



**SLOVENSKI STANDARD**  
**oSIST prEN ISO 3991:2023**  
**01-marec-2023**

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**Kmetijski stroji - Robotski sistemi za krmljenje - Varnost (ISO/DIS 3991:2023)**

Agricultural machinery - Robotic feed systems - Safety (ISO/DIS 3991:2023)

Landmaschinen - Roboter-Fütterungssysteme - Sicherheit (ISO/DIS 3991:2023)

Matériel agricole - Systèmes d'alimentation robotisés - Sécurité (ISO/DIS 3991:2023)

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**ICS:**

65.060.99	Drugi kmetijski stroji in oprema	Other agricultural machines and equipment
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# DRAFT INTERNATIONAL STANDARD

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## Agricultural machinery — Robotic feed systems — Safety

ICS: 65.060.99

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# Contents

Page

<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>3</b>
<b>4 Safety requirements and / or protective measures</b> .....	<b>6</b>
4.1 General.....	6
4.2 Storage of feed.....	7
4.2.1 Feed storage devices.....	7
4.2.2 Feed storage area.....	8
4.3 Loading.....	8
4.4 Checking of the mixing.....	8
4.5 Travelling.....	8
4.5.1 Area of travelling and pathways.....	8
4.5.2 Safety distance along the route.....	8
4.6 MFU.....	10
4.6.1 General.....	10
4.6.2 Obstacle protective system.....	10
4.6.3 Braking system.....	14
4.6.4 Audible alarm.....	15
4.6.5 Visual alarm.....	15
4.7 Distributing.....	15
4.8 Pushing feed/Cleaning.....	15
4.9 Electrical safety.....	16
4.9.1 General.....	16
4.9.2 Battery charging.....	16
4.10 Controls.....	16
4.10.1 Location.....	16
4.10.2 Controls for operational modes.....	16
4.11 Operational modes.....	17
4.11.1 General.....	17
4.11.2 Manual mode.....	17
4.11.3 Autonomous mode.....	18
4.11.4 Semi-Autonomous Robotic feed system.....	18
4.11.5 Service mode.....	18
4.12 Service and Maintenance.....	18
4.13 Emergency stop devices.....	19
4.14 Noise reduction as safety requirement.....	19
4.15 Fire and explosion.....	19
<b>5 System integration</b> .....	<b>19</b>
5.1 General.....	19
5.2 Layout design.....	19
5.3 Zones.....	20
5.3.1 Common zone.....	20
5.3.2 Caution zone.....	20
5.3.3 Restricted zone.....	20
<b>6 Information for use</b> .....	<b>21</b>
6.1 Operators manual.....	21
6.1.1 General.....	21
6.2 Layout.....	21
6.3 Marking.....	22
6.3.1 General.....	22

## ISO/DIS 3991:2022(E)

6.3.2 Safety signs .....	22
<b>Annex A (informative) Examples of Robotic feed system.....</b>	<b>24</b>
<b>Annex B (informative) List of significant hazards.....</b>	<b>27</b>
<b>Annex C (normative) Safety functions of RFS requiring functional safety analysis.....</b>	<b>30</b>
<b>Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC amended by Directive 2009/127/EC aimed to be covered.....</b>	<b>32</b>
<b>Bibliography.....</b>	<b>35</b>

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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](http://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](http://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](http://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 3, Safety and comfort.

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](http://www.iso.org/members.html)

## ISO/DIS 3991:2022(E)

### Introduction

This document is a type-C standard as specified in EN ISO 12100: 2010.

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.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

The purpose of this standard is to establish specific design principles for semi-autonomous and autonomous functions of Robotic Feed Systems (RFS) agricultural machinery. The application of other Type C standards which deal with relevant significant hazards to the machinery covered in the scope of this standard is explained in [clause 4](#).

The requirements of this document concern designers, manufacturers and their authorized representatives of feed systems. This document also includes information to be provided by the manufacturer to the user.



