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**Nizkonapetostne stikalne in krmilne naprave - 7-1. del: Pomožna oprema -  
Priključni bloki za bakrene vodnike**

Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors

Niederspannungsschaltgeräte - Teil 7-1: Hilfseinrichtungen - Reihenklemmen für Kupferleiter

Appareillage à basse tension - Partie 7-1: Matériels accessoires - Blocs de jonction pour conducteurs en cuivre

**Ta slovenski standard je istoveten z: prEN IEC 60947-7-1:2023**

[oSIST prEN IEC 60947-7-1:2024](http://standards.iteh.ai/catalog/standards/sist/4004742-3507-4007-0001-22/iec/60947-7-1:2024)

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# 121A/579/CDV

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OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
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<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING  <b>Attention IEC-CENELEC parallel voting</b>  The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.  The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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Recipients of this document are invited to submit, with their comments, notification of any relevant "In Some Countries" clauses to be included should this proposal proceed. Recipients are reminded that the CDV stage is the final stage for submitting ISC clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

**Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors**

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NOTE FROM TC/SC OFFICERS:

SC121A Officers support circulation of CDV for project IEC 60947-7-1 ED4.  
Secretary Note: NC experts are kindly requested to refer their comments to line number.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –**

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**Part 7-1: Ancillary equipment –  
Terminal blocks for copper conductors**

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## FOREWORD

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International Standard IEC 60947-7-1 has been prepared by subcommittee 121A: Low-voltage switchgear and controlgear, of IEC technical committee 121: Switchgear and controlgear and their assemblies for low-voltage.

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This fourth edition cancels and replaces the third edition published in 2009. This edition constitutes a technical revision.

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

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- a) Scope extension for smaller conductor cross-sections;
- b) Implementation of a contact pressure via insulation material (CoPI) test;
- c) Introduction of new informative Annex E for larger cross sections;
- d) Reorganisation of all tables merged into two tables for electrical and mechanical values;
- e) Implementation of AWG-sizes conductor types as an equivalent type of metric conductor with examples in Annex C;

180 f) Reorganisation of Annex D test disconnect terminal blocks to enhance readability.

181 This standard shall be read in conjunction with IEC 60947-1:2020. The provisions of the general  
182 rules dealt with in IEC 60947-1:2020 are applicable to this standard, where specifically called  
183 for. Clauses and subclauses, tables, figures and annexes thus applicable are identified by  
184 reference to IEC 60947-1:2020, e.g. 1.2 of IEC 60947-1:2020, Table 4 of IEC 60947-1:2020 or  
185 Annex A of IEC 60947-1:2020.

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

FDIS	Report on voting
121A/XX/FDIS	121A/XX/RVD

187

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

190 The language used for the development of this International Standard is English.

191 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in  
192 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available  
193 at [https://www.iec.ch/members\\_experts/refdocs](https://www.iec.ch/members_experts/refdocs). The main document types developed by IEC  
194 are described in greater detail at <https://www.iec.ch/standardsdev/publications>.

195 The committee has decided that the contents of this document will remain unchanged until the  
196 stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the  
197 specific document. At this date, the document will be

- 198 • reconfirmed,
- 199 • withdrawn,
- 200 • replaced by a revised edition, or
- 201 • amended.

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203 The National Committees are requested to note that for this document the stability date  
204 is 202X..

205 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED  
206 AT THE PUBLICATION STAGE.



## LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR –

### Part 7-1: Ancillary equipment – Terminal blocks for copper conductors

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#### 213 1 Scope

214 This part of IEC 60947 specifies requirements for terminal blocks with screw-type or screw-  
215 less-type clamping units primarily intended for industrial or similar use and to be fixed to a  
216 support to provide electrical and mechanical connection between copper conductors. It applies  
217 to terminal blocks intended to connect round copper conductors, with or without special  
218 preparation, having a cross-section between 0,05 mm<sup>2</sup>/30 AWG and 300 mm<sup>2</sup>/600 kcmil,  
219 intended to be used in circuits of a rated voltage not exceeding 1 000 V AC up to 1 000 Hz or  
220 1 500 V DC. The tests on terminal blocks are made with AC or DC supply as required in relevant  
221 clauses of this document.

222 Terminal blocks are electrical components, which are typically installed in enclosures according  
223 to IEC 60947-1:2020 clause 3.3.16 enclosure: part providing a specified degree of protection  
224 of equipment against certain external influences and a specified degree of protection against  
225 approach to or contact with hazardous live parts and hazardous mechanical part. For this kind  
226 of components IEC Guide 116 states that there are "however, other electrical components that  
227 are intended to be incorporated into other electrical equipment".

228 NOTE 1 No IP degree listing for terminal blocks is required, but possible.

229 NOTE 2 AWG is the abbreviation of "American Wire Gage" (Gage (US) = Gauge (UK))

230 kcmil = 1 000 cmil;

231 1 cmil = 1 circular mil = surface of a circle having a diameter of 1 mil

232 1 mil = 1/1 000 inch

233 This document may be used as a guide for

- 234 – terminal blocks requiring the fixing of special devices to the conductors, for example quick  
235 connect terminations or wrapped connection, etc.;
- 236 – terminal blocks providing wire-binding screw (see IEC 60947-1:2020, Annex D, Figure D.2),  
237 stud and nut terminations (see IEC 60947-1:2020, Annex D, Figure D.4 and D.5), lug  
238 terminations (see IEC 60947-1:2020, Annex D, Figure D.6) and terminal blocks providing  
239 direct contact to the conductors by means of edges or points penetrating the insulation, for  
240 example insulation displacement connection (IDC) (see IEC 60352-4:2020, Figure 2), etc.;
- 241 – special types of terminal blocks, for example with diodes or varistors or similar component  
242 holders, etc.;
- 243 – terminal blocks with capability to connect conductors with cross sections larger than  
244 300mm<sup>2</sup>/600 kcmil, see Annex E.

245

246 Where applicable in this document, the term "clamping unit" has been used instead of the term  
247 "terminal". This is taken into account in case of reference to IEC 60947-1:2020.

#### 248 2 Normative references

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

253 IEC 60068-2-1:2007 *Environmental testing - Part 2-1: tests - Test A: Cold*

- 254 IEC 60068-2-2:2007 *Environmental testing - Part 2-2: tests - Test B: Dry heat*
- 255 IEC 60352-4: 2020, *Solderless connections - Part 4: Non-accessible insulation displacement*  
256 *(ID) connections - General requirements, test methods and practical guidance*
- 257 IEC 60695-11-5: 2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method*  
258 *– Apparatus, confirmatory test arrangement and guidance*
- 259 IEC 60947-1: 2020, *Low-voltage switchgear and controlgear Part 1: General rules*
- 260 ISO 4046-4: 2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and*  
261 *board grades and covered products*

### 262 3 Terms and definitions

263 For the purposes of this document, the definitions given in IEC 60947-1:2020, together with the  
264 following terms and definitions apply.

265 ISO and IEC maintain terminological databases for use in standardization at the following  
266 addresses:

- 267 • IEC Electropedia: available at <https://www.electropedia.org/>
- 268 • ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 269 3.1

##### 270 terminal block

271 insulating part carrying one or more mutually insulated terminal assemblies and intended to be  
272 fixed to a support

#### 273 3.2

##### 274 rated cross-section

275 value of the maximum cross-section of all connectable types of conductors, rigid (solid and  
276 stranded) and flexible, stated by the manufacturer, and to which certain thermal, mechanical  
277 and electrical requirements are referred

#### 278 3.3

##### 279 rated connecting capacity

280 range of cross-section and, if applicable, the number of connectable conductors, for which the  
281 terminal block is designed

#### 282 3.4

##### 283 terminal assembly

284 two or more clamping units fixed to the same conductive part

#### 285 3.5

##### 286 contact pressure via insulating material (for a clamping unit) [CoPI]

287 contact force of a clamping unit where contact pressure is transmitted through insulating  
288 material

### 289 4 Classification

290 Distinction is made between various types of terminal blocks as follows:

- 291 – method of fixing the terminal block to the support;
- 292 – number of poles;
- 293 – type of clamping units: screw-type clamping units or screwless-type clamping units (see  
294 3.5.25 of IEC 60947-1:2020);
- 295 – ability to receive prepared conductors (see 3.5.28 of IEC 60947-1:2020);

- 296 – terminal assemblies with identical or dissimilar clamping units;
- 297 – number of clamping units on each terminal assembly;
- 298 – service conditions;
- 299 – ability to receive different types of conductors, e.g, solid, rigid stranded or flexible
- 300 conductors.

## 301 **5 Characteristics**

### 302 **5.1 Summary of characteristics**

303 The characteristics of a terminal block are as follows:

- 304 – type of terminal block (see 5.2);
- 305 – rated and limiting values (see 5.3).

### 306 **5.2 Type of terminal block**

307 The following shall be stated:

- 308 – type of clamping units (e.g. screw-type, screwless-type);
- 309 – number of clamping units.

