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# International Standard



# 5130

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Acoustics — Measurement of noise emitted by stationary road vehicles — Survey method

*Acoustique — Mesurage du bruit émis par les véhicules routiers à l'arrêt — Méthode de contrôle*

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Descriptors : road vehicles, acoustic measurement, noise (sound), inspection.

## 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 5130 was developed by Technical Committee ISO/TC 43, *Acoustics*, and was circulated to the member bodies in December 1979.

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

Austria	Greece	Poland
Brazil	Hungary	Romania
Canada	India	South Africa, Rep. of
China	Ireland	Spain
Czechoslovakia	Israel	Sweden
Denmark	Italy	United Kingdom
Finland	Japan	USA
France	Netherlands	USSR
Germany, F. R.	Norway	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Belgium  
Switzerland

This International Standard, together with International Standard ISO 362-1981, cancels and replaces ISO Recommendation R 362-1964, of which it constitutes a technical revision.

# Acoustics — Measurement of noise emitted by stationary road vehicles — Survey method

## 0 Introduction

This International Standard specifies a test method for the determination of noise emitted by stationary road vehicles in use, the noise being measured in proximity to the exhaust. This method is complementary to, but independent of, measuring methods specified in other International Standards and intended for type approval of vehicles.

An additional method, where the measurement of noise is made near the engine, is given in an annex because it requires instrumentation which is presently under development in different countries to avoid damage to the engine.

## 1 Scope and field of application

This International Standard specifies a survey method for measuring the noise produced by a stationary road vehicle at a readily obtainable site having specific characteristics.

The method is intended to check vehicles in use, and also to determine variations in the noise emitted by different parts of the vehicle under test, which can result from

- the wear, maladjustment or modification of particular components, when the defect does not appear by visual inspection;
- the partial or complete removal of devices reducing the emission of certain noises.

These variations shall be determined by comparing the measurements with reference measurements made under similar conditions, for example during the type approval of the vehicle.

This International Standard does not apply to agricultural and forestry tractors for which the measurement of noise emitted when stationary will form the subject of ISO 7217.

## 2 Reference

IEC Publication 651, *Sound level meters*.

## 3 Instrumentation

### 3.1 Instrumentation for acoustical measurements

The sound level meter (or the equivalent measuring system) shall meet the type 1 or 0 requirements of IEC Publication 651.

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

The sound level meter shall be calibrated and adjusted according to the manufacturer's instructions or with a standard sound source (for example a pistonphone) at the beginning and at the end of each series of measurements.

It is recommended that, if the errors of the sound level meter obtained from these calibrations change by more than 1 dB during a series of measurements, the test be considered invalid.

NOTES — If a windscreen is used, it should be of a type specified by the manufacturer to be suitable for the particular microphone. It should be ascertained from the manufacturer that the use of the windscreen does not influence the accuracy of the sound level meter detectably under the ambient conditions of test.

### 3.2 Instrumentation for engine speed measurement

A revolution counter shall be used, with an accuracy of 3 % or better.

## 4 Test site — Local conditions

To reduce the influence of the surroundings on the noise measurements, a test site meeting the following requirements shall be used :

Any open space may be considered as a suitable test site if it consists of a flat area made of concrete, asphalt or hard material having a high acoustical reflectivity, excluding compressed or other earth surfaces. The edges of the test site shall be at least 3 m from the extremities of the vehicle and there shall be no feature or object present on the test site likely to affect the reading of the sound level meter; in particular, the vehicle shall be at a distance not less than 1 m from a pavement edge when the exhaust noise is measured. Any significant obstacles outside the test site shall in addition not be closer than 3 m to the microphone during the test.

With the exception of the observer and driver, no person whose presence influences the meter readings shall remain in the test site during the test.

The measurements shall not be made in adverse weather conditions. Gusts of wind shall not affect the measurements. It is recommended that tests should not be made if the wind speed at microphone height exceeds 5 m/s.

## 5 Background noise and wind interference

The level of background noise (including any wind) at each measurement position shall be at least 10 dB less than the levels measured during the tests.

