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Tractors and machinery for agriculture — Auto-guidance systems for operator-controlled tractors and self-propelled machines — Safety requirements

Tracteurs et matériels agricoles — Systèmes d'autoguidage pour tracteurs commandés par opérateur et pour machines automotrices — Exigences de sécurité

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 10975 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort*.

Introduction

Auto-guidance systems are used in tractors and self-propelled agricultural machines to reduce operator fatigue and to increase the accuracy and efficiency of field operations. To ensure the proper function and safety of such systems, this International Standard specifies requirements for controls and displays, activation and deactivation of the system, audible and/or visual indicators to show the status of the system and the information to be provided to the operator. According to the current practice, these requirements are applicable to factory installed systems and systems intended to be retrofitted.

Tractors and machinery for agriculture — Auto-guidance systems for operator-controlled tractors and self-propelled machines — Safety requirements

1 Scope

This International Standard specifies safety requirements for auto-guidance systems used in agricultural tractors and self-propelled agricultural machines.

It is applicable to auto-guidance systems which are factory installed as an integral part of the tractor or self-propelled machine as well as systems designed to be retrofitted to equipment after such equipment has left the control of the manufacturer.

It is not applicable to guidance systems used in tractors or self-propelled machines that do not require an on-board operator for primary control of the tractor or self-propelled machine.

This International Standard does not specify requirements necessary to ensure the integrity of the complex electronic control system which can be an integral part of the auto-guidance system. Such requirements are dealt with in other International Standards which address complex electrical/electronic vehicle control systems.

When requirements of this International Standard are different from those which are stated in a machine specific standard, the requirements of the machine specific standard take precedence over the requirements of this International Standard.

This International Standard is neither applicable to tractors and self-propelled machines which were manufactured with an auto-guidance system before the date of publication of this International Standard, nor to self-contained auto-guidance retrofit systems which were individually placed on the market before the date of publication of this International Standard.

NOTE Specific road traffic regulations can impose additional requirements for auto-guidance systems.

2 Normative references

The following referenced documents are indispensable for the application 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 3600, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and presentation*

ISO 4254-1, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 10998, *Agricultural tractors — Requirements for steering*

ISO 11684, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

ISO 12100-1, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 15077, *Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation*

ISO 26322-1, *Tractors for agriculture and forestry — Safety — Part 1: Standard tractors*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4254-1, ISO 10998, ISO 12100-1 and ISO 26322-1 and the following apply.

3.1
activity monitor
type of operator presence system whereby the auto-guidance system receives feedback from the operator's station indicating that an operator is present at the operator station

3.2
auto-guidance system
group of components used in conjunction with the main steering system which provides assistance to the operator in steering the tractor or self-propelled machine, but in which the operator remains at all times in primary control

3.3
complex electronic control system
electronic control systems subject to a hierarchy of control in which a controlled function may be over-ridden by a higher level electronic control system/function

3.4 States

3.4.1
active state
switched on and providing dynamic steering commands to the tractor or self-propelled machine

3.4.2
enabled state
switched on and prepared to carry out steering of the tractor or self-propelled machine upon receipt of a valid command or signal

3.4.3
disabled state
switched off or not prepared to carry out steering

3.5
signal
information or data in the form of either electrical voltages or currents, digital messages by a direct connection or by a communication data network which is provided to a control system

EXAMPLE Satellite signals provided by a receiver by a RS232 connection or a network in conformity with ISO 11783 (all parts).

3.6
visual indicator
signal that is intended to be detected by the sense of sight

EXAMPLE A lamp, LED, display message or display symbol.

4 Safety requirements and/or measures

4.1 Controls and displays

4.1.1 Location, marking and method of operation of controls shall comply with the requirements of ISO 15077.

4.1.2 A display, if provided, shall be constructed and positioned such that the operator has adequate visibility to operate the machine and view the work area and so as to not interfere with direct access to primary machine controls. The display may be mounted in such a way that it can be positioned in different locations, e.g. to account for adequate visibility for field operations as compared to operation on roadways.

