



SLOVENSKI STANDARD
oSIST prEN ISO 5010:2018
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Stroji za zemeljska dela - Stroji na kolesih - Zahteve za krmiljenje (ISO/DIS 5010:2018)

Earth-moving machinery - Wheeled machines - Steering requirements (ISO/DIS 5010:2018)

Erdbaumaschinen - Bereifte Maschinen - Lenkanlagen (ISO/DIS 5010:2018)

Engins de terrassement - Engins équipés de pneumatiques - Systèmes de direction (ISO/DIS 5010:2018)

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53.100 Stroji za zemeljska dela Earth-moving machinery

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Earth-moving machinery — Wheeled machines — Steering requirements

Engins de terrassement — Engins équipés de pneumatiques — Systèmes de direction

ICS: 53.100

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ISO/DIS 5010:2018(E)**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.

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 5010 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety requirements and human factors*.

The main changes with respect to previous edition are that Earth-moving machinery (EMM) with a maximum machine speed < 20 km/h is also covered by the standard.

This fourth edition cancels and replaces the third edition (ISO 5010:2007), which has been technically revised.

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Introduction

This standard now includes steering requirements for drums and crawler wheel assembly EMM.

Functional safety of Steering system is not covered in this document. Guidance for functional safety of steering systems can be found in the following standards: ISO 15998:2008, ISO/TS 15998-2:2012 and ISO 13849-1:2015. The ISO 19014- series is under development, once it is published it will give the Functional safety requirements of the Earth-Moving Machinery

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Earth-moving machinery — Wheeled machines — Steering requirements

1 Scope

This document specifies steering system tests and performance criteria for evaluating the steering capability of wheeled, ride-on earth-moving machinery as defined in ISO 6165. Wheeled machines include machines equipped with wheels, one or more drums or crawler wheel assemblies.

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 3450, *Earth-moving machinery — Wheeled or high-speed rubber-tracked machines — Performance requirements and test procedures for brake systems*

ISO 6014, *Earth-moving machinery — Determination of ground speed*

ISO 6165, *Earth-moving machinery — Basic types — Identification and terms and definitions*

ISO 7457, *Earth-moving machinery — Determination of turning dimensions of wheeled machines*

ISO 10968, *Earth-moving machinery — Operator's controls*

ISO 13849 (all parts), *Safety of machinery — Safety-related parts of control systems*

ISO 15998, *Earth-moving machinery — Machine-control systems (MCS) using electronic components — Performance criteria and tests for functional safety*

ISO 18752, *Rubber hoses and hose assemblies — Wire- or textile-reinforced single-pressure types for hydraulic applications — Specification*

ISO 19014, *Earth-moving machinery — Control system safety — Risk assessment and determination of performance level*

IEC 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

steering system

system including all machine elements between the operator and the ground-contacting wheels, drums or crawler wheel assemblies participating in steering the machine

3.1.1

manual steering system

steering system depending exclusively on the muscular power of the operator to effect steering of the machine

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3.1.2

powered steering system

steering system employing auxiliary power sources to supplement or replace the muscular power of the operator to effect steering of the machine

3.1.3

primary steering system

steering system used to steer the machine when the steering system functions as intended

3.1.4

secondary steering system

steering system used to steer the machine in the event of a failure of the primary steering power source(s) or engine stoppage

3.2

wheel

circular structure able to rotate on an axle, either directly or with the use of bearing(s), with the external part in contact with the ground

3.3

crawler wheel assembly

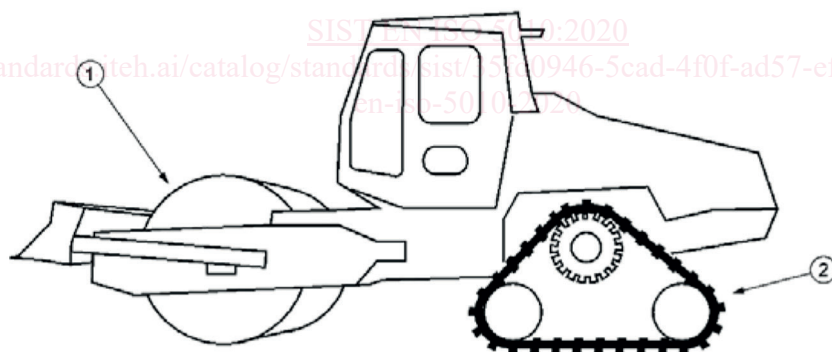
crawler system used to replace a wheel on a single axle See Fig 1

Note 1 to entry: Machines with crawler wheel assemblies are steered using techniques common to rubber-tyred machines, for example Ackermann steering, articulated steering

3.4

wheeled machine

machine on wheels, drums or crawler wheel assemblies See Fig 1

**Key**

- 1 drum
- 2 crawler wheel

Figure 1 — Wheeled machine with drum and crawler wheel assemblies

3.5

steering power sources

3.5.1

primary steering power source

means for providing power to effect steering in a power assisted steering in a powered steering system

EXAMPLE Hydraulic pump, air compressor, electric generator.

3.5.2**secondary steering power source**

means for providing power to the secondary steering system in the event of primary steering power source failure

EXAMPLE EXAMPLE Hydraulic pump, air compressor, accumulator, battery.

Note 1 to entry: It is assumed that not more than one failure will occur at the same time

3.5.3**primary steering power source failure**

complete and instantaneous loss of the primary steering power source

Note 1 to entry: It is assumed that not more than one failure will occur at the same time

3.6**steering control element**

control elements used by the operator to transmit the desired direction of steering of the machine or generate control of the relative speed of the left-hand and right-hand sides of the drive system

EXAMPLE 1 steering wheel, lever controls, joystick controls, pushbutton/touch pad controls and foot pedal controls

EXAMPLE 2 For a machine that has an equal alternative operator's position both at left and right-hand side of the machine equipped with a conventional steering wheel at both positions (e. g. some kind of rollers), these two steering wheels shall be considered as one steering element

3.6.1**principal steering control element**

steering control element at the operator's positions that is used to fulfil the primary steering and secondary steering, if applicable

3.6.2**alternative steering control element**

additional steering control element, that can be used instead of the principal steering control element to fulfil primary steering

3.7**steering effort**

necessary force exerted by the operator on the steering control element in order to steer the machine

3.8**steering angle**

total displacement angle between the front wheels and the rear wheels as they move about one or more vertical steering axes from their normal straight-ahead condition to a turned condition

Note 1 to entry: The steering angle for multiple-axle machines is determined between the wheels at the farthest forward and farthest rearward axles.

Note 2 to entry: Ackermann steering inherently has a greater steering angle on the side of the machine toward the inside of the turn as compared to the wheels on the outside of the turn. Therefore, where Ackermann steering is involved, the location of the steering angle measurement also needs to be specified.

Note 3 to entry: A steering angle accomplished by a combination of geometries incorporating Ackermann steering is included, and also requires the location of the steering angle measurement to be specified.

3.9**wheel circle**

outer wheel clearance diameter determined in accordance with [Clause 7](#)

3.10**working circuit pressure**

nominal pressure applied to the specific circuit by the pumps