

SLOVENSKI STANDARD oSIST prEN IEC 61000-2-4:2023

01-november-2023

Elektromagnetna združljivost (EMC)	- 2-4. del: Okolje - Združljivi nivoji v sistemu
za distribucijo električne energije pr	i prenapetostnih udarih za nizkofrekvenčne
motnje v vodnikih v industrijskih ob	jektih
Electromagnetic compatibility (EMC) - power distribution systems in industrial disturbances	Part 2-4: Environment - Compatibility levels in locations for low-frequency conducted
Elektromagnetische Verträglichkeit (EN	/IV) - Teil 2-4: Umgebungsbedingungen -
Verträglichkeitspegel für niederfrequen	te leitungsgeführte Störgrößen in Industrieanlagen
Compatibilité électromagnétique (CEM) - Partie 2-4: Environnement - Niveaux de
compatibilité dans les installations indu	istrielles pour les perturbations conduites à basse
fréquence	EN IEC 61000-2-4:2023
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ICS:

33.100.01 Elektromagnetna združljivost Electromagnetic compatibility na splošno in general

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77A/1180/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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DATE OF CIRCULATION:

CLOSING DATE FOR VOTING: 2023-12-22

SUPERSEDES DOCUMENTS:

2023-09-29

77A/1081/CD, 77A/1110A/CC

IEC SC 77A : EMC - LOW FREQUENCY PHENOMENA			
SECRETARIAT:	SECRETARY:		
France	Mr Cédric LAVENU		
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD:		
	Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.		
FUNCTIONS CONCERNED:			
EMC Environment	QUALITY ASSURANCE SAFETY		
SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting 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	Not submitted for CENELEC parallel voting		

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TITLE:

Electromagnetic compatibility (EMC) – Part 2-4: Environment – Compatibility levels in power distribution systems in industrial locations for low-frequency conducted disturbances

PROPOSED STABILITY DATE: 2025

NOTE FROM TC/SC OFFICERS:

Please note the change in title. Original title: Electromagnetic compatibility (EMC) - Part 2-4: Environment - Compatibility levels in industrial plants for low-frequency conducted disturbances

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IEC CDV 61000-2-4/Ed3 © IEC 2023 77A/1180/CDV _ 4 _ INTERNATIONAL ELECTROTECHNICAL COMMISSION 80 81 82 ELECTROMAGNETIC COMPATIBILITY (EMC) -83 84 Part 2-4: Environment – 85 Compatibility levels in power distribution systems in industrial locations 86 for low-frequency conducted disturbances 87 88 89 FOREWORD 90 91 92 93 94 95 96 97 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for 98 Standardization (ISO) in accordance with conditions determined by agreement between the two organizations. 99 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an 100 international consensus of opinion on the relevant subjects since each technical committee has representation 101 from all interested National Committees. 102 3) The documents produced have the form of recommendations for international use and are published in the form 103 of standards, technical specifications, technical reports or guides and they are accepted by the National 104 Committees in that sense. 105 4) In order to promote international unification, IEC National Committees undertake to apply IEC International 106 107 Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the 108 latter. 109 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any 110 equipment declared to be in conformity with one of its standards. 111 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject 112 of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights. 113 International Standard IEC 61000-2-4 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility. 114 This standard forms part 2-4 of IEC 61000. It has the status of a basic EMC publication in 115 accordance with IEC Guide 107. 116 117 This third edition cancels and replaces the second edition, published in 2002, and constitutes a technical revision. 118 119 The text of this standard is based on the following documents: FDIS Report on voting 77A/378/FDIS 77A/383/RVD 120 121 Full information on the voting for the approval of this standard can be found in the report on 122 voting indicated in the above table. This publication has been drafted in accordance with the ISO/IEC Directives, Part 3. 123 Annexes A, B and C are for information only. 124 125 At this date, the publication will be

- 126 reconfirmed;
- withdrawn;
- 128 replaced by a revised edition, or

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129	• amended.			

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131 The contents of the corrigendum of July 2014 have been included in this copy.

