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2015-09-15

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

**Part 1:
M and N categories**

iTeh STANDARD PREVIEW
*Mesurage du bruit émis par les véhicules routiers en accélération —
Méthode d'expertise —
Partie 1: Catégories M et N*
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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO 362-1:2007), which has been technically revised.

It also incorporates the Corrigendum ISO 362-1:2007/Cor.1:2009.

ISO 362 consists of the following parts, under the general title *Measurement of noise emitted by accelerating road vehicles — Engineering method*:

- Part 1: *M and N categories*
- Part 2: *L category*
- Part 3: *Indoor testing M and N categories*

This corrected version of ISO 362-1:2015 incorporates the following correction:

- 8.2.3 (2nd paragraph) The following sentence was added: *The minimum tread depth shall be at least 80 % of the full tread depth.*

Introduction

An extensive review was conducted of actual in-use vehicle operations, beginning with data from the TUV Automotive study in the early 1990s and continuing with data developed through other committee members from 1996 through 2000. It includes nearly 100 vehicles operated on a variety of urban roads in Europe and Asia. The primary focus of the in-use measurements was to determine how vehicles are driven with a variety of vehicles, driving behaviours, and traffic situations. The in-use behaviour determined from these studies was successfully correlated to urban traffic use in the United States by evaluation of the fuel economy test cycles used by the United States Environmental Protection Agency (USEPA). The resulting test specifications are therefore valid for all global urban use conditions.

The procedure defined here provides a measure of the sound pressure level from vehicles under controlled and repeatable conditions. The definitions have been made according to the requirements of vehicle categories. In cases of vehicles other than very heavy trucks and buses, the working group found that attempts to conduct a partial load test as in actual use resulted in considerable run-to-run variability that significantly interfered with the repeatability and reproducibility of the test cycle. Therefore, two primary operating conditions (i.e. a wide-open-throttle acceleration phase and a constant speed phase) were used to guarantee simplicity. The combination was found to be equivalent to the partial throttle and partial power (engine load) actually used.

As a further consequence of the investigation of the requirements for an efficient test, it was decided to design a test which was independent of vehicle design and therefore safe and adaptable for future technologies, as well as for future traffic conditions. The test guarantees an excitation of all relevant noise sources, and the final test result reflects a combination of these sources as a compromise between normal urban use and “worst case”.

In 2004, the given test for M and N category vehicles was evaluated for technical accuracy and practical considerations by test programmes carried out by the Japan Automobile Standards Internationalization Center (JASIC), the European Automotive Manufacturers Association (ACEA), and the Society of Automotive Engineers, Inc. (SAE) in the United States. Over 180 vehicles were included in these tests. The reports of these test programmes were considered prior to preparation of this part of ISO 362.

This part of ISO 362 was developed following demands for a new test procedure considering the following:

- “The test procedure (ISO 362) doesn’t reflect realistic driving conditions” (1996 EU Green Paper);
- “In the case of motor vehicles, other factors are also important such as the dominance of tyre noise above quite low speeds (50 km/h)” (1996 EU Green Paper).
- “A new measurement procedure should require that the major noise sources of a vehicle be measured” (2001 Noise Emission of Road Vehicles – I-INCE).

This edition of ISO 362-1 while maintaining the same technical procedures as the previous edition, has been revised based on practical experience to provide additional clarification, to provide additional equivalent test modes for heavy commercial vehicles, and to incorporate provisions for addressing hybrid propulsion systems for M1 and N1 category vehicles.

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

Part 1: M and N categories

IMPORTANT — The electronic file of this International Standard contains colours which are considered to be useful for the correct understanding of the International Standard. Users should therefore consider printing this International Standard using a colour printer.

1 Scope

This part of ISO 362 specifies an engineering method for measuring the noise emitted by road vehicles of categories M and N under typical urban traffic conditions. It excludes vehicles of category L1 and L2, which are covered by ISO 9645, and vehicles of category L3, L4, and L5, which are covered by ISO 362-2.

