



**SLOVENSKI STANDARD**  
**oSIST-TS CLC/prTS 50549:2010**  
**01-maj-2010**

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**Zahteve za priklop generatorjev za toke nad 16 A na fazo na nizkonapetostni distribucijski sistem ali na srednjenapetostni distribucijski sistem**

Requirements for the connection of generators above 16 A per phase to the LV distribution system or to the MV distribution system

iTeh STANDARD PREVIEW  
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Prescriptions pour le raccordement de générateurs de plus de 16 A par phase au réseau de distribution BT ou au réseau de distribution MT

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**Ta slovenski standard je istoveten z: CLC/prTS 50549:2010**

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29.240.01	Omrežja za prenos in distribucijo električne energije na splošno	Power transmission and distribution networks in general
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ICS

English version

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This draft Technical Specification is submitted to CENELEC members for comments prior to the voting meeting of 2010-10-27.

Deadline for CENELEC: 2010-06-18.

It has been drawn up by CLC/TC 8X.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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## CENELEC

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

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## Foreword

This draft Technical Specification was prepared by WG 03 - Requirements for connection of generators to distribution networks of the Technical Committee CENELEC TC 8X, System aspects for electrical energy supply.

It is circulated for comments prior to the voting meeting foreseen on 2010-10-27 in accordance with the Internal Regulations, Part 2, Subclause 11.3.3.2.

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## 83 1 Scope

84 The purpose of this Technical Specification is to provide technical guidance for the connection of  
85 generating plants which can be operated in parallel with a public distribution network.

86 The requirements of this Technical Specification only apply to electrical machinery and equipment,  
87 irrespective of the kind of primary energy source.

88 This Technical Specification applies to all three-phase generating units that meet all of the following  
89 conditions as an individual unit or as a cluster of units with a common point of connection:

- 90 • converting any primary energy source into AC electricity;
- 91 • connected to the LV network and rated at more than 16A per phase or connected to the MV  
92 network;
- 93 • intended to operate permanently in parallel with a public distribution network under normal network  
94 operating conditions.

95

96 This Technical Specification defines interconnection requirements and a conformance test procedure.

97 This Technical Specification is intended to be used as a technical reference in connection agreements  
98 between DNOs and electricity producers.

99 Island operation of generating plants, both intentional and unintentional, is out of the scope of this  
100 Technical Specification.

101 Safety of personnel is out of the scope of this Technical Specification.

## 102 2 Normative references

103 The following referenced documents are indispensable for the application of this document. For dated  
104 references, only the edition cited applies. For undated references, the latest edition of the referenced  
105 document (including any amendments) applies.

106 IEC 60050, *International Electrotechnical Vocabulary*

107 EN 50160, *Voltage characteristics of electricity supplied by public distribution networks*

## 108 3 Definitions

109 For the purposes of this document, the definitions given in IEC 60050 and the following definitions  
110 apply.

### 111 3.1

#### 112 connection agreement

113 written agreement between a producer and a DNO regarding the connection of a generating plant to a  
114 Public Distribution Network

### 115 3.2

#### 116 disconnection

117 separation of the active parts of the generator from the public distribution network by means of  
118 mechanical contacts providing basic insulation at least

- 119 **3.3**  
120 **Equipment Under Test (EUT)**  
121 generating unit and all associated equipment that is being subjected to the functional tests and  
122 protection tests described in this Technical Specification
- 123 **3.4**  
124 **essential loads**  
125 electric loads close to the generating plant, which are deemed essential by the party installing the  
126 generating plant
- 127 NOTE In case of islanding, essential loads may be supplied by the internal distribution network of the producer by opening  
128 the interface switch.
- 129 **3.5**  
130 **general switch**  
131 switch installed as close as possible to the Point of Common Coupling (PCC), for protection and  
132 disconnection of the whole plant from the distribution network
- 133 **3.6**  
134 **generating plant**  
135 set of generating units, circuits, equipment and auxiliary services for the production of electricity
- 136 NOTE A generating plant may include electric loads.
- 137 **3.7**  
138 **generating unit**  
139 set composed of one or more primary energy sources and one generator, to which the primary energy  
140 sources supply their non-electric energy for conversion into electricity
- 141 **3.8**  
142 **generator**  
143 electric machine which converts non-electric energy (supplied by primary energy sources) into  
144 electricity
- 145 **3.9**  
146 **generator switch**  
147 switch installed electrically close to the terminals of each generator of the generating plant, for  
148 protection and disconnection of that generator
- 149 **3.10**  
150 **interconnection system**  
151 all equipment and functions (included the generator switch) used to connect a generating unit to a  
152 public distribution network
- 153 **3.11**  
154 **islanding**  
155 condition in which the generating plant is supplying loads not connected to a public distribution  
156 network
- 157 **3.12**  
158 **interface switch**  
159 switch installed in the producer's network, for separation of a part of the producer's network from the  
160 public distribution network, in order to enable island operation of a part of the producer's network
- 161 **3.13**  
162 **low voltage (LV) system**  
163 electric system with a nominal AC voltage less than 1 kV



- 164 **3.14**  
165 **MV system**  
166 electric system with a nominal AC voltage 1 kV or more, but less than 35 kV
- 167 **3.15**  
168 **network**  
169 one or several electric systems which are outside the generating plant
- 170 **3.16**  
171 **network operation under normal conditions**  
172 stationary operating conditions where electricity demand is fully met without the ratings of any  
173 component of the electricity network being exceeded
- 174 **3.17**  
175 **operation in parallel with the Public Distribution Network**  
176 situation where the generating plant is connected to and operating in synchronism with a public  
177 distribution network
- 178 **3.18**  
179 **Point of Common Coupling (PCC)**  
180 point of a power network, electrically nearest to a particular network user, at which other network users  
181 are, or may be, connected
- 182 **3.19**  
183 **point of connection**  
184 point on a public power supply system where a generating plant is, or can be connected
- 185 **3.20**  
186 **primary energy source**  
187 non- electric energy source supplying an electric generator
- 188 NOTE Examples of primary energy sources include gas turbines, wind turbines and photovoltaic cells.
- 189 **3.21**  
190 **producer**  
191 party planning to connect an electricity generating plant to a public distribution network
- 192 **3.22**  
193 **producer's network**  
194 electrical installations owned/operated by the producer for internal distribution of electricity
- 195 **3.23**  
196 **protection**  
197 any function that automatically trips a switch when a given condition occurs
- 198 **3.24**  
199 **Public Distribution Network switch**  
200 switch installed electrically close to the interface between the producer's network and the public  
201 distribution network
- 202 **3.25**  
203 **reset ratio**  
204 ratio of the value of an electrical parameter that causes a protection function to reset and the value of  
205 the same parameter that had triggered the protection to trip

206 **3.26**  
207 **reset time**  
208 for a protection function in the trip state, the time lag from the input being removed and the output  
209 circuit changing state

210 **3.27**  
211 **response time**  
212 time interval starting when a protection function is triggered and ending when the protection equipment  
213 responds as expected

214 **3.28**  
215 **rotating generating plant**  
216 generating plant that, through rotating machinery, converts the primary energy source into electric  
217 energy to be supplied to a network

218 **3.29**  
219 **Short Circuit Ratio (SCR)**  
220 ratio of the following quantities, referring to a synchronous generator:  
221 - numerator: Open Circuit Field Current to obtain 1 p.u. Terminal Voltage,  
222 - denominator: Short Circuit Field Current to obtain 1 p.u. Terminal Current

223 **3.30**  
224 **simulated grid**  
225 set of equipment, movable or immovable, for voltage and frequency testing, which simulates an  
226 electric grid. Where appropriate, the grid itself can be employed instead of the simulated grid, provided  
227 its integrity and the safety of operation are guaranteed

228 **3.31**  
229 **static generating plant**  
230 generating plant that, through static devices, converts the primary energy source into electric energy  
231 to be supplied to the network

232 **3.32**  
233 **temporary operation in parallel with the Public Distribution Network**  
234 conditions in which the generating plant is connected to a public distribution network, during defined  
235 short periods, to maintain the continuity of the supply voltage and to facilitate testing

236 **3.33**  
237 **trip time**  
238 time lag starting when the measured quantity (e.g. frequency, voltage, power) exceeds the trip  
239 threshold and ending when the tripping command is issued

## 240 **4 Interconnection requirements**

241 This clause defines connection criteria of the generating plants to the public distribution network and  
242 provides guidance for the selection of connection schemes and for the co-ordination of protection.

243 Three-phase generating plants (whether equipped with rotating or static generators) may be operated  
244 in parallel with a public distribution network, subject to compliance with the requirements of this  
245 Technical Specification. When the generating plant is composed of clusters of single-phase  
246 generators, efforts should be made to ensure power balance between phases.

247 The provisions of this Technical Specification are independent of the duration of generating unit  
248 operation in parallel. It rests with the DNO to relax, if deemed appropriate, interconnection  
249 requirements for an individual generator whose operation in parallel only lasts for a short time  
250 (temporary operation in parallel). The relaxed requirements shall be recorded in the Connection  
251 Agreement, along with the maximum allowable duration of the temporary operation in parallel. An  
252 appropriate device shall automatically disconnect the generator as soon as the maximum allowable  
253 duration has elapsed.

#### 254 4.1 network integration

255 All generating plants shall meet the following connection requirements:

- 256 • the total installed power shall be compatible with the operating criteria agreed with the DNO;
- 257 • the connection of the generating plant shall not cause the short circuit current to exceed the  
258 breaking and making capacity of any circuit breaker;
- 259 • the settings applied to the protection equipment shall be selected to ensure correct tripping of the  
260 generator under fault conditions and stability against network disturbances as agreed with the  
261 DNO;
- 262 • where the generating plant is connected to a public distribution network that is fitted with an auto-  
263 reclose circuit breaker, the trip times of the generator switches shall be such that there is no risk of  
264 an out of phase reclosure;
- 265 • the generating plant shall not cause the current carrying capacity of the lines and transformers to  
266 be exceeded.

