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## Earth-moving machinery — Safety requirements for remote operator control

*Engins de terrassement — Exigences de sécurité pour la commande à distance utilisée par l'opérateur*



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Published in Switzerland

## Foreword

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ISO 15817 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety requirements and human factors*.

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# Earth-moving machinery — Safety requirements for remote operator control

## 1 Scope

This International Standard specifies the safety requirements for wireless and/or wired remote control systems, used on earth-moving machinery as defined in ISO 6165.

It does not apply to autonomous control systems that enable a machine to work without the assistance of an operator, but rather is applicable to machines controlled remotely by an operator. This International Standard does not apply to the remote control of attachments on non-remote controlled machines.

This International Standard does not specify performance criteria for the remote control system. Where “wireless control” or “wired control” features as a subclause title, the provisions of that subclause are applicable to the corresponding control only.

## 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 — Braking systems of rubber-tired machines — Systems and performance requirements and test procedures*

ISO 5006-1, *Earth-moving machinery — Operator's field of view — Part 1: Test method*

ISO 6165, *Earth-moving machinery — Basic types — Vocabulary*

ISO 6405-1, *Earth-moving machinery — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 6405-2, *Earth-moving machinery — Symbols for operator controls and other displays — Part 2: Specific symbols for machines, equipment and accessories*

ISO 9244, *Earth-moving machinery — Safety signs and hazard pictorials — General principles*

ISO 10265, *Earth-moving machinery — Crawler machines — Performance requirements and test procedures for braking systems*

ISO 13766, *Earth-moving machinery — Electromagnetic compatibility*

ISO 15998, *Earth-moving machinery — Machine-control systems (MCS) using electronic components — Performance criteria and tests for functional safety<sup>1)</sup>*

ISO 17063, *Earth-moving machinery — Braking systems of pedestrian-controlled machines — Performance requirements and test procedures*

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1) To be published.

IEC 60068-2-32, *Basic environment testing procedures — Part 2: Tests — Test Ed: Free fall*

IEC 60204-1:2000, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC 60529, *Degrees of protection provided by enclosures (IP code)*

IEC 60947-5-1, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices*

### 3 Terms and definitions

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

#### 3.1

##### **remote control**

##### **remote operator control**

control of a machine by wireless or wired transmission of signals from a remote control box not located on the machine to a receiving unit located on the machine

#### 3.2

##### **remote control system**

system for transmitting operational information or control to a remote-controlled machine

NOTE It consists of a remote control box and a receiving unit.

#### 3.3

##### **remote-controlled operation**

operation of a machine by an operator distant from the machine

#### 3.4

##### **remote control box**

device with controls to actuate all needed operating functions for control of the machine from a distant place

NOTE The signals are transmitted between the remote control box and the receiving unit.

#### 3.5

##### **receiving unit**

device located on the machine to receive signals emitted from the remote control box and to process these signals into machine operating orders

NOTE It consists of following elements:

- receiving element that receive signals from the remote control box;
- monitoring element for confirming signals;
- output intersection element that drives the control devices of the machine.

The receiving unit may also include means of return signal transmission for confirmation.

#### 3.6

##### **control cable**

electric wire for transmitting signals between the remote-control box and the receiving unit

#### 3.7

##### **hazard zone**

area defined by the manufacturer of the machine and by the use of the machine where potential for injury might exist due to movement of the machine and its application