

1. Scope

This Regulation contains provisions on the sound emitted by motor vehicles and applies to vehicles of categories M and N.¹

The specifications in this Regulation are intended to reproduce the sound levels which are generated by vehicles during normal driving in urban traffic.

This regulation provides, as well, **Real Driving Additional Sound Emission Provisions (RD-ASEP)** for vehicles of categories M₁ and N₁ referring to **typical on road driving conditions including high accelerations and engine loads** for urban and suburban traffic, **except for highways situations**.

power

2. Definitions

For the purpose of this Regulation,

- 2.1. *exterior* "Approval of a vehicle" means the approval of a vehicle type with regard to sound;
- 2.2. "Vehicle type" means a category of motor vehicles which do not differ in such essential respects as:
- 2.2.1. For vehicles tested according to Annex 3, paragraph 3.1.2.1.:
- 2.2.1.1. The shape or materials of the engine compartment and its soundproofing;
- 2.2.1.2. The type of engine (positive or compression ignition, two- or four-stroke, reciprocating or rotary piston), number and capacity of cylinders, number and type of carburetors or injection system, arrangement of valves, or the type of electric motor; *number and*
- 2.2.1.3. Rated maximum net power and corresponding rated engine speed(s); however if the rated maximum net power and the corresponding rated engine speed differs only due to different engine mappings, these vehicles may be regarded as from the same type; *power*
- 2.2.1.4. The silencing system.
- 2.2.2. For vehicles tested according to Annex 3, paragraph 3.1.2.2.:
- 2.2.2.1. The shape or materials of the engine compartment and its soundproofing;
- 2.2.2.2. The type of engine (positive or compression ignition, two- or four-stroke, reciprocating or rotary piston), number and capacity of cylinders, type of injection system, arrangement of valves, rated engine speed (S), or the type of electric motor;
- 2.2.2.3. Vehicles having the same type of engine and/or different overall gear ratios may be regarded as vehicles of the same type;

¹ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

2.3. However, if the differences in paragraph 2.2.2. provide for different target conditions, as described in paragraph 3.1.2.2. of Annex 3, these differences are to be considered as a change of type;

2.4. "Mass of a vehicle in running order (m_{RO})" means

(a) In the case of a motor vehicle:

The mass of the ^{unladen} vehicle, with its fuel tank(s) filled to at least 90 per cent of its or their capacity/ies, including the mass of the driver, of ~~the fuel and~~ liquids, fitted with the standard equipment in accordance with the manufacturer's specifications and, when they are fitted, the mass of the bodywork, the cabin, the coupling and the spare wheel(s), as well as the tools;

(b) In the case of a ^{towing vehicle designed to be couple to a} trailer:

The mass of the vehicle including the fuel and liquids, fitted with the standard equipment in accordance with the manufacturer's specifications, and, when they are fitted, the mass of the bodywork, additional coupling(s), the spare wheel(s) and the tools.

2.5. "Technically permissible maximum laden mass (M)" means the maximum mass allocated to a vehicle on the basis of its construction features and its design performances; the technically permissible laden mass of a trailer or of a semi-trailer includes the static mass transferred to the towing vehicle when coupled;

2.6. "Vehicle length" means a dimension which is measured according to ISO standard 612-1978, term No. 6.1. In addition to the provisions of that standard, when measuring the vehicle structural length, the following devices shall not be taken into account:

- (a) Wiper and washer devices;
- (b) Front or rear marker-plates;
- (c) Customs sealing devices and their protection;
- (d) Devices for securing the tarpaulin and their protection;
- (e) Lighting equipment;
- (f) Rear view mirrors; *device for indirect vision*
- (g) Rear space watching aids;
- (h) Air-intake pipes;
- (i) Length stops for demountable bodies;
- (j) Access steps;
- (k) Ram rubbers;
- (l) Lifting platforms, access ramps and similar equipment in running order, not exceeding 200 mm, provided that the loading capacity of the vehicle is not increased, *300*
- (m) Coupling devices for motor vehicles.

