SLOVENSKI STANDARD
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Kmetijski stroji in traktorji - Varnost delno avtomatiziranih, polavtonomnih in avtonomnih strojev - 1. del: Načela strojnega oblikovanja in terminologija (ISO/DIS 18497-1:2022)

Agricultural machinery and tractors - Safety of partially automated, semi-autonomous and autonomous machinery - Part 1: Machine design principles and vocabulary (ISO/DIS 18497-1:2022)

Landwirtschaftliche Maschinen und Traktoren - Sicherheit von teilautomatisierten, halbautonomen und autonomen Maschinen - Teil 1: Konstruktionsprinzipien und Vokabular für Maschinen (ISO/DIS 18497-1:2022)

Tracteurs et matériels agricoles - Sécurité des machines partiellement automatisées, semi-autonomes et autonomes - Partie 1: Principes de conception des machines et vocabulaire (ISO/DIS 18497-1:2022)

Ta slovenski standard je istoveten z: **prEN ISO 18497-1**

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01.040.65	Kmetijstvo (Slovarji)	Agriculture (Vocabularies)
65.060.01	Kmetijski stroji in oprema na splošno	Agricultural machines and equipment in general

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Agricultural machinery and tractors — Safety of partially automated, semi-autonomous and autonomous machinery —

Part 1:
Machine design principles and vocabulary

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IMPORTANT — Please use this updated version dated 2021-12-22, and discard any previous version of this DIS.

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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 first edition of ISO 18497-1, together with the other parts of the series, cancels and replaces the first edition (ISO 18497:2018), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Machine design principles and vocabulary were made as its own part (ISO 18497-1) and substantially revised to account for the wide range of functionality and use cases within agricultural machines and tractors

— Obstacle protective systems was made its own part (ISO 18497-2[1]) and substantially revised to account for the wide range of functionality and use cases within agricultural machines and tractors

— Autonomous operating zones were defined and was made its own part (ISO 18497-3), accounting for the wide range of functionality and use cases within agricultural machines and tractors

— Verification and validation methods was made its own part (ISO 18497-4) and substantially revised to account for the wide range of functionality and use cases within agricultural machines and tractors

A list of all parts in the ISO 18497 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.

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1) Under preparations

Introduction

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 organisations, 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.

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

— Type-A standards (basis standards) give basic concepts, principles for design, and general aspects that can be applied to machinery;

— Type-B standards (generic safety standards) deal with one or more safety aspects or one or more types 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-hands controls, interlocking devices, pressure sensitive devices, guards);

— Type-C standards (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines.

The purpose of this standard is to establish general design principles for partially automated, semi-autonomous and autonomous functions of agricultural machinery and tractors.

Manual non-automated functions are addressed in existing agricultural machinery and tractor safety standards. Due to the potential number of different functions of agricultural machinery and tractors and the mixed type and mode to which these functions can exist, it is necessary to establish general design principles to guide the combination, operator location and types of interaction of these functions so that further type-C safety standards can be developed consistently and explicitly to address the mitigation of risk of injury to operators and by standards, which the primary focus of safety standards. Attempting to define risk mitigation requirements based on combinations of type and mode of functions alone cannot be accomplished accurately for all agricultural machinery and tractors due to the wide variety of the machinery and variety of functionality.

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Therefore the familiar representation of SAE J3016[1] with six levels of automation was deliberately not chosen as a basis for this standard and it is necessary to develop more specific type-C safety standards, using the general design principles of this document, to adequately account for the risks of agricultural machinery and tractors used in a specified way with various types of partially automated, semi-autonomous and autonomous functions.

Should requirements of this document for partially automated, semi-autonomous and autonomous functions of agricultural machinery and tractors be different from those which are stated in a machine-specific type-C standard dealing with partially automated, semi-autonomous and autonomous functions of agricultural machinery and tractors, the requirements of the machine-specific standard take precedence over the requirements of this document.

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Agricultural machinery and tractors — Safety of partially automated, semi-autonomous and autonomous machinery —

Part 1:
Machine design principles and vocabulary

1 Scope

This document specifies principles for the design of agricultural machinery and tractors that are used in agricultural applications and that have partially automated, semi-autonomous and autonomous functions. Additionally, it provides guidance on the type of information, to be provided by the manufacturer, on safe working practices (including information about residual risks).

The purpose of this document is to assist in the provision of more specific safety requirements, means of verification and information for use to ensure an appropriate level of safety for agricultural machinery and tractors with partially automated, semi-autonomous and autonomous functions used in a specified way.

