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Splošni postopek preverjanja učinkovitosti zaščitnih ukrepov za električno opremo po popravilu

General procedure for verifying the effectiveness of the protective measures of electrical equipment after repair

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General procedure for verifying the effectiveness of the protective measures of electrical equipment after repair

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This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2019-04-26.

It has been drawn up by CLC/TC 85X.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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prEN 50678:2019

CONTENTS

European foreword	5
Introduction	6
1 Scope	7
2 Normative references	7
3 Terms and definitions	8
4 Requirements	11
5 Tests	11
5.1 General	11
5.1.1 General test conditions	11
5.1.2 Visual inspection	12
5.1.3 Test of the protective measures against electric hazards	12
5.1.4 Confirmation of the compliance of additional protective measures	13
5.1.5 Documentation and evaluation of test	13
5.2 Visual inspection	13
5.3 Measuring of protective bonding resistance	14
5.4 Measurement of the insulation resistance	16
5.5 Measurement of protective conductor current	24
5.6 Measurement of the touch current	29
5.7 Confirmation of the compliance of the specifications for the protective measure SELV/PELV	35
5.8 Measurement of the leakage current produced by a floating input with a rated input voltage above 50 V AC or 120 V DC	35
5.9 Confirmation of the operation of further protective measures	36
5.10 Confirmation of the polarity of mains plug wiring	37
5.11 Functional test	37
6 Documentation and evaluation of test	37
7 Measuring equipment	37
Annex A (informative) General guidance and rationale	38
A.1 Intended audience	38
A.2 Rationale	39
Annex B (normative) Requirements for test instruments	42
B.1 General	42
B.2 Protective bonding resistance	42
B.3 Insulation resistance	42
B.4 Leakage current	42
B.4.1 General	42
B.4.2 Direct method	42
B.4.3 Residual current test method	43
B.4.4 Alternative method for leakage current	43
Annex C (informative) Schematics for test sequences	44
C.1 Schematic test sequence for equipment of protective class I	44
C.2 Schematic test sequence for equipment of protective class II	45

Annex D (normative) Requirements for testing household and similar appliances in the scope of standard series EN 60335.....	46
Bibliography.....	47

Figures

Figure 1a — Example measuring circuit for the measurement of protective earth resistance in equipment that is disconnected from the supply mains	15
Figure 1b — Example measuring circuit for the measurement of protective earth resistance in equipment, which for functional reasons cannot be disconnected from supply mains, or in equipment or permanently connected to mains	16
Figure 1 — Example measuring circuits for the measurement of protective earth resistance.....	16
Figure 2a — Example measuring circuit for the measurement of insulation resistance – equipment with protective earth connector and a plug	18
Figure 2b — Example measuring circuit for the measurement of insulation resistance – equipment with protective earth connector fixed installed and accessible conductive parts not connected to protective earth.....	19
Figure 2c — Example measuring circuit for the measurement of insulation resistance – equipment with double insulation and a plug	20
Figure 2d — Example measuring circuit for the measurement of insulation resistance – equipment with SELV/PELV and a plug.....	21
Figure 2e — Example measuring circuit for the measurement of insulation resistance – equipment with protective earth connector and a plug and accessible conductive parts not connected to protective earth.....	22
Figure 2f — Example measuring circuit for the measurement of insulation resistance – equipment with protective isolation transformers, verifying the safe insulation	23
Figure 2 — Example measuring circuits for the measurement of insulation resistance	23
Figure 3a — Example protective conductor current – direct method.....	25
Figure 3b — Example protective conductor current – residual current method.....	26
Figure 3c — Example protective conductor current – alternative method	27
Figure 3d — Example protective conductor current – residual current method.....	28
Figure 3e — Example protective conductor current – direct method with clamp.....	29
Figure 3 — Example protective conductor current.....	29
Figure 4a — Example touch current – residual current method.....	31
Figure 4b — Example touch current – direct method.....	32
Figure 4c — Example touch current – alternative method	33
Figure 4d — Example touch current; direct method – on SELV/PELV connectors	34
Figure 4 — Example touch current – different measuring methods.....	34
Figure 5 — Example leakage current produced by a floating input with a rated input voltage	36
Figure C.1 — Schematic test sequence for equipment of protective class I.....	44
Figure C.2 — Schematic test sequence for equipment of protective class II.....	45

