TECHNICAL REPORT

ISO/TR 9953

First edition
1996-12-15

Earth-moving machinery — Warning devices for slow-moving machines — Ultrasonic and other systems

Engins de terrassement — Dispositifs avertisseurs des machines à déplacement lent — Systèmes à ultrasons et autres

Reference number
ISO/TR 9953:1996(E)

Documents
Document Sharing Hub

Full document details: ISO_TR 9953_1996

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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/TR 9953, which is a Technical Report of type 2, was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety requirements and human factors*.

This document is being issued in the type 2 Technical Report series of publications (according to subclause G.3.2.2 of part 1 of the ISO/IEC Directives 1995) as a "prospective standard for provisional application" in

© ISO 1996

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Documents
Document Sharing Hub

Full document details: ISO_TR 9953_1996

the field of detection devices for reversing commercial vehicles because there is an urgent need for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the ISO Central Secretariat.

A review of this Technical Report (type 2) will be carried out not later than two years after its publication with the options of: extension for another three years; conversion into an International Standard; or withdrawal.

Annex A forms an integral part of this Technical Report.

Documents
Document Sharing Hub

Full document details: ISO_TR 9953_1996

Introduction

This Technical Report outlines the procedure and sets criteria necessary to qualify a machine-mounted detecting/warning device.

The purpose of this warning device is to prevent serious injury to persons caused by backward movement of machines where the direct view of the operator is restricted by parts or components of the machine (i.e. engine hood).

The system provides the operator with audible and additional optical warning of persons or objects in the path of the machine during self-propelled rearward movement.

After evaluating all currently available alternatives, experts and organizations responsible for occupational safety consider that the most effective reduction in accidents can be achieved by monitoring the area to the rear of the machine with ultrasonic sensors or similar systems which are linked to visual/acoustic warning devices in the cab.

Requirements and tests contained in this Technical Report for warning devices on reversing slow-moving machines have been devised by ISO/TC 127/SC 2, which includes equipment manufacturers, earth-moving machine manufacturers, and organizations representing operators and those responsible for occupational safety. Manufacturers and test houses are requested to present their experience with the requirements of this Technical Report. In this regard, the following should be observed.

a) In the opinion of the experts in the subcommittee, rearward detection devices cannot be implemented on their own. The accident-preventing function can only be tested in conjunction with the relevant machine model, by optimizing the monitoring range. A generally mandatory measuring plan is necessary for this.

b) As with these devices, the safety questions for reversing detection devices scarcely concern prevention of electrical contact or sharp mechanical edges, etc., but rather reliability of operation (possibly including self-monitoring). Requirements should focus primarily on this.

Documents
Document Sharing Hub
Full document details: ISO_TR 9953_1996

Earth-moving machinery — Warning devices for slow-moving machines — Ultrasonic and other systems

1 Scope

This Technical Report describes a method for evaluating the performance of a monitoring system, the minimum monitoring range behind the machine during rearward movement, the optical and audible information to the operator, and the self-testing properties of the system.

It is applicable to machines as defined in ISO 6165, with an operating speed of up to 5 km/h, and having visibility restrictions in accordance with ISO 5006-2, visibility category III at field of view (see 4.4.3 of ISO 5006-2:1993) and at visual field (see 4.5.3 of ISO 5006-2:1993).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Technical Report. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5006-2:1993, *Earth-moving machinery — Operator's field of view — Part 2: Evaluation method.*

ISO 6165:— [1], *Earth-moving machinery — Basic types — Vocabulary.*

ISO 7731:1986, *Danger signals for work places — Auditory danger signals.*

ISO 9227:1990, *Corrosion tests in artificial atmospheres — Salt spray tests.*

ISO 13766:— [2], *Earth-moving machinery — Electromagnetic compatibility.*

IEC 529:1989, *Degrees of protection provided by enclosures (IP code).*

1) To be published. (Revision of ISO 6165:1987)

2) To be published.

AVA Documents
Document Sharing Hub

Full document details: ISO_TR 9953_1996

3 Definitions

For the purposes of this Technical Report, the following definitions apply.

3.1 monitoring system: System which monitors an area at the rear of a machine during rearward movement to indicate an object in the monitoring range by optical and acoustical signals to the operator. The monitoring system contains components as defined in 3.1.1 to 3.1.3.

3.1.1 sensor: Component which detects objects in the monitoring range.

3.1.2 evaluation device: Component which analyses the signals from the sensors and the self-testing property and transmits a corresponding signal to the indication device.

3.1.3 indication device: Component which transmits to the operator audible/optical warning signals related to the respective distance or area.

3.2 monitoring range: Specific three-dimensional area behind the machine, which is divided into a pre-warning range, a main warning range and a collision range. (See figure 1.)

3.3 test body: A standard measuring unit to test the geometry and size of the warning area and its position relative to the machine. It can be made of metal or plastic, depending on the system used.

3.4 sensor location: The location where the sensors are fitted to the machine.

3.5 audible warning signals: Signals to warn the operator audibly in the event of persons or objects within the monitoring range.

3.6 optical warning signals: Signals to warn the operator visually in the event of persons or objects within the monitoring range.

3.7 slow-moving machine: Earth-moving machine which operates at a speed of up to 5 km/h during rearward movement at working and manoeuvring modes.

3.8 monitoring of operational reliability: A self-testing property of the system, with the minimum requirements as specified in 4.8.

3.9 evaluation time: Time from the first registration of an object within the monitoring range to the signal output.

4 Requirements

4.1 Monitoring range

The monitoring range shall be measured from the most rearward outline of the machine. The monitoring range is defined by the measuring points in figures 2 to 5.

4.2 Sensor location

The sensor(s) should be fitted to the rear of the machine and so arranged that the monitoring range as specified in 4.1 is covered. For excavators, the sensor(s) should be fitted to the rear of the upper structure so that the monitoring area is controlling rearward movement in relation to the operator's facing direction. The sensor location should not restrict any function or operation of the machine.

AVA Documents
Document Sharing Hub

Full document details: ISO_TR 9953_1996