The specifications are intended to reproduce the level of noise generated by the principal noise sources during normal driving in urban traffic (see [Annex A](#)).

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 test method requires an acoustical environment that is obtained only in an extensive open space. Such conditions are usually provided for [ISO 362-1:2015](#)

- type approval measurements of a vehicle
- measurements at the manufacturing stage, and
- measurements at official testing stations.

NOTE 1 The results obtained by this method give an objective measure of the noise emitted under the specified conditions of test. It is necessary to consider the fact that the subjective appraisal of the noise annoyance of different classes of motor vehicles is not simply related to the indications of a sound measurement system. As annoyance is strongly related to personal human perception, physiological human conditions, culture, and environmental conditions, there is a large variation and it is, therefore, not useful as a parameter to describe a specific vehicle condition.

NOTE 2 Spot checks of vehicles chosen at random are rarely made in an ideal acoustical environment. If measurements are carried out on the road in an acoustical environment that does not fulfil the requirements stated in this part of ISO 362, the results obtained can deviate appreciably from the results obtained using the specified conditions.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1176, *Road vehicles — Masses — Vocabulary and codes*

ISO 2416, *Passenger cars — Mass distribution*

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

ISO 10844:2014, *Acoustics — Specification of test tracks for measuring noise emitted by road vehicles and their tyres*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1176 and ISO 2416 and the following apply.

3.1 Vehicle mass

3.1.1

kerb mass

complete shipping mass of a vehicle fitted with all equipment necessary for normal operation plus the mass of the following elements for M1, N1, and M2 having a maximum authorized mass not exceeding 3 500 kg:

- 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 1 to entry: The definition of kerb mass can vary from country to country, but in this part of ISO 362, it refers to the definition contained in ISO 1176.

3.1.2

maximum authorized mass

kerb mass plus the maximum allowable payload

3.1.3

unladen vehicle mass

nominal mass of a complete N2, N3, or M2 vehicle having a maximum authorized mass greater than 3 500 kg or an M3 vehicle as determined by the following conditions:

- a) mass of the vehicle includes the bodywork and all factory-fitted equipment and electrical and auxiliary equipment for normal operation of the vehicle, including liquids, tools, fire extinguisher, standard spare parts, chocks, and spare wheel, if fitted;
- b) the fuel tank is filled to at least 90 % of rated capacity and the other liquid-containing systems (except those for used water) are filled to 100 % of the capacity specified by the manufacturer

3.1.4

driver mass

nominal mass of a driver

3.1.5

mass in running order

nominal mass of an N2, N3, or M2 vehicle having a maximum authorized mass greater than 3 500 kg or an M3 vehicle as determined by the following conditions:

- a) the mass is taken as the sum of the unladen vehicle mass and the driver's mass;

- b) in the case of category M2 and M3 vehicles that include seating positions for additional crewmembers, their mass is incorporated in the same way and equal to that of the driver

Note 1 to entry: The driver's mass is calculated in accordance with ISO 2416.

3.1.6

maximum axle (group of axles) capacity

permissible mass corresponding to the maximum mass that can be carried by the axle (group of axles) as defined by the vehicle manufacturer, not exceeding the axle manufacturer's specifications

3.1.7

unladen axle (group of axles) load

actual mass carried by the axle (group of axles) in an unladen condition

Note 1 to entry: The unladen vehicle mass is equal to the sum of the unladen axles (group of axles) load.

3.1.8

extra loading

mass which is added to the unladen vehicle mass

3.1.9

laden axle (group of axles) load

actual mass carried by the axle (group of axles) in a laden condition

3.2

power-to-mass ratio index

PMR

dimensionless quantity used for the calculation of acceleration according to the following formula:

$$\text{PMR} = \frac{P_n}{m_t} \times 1\,000$$

where

P_n is the numerical value of total engine power, expressed in kilowatts;

m_t is the numerical value of the test mass, expressed in kilograms

3.2.1

total engine power

sum of all power from available propulsion sources

3.3

rated engine speed

S

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

Note 1 to entry: If the rated maximum net power is reached at several engine speeds, S used in this part of ISO 362 is the highest engine speed at which the rated maximum net power is reached.

