
**Garden equipment — Safety
requirements for combustion-engine-
powered lawnmowers —**

**Part 1:
Terminology and common tests**

**AMENDMENT 1: Annex G (Vibration test
code — Hand-arm vibration and whole-
body vibration)**

[ISO 5395-1:2013/Amd.1:2017](https://standards.iteh.ai/standards/ISO/5395-1:2013/Amd.1:2017)

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**Matériel de jardinage — Exigences de sécurité pour les tondeuses à
gazon à moteur à combustion interne —**

Partie 1: Terminologie et essais communs

*AMENDEMENT 1: Annexe G (Code d'essai de vibration — Vibrations
main-bras et vibrations transmises à l'ensemble du corps)*



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[ISO 5395-1:2013/Amd 1:2017](https://standards.iteh.ai/catalog/standards/sist/8b51c2fd-8b1a-4a18-837e-c467cabccffa/iso-5395-1-2013-amd-1-2017)
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This document was prepared by Technical Committee ISO/TC 23 *Tractors and machinery for agriculture and forestry*, Subcommittee SC 13 *Powered lawn and garden equipment*.

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Part 1: Terminology and common tests

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Normative references

Add the following references.

ISO 5349-1, *Mechanical vibration — Measurement and evaluation of human exposure to hand-transmitted vibration — Part 1: General requirements*

ISO 8041, *Human response to vibration — Measuring instrumentation*

Annex G

Replace Annex G with the following. Note that G.1 has not been revised, but has been kept here for context.

G.1 General

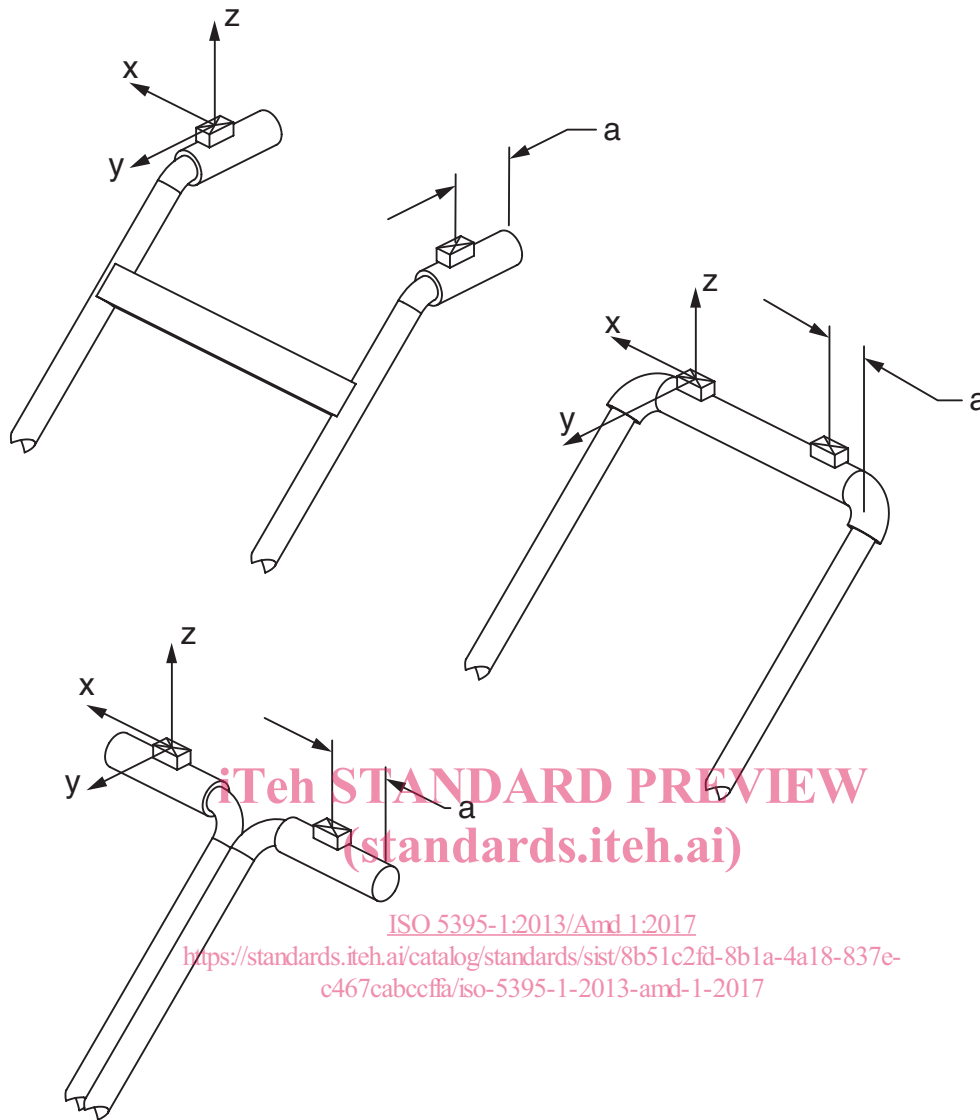
This annex specifies a vibration test code for determining, efficiently and under specified conditions, the magnitude of vibration at the handles of pedestrian-controlled lawnmowers, including sulkies, steering controls of ride-on lawnmowers and whole-body vibrations for operators on sulkies and ride-on lawnmowers.