Tables

prEN 50678:2019

Table 1 — Limits (minimum values) for insulation resistance	17
Table 2 — Limits (maximum values) for protective conductor current	24
Table 3 — Limits (maximum values) for touch current.....	30
Table A.1 — Addressees and their possible interest in this standard.....	38
Table A.2 — Reasons for choosing different measuring methods for leakage current.....	40

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1 European foreword

2 This document [prEN 50678:2019] has been prepared by CLC/TC 85X "**Measuring equipment for**
3 **electrical and electromagnetic quantities**".

4 This document is currently submitted to the Enquiry.

5 The following dates are proposed:

- latest date by which the existence of this document has to be announced at national level (doa) dor + 6 months
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) dor + 12 months
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months (to be confirmed or modified when voting)

6

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prEN 50678:2019

7 Introduction

8 This standard intends to provide a general test procedure to verify the effectiveness of the basic
9 protective measures for electrical equipment after it has been repaired, thus ensuring the safety of
10 people using repaired equipment.

11 This standard may be considered to support compliance with the European Directive 2009/104/EG
12 concerning the minimum safety and health requirements for the use of work equipment by workers at
13 work.

14 In general, the test procedure for verification of products after repair is the responsibility of the related
15 product technical committees. This document may be taken into consideration by product technical
16 committees if they need to take into consideration modified or additional tests for verification after
17 repairs for products falling within their scope.

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19 **1 Scope**

20 This document specifies requirements for setting a uniform procedure to verify the effectiveness of the
21 protective measures for current-using electrical equipment or appliances after they have been repaired.

22 This procedure is applicable to equipment or appliances that are pluggable equipment type A
23 connected to final circuits via a plug or permanently connected equipment, with a rated voltage above
24 25 V AC and 60 V DC up to 1 000 V AC and 1 500 V DC, and currents up to 63A.

25 This standard does not cover:

26 — type tests, routine tests and acceptance tests for product safety requirements and product
27 functional requirements.

28 NOTE Product safety requirements and product functional requirements are specified in the related product
29 standards.

30 This document assumes that the electrical equipment under consideration complies with its related
31 product standard, has been introduced on the market, has been in use, has failed, and has then been
32 repaired.

33 It intends to verify that operations for repairs have not jeopardized basic protective measures, for
34 example to verify the continuity of the protective conductor, the withstand capability of the insulation or
35 to verify that no metallic part is loose or is inadvertently inserted in the device.

36 This document does not apply to:

37 — devices and equipment that are part of the fix electrical installations. For these devices, tests for
38 verification after repair are covered by IEC 60364-6;

39 — audio/video, information and communication technology equipment;

40 — uninterruptible Power Supply (UPS);

41 — charging stations for electro-mobility;

42 — power supplies;

43 — programmable Logic Controllers (PLC);

44 — power Drives;

45 — devices for EX-zones or for mining applications in general;

46 — products already covered by standards addressing similar topics such as:

47 — medical equipment covered by IEC 60601-1. For these devices, tests for verification after
48 repair are covered by IEC 62353;

49 — arc welding equipment covered by IEC 60974-1. For these devices, tests for verification after
50 repair are covered by IEC 60974-4.

