



BSI Standards Publication

Earth-moving machinery — Machine control systems (MCS) using electronic components

Part 2: Use and application of ISO 15998

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National foreword

This Published Document is the UK implementation of ISO/TS 15998-2:2012.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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**Earth-moving machinery – Machine
control systems (MCS) using
electronic components –**

**Part 2:
Use and application of ISO 15998**

*Engins de terrassement – Systèmes de contrôle-commande utilisant
des composants électroniques –*

Partie 2: Utilisation et application de l'ISO 15998



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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.

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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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/TS 15998-2 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 3, *Machine characteristics, electrical and electronic systems, operation and maintenance*.

ISO 15998 consists of the following parts, under the general title *Earth-moving machinery — Machine control systems (MCS) using electronic components*:

- *Performance criteria and tests for functional safety*
- *Part 2: Use and application of ISO 15998* [Technical Specification]

ISO 15998:2008, *Performance criteria and tests for functional safety*, is to become Part 1.

Introduction

The complexity inherent in electronic controls standards makes it difficult to determine even the basic levels of safety requirements. This part of ISO 15998 has been developed to assist the user of ISO 15998 by defining common earth-moving machinery features and possible failure modes with the reasonable and consistent levels of safety requirements. It will help the user to know that others will be adopting similar requirements for similar hazardous conditions.

While the first part of ISO 15998 and its reference documents are written in the abstract, this Technical Specification outlines processes in a way that relate directly to earth-moving machinery. Through its multiple examples, the user can more easily determine how to apply ISO 15998 to the different types of earth-moving machine.

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Earth-moving machinery — Machine control systems (MCS) using electronic components —

Part 2: Use and application of ISO 15998

1 Scope

This part of ISO 15998 assists in the interpretation and application of the performance criteria and tests of functional safety for electronic machine control systems (MCS), used on earth moving machinery, given in the first part of ISO 15998, by

- illustrating an alternative method of hazard assessment,
- providing information and application examples to illustrate compliance with ISO 15998,
- clarifying definitions, requirements and application of ISO 15998, including addressing the risk of hazardous machine movements by safety-related MCS, and
- providing guidance on the use and relationship of the normative references cited in the first part of ISO 15998.

Electronic MCS are those control systems that directly affect machine motion, i.e. propulsion (powered motion), braking, steering, attachments and working tool control systems. ISO 15998 is applicable to the mechanical failures of switches, sensors and other electronic devices and to the mechanical failure of solenoid valves such as sticking caused by debris (electronic fault monitoring of the solenoid valve function can be used if the risk assessment determines it is necessary).

Systems and ESAs (electrical/electronic subassemblies) that are ancillary to machine operation and which do not alter machine control — such as monitors, alarms, gauges, lights and wipers, as well as those portions of systems that provide feedback to the operator — are outside the scope of ISO 15998, as are purely hydraulic, pneumatic and/or mechanical MCS not using electronic/electric components, and mechanical failures such as broken axles, purely mechanical valves, tyres and similar.

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 13706, *Earth-moving machinery — Electromagnetic compatibility*

ISO 13849-1:2006, *Safety of machinery — Safety related parts of control systems*. Corrected by ISO 13849-1:2006/Cor 1:2009

ISO 15998:2008, *Earth-moving machinery — Machine-control systems (MCS) using electronic components — Performance criteria and tests for functional safety*¹⁾

1) To become ISO 15998-1.