SLOVENSKI STANDARD
SIST EN ISO 3450:2000

01-april-2000

Earth-moving machinery - Braking systems of rubber-tyred machines - Systems and performance requirements and test procedures (ISO 3450:1996)

Earth-moving machinery - Braking systems of rubber-tyred machines - Systems and performance requirements and test procedures (ISO 3450:1996)

Erdbaumaschinen - Bremsanlagen von gummibereiften Maschinen - Systeme, Anforderungen und Prüfungen (ISO 3450:1996)

Engins de terrassement - Dispositifs de freinage des engins sur roues équipés de pneumatiques - Exigences relatives aux dispositifs et a leurs performances, et méthodes d'essai (ISO 3450:1996)

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CEN

European Committee for Standardization
Comite Europeen de Normalisation
Europaisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

The text of the International Standard ISO 3450:1996 has been prepared by Technical Committee ISO/TC 127 "Earth-moving machinery" in collaboration with Technical Committee CEN/TC 151 "Construction equipment and building material machines - Safety", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 1996, and conflicting standards shall be withdrawn at the latest by October 1996.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 3450:1996 has been approved by CEN as a European Standard without any modification.

INTERNATIONAL STANDARD

ISO 3450

Third edition
1996-04-01

Earth-moving machinery — Braking systems of rubber-tyred machines — Systems and performance requirements and test procedures

Engins de terrassement — Dispositifs de freinage des engins sur roues équipés de pneumatiques — Exigences relatives aux dispositifs et à leurs performances, et méthodes d'essai

Reference number
ISO 3450:1996(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.

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.

International Standard ISO 3450 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety requirements and human factors*.

This third edition cancels and replaces the second edition (ISO 3450:1985), of which it constitutes a technical revision.

Annex A of this International Standard is for information only.

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Earth-moving machinery — Braking systems of rubber-tyred machines — Systems and performance requirements and test procedures

1 Scope

This International Standard specifies minimum performance and test criteria for brake systems to enable uniform assessment of the braking capability of earth-moving machinery which operates on work sites or travels on public roads. Service secondary, and parking brake systems, and retarders are covered by this International Standard.

This International Standard applies to self-propelled, rubber-tyred loaders, tractors, graders, backhoe loaders, tractor-scrapers, excavators and dumpers as defined in ISO 6165.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 6014:1986, *Earth-moving machinery — Determination of ground speed.*

ISO 6016:1982, *Earth-moving machinery — Methods of measuring the masses of whole machines, their equipment and components.*

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

ISO 7132:1990, *Earth-moving machinery — Dumpers — Terminology and commercial specifications.*

ISO 9248:1992, *Earth-moving machinery — Units for dimensions, performance and capacities, and their measurement accuracies.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 earth-moving machine: Rubber-tyred machine as defined in ISO 6165 which operates on work sites or travels on public roads.

3.2 brake system: All the components which combine together to stop and/or hold the machine, consisting of a control, means of brake actuation, the brake(s) and, if the machine is so equipped, the retarder.

3.2.1 service brake system: Primary system used for stopping and holding the machine.

3.2.2 secondary brake system: System used for stopping the machine in the event of any single failure in the service brake system.

3.2.3 parking brake system: System used to hold a stopped machine in a stationary position.

3.2.4 Brake system components

3.2.4.1 brake control: Component directly activated by the operator to cause a force to be transmitted to the brake(s).

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

3.2.4.2 brake actuation system: All of the components between the control and the brake(s) which connect(s) them functionally.

3.2.4.3 brake(s): Component which directly applies a force to oppose movement of the machine. Brakes may, for example, be of friction, electrical, hydrostatic or other fluid types.

3.2.4.4 retarder: Energy-absorption component normally used to control machine speed.

3.3 common component: Component that performs a function in two or more brake systems.

3.4 machine mass: Operating mass of a machine which includes the heaviest combination of cab, canopy, ROPS or FOPS with all their components and mountings, and equipment approved by the manufacturer of the machine, including operator and full liquid systems according to ISO 6016.

3.5 stopping distance, s: Distance travelled by the machine from the point on the test course at which the machine brake control actuation begins to the point on the test course where the machine is fully stopped.

3.6 mean deceleration, a: Average rate of change of the velocity of the machine from the instant the brake control actuation begins until a full stop is achieved.

NOTE 1 It may be determined from the formula

$$a = \frac{v^2}{2s}$$

where

a is the mean deceleration, in metres per second squared;

v is the velocity of the machine immediately prior to the brake control being activated, in metres per second;

s is the stopping distance, in metres.

3.7 burnish: Procedure to condition the frictional surfaces of the machine brake(s).

3.8 brake system pressure: Fluid pressure available to the brake control.

3.9 brake application pressure: Fluid pressure measured at the brake.

3.10 modulated braking: Capability to continuously and progressively increase and decrease the braking force by operation of the brake control.

3.11 test course: Surface upon which the test is carried out. (See 6.2.)

3.12 cold brakes: Expression designating brakes where

— the brakes have not been actuated in the previous 1 h, except in accordance with 6.9; or

— the brakes have been cooled to 100 °C or less when measured on the brake disc or on the outside of the brake drum; or

— in the case of totally enclosed brakes, including oil-immersed brakes, the temperature measured on the outside of the housing closest to the brake is below 50 °C or within the manufacturer's specifications.

3.13 maximum machine level surface speed: Machine speed determined in accordance with ISO 6014, or equivalent.

4 Instrument accuracy

The instruments used to carry out the required measurements shall conform to conditions of ISO 9248.

5 General requirements

The following requirements for brake systems apply to all machines given in clause 1.

5.1 Required brake systems

The machine shall have the following brake systems:

a) a service brake system;

b) a secondary brake system;

c) a parking brake system.

No brake system shall contain a disconnect such as a clutch or shiftable gear-box which allows the brake(s) to be disabled.

A power source disconnect designed for cold weather starting which also disables a brake system shall require application of the parking brake prior to disconnection.

5.2 Common components

Brake systems may use common components. However, a failure of any single component other than a tyre, or a failure of any single common component, shall not reduce the effectiveness of the machine's stopping capability to less than the secondary performance defined in 5.4, and table 2, 3 or 4, as applicable, with one exception: a common control (lever, pedal, switch, etc.) may be used to actuate combined service and secondary brake systems provided that another dynamic braking capability is provided that will stop the machine within 120 % of the dynamic stopping distance shown for secondary brakes in table 2, 3 or 4, as applicable. This braking capability may be applied automatically and without modulation.

5.3 Service brake system

5.3.1 All machines shall meet the service brake performance requirements of 7.5, 7.6 or 7.7 as applicable.

If other systems are provided with power from the service brake system, any failure in these systems shall be considered to be the same as a failure in the service brake system.

5.3.2 All machines shall have brakes of equal nominal capacity rating applicable to each wheel of at least one axle. Machines with semi-trailed units shall have brakes applicable to at least one axle of the towing machine and one axle of the semi-trailed units.

5.3.3 The service brake system shall be modulated as defined in 3.10.

5.4 Secondary brake system

All machines shall meet the secondary brake performance requirements of 7.6 or 7.7, as applicable.

The secondary brake system shall be modulated as defined in 3.10.

5.5 Parking brake system

A parking brake disconnect (release) designed to allow movement of disabled machines shall be located outside the operator's station unless it can be reapplied immediately.

All machines shall meet the parking brake requirements of 7.5.

After being applied, this system shall not depend on an exhaustible energy source. The parking brake system may use common components with other brake systems provided the requirements of 7.5 are met.

5.6 Warning device for stored energy sources

If stored energy is used for the service brake system, that system shall be equipped with a warning device which is activated before the system energy drops below 50 % of the maximum operating energy level specified by the manufacturer or the level required to meet the secondary brake performance requirements, whichever level is higher.

The device shall readily attract the operator's attention by providing a continuous visible and/or audible warning. Gauges indicating pressure or vacuum do not meet this requirement.

6 Test conditions

6.1 Manufacturer's precautions shall be observed while carrying out performance tests.

6.2 The test course shall consist of a hard, dry surface with a well-compacted base. Ground moisture may be present to the extent that it does not adversely affect the braking test.

The test course shall not have a slope of more than 3 % at right angles to the direction of travel. Slope in the direction of travel shall be as specified for the test being carried out.

The approach to the test course shall be of sufficient length, smoothness and uniformity of slope to ensure the required machine speed is reached before the brakes are actuated.

6.3 The machine mass and axle load distribution shall be as defined in 6.3.1 or 6.3.2, as applicable.

6.3.1 The test mass of all machines except dumpers and tractor-scrapers shall be as stated in 3.4 without a payload and at the manufacturer's specified axle load distribution.

6.3.2 The test mass of dumpers and tractor-scrapers shall be as stated in 3.4 and include a payload. The machine test mass shall be equal to the manufacturer's specifications for gross mass (the sum of the machine mass and payload) and axle load distribution.

6.4 All parameters relating to braking systems shall be within the machine manufacturer's specifications, i.e. tyre size and pressure, brake adjustment, warning