



SURFACE VEHICLE STANDARD	J2805™	JUL2025
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Superseding J2805 MAY2020		
Measurement of Noise Emitted by Accelerating Road Vehicles		

RATIONALE

SAE J2805 is the technical mirror of ISO 362-1. SAE J2805 and ISO 362-1 serve to measure in a performance-based and technology-neutral manner the 90th percentile exterior sound emission of road vehicles. The test procedure is based on extensive statistical investigations of vehicle operation in real traffic and is therefore well correlated to actual in-use sound emissions.

The 2025 revision of SAE J2805 incorporates updates that extend the test procedure for M2, M3, N2, and N3 vehicles to provide a test provision for expected new technologies (e.g., Electric Vehicles) that have the capability to accelerate faster than the current version accounts for.

FOREWORD

This SAE Standard is based on ISO 362-1:2015 with additional clarifications based on review of ISO 362-1:2015 by the SAE Light Vehicle Exterior Noise Committee and editorial changes to bring the document into alignment with SAE editorial standards. Evaluation of ISO 362-1:2015 was conducted by the SAE Light Vehicle Exterior Noise Committee in 2015. Further updates to SAE J2805 are based on changes to ECE R51.03 adopted through 2019.

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5.	SPECIFICATION OF THE ACCELERATION FOR VEHICLES OF CATEGORIES M1 AND M2 HAVING A MAXIMUM AUTHORIZED MASS NOT EXCEEDING 3500 KG, AND OF CATEGORY N1, AND OF CATEGORY N2 DERIVED FROM N1	13
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1. SCOPE

This SAE Standard is equivalent to ISO 362-1:2015 and 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, L2, L3, L4, and L5.

The specifications are intended to reproduce the level of noise generated by the principal noise sources during normal driving in urban traffic. 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 during:

- Measurements of vehicles for regulatory certification and/or type approval
- Measurements at the manufacturing stage
- Measurements at official testing stations

Annex A provides background information on the use of this standard consistent with the intent.

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, 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 fulfill the requirements stated in this document, the results obtained may deviate appreciably from the results obtained using the specified conditions.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1349 Engine Power Test Code - Spark Ignition and Compression Ignition - As Installed Net Power Rating

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 362-1 Measurement of noise emitted by accelerating road vehicles - Engineering method - Part 1: M and N categories

ISO 362-3 Acoustics - Measurement of noise emitted by accelerating road vehicles - Engineering method - Part 3: Indoor testing M and N categories

ISO 1176 Road vehicles - Masses - Vocabulary and codes

ISO 1585	Road vehicles - Engine test code - Net power
ISO 2416	Passenger cars - Mass distribution
ISO 10844	Acoustics - Specification of test tracks for measuring noise emitted by road vehicles and their tires

2.1.3 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

IEC 60942	Electroacoustics - Sound Calibrators
IEC 61672-1	Electroacoustics - Sound Level Meters - Part 1: Specifications
IEC 61672-3	Electroacoustics - Sound Level Meters - Part 3: Periodic Tests

2.1.4 United Nations Publications

Available from United Nations Economic Commission for Europe, Sustainable Transport Division, Palais des Nations. CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, www.unece.org.

United Nations Economic Commission for Europe (UNECE) document TRANS/WP.29/78/Rev.5 (7 June 2017) Consolidated Resolution on the Construction of Vehicles (R.E.3).
<https://unece.org/fileadmin/DAM/trans/main/wp29/wp29resolutions/ECE-TRANS-WP.29-78r5e.pdf>

Regulation 51.03	Noise of M and N Categories of Vehicles
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2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J366	Exterior Sound Level for Heavy Trucks and Buses
SAE J1470	Measurement of Noise Emitted by Accelerating Highway Vehicles

3. DEFINITIONS

3.1 Vehicle Mass Definitions

Mass definitions in this document refer to ISO 1176 and ISO 2416.

3.1.1 CURB MASS

Complete shipping mass of a vehicle fitted with all standard equipment necessary for normal operation plus the mass of the following elements for M1, N1, and M2 having a maximum authorized mass not exceeding 3500 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

The definition of curb mass may vary from country to country, but in this document, it refers to the definition contained in ISO 1176.

3.1.2 MAXIMUM AUTHORIZED MASS

Curb mass plus the maximum authorized payload.