2.7. "Vehicle width" means a dimension which is measured according to ISO standard 612-1978, term No. 6.2. In addition to the provisions of that standard,

different from RE3

*100%
100%*

towing vehicle designed to be couple to a

Vertical

*EU
No. 1230/2012*

where

when measuring the vehicle structural width, the following devices shall not be taken into account:

- (a) Customs sealing devices and their protection;
- (b) Devices for securing the tarpaulin and their protection;
- (c) Tyre failure tell-tale devices;
- (d) Protruding flexible parts of a spray-suppression system;
- (e) Lighting equipment.

2.8. "Rated maximum net power, P_N " means the engine power expressed in kW and measured by the method pursuant to Regulation No. 85.

2.8.1. If two or more sources of propulsive power operate at the conditions of test specified in Annex 3 to this Regulation, 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 to the vehicle in combination at the conditions of test, specified in Annex 3 to this Regulation.

The specified power for non-combustion engines shall be the power stated by the vehicle manufacturer.

2.9. "Rated engine speed, S " means the declared engine speed in min^{-1} (rpm) at which the engine develops its rated maximum net power pursuant to Regulation No. 85 or, where the rated maximum net power is reached at several engine speeds, the highest one of those speeds.

2.10. "Power to Mass Ratio index (PMR)" means a numerical quantity (see Annex 3, paragraph 3.1.2.1.1.) with no dimension used for the calculation of acceleration.

2.11. "Reference point" means one of the following points:

2.11.1. In the case of vehicles of categories M_1 , N_1 and $M_2 \leq 3,500$ kg technically permissible maximum laden mass:

- (a) For front engine vehicles: the front end of the vehicle;
- (b) For mid-engine vehicles: the centre of the vehicle;
- (c) For rear engine vehicles: the rear end of the vehicle.

For vehicles having multiple propulsion sources, the reference point is determined by the position of the propulsion source having the highest power. If there are multiple propulsion sources of equivalent power, then the position of the most forward propulsion source shall prevail.

2.11.2. In the case of vehicles of categories $M_2 > 3,500$ kg technical permissible maximum laden mass, M_3 , N_2 , N_3 :

- (a) For front-engine vehicles, the front end of the vehicle;
- (b) For all other vehicles, the border of the engine closest to the front of the vehicle;

2.12. "Engine" means the power source without detachable accessories.

Not before.

according to

before.

dimensionless

2.11

(CM)

- 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.
- 2.13. "Target acceleration" means acceleration at a partial throttle condition in urban traffic and is derived from statistical investigations.
- 2.14. "Reference acceleration" means the required acceleration during the acceleration test on the test track.
- 2.15. "Gear ratio weighting factor k " means a dimensionless numerical quantity used to combine the test results of two gear ratios for the acceleration test and the constant speed test.
- 2.16. "Partial power factor k_p " means a numerical quantity with no dimension used for the weighted combination of the test results of the acceleration test and the constant speed test for vehicles.
- 2.17. "Pre-acceleration" means application of acceleration control device prior to AA' for the purpose of achieving stable acceleration between AA' and BB' as referred to in Figure 1 of Appendix 1 to Annex 3.
- 2.18. Gear²
- 2.18.1. "Gear ratios"
- 2.18.1.1. "Internal gearbox ratio" means the ratios of engine to gearbox output shaft revolutions.
- 2.18.1.2. "Final drive ratio" means the ratio(s) of gearbox output shaft to driven wheel revolutions.
- 2.18.1.3. "Total gear ratio" means the ratios between vehicle speed and engine speed during the passage of the vehicle through the test track.
- 2.18.1.4. "Gear ratio" used in context with vehicles tested according to paragraph 3.1.2.1. of Annex 3 and Annex 7 is the total gear ratio as defined in paragraph 2.18.1.3. above.
- 2.18.2. "Locked gear ratio" means the control of the transmission such that the gear will not change during a test.
- 2.18.3. "Gear" means in the context of this Regulation a discrete gear ratio either selectable by the driver or by an external device.
- 2.18.4. For vehicles tested according to paragraph 3.1.2.1. of Annex 3 and Annex 7, "gear _{i} " and "gear _{$i+1$} " are defined as two gears in sequence, where gear _{i} either provides an acceleration within the 5 per cent tolerance according to paragraph 3.1.2.1.4.1. (a) of Annex 3 or an acceleration greater than the reference

² Note: The common understanding of a "low gear" or a "high gear" shall not apply to gear ratios. For example, the lowest gear for forward driving, the first gear, has the highest gear ratio of all forward driving gears. While manual transmission has discrete gears, many non-manual transmissions can have more gear ratios engaged by the control unit of the transmission.

acceleration, and gear+1 an acceleration lower than the reference acceleration according to paragraph 3.1.2.1.4.1. (b) or (c) of Annex 3.