## 6 Test procedure

### 6.1 Number of measurements

At least three measurements shall be carried out at each measuring position. The measurements shall be considered valid if the range of three measurements made immediately one after the other is not greater than 2 dB. The arithmetic mean value given by these three measurements shall constitute the result.

### 6.2 Positioning and preparation of the vehicle

The vehicle shall be located in the centre of the test area, with the gear in neutral and with the clutch engaged.

Before each series of measurements the engine shall be brought to its normal operating temperature.

In the case of a motor-cycle having no neutral gear position, measurements shall be carried out with the rear wheel raised off the ground.

### 6.3 Measurement of noise in proximity to the exhaust (see figure 1)

#### 6.3.1 Microphone positions

The height of the microphone above the ground shall be equal to that of the outlet orifice of the exhaust gases, but in any case shall not be less than 0,2 m.

The microphone shall be pointed towards the outlet orifice and located at a distance of 0,5 m from the latter.

Unless otherwise indicated by the manufacturer of the sound level meter, its reference axis for free field conditions (see IEC Publication 651) shall be parallel to the ground and shall make an angle of  $45^\circ \pm 10^\circ$  with the vertical plane containing the direction of the gas flow.

In relation to this plane, the microphone shall be placed towards the external side of the vehicle, as shown in figure 1.

In the case of a vehicle provided with two or more exhaust outlets spaced not more than 0,3 m apart and connected to a single silencer, only one measurement position shall be used; the microphone position shall be related to the outlet orifice nearest to the external side of the vehicle or, when such an outlet orifice cannot be determined, to the outlet which is the highest above the ground.

For vehicles with a vertical exhaust (for example commercial vehicles), the microphone shall be placed at the height of the exhaust outlet, orientated upwards and with its axis vertical. It shall be placed at a distance of 0,5 m from the side of the vehicle nearer to the outlet orifice.

For vehicles provided with exhaust outlet orifices spaced more than 0,3 m apart, one measurement shall be made for each outlet as if it were the only one, and the highest level noted.

When the vehicle design is such that the microphone cannot be placed according to figure 1, because of the presence of obstacles being part of the vehicle (for example spare wheel, oil tank, battery), a figure clearly showing the place chosen for the microphone shall be drawn when the measurement is carried out. As far as possible, the microphone shall be placed at a distance greater than 0,5 m from the nearest obstacle and its reference axis for free field conditions (see IEC Publication 651) shall be orientated towards the exhaust gas orifice at a place which is the least masked by the above mentioned obstacles.

#### 6.3.2 Engine operating conditions

The engine speed shall be stabilized at one of the following values :

- for vehicles, except motor-cycles, with controlled ignition engine :  $3 n/4$ ,
- for vehicles, except motor-cycles, with diesel engine :  $3 n/4$ ; if  $3 n/4$  cannot be adjusted by the accelerator : the governed no-load speed,
- for motor-cycles :  $n/2$  if  $n > 5\ 000$  rev/min or  $3 n/4$  if  $n < 5\ 000$  rev/min,

where  $n$  is the engine speed at which the engine produces its maximum power as indicated by the manufacturer.

NOTE — It is recommended that it be ascertained that the governed speed of the diesel engine corresponds to its nominal governed speed.