4.1.3 In the case where the visual indicator is available as information on a display which utilizes more than one operator-selected screen or page, the indicator need not be present on each screen or page, but shall be present on at least one designated screen or page. The designated screen or page shall be identified in the operator's manual.

4.2 Operator presence system

An operator presence system shall be provided. This requirement is fulfilled through the use of a mechanical/electrical/electronic means used to detect if an operator is no longer in the operator station or an activity monitor or other technical solutions which are capable of detecting the presence of an operator in the operator station.

4.3 State requirements

4.3.1 At engine start-up, the auto-guidance system shall be in the disabled state.

4.3.2 Means such as contact switches, soft keys or other similar devices, accessible to the operator, shall be provided to change

a) between the disabled and enabled states,

b) from the enabled state to the active state, and

c) from the active state to the disabled state.

4.3.3 A visual indicator showing the current (disabled, enabled or active) state of the system shall be provided.

4.3.4 An audible indicator shall be provided which shall sound when the system enters or leaves the active state.

4.3.5 The system shall require a command from the operator to change from the disabled or enabled state to the active state.

4.3.6 When the tractor or self-propelled machine is stationary, there shall be no movement of steering components initiated by the auto-guidance system.

4.3.7 The system shall automatically change from the active state to either enabled or disabled state under any of the following conditions.

a) The operator turns the steering wheel, which can be measured by either rate or range of motion or increased hydraulic pressure or flow rate:

   1) if rate of motion is measured, the auto-guidance system shall change state if the steering wheel is moved at an angular speed of 50°/s or faster;

2) if range of motion is measured, the auto-guidance system shall change state if the steering wheel moves 30 ° or more;

3) for vehicles without a steering wheel, the auto-guidance system shall leave the active state when the operator manipulates the primary steering controls;

4) for vehicles with a steering wheel, the steering effort required to leave the active state shall not exceed 250 N (as defined in ISO 10998);

b) For systems that rely only on satellite signals, whenever the satellite systems signal provide insufficient data to determine vehicle position to the desired level of accuracy.

c) For systems that rely not only on satellite signals, whenever all signals (e.g. crop feeder data and satellite signals) are lost.

d) Within a maximum of 10 s after an indication that the operator is not present or else is not active in the operator station.

5 Information for use

5.1 Operator's manual

5.1.1 An operator's manual complying with the requirements of ISO 3600 shall be provided with each system.

5.1.2 In particular, instructions shall be given that the operator shall disable (i.e. set to the disabled state) the auto-guidance system when the tractor or self-propelled machine is travelling on a public roadway.

5.2 Safety and instructional signs

5.2.1 Safety signs conforming to the requirements of ISO 11684 shall be appropriately displayed when necessary to alert the operator and others to the risk of personal injury during normal operation and service.

5.2.2 Safety signs may be affixed to the equipment or displayed as electronic images, either momentarily or for the entire period of operation.

5.2.3 Instructional signs relating to equipment operation, servicing and care shall have an appearance, different from safety signs affixed to the equipment or displayed as electronic images.

Bibliography

[1] ISO 11783-1, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 1: General standard for mobile data communication*

[2] ISO 11783-2, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 2: Physical layer*

[3] ISO 11783-3, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 3: Data link layer*

[4] ISO 11783-4, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 4: Network layer*

[5] ISO 11783-5, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 5: Network management*

[6] ISO 11783-6, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 6: Virtual terminal*

[7] ISO 11783-7, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 7: Implement messages application layer*

[8] ISO 11783-8, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 8: Power train messages*

[9] ISO 11783-9, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 9: Tractor ECU*

[10] ISO 11783-10[1)], *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 10: Task controller and management information system data interchange*

[11] ISO 11783-11, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 11: Mobile data element dictionary*

[12] ISO 11783-12, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 12: Diagnostics services*

[13] ISO 11783-13, *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 13: File server*

[14] ISO 11783-14[1)], *Tractors and machinery for agriculture and forestry — Serial control and communications data network — Part 14: Sequence control*

1) To be published.