- 2.19. "*Silencing system*" means a complete set of components necessary for limiting the sound produced by an engine, its intake and its exhaust (the exhaust manifold(s), the catalyst(s) and emission after-treatment device(s) are not considered part of the silencing system; these parts belong to the engine).
- 2.20. "*Design family of exhaust silencing system or exhaust silencing system components*" means a group of silencing systems or components thereof in which all of the following characteristics are the same:
- (a) The presence of net gas flow of the exhaust gases through the absorbing fibrous material when in contact with that material;
 - (b) The type of the fibres;
 - (c) Where applicable, binder material specifications;
 - (d) Average fibre dimensions;
 - (e) Minimum bulk material packing density in kg/m³;
 - (f) Maximum contact surface between the gas flow and the absorbing material.
- 2.21. "*Exhaust silencing system of different types*" means silencing systems which significantly differ in respect of at least one of the following:
- (a) Trade names or trademarks of their components;
 - (b) The characteristics of the materials constituting their components, except for the coating of those components;
 - (c) The shape or size of their components;
 - (d) The operating principles of at least one of their components;
 - (e) The assembly of their components;
 - (f) The number of exhaust silencing systems or components.
- 2.22. "*Replacement silencing system*" means any part of the silencing system or its components intended for use on a vehicle, other than a part of the type fitted to this vehicle when submitted for type-approval pursuant to this Regulation.
- 2.23. "*R-point*" means R-point as defined in paragraph 2.4. of Annex 1 to the Consolidated Resolution on the Construction of Vehicles (R.E.3.).

or seating reference point

2.24. Table of symbols

2.24.1. Table of symbols for Annex 3

Annex 3

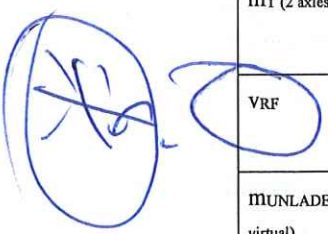


Symbols listed under the paragraphs 2.2.1 up to 3.1.1 are general symbols used for both test methods described under paragraphs 3.1.2.1 and 3.1.2.2.

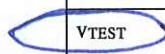
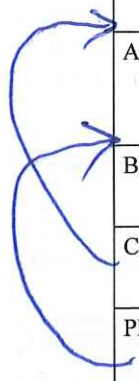
Symbols listed under the paragraphs 3.1.2.1 are used for the test method of vehicles of category M₁, N₁ and M₂ ≤ 3,500 kg technically permissible maximum laden mass.

Symbols listed under the paragraphs 3.1.2.2 are used for the test method of vehicles of category M₂ > 3,500 kg technically permissible maximum laden mass, M₃, N₂, N₃.

Symbol	Unit	Paragraph	Explanation
m _{RO}	kg	2.2.1.	mass in running order; value to be reported and used for calculations to a precision of 10 kg
m _T	kg	2.2.1.	test mass of the vehicle; value to be reported and used for calculations to a precision of 10 kg
m _{TARGET}	kg	2.2.1.	target mass of the vehicle
m _{XLOAD}	kg	2.2.1.	extra loading
m _{FA LOAD UNLADEN}	kg	2.2.1.	front axle load in unladen condition
m _{RA LOAD UNLADEN}	kg	2.2.1.	rear axle load in unladen condition
m _{UNLADEN}	kg	2.2.1.	unladen vehicle mass
m _{AC RA MAX}	kg	2.2.1.	Technically permissible maximum laden mass allowed for the rear axle as declared by the manufacturer
m _D	kg	2.2.1.	mass of driver
m _{CHASSIS M2M3}	kg	2.2.1.	mass of the incomplete vehicle (M ₂ or M ₃)
m _{XLOAD M2M3}	kg	2.2.1.	extra load to be added to the incomplete vehicle (M ₂ or M ₃) to reach the mass of the vehicle in running order as chosen by the manufacturer
m _{FA LOAD LADEN}	kg	2.2.7.2.	front axle load in laden condition
m _{RA LOAD LADEN}	kg	2.2.7.2.	rear axle load in laden condition
m _{T (2 axles virtual)}	kg	2.2.7.4.	test mass of a virtual vehicle with two axles (4x2 or 4x4)
VRF	—	2.2.7.4.	vehicle with more than two axles representing the vehicle family
m _{UNLADEN (2 axles virtual)}	kg	2.2.7.4.	unladen vehicle mass of the virtual vehicle with two axles
m _{XLOAD (2 axles virtual)}	kg	2.2.7.4.	extra loading for the virtual vehicle with two axles



Symbol	Unit	Paragraph	Explanation
MAC RA MAX (chosen)	kg	2.2.7.4.	Technically permissible maximum laden mass allowed for the chosen rear axle as defined in paragraph 2.2.7.4. in Annex 3
AA'	—	3.1.1.	line perpendicular to vehicle travel which indicates beginning of zone in which to record sound pressure level during test
BB'	—	3.1.1.	line perpendicular to vehicle travel which is 10.00 m behind line PP'
CC'	—	3.1.1.	line of vehicle travel through test surface defined in ISO 10844
PP'	—	3.1.1.	line perpendicular to vehicle travel which indicates location of microphones
VTEST	km/h	3.1.2.1.	vehicle test speed
PMR	—	3.1.2.1.1.	power-to-mass ratio index to be used for calculations; value to be reported and used for calculations to the first decimal place
P _N	kW	3.1.2.1.1.	rated total engine net power (different from 2.8)
l	m	3.1.2.1.2.	reference length; value to be reported and used for calculations to a precision of 0.01 m (1 cm)
l _{VEH}	m	3.1.2.1.2.	length of vehicle; value to be reported and used for calculations to a precision of 0.01 m (1 cm)
V _{AA'}	km/h	3.1.2.1.2.	vehicle velocity when the reference point passes line AA' (see paragraph 2.11. for definition of reference point); value to be reported and used for calculations to the first decimal place
V _{BB'}	km/h	3.1.2.1.2.	vehicle velocity when the reference point or rear of the vehicle passes line BB' (see paragraph 2.11. for definition of reference point); value to be reported and used for calculations to the first decimal place
V _{PP'}	km/h	3.1.2.1.2.	vehicle velocity when the reference point passes line PP' (see paragraph 2.11. for definition of reference point)
a _{ACC TEST}	m/s ²	3.1.2.1.2.1.	acceleration from AA' to BB'; value to be reported and used for calculations to the second decimal place
a _{ACC TEST,i}	m/s ²	3.1.2.1.2.1.	acceleration achieved in a particular gear i; value to be reported and used for calculations to the second decimal place
l _{PA}	m	3.1.2.1.2.1.	point of depressing the accelerator before line AA'; value to be reported in full meter
a _{ACC TEST PP'-BB'}	m/s ²	3.1.2.1.2.2.	acceleration from PP' to BB'; value to be reported and used for calculations to the second decimal place



(resolution)
(accuracy)

Symbol	Unit	Paragraph	Explanation
a _{URBAN}	m/s ²	3.1.2.1.2.3.	target acceleration representing urban traffic acceleration; value to be reported and used for calculations to the second decimal place
a _{ACC REF}	m/s ²	3.1.2.1.2.4.	reference acceleration for the acceleration test; value to be reported and used for calculations to the second decimal place
k _P	—	3.1.2.1.3.	partial power factor; value to be reported and used for calculations to the second decimal place
a _{ACC i}	m/s ²	3.1.2.1.4.1. <i>average</i>	acceleration in gear ratio i; value to be reported and used for calculations to the second decimal place
a _{ACC (i+1)}	m/s ²	3.1.2.1.4.1.	acceleration in gear ratio (i + 1); value to be reported and used for calculations to the second decimal place
gear ratio i	—	3.1.2.1.4.1.	gear ratio which provides an acceleration within the 5 per cent tolerance of the reference acceleration a _{ACC REF} or greater than the reference acceleration a _{ACC REF}
gear ratio i+1	—	3.1.2.1.4.1.	second of two gear ratios, with an acceleration lower than gear ratio i
gear ratio i+2, i+3, ...	—	3.1.2.1.4.1.	gear ratios selectable for the pass-by test of Annex 3, if gear ratio i and gear ratio i+1 exceed an acceleration of 2.0 m/s ²
k	—	3.1.2.1.4.1.	gear ratio weighting factor; value to be reported and used for calculations to the second decimal place
n _{MAX}	1/min	3.1.2.1.4.1	Maximum engine rotational speed permitted for M₁, N₁, and M₂ less than 3500 kg; value to be reported and used for calculations to a precision of 10 min⁻¹ (xxx0)
n _{BB'}	1/min	3.1.2.2.	engine rotational speed of the vehicle, when the reference point passes BB'; value to be reported and used for calculations to a precision of 10 min⁻¹ <i>for M₂, N₂, M₃, N₃</i>
S	1/min	3.1.2.2.	rated engine rotational speed in revs per minute, synonymous with the engine rotational speed at maximum power
n_{TARGET BB'}	1/min	3.1.2.2.1.1.(a)	target engine rotational speed of the vehicle when the reference point has to pass line BB' (see 2.11.2. for definition of reference point)
v _{TARGET BB'}	km/h	3.1.2.2.1.1.(a)	target vehicle velocity when it is necessary that the reference point has to pass line BB' (see 2.11.2. for definition of reference point)
v _{BB' GEAR i}	km/h	3.1.2.2.1.1.(b)	target vehicle velocity when certain conditions are met
v _{BB' GEAR i, i=1,2}	km/h	3.1.2.2.1.1. (c)	target vehicle velocity when certain conditions are met

<i>Symbol</i>	<i>Unit</i>	<i>Paragraph</i>	<i>Explanation</i>
gear _x	-	3.1.2.2.1.1. (d)	first of two gear ratios used for testing of M ₂ having a maximum authorized mass of more than 3 500 kg, M ₃ , N ₂ , and N ₃ where certain criteria on test conditions are met
gear _y	-	3.1.2.2.1.1. (d)	second of two gear ratios used for testing of M ₂ having a maximum authorized mass of more than 3,500 kg, M ₃ , N ₂ , and N ₃ where certain criteria on test conditions are met
VBB' X	km/h	3.1.2.2.1.1. (d)	target vehicle velocity when certain conditions are met
VBB' Y	km/h	3.1.2.2.1.1. (d)	target vehicle velocity when certain conditions are met
VBB'1	km/h	3.1.2.2.1.2. (b)	target vehicle velocity when certain conditions are met
VBB'2	km/h	3.1.2.2.1.2. (b)	target vehicle velocity when certain conditions are met
n _{BB'i} , i=1,2	1/min	3.1.2.2.1.2. (d)	engine rotational speed when the reference point passes BB' when certain conditions are met 10min⁻¹
L _{CRS i}	dB(A)	3.1.3.1.	vehicle sound pressure level at constant speed test for gear i; value to be reported and used for calculations to the first decimal place
L _{CRS (i+1)}	dB(A)	3.1.3.1.	vehicle sound pressure level at constant speed test for gear (i + 1); value to be reported and used for calculations to the first decimal place
L _{CRS REP}	dB(A)	3.1.3.1.	reported vehicle sound pressure level at constant speed test; value to be reported and used for calculations to the first decimal place
L _{ACC i}	dB(A)	3.1.3.1.	vehicle sound pressure level for the acceleration test for gear i; value to be reported and used for calculations to the first decimal place
L _{ACC (i+1)}	dB(A)	3.1.3.1.	vehicle sound pressure level for the acceleration test for gear (i + 1); value to be reported and used for calculations to the first decimal place
L _{ACC REP}	dB(A)	3.1.3.1.	reported vehicle sound pressure level for the acceleration test to be reported and used for calculations to the first decimal place
L _{URBAN}	dB(A)	3.1.3.1.	reported vehicle sound pressure level representing urban operation; value to be reported mathematically rounded to the nearest integer

All need to check.