Although the magnitudes measured are obtained in an artificial operation, they nevertheless give an indication of the values to be found in a real work situation.

G.2 Characterization of hand-arm vibration – Pedestrian-controlled lawnmowers

G.2.1 Direction of measurement

Translational vibration transmitted to the hand is related to the x, y, or z directions shown in [Figure G.1](#).



Key
 a 100 mm

Figure G.1 — Examples of transducer location/orientation (pedestrian-controlled machines)

If the handle design is not covered by one of the examples, the transducer for the hand-arm vibrations shall be located at the normal operating hand position between the thumb and index finger. This position shall be described in the test report.

G.2.2 Location of measurement

The machine shall be held with both hands. Measurements shall be carried out with the transducer as close as possible to a point on the grip surface between the thumb and the index finger (see examples in [Figure G.1](#)).

G.2.3 Magnitude of vibration

The magnitude of vibration shall be the frequency-weighted acceleration a_{hw} in m/s^2 , expressed as a root-mean-square (RMS) value. The frequency weighting shall be according to ISO 5349-1.

The duration time T shall be not less than 8 s for each measurement.

G.2.4 Combination of vibration directions

See ISO 20643:2005/Amd 1:2012, 6.4.

The vibration total value a_{hv} is determined from:

$$a_{hv} = \sqrt{a_{hwx}^2 + a_{hwy}^2 + a_{hwz}^2}$$

where a_{hwx} , a_{hwy} , a_{hwz} are the RMS values of the frequency-weighted acceleration in the x- direction, y-direction, and z-direction, respectively.

G.3 Characterization of hand-arm and whole -body vibration – Ride-on lawnmowers

G.3.1 Direction of measurement

G.3.1.1 Translational hand-transmitted vibration from a steering wheel is related to the steering wheel as follows:

- x-direction: the radial direction;
- y-direction: the direction tangential to the rim of the steering wheel;
- z-direction: the direction orthogonal to both the x-direction and the y-direction.

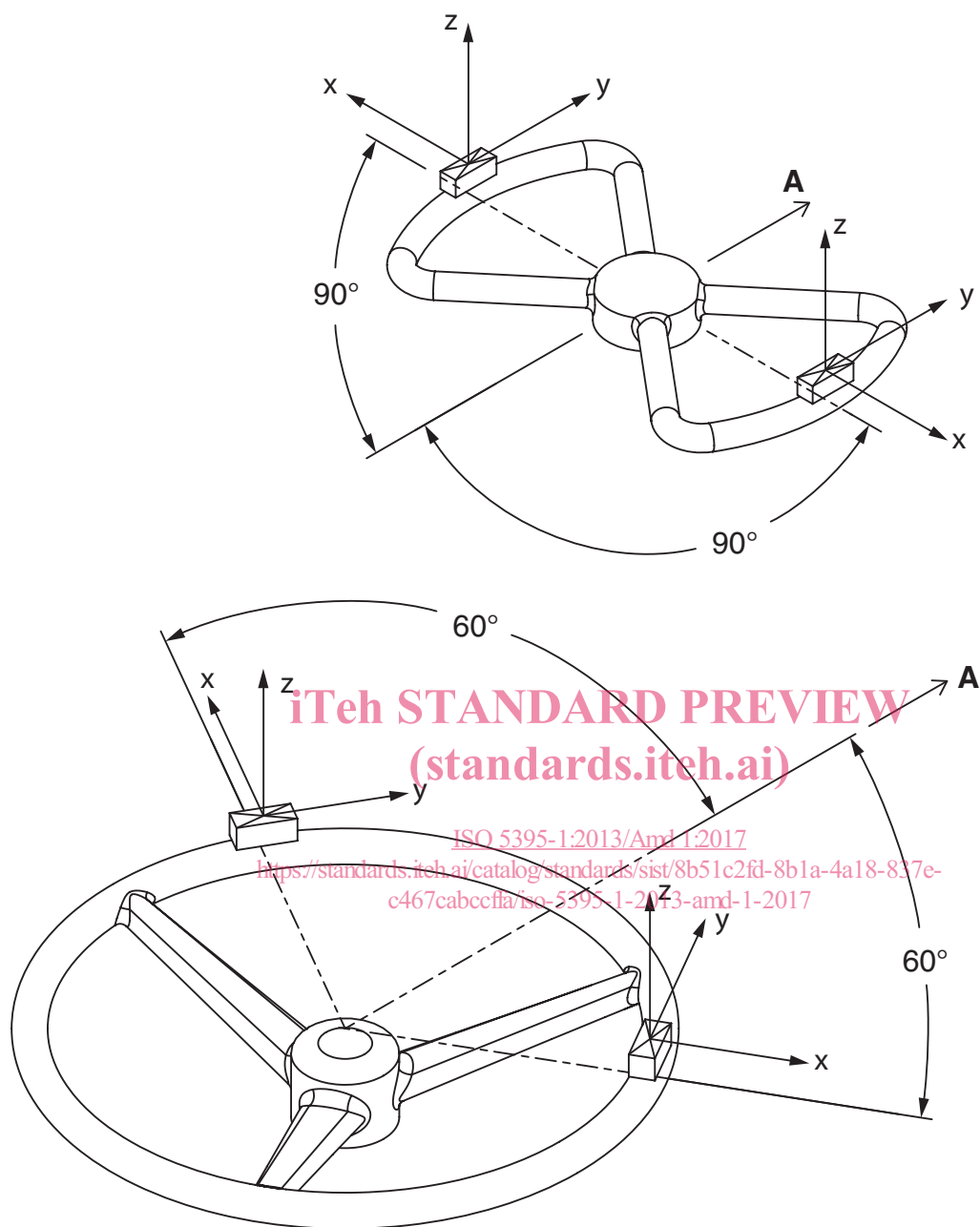
Those directions are illustrated in [Figure G.2](#).