3.1.3 UNLADEN VEHICLE MASS

Nominal mass of a complete N2, N3, or M2 vehicle having a maximum authorized mass greater than 3500 kg, or an M3 vehicle as determined by the following conditions:

- Mass of the vehicle includes the bodywork and all factory-fitted equipment, electrical, and auxiliary equipment for normal operation of the vehicle, including liquids, tools, fire extinguisher, standard spare parts, chocks, and spare wheel, if fitted.
- 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 a complete N2, N3, or M2 vehicle having a maximum authorized mass greater than 3500 kg, or an M3 vehicle as determined by the following conditions:

- The mass is taken as the sum of the unladen vehicle mass and the driver's mass.
- 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.

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 to 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: 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 Equation 1:

$$PMR = \frac{P_n}{m_{ro}} \times 1000 \quad (\text{Eq. 1})$$

where:

PMR = dimensionless quantity

P_n = numerical value of total engine power, expressed in kilowatts

m_{ro} = numerical value of the running order 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 an internal combustion engine develops its rated maximum net power as stated by the manufacturer.

If the rated maximum net power is reached at several engine speeds, S used in this part is the highest engine speed at which the rated maximum net power is reached.

NOTE: SAE J1349 provides a test method to establish rated engine speed.

3.4 Vehicle Categories

3.4.1 CATEGORY L

Motor vehicles with fewer than four wheels.

Refer to United Nations Economic Commission for Europe (UNECE) document TRANS/WP.29/78/Rev.5 (7 June 2017) Consolidated Resolution on the Construction of Vehicles (R.E.3).

3.4.1.1 CATEGORY L1 AND L2

Mopeds.

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 1000 kg, and wheels attached asymmetrically along the longitudinal vehicle axis.

3.4.1.5 CATEGORY L6

Four-wheeled motor 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 motor 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 5000 kg.

NOTE: In this definition, "maximum mass" is equivalent to "maximum authorized mass" used elsewhere in this document.

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 5000 kg.

NOTE: In this definition, "maximum mass" is equivalent to "maximum authorized mass" used elsewhere in this document.

3.4.2.4 INCOMPLETE VEHICLE CATEGORY OF M2 AND M3

Incomplete vehicles with just chassis rails or tube assembly, power train, and axles, which are intended to be completed with bodywork, customized to the needs of the transporter 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 3500 kg.

3.4.3.2 CATEGORY N2

Vehicles used for the carriage of goods and having a maximum authorized mass exceeding 3500 kg but not exceeding 12000 kg.

3.4.3.3 CATEGORY N3

Vehicles used for the carriage of goods and having a maximum authorized mass exceeding 12000 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 3500 KG

Point on the vehicle as follows:

- For front engine vehicles, it is the front end of the vehicle.
- For mid-engine vehicles, it is the center of the vehicle.
- For rear engine vehicles, it is the rear end of the vehicle.

3.5.2 REFERENCE POINT FOR CATEGORY M2 HAVING A MAXIMUM AUTHORIZED MASS EXCEEDING 3500 KG, M3, N2, AND N3 VEHICLES

Point on the vehicles as follows:

- For front engine vehicles, it is the front end of the vehicle.
- For all other vehicles, it is 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.

3.7 REFERENCE ACCELERATION

Required acceleration during the acceleration test on the test track.

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 3500 kg.

3.10 PRE-ACCELERATION

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

See Figure 1 for additional details.

3.11 LOCKED GEAR RATIOS

Control of transmission such that the transmission gear cannot change during a test.

3.12 ENGINE

Power source without detachable accessories.

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

An interval between 70 and 74% of the speed S for vehicles of category M2 having a maximum authorized mass exceeding 3500 kg and N2 and an interval between 85 and 89% of the speed S for vehicles of categories M3 and N3.

3.16 TARGET VEHICLE SPEED, $v_{\text{target BB'}}$

Vehicle speed of 35 km/h $\pm$ 5 km/h.

3.17 KICKDOWN

A driver activated automated gearshift to a test condition outside the target conditions as defined in this standard.

3.18 PREVENTION OF DOWNSHIFT

A measure by the vehicle manufacturer to ensure that the vehicle tested within its specific target conditions.

3.19 STABLE ACCELERATION

Acceleration which avoids unsteady accelerations such as lugging, jerking, hesitation, delays, or other similar effects. When acceleration is calculated as part of the measurement, stable acceleration means a consistent acceleration over the length of the test track.

