flashover" is used when a disruptive discharge occurs over the surface of a solid dielectric in a gaseous
389 or liquid medium. The term "puncture" is used when a disruptive discharge occurs through a solid dielectric

390 **3.1.103**

391 **relative pressure**

392 pressure that refers to the local atmospheric pressure

393 Note 1 to entry: When defining a filling level it is in reference to the standard atmospheric pressure of 101,3 kPa, as defined in
394 IEC 62271-1

395 **3.1.104**

396 **segregation**

397 <of conductors> arrangement of conductors with earthed metal interposed between them in
398 such a manner that disruptive discharges can only occur to earth

399 Note 1 to entry: A segregation can be established between the conductors as well as between the open contacts
400 of a switching device like a disconnecter.

401 Note 2 to entry: This definition does not specify any mechanical protection (IP and IK).

402 [SOURCE: IEC 60050-441:1984, 441-11-11, modified – Notes to entry have been added.]

403 **3.1.105**

404 **in service**

405 <condition of an assembly> condition where at least one high voltage part in the assembly is
406 energized

407 **3.1.106**

408 **normal operating condition**

409 <of an assembly> in service condition with all doors and covers properly closed and secured

410 **3.1.107**

411 **normal use**

412 <of an assembly> use of the assembly as defined by the manufacturer's instructions
413 reference, corresponding to the conditions and operations in service

414 Note 1 to entry: "normal use" may include maintenance activities within an accessible high-voltage compartment.

415 **3.1.108**

416 **electric shock**

417 physiological effect resulting from an electric current through a human or animal body

418 [SOURCE: IEC 60050-195:1998, 195-01-04]

419 **3.2 Assemblies of switchgear and controlgear**

420 The definitions in 3.2 of IEC 62271-1:2017 are applicable, with the following additions:

421 **3.2.101**

422 **solid-insulation enclosed switchgear and controlgear**

423 **assembly**

424 switchgear and controlgear assemblies with an external solid insulating enclosure and
425 completely assembled, except for external connections

426 Note 1 to entry: This term generally is applicable to high-voltage switchgear and controlgear.

427 Note 2 to entry: The external insulation may be supplied with a (semi-)conducting layer.

428 Note 3 to entry: The term "external connections" corresponds to "external conductors (cables or bars) connecting
429 the assembly to the network or an external installation".

430 **3.2.102**

431 **multi-tier design**

432 design of an assembly in which the main switching devices of two or more functional units are
433 arranged vertically (one above the other) within a common enclosure.

434 **3.3 Parts of assemblies**

435 The definitions in 3.3 of IEC 62271-1:2017 are applicable.

436 **3.4 Switching devices**

437 The definitions in 3.4 of IEC 62271-1:2017 are applicable.

438 **3.5 Parts of switchgear and controlgear**

439 The definitions in 3.5 of IEC 62271-1:2017 are applicable, with the following additions:

440 **3.5.101**

441 **enclosure**

442 <of an assembly> part of an assembly providing a specified degree of protection of equipment
443 against external influences and a specified degree of protection against approach to or
444 contact with live parts and against contact with moving parts

445 [SOURCE: IEC 60050-441:1984, 441-13-01]

446 **3.5.102**

447 **solid insulating enclosure**

448 <of an assembly> part of an assembly providing a specified degree of protection of equipment
449 against external influences and a specified degree of protection against electric shock by
450 limiting the approach to or contact with live parts and against contact with moving parts

451 Note 1 to entry: The main part of the enclosure is of solid insulating material and may have added (semi-)
452 conductive layers.

453 Note 2 to entry: If the resistance of the enclosure of the switchgear and controlgear to the earthing point provided
454 is everywhere less than, or equal to, 100 mΩ, it is identical to the maximum electrical resistance requested by IEC
455 62271-200:2021.

456 [SOURCE: IEC 60050-441:1984, 441-13-01, modified – “electric shock by limiting the” has
457 been added; Notes to entry added.]

458 **3.5.103**

459 **functional unit**

460 <of an assembly> part of an assembly comprising the main circuits, earthing circuit and
461 auxiliary circuits that contribute to the fulfilment of a single function

462 Note 1 to entry: Functional units can be distinguished according to the function for which they are intended, for
463 example, incoming unit, through which electrical energy is normally fed into the assembly, outgoing unit, through
464 which electrical energy is normally supplied to one or more external circuits.

465 [SOURCE: IEC 60050-441:1984, 441-13-04, modified – modification of the wording]

466 **3.5.104**

467 **component**

468 <of an assembly> essential part of the high-voltage or earthing circuits of an assembly which
469 serves a specific function (e.g. circuit-breaker, disconnecter, switch, fuse, earthing switch,
470 instrument transformer, bushing, busbar)