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**Acoustics — Measurement of noise emitted  
by accelerating road vehicles —  
Engineering method**

*Acoustique — Mesurage du bruit émis par les véhicules routiers en  
accélération — Méthode d'expertise*

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## Contents

Page

<b>1</b>	<b>Scope.....</b>	<b>1</b>
<b>2</b>	<b>Normative references .....</b>	<b>1</b>
<b>3</b>	<b>Definitions.....</b>	<b>2</b>
<b>4</b>	<b>Vehicle categories.....</b>	<b>2</b>
<b>5</b>	<b>General considerations .....</b>	<b>3</b>
5.1	Driving conditions .....	3
5.2	Interpretation of results.....	3
<b>6</b>	<b>Instrumentation .....</b>	<b>3</b>
6.1	Instruments for acoustical measurement .....	3
6.2	Instrumentation for speed measurements .....	4
6.3	Meteorological instrumentation .....	4
<b>7</b>	<b>Acoustical environment, meteorological conditions and background noise .....</b>	<b>4</b>
7.1	Test site .....	4
7.2	Meteorological conditions .....	4
7.3	Background noise.....	5
<b>8</b>	<b>Procedure.....</b>	<b>5</b>
8.1	Microphone positions.....	5
8.2	Number of measurements.....	5
8.3	Conditions of the vehicle .....	5
8.4	Operating conditions.....	6
8.5	Readings to be taken and reported values .....	9
8.6	Measurement uncertainty .....	9
<b>9</b>	<b>Test report .....</b>	<b>10</b>
	<b>Annex A: Measurement uncertainty.....</b>	<b>11</b>
	<b>Annex B: Bibliography.....</b>	<b>12</b>

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## 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 362 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This third edition cancels and replaces the second edition (ISO 362:1994), which has been technically revised. The method has been modified in relation to earlier editions in order to improve the reproducibility.

Annexes A and B of this International Standard are for information only.

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# Acoustics — Measurement of noise emitted by accelerating road vehicles — Engineering method

## 1 Scope

This International Standard specifies an engineering method for measuring the noise emitted by accelerating road vehicles.

The method is designed to meet the requirements of simplicity as far as they are consistent with reproducibility of results under the operating conditions of the vehicle.

The specifications are intended to reproduce the noise levels which are produced during the use of intermediate gears with full utilization of the engine power available as may occur in urban traffic.

The test method requires an acoustical environment which can only be obtained in an extensive open space. Such conditions can usually be provided for:

- type approval measurements of vehicle; [ISO 362:1998](https://standards.iteh.ai/catalog/standards/sist/e0c75eba-7894-4aa8-88f6-44c036e/iso-362-1998)
- measurements at the manufacturing stage; and
- measurements at official testing stations.

**NOTE** It should be noted that spot checking of vehicles chosen at random can rarely be made in an ideal acoustical environment. If measurements have to be carried out on the road in an acoustical environment which does not fulfil the requirements stated in this International Standard, it should be recognized that the results obtained may deviate appreciably from the results obtained using the specified conditions.

## 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 edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 10844:1994, *Acoustics — Test surface for road vehicle noise measurements*

IEC 60651:1979, *Sound level meters*

IEC 60942:1988, *Sound calibrators*

### 3 Definitions

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

#### 3.1

##### **automatic downshift**

gear change to a lower gear (higher transmission ratio) which can be initiated at the will of the driver

**NOTE** An automatic downshift may be initiated, for example, by a change of pressure on or position of the accelerator control, thereby activating a special programme which effects downshifts to gears which are lower than those normally used in urban driving.

#### 3.2

##### **intermediate result**

value calculated from the test series measurements and used to determine the reported value

#### 3.3

##### **kerb mass**

complete shipping mass of a vehicle fitted with all equipment necessary for normal operation plus the mass of the following elements:

- lubricants, coolant (if needed), washer fluid,
- fuel (tank filled to at least 90 % of the capacity specified by the manufacturer),
- other equipment if included as basic parts for the vehicle, such as spare wheel(s), wheel chocks, fire extinguisher(s), spare parts, and tool-kit

**NOTE** The definition of kerb mass may vary from country to country, but in this International Standard it refers to the definition contained in ISO 1176.

#### 3.4

##### **rated engine speed, $S$**

engine speed at which the engine develops its rated maximum net power as stated by the manufacturer

### 4 Vehicle categories

#### 4.1 Category L: motor vehicles with less than four wheels:

- L1 and L2: mopeds (see ISO 9645 for further details),
- L3: two-wheeled motor vehicles with an engine cylinder capacity  $> 50 \text{ cm}^3$  or maximum speed  $> 50 \text{ km/h}$ ,
- L4: three-wheeled motor vehicles with an engine cylinder capacity  $> 50 \text{ cm}^3$  or maximum speed  $> 50 \text{ km/h}$ , the wheels being attached asymmetrically along the longitudinal vehicle axis,
- L5: three-wheeled motor vehicles with an engine cylinder capacity  $> 50 \text{ cm}^3$  or maximum speed  $> 50 \text{ km/h}$ , having a gross vehicle mass rating  $< 1000 \text{ kg}$  and wheels attached asymmetrically along the longitudinal vehicle axis.

#### 4.2 Category M: motor vehicles with at least four wheels, used for the carriage of passengers:

- M1: vehicles used for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat,
- M2: vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat, and having a maximum mass not exceeding 5 t,
- M3: vehicles used for the carriage of passengers and comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5 t.

#### 4.3 Category N: motor vehicles with at least four wheels used for the carriage of goods:

- N1: vehicles used for the carriage of goods and having a maximum authorized total mass not exceeding 3,5 tonnes,
- N2: vehicles used for the carriage of goods and having a maximum authorized total mass exceeding 3,5 tonnes but not exceeding 12 tonnes,
- N3: vehicles used for the carriage of goods and having a maximum authorized total mass exceeding 12 tonnes.

## 5 General considerations

### 5.1 Driving conditions

This International Standard is based on a test with vehicles in motion. Measurements shall be related to operating conditions of the vehicle which give the highest noise level which may occur during urban driving and which lead to reproducible noise emission. Therefore, an acceleration test from a stated vehicle speed is specified.

### 5.2 Interpretation of results

The results obtained by this method give an objective measure of the noise emitted under the specified conditions of test.

NOTE It is necessary to consider the fact that the subjective appraisal of the annoyance of different classes of motor vehicles is not simply related to the indications of a sound measurement system.

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## 6 Instrumentation <https://standards.iteh.ai/catalog/standards/sist/e0c75eba-7894-4aa8-88f6-4c54ad6c036e/iso-362-1998>

### 6.1 Instruments for acoustical measurement

#### 6.1.1 General

The sound level meter or the equivalent measuring system, including the windscreen recommended by the manufacturer shall at least meet the requirements of Type 1 instruments in accordance with IEC 60651.

The measurements shall be made using the frequency weighting A, and the time weighting F.

When using a system that includes a periodic monitoring of the A-weighted sound pressure level, a reading should be made at a time interval not greater than 30 ms.

#### 6.1.2 Calibration

At the beginning and at the end of every measurement session, the entire measurement system shall be checked by means of a sound calibrator that fulfils the requirements for sound calibrators of at least precision Class 1 according to IEC 60942. Without any further adjustment the difference between the readings of two consecutive checks shall be less than or equal to 0,5 dB. If this value is exceeded, the results of the measurements obtained after the previous satisfactory check shall be discarded.

#### 6.1.3 Compliance with requirements

The compliance of the sound calibration device with the requirements of IEC 60942 shall be verified once a year and the compliance of the instrumentation system with the requirements of IEC 60651 shall be verified at least every 2 years, by a laboratory which is authorized to perform calibrations traceable to the appropriate standards.

## 6.2 Instrumentation for speed measurements

The rotational speed of the engine and the road speed of the vehicle during the constant speed approach shall be measured with instruments meeting specification limits of  $\pm 2\%$  or less.

## 6.3 Meteorological instrumentation

The meteorological instrumentation used to monitor the environmental conditions shall include the following:

- a temperature-measuring device meeting specification limits of  $\pm 1\text{ }^{\circ}\text{C}$  or less;
- a wind speed measuring device meeting specification limits of  $\pm 1,0\text{ m/s}$ .

# 7 Acoustical environment, meteorological conditions and background noise

## 7.1 Test site

The test site should be constructed according to the requirements given in ISO 10844.

The test site shall be substantially level. The surface of the test track shall be dry and its texture such that it does not cause excessive tyre noise. The test track surface shall meet the requirements of ISO 10844.

The test site shall be such that when a small omnidirectional noise source is placed in its surface at the central point (intersection of the microphone line and the centre of the vehicle lane), see figure 1, deviations from hemispherical divergence shall not exceed  $\pm 1\text{ dB}$ .

This condition is deemed to be satisfied if the following requirements are met:

- a) within a radius of 50 m around the centre of the track, the space shall be free of large reflecting objects, such as fences, rocks, bridges or buildings;
- b) the test track and the surface of the site shall be dry and free from absorbing materials, such as powdery snow or loose debris;
- c) 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 observer shall be positioned so as not to influence the meter reading.

**NOTE** It is recommended that the test area be a substantially flat plane, particularly in the portion of the area between the vehicle path and the microphone location (see figure 1).

## 7.2 Meteorological conditions

The meteorological instrumentation should be positioned adjacent to the test area at a height representative of the site, except as noted below.