3.20 WIDE OPEN THROTTLE, WOT

This term indicates full load achievable by the vehicle powertrain. Historically achieved on ICE engines by opening the throttle plate to the fully open position. Commonly achieved by pushing the acceleration pedal to fully depressed. This condition is not constrained to only vehicles with throttle plates.

4. SYMBOLS AND ABBREVIATED TERMS

Table 1 lists the symbols, terms, and abbreviated terms used in this part and the subclause where they are first used.

Table 1 - Symbols and abbreviated terms used and corresponding clauses

Symbol	Unit	Clause	Explanation
AA'	--	3.10	Line perpendicular to vehicle travel which indicates beginning of zone in which to record sound pressure level during test.
$a_{wot\ i}$	m/s ²	5.1	Acceleration at wide open throttle in gear i.
$a_{wot\ i}$	m/s ²	5.1	Acceleration at wide open throttle in gear i.
$a_{wot\ i+1}$	m/s ²	5.1	Acceleration at wide open throttle in gear (i+1).
$a_{wot\ test}$	m/s ²	5.1	Acceleration at wide open throttle in single gear test cases.
$a_{wot\ ref}$	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 is 10.00 m behind line PP'.
CC'	--	8.1	Center line of vehicle travel through test surface as defined in ISO 10844.
gear i	--	8.3.1.3.2	Gear ratio which provides an acceleration within the 5% tolerance of the reference acceleration a_{wot_ref} or greater than the reference acceleration a_{wot_ref} .
gear i+1	--	8.3.1.3.2	The second of two gear ratios, with an acceleration 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 3500 kg, 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 3500 kg, 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.
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'.
$L_{crs(i)}$	dB	8.4.3.2	Vehicle sound pressure level at constant speed test for gear i.
$L_{crs(i+1)}$	dB	8.4.3.2	Vehicle sound pressure level at constant speed test for gear (i+1).
$L_{crs\ rep}$	dB	8.4.3.2	Reported vehicle sound pressure level at constant speed test.
$L_{wot\ (i)}$	dB	8.4.3.2	Vehicle sound pressure level at wide open throttle test for gear i.
$L_{wot\ (i+1)}$	dB	8.4.3.2	Vehicle sound pressure level at wide open throttle test for gear (i+1).
$L_{wot\ rep}$	dB	8.4.3.2	Reported vehicle sound pressure level at wide open throttle.
L_{urban}	dB	8.4.3.2	Reported vehicle sound pressure level representing urban operation.

Symbol	Unit	Clause	Explanation
$m_{fa \text{ load unladen}}$	kg	8.2.2.1	Unladen front axle load.
$m_{ac \text{ ra max}}$	kg	8.2.2.1	Maximum rear axle capacity.
$m_{ac \text{ ra max (chosen)}}$	kg	8.2.2.2.4	Technically permissible maximum laden mass allowed for the chosen rear axle as defined in 8.2.2.2.4.
$m_{ra \text{ load unladen}}$	kg	8.2.2.1	Unladen rear axle load.
m_d	kg	8.2.2.1	Mass of driver.
m_{curb}	kg	8.2.2.1	Curb 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.
$m_{fa \text{ load laden}}$	kg	8.2.2.2.2	Laden front axle load.
$m_{ra \text{ load laden}}$	kg	8.2.2.2.2	Laden rear axle load.
m_{ref}	kg	8.2.2.1	Curb mass + 75 kg for the driver (75 kg $\pm$ 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_t (2 axles virtual)	kg	8.2.2.2.4	Test mass of a virtual vehicle with two axles (4x2 or 4x4).
m_{target}	kg	8.2.2.1	Target mass of the vehicle.
$m_{unladen}$	kg	8.2.2.1	Unladen vehicle mass.
$m_{unladen}$ (2 axles virtual)	kg	8.2.2.2.4	Unladen vehicle mass of the virtual vehicle with two axles.
$m_{fa \text{ (vrf) load unladen}}$	kg	8.2.2.2.4	Measured unladen front axle load of the virtual vehicle with more than two axles.
m_{xload}	kg	8.2.2.1	Extra loading.
$n_{PP'}$	1/min	Section 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).
PMR	--	3.2	Power-to-mass ratio index to be used for calculations (abbreviation).
P_n	kW	3.2	Rated total engine power (refer to ISO 1585 for combustion engines).
PP'	--	3.13	Line perpendicular to vehicle travel which indicates location of microphones.
S	1/min	3.3	Rated engine rotational speed in revs per minute, synonymous with the engine rotational speed at maximum power.
$V_{AA'}$	km/h	5.2.1	Vehicle velocity when reference point or reference length passes line AA'. See 5.1 for definition of reference point. Value to be reported and used for calculations to the first decimal place.
$V_{BB'}$	km/h	5.2.1	Vehicle velocity when reference point or reference length passes line BB'. See 3.5 for definition of reference point and 5.1 for definition of reference length. Value to be reported and used for calculations to the first decimal place.
$V_{BB'1}$	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 or reference length passes line PP'. See 5.1 for definition of reference point. Value to be reported and used for calculations to the first decimal place.