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134	INTRODUCTION
135	IEC 61000 is published in separate parts according to the following structure:
136	Part 1: General
137 138 139	General considerations (introduction, fundamental principles) Definitions, terminology Part 2: Environment
140 141 142 143	Description of the environment Classification of the environment Compatibility levels Part 3: Limits
144	Emission limits
145 146	Immunity limits (in so far as they do not fall under the responsibility of the product committees)
147	Part 4: Testing and measurement techniques
148	Measurement techniques
149	Testing techniques
150	Part 5: Installation and mitigation guidelines
151	Installation guidelines iTeh Standards
152	Mitigation methods and devices
153	Part 6: Generic standards TPS://Standards.iteh.al)
154	Part 9: Miscellaneous Document Preview
155 156 157	Each part is further subdivided into several parts, published either as International Standards, technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number

157 sections. Others will be published with the part number followed by a dash and a second number
 158 identifying the subdivision (example: 61000-3-11).

Detailed information on the various types of disturbances that can be expected on public power
 supply systems can be found in IEC 61000-2-1 and IEC 61000-2-12.

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162	ELECTROMAGNETIC COMPATIBILITY (EMC) –
163	
164	Part 2-4: Environment –
165	Compatibility levels in power distribution systems in industrial locations
166	for low-frequency conducted disturbances
167	

168

169 **1 Scope**

This part of IEC 61000 is related to conducted disturbances in the frequency range from 0 kHz
to 150 kHz. It gives compatibility levels for industrial locations, with a nominal voltage up to 35
kV and a nominal frequency of 50 Hz or 60 Hz.

173 NOTE 1 Industrial locations are defined in 3.1.8.

174 Power distribution systems on ships, aircraft, offshore platforms and railways are not included.

NOTE 2 See also Annex E. The compatibility levels specified in this standard apply at the in-plant point of coupling (IPC). The level of the low-frequency disturbances at the terminals of equipment receiving its supply from the IPC is generally assumed to be similar to the disturbance level at the IPC itself. However, in some situations this is not the case, particularly when a long feeder is dedicated to the supply of a particular load, or when a disturbance is generated or amplified within the installation of which the equipment forms a part.

180 Compatibility levels are specified for the types of low-frequency electromagnetic disturbances

- expected at any in-plant point of coupling (IPC) within industrial locations, for guidance in the definition of:
- a) limits for disturbance emissions in industrial power distribution systems (including the planning levels defined in 3.1.5); **b**
- 185 NOTE 3 A very wide range of conditions is possible in the electromagnetic environments of industrial networks. 186 These are approximated in this standard by the three classes described in Clause 4. However, it is the 187 responsibility of the operator of such a network to take account of the particular electromagnetic and economic 188 conditions, including equipment characteristics, in setting the above-mentioned limits.
- b) immunity levels for the equipment within these systems.
- 190 The disturbance phenomena considered are:

191 – voltage deviations; <u>oSIST prEN IEC 61000-2-4:2023</u>

192 – voltage dips and short interruptions;

- 193 voltage imbalance;
- 194 power-frequency variations;
- 195 harmonics up to order 40;
- 196 interharmonics up to the 40th harmonic;
- 197 voltage components above the 40th harmonic up to 150 kHz;
- 198 d.c. component;
- 199 transient overvoltages.
- The compatibility levels are given for different classes of environment determined by the characteristics of the supply network and loads.

NOTE 4 Compatibility levels at the point of common coupling (PCC) on public networks are specified in
 IEC 61000-2-2 for low-voltage networks and IEC 61000-2-12 for medium-voltage networks. Technical reports
 IEC 61000-3-6 and IEC 61000-3-7 describe the approach of power distribution system operators to the limitation of
 emissions from installations and large loads.