51 **2 Normative references**

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

55 EN 60335, *Household and similar electrical appliances*

prEN 50678:2019

- 56 HD 60364-6, *Low-voltage electrical installations — Part 6: Verification*
- 57 EN 61010-1:2010, *Safety requirements for electrical equipment for measurement, control and*
58 *laboratory use — Part 1: General requirements*
- 59 EN 61010-2-030:2010, *Safety requirements for electrical equipment for measurement, control, and*
60 *laboratory use — Part 2-030: Particular requirements for testing and measuring circuits*
- 61 EN 61010-2-032, *Safety requirements for electrical equipment for measurement, control, and*
62 *laboratory use — Part 2-032: Particular requirements for hand-held and hand-manipulated current*
63 *sensors for electrical test and measurement*
- 64 EN 61557-2, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. —*
65 *Equipment for testing, measuring or monitoring of protective measures — Part 2: Insulation resistance*
- 66 EN 61557-4, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. —*
67 *Equipment for testing, measuring or monitoring of protective measures — Part 4: Resistance of earth*
68 *connection and equipotential bonding*
- 69 EN 61557-16, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c.*
70 *— Equipment for testing, measuring or monitoring of protective measures — Part 16: Equipment for*
71 *testing the effectiveness of the protective measures of electrical equipment and/or medical electrical*
72 *equipment*
- 73 EN 62353:2014, *Medical electrical equipment — Recurrent test and test after repair of medical*
74 *electrical equipment*

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75 3 Terms and definitions

- 76 For the purposes of this document, the following terms and definitions apply.
- 77 ISO and IEC maintain terminological databases for use in standardization at the following addresses:
- 78 — IEC Electropedia: available at <http://www.electropedia.org/>
- 79 — ISO Online browsing platform: available at <http://www.iso.org/obp>

80 Note 1 to entry: Some of the definitions are different from those in the product standards for type testing, as
81 different measuring methods are used.

82 3.1
83 electrical safety

84 protection within an equipment which limits the effects of electrical current on a user or other
85 individuals

86 Note 1 to entry: Safety is defined as freedom from unacceptable risk (refer to ISO 14971:2007, definition
87 2.24).

88 3.2
89 testing

90 visual control, measure and prove the electrical equipment after repair to assure that equipment
91 remains safe to use

92 3.3
93 maintenance

94 combination of all technical and administrative means, including supervising means, to keep or restore
95 an equipment in working condition

- 96 **3.4**
 97 **repair**
 98 means for restoration of the intended function of the equipment
- 99 **3.5**
 100 **(electrically) skilled person**
 101 person with relevant education and experience to enable him or her to perceive risks and to avoid
 102 hazards which electricity can create
- 103 [SOURCE: IEC 60050-195:1998, 195-04-01]
- 104 **3.6**
 105 **(electrically) instructed person**
 106 person adequately advised or supervised by electrically skilled persons to enable him or her to
 107 perceive risks and to avoid hazards which electricity can create
- 108 [SOURCE: IEC 60050-195:1998, 195-04-02]
- 109 **3.7**
 110 **electrical equipment**
 111 single apparatus using electrical energy and connected by plug or permanently connected to a final
 112 circuit of the distribution system
- 113 Note 1 to entry: Equipment includes those accessories as defined by the manufacturer that are necessary to
 114 enable the normal use of the equipment.
- 115 **3.8**
 116 **final circuit (of buildings)**
 117 electric circuit intended to supply directly electric current to current-using equipment or socket-outlets
- 118 [SOURCE: IEC 60050-826:2004, 826-14-03] EN 50678:2020
<https://standards.iteh.ai/catalog/standards/sist/c5bbbc79-2de9-42f5-b7e4-e86c5c480706/sist-en-50678-2020>
- 119 **3.9**
 120 **leakage current**
 121 current flowing from live parts of the equipment to earth
- 122 [SOURCE: IEC 60050-442:1998, 442-01-24 modified – the term has changed and a reference to the
 123 absence of an insulation fault has been removed]
- 124 **3.10**
 125 **touch-current**
 126 electric current passing through a human body or through an animal body when it touches one or more
 127 accessible parts of electrical equipment not connected to protective earth
- 128 [SOURCE: IEC 60050-195:1998, 195-05-21 modified – the wording of the definition has been
 129 narrowed to electrical equipment not connected to protective earth]
- 130 **3.11**
 131 **protective conductor current**
 132 electric current which flows in a protective conductor and is frequency weighted according to the
 133 characteristics of the human body
- 134 [SOURCE: IEC 60050-826:2004, 826-11-21, modified – the wording of the definition has been
 135 expanded.]
- 136 **3.12**
 137 **residual current**
 138 vectorial sum of the currents flowing in the live conductors of the mains circuit of the equipment and
 139 frequency weighted according to the characteristics of the human body

prEN 50678:2019

140 [SOURCE: IEC 60050-442:1998, 442-05-19 modified – the wording of the definition has been
141 expanded]

3.13**insulation resistance**

144 resistance under specified conditions between two conductive elements separated by insulating
145 materials

146 [SOURCE: IEC 60050-151:2001, 151-15-43]

3.14**protective bonding resistance**

149 resistance between any accessible conductive part, which has to be connected for safety purposes to
150 the protective earth terminal, and the

151 — protective terminal of the mains plug, or

152 — protective terminal of the equipment inlet, or

153 — protective terminal permanently connected to the supply mains,

154 resistance between protective earth terminals at each end of a detachable power supply cord,
155 extension leads and multi-way adapters

3.15**SELV**

158 electric system in which the voltage cannot exceed the value of extra-low voltage:

159 — under normal conditions and

160 — under single fault conditions, including earth faults in other electric circuits

161 Note 1 to entry: SELV is the abbreviation for safety extra-low voltage.

162 [SOURCE: IEC 60050-826:2004, 826-12-31]

3.16**PELV**

165 electric system in which the voltage cannot exceed the value of extra-low voltage:

166 — under normal conditions and

167 — under single fault conditions, except earth faults in other electric circuits

168 Note 1 to entry: PELV is the abbreviation for protective extra-low voltage.

169 [SOURCE: IEC 60050-826:2004, 826-12-32]

3.17**permanently connected equipment**

172 equipment that can only be electrically connected to or disconnected from the mains by the use of a
173 tool

3.18**pluggable equipment type A**

176 equipment that is intended for connection to the mains via a non-industrial plug and socket outlet or
177 via a non-industrial appliance coupler, or both

178 Note 1 to entry: Examples are plugs and socket-outlets covered by standards such as IEC/TR 60083 and
179 IEC 60320-1.

180 **3.19**

181 **current-using equipment**

182 electrical equipment intended to convert electrical energy into another form of energy, for
183 example light, heat, mechanical energy

184 [SOURCE: IEC 60050-826:2004, 826-16-02]

185 **4 Requirements**

186 Tests after repair shall only be performed by an electrically skilled person.

187 The qualification of the electrically instructed person shall include training on the subject and on the
188 test equipment. See 3.6.

189 Additional requirements (e.g. for the mechanical safety or for fire protection) according to the
190 requirements from the product safety standard shall be taken into account.

191 If testing the equipment requires additional knowledge or additional test and measurement equipment,
192 for example equipment for microwaves, tests shall be done according to the instructions of the
193 manufacturer.

194 All tests shall be performed in such a manner that the risk for testing personnel or other individuals
195 shall be reduced by appropriate protective measures.

196 If not otherwise stated, all values for current and voltage are the RMS values of an alternating, direct
197 or composite voltage or current.

198 The applicable tests as listed in Clause 5 shall be used to advise that:

- 199 — there are no visible faults on safety related parts, which are accessible by the user, and
200 — by the intended use of the equipment, no hazard for the user or the environment originates.

201 The electrically skilled person who is responsible for the test shall decide if additional tests are
202 required to meet the protective measures.

203 The electrically skilled person may decide that, for equipment that is connected to the distribution
204 system with fixed and protected wiring and is not intended to be hand-held during operation, the test is
205 carried out according to this standard and/or according to HD 60364-6.

206 The test procedure shall be interrupted and the equipment shall be disconnected from mains and
207 marked as failed, if it is found that during the test:

- 208 — reduced safety levels are present due to damage or from unintended use, and/or
- 209 — functional hazards could occur.

210 **5 Tests**

211 **5.1 General**

212 **5.1.1 General test conditions**

213 The tests may be performed at the ambient temperature, humidity and atmospheric pressure present
214 at the location of testing. The operational limits of the test equipment and the equipment under test
215 shall be taken into account.