# Agricultural machinery — Robotic feed systems — Safety

## 1 Scope

This International Standard specifies the safety requirements and their verification for the design and construction of Robotic Feed Systems (RFS) (see [Annex A](#) - Examples of Robotic feed system) which distribute feed and perform at least one of the following functions without the need of human interaction:

- storing of feed;
- loading of mobile feed unit (MFU);
- mixing;
- travelling;
- cleaning (residual feed);
- pushing feed.

Additionally, it provides the type of information, to be provided by the manufacturer, on safe working practices (including information about residual risks).

This document is for feeding livestock (e.g. cows, sheep, pigs).

When the RFS is intended to be used for other kind of animals other than livestock, the manufacturer shall perform an additional risk assessment for potential risks caused to this kind of animals.

This document does not apply to:

- Systems designed to be used at a fixed location and that discharge feed at a remote location (e.g. chain conveyor feed systems, belt conveyor feed systems or liquid feed systems);
- Tractors;
- Systems designed for field application.

This document deals with all the significant hazards, hazardous situations and events relevant to Robotic Feed Systems (RFS) see [Annex B](#), when they are used as intended and under the conditions of misuse, which are reasonably foreseeable, by the manufacturer as listed in [clause 4](#), except for the hazards arising from:

- Internal combustion engines of Robotic Feed Systems (RFS)

NOTE Hazards related to internal combustion engines of robotic feed systems (e.g. exhaust emissions in buildings) will be considered in separate standards

Environmental aspects (except noise) have not been considered in this standard.

This document is not applicable to feed systems manufactured before the date of its publication.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

**ISO/DIS 3991:2022(E)**

- EN 703:2021, *Agricultural machinery – Silage loading, mixing and/or chopping and distributing machines – Safety*
- EN 1175:2020, *Safety of industrial trucks – Electrical/ electronic requirements*
- EN-ISO 3691-4:2020, *Industrial trucks – Safety requirements and verification -Part 4: Driverless industrial trucks and their systems*
- EN-ISO 4254-1:2015, *Agricultural machinery – Safety – Part 1: General requirements*
- EN-ISO 7731:2008, *Ergonomics – Danger signals for public and work areas – Auditory danger signals*
- ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*
- EN-ISO 12100:2010, *Safety of machinery – General principles for design – Risk assessment and risk reduction*
- EN-ISO 13849-1:2015, *Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*
- EN-ISO 13849-2:2012, *Safety of machinery - Safety-related parts of control systems - Part 2: Validation*
- EN-ISO 13850:2015, *Safety of machinery – Emergency stop function – Principles for design*
- EN-ISO 13856-2:2013, *Safety of machinery – Pressure-sensitive protective devices – Part 2: General principles for design and testing of pressure-sensitive edges and pressure-sensitive bars*
- EN-ISO 13856-3:2013, *Safety of machinery – Pressure-sensitive protective devices – Part 3: General principles for design and testing of pressure-sensitive pressure sensitive protective devices, plates, wires and similar devices*
- EN-ISO 13857:2008, *Safety of machinery – Safety distances to prevent caution zones being reached by upper and lower limbs*
- EN-ISO 14119:2013, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection*
- EN-ISO 14120:2015, *Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards*
- ISO 15817:2012, *Earth-moving machinery — Safety requirements for remote operator control systems*
- EN-ISO 16230-1:2015, *Agricultural machinery and tractors – Safety of higher voltage electrical and electronic components and systems – Part 1: General requirements*
- EN-ISO 25119-1:2018/A1:2020, *Tractors and machinery for agriculture and forestry – Safety-related parts of control systems – Part 1: General principles for design and development*
- EN-ISO 25119-2:2019, *Tractors and machinery for agriculture and forestry – Safety-related parts of control systems – Part 2: Concept phase*
- EN-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 25119-4:2018/A1:2020, *Tractors and machinery for agriculture and forestry – Safety-related parts of control systems – Part 4: Production, operation, modification and supporting processes*
- EN-IEC 60204-1:2018, *Safety of machinery – Electrical equipment of machines – Part 1: general requirements*
- IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards - Immunity standard for industrial environments*

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

EN-IEC 61496-1:2020, *Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests*

EN-IEC 61496-2:2020, *Safety of machinery – Electro-sensitive protective equipment – Part 2: Particular requirements for equipment using active opto-electronic protective devices*

