
International Standard



6014

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Earth-moving machinery — Determination of ground speed

Engins de terrassement — Détermination de la vitesse au sol

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6014 was developed by Technical Committee ISO/TC 127, *Earth-moving machinery*, and was circulated to the member bodies in August 1978.

It has been approved by the member bodies of the following countries :

Australia	Germany, F. R.	Spain
Austria	Italy	Sweden
Belgium	Japan	United Kingdom
Brazil	Korea, Rep. of	USA
Bulgaria	Poland	USSR
Egypt, Arab Rep. of	Romania	Yugoslavia
France	South Africa, Rep. of	

No member body expressed disapproval of the document.

Earth-moving machinery — Determination of ground speed

1 Scope and field of application

This International Standard specifies a method of determining the speed of earth-moving machinery. It applies to both wheel-ed and track-laying earth-moving machinery.

The test method specified may be used for many purposes, and for any particular purpose the condition of the machine, for example laden or unladen, should be stated in the test report.

2 Definitions

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

2.1 test track : The area upon which the test is conducted.

2.2 test track length : The measured length of the track over which the speed is measured.

2.3 time recorder : Apparatus arranged to measure the time interval.

2.4 time interval : The time taken for the machine to travel the test track length.

2.5 machine speed : The average speed of the machine as it is driven over the test track length.

2.6 test speed : The mean value of the average speeds recorded in the individual tests.

2.7 mass : The mass of the machine in the condition in which it is tested, including the mass of the operator and fuel.

3 Apparatus

Any equipment may be used to measure the speed of the machine provided that the accuracies specified in clause 5 are achieved.

3.1 For example, the following equipment may be used (see the figure) :

3.1.1 Light source, used to activate a photo-sensitive transistor. It may be an electric lamp fed by a battery, generator or mains supply.

3.1.2 Control box, linked to the photo-sensitive transistor and the electronic digital display timer, incorporating a switch to permit time measurements in either direction.

3.1.3 Electronic digital display timer (otherwise referred to as the variable time base counter), used to measure the time interval during which the machine under test traverses the test lengths of the track.

3.1.4 Electrical supply. This may be a direct current supplied by batteries, when an inverter is required to produce an alternating current from a direct current electrical supply. Alternatively, a mains alternating current may be used.

3.1.5 Tape measure, at least 25 m in length, to determine the test track length.

3.1.6 Adjustable tripods, to support all light sources and photo-sensitive transistors at the same height.

3.2 Alternatively, the time may be measured with stop-watch equipment.

4 Test conditions

The test may be carried out on any type of track but the test track length shall be a minimum of 20 m and in any case of sufficient length to be compatible with the speed of the machine being tested. Since the apparatus used in the test can be completely portable, it is possible to make speed measurements on gradients, on natural ground and on normal road surfaces in any conditions. The time recorder shall be set up in such a way that the machine under test has a sufficiently long approach route to the test length in which to gain the speeds required, and enough room to brake, turn around and, if required, undergo a test in the opposite direction. The test track and machine conditions shall be as specified in the appropriate standard (for example, ISO 5009 or ISO 3450, for braking tests which require a knowledge of the speed of the machine, the conditions shall be as required in the standard).

For level test tracks, the difference in height between any two points not less than 25 m apart along the test track shall not exceed 100 mm.

The cross fall for all test tracks shall not exceed 1 in 40.

Immediately prior to the test, the machine shall be run for a period sufficient to ensure that the engine, transmission, oils and coolant are at normal working temperatures.

5 Procedure

The machine, prepared as required, shall be driven towards the test area at a constant speed and shall be driven through the test track length without any change on the throttle setting or gear. It shall be driven in a direction parallel to the longitudinal axis of the test length of the track. The time interval for a point on the machine to traverse the test track length shall be recorded.

The test shall be carried out not less than three times in each direction if the track is level, and not less than six times in one direction if the speed on a gradient is to be determined. The maximum wind speed for tests in one direction shall be 6 m/s. The average machine speed over the test track length shall be calculated for each individual test and the mean value of all the speeds calculated and reported as the test speed.

The following accuracies shall be adhered to when conducting the tests :

Measurement	Accuracy
Test length of track, <i>l</i> , in metres	± 0,25 %
Time interval, <i>t</i> , in seconds	± 2,0 %

The speed, *v*, in metres per second, shall be calculated from the formula

$$v = \frac{l}{t}$$

The test speed shall be the mean of not less than six individual speed measurements.