Note 2 to entry: ISO 80000-3 defines this term as "rated engine rotational frequency". The term "rated engine speed" was retained due to its common understanding by practitioners and its use in government regulations.

3.4 Vehicle categories

3.4.1

category L

motor vehicles with fewer than four wheels

Note 1 to entry: United Nations Economic Commission for Europe (UNECE) document TRANS/WP.29/78/Rev.1/Amend.4 (26 April 2005) extended the L category to four-wheeled vehicles as defined by L6 and L7.

3.4.1.1

category L1 and L2

mopeds

Note 1 to entry: See ISO 9645 for further details.

3.4.1.2

category L3

two-wheeled motor vehicles with an engine cylinder capacity greater than 50 cm³ or maximum speed greater than 50 km/h

3.4.1.3

category L4

three-wheeled motor vehicles with an engine cylinder capacity greater than 50 cm³ or maximum speed greater than 50 km/h, the wheels being attached asymmetrically along the longitudinal vehicle axis

3.4.1.4

category L5

three-wheeled motor vehicles with an engine cylinder capacity greater than 50 cm³ or maximum speed greater than 50 km/h, having a gross vehicle mass rating not exceeding 1 000 kg and wheels attached symmetrically along the longitudinal vehicle axis

3.4.1.5

category L6

four-wheeled vehicles whose unladen mass is not more than 350 kg, not including the mass of the batteries in the case of electric vehicles, whose maximum design speed is not more than 45 km/h and whose engine cylinder capacity does not exceed 50 cm³ for spark (positive) ignition engines, or whose maximum net power output does not exceed 4 kW in the case of other internal combustion engines, or whose maximum continuous rated power does not exceed 4 kW in the case of electric engines

3.4.1.6

category L7

four-wheeled vehicles, other than those classified as category L6, whose unladen mass is not more than 400 kg (550 kg for vehicles intended for carrying goods), not including the mass of the batteries in the case of electric vehicles, and whose maximum continuous rated power does not exceed 15 kW

3.4.2

category M

power-driven vehicles having at least four wheels and used for the carriage of passengers

3.4.2.1

category M1

vehicles used for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat

3.4.2.2

category 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 5 000 kg

Note 1 to entry: In this definition, "maximum mass" is equivalent to "maximum authorized mass" used elsewhere in this part of ISO 362.

3.4.2.3

category 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 5 000 kg

Note 1 to entry: In this definition, "maximum mass" is equivalent to "maximum authorized mass" used elsewhere in this part of ISO 362.

3.4.2.4**incomplete vehicle of category M2 or M3:**

incomplete vehicle with just chassis rails or tube assembly, power train, and axles, which is intended to be completed with bodywork, customized to the needs of the transport operator

3.4.3**category N**

power-driven vehicles having at least four wheels and used for the carriage of goods

3.4.3.1**category N1**

vehicles used for the carriage of goods and having a maximum authorized mass not exceeding 3 500 kg

3.4.3.2**category N2**

vehicles used for the carriage of goods and having a maximum authorized mass exceeding 3 500 kg but not exceeding 12 000 kg

3.4.3.3**category N3**

vehicles used for the carriage of goods and having a maximum authorized mass exceeding 12 000 kg

3.5**reference point**

point depending on the design and category of the vehicle

3.5.1

reference point for category M1 and N1 vehicles and M2 having a maximum authorized mass not exceeding 3 500 kg

point on the vehicle as follows:

- for front-engine vehicles, the front end of the vehicle;
- for mid-engine vehicles, the centre of the vehicle;
- for rear-engine vehicles, the rear end of the vehicle

3.5.2

reference point for category M2 having a maximum authorized mass exceeding 3 500 kg, M3, N2, and N3 vehicles

point on the vehicle as follows:

- for front-engine vehicles, the front end of the vehicle;
- for all other vehicles, the border of the engine closest to the front of the vehicle

3.6**target acceleration**

acceleration at a partial throttle condition in urban traffic, derived from statistical investigations

Note 1 to entry: Refer to [Annex A](#) for more detailed explanations.

