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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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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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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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International Standard IEC 61000-2-4 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

This standard forms part 2-4 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This third edition cancels and replaces the second edition, published in 2002, and constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
77A/378/FDIS	77A/383/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A, B and C are for information only.

At this date, the publication will be

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- withdrawn;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

129 • amended.

130

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

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133

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[oSIST prEN IEC 61000-2-4:2023](https://standards.iteh.ai/catalog/standards/sist/e0c5f8f1-7830-4887-8ad8-63b5cac89133/osist-pren-iec-61000-2-4-2023)

<https://standards.iteh.ai/catalog/standards/sist/e0c5f8f1-7830-4887-8ad8-63b5cac89133/osist-pren-iec-61000-2-4-2023>

134 INTRODUCTION

135 IEC 61000 is published in separate parts according to the following structure:

136 **Part 1: General**

137 General considerations (introduction, fundamental principles)

138 Definitions, terminology

139 **Part 2: Environment**

140 Description of the environment

141 Classification of the environment

142 Compatibility levels

143 **Part 3: Limits**

144 Emission limits

145 Immunity limits (in so far as they do not fall under the responsibility of the product
146 committees)

147 **Part 4: Testing and measurement techniques**

148 Measurement techniques

149 Testing techniques

150 **Part 5: Installation and mitigation guidelines**

151 Installation guidelines

152 Mitigation methods and devices

153 **Part 6: Generic standards**154 **Part 9: Miscellaneous**

155 Each part is further subdivided into several parts, published either as International Standards,
156 technical specifications or technical reports, some of which have already been published as
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).

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

161

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 2-4: Environment –

Compatibility levels in power distribution systems in industrial locations for low-frequency conducted disturbances

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169 1 Scope

170 This part of IEC 61000 is related to conducted disturbances in the frequency range from 0 kHz
171 to 150 kHz. It gives compatibility levels for industrial locations, with a nominal voltage up to 35
172 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.

175 NOTE 2 See also Annex E. The compatibility levels specified in this standard apply at the in-plant point of coupling
176 (IPC). The level of the low-frequency disturbances at the terminals of equipment receiving its supply from the IPC is
177 generally assumed to be similar to the disturbance level at the IPC itself. However, in some situations this is not the
178 case, particularly when a long feeder is dedicated to the supply of a particular load, or when a disturbance is
179 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
181 expected at any in-plant point of coupling (IPC) within industrial locations, for guidance in the
182 definition of:

183 a) limits for disturbance emissions in industrial power distribution systems (including the
184 planning levels defined in 3.1.5);

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.

189 b) immunity levels for the equipment within these systems.

190 The disturbance phenomena considered are:

191 – voltage deviations; [oSIST prEN IEC 61000-2-4:2023](https://standards.globalspec.com/stds/iec/61000-2-4)

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.

200 The compatibility levels are given for different classes of environment determined by the
201 characteristics of the supply network and loads.

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

206 2 Normative references

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

- 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*
- 214 IEC 61000-2-2, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility*
215 *levels for low-frequency conducted disturbances and signalling in public low-voltage power*
216 *supply systems*
- 217 IEC 61000-2-12, *Electromagnetic compatibility (EMC) – Part 2-12: Environment – Compatibility*
218 *levels for low-frequency conducted disturbances and signalling in public medium-voltage power*
219 *supply systems*
- 220 ISO/IEC Guide 98-3,2008: *Uncertainty of measurement — Part 3: Guide to the expression of*
221 *uncertainty in measurement (GUM 1:1995)*
- 222 IEC 61000-4-7: *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement*
223 *techniques – General guide on harmonics and interharmonics measurements and*
224 *instrumentation, for power supply systems and equipment connected thereto*
- 225 CISPR 16-1-1: *Specification for radio disturbance and immunity measuring apparatus and*
226 *methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring*
227 *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

232 **3 Definitions**

233 For the purposes of this document, the following terms and definitions apply.

234 ISO and IEC maintain terminological databases for use in standardization at the following
235 addresses:236 • IEC Electropedia: available at <http://www.electropedia.org/>237 • 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**246 amount or magnitude of an electromagnetic disturbance, measured and evaluated in a specified
247 way

248 [IEV 161-03-01, modified]

249 **3.1.3**250 **electromagnetic compatibility**251 **EMC**252 ability of an equipment or system to function satisfactorily in its electromagnetic environment
253 without introducing intolerable electromagnetic disturbances to anything in that environment

¹ GUM: Guides to the expression of uncertainty in measurement

254 [IEV 161-01-07]

255 NOTE 1 Electromagnetic compatibility is a condition of the electromagnetic environment such that, for every
256 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 immunity level of devices, equipment and systems, at any location, are not exceeded by the disturbance level at that
260 location, resulting from the cumulative emission of all sources and other factors such as circuit impedances.
261 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 NOTE 4 Electromagnetic compatibility is a term used also to describe the field of study of the adverse
266 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 NOTE By convention, the compatibility level is chosen so that there is only a small probability that it will be exceeded
275 by the actual disturbance level.

276 **3.1.5** 277 **planning level**

278 level of a particular disturbance in a particular environment, adopted as a reference value
279 for the limits to be set for the emission of large loads and installations, in order to coordinate
280 those limits with all the limits adopted for equipment intended to be connected to the power
281 supply system

282 NOTE The planning level is locally specific and is adopted by those responsible for planning and operating the
283 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** 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 Note 1 to entry: Industrial locations can generally be described by the existence of an installation with one or
303 more of the following characteristics:

- 305 • significant amount of electrical power generated, transmitted and/or consumed;
- 306 • frequent switching of heavy inductive or capacitive loads;
- 307 • high currents and associated magnetic fields;
- 308 • presence of industrial, high power scientific and medical (ISM) equipment (for example, welding
309 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.

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 Note 1 to entry: In general, the electromagnetic environment is time-dependent and its description can be better
 323 described with a statistical approach.

324 Note 2 to entry: It is very important not to confuse the concept of electromagnetic environment with the surrounding
 325 location.

326 [SOURCES: 61000-6-4, 3.1.13, IEC 60050-161:1990, IEC 161-01-01, modified – Note 2 to
 327 entry has been added.]

328 **3.1.10** 329 **in-plant point of coupling** 330 **IPC**

331 point inside a non-public power distribution system, electrically nearest to a given load, at which
 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
 337 the Fourier Transform as defined in IEC 101-13-09. See Annex A.

338 NOTE The Fourier Transform of a function of time, whether periodic or non-periodic, is a function in the frequency
 339 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 IEC and other standards.
 343 Some of those other definitions, although not used in this standard, are discussed in Annex A.

344 **3.2.1** 345 **fundamental frequency**

346 frequency, in the spectrum obtained from a Fourier transform of a time function, to which all the
 347 components of this spectrum are referred.

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** 353 **fundamental component (or fundamental)**

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

356 **3.2.3** 357 **harmonic frequency**

358 frequency which is an integer multiple of the fundamental frequency