2.24.2. Table of symbols for Annex 7

Symbol	Unit	Paragraph	Explanation
a _{ACC} ASEP	m/s ²	2.3.	maximum required acceleration
κ	—	2.3.	gears to be tested under "Additional Sound Emission Provisions" (ASEP)
n _{BB'} ASEP	1/min	2.3.	maximum test engine speed; value to be reported and used for calculations to a precision of 10 min ⁻¹
v _{AA'} ASEP	km/h	2.3.	target vehicle velocity for test point P1 of the assessment method according paragraph 2.4
v _{BB'} ASEP	km/h	2.3.	target vehicle velocity for test point P4 of the assessment method according paragraph 2.4
P _j	—	2.4.	test point(s) under ASEP
j	—	2.4.	index for the test points under ASEP
v _{BB'} j	km/h	2.4.	vehicle test speed at BB' for a particular ASEP test point
a _{ACC TEST} κj	m/s ²	2.5.	acceleration achieved in gear κ and at test point j
L _{ACC} κj	dB(A)	2.5.	sound pressure level measured for a gear κ and at a test point j; value to be reported and used for calculations to the first decimal place
n _{BB'} κj	1/min	2.5.	vehicle test engine speed at BB' for a gear κ and at test point j
v _{AA'} κj	km/h	2.5.	vehicle test speed at AA' for a gear κ and at test point j; value to be reported and used for calculations to the first decimal place
v _{BB'} κj	km/h	2.5.	vehicle test speed at BB' for a gear κ and at test point j; value to be reported and used for calculations to the first decimal place
v _{PP'} κj	km/h	2.5.	vehicle test speed at PP' for a gear κ and at test point j; value to be reported and used for calculations to the first decimal place
L _{ANCHOR}	dB(A)	3.1.	reported vehicle sound pressure level for gear ratio i from Annex 3; value to be reported and used for calculations to the first decimal place
n _{ANCHOR}	1/min	3.1.	reported vehicle engine speed for gear ratio i from Annex 3
v _{ANCHOR}	km/h	3.1.	reported vehicle test speed for gear ratio i at BB' from Annex 3; value to be reported and used for calculations to the first decimal place
L _{κj}	dB(A)	3.5.	sound pressure level measured for a gear κ and at a test point j; value to be reported and used for calculations to the first decimal place

Symbol	Unit	Paragraph	Explanation
K _P ASEP	—	4.2.1.	partial power factor determined for the L _{URBAN} principle of ASEP
L _{ACC} ASEP	dB(A)	4.2.1.	vehicle sound pressure level measured for the L _{URBAN} principle of ASEP; value to be reported and used for calculations to the first decimal place
L _{URBAN} ASEP	dB(A)	4.2.1.	Estimated urban sound pressure level determined for the L_{URBAN} principle of ASEP; value to be reported and used for calculations to the first decimal place
L _{URBAN MEASURED} ASEP	dB(A)	4.2.1.	interim result for calculation of ΔL _{URBAN} ASEP; value to be reported and used for calculations to the first decimal place
L _{URBAN} NORMALIZED	dB(A)	4.2.1.	interim result for calculation of ΔL _{URBAN} ASEP; value to be reported and used for calculations to the first decimal place
ΔL _{URBAN} ASEP	dB(A)	4.2.1.	estimated deviation from urban sound pressure level; value to be reported to the first decimal place
α	—	5.2	gear to be determined for the reference sound assessment according to the type of transmission
L _{REF}	dB(A)	5.3.	reference sound pressure level for reference sound assessment; value to be reported and used for calculations to the first decimal place
n _{REF}	1/min	5.3.	reference engine speed for reference sound assessment
V _{REF}	km/h	5.3.	reference vehicle test speed for reference sound assessment
n _{BB'} REF	1/min	5.3.	Reference vehicle test engine speed for reference sound assessment
V _{BB'} REF	km/h	5.3.	reference vehicle test speed for reference sound assessment

Symbol	Unit	Paragraph	Explanation
L _{TEST}	dB(A)	3.5.3.	sound pressure level measured; value to be reported and used for calculations to the first decimal place
V _{AA'} TEST	km/h	3.5.3.	
V _{PP'} TEST	km/h	3.5.3.	
V _{BB'} TEST	km/h	3.5.3.	
n _{AA'} TEST	1/min	3.5.3.	<i>Introduction of n_{XX'} TEST with reference to the rear of the vehicle 'only' in ASEP to make the difference with the definition for Heavy vehicles in Annex 3</i>