This document deals with all the significant hazards, hazardous situations and events, relevant to agricultural machinery and tractors with partially automated, semi-autonomous and autonomous functions when used as intended and under the conditions of misuse foreseeable by the manufacturer during normal operation and service.

While this document gives principles for the design, verification, validation and provision of information for use, the detailed requirements are dependent on the use case. Therefore, the design principles given in this document needs to be extended and clarified by the use of relevant specific (type-C) standards, when available, or by the manufacturer of the machine using a risk assessment. Applicability of the design principles and any additional requirements, for design, verification, validation or information for use are outside the scope of this document.

NOTE   Safety requirements for specific non-automated functions of agricultural machinery and tractors can be available in machine-specific type-C standards.

This document is not applicable to:

— forestry applications;

— operations on public roads including relevant requirements for braking and steering systems.

This document is not applicable to agricultural machinery and tractors which are manufactured before the date of its publication, or to systems applied to agricultural machinery and tractors put into use before the date of its publication.

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 3767-1:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols*

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ISO 3767-2:2016, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 2: Symbols for agricultural tractors and machinery*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13849-2:2012, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

ISO 18497-2, *Agricultural machinery and tractors — Safety of partially automated, semi-autonomous and autonomous machinery – Principles for design — Part 2: Design principles for obstacle protective systems*

ISO 18497-3, *Agricultural machinery and tractors — Safety of partially automated, semi-autonomous and autonomous machinery – Principles for design — Part 3: Design principles for autonomous operating zones*

ISO 18497-4, *Agricultural machinery and tractors — Safety of partially automated, semi-autonomous and autonomous machinery – Principles for design — Part 4: Design principles for verification and validation methods*

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

ISO 25119-2:2019, *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*

ISO 11783-14:2013, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 14: Sequence control*

3   Terms and definitions

For the purposes of this document, the terms and definitions given in other related agricultural machinery and tractor standards apply (e.g. ISO 4254-1,[2] ISO 12100:2010 and ISO 26322-1[18]).

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

	Manual Non-Automated (3.1)	Partially Automated (3.2)	Semi-Autonomous (3.3)	Autonomous (3.4)
Functions (3.5)	Non-Automated (3.6)			
		Automated (3.7)		
Modes	Manual Mode (3.9)			
		Autonomous Mode (3.10)		

Figure 1 — Terms used for combinations of functions and modes

3.1
manual non-automated
non-automated (3.6) only machine *functions* (3.5) that are intended to operate in *manual mode* (3.9) during all of the machine's *operating cycle* (3.11)

Note 1 to entry: See Figure 1

EXAMPLE   to entry   Implement height above ground controlled manually by the operator.

3.2
partially automated
non-automated (3.6) and *automated* (3.7) machine *functions* (3.5) that are intended to operate in *manual mode* (3.9) during all of the machine's *operating cycle* (3.11)

Note 1 to entry: See Figure 1

EXAMPLE   to entry   Implement height above ground maintained automatically to a set point controlled by the operator.

3.3
semi-autonomous
automated (3.7) machine *functions* (3.5) that are intended to operate in *autonomous mode* (3.10) during part of the machine's *operating cycle* (3.11) in addition to *non-automated* (3.6) and *automated* (3.7) machine *functions* (3.5) that are intended to operate in *manual mode* (3.9) to complete some of the tasks assigned

Note 1 to entry: See Figure 1

EXAMPLE 1   Implement height above ground maintained automatically to a set point controlled by the operator in specific conditions, and maintained automatically to a set point controlled by machine without operator interaction during all of the machine's other operating cycles.

EXAMPLE 2   Automated field cultivating machine completing entire operating cycle of field work without operator interaction and also used to complete other operating cycles of field work in specific conditions manually by an operator.

3.4
autonomous
automated (3.7) machine *functions* (3.5) that operate in *autonomous mode* (3.10) during all of the machine's *operating cycle* (3.11)

Note 1 to entry: See Figure 1

EXAMPLE 1   Implement height above ground maintained automatically to a set point controlled by the machine without operator interaction during all of the machine's operating cycles.

EXAMPLE 2   Automated field cultivating machine completing all operating cycles of work without operator interaction.

3.5
function
defined activity or behavior of a machine or a machine system

Note 1 to entry: Examples of function are: machine propel, steering, braking, lights, 3-point hitch, hydraulic driven unit, implement control (ISOBUS CAN, power-take-off, hydraulic), etc.

3.6
non-automated
technique, method, or system of operating and controlling machine *function(s)* (3.5) by direct means

Note 1 to entry: Direct means are typically accomplished through constant *operator interaction* (3.12)

3