
Električna varnost v nizkonapetostnih razdelilnih sistemih za izmenične napetosti do 1 000 kV in enosmerne napetosti do 1 500 kV - Oprema za preskušanje, merjenje ali nadzorovanje zaščitnih ukrepov - 9. del: Oprema za ugotavljanje mesta izolacijske okvare v IT-sistemih

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems

Elektrische Sicherheit in Niederspannungsnetzen bis AC 1 000 V und DC 1 500 V – Geräte zum Prüfen, Messen oder Überwachen von Schutzmaßnahmen – Teil 9: Einrichtungen zur Isolationsfehlersuche in IT-Systemen

Sécurité électrique dans les réseaux de distribution basse tension de 1 000 V c.a. et 1 500 V c.c - Dispositifs de contrôle, de mesure ou de surveillance de mesures de protection - Partie 9: Dispositifs de localisation de défauts d'isolement pour réseaux IT

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TITLE:

Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. - Equipment for testing, measuring or monitoring of protective measures - Part 9: Equipment for insulation fault location in IT systems

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING OR MONITORING OF PROTECTIVE MEASURES –

108

Part 9: Equipment for insulation fault location in IT systems

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FOREWORD

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143

IEC 61557-9 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities. It is an International Standard.

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145

This fourth edition cancels and replaces the third edition published in 2014. This edition constitutes a technical revision.

146

147

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

148

149

a) New terms and definitions on maximum admissible locating AC and DC currents and voltages

150

b) The requirements locating current and locating voltage have been revised

151

c) Performance requirements have been added.

152

d) The test requirements for locating current and locating voltage have been revised

153

e) The structure of this part has been adapted to IEC 61557-1:2019

154

f) The limit values under A.2 were adapted to fit the changed test methods in 6.2.3

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

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

156
157 Full information on the voting for its approval can be found in the report on voting indicated in
158 the above table.

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

160 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
161 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
162 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
163 described in greater detail at www.iec.ch/standardsdev/publications.

164 This part of IEC 61557 shall be used in conjunction with Part 1.

165 A list of all parts in the IEC 61557 series, published under the general title *Electrical safety in*
166 *low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing,*
167 *measuring or monitoring of protective measures*, can be found on the IEC website.

168 The committee has decided that the contents of this document will remain unchanged until the
169 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
170 specific document. At this date, the document will be

- 171 • reconfirmed,
- 172 • withdrawn,
- 173 • replaced by a revised edition, or
- 174 • amended.

175

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177
178 **ELECTRICAL SAFETY IN LOW VOLTAGE DISTRIBUTION SYSTEMS UP**
179 **TO 1 000 V AC AND 1 500 V DC – EQUIPMENT FOR TESTING, MEASURING**
180 **OR MONITORING OF PROTECTIVE MEASURES –**

181
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183 **Part 9: Equipment for insulation fault location in IT systems**
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187
188 **1 Scope**

189 This part of IEC 61557 specifies the requirements for the insulation fault location system (IFLS)
190 that localizes insulation faults in any part of the system in unearthed IT AC systems and
191 unearthed IT AC systems with galvanically connected DC circuits having nominal voltages up
192 to 1 000 V AC, as well as in unearthed IT DC systems with voltages up to 1 500 V DC,
193 independent of the measuring principle.

194 IT systems are described in IEC 60364-4-41. Additional data for a selection of devices in other
195 standards should be noted.

196 NOTE Further information on insulation fault location can be found in the following standards: IEC 60364-4-41:2005,
197 411.6, and IEC 60364-5-53:2019, 531.3.

198 **2 Normative references**

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

203 IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

204 IEC 60068-2-27:2009, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

205 IEC 60364-7-710:2021, *Electrical installations of buildings – Part 7-710: Requirements for*
206 *special installations or locations – Medical locations*

207 IEC 60529, *Degree of protection provided by enclosures (IP Code)*

208 IEC 60721-3-1, *Classification of environmental conditions – Part 3-1: Classification of groups*
209 *of environmental parameters and their severities – Storage*

210 IEC 60721-3-2, *Classification of environmental conditions – Part 3-2: Classification of groups*
211 *of environmental parameters and their severities – Transportation and handling*

212 IEC 60721-3-3, *Classification of environmental conditions – Part 3-3: Classification of groups*
213 *of environmental parameters and their severities – Stationary use at weatherprotected locations*