### 310 **5.3 Rated and limiting values**

#### 311 **5.3.1 Rated voltages**

312 Subclauses 5.3.1.2 and 5.3.1.3 of IEC 60947-1:2020 apply.

#### 313 **5.3.2 Short-time withstand current**

314 A specified RMS value of current which a terminal block shall be able to withstand during a  
315 specified short-time under prescribed conditions of use and behaviour (see 8.2.3 and 9.4.6)

#### 316 **5.3.3 Standard cross-section**

317 The standard values of cross-sections of round copper conductors to be used are contained in  
318 Table 1.

#### 319 **5.3.4 Rated cross-section**

320 The rated cross-section shall be selected from the standard cross-sections given in Table 1.

#### 321 **5.3.5 Rated connecting capacity**

322 For terminal blocks with a rated cross-section of 35 mm<sup>2</sup>/2 AWG or less, the minimal  
323 requirement of rated connecting capacity specified in table 1 applies. A rated connecting  
324 capacity wider than the rated connecting capacity specified in table 1 is to be declared, if  
325 applicable.

326 For rated cross-section above 35 mm<sup>2</sup>/2 AWG, the manufacturer shall state the maximum and  
327 minimum cross sections conductors that can be connected. Several connecting capacities can  
328 be defined according to the type of conductors, rigid (solid or stranded) or flexible, while  
329 remaining consistent with the same rated cross-section.

330 The manufacturer shall also state the number of conductors that can be connected  
331 simultaneously to each clamping and any necessary preparation at the end of the conductor.

## 332 6 Product information

### 333 6.1 Marking

#### 334 6.1.1 Manufacturer or trade mark

335 All terminal blocks shall be marked in a durable and legible manner with the name of the  
336 manufacturer or a trade mark by which the manufacturer can be readily identified.

#### 337 6.1.2 Type reference

338 All terminal blocks shall be marked in a durable and legible manner with a type reference  
339 permitting its identification in order to obtain relevant information from the manufacturer or his  
340 product documentation (e.g. machine-readable code with reference to internet, electronic  
341 catalogues, web-link on the package unit or product inserts, etc.).

#### 342 6.1.3 Very small terminal blocks

343 For very small terminal blocks with limited practical space for marking, only 6.1.1 applies.  
344 Information of 6.1.2 shall be permitted to be marked on the smallest package unit or product  
345 inserts.

## 346 6.2 Additional information

347 The following information shall be stated by the manufacturer, if applicable, e.g. in the product  
348 documentation (e.g. machine-readable code with reference to internet, electronic catalogues,  
349 web-link on the package unit or product inserts, etc.):

- 350 a) IEC 60947-7-1, if the manufacturer claims compliance with this document;
- 351 b) the rated cross-section;
- 352 c) the rated connecting capacity, if wider than in Table 1;
- 353 d) the rated insulation voltage ( $U_i$ );
- 354 e) the rated impulse withstand voltage ( $U_{imp}$ ), when determined;
- 355 f) service conditions, if different from those of Clause 7;
- 356 g) conventional free air thermal current ( $I_{th}$ );
- 357 h) following information for non-universal terminal blocks, depending on the classification,  
358 shall be used:
  - 359 – for clamping units declared for solid conductors “solid” or the abbreviations “s” or “sol”;
  - 360 – for clamping units declared for rigid stranded conductors “rigid stranded” or the  
361 abbreviation “r”;
  - 362 – for clamping units declared for flexible conductors “flexible” or the abbreviation “f”;
- 363 i) special preparation of the end of the conductor;
- 364 j) number of conductors simultaneously connectable, if different from one;
- 365 k) the manufacturer’s declared tightening torque, either from Table 4 of IEC 60947-1:2020 or  
366 higher;
- 367 l) installation instructions;
- 368 m) safety instructions.

369 NOTE 1 In some countries tightening torque values lower than those as listed in Table 4 of IEC 60947-1:2020 are  
370 allowed according to their national product standards: United States of America and Canada.

371 NOTE 2 Material declarations according to IEC TS 63058 or equivalent can be provided. IEC TS 63058 provides  
372 methods for assessing the environmental impact of switchgear and controlgear, guidance on environmentally  
373 conscious design and on information required for end-of-life treatments.

## 374 7 Normal service, mounting and transport conditions

375 Clause 7 of IEC 60947-1:2020 applies.

## 376 **8 Constructional and performance requirements**

### 377 **8.1 Constructional requirements**

#### 378 **8.1.1 Clamping units**

379 Subclause 8.1.8.1 of IEC 60947-1:2020 applies with following modifications.

380 The clamping units shall allow the conductors to be connected by means ensuring that a reliable  
381 mechanical linkage and electrical contact is properly maintained.

382 Screw-type clamping units are not suitable for the connection of flexible conductors with tin  
383 soldered ends.

384 The clamping units shall be able to withstand the force that can be applied through the  
385 connected conductors.

386 Compliance is checked by inspection and by the tests of 9.3.3.1, 9.3.3.2 and 9.3.3.3.

387 If contact pressure of the clamping unit is transmitted through insulating material other than  
388 ceramic or pure mica, the test described in 9.4.8 contact pressure via insulating material (CoPI)  
389 test shall be performed to prove that there is sufficient resiliency in the metallic parts to  
390 compensate for any possible shrinkage of the insulation material.