6 Test report

The test report shall contain the following information :

- a) reference to this International Standard;
- b) the type of machine;
- c) the make of machine;
- d) the number or identification of the machine;
- e) whether wheeled or tracked machine;
- f) condition of the machine, for example laden or unladen or as otherwise tested;
- g) mass of machine, in kilograms;
- h) auxiliary components attached, for example dozer blade;

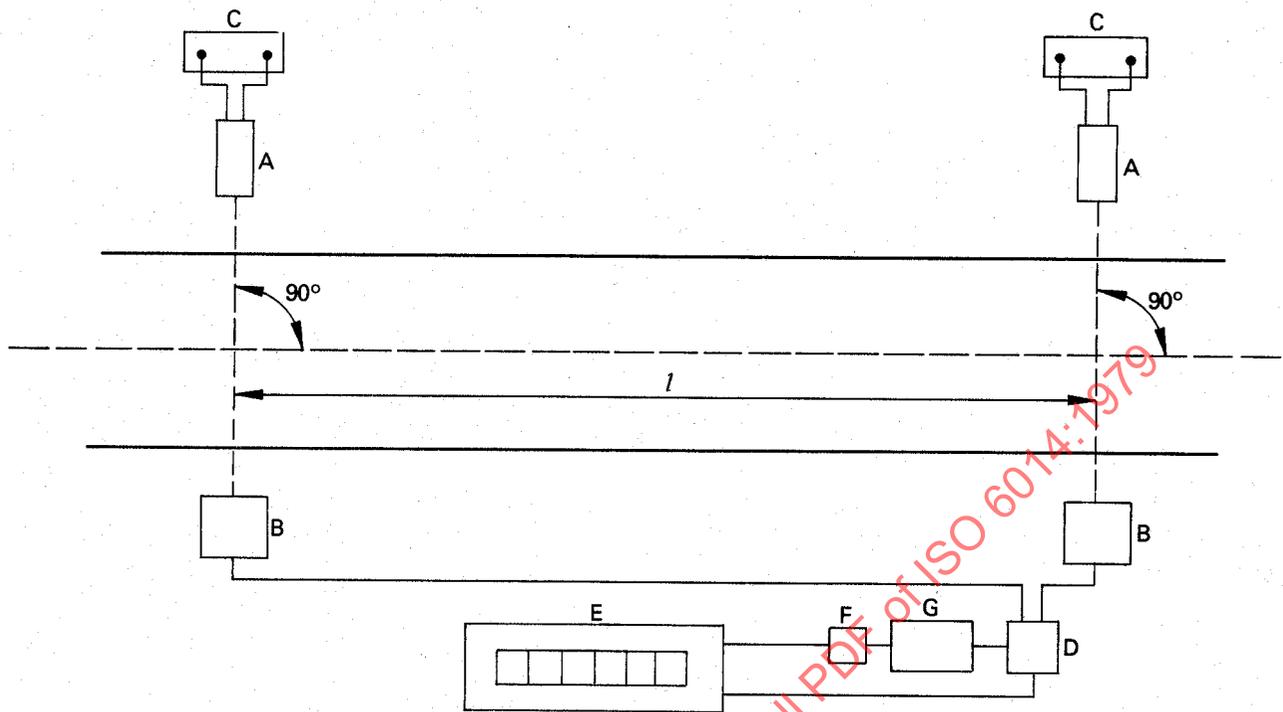
- j) attitude of attachment for example "bucket at the carry position";
- k) tyre size, ply rating, and condition;
- m) type pressure, in kilopascals;
- n) condition of the test track, i.e. wet or dry;
- p) type of test track, i.e. asphalt, concrete, gravel, natural ground;
- q) measured length of test track, in metres;
- r) longitudinal gradient of test track, i.e. level, "up gradient", "down gradient";
- s) cross-fall of test track;
- t) machine gear at which test was conducted;
- u) weather conditions, including wind speed, in metres per second, and direction relative to the test track;
- v) any other details relevant to the particular test carried out, for example type and mode of operation of brakes, condition of machine;
- w) machine speed measurements :

Test No.	Direction of travel for example left to right, right to left, downhill	Time interval <i>t</i> s	Machine speed $v = \frac{l}{t}$ m/s (km/h)
<i>n</i>			
1		<i>t</i> ₁	<i>v</i> ₁
2		<i>t</i> ₂	<i>v</i> ₂
3		<i>t</i> ₃	<i>v</i> ₃
4		<i>t</i> ₄	<i>v</i> ₄
5		<i>t</i> ₅	<i>v</i> ₅
6		<i>t</i> ₆	<i>v</i> ₆
.		.	.
.		.	.
.		.	.
<i>n</i>		<i>t</i> _{<i>n</i>}	<i>v</i> _{<i>n</i>}

- y) determined test speed, *v*, of machine, in kilometres per hour :

$$v = \frac{v_1 + v_2 + v_3 + \dots + v_n}{n}$$

NOTE — The average value of speed *v* should be rounded to the first decimal digit.



- A Light source
- B Photo-sensitive transistor
- C 12 V battery
- D Control box
- E Electronic digital display timer
- F Invertor
- G D.C. supply battery
- l Test track length

Figure — Typical layout of equipment for the measurement of machine

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