<i>Symbol</i>	<i>Unit</i>	<i>Paragraph</i>	<i>Explanation</i>
$n_{BB'}$ TEST	1/min	3.5.3.	<i>Introduction of $n_{XX'}$ TEST with reference to the rear of the vehicle 'only' in ASEP to make the difference with the definition for Heavy vehicles in Annex 3</i>
a_{TEST}	m/s ²	3.5.4.1.	
L_{EXP}	dB(A)	3.5.4.3.	
$L_{TEST EXP}$	dB(A)	4.1.	
Annex7-Appendix 1			
$L_{ACC REP}$	dB(A)	2.2.1.2.	
$V_{BB'ACC REP}$	km/h	2.2.1.2.	
$n_{BB'ACC REP}$	1/min	2.2.1.2.	
$L_{CRS REP}$	dB(A)	2.2.1.2.	
$V_{BB'CRS REP}$	km/h	2.2.1.2.	
$n_{BB'CRS REP}$	1/min	2.2.1.2.	
α		2.3.1.	
$L_{REF TR}$	dB(A)	2.3.1.	
$L_{REF PT}$	dB(A)	2.5.	
$L_{REF DYN}$	dB(A)	2.6.	
ΔL_{DYN}	dB(A)	2.7.	
$L_{REF TR ADJ}$	dB(A)	2.7.	
$L_{REF PT ADJ}$	dB(A)	2.7.	
$\theta_{TR LO}$		2.7.	
$\theta_{PT LO}$		2.7.	
$n_{SHIFT PT}$	1/min	2.7.	
i_{TEST}		3.2.1.	
$L_{CRS REP'}$	dB(A)	3.2.3.2.2.	Corrected cruise test result
$L_{ACC REP'}$	dB(A)	3.2.3.3.2.	
$L_{ACC REP'}$	dB(A)	3.2.3.3.2.	Correction of sound pressure level
Limit	dB(A)	3.2.3.3.2.	
$L_{TR EXP}$	dB(A)	3.3.	
$\theta_{TR HI}$		3.3.	
$L_{PT EXP}$	dB(A)	3.4.	
$\theta_{PT HI}$		3.4.	
$L_{DYN EXP}$		3.5.	

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- 2.26.2. "Stable acceleration" applicable to vehicles of category M₁, N₁ and M₂ < 3,500kg technically permissible maximum laden mass avoids acceleration delays in acceleration due to engine control application, at the moment when the acceleration unit is depressed. This is typically ensured by using pre-acceleration.
- 2.26.3. "Stable acceleration" for the purpose of Annex 7 is based on the assumption of a constant acceleration over the complete measurement distance between AA' and BB' plus the vehicle length.
- 2.27. "Kickdown" means a driver initiated automated gear shift to a test condition outside the specific target conditions for the vehicle as defined in Annex 3.
- 2.28. "Prevention of downshift" means a measure by the vehicle manufacturer to ensure that the vehicle is tested within its specific target conditions as defined in Annex 3 and Annex 7.

modes?

- 2.29. "**Exhaust silencing system with variable geometry**" means a silencing system, not including pressure charging, containing one or more active, passive, or self-actuated moving parts or devices.

These parts or devices will cause a change of the gas flow through the exhaust silencing system and result in a change of the sound reduction performance, by opening or closing one or more valves in the exhaust gas flow as a function of varying driving or engine conditions (rpm engine speed, load, vehicle speed, etc.).

Active devices mean actuators, controlled by any means.

Passive or self-actuated devices mean units controlled e.g. by exhaust flow.

- 2.30. "**Exterior sound enhancement system**" means a system that is installed to a vehicle for producing exterior sound, such as but not limited to sound actuators, either integrated into an exhaust silencing system or mounted as an individual unit.

*type A?
type B?*

- 2.31. "**Deceleration**" means the vehicle deceleration stipulated by the release of the acceleration control unit only, without any driver applied braking (service brake, retarder, parking brake, etc...).

- 2.32. "**Performance**" means the product of acceleration and vehicle speed as quantity of the achieved vehicle performance.

- 2.33. "**Electronic Control System**" means a combination of units, designed to co-operate in the production of the stated vehicle control function by electronic data processing. Such systems, often controlled by software, are built from discrete functional components such as sensors, electronic control units and actuators and connected by transmission links. They may include mechanical, electro-pneumatic or electro-hydraulic elements. "The System", referred to herein, is the one for which type approval is being sought.

- 2.34. "**Software**" means the part of an Electronic Control System that consists of digital data and instructions."