206 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. IEC CDV 61000-2-4/Ed3 © IEC 2023 - 8 -

- 210 IEC 60050-101, International Electrotechnical Vocabulary (IEV) Part 101: Mathematics
- 211 IEC 60050-161, International Electrotechnical Vocabulary (IEV) Chapter 161: Electro-212 magnetic compatibility
- 213 IEC 60050-551, International Electrotechnical Vocabulary (IEV) Part 551: Power electronics
- IEC 61000-2-2, Electromagnetic compatibility (EMC) Part 2-2: Environment Compatibility
 levels for low-frequency conducted disturbances and signalling in public low-voltage power
 supply systems
- IEC 61000-2-12, Electromagnetic compatibility (EMC) Part 2-12: Environment Compatibility
 levels for low-frequency conducted disturbances and signalling in public medium-voltage power
 supply systems
- ISO/IEC Guide 98-3,2008: Uncertainty of measurement Part 3: Guide to the expression of uncertainty in measurement (GUM ¹:1995)

1222 IEC 61000-4-7: Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement 1223 techniques – General guide on harmonics and interharmonics measurements and 1224 instrumentation, for power supply systems and equipment connected thereto

- CISPR 16-1-1: Specification for radio disturbance and immunity measuring apparatus and
 methods Part 1-1: Radio disturbance and immunity measuring apparatus Measuring
 apparatus
- 228 CISPR 16-2-1: Specification for radio disturbance and immunity measuring apparatus and 229 methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted 230 disturbance measurements
- 231

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232 3 Definitions

- 233 For the purposes of this document, the following terms and definitions apply.
- ISO and IEC maintain terminological databases for use in standardization at the followingaddresses:
- o<u>SIST prEN IEC Electropodia: available at http://www.electropodia.arg/</u>
- IEC Electropedia: available at http://www.electropedia.org/
 - ISO Online browsing platform: available at http://www.iso.org/obp
 - 238 3.1 General definitions
 - 239 **3.1.1**

240 (electromagnetic) disturbance

- 241 electromagnetic phenomenon that can degrade the performance of a device, equipment or 242 system
- 243 [IEV 161-01-05, modified, delete Notes 1, 2, 3 and the last part of the definition]
- 244 **3.1.2**

245 disturbance level

- amount or magnitude of an electromagnetic disturbance, measured and evaluated in a specified
 way
- 248 [IEV 161-03-01, modified]

249 **3.1.3**

250 electromagnetic compatibility

251 **EMC**

- ability of an equipment or system to function satisfactorily in its electromagnetic environment
- without introducing intolerable electromagnetic disturbances to anything in that environment

¹ GUM: Guides to the expression of uncertainty in measurement

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254 [IEV 161-01-07]

255 256 NOTE 1 Electromagnetic compatibility is a condition of the electromagnetic environment such that, for every phenomenon, the disturbance emission level is sufficiently low and immunity levels are sufficiently high so that all 257 devices, equipment and systems operate as intended.

258 NOTE 2 Electromagnetic compatibility is achieved only if emission and immunity levels are controlled such that the 259 260 261 immunity level of devices, equipment and systems, at any location, are not exceeded by the disturbance level at that location, resulting from the cumulative emission of all sources and other factors such as circuit impedances. Conventionally, compatibility is said to exist if the probability of the departure from intended performance or of the 262 adverse effect is sufficiently low. See Clause 4 of IEC 61000-2-1.

- 263 NOTE 3 Where the context requires it, compatibility is intended to refer to a single disturbance or class of 264 disturbances.
- 265 266 NOTE 4 Electromagnetic compatibility is a term used also to describe the field of study of the adverse electromagnetic effect which devices, equipment and systems undergo from each other or from electromagnetic 267 phenomena.

268 3.1.4

269 (electromagnetic) compatibility level

270 specified electromagnetic disturbance level used as a reference level in a specified environment 271 for coordination in the setting of emission and immunity limits

272 [IEV 161-03-10, modified, the last sentence of Note 1 is deleted because it is less relevant in 273 industrial locations compared to public locations]

274 275 NOTE By convention, the compatibility level is chosen so that there is only a small probability that it will be exceeded by the actual disturbance level.

276 3.1.5

277 planning level

level of a particular disturbance in a particular environment, adopted as a reference value 278

for the limits to be set for the emission of large loads and installations, in order to coordinate 279 280 those limits with all the limits adopted for equipment intended to be connected to the power 281 supply system

282 283 NOTE The planning level is locally specific and is adopted by those responsible for planning and operating the power supply network in the relevant area. (For further explanation, see Annex A of IEC 61000-2-2 and IEC TS 284 61000-1-2.)

285 3.1.6

286 Industrial and private power distribution system

287 Distribution network which is separated by at least one separation transformer from the public

288 power supply system at which other customer installations are connected

289 3.1.7

290 point of common coupling

291 PCC

292 point on a public power supply network, electrically nearest to a particular load, at which other 293 loads are, or could be, connected

294 NOTE The PCC is usually the point for which electromagnetic compatibility in public networks is to be considered.

295 [IEV 161-07-15, modified. The two notes have been deleted. The content of Note 2 is integrated 296 in the definition.]

297 3.1.8

306

307

308

309

298 industrial location

299 location characterized by an installation consisting of a separate power distribution 300 network, supplied by a high- or medium-voltage transformer, dedicated for the supply of 301 this installation

302 303 Note 1 to entry: Industrial locations can generally be described by the existence of an installation with one or 304 more of the following characteristics: 305

- significant amount of electrical power generated, transmitted and/or consumed;
- frequent switching of heavy inductive or capacitive loads; ٠
- high currents and associated magnetic fields;
- presence of industrial, high power scientific and medical (ISM) equipment (for example, welding . machines).
- 310 The electromagnetic environment at an industrial location is predominantly produced by the equipment and 311 installation present at the location. There are types of industrial locations where some of the electromagnetic 312 phenomena appear in a more severe degree than in other installations.

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- 313 Example locations include metalworking, pulp and paper, chemical plants, car production, farm building, high 314
- voltage areas of airports. 315 Note 2 to entry: The connection between location and electromagnetic environment is given in 3.1.8
- 316
- 317 [SOURCE: 61000-6-4, 3.1.12, modified – The clause reference in Note 2 to entry has been 318 updated]
- 319 3.1.9

320 electromagnetic environment

- 321 totality of electromagnetic phenomena existing at a given location
- 322 323 Note 1 to entry: In general, the electromagnetic environment is time-dependent and its description can be better described with a statistical approach.
- 324 325 Note 2 to entry: It is very important not to confuse the concept of electromagnetic environment with the surrounding location.
- 326 [SOURCES: 61000-6-4, 3.1.13, IEC 60050-161:1990, IEV 161-01-01, modified - Note 2 to 327 entry has been added.]

328 3.1.10

329 in-plant point of coupling

IPC 330

- point inside a non-public power distribution system, electrically nearest to a given load, at which 331 332 loads from other branches are, or could be, connected
- 333 NOTE The IPC is usually the point for which electromagnetic compatibility in industrial networks is to be considered.

334 3.2 Phenomena-related definitions

- 335 The definitions below that relate to harmonics are based on the analysis of system voltages or
- 336 currents by the Discrete Fourier Transform method (DFT). This is the practical application of the Fourier Transform as defined in IEV 101-13-09. See Annex A. 337
- 338 339 NOTE The Fourier Transform of a function of time, whether periodic or non-periodic, is a function in the frequency domain and is referred to as the frequency spectrum of the time function, or simply spectrum. If the time function is 340 periodic the spectrum is constituted of discrete lines (or components). If the time function is not periodic, the spectrum 341 is a continuous function indicating components at all frequencies.
- 342 Other definitions related to harmonics or interharmonics are given in IEV and other standards. 343 Some of those other definitions, although not used in this standard, are discussed in Annex A.

3.2.1 344

- fundamental frequency dards/sist/e0c5f8f1-7830-4887-8ad8-63b5cac89133/osist-pren-iec-61000-2-4-2023 345
 - 346 frequency, in the spectrum obtained from a Fourier transform of a time function, to which all the components of this spectrum are referred. 347
 - 348 [IEV 101-14-50, modified]
 - 349 Note 1 to entry: In the case of a periodic function, the fundamental frequency is generally equal to the frequency of 350 the function itself (see A.1.). For the purposes of this standard, the fundamental frequency is also the same as the 351 power supply frequency.

352 3.2.2

fundamental component (or fundamental) 353

- spectral component of a periodic time function whose frequency is equal to the fundamental 354 355 frequency
- 356 3.2.3

357 harmonic frequency

frequency which is an integer multiple of the fundamental frequency 358