For some machines, a steering control (e.g. levers) is used instead of a steering wheel. In such cases, the directions shall be documented in the test report.

G.3.1.2 Translational whole-body transmitted vibration to the human body is related to the appropriate directions of an orthogonal coordinate system (see [Figure G.3](#)).

The terminology commonly used in biodynamics relates the coordinate systems to the human skeleton in a normal anatomical position. The directions are as follows:

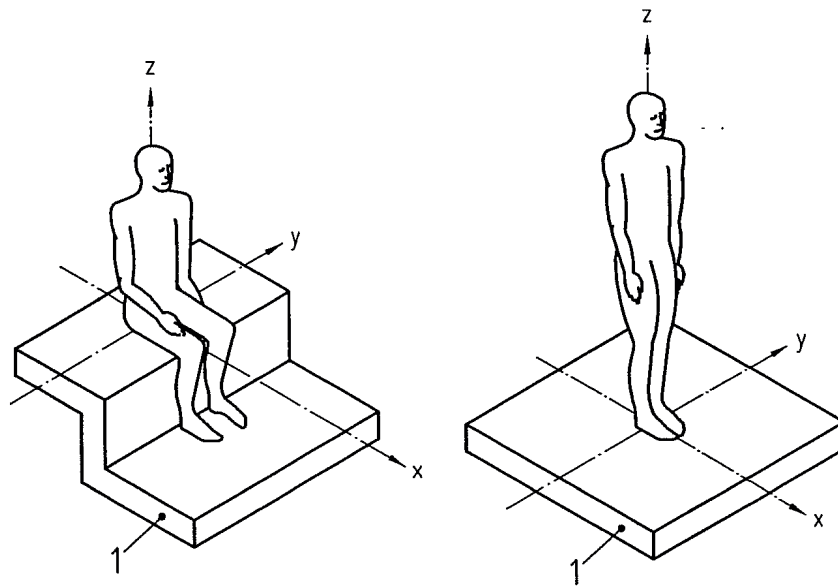
- x-direction: back to chest;
- y-direction: right side to left side;
- z-direction: foot (or buttocks) to head.



Key

A machine front

Figure G.2 — Examples of transducer location/orientation for hand-arm vibration (ride-on machine)

**Key**

1 supporting surface

Figure G.3 — Directions of the basicentric coordinate system for mechanical whole-body vibration influencing human beings
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G.3.2 Location of measurement

The specific requirements shall be according to EN 1032:2003+A1:2008, 6.2.

G.3.3 Magnitude of vibration

The specific requirements shall be according to EN 1032:2003+A1:2008, 6.3.

Measurement time shall be according to G.5.3.

G.3.4 Multi-axial vibration measurements

The specific requirements shall be according to EN 1032:2003+A1:2008, 6.4.

G.4 Instrumentation**G.4.1 General**

The vibration measurement system shall be in accordance with ISO 8041.

Instrumentation for measuring the parameters (e.g. for controlling the working conditions), whose characteristics are not covered by ISO 8041, shall be documented in the vibration test report. The justification for use of such instrumentation shall be given, together with a detailed specification of the instrumentation.

Tachometers shall have an accuracy of $\pm 2,5\%$.

Calibration shall be in accordance with ISO 16063 for the hand-arm and for whole-body vibration.

G.4.2 Instrumentation for measurement of hand-arm vibration of pedestrian-controlled lawnmowers

Vibration measurement systems shall be in accordance with ISO 8041.