It is recommended that the measurements be made when the ambient air temperature is within the range from  $0\text{ }^{\circ}\text{C}$  to  $40\text{ }^{\circ}\text{C}$ .

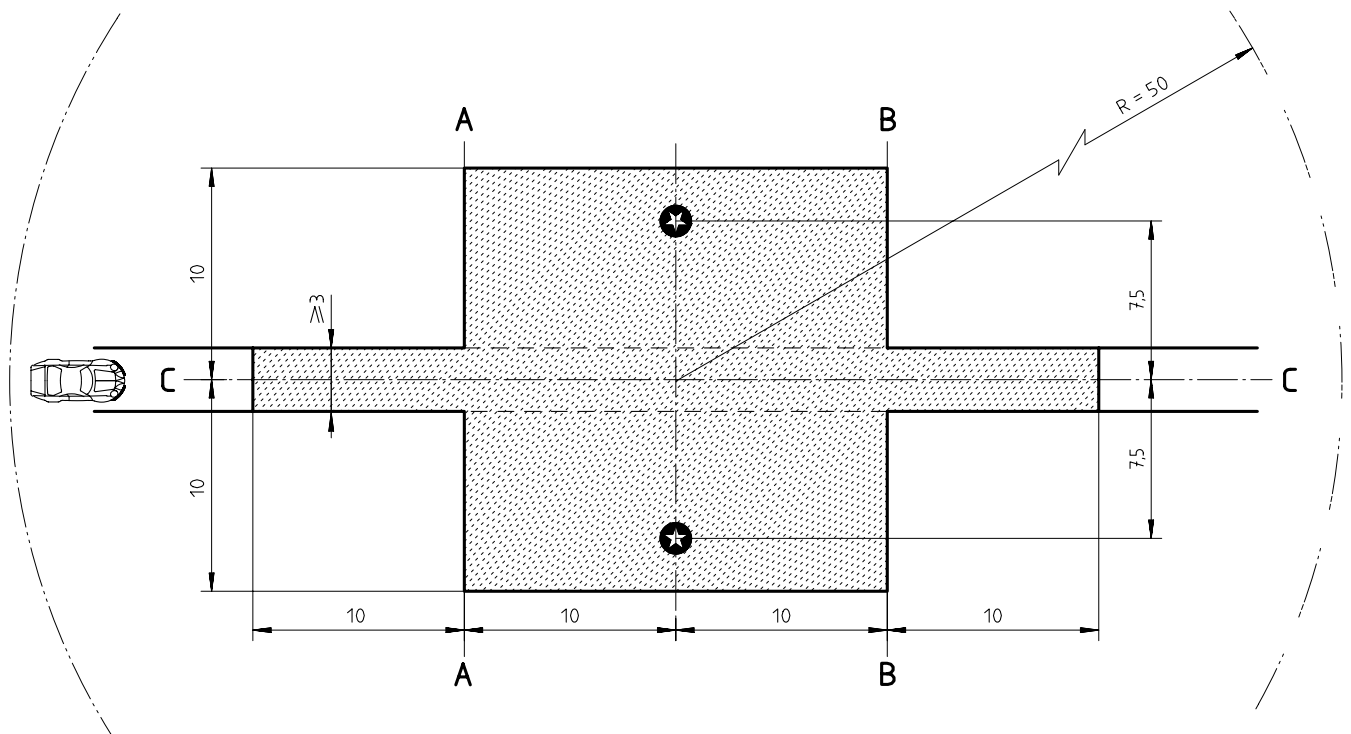
It is recommended that tests should not be carried out if the wind speed, including gusts, at microphone height exceeds  $5\text{ m/s}$  during the sound measurement interval.

It is recommended that a value representative of temperature, wind speed and direction, relative humidity, and barometric pressure be recorded during the sound measurement interval.

**NOTE** When comparing data under different environmental conditions, the effects of temperature and other factors should be considered.



Dimensions in metres



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NOTE Shaded area ("test area") is the minimum area to be covered with a surface complying with ISO 10844.

Figure 1 — Test site dimensions

### 7.3 Background noise

It is recommended that the A-weighted background noise (including any wind noise) be 15 dB below the emissions produced by the vehicle under test, but it shall always be at least 10 dB below.

### 8.1 Microphone positions

The distance from the microphone positions to the centreline of travel CC (see figure 1) on the test track shall be  $7,5 \text{ m} \pm 0,05 \text{ m}$ .

The microphone shall be located  $1,2 \text{ m} \pm 0,02 \text{ m}$  above the ground level. The reference axis for free-field conditions (see IEC 60651) shall be horizontal and directed perpendicularly towards the path of the centreline of travel CC.

### 8.2 Number of measurements

Make at least four measurements on each side of the vehicle.

### 8.3 Conditions of the vehicle

The vehicle shall be supplied with fuel, spark plugs, a fuel supply system, etc., as specified by the vehicle manufacturer.