- 2.35. "**Rx Software Identification Number (RXSWIN)**" means a dedicated identifier, defined by the vehicle manufacturer, representing information about the type approval relevant software of the Electronic Control

System contributing to the UN Regulation No. 51.04 type approval relevant characteristics of the vehicle.

3. Application for approval

- 3.1. The application for approval of a vehicle type with regard to sound shall be submitted by its manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the undermentioned documents and the following particulars in triplicate:
 - 3.2.1. A description of the vehicle type with regard to the items mentioned in paragraph 2.2. above. The numbers and/or symbols identifying the engine type and the vehicle type shall be specified;
 - 3.2.2. A list of the components, duly identified, constituting the sound reduction system;
 - 3.2.3. A drawing of the assembled sound reduction system and an indication of its position on the vehicle;
 - 3.2.4. Detailed drawings of each component to enable it to be easily located and identified, and a specification of the materials used.
 - 3.2.5. A technical information document including the information as outlined in Annex 1, Appendix 2.
- 3.3. In the case of paragraph 2.2.2. the single vehicle, representative of the type in question, will be selected by the Technical Service conducting approval tests, in accordance with the vehicle manufacturer following the specification laid down in paragraph 3.1.2.2. in Annex 3.
- 3.4. At the request of the Technical Service conducting approval tests, the vehicle manufacturer shall, in addition, submit a sample of the sound reduction system and an engine of at least the same cylinder capacity and rated maximum net power as that fitted to the vehicle in respect of which type-approval is sought.
- 3.5. The Type Approval Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

4. Markings

- 4.1. The components of the sound reduction system, excluding fixing hardware and piping, shall bear:
 - 4.1.1. The trade name or mark of the manufacturer of the sound reduction system and of its components; and
 - 4.1.2. The manufacturer's trade description;
- 4.2. These markings shall be clearly legible and be indelible even after fitting.
- 4.3. A component may carry several approval numbers if it has been approved as component of several replacement silencing systems.

5. Approval

- 5.1. Type approval shall only be granted if the vehicle type meets the requirements of paragraphs 6. and 7. below.
- 5.2. An approval number shall be assigned to each type approved. Its first two digits (at present 04 corresponding to the 04 series of amendments) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another vehicle type.
- 5.3. Notice of approval or of extension or of refusal or withdrawal of approval or of production definitively discontinued of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation.
- 5.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
 - 5.4.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;³
 - 5.4.2. The number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in paragraph 5.4.1.
- 5.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 5.4.1. need not be repeated; in such a case the regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 5.4.1.
- 5.6. The approval mark shall be clearly legible and be indelible.
- 5.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 5.8. Annex 2 to this Regulation gives examples of arrangements of the approval mark.

6. Specifications

- 6.1. General specifications
 - 6.1.1. The vehicle, its engine and its sound reduction system shall be so designed, constructed and assembled as to enable the vehicle, in normal use, despite the

³ The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev. 3, Annex 3 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

vibration to which it may be subjected, to comply with the provisions of this Regulation.

6.1.2. The sound reduction system shall be so designed, constructed and assembled as to be able to reasonably resist the corrosive phenomena to which it is exposed having regard to the conditions of use of the vehicle, including regional climate differences, **and against manipulation.**

6.2. Specifications regarding sound levels

6.2.1. Methods of measurement

6.2.1.1. The sound made by the vehicle type submitted for approval shall be measured either indoors or outdoors by the methods described in Annex 3 **and Annex 7** to this Regulation. The specific conditions for indoor testing are provided in Annex 8 to this Regulation. The results of the outdoor and indoor tests are deemed equivalent.

For each specific test condition for vehicles, the manufacturer can select to test the vehicle either indoors or outdoors. The Type Approval Authority shall always have the option to mandate an outdoor test for verification. The option of the type approval authority to mandate an outdoor test shall apply to any test specified in this Regulation, including conformity of production testing.

In addition, the sound shall be measured on the stationary¹ vehicle; in the case of a vehicle where an internal combustion engine cannot operate when the vehicle is stationary, the emitted sound shall only be measured in motion. In the case of a hybrid electrical vehicle of category M₁ where an internal combustion engine cannot operate when the vehicle is stationary, the emitted sound shall be measured according to Annