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Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems

Part 2: Particular requirements for externally-powered machines

AS ISO 14990.2:2022

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Australasian Institute of Mining & Metallurgy
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Better Regulation Division — Safework NSW
Construction and Mining Equipment Industry Group
Department of Regional NSW
Engineers Australia
Institute of Instrumentation, Control & Automation Australia
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Mining Electrical and Mining Mechanical Engineering Society
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Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems

Part 2: Particular requirements for externally-powered machines

First published as AS ISO 14990.2:2022.

Preface

This Standard was prepared by the Standards Australia Committee ME-063, Earthmoving Equipment.

The objective of this document is to specify the particular safety requirements for the electrical equipment and its components incorporated in externally-powered (mains-connected, including machines powered by external dedicated generators), electrically-driven earth-moving machines (EMMs).

This document is applicable to those machines using on-board voltages in the range of 50 V–36 kV AC r.m.s. at any frequency and 75 V–36 kV DC — including any repetition rate of pulsating DC — intended for outdoor use. Voltages occurring within devices are not considered to be on-board voltages and are thus not within its scope.

This document is intended to be used in conjunction with AS 14990.1:2022, which gives general requirements for EMMs regardless of how they are powered. Requirements specific to self-powered machines are given in AS ISO 14990.3:2022. However, it is possible for an EMM to be both self-powered and externally-powered (e.g. a battery-powered machine having a built-in charger with power supply function), in which case AS ISO 14990.3:2022 is also applicable.

This document is identical with, and has been reproduced from, ISO 14990-2:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives and related components and systems — Part 2: Particular requirements for externally-powered machines*.

As this document has been reproduced from an International Standard, a full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

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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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 3, *Machine characteristics, electrical and electronic systems, operation and maintenance.*

This document is intended to be used in conjunction with ISO 14990-1.

Introduction

This document is a type-C standard as defined in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations, or hazardous events are covered are indicated in ISO 14990-1:2016, Annex A.

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

Electrification is an enabling technology providing increased flexibility in machine form packaging. Because in the past earth-moving machinery (EMM) electrical systems have predominately been in the 12–24 V DC range, two safety aspects require particular attention:

— significantly higher voltages, such as are utilized in industrial or structural applications and in other transportation sectors;

— greater available electrical energy.

Portions of this document appear to govern electrical design practices (e.g. Clauses 9, 11, 12, and 17). Their requirements are necessary because certain aspects of design cannot be separated from electrical safety.

Some of the content of this document is based on IEC 60204-1 and IEC 60204-11, adapted to the needs of earth-moving machinery. Non-electrical hazards are addressed in the ISO 20474 series.

Figure 1 is provided as an aid to the understanding of the interrelationship of the various elements of a machine and its associated equipment. Figure 1 is a block diagram of a typical machine and associated equipment showing the various elements of the electrical equipment addressed in this document.

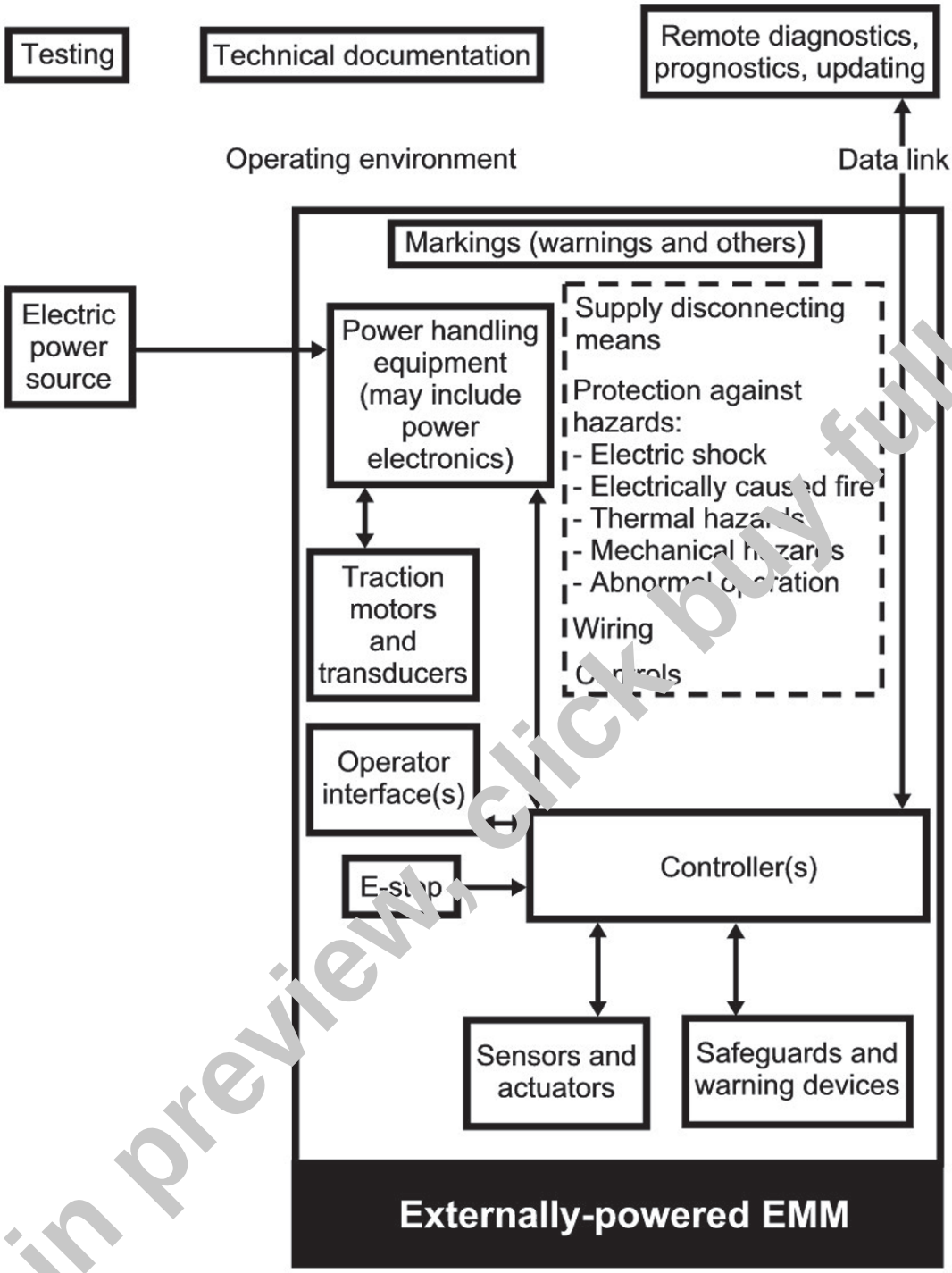

Figure 1 — Block diagram of a typical machine

NOTES

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1 Scope

This document specifies the particular safety requirements for the electrical equipment and its components incorporated in externally-powered (mains-connected, including machines powered by external dedicated generators), electrically-driven earth-moving machines (EMMs).

It is applicable to those machines using on-board voltages in the range of 50 V–36 kV AC r.m.s. at any frequency and 75 V–36 kV DC — including any repetition rate of pulsating DC — intended for outdoor use. Voltages occurring within devices are not considered to be on-board voltages and are thus not within its scope.

It is intended to be used in conjunction with ISO 14990-1, which gives general requirements for EMMs regardless of how they are powered. Requirements specific to self-powered machines are given in ISO 14990-3. However, it is possible for an EMM to be both self-powered *and* externally-powered (e.g. a battery-powered machine having a built-in charger with power supply function), in which case ISO 14990-3 is also applicable.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 14990-1:2016, *Earth-moving machinery — Electrical safety of machines utilizing electric drives or related components and systems — Part 1: General requirements*

ISO 14990-3, *Earth-moving machinery — Electrical safety of machines utilizing electric drives or related components and systems — Part 3: Particular requirements for self-powered machines*

IEC 60071-1:2006, *Insulation Coordination — Part 1: Definitions, principles and rules.* Amended by IEC 60071-1:2006/Amd. 1:2010

IEC 60364-5-52, *Low-voltage electrical installations — Part 5-52: Selection and erection of electrical equipment — Wiring systems*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification — Identification of equipment terminals, conductor terminations and conductors*

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms, definitions and abbreviated terms given in ISO 14990-1 apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp