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Elektromotorna ročna orodja, prenosna orodja ter stroji za trato in vrt - Varnost - 4-12. del: Posebne zahteve za robotske kosilnice

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery - Safety - Part 4-12: Particular requirements for robotic lawnmowers

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ICS:

25.140.20	Električna orodja	Electric tools
65.060.70	Vrtnarska oprema	Horticultural equipment

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116/962/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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IEC TC 116 : SAFETY OF MOTOR-OPERATED ELECTRIC TOOLS	
SECRETARIAT: United States of America	SECRETARY: Ms Heather Darrah
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED: Safety	
<input checked="" type="checkbox"/> 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 CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Electric motor-operated hand-held tools, transportable tools and lawn and garden machinery - Safety - Part 4-12: Particular requirements for robotic lawnmowers

PROPOSED STABILITY DATE: 2032

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**ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS,
TRANSPORTABLE TOOLS AND LAWN AND GARDEN
MACHINERY – SAFETY –**

Part 4-12: Particular requirements for robotic lawnmowers

FOREWORD

- 116 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising
117 all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international
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145 indispensable for the correct application of this publication.
- 146 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent
147 rights. IEC shall not be held responsible for identifying any or all such patent rights.

148 IEC 62841-4-12 has been prepared by IEC technical committee 116: Safety of motor-operated
149 electric tools. It is an International Standard.

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

Draft	Report on voting
116/xxx/FDIS	116/xxx/RVD

151

152 Full information on the voting for its approval can be found in the report on voting indicated in
153 the above table.

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

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155 This document is to be used in conjunction with the first edition of IEC 62841-1:2014 and IEC
156 62841-1:2014/AMD1:2025.

157 This document supplements or modifies the corresponding clauses in IEC 62841-1, so as to
158 convert it into the IEC Standard: Particular requirements for robotic lawnmowers.

159 Where a particular subclause of IEC 62841-1 is not mentioned in this document, that subclause
160 applies as far as reasonable. Where this document states "addition", "modification" or
161 "replacement", the relevant text in IEC 62841-1 is to be adapted accordingly.

162 The following print types are used:

- 163 – requirements: in roman type;
- 164 – *test specifications: in italic type;*
- 165 – notes: in small roman type.

166 The terms defined in Clause 3 are printed in **bold typeface**.

167 Subclauses, notes, tables and figures which are additional to those in IEC 62841-1:2014 as
168 well as Annexes of IEC 62841-1:2014, except as described for Annex K below, are numbered
169 starting from 101.

170 Subclauses, notes, tables and figures in Annex K which are additional to those in the main body
171 of this document are numbered starting from 301.

172 A list of all parts in the IEC 62841 series, published under the general title *Electric motor-*
173 *operated hand-held tools, transportable tools and lawn and garden machinery – Safety*, can be
174 found on the IEC website.

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

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

- 182 • reconfirmed,
- 183 • withdrawn,
- 184 • replaced by a revised edition, or
- 185 • amended.

186 NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing
187 organizations may need a transitional period following publication of a new, amended or revised IEC publication in
188 which to make products in accordance with the new requirements and to equip themselves for conducting new or
189 revised tests.

190 It is the recommendation of the committee that the content of this publication be adopted for implementation nationally
191 not earlier than 36 months from the date of publication.

192

193 **ELECTRIC MOTOR-OPERATED HAND-HELD TOOLS,**
 194 **TRANSPORTABLE TOOLS AND LAWN AND GARDEN**
 195 **MACHINERY – SAFETY –**

196
 197 **Part 4-12: Particular requirements for robotic lawnmowers**
 198

199 **1 Scope**

200 *Replacement:*

201 This International Standard deals with the safety of

- 202 – electric motor-operated or magnetically driven rechargeable battery-powered rotary **robotic**
- 203 **lawnmowers;**
- 204 – their **batteries;** and
- 205 – their **peripherals.**

206 **Robotic lawnmowers** are also referred to as “machines” in this document.

207 The maximum **rated voltage** for machines and their **battery** packs is 250 V d.c.

208 The **rated voltage** for **peripherals** is not more than

- 209 – 250 V single-phase a.c. or d.c.; and
- 210 – 480 V for three-phase a.c.

211 This document deals with the hazards presented by machines and **peripherals** which are
 212 encountered by all persons in the **normal use** and reasonably foreseeable misuse of the
 213 machines and **peripherals.**

214 When evaluating a rechargeable **battery** for protection against electric shock during charging,
 215 **creepage distances, clearances** and distances through insulation, the relevant requirements
 216 of this document are applicable with the **battery** fitted to the intended **charger.**

217 Since rechargeable **battery** packs for machines and **peripherals** are submitted to different use
 218 patterns (such as rough use, high charging and discharging currents) their safety can be
 219 evaluated only by this document and not by using other standards for rechargeable **battery**
 220 packs, such as IEC 62133-1:2017 or IEC 62133-2:2017, unless otherwise indicated in this
 221 document. All relevant aspects related to the safety of rechargeable **batteries** are addressed
 222 in this document, such that the requirements of IEC 62133-1:2017 or IEC 62133-2:2017 need
 223 not be separately applied.

224 When evaluating the risk of **fire** associated with rechargeable **battery** packs for machines and
 225 **peripherals,** consideration has been given to the fact that these **battery** packs are unattended
 226 energy sources and have been evaluated as such in this document. Requirements in other
 227 standards regarding the risk of **fire** due to the charging of these **battery** packs are therefore
 228 considered to be fulfilled.

229 This document also addresses requirements covering the use of lithium-ion **cells** employed in
 230 **battery systems** in **robotic lawnmowers** and **battery**-powered **peripherals.** The following is
 231 considered within the context of these requirements:

- 232 – These requirements address the risk of **fire** or **explosion** of these **batteries** and not any
- 233 possible hazards associated with toxicity nor potential hazards associated with
- 234 transportation or disposal.

235 NOTE 1 IEC 62281:2019 covers the safety aspects of lithium-ion **batteries** during transport.

- 236 – **Battery systems** covered by these requirements are not intended to be serviced by the end
237 user.
- 238 – These requirements are intended to provide comprehensive evaluation of a **battery** only if
239 used in products covered by this document.
- 240 – These requirements address the safety of **lithium-ion battery systems** during storage and
241 use including discharge and charge. These requirements are only considered to be
242 supplementary requirements in regards to battery **charger** fire and electric shock.
- 243 – These requirements refer to and require parameters supplied in reference to the **cells** that
244 establish conditions for safe use of those **cells**. Those parameters form the basis of
245 acceptance criteria for a number of tests contained herein. This document does not
246 independently evaluate the safety of **cells**. These parameters, taken as a set, constitute the
247 “**Specified Operating Region**” for a **cell**. There may be several sets of **specified operating**
248 **region(s)**.
- 249 Mains-powered circuits for **battery** charging, preheating or other non-motor functions are
250 covered under Annex GG.

251 This document does not apply to **robotic lawnmowers** using **general purpose batteries**
252 installed by the user and this document alone will not be sufficient to ensure all hazards are
253 considered for these products.

254 This document does not apply to **battery-powered peripherals** powered by rechargeable
255 **general purpose batteries**.

256 This document does not apply to the safety of battery **chargers** themselves.

257 NOTE 2 IEC 60335-2-29 covers a variety of **chargers**. The IEC 61558 series covers transformers and power
258 supplies.

259 **2 Normative references**

260 IEC 62841-1:2014, Clause 2 and IEC 62841-1:2014/AMD1:2025, Clause 2 are applicable,
261 except as follows:

262 *Addition:*

263 IEC 60112:2025, *Method for the determination of the proof and the comparative tracking indices*
264 *of solid insulating materials*

265 IEC 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3:*
266 *Use of coating, potting or moulding for protection against pollution*

267 IEC 60664-4:2005, *Insulation coordination for equipment within low-voltage systems – Part 4:*
268 *Consideration of high-frequency voltage stress*

269 IEC 61672-1:2013, *Electroacoustics – Sound level meters – Part 1: Specifications*

270 IEC 62841-1:2014, *Electric motor-operated hand-held tools, transportable tools and lawn and*
271 *garden machinery – Safety – Part 1: General requirements*

272 IEC 62841-1:2014/AMD1:2025

273 ISO 354:2003, *Acoustics – Measurement of sound absorption in a reverberation room*

274 ISO 5395-1:2013, *Garden equipment – Safety requirements for combustion-engine-powered*
275 *lawnmowers – Part 1: Terminology and common tests*
276 ISO 5395-1:2013/Amd1:2017

- 277 ISO 5395-2:2013, *Garden equipment – Safety requirements for combustion-engine-powered*
 278 *lawnmowers – Part 2: Pedestrian-controlled lawnmowers*
 279
- 280 ISO 5395-3:2013, *Garden equipment — Safety requirements for combustion-engine-powered*
 281 *lawnmowers — Part 3: Ride-on lawnmowers with seated operator*
 282 ISO 5395-3:2013/Amd 1:2017
 283 ISO 5395-3:2013/Amd 2:2017
- 284 ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols*
- 285 ISO 8295:1995, *Plastics – Film and sheeting – Determination of the coefficients of friction*
- 286 ISO 9773:2024, *Plastics – Determination of burning behaviour of thin flexible vertical specimens*
 287 *in contact with a small flame ignition source*
- 288 ISO 11684:2023, *Tractors, machinery for agriculture and forestry, powered lawn and garden*
 289 *equipment — Safety labels — General principles*
- 290 ISO 13857:2019, *Safety of machinery – Safety distances to prevent hazard zones being*
 291 *reached by upper and lower limbs*
- 292 ISO/TS 19206-9:2025, *Fine ceramics (advanced ceramics, advanced technical ceramics) —*
 293 *Mechanical properties of ceramic composites — Part 9: Determination of fatigue behaviour at*
 294 *room temperature*
- 295 *Replacement:*
- 296 IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods –*
 297 *Glow-wire flammability test method for end-products*
- 298 ISO 3744:2025, *Acoustics – Determination of sound power levels of noise sources using sound*
 299 *pressure — Engineering methods for an essentially free field over a reflecting plane*

300 **3 Terms and definitions**

301 IEC 62841-1:2014, Clause 3 and IEC 62841-1:2014/AMD1:2025, Clause 3 are applicable,
 302 except as follows:

303 *Addition:*

304 **3.101**

305 **automatic mode**

306 autonomous operation of the machine in which all safety functions are ensured in its **working**
 307 **area** without the use of a **manual controller**

308 NOTE 101 to entry: Operation of the machine without the use of a **manual controller** and without the **cutting**
 309 **means** operating during set up of the **working area** is not considered to be operation in **automatic mode**.

310 **3.102**

311 **charging station**

312 automatic **battery** charging facility

313 **3.103**

314 **class II peripheral**

315 **peripheral** in which protection against electric shock does not rely on **basic insulation** only,
 316 but in which additional safety precautions, such as **double insulation** or **reinforced insulation**,

317 are provided, there being no provision for protective earthing or reliance upon installation
318 conditions

319 **3.104**

320 **class III peripheral**

321 **peripheral** in which protection against electric shock relies on supply at **safety extra-low**
322 **voltage**, and in which voltages higher than those of **safety extra-low voltages** are not
323 generated

324 **3.105**

325 **cutting means**

326 rotating mechanism or rotating part of the **lawnmower** that is designed to perform the cutting
327 action, in which the **cutting means**, cutting by impact, rotate about an axis (axes) normal to the
328 cutting plane

329 NOTE 101 to entry: The term “blade” can be used in warnings and instructions to denote “**cutting means**”.

330 **3.106**

331 **cutting means enclosure**

332 part or assembly, including the **discharge chute** and **guard** for **grass catcher** opening,
333 designed to prevent unintended contact with the **cutting means**

334 **3.107**

335 **cutting means tip circle**

336 path described by the outermost point of the **lawnmower cutting means** cutting edge as it
337 rotates about its shaft axis

338 **3.108**

339 **cutting position**

340 any height setting of the cutting means designated by the manufacturer for cutting grass

341 **3.109**

342 **discharge chute**

343 portion of the **cutting means enclosure**, extending outward from the **discharge opening**,
344 designed to control the ejection of material from the **cutting means**

345 **3.110**

346 **discharge opening**

347 opening in the **cutting means enclosure** through which material such as grass clippings can
348 be discharged

349 **3.111**

350 **functional earth**

351 earthing of a point in equipment or in a system, which is necessary for a purpose other than
352 safety

353 NOTE 101 to entry: Examples of the purpose of a **functional earth** include the reduction of the build-up of static
354 electricity and the reduction of electromagnetic emissions.

355 **3.112**

356 **grass catcher**

357 part or combination of parts which provides a means for collecting grass clippings or debris

358 **3.113**
 359 **hazard zone**
 360 area, not including the **stop zone**, in which if an obstacle exists, then the potential for injury
 361 can exist

362 **3.114**
 363 **high energy robotic lawnmower**
 364 **robotic lawnmower** with a **cutting means** kinetic energy exceeding 200 J

365 NOTE 101 to entry: The formula to determine the kinetic energy is in Annex FF.

366 **3.115**
 367 **high mass robotic lawnmower**
 368 **robotic lawnmower** having a mass greater than 78 kg

369 **3.116**
 370 **lawnmower**
 371 lawn cutting machine, where the **cutting means** cuts approximately parallel to the ground and
 372 which uses the ground to determine the **cutting height** by means of wheels or skids, etc.

373 **3.117**
 374 **lift sensor**
 375 device that senses when all or part of the machine is lifted from the ground

376 **3.118**
 377 **lithium-ion battery system**
 378 combination of a lithium-ion **battery**, the **charging system**, the machine and/or **peripheral(s)**
 379 and the interfaces between them as existing during operation of the machine and/or
 380 **peripheral(s)** or during charging

381 **3.119**
 382 **low energy robotic lawnmower**
 383 **robotic lawnmower** with a **cutting means** kinetic energy less than or equal 200 J

384 NOTE 101 to entry: The formula to determine the kinetic energy is in Annex FF.

385 **3.120**
 386 **low mass robotic lawnmower**
 387 **robotic lawnmower** with a maximum mass of 78 kg

388 **3.121**
 389 **low-power circuit**
 390 circuit that meets the requirements of IEC 62841-1:2014, Annex H

391 **3.122**
 392 **manual controller**
 393 device provided by the manufacturer either connected by a wire or wireless that allows manual
 394 operation of the machine

395 NOTE 101 to entry: A device not provided by the manufacturer, such as a smartphone or tablet, is not considered
 396 to be a **manual controller**.

397 NOTE 102 to entry: A manual controller can be used to move the machine in areas outside of the working area.

398 **3.123**
 399 **manual mode**
 400 manual control of the machine by use of a **manual controller** or by riding a **multifunctional**
 401 **machine**.

402 **3.124**
 403 **manual stop**
 404 manually actuated device using software-based or hardware-based components that brings the
 405 **traction drive** and **cutting means** to a stop

406 **3.125**
 407 **maximum speed**
 408 highest steady-state **cutting means** speed attainable under all conditions of **normal use**,
 409 including no-load, when adjusted in accordance with the manufacturer's specifications and/or
 410 instructions

411 NOTE 101 to entry: The steady-state **cutting means** speed excludes transients such as overshoot that may occur
 412 before attaining a steady-state condition.

413 **3.126**
 414 **obstruction sensor**
 415 device that senses a person or obstruction using either physical contact or non-contact mean

416 **3.127**
 417 **multifunctional machine**
 418 a machine on which a person can ride and which can be operated as **robotic lawnmower**.

419 **3.128**
 420 **operator control**
 421 device requiring operator actuation to perform specific functions during **normal operation**

422 NOTE 101 to entry: This includes controls on a **manual controller**.

423 **3.129**
 424 **operator presence control**
 425 control designed to detect when the operator's actuating force is removed

426 **3.130**
 427 **perimeter delimiter**
 428 device(s) that defines the perimeter of the **working area** within which the machine can operate
 429 automatically

430 NOTE 101 to entry: An example of a **perimeter delimiter** is a boundary wire that emits a signal to indicate the limit
 431 of the **working area**.

432 NOTE 102 to entry: Devices that function as a reference for determining the machine position within a virtual map,
 433 such as satellites, camera, ultrasonic are not considered to be **perimeter delimiters**.

434 **3.131**
 435 **peripheral**
 436 equipment additional to the machine itself that is provided by the manufacturer for **normal use**
 437 of the machine, e.g. **charging station(s)**, manual controller, signal source for **perimeter**
 438 **delimiter**

439 **3.132**
 440 **remote setting device**
 441 setting device, such as a smartphone or tablet, which is not connected by wire to the machine
 442 and designed to set the basic functions of the machine

443 NOTE 101 to entry: A **remote setting device** is not a **manual controller**.

444 **3.133**
 445 **robotic lawnmower**
 446 unattended **lawnmower** that operates automatically

447 NOTE 101 to entry: When the term 'machine' is used in the text of this standard, it is used to denote a **robotic**
448 **lawnmower**.

449 **3.134**
450 **rollover sensor**
451 device that senses when the machine is inverted

452 **3.135**
453 **sensor**
454 device that responds to physical stimuli (such as, but not limited to, heat, light, sound, pressure,
455 magnetism, motion) and transmits the resulting signal or data providing a measurement,
456 operating a **control**, or both

457 NOTE 101 to entry: **Lift sensors, obstruction sensors, rollover sensors, and tilt sensors** are examples of
458 **sensors**.

459 **3.136**
460 **setup device**
461 setting device, such as a smartphone or tablet, which is designed to set the **working area** and
462 settings of the machine as well as moving it in **setup mode**

463 **3.137**
464 **setup mode**
465 mode of the machine for defining the **working area** parameters

466 **3.138**
467 **stop zone**
468 area in which contact with the machine is likely to occur

469 **3.139**
470 **stopping time**
471 time elapsed between the instant when a stop command occurs and the instant at which the
472 machine or component comes to a stop

473 **3.140**
474 **tilt sensor**
475 device that senses when the machine is at or above a predetermined angle of incline

476 **3.141**
477 **traction drive**
478 means (system) used to transmit power to the ground drives means

479 **3.142**
480 **warning zone**
481 area in which if an obstacle exists and no action is taken, then the obstacle might enter either
482 the **hazard zone** or the **stop zone**

483 **3.143**
484 **working area**
485 area in which the machine can function in **automatic mode**

486 **4 General requirements**

487 IEC 62841-1:2014, Clause 4 is applicable, except as follows:

488 *Addition:*

489 All requirements for machines in the main body of this document are also applicable for mains
490 powered **peripherals**, unless otherwise specified.