Symbol	Unit	Clause	Explanation
$V_{\text{targetBB'}}$	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_{rf}	--	8.2.2.2.4	Vehicle with more than two axles representing the vehicle family.

5. SPECIFICATION OF THE ACCELERATION FOR VEHICLES OF CATEGORIES M1 AND M2 HAVING A MAXIMUM AUTHORIZED MASS NOT EXCEEDING 3500 KG, AND OF CATEGORY N1, AND OF CATEGORY N2 DERIVED FROM N1

5.1 General

5.1.1 Applicability and Conditions

All accelerations are calculated using different speeds of the vehicle on the test track. The formulas given in 5.2 are used for the calculation of $a_{\text{wot } i}$, $a_{\text{wot } (i+1)}$, and $a_{\text{wot test}}$. The speed either at AA' ($V_{\text{AA'}}$) or PP' ($V_{\text{PP'}}$) is defined by the vehicle speed when the reference point passes AA' or PP'. The speed at BB' ($V_{\text{BB'}}$) 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 Equations 2 and 3. If the reference point is the front of the vehicle, $l_{\text{ref}} = l_{\text{veh}}$ is the length of vehicle; if the reference point is the midpoint of the vehicle, $l_{\text{ref}} = 1/2 l_{\text{veh}}$ (i.e., 0.5X 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) which 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 needs.

Vehicles of category N2 which are derived from N1 and use the same propulsion systems as an N1 vehicle may be tested using the provisions of 8.3.1.

5.2 Calculation of Acceleration

5.2.1 Calculation Procedure for Vehicles with Manual Transmission, Automatic Transmission, Adaptive Transmission, and Continuously Variable Transmission (CVT) Tested with Locked Gear Ratios

The value of $a_{\text{wot test}}$ used in the determination of gear selection shall be the average of the four $a_{\text{wot test, } j}$ values during each valid measurement run.

Calculate $a_{\text{wot test, } j}$ using Equation 2:

$$a_{\text{wot test, } j} = [(V_{\text{BB' }, j}/3.6)^2 - (V_{\text{AA' }, j}/3.6)^2]/[2(l_{20}+l_{\text{ref}})] \quad (\text{Eq. 2})$$

where:

$a_{\text{wot test, } j}$ = numerical value of the acceleration, expressed in meters per second squared

$V_{\text{BB' }, j}$, $V_{\text{AA' }, j}$ = numerical values of the velocity, expressed in kilometers per hour

l_{20} , l_{ref} = numerical values of the length, expressed in meters

Pre-acceleration may be used.

Each $a_{\text{wot test}, j}$ shall be reported to two significant digits after the decimal place (x.xx). Calculation of $a_{\text{wot test}}$ shall use each $a_{\text{wot test}, j}$, and the final reported $a_{\text{wot test}}$ shall be reported to two significant digits after the decimal place (x.xx). The final reported $a_{\text{wot test}}$ shall be used in all subsequent calculations.

5.2.2 Calculation Procedure for Vehicles with Automatic Transmission, Adaptive Transmission, and CVT Tested with Non-Locked Gear Ratios

The value of $a_{\text{wot test}}$ used in the determination of gear selection shall be the average of the four $a_{\text{wot test}, j}$ values during each valid measurement run.

If the devices or measures described in 8.3.1.3.3 can be used to control transmission operation for the purpose of achieving test requirements, calculate $a_{\text{wot test}, j}$ using Equation 2.

Pre-acceleration may be used.