267 A connection agreement shall be reached between the DNO and the Producer, prior to connection.  
268 The connection agreement shall include, but shall not be limited to, the following issues:

- 269 • maximum power to be installed in the generating plant;
- 270 • connection voltage level (MV or LV) at PCC (to be agreed upon between the producer and the  
271 DNO, in compliance with national standards and regulations);
- 272 • contribution of the generating plant to short circuit current;
- 273 • if appropriate, instantaneous power factor at PCC (loads, if any, are non included);
- 274 • operation and settings of automatic voltage power factor controller and power controller where  
275 present;
- 276 • single line diagram of installation with clearly marked connection point, installation boundary and  
277 measuring point;
- 278 • earthing arrangement of the generating plant (in compliance with national legislation, standards  
279 and regulations);
- 280 • reconnection requirement;
- 281 • setting applied to the interface protection.

#### 282 4.2 connection scheme

283 The plant shall be in compliance with national legislation, standards and regulations and agreed upon  
284 between the producer and the DNO. The plant shall assure the following:

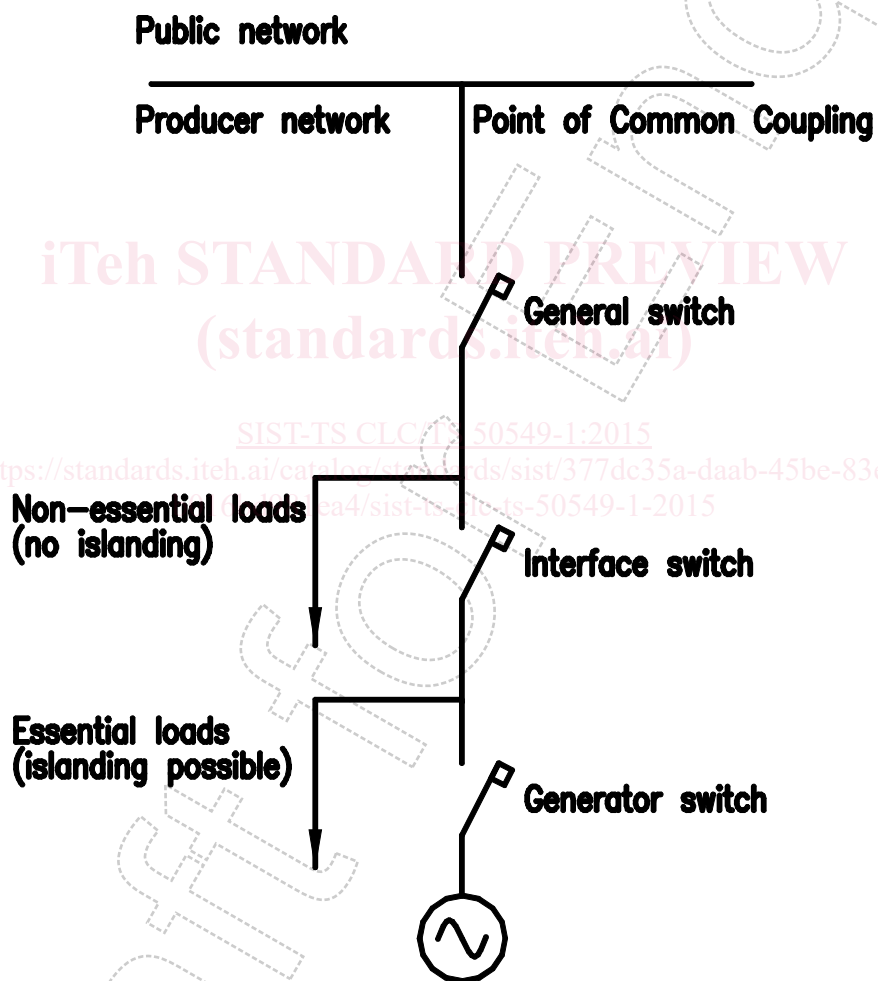
- 285 a) start up, operation and stop under normal network operating conditions, i.e. in the absence of  
286 faults or malfunctions;
- 287 b) faults and malfunctions within the generating plant shall not impair the integrity of the public  
288 distribution network;
- 289 c) co-ordinated operation of the interface switch with the generator switch, the general switch and the  
290 public distribution network switch, for faults or malfunctions during operation in parallel with the  
291 public distribution network;

292 d) disconnection of the generating plant from the public distribution network by tripping the interface  
293 switch in the following cases:

- 294 — intentional opening of the public distribution network switch,  
295 — faults in the generating plant or on the public distribution network,  
296 — abnormal voltage or frequency (i.e. excursions outside of set limits).

297 In order to satisfy the above functions, co-ordinated but independent switches and protection  
298 equipment shall be applied to each of the following sections of the generating plant, as shown in  
299 Figure 1:

- 300 • generator;  
301 • part of the producer's network designed to run as an island (if required);  
302 • the remaining part of the producer's (i.e. all of the producer's network less the island section);  
303 • Public Distribution Network.



304  
305 **Figure 1 - Electricity generating plant connected to a Public Distribution Network**  
306 **(schematic view)**

307