EN-IEC 62485-6:2021, *Safety requirements for secondary batteries and battery installations – Part 6: Lithium-ion batteries for traction applications*

EN-IEC 62619:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications*

### 3 Terms and definitions

For the purpose of this document the following terms and definitions apply:

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### **Robotic Feed System (RFS)**

system consisting of various machinery performing the necessary functions to feed livestock. The robotic feed system is either semi-autonomous (see 3.1.1) or autonomous (see 3.1.2)

##### 3.1.1

##### **semi-autonomous feed system**

system comprising feed robotic device(s) (see 3.2.1) and any machinery, equipment, devices, or sensors supporting the feed robotic device(s) performing its feed task

##### 3.1.2

##### **autonomous feed system**

system comprising feed robot(s) (see 3.2.2) and any machinery, equipment, devices, or sensors supporting the feed robot performing its feed task

#### 3.2

##### **Mobile Feed Unit (MFU)**

Specific mobile device used to deploy the feed to the livestock, which is either a feed robotic device or a feed robot as part of a Robotic Feed System (RFS)

##### 3.2.1

##### **feed robotic device**

actuated programmable mechanism fulfilling the characteristics of feed robot but operating at a semi-autonomous level of autonomy. Example: Hanging MFU

##### 3.2.2

##### **feed robot**

actuated programmable mechanism operating at an autonomous level of autonomy

#### 3.3

##### **autonomy**

## ISO/DIS 3991:2022(E)

## 3.3.1

**level of autonomy**

combinations of functions and modes described by the terms manual non-automated, partially automated, semi-autonomous and autonomous

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

## 3.3.2

**autonomous**

*automated machine functions* that operate in *autonomous mode* during all of the machine's *operating cycle*

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

## 3.3.3

**automated**

the technique, method, or system of operating and controlling machine *function(s)* by *automatic* means

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

## 3.3.4

**automatic**

a process or part of a process when machine *functions* follow defined rules

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

## 3.3.5

**semi autonomous**

*automated machine functions* that are intended to operate in *autonomous mode* during part of the machine's *operating cycle* in addition to *non-automated* and *automated machine functions* that are intended to operate in *manual mode* to complete some of the tasks assigned

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

## 3.4

**operator**

designated person who is responsible for the movement and operation of the RFS. An operator can be local or remote

## 3.5

**feed storage area**

designated area where one or more different feed storage devices are located and/or where feedstuffs are stocked in bulk

## 3.6

**feed storage device**

device for intermediate storage and processing of feedstuffs (e.g. Feed bunker)

## 3.7

**filling**

act of supplying feedstuffs to the feed storage area or to the feed storage device(s)

### 3.8

#### **loading**

act of transferring feedstuffs into the MFU

### 3.9

#### **loading area**

designated area where the loading (see 3.8) is performed

### 3.10

#### **modes**

#### **3.10.1**

##### **manual mode**

mode of machine operation in which machine function(s) are controlled by an operator

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: This mode is usually used for teaching, tele-operation, fault-finding, repair, cleaning, etc.

Note 2 to entry: definition will be deleted once ISO 18497-1 is published

#### **3.10.2**

##### **autonomous mode**

mode of machine operation in which a machine performs functions related to its defined tasks without operator interaction

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published

#### **3.10.3**

##### **service mode**

Mode of machine operation in which service is performed

Note 1 to entry: see ISO 4254-1: 2015 for definition service

### 3.11

#### **zones**

#### **3.11.1**

##### **common zone**

designated area with allowance for people which includes the autonomous operating zone of the RFS

#### **3.11.2**

##### **caution zone**

designated area part of a common zone where there is an increased risk of hazard e.g. due to inadequate clearance or where a load transfer operation takes place

#### **3.11.3**

##### **restricted zone**

designated area with no allowance for people, which contain hazardous autonomous functions of the RFS

#### **3.11.4**

##### **autonomous operating zone**

Designated area in which machines operate in autonomous mode

[SOURCE: ISO/DIS 18497-1<sup>[1]</sup>]

Note 1 to entry: definition will be deleted once ISO 18497-1 is published)