If the devices or measures described in 8.3.1.3.3 are not used, calculate $a_{\text{wot test}, j}$ using Equation 3:

$$a_{\text{wot test}, j} = [(V_{\text{BB}}/3.6)^2 - (V_{\text{PP}}/3.6)^2] / [2(l_{10} + l_{\text{ref}})] \quad (\text{Eq. 3})$$

where:

$a_{\text{wot test}, j}$ = numerical value of the acceleration, expressed in meters per second squared

V_{PP} , V_{AA} = numerical values of the velocity, expressed in kilometers per hour

l_{20} , l_{ref} = numerical values of the length, expressed in meters

Pre-acceleration shall not be used.

Each $a_{\text{wot test}, j}$ shall be reported to two significant digits after the decimal place (x.xx). Calculation of $a_{\text{wot test}}$ shall use each $a_{\text{wot test}, j}$, and the final reported $a_{\text{wot test}}$ shall be reported to two significant digits after the decimal place (x.xx). The final reported $a_{\text{wot test}}$ shall be used in all subsequent calculations.

NOTE: It would be useful for these types of vehicles to record the vehicle speeds at AA', PP', and BB' to provide information for a future revision of this document.

5.3 Calculation of the Target Acceleration

Calculate a_{urban} using Equation 4:

$$a_{\text{urban}} = 0.63 \lg(\text{PMR}) - 0.09 \quad (\text{Eq. 4})$$

where:

a_{urban} = numerical value of the acceleration, expressed in meters per second squared

PMR = dimensionless value of the power-to-mass index

The calculated a_{urban} value shall be reported to two significant digits (x.xx) after the decimal place. The reported a_{urban} shall be used in all subsequent calculations.

5.4 Calculation of the Reference Acceleration

Calculate $a_{\text{wot ref}}$ using the equations:

$$a_{\text{wot ref}} = 1.59 \lg(\text{PMR}) - 1.41 \quad \text{for PMR} \geq 25 \quad (\text{Eq. 5})$$

or

$$a_{\text{wot ref}} = a_{\text{urban}} = 0.63 \lg(\text{PMR}) - 0.09 \quad \text{for PMR} < 25 \quad (\text{Eq. 6})$$

where:

$a_{\text{wot ref}}$ = numerical value of the reference acceleration, expressed in meters per second squared

a_{urban} = numerical value of the acceleration relative to urban traffic, expressed in meters per second squared

PMR = dimensionless value of power to mass index

The calculated $a_{\text{wot ref}}$ value shall be reported to two significant digits (x.xx) after the decimal place. The reported $a_{\text{wot ref}}$ shall be used in all subsequent calculations.

NOTE: Calculations of $a_{\text{wot ref}}$ and a_{urban} for a specific vehicle are based on statistical analyses of in-use vehicle data. As such, this is not strictly a calculation of acceleration based on the independent non-dimensional variable PMR, since this is used as a function to identify the appropriate target acceleration.

5.5 Partial Power Factor k_p

Partial power factor, k_p , is:

$$k_p = 1 - (a_{\text{urban}}/a_{\text{wot test}}) \quad (\text{Eq. 7})$$

In cases other than a single gear test, $a_{\text{wot ref}}$ shall be used instead of $a_{\text{wot test}}$ as defined in 8.4.3.2.

The final reported k_p value shall be mathematically rounded to two significant digits (x.xx) after the decimal place. The final reported k_p shall be used in all subsequent calculations.

6. INSTRUMENTATION

6.1 Instruments for Acoustical Measurement

6.1.1 General

The apparatus used for measuring the sound pressure level shall be a sound level meter or equivalent measurement system meeting the requirements of Class 1 instruments (inclusive of the recommended windscreen, if used). These requirements are described in IEC 61672-1.

For indoor testing using ISO 362-3, when no general statement or conclusion can be made about conformance of the sound level meter by each channel of the array conformance (e.g., when pass-by sound level simulation algorithms do not compute the overall level but spectrum or temporal to recompute it), a simulated pass-by run shall be performed at a constant speed of 50 km/h while a constant tone signal is supplied to all channels of the arrays. The simulated A-weighted sound level is processed and the deviation from a reference tone signal shall be checked in accordance with IEC 61672-3.

The entire measurement system shall be checked by means of a sound calibrator that fulfills the requirements of Class 1 sound calibrators according to IEC 60942.