214 IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control,*
215 *and laboratory use – Part 1: General requirements*
216 IEC 61010-1:2010/AMD1:2016

217 IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and*
 218 *laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring*
 219 *circuits*

220 IEC 61010-031, *Safety requirements for electrical equipment for measurement, control and*
 221 *laboratory use – Part 031: Safety requirements for hand-held and hand-manipulated probe*
 222 *assemblies for electrical test and measurement*

223 IEC 61010-2-032, *Safety requirements for electrical equipment for measurement, control, and*
 224 *laboratory use – Part 2-032: Particular requirements for hand-held and hand-manipulated*
 225 *current sensors for electrical test and measurement*

226 IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

227 IEC 61326-2-2, *Electrical equipment for measurement, control and laboratory use – EMC*
 228 *requirements – Part 2-2: Particular requirements – Test configurations, operational conditions*
 229 *and performance criteria for portable test, measuring and monitoring equipment used in low-*
 230 *voltage distribution systems*

231 IEC 61326-2-4, *Electrical equipment for measurement, control and laboratory use – EMC*
 232 *requirements – Part 2-4: Particular requirements – Test configurations, operational conditions*
 233 *and performance criteria for insulation monitoring devices according to IEC 61557-8 and for*
 234 *equipment for insulation fault location according to IEC 61557-9*

235 IEC 61557-1:2019, *Electrical safety in low voltage distribution systems up to 1 000 V AC and*
 236 *1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 1:*
 237 *General requirements*

238 IEC 61557-8:2014, *Electrical safety in low voltage distribution systems up to 1 000 V AC and*
 239 *1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 8:*
 240 *Insulation monitoring devices for IT systems*

241 IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use - EMC*
 242 *requirements - Part 1: General requirements*

243 **3 Terms, definitions and abbreviations**

244 **3.1 Terms, definitions, symbols and units**

245 For the purposes of this document, the terms and definitions given in IEC 61557-1, IEC 61557-
 246 8 and the following apply.

247 ISO and IEC maintain terminological databases for use in standardization at the following
 248 addresses:

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

251 **3.1.1**

252 **insulation fault location system**

253 **IFLS**

254 device, equipment or combination of devices used for insulation fault location in IT systems

255 Note 1 to entry: IFLS functionality can be used in addition to insulation monitoring functionality. It injects a locating
 256 current between the electrical system and earth and locates the insulation fault.

257 Note 2 to entry: The abbreviation 'IFLS' will be used in the document to denote insulation fault location system.

258 **3.1.2**
259 **locating current**

260 I_L

261 current that is injected by the locating current injector during the location process. The locating
262 current can be generated by:

- 263 – an active locating source with a sufficiently large internal impedance using an independent
264 voltage source different from the system to be monitored, or
- 265 – a passive locating current source driven directly from the system to be monitored

266 **3.1.3**
267 **locating voltage**

268 U_L

269 voltage present at the measuring terminals of the locating current injector during the
270 measurement when the device has an active locating source

271 Note 1 to entry: In a fault-free, de-energized system, this represents the voltage present between the terminals of
272 the locating device to the system to be monitored and the terminals for the connection to the PE conductor.

273 **3.1.4**
274 **response sensitivity**

275 value of the evaluating current or insulation resistance at which the insulation fault locator
276 responds under specified conditions

277 Note 1 to entry: Response sensitivity can either be a fixed threshold or a response curve.

278 **3.1.5**
279 **insulation fault locator**

280 IFL

281 device or part of a device for the location of the insulation fault

282 **3.1.6**
283 **locating current sensor**

284 LCS

285 sensor for the detection of the locating current used for the location of the insulation fault

286 **3.1.7**
287 **locating current injector**

288 LCI

289 device or part of a device, that has the function to inject the locating current into the IT system
290 in order to locate the insulation fault

291 **3.1.8**
292 **passive locating current injector**

293 locating current injector that generates the locating current directly from the system to be
294 monitored

295 **3.1.9**
296 **active locating current injector**

297 locating current injector that generates the locating current from a locating voltage source which
298 is different from the system to be monitored

299 **3.1.10**
300 **insulation fault location system in medical locations**

301 MED-IFLS

302 specific insulation fault location equipment dedicated to locating insulation faults in IT systems
303 of group 2 medical locations

304 Note 1 to entry: The MED-IFLS is described in IEC 61557-9:20xx, Annex A.

305 Note 2 to entry: Medical locations are defined in IEC 60364-7-710.

306 **3.1.11**
307 **response time**

308 t_{al}
309 time required by insulation fault location equipment to respond under specified performance
310 conditions

