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

Engins de terrassement — Dispositifs de freinage des engins à conducteur accompagnant — Exigences de performance et modes opératoires d'essai

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Foreword

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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.

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 17063 was prepared by Technical Committee ISO/TC 127, *Earth-moving machinery*, Subcommittee SC 2, *Safety requirements and human factors*.

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

1 Scope

This International Standard specifies minimum performance criteria and tests for braking systems, enabling uniform assessment of the braking capability of pedestrian-controlled, self-propelled earth-moving machinery (as specified in ISO 6165) with a machine mass greater than 115 kg and a travel speed of less than 6 km/h. It is applicable to both service and parking brakes.

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 6014, *Earth-moving machinery — Determination of ground speed*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6165 and the following apply.

3.1
pedestrian controlled machine
self-propelled crawler or wheeled machine designed to be controlled by a person that does not ride on the machine

3.2
braking system
components which combine together to stop and/or hold machine, consisting of the **brake** (3.3.1), **brake actuation system** (3.3.2) and **brake control** (3.3.3)

3.2.1
service brake
primary system used for stopping and holding machine

3.2.2
parking brake
system used to hold stopped machine in a stationary position

3.3
braking system components

3.3.1
brake
component(s) which directly applies a force to oppose movement of machine

NOTE Brakes may, for example, be of friction, electrical, or hydrostatic or other fluid types.

3.3.2
brake actuation system
all components between **brake control** (3.3.3) and **brake(s)** (3.3.1) which connect the brake control and brake(s) functionally

3.3.3
brake control
component directly activated by operator to apply the **braking system** (3.2)

3.4
machine mass
maximum operating mass of machine as specified by machine manufacturer

NOTE See ISO 6016.

3.5
stopping distance
distance travelled by machine from point on **test course** (3.7) at which machine brake control actuation begins to point on test course where machine is fully stopped

3.6
maximum machine level surface speed
machine speed determined in accordance with ISO 6014

3.7
test course
surface upon which the test is carried out

NOTE See Clause 5.

4 General requirements

4.1 Braking systems

Pedestrian controlled machines shall be fitted with means for satisfying the requirements of a service brake system and a parking brake system.

Ground drive systems, including hydrostatic drives, which satisfy the braking requirements of 6.1 and 6.2 are acceptable as the braking means.

The braking system shall not contain a disconnect, such as a clutch or shiftable gear box, which allows the brake(s) to be disabled. Disconnects designed to allow movement of disabled machines shall be located outside the operator's position.

4.2 Brake controls

Braking system controls shall be capable of being applied by the operator from the normal operating position(s), as specified by the manufacturer.

The force to actuate the brake control shall not exceed 20 N for finger (flip levers and switches) actuation and 220 N for hand grasp actuation.

5 Test conditions

Immediately prior to performing the brake tests, machine systems recommended by the manufacturer shall be at normal operating temperature.

The test machine shall be configured for operating in the manufacturer's recommended transport position and the mass shall be the machine mass (3.4).

The test course shall consist of a hard, dry surface with a well-compacted base and a slope no greater than 3 % transversely. The slope in the direction of travel shall be as specified for the test being conducted.

Manufacturers' precautions shall be observed while carrying out performance tests.

6 Test and performance criteria

6.1 Service brake

6.1.1 Requirements

A means shall be provided for stopping and holding the machine's motion in both forward and reverse directions.

6.1.2 Test procedure

6.1.2.1 Stopping

The machine stopping distance shall be determined at maximum forward and maximum reverse speeds. When testing a machine equipped with separate clutch and brake controls, the clutch shall be disengaged simultaneously with brake engagement. The test course shall be in accordance with Clause 5 with no more than 1 % slope in the direction of travel.

6.1.2.2 Holding

The holding performance shall be determined by placing the machine on a 25 % test slope, or if less, the maximum slope the machine can ascend in both forward and reverse directions.

An alternative test method is to apply a pulling force to the stationary machine on a level surface with the service brake system applied. The pulling force shall be applied horizontally below the centre of gravity to achieve a minimum force equivalent to the slope. For a slope of 25 %, the equivalent force in newtons is 2,38 times the machine mass in kilograms.

For machines using the hydrostatic drive system as a service brake, hydraulic power may be used to prevent creeping.

6.1.3 Performance acceptance

6.1.3.1 Stopping distance

The braking system shall stop the machine from its maximum machine level surface speed in both forward and reverse directions. The stopping distance in metres shall be less than or equal to 0,2 of the maximum surface speed measured in kilometres per hour.

6.1.3.2 Holding performance

With the service brake system applied, the machine shall hold in both forward and reverse directions when tested according to 6.1.2.2. Creep rate without use of hydraulic power (refer 6.1.2.2) shall not exceed 2 m/min.

6.2 Parking brake

6.2.1 Requirements

A means shall be provided for holding the machine stationary unless it can be manually turned perpendicular to a 20 % slope. The parking brake may be in combination with the service brake.

After being applied, the system shall not be dependent upon an exhaustible energy source. The control shall be fixable in its actuated position or automatically applied in case of loss of energy. The likelihood of accidental release shall be reduced. If the ground drive system serves as the parking brake, actuation of a control with the engine off shall not result in machine movement on the test slope unless the control can be immediately reapplied and stop the machine.

When chocks are used to meet parking brake requirements, instructions for their use and storage on the machine shall be provided.

6.2.2 Test procedure

Position the machine on a 20 % test slope with the parking brake system applied. Alternatively, apply a pulling force to the stationary machine on a level surface with the parking brake system applied. Apply the pulling force horizontally below the centre of gravity to achieve a minimum force equivalent to the 20 % slope. The equivalent force in newtons is 1,92 times the machine mass in kilograms.

6.2.3 Performance acceptance

The parking brake system shall hold the machine stationary with the engine off and the ground drive in neutral (if applicable) in both forward and reverse directions.

7 Test report

The test report shall contain the following information:

a) reference to this International Standard (i.e. ISO 17063);

b) type of machine;

c) model and serial number of the test machine;

d) mass of the machine as tested;

e) manufacturer’s approved maximum machine mass;

f) tyre or track size;

g) description of the brakes;

h) type of braking system;

i) slope of the test course or force applied;

j) results of all brake tests;

k) force levels applied to the controls;

l) machine maximum level surface speed;

m) date test was performed;

n) signature of person performing the test;

o) manufacturer of machine.

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