#### 391 **8.1.2 Mounting**

392 Terminal blocks shall be provided with means that allow them to be securely attached to a rail  
393 or a mounting surface.

394 Tests shall be made in accordance with 9.3.2.

395 NOTE Information on mounting on rails can be found in IEC 60715.

#### 396 **8.1.3 Clearances and creepage distances**

397 For terminal blocks for which the manufacturer has stated values of rated impulse withstand  
398 voltage ( $U_{imp}$ ) and rated insulation voltage ( $U_i$ ), minimum values of clearances and creepage  
399 distances are given in Table 13 and Table 15 of IEC 60947-1:2020.

400 For terminal blocks for which the manufacturer has not declared a value of rated impulse  
401 withstand voltage ( $U_{imp}$ ), guidance for minimum values is given in Annex H of IEC 60947-  
402 1:2020.

403 Electrical requirements are given in 8.2.2.

#### 404 **8.1.4 Terminal block identification and marking**

405 Clause 8.1.8.4 of IEC 60947-1:2020 applies with the following addition.

406 A terminal block shall have provision, or at least space, for identification marks or numbers for  
407 each clamping unit or terminal assembly related to the circuit of which it forms a part.

408 For the identification of the terminal blocks the colour combination green-yellow is not allowed.

409 NOTE Such provision may consist of separate marking items, such as marking tags, identification labels, etc.

#### 410 **8.1.5 Resistance to abnormal heat and fire**

411 The insulation material of the terminal block shall not be adversely affected by abnormal heat  
412 and fire.

413 Compliance is checked by the needle flame test according to IEC 60695-11-5:2016 as specified  
414 in 9.5 of this document.

#### 415 **8.1.6 Rated cross-section and rated connecting capacity**

416 Terminal blocks shall be so designed that conductors of the rated cross-section and the rated  
417 connecting capacity, if applicable, can be accepted.

418 The verification of the rated connecting capacity and rated cross-section is checked by the test  
419 according in 9.3.3.4.

420 Note: The verification of the rated cross-section may be performed by the special test according to 9.3.3.5.

### 421 **8.2 Performance requirements**

#### 422 **8.2.1 Temperature rise**

423 The temperature-rise of any part of the centrally located terminal block shall not exceed 45 K,  
424 see Figure 2.

#### 425 **8.2.2 Dielectric properties**

426 If the manufacturer has declared a value of the rated impulse withstand voltage ( $U_{imp}$ ) (see  
427 5.3.1.3 of IEC 60947-1:2020), the requirements of 8.2.3.1 except item c) and 8.2.3.2 of  
428 IEC 60947-1:2020 apply. If applicable, the impulse withstand voltage test shall be carried out  
429 in accordance with 9.4.3 a) of this document. For the verification of solid insulation, the  
430 requirements of 8.2.3.1 except item c) of IEC 60947-1:2020 apply. The power-frequency  
431 withstand voltage test shall be carried out in accordance with 9.4.3 b).

432 The verification of sufficient clearances and creepage distances shall be made in accordance  
433 with 9.4.2.

#### 434 **8.2.3 Short-time withstand current**

435 A terminal block shall be capable of withstanding for 1 s the short-time withstand current which  
436 corresponds to 120 A/mm<sup>2</sup> of its rated cross-section, in accordance with 9.4.6.

#### 437 **8.2.4 Voltage drop**

438 The voltage drop on a terminal block, measured according to 9.4.4, shall not exceed the values  
439 specified in 9.4.4 and, where applicable, in 9.4.7.

#### 440 **8.2.5 Electrical performance after ageing (for screwless-type terminal blocks only)**

441 Screwless-type terminal blocks without contact pressure via insulating material (CoPI) shall be  
442 capable of withstanding the ageing test comprising 192 temperature cycles in accordance with  
443 9.4.7.

444 Screwless-type terminal blocks with contact pressure via ceramic or pure mica shall be capable  
445 of withstanding the ageing test comprising 192 temperature cycles in accordance with 9.4.7.

446 Screwless-type terminal blocks with contact pressure via insulating material (CoPI) other than  
447 ceramic or mica shall fulfil the requirements of clause 8.2.6.

#### 448 **8.2.6 Contact pressure via insulating material (CoPI)**

449 Terminal blocks with contact pressure via insulating material other than ceramic or pure mica,  
450 shall be capable of withstanding the ageing test sequence including preconditioning and  
451 comprising 384 temperature cycles in accordance with 9.4.8.