3.7**reference acceleration**

required acceleration during the acceleration test on the test track

Note 1 to entry: Refer to [Annex A](#) for more detailed explanations.

3.8
gear ratio weighting factor

k

dimensionless quantity used to combine the test results of two gear ratios for the acceleration test and the constant-speed test

3.9
partial power factor

k_p

dimensionless quantity used for the weighted combination of the test results of the acceleration test and the constant-speed test for vehicles of categories M1, N1, and M2 having a maximum authorized mass not exceeding 3 500 kg

Note 1 to entry: Refer to [Annex A](#) for more detailed explanations.

3.10
pre-acceleration

application of acceleration control device prior to the position AA' for the purpose of achieving stable acceleration between AA' and BB'

Note 1 to entry: See [Figure 1](#) for additional details.

3.11
locked gear ratio

control of transmission such that the transmission gear cannot change during a test

3.12
engine

power source without detachable accessories

Note 1 to entry: Power source includes in this context all sources of motive power; for example, electric or hydraulic power sources used alone or in combination with other power sources.

3.13
test track length

l_{10}

length of test track used in the calculation of acceleration from points PP' to BB'

3.14
test track length

l_{20}

length of test track used in the calculation of acceleration from points AA' to BB'

3.15
target engine rotational speed

$n_{\text{target BB'}}$

interval between 70 % and 74 % of the speed S for vehicles of category M2 having a maximum authorized mass exceeding 3 500 kg and N2 and an interval between 85 % and 89 % of the speed S for vehicles of category M3 and N3

3.16
target vehicle speed

$v_{\text{target BB'}}$

vehicle speed of 35 km/h \pm 5 km/h

4 Symbols terms and abbreviated terms

[Table 1](#) lists the symbols, terms, and abbreviated terms used in this part of ISO 362 and the subclause where they are used for the first time.

Table 1 — Symbols and abbreviated terms used and corresponding clauses

Symbol	Unit	Subclause	Explanation
AA'	—	3.10	Line perpendicular to vehicle travel which indicates beginning of zone in which to record sound pressure level during test
a_i	m/s ²	A.2.6	Partial throttle acceleration in gear i
a_{\max}	m/s ²	A.2.2.3	Maximum acceleration during an acceleration phase measured in in-use studies
$a_{\max 90}$	m/s ²	A.2.3.1	90 th percentile of maximum acceleration during an acceleration phase measured in in-use studies
a_{wot}	m/s ²	A.2.2.1	In-use acceleration measured in urban traffic for a specific vehicle
$a_{\text{wot } 50}$	m/s ²	A.2.8.1	Acceleration at 90 th percentile of noise emission and 50 km/h vehicle velocity for a specific vehicle
$a_{\text{wot } i}$	m/s ²	5.1	Acceleration at wide-open-throttle in gear i
$a_{\text{wot } (i + 1)}$	m/s ²	5.1	Acceleration at wide-open-throttle in gear $(i + 1)$
$a_{\text{wot test}}$	m/s ²	5.1	Acceleration at wide-open throttle in single gear test cases
$a_{\text{wot ref}}$	m/s ²	5.4	Reference acceleration for the wide-open-throttle test
a_{urban}	m/s ²	5.3	Target acceleration representing urban traffic acceleration
BB'	—	3.10	Line perpendicular to vehicle travel which indicates end of zone in which to record sound pressure level during test
CC'	—	8.1	Centre line of vehicle travel through test surface as defined in ISO 10844
$\delta_1 - \delta_7$	dB	B.2	Input quantities to allow for any uncertainty
gear i	—	8.3.1.3.2	First of two gear ratios for use in the vehicle test
gear $(i + 1)$	—	8.3.1.3.2	Second of two gear ratios, with an engine speed lower than gear ratio i
gear x	—	8.3.2.3.2	First of two gear ratios used for testing of M2 having a maximum authorized mass of more than 3 500kg, M3, N2, and N3 where certain criteria on test conditions are met
gear y	—	8.3.2.3.2	Second of two gear ratios used for testing of M2 having a maximum authorized mass of more than 3 500kg, M3, N2, and N3 where certain criteria on test conditions are met
j	—		Index for single test run within overall acceleration or constant speed test series i or $(i + 1)$
k_p	—	3.9	Partial power factor
k	—	3.8	Gear ratio weighting factor
k_n	—	A.2.8.1	Interpolation factor between gears
l_{ref}	m	5.1	Reference length
l_{veh}	m	5.1	Length of vehicle
l_{10}	m	3.13	Length of test section for calculation of acceleration from PP' to BB'
l_{20}	m	3.14	Length of test section for calculation of acceleration from AA' to BB'
$L_{\text{crs } i}$	dB	8.4.3.2	Vehicle sound pressure level at constant speed test for gear i
$L_{\text{crs } (i + 1)}$	dB	8.4.3.2	Vehicle sound pressure level at constant speed test for gear $(i + 1)$
$L_{\text{crs rep}}$	dB	8.4.3.2	Reported vehicle sound pressure level at constant speed test
$L_{\text{wot } i}$	dB	8.4.3.2	Vehicle sound pressure level at wide-open-throttle test for gear i
$L_{\text{wot } (i + 1)}$	dB	8.4.3.2	Vehicle sound pressure level at wide-open-throttle test for gear $(i + 1)$
$L_{\text{wot rep}}$	dB	8.4.3.2	Reported vehicle sound pressure level at wide-open-throttle

Table 1 (continued)

Symbol	Unit	Subclause	Explanation
L_{urban}	dB	8.4.3.2	Reported vehicle sound pressure level representing urban operation
$m_{fa\ load\ unladen}$	kg	8.2.2.1	Unladen front axle load
$m_{ac\ ra\ max}$	kg	8.2.2.1	Maximum rear axle capacity
$m_{ra\ load\ unladen}$	kg	8.2.2.1	Unladen rear axle load
m_d	kg	8.2.2.1	Mass of driver
m_{kerb}	kg	8.2.2.1	Kerb mass of the vehicle
$m_{chassisM2M3}$	kg	8.2.2.1	Mass of the incomplete vehicle (M2 or M3)
$m_{xloadM2M3}$	kg	8.2.2.1	Extra load to be added to the incomplete vehicle (M2 or M3) to reach the mass of the vehicle in running order as chosen by the manufacturer
$M_{fa\ load\ laden}$	kg	8.2.2.2.2	Laden front axle load
$M_{ra\ load\ laden}$	kg	8.2.2.2.2	Laden rear axle load
m_{ref}	kg	8.2.2.1	Kerb mass + 75 kg for the driver (75 kg ± 5 kg in the case of category L)
m_{ro}	kg	8.2.2.1	Mass in running order
m_t	kg	3.2	Test mass of the vehicle
m_{target}	kg	8.2.2.1	Target mass of the vehicle
$m_{unladen}$	kg	8.2.2.1	Unladen vehicle mass
m_{xload}	kg	8.2.2.1	Extra loading
n	1/min	A.2.4	Engine rotational speed of the vehicle
$n_{PP'}$	1/min	9	Engine rotational speed of the vehicle when the reference point passes PP'
$n_{BB'}$	1/min	8.3.2.2.1	Engine rotational speed of the vehicle when the reference point passes BB'
$n_{targetBB'}$	1/min	8.3.2.2	Target engine rotational speed of the vehicle when the reference point has to pass line BB' (see 5.1 for definition of reference point)
$(n/S)_{a\ 90}$	—	A.2.8.1	Dimensionless engine rotational speed ratio at 90 th percentile acceleration
$(n/S)_{L\ 90}$	—	A.2.6	Dimensionless engine rotational speed ratio at 90 th percentile noise emission
$(n/S)_i$	—	A.2.8.1	Dimensionless engine rotational speed ratio at maximum acceleration of i gear
$(n/S)_{(i+1)}$	—	A.2.8.1	Dimensionless engine rotational speed ratio at maximum acceleration of $(i + 1)$ gear
PMR	—	3.2	Power-to-mass ratio index to be used for calculations (abbreviation)
P_n	kW	3.2	Rated total engine power (see ISO 1585 for combustion engines)
PP'	—	3.13	Line perpendicular to vehicle travel that indicates location of microphones
S	1/min	3.3	Rated engine rotational speed in revolutions per minute, synonymous with the engine rotational speed at maximum power
$v_{AA'}$	km/h	5.2.1	Vehicle velocity when reference point passes line AA' (see 5.1 for definition of reference point)

