

SESKO

Mobile machines and EMC standards

SESKO in brief

- National organization for electrotechnical standardization
- Member of IEC and CENELEC
- >500 experts participates in various standardization committees and working groups

International electrotechnical standardization

- IEC: 227 Technical committees, 1593 Working Groups, about 30 000 contributing experts globally
- CENELEC: 92 Technical committees, >400 Working Groups

Mobile machines and EMC standards

- Topics
 - Relevant EU Directives
 - What is covered
 - On the road or not?
 - EMC with Machinery Directive and EMC Directive

Mobile machines and EMC standards

- Relevant EU Directives
 - Machinery
 - EMC
 - Radio Equipment

Mobile machines and EMC standards

- Exclusions from MD
 - specific equipment for use in fairgrounds and/or amusement parks
 - agricultural and forestry tractors,
 - motor vehicles and their trailers subject to EU type approval

Mobile machines and EMC standards

- Subject to interpretation
 - Drones
 - Covered unless they are "means of transport" or "toys"

Mobile machines and EMC standards

- Mobile machinery on the road
 - No EU type approval at the moment, but [in progress](#) in the EU. National type approval can be obtained. MD and EMCD are applicable.
- Not used on road
 - MD and EMCD are applicable.
- Radio Equipment Directive 2014/53/EU may also be applicable

MD vs EMCD

- The EMCD applies to machinery that contains electrical or electronic parts that may generate or be affected by electromagnetic disturbance.
- The EMCD covers aspects of electromagnetic compatibility related to the functioning of machinery (See the [Guide for the Machinery Directive](#), Ed 2.3, April 2024).

MD vs EMCD

- However, the MD covers the immunity of machinery with respect to safety-related electromagnetic disturbance, whether transmitted by radiation or by wire.
- More on next slides

MD specific

- Annex I Essential health and safety requirements
- 1.2.1 Safety and reliability of control systems
- Control systems must be designed and constructed in such a way as to prevent hazardous situations from arising. Above all, they must be designed and constructed in such a way that:
 - – they can withstand the intended operating stresses and external influences



Applicable standards

- EN IEC 62061:2021 Safety of machinery - Functional safety of safety-related control systems
- EN 61000-1-2:2016 Electromagnetic compatibility (EMC). Part 1-2: General. Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena
- EN 61326-3-1:2017 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications
- EN 61000-6-7:2015 Generic standards - Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations

EMC Requirements - General

- Harmonised standard EN IEC 62061:2021 *Safety of machinery - Functional safety of safety-related control systems*
- In its Clause 6.6 Electromagnetic immunity
 - “The safety-related control system shall fulfil the applicable requirements of IEC 61000-1-2.”
 - “The appropriate immunity levels in the case of industrial environments are given by IEC 61326-3-1 or IEC 61000-6-7 as a minimum.”

EMC Requirements - Details

- IEC 61000-1-2
- Clause 9.3.4 Variation of test settings
 - Suggests that the default in basic standards may not be enough
 - Recommendations to consider modifications to immunity test methods
 - Examples: additional phase angles and number of pulses in transient injection, several incident angles in RF field immunity

EMC Requirements - Details

- IEC 61000-1-2
- Clause 9.3.5 Environmental factors
 - Evaluation of ageing effects should be considered
 - Evaluation of the reduction in effectiveness of electromagnetic mitigation measures associated with the equipment or product due to corrosion or mechanical movement during the anticipated lifetime of the system
 - Testing the external enclosure may be sufficient for ageing effects

EMC Requirements - Details

- IEC 61326-3-1 and IEC 61000-6-7
- Common: higher immunity levels compared to normal Industrial environment given in IEC 61000-6-2
 - E.g. 20 V/m RF field, 4 kV power line surge
 - Also, the number of pulses and test durations are increased

Things to consider

- Higher levels or more pulses/longer exposure time?
 - Variation in series production
 - Ageing – deterioration of shielding effectiveness
 - Sensitive moments in operation cycle
 - Need to stay within real failure mechanism – safety margin to what?

Mobility

- Useful guidance is found, e.g. in CISPR [Guidance for robots](#)
- Considerations
 - Rollers
 - Idle and operating modes –detect unintended start and stop
 - Primary functions active at the same time or consecutively

SESKO in IEC and Cenelec standardization

- Contact persons: <https://sesko.fi/en/contact/personnel/>

Standards	IEC	SESKO
IEC 62061	IEC TC 44 Safety of machinery - Electrotechnical aspects	SK 44 koneiden sähköturvallisuus
IEC 61326-3-1	TC 65/SC 65A Industrial-process measurement, control and automation – System aspects	SK 65 Teollisuusprosessien ohjaus
IEC 61000-1-2 IEC 61000-6-7	TC 77 Electromagnetic compatibility	SK 77 Sähkömagneettinen yhteensopivuus (EMC)

Thank you!