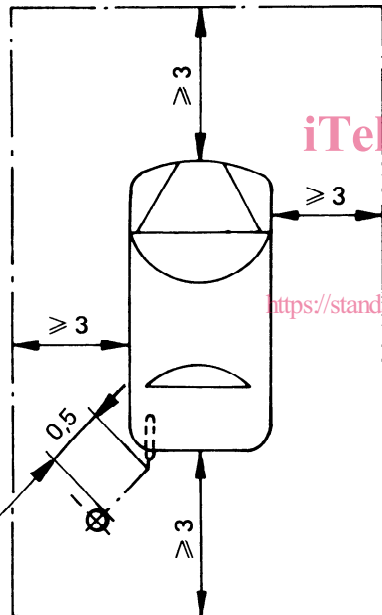
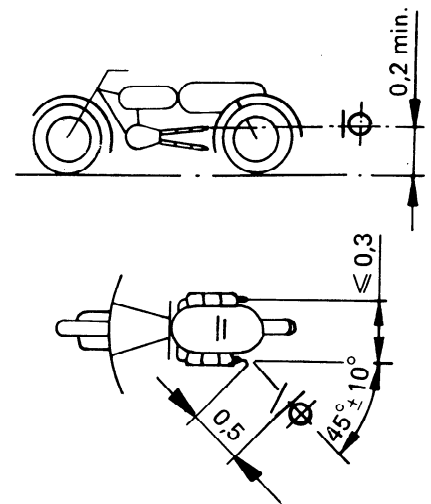
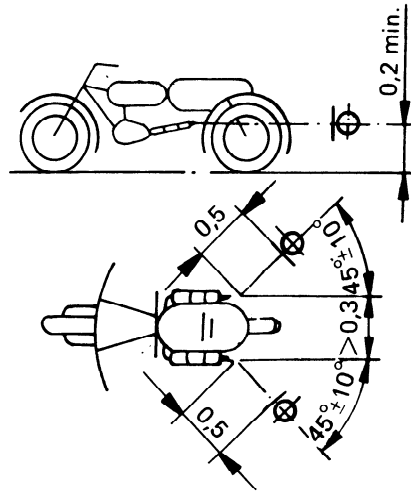
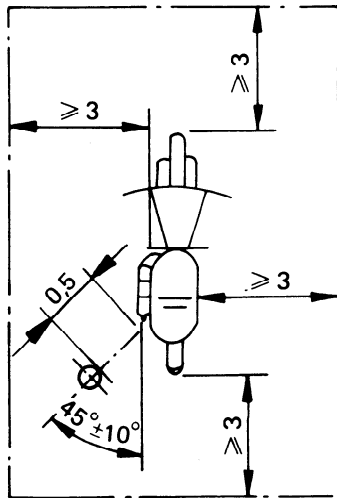
The throttle shall then be suddenly closed, and the noise measured during a period of operation consisting of a brief maintenance of the above constant engine speed and throughout the deceleration. The highest level only shall be recorded.

## 7 Interpretation of results

The results of testing vehicles in use may be interpreted by comparison with the results of a reference test in which new vehicles are tested using the same method. Reference tests may have been carried out during type approval.

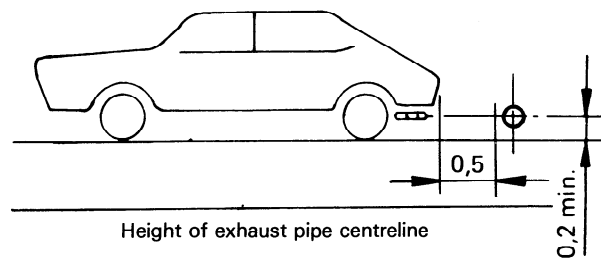
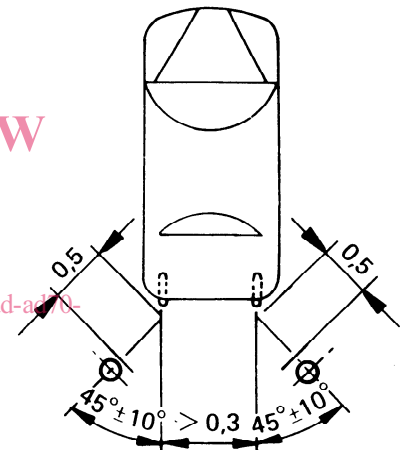
Distances in metres