311 Note 1 to entry: The requirements for the condition can be found in IEC 61557-9:202x, A.2.2.4.

312 **3.1.12**
313 **group 2 medical locations**

314 medical location where ME equipment or ME systems are intended to be used intrusively, externally or
315 invasively to any part of the patient and where discontinuity of the electrical supply, such as protection
316 against electric shock, represents a risk to the safety of the patient

317 [SOURCE: IEC 60364-7-710:2021, 710.3.9]

318 **3.1.13**
319 **portable equipment for insulation fault location**

320 PIFL
321 equipment used for temporary insulation fault location in IT systems instead of, or in addition
322 to, fixed installed equipment for insulation fault location

323 Note 1 to entry: The requirements for PIFL are defined in IEC 61557-9:202x, Annex B.

324 **3.1.14**
325 **system leakage capacitance for IFLS**

326 C_{el}
327 maximum value of the total capacitance to earth of the system to be monitored including any
328 connected appliances up to which the IFLS can work as specified

329 Note 1 to entry: The system leakage capacitance is the sum of the leakage capacitances of all phase conductors
330 including the neutral conductor to earth.

331 **3.1.15**
332 **maximum admissible locating AC current**

333 $I_{limit AC}$
334 maximum peak value of the locating current above a pre-set level of frequency

335 Note 1 to entry: The frequency and current levels are derived from IEC 61140.

336 **3.1.16**
337 **maximum admissible locating DC current**

338 $I_{limit DC}$
339 maximum peak value of the locating current below a pre-set level of frequency

340 Note 1 to entry: The frequency and current levels are derived from IEC 61140.

341 **3.1.17**
342 **maximum admissible locating AC voltage**

343 $U_{limit AC}$
344 maximum peak value of the locating voltage above a pre-set level of frequency

345 Note 1 to entry: The frequency and voltage levels are derived from IEC 61140.

346 **3.1.18**
347 **maximum admissible locating DC voltage**

348 $U_{limit DC}$
349 maximum peak value of the locating voltage below a pre-set level of frequency

350 Note 1 to entry: The frequency and voltage levels are derived from IEC 61140.

351 **3.1.19**

352 **injection resistance**

353 R_i

354 resistance of the locating current injector between the injection terminal and the earth terminal

355 **3.1.20**

356 **injection impedance**

357 Z_i

358 total impedance of the locating current injector between the injection terminal and the earth
359 terminal, measured at the nominal frequency

360 **3.2 Abbreviated terms and symbols**

361 The abbreviated terms and symbols listed in Table 1 apply to this document.

362 **Table 1 – Abbreviations and symbols**

Abbreviation or symbol	Explanation	Referenced clause	Other referenced standard
C_{Ld}	System leakage capacitance downstream of the evaluating current sensor	Figure C.2	
C_{Lu}	System leakage capacitance upstream of the evaluating current sensor	Figure C.2	
C_{el}	system leakage capacitance for IFLS	3.1.14	
EMC	Electromagnetic compatibility	4.6	IEC 60050-161:1990, 161-01-07
FE	Functional earth terminal	4.5.2	IEC 61010-1
g_n	standard acceleration of free fall	Table 2	IEC 60068-2-27:2009, 3.3 IEV 60050-113, 113-01-40
IFL	Insulation fault locator	3.1.5, C.1	
IFLS	Insulation fault location system	3.1.1, Annex C	
I_L	Locating current	4.4.2, C.1	
IMD	Insulation monitoring device	Annex C	IEC 61557-8:2014, 3.1.14
IP	Degree of protection of enclosure	4.7.3	IEC 60050-426:2008, 426-04-02
LCI	Locating current injector	3.1.7, C.2	
LCS	Locating current sensor	3.1.6, C.1	
LLW	Local location warning	4.2.2	
PE	Protective conductor	4.5.3	IEC 60050-195:1998, 195-02-09
PIFL	Portable equipment for insulation fault location	3.1.13, Annex C	
PLCI	Passive locating current injector	3.1.8	
ALCI	Active locating current injector	3.1.9	
PLCS	Portable locating current sensor	B.2.2.1	
Q	Quality factor	Table 2	IEC 60050-195:2021, 151-15-46
R_F	Insulation resistance	6.2.2, C.2	IEC 61557-8:2014, 3.1.2