Table 1 (continued)

Symbol	Unit	Subclause	Explanation
$v_{BB'}$	km/h	5.2.1	Vehicle velocity when reference point or reference length passes line BB' (see 5.1 for definition of reference length and see 3.5 for definition of reference point)
$v_{BB'1}$	km/h	8.3.2.3.3	Target vehicle velocity when certain conditions are met
$v_{BB'2}$	km/h	8.3.2.3.3	Target vehicle velocity when certain conditions are met
$v_{PP'}$	km/h	5.2.2	Vehicle velocity when reference point passes line PP' (see 5.1 for definition of reference point)
$v_{\text{target BB}'}$	km/h	8.3.2.2	Target vehicle velocity when it is necessary that the reference point pass line BB' (see 5.1 for definition of reference point)
v_{test}	km/h	8.3.1.2	Target vehicle test velocity
$v_{a \text{ max } 50}$	km/h	A.2.3.1	50 th percentile vehicle velocity at maximum acceleration during an acceleration phase measured in in-use studies
$v_{a \text{ max } 90}$	km/h	A.2.3.1	90 th percentile vehicle velocity at maximum acceleration during an acceleration phase measured in in-use studies

5 Specification of the acceleration for vehicles of categories M1 and M2 having a maximum authorized mass not exceeding 3 500 kg and of category N1

5.1 General

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5.1.1 Applicability and conditions

All accelerations are calculated using different speeds of the vehicle on the test track. The formulae given in [5.2](#) are used for the calculation of $a_{\text{wot } l}$, $a_{\text{wot } (l+1)}$ and $a_{\text{wot test}}$. The speed either at AA' ($v_{AA'}$) or PP' ($v_{PP'}$) is defined by the vehicle speed when the reference point passes AA' or PP'. The speed at BB' ($v_{BB'}$) is defined when the rear of the vehicle passes BB' or the front of the vehicle passes BB' + 5 m if l_{ref} is chosen as 5 m. The method used for determination of the acceleration shall be indicated in the test report

Due to the definition of the reference point for the vehicle, the length of the vehicle is considered to be different in Formulae (2) and (3). If the reference point is the front of the vehicle, $l_{\text{ref}} = l_{\text{veh}}$, i.e. the length of vehicle; if the reference point is the midpoint of the vehicle, $l_{\text{ref}} = 0,5 l_{\text{veh}}$ (i.e. 0,5 times the length of vehicle); if the reference point is the rear of the vehicle, $l_{\text{ref}} = 0$.

At the choice of the vehicle manufacturer, front engine vehicles may use $l_{\text{ref}} = 5$ m, and mid engine vehicles may use $l_{\text{ref}} = 2,5$ m

The dimensions of the test track are used in the calculation of acceleration. These dimensions are defined as follows: $l_{20} = 20$ m, $l_{10} = 10$ m.

Due to the large variety of technologies, it is necessary to consider different modes of calculation. New technologies (such as continuously variable transmission) and older technologies (such as automatic transmission) that have no electronic control require a more specific treatment for a proper determination of the acceleration. The given possibilities for calculation of the acceleration shall cover these requirements.

5.1.2 Calculation of total engine power

If two or more sources of propulsive power operate at the conditions of test specified in this part of ISO 362, the total engine power, P_n , shall be the arithmetic sum of parallel propulsive engines on the vehicle. Applicable parallel propulsive engines are those power sources which provide forward motion