Height of exhaust pipe centreline

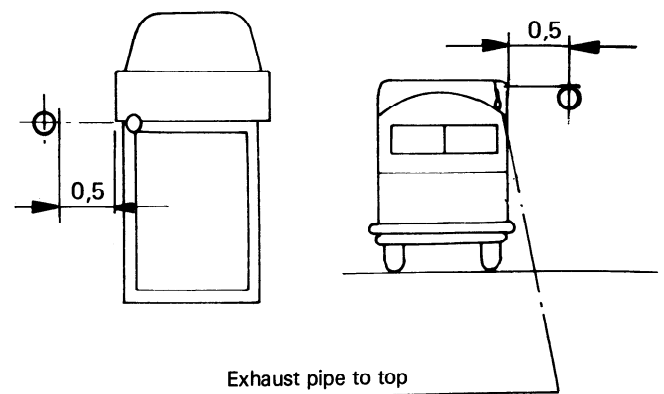
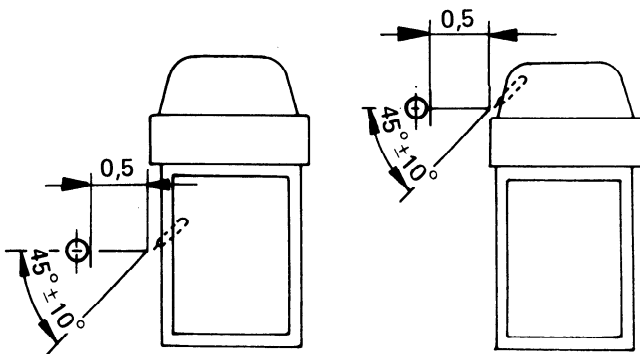


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Height of exhaust pipe centreline



Exhaust pipe to top

Figure 1 – Test site and microphone positions for measuring exhaust noise

Owing to

- a) variations in sound level among vehicles of the same type and
- b) the accuracy of the test method,

differences between the sound level of the vehicle in use and that in the corresponding reference test should not be considered significant unless they equal or exceed 5 dB.

The values obtained by this method are not representative of the total noise emitted by the vehicles in motion, as measured in other International Standards. They should not be used to make comparison between the total noise emitted by different vehicles.

## 8 Test report

The test report shall include the following information :

- a) a reference to this International Standard and either the reference "clause 6" or "annex";
- b) the vehicle type tested, with a description of any abnormal conditions;
- c) the test site, ground conditions and weather conditions;
- d) the measurement instrumentation (including wind-screen, if used);
- e) the location and orientation of the microphone;
- f) engine operating speeds used for the tests;
- g) the A-weighted sound pressure levels determined by the tests;
- h) A-weighted sound pressure levels of the background noise at each measuring position.

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## Annex

### Measurement of noise near the engine

(This annex is an integral part of the standard.)

#### A.1 Microphone position (see figure 2)

The height of the microphone above the ground shall be 0,5 m. Its reference axis for free field conditions (see IEC Publication 651) shall be parallel to the ground and situated in a vertical plane whose position depends on the type of vehicle as follows :

- engine in front : vertical plane through the front axle;
- engine at the rear : vertical plane through the rear axle;
- engine at the centre and motor-cycles : vertical plane through the midpoint of the wheel base.

Unless otherwise indicated by the manufacturer of the sound level meter, the microphone shall be pointed towards the vehicle and placed at a distance of 0,5 m measured horizontally from the lower edge of the nearest wheel rim or from the line joining the lower edge of the rims of the front and rear wheels. The measurement shall be made only on the side farthest from the driving position.

For motor-cycles, the distance of the microphone shall be measured from the external side of the motor case or from the cylinder head, whichever projects farther. The measurement shall be made on the side of air intake or, if the latter is in the longitudinal median plane, on the right-hand side of the vehicle.

#### A.2 Engine operating conditions

The engine shall be stabilized at idling speed and the throttle shall then be completely opened as rapidly as possible, and kept open as long as is necessary to obtain one of the following maximum engine speeds :

- for engines with controlled ignition : engine speed equal to  $n/2$ ; a suitable device shall be used to retain the sound level corresponding to the rotation speed  $n/2$ ,
- for diesel engines : the governed no-load speed,

where  $n$  is the engine speed at which the engine produces its maximum power as indicated by the manufacturer.

The noise shall be measured during the period specified above. The highest level only shall be noted. At least three measurements shall be carried out. The measurement shall be considered valid if the range of three measurements made immediately one after the other is not greater than 2 dB. The arithmetic mean value of these three measurements shall be considered as the result.

#### NOTES

- 1 It is recommended that it be ascertained that the governed speed of the diesel engine corresponds to its nominal governed speed.
- 2 Care should be taken that the safety device used to prevent overspeeding of petrol engines during this test is not harmful for the vehicle.
- 3 Short-circuiting the ignition may saturate material in the exhaust system with petrol or cause ignition of this petrol at a later moment.
- 4 For the reference test, it should be verified that the cooling fan and other accessories necessary for engine functioning are working.

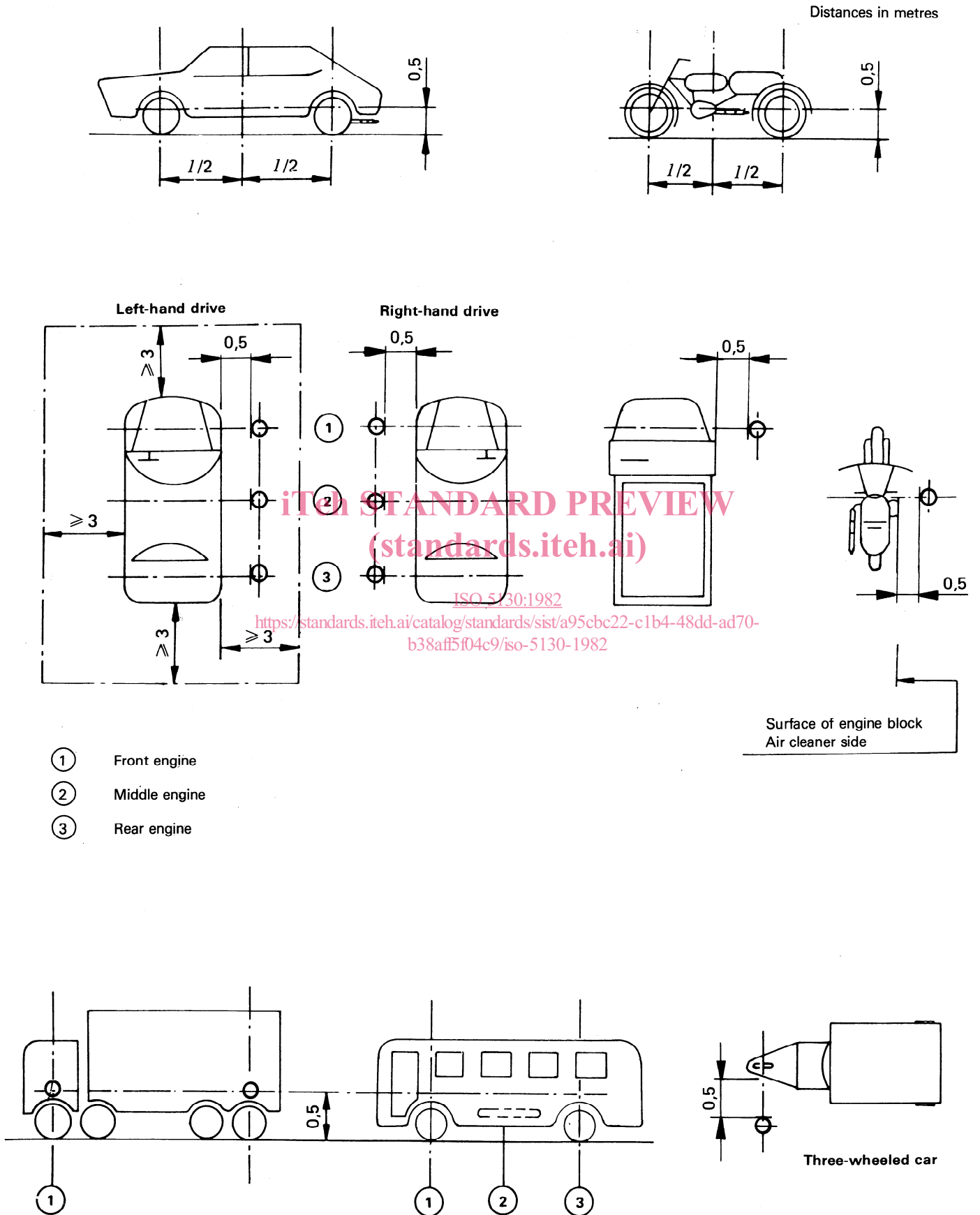


Figure 2 — Test site and microphone positions for measuring engine noise