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Tractors and machinery for agriculture and forestry - Safety-related parts of control systems - Part 1: General principles for design and development (ISO 25119-1:2018)

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 02/24

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English Version

Tractors and machinery for agriculture and forestry -
Safety-related parts of control systems - Part 1: General
principles for design and development (ISO 25119-
1:2018)

Tracteurs et matériels agricoles et forestiers - Parties
des systèmes de commande relatives à la sécurité -
Partie 1: Principes généraux pour la conception et le
développement (ISO 25119-1:2018)

Traktoren und Maschinen für die Land- und
Forstwirtschaft - Sicherheitsbezogene Teile von
Steuerungen - Teil 1: Allgemeine Gestaltungs- und
Entwicklungsleitsätze (ISO 25119-1:2018)

This European Standard was approved by CEN on 9 January 2023.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

The text of ISO 25119-1:2018 has been prepared by Technical Committee ISO/TC 23 "Tractors and machinery for agriculture and forestry" of the International Organization for Standardization (ISO) and has been taken over as EN ISO 25119-1:2023 by Technical Committee CEN/TC 144 "Tractors and machinery for agriculture and forestry" the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2024, and conflicting national standards shall be withdrawn at the latest by March 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s) / Regulation(s).

For the relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO 25119-1:2018 has been approved by CEN as EN ISO 25119-1:2023 without any modification.

EN ISO 25119-1:2023 (E)**Annex ZA**
(informative)**Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered**

This European Standard has been prepared under a Commission's standardization request "M/396 Mandate to CEN and CENELEC for Standardisation in the field of machinery" to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1— Correspondence between this European Standard and Annex I of Directive 2006/42/EC

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/sub-clause(s) of this EN	Remarks/Notes
1.1.2. Principles of safety integration	-----	
1.1.2(a)	6, 7, 8, 9	
1.1.2(c)	6, 7, 8, 9	
1.1.2(d)		NOT COVERED
1.1.2(e)		NOT COVERED
1.1.3. Materials and products		NOT COVERED
1.1.4. Lighting		NOT COVERED
1.1.5. Design of machinery to facilitate its handling		NOT COVERED
1.1.6. Ergonomics		NOT COVERED
1.1.7. Operating positions		NOT COVERED
1.1.8. Seating		NOT COVERED
1.2. CONTROL SYSTEMS	-----	
1.2.1. Safety and reliability of control systems	6, 7, 8, 9	
1.2.2. Control devices		NOT COVERED
1.2.3. Starting		NOT COVERED
1.2.4. Stopping	-----	

1.2.4.1 Normal Stop		NOT COVERED
1.2.4.2. Operational stop		NOT COVERED
1.2.4.3. Emergency stop		NOT COVERED
1.2.4.4. Assembly of machinery		NOT COVERED
1.2.5. Selection of control or operating modes		NOT COVERED
1.2.6. Failure of the power supply	6, 7, 8, 9	
1.3. PROTECTION AGAINST MECHANICAL HAZARDS	----	
1.3.1. Risk of loss of stability		NOT COVERED
1.3.2. Risk of break-up during operation		NOT COVERED
1.3.3. Risks due to falling or ejected objects		NOT COVERED
1.3.4. Risks due to surfaces, edges or angles		NOT COVERED
1.3.5. Risks related to combined machinery		NOT COVERED
1.3.6. Risks related to variations in operating conditions		NOT COVERED
1.3.7. Risks related to moving parts		NOT COVERED
1.3.8. Choice of protection against risks arising from moving parts		NOT COVERED
1.3.9. Risks of uncontrolled movements		NOT COVERED
1.4. REQUIRED CHARACTERISTICS OF GUARDS AND PROTECTIVE DEVICES	----	
1.4.1. General requirements		NOT COVERED
1.4.2. Special requirements for guards		NOT COVERED
1.4.3. Special requirements for protective devices		NOT COVERED
1.5. RISKS DUE TO OTHER HAZARDS	----	
1.5.1. Electricity supply		NOT COVERED
1.5.2. Static electricity		NOT COVERED
1.5.3. Energy supply other than electricity		NOT COVERED
1.5.4. Errors of fitting		NOT COVERED

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1.5.5. Extreme temperatures		NOT COVERED
1.5.6. Fire		NOT COVERED
1.5.7. Explosion		NOT COVERED
1.5.8. Noise		NOT COVERED
1.5.9. Vibrations		NOT COVERED
1.5.10. Radiation		NOT COVERED
1.5.11. External radiation		NOT COVERED
1.5.12. Laser radiation		NOT COVERED
1.5.13. Emissions of hazardous materials and substances		NOT COVERED
1.5.14. Risk of being trapped in a machine		NOT COVERED
1.5.15. Risk of slipping, tripping or falling		NOT COVERED
1.5.16. Lightning		NOT COVERED
1.6. MAINTENANCE	-----	
1.6.1. Machinery maintenance		NOT COVERED
1.6.2. Access to operating positions and servicing points		NOT COVERED
1.6.3. Isolation of energy sources		NOT COVERED
1.6.4. Operator intervention		NOT COVERED
1.6.5. Cleaning of internal parts		NOT COVERED
1.7. INFORMATION	----	
1.7.1. Information and warnings on the machinery	8.4.3, 8.5	
1.7.1.1. Information and information devices	8.4.3, 8.5	
1.7.1.2. Warning devices		NOT COVERED
1.7.2. Warning of residual risks		NOT COVERED
1.7.3. Marking of machinery		NOT COVERED
1.7.4. Instructions		NOT COVERED
2.4. MACHINERY FOR PESTICIDE APPLICATION	----	
2.4.2. General		NOT COVERED
2.4.3. Controls and monitoring		NOT COVERED
2.4.4. Filling and emptying		NOT COVERED
2.4.5. Application of pesticides	----	

2.4.5.1. Application rate		NOT COVERED
2.4.5.2. Distribution, deposition and drift of pesticide		NOT COVERED
2.4.5.3. Tests		NOT COVERED
2.4.5.4. Losses during stoppage		NOT COVERED
2.4.6. Maintenance	----	
2.4.6.1. Cleaning		NOT COVERED
2.4.6.2. Servicing		NOT COVERED
2.4.7. Inspections		NOT COVERED
2.4.8. Marking of nozzles, strainers and filters		NOT COVERED
2.4.9. Indication of pesticide in use		NOT COVERED
2.4.10. Instructions		NOT COVERED
3.2. WORK POSITIONS	---	
3.2.1. Driving position		NOT COVERED
3.2.2. Seating		NOT COVERED
3.2.3. Positions for other persons		NOT COVERED
3.3. CONTROL SYSTEMS	---	
3.3.1. Control devices		NOT COVERED
3.3.2. Starting/moving		NOT COVERED
3.3.3. Travelling function		NOT COVERED
3.3.4. Movement of pedestrian-controlled machinery		NOT COVERED
3.3.5. Control circuit failure		NOT COVERED
3.4. PROTECTION AGAINST MECHANICAL HAZARDS	---	
3.4.1. Uncontrolled movements		NOT COVERED
3.4.2. Moving transmission parts		NOT COVERED
3.4.3. Roll-over and tip-over		NOT COVERED
3.4.4. Falling objects		NOT COVERED
3.4.5. Means of access		NOT COVERED
3.4.6. Towing devices		NOT COVERED
3.4.7. Transmission of power between self-propelled machinery (or tractor) and recipient machinery		NOT COVERED
3.5. PROTECTION AGAINST OTHER	----	

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HAZARDS		
3.5.1. Batteries		NOT COVERED
3.5.2. Fire		NOT COVERED
3.5.3. Emissions of hazardous substances		NOT COVERED
3.6. INFORMATION AND INDICATIONS	----	
3.6.1. Signs, signals and warnings		NOT COVERED
3.6.2. Marking		NOT COVERED
3.6.3. Instructions	----	
3.6.3.1. Vibrations		NOT COVERED
3.6.3.2. Multiple uses		NOT COVERED

Table ZA.2 — Applicable Standards to confer presumption of conformity as described in this Annex ZA

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
ISO 25119-2:2019	ISO 25119-2:2019	Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 2: Concept phase	EN ISO 25119-2:2023
ISO 25119-3:2018 ISO 25119-3:2018/A1:2020	ISO 25119-3:2018 ISO 25119-3:2018/A1:2020	Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 3: Series development, hardware and software	EN ISO 25119-3:2023 EN ISO 25119-3:2023/A1:2023
ISO 25119-4:2018 ISO 25119-4:2018/A1:2020	ISO 25119-4:2018 ISO 25119-4:2018/A1:2020	Tractors and machinery for agriculture and forestry — Safety-related parts of control systems Part 4: production, operation, modification and supporting processes	EN ISO 25119-4:2023 EN ISO 25119-4:2023/A1:2023

The documents listed in the Column 1 of table ZA.2, in whole or in part, are normatively referenced in this document, i.e. are indispensable for its application. The achievement of the presumption of conformity is subject to the application of the edition of Standards as listed in Column 4 or, if no European Standard Edition exists, the International Standard Edition given in Column 2 of table ZA.2.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

INTERNATIONAL STANDARD

ISO 25119-1

Second edition
2018-10

Tractors and machinery for agriculture and forestry — Safety- related parts of control systems —

Part 1: General principles for design and development

*Tracteurs et matériels agricoles et forestiers — Parties des systèmes
de commande relatives à la sécurité —*

Partie 1: Principes généraux pour la conception et le développement



Reference number
ISO 25119-1:2018(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 19, *Agricultural electronics*.

This second edition cancels and replaces the first edition (ISO 25119-1:2010), which has been technically revised. The main changes compared from the previous edition are as follows:

- the introduction has been modified to add specific information on safety standards;
- Tables 1 to 3 have been deleted and the succeeding tables have been renumbered;
- Clause 5 (management system) has been inserted and the succeeding clauses have been renumbered;
- in 8.5, work products from the safety management activities after SOP have been specified;
- Figure 2 has been modified;
- the document has been editorially revised.

A list of all parts in the ISO 25119 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

ISO 25119-1:2018(E)

Introduction

ISO 25119 (all parts) sets out an approach to the assessment, design and verification, for all safety life cycle activities, of safety-related parts comprising electrical and/or electronic and/or programmable electronic systems (E/E/PES) on tractors used in agriculture and forestry, and on self-propelled ride-on machines and mounted, semi-mounted and trailed machines used in agriculture. It is also applicable to mobile municipal equipment.

A prerequisite to the application of ISO 25119 (all parts) is the completion of a suitable hazard identification and risk analysis (e.g. ISO 12100) for the entire machine. As a result, an E/E/PES is frequently assigned to provide safety-related functions that create safety-related parts of control systems (SRP/CS). These can consist of hardware or software, can be separate or integrated parts of a control system, and can either perform solely safety-related functions or form part of an operational function.

In general, the designer (and to some extent, the user) will combine the design and validation of these SRP/CS as part of the risk assessment. The objective is to reduce the risk associated with a given hazard (or hazardous situation) under all conditions of use of the machine. This can be achieved by applying various measures (both SRP/CS and non-SRP/CS) with the end result of achieving a safe condition.

ISO 25119 (all parts) allocates the ability of safety-related parts to perform a safety-related function under foreseeable conditions into five performance levels. The performance level of a controlled channel depends on several factors, such as system structure (category), the extent of fault detection mechanisms (diagnostic coverage), the reliability of components (mean time to dangerous failure, common-cause failure), design processes, operating stress, environmental conditions and operation procedures. Three types of failures that can cause E/E/PES malfunctions leading to potential hazardous situations are considered: systematic, common-cause and random.

In order to guide the designer during design, verification, and to facilitate the assessment of the achieved performance level, ISO 25119 (all parts) defines an approach based on a classification of architecture with different design features and specific behaviour in case of a fault.

The performance levels and categories can be applied to the control systems of all kinds of mobile machines: from simple systems (e.g. auxiliary valves) to complex systems (e.g. steer by wire), as well as to the control systems of protective equipment (e.g. interlocking devices, pressure sensitive devices).

ISO 25119 (all parts) adopts a risk-based approach for the determination of the risks, while providing a means of specifying the required performance level for the safety-related functions to be implemented by E/E/PES safety-related channels. It gives requirements for the whole safety life cycle of E/E/PES (design, validation, production, operation, maintenance, decommissioning), necessary for achieving the required functional safety for E/E/PES that are linked to the performance levels.

The structure of safety standards in the field of machinery is as follows.

- a) Type-A standards (basic safety standards) give basic concepts, principles for design and general aspects that can be applied to machinery.
- b) Type-B standards (generic safety standards) deal with one or more safety aspect(s), or one or more type(s) of safeguards that can be used across a wide range of machinery:
 - type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
 - type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure sensitive devices, guards).
- c) Type-C standards (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines.

This document is a type-B1 standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

In addition, this document is intended for standardization bodies elaborating type-C standards.

The requirements of this document can be supplemented or modified by a type-C standard.

For machines which are covered by the scope of a type-C standard and which have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.

Tractors and machinery for agriculture and forestry — Safety-related parts of control systems —

Part 1: General principles for design and development

1 Scope

This document sets out general principles for the design and development of safety-related parts of control systems (SRP/CS) on tractors used in agriculture and forestry and on self-propelled ride-on machines and mounted, semi-mounted and trailed machines used in agriculture. It can also be applied to mobile municipal equipment (e.g. street-sweeping machines).

This document is not applicable to:

- aircraft and air-cushion vehicles used in agriculture;
- lawn and garden equipment.

This document specifies the characteristics and categories required of SRP/CS for carrying out their safety-related functions. It does not identify performance levels for specific applications.

NOTE 1 Machine specific type-C standards can specify performance levels (AgPL) for safety-related functions in machines within their scope. Otherwise, the specification of AgPL is the responsibility of the manufacturer.

This document is applicable to the safety-related parts of electrical/electronic/programmable electronic systems (E/E/PES), as these relate to mechatronic systems. It covers the possible hazards caused by malfunctioning behaviour of E/E/PES safety-related systems, including interaction of these systems. It does not address hazards related to electric shock, fire, smoke, heat, radiation, toxicity, flammability, reactivity, corrosion, release of energy, and similar hazards, unless directly caused by malfunctioning behaviour of E/E/PES safety-related systems. It also covers malfunctioning behaviour of E/E/PES safety-related systems involved in protective measures, safeguards, or safety-related functions in response to non-E/E/PES hazards.

Examples included within the scope of this document:

- SRP/CS limiting current flow in electric hybrids to prevent insulation failure/shock hazards;
- electromagnetic interference with the SRP/CS;
- SRP/CS designed to prevent fire.

Examples not included in the scope of this document:

- insulation failure due to friction that leads to electric shock hazards;
- nominal electromagnetic radiation impacting nearby machine control systems;
- corrosion causing electric cables to overheat.

This document is not applicable to non-E/E/PES systems (e.g. hydraulic, mechanic or pneumatic).

NOTE 2 See also ISO 12100 for design principles related to the safety of machinery.

This document is not applicable to safety related parts of control systems manufactured before the date of its publication.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 25119-2:2018, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 2: Concept phase*

ISO 25119-3:2018, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 3: Series development, hardware and software*

ISO 25119-4:2018, *Tractors and machinery for agriculture and forestry — Safety-related parts of control systems — Part 4: production, operation, modification and supporting processes*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN