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Acoustics — Agricultural and forestry wheeled tractors and self-propelled machines — Measurement of noise emitted when in motion

*Acoustique — Tracteurs agricoles et forestiers à roues et machines
automotrices — Mesurage du bruit émis en mouvement*



Reference number
ISO 7216:1992(E)

Foreword

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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 7216 was prepared jointly by Technical Committees ISO/TC 43, *Acoustics*, Sub-Committee SC 1, *Noise* and ISO/TC 23, *Tractors and machinery for agriculture and forestry*.

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Acoustics — Agricultural and forestry wheeled tractors and self-propelled machines — Measurement of noise emitted when in motion

1 Scope

This International Standard specifies a method for measuring the A-weighted sound pressure level of the noise emitted by agricultural and forestry wheeled tractors and self-propelled machines, fitted with elastic tyres, the noise being measured while the vehicle is in motion.

It is not applicable to special forestry machinery, for example, forwarders, skidders, etc., as defined in ISO 6814.

NOTE 1 The test method calls for an acoustical environment which can only be obtained in an extensive open space.

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 6814:1983, *Machinery for forestry — Mobile and self-propelled machinery — Identification vocabulary*.

IEC 651:1979, *Sound level meters*.

IEC 942:1988, *Sound calibrators*.

3 Definitions

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

3.1 agricultural tractor: A self-propelled wheeled machine having at least two axles, or a track-laying machine, particularly designed to pull, push, carry and operate implements used for agricultural work (including forestry work). It may be provided with a detachable loading platform.

3.2 agricultural self-propelled machine: A machine, other than a tractor, having its own means of propulsion and normally intended for use in agriculture and forestry.

4 Instrumentation

4.1 A suitable measuring device is a sound level meter meeting or exceeding the requirements of a type 1 instrument in accordance with IEC 651.

4.2 If alternative measuring equipment including, for example, a tape recorder and/or level recorder, is used, the tolerances of the several sections of the measuring chain shall not exceed the tolerances given in relevant clauses of IEC 651. If a tape recorder is used as part of the measuring equipment, it may be necessary to include suitable weighting networks for recording and reproduction to provide an adequate signal-to-noise ratio over the whole frequency range of interest.

4.3 The calibration of the equipment at the time of measurements shall be, in all respects, in accordance with the specifications of IEC 651 for a type 1 instrument. Checking of the calibration shall be carried out at appropriate intervals and at least before and after each measurement session, using an acoustical calibrator in accordance with the specifications of IEC 942 for a class 1 instrument.

The calibrator shall be checked annually to verify its output and its calibration shall be traceable to a national standards laboratory.

4.4 The rotational speed of the engine and the road speed of the machine shall be measured with instruments having an accuracy of $\pm 0,5$ % for engine speed and $\pm 1,5$ % for road speed.

5 Meteorological conditions

The test shall not be carried out in adverse weather conditions which are likely to affect the measurements.

The wind velocity measured at 1,2 m above ground level shall not exceed an average value of 5 m/s averaged over a 30 s period, or a maximum value of 8 m/s during the test period. For wind speeds in excess of 1 m/s, a microphone windscreen shall be used; appropriate compensation for the effects of its use shall be allowed for in the calibration.

6 Background noise

The A-weighted sound pressure level of the background noise, including wind noise, shall be at least 10 dB below that produced by the machine being tested.

7 Acoustical environment

7.1 The test site shall consist of a track across a substantially level, open space. It shall be such that hemispherical divergence exists between the noise source and the microphone to within ± 1 dB. This condition is deemed to be satisfied if, within a radius of not less than 50 m, there are no objects (such as buildings, solid fences, rocks and other machines) likely to reflect significant sound.

7.2 The surface of an area having a radius not less than 10 m about the centre of the site (the test area) shall consist of smooth concrete, asphalt or similar hard material, dry and free from acoustically ab-

sorptive materials, such as powdery snow, grass and ashes.

7.3 In the vicinity of the microphone, there shall be no obstacle that could influence the acoustical field and no person shall remain between the microphone and the noise source. The meter reader shall be positioned so as not to influence the meter reading.

8 Layout of the test area

8.1 The centreline of the track (CC), a line (PP) perpendicular to it and passing through the centre of the test area and two lines (AA and BB) parallel to line PP and 10 m from it shall be marked on the track (see figure 1).

8.2 The microphone positions shall be located on the line PP on each side of the centreline and 7,5 m from it as shown in figure 1.

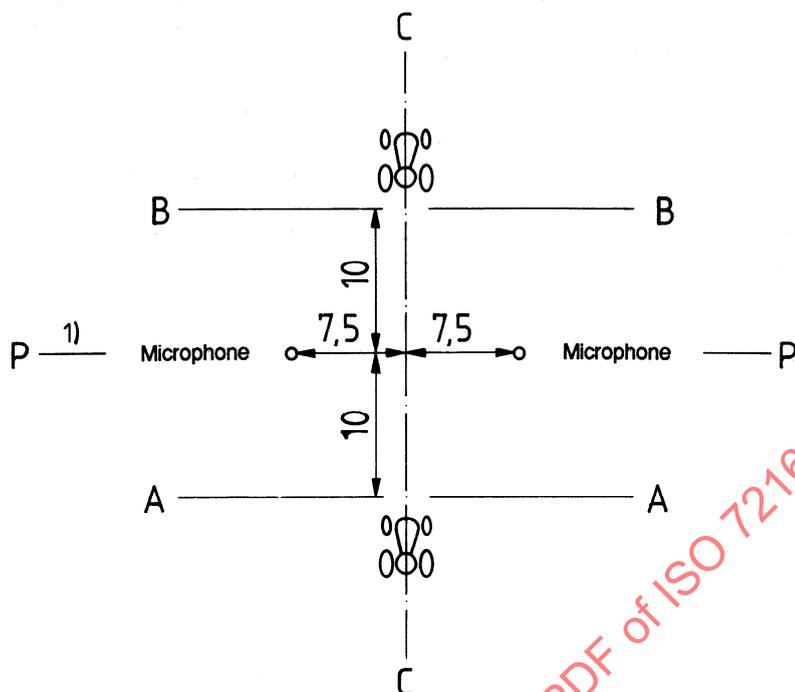
The microphone shall be 1,2 m above ground level.

The microphone shall be oriented in a direction normal to the centreline of the path of travel on the track.

9 Machine conditions

9.1 The machine being tested shall comply with the manufacturer's specifications and shall be operated in accordance with published instructions. It shall be unladen and unballasted and, except in the case of non-separable machines, be without trailer or semi-trailer.

9.2 Immediately before the test, the engine shall be brought to its normal operating temperatures.



- 1) One microphone position may be eliminated, in which case an additional test run from BB to AA is required

Figure 1 — Layout of the test area — Microphone positions

9.3 If the machine is fitted with more than two-wheel drive, it shall be tested in the drive which is intended for normal road use.

9.4 The machine shall be fitted with tyres in accordance with the manufacturer's specifications. The tyres shall not be more than 50 % worn.

9.5 During the test, only those components required for operation on the track shall be in operation.

10 Test procedure

10.1 The machine, with its centreline over the centreline of the track, shall approach line AA at a steady speed corresponding to three-quarters of the maximum speed in the transmission ratio giving the highest travel speed.

10.2 When the front of the machine reaches line AA, open the governor (throttle) fully as rapidly as practicable and hold it in that position until the rear of the vehicle crosses line BB. Then return the governor (throttle) to the slow-idle position as quickly as possible.

10.3 Note the maximum A-weighted sound pressure levels, measured with time-weighting characteristic F during the period in which the machine travels between lines AA and BB. If a sound peak obviously out of character with the general sound pressure level is observed, discard the measurement.

11 Expression of results

11.1 The results shall be considered as valid if the difference between two consecutive measurements made on the side of the machine which gives the higher A-weighted sound pressure does not exceed 2 dB.

11.2 The average of the two highest consecutive values from 10.3, validated as in 11.1, shall constitute the overall test result.

12 Test report

The test report shall include the following details:

- reference to this International Standard;
- the name and address of the manufacturer;
- the machine type, model serial number and transmission type;

- d) the type and rated speed of the engine;
- e) a brief description of the silencing system, if provided;
- f) whether the machine is in two- or four-wheel drive; ,
- g) details of the test site, the testing ground conditions and meteorological conditions;
- h) the measuring instrumentation (including windscreen, if used);
- i) the A-weighted sound pressure level of the background noise;
- j) the number of measurements and the sound pressure levels recorded;
- k) overall test result (see 11.2);
- l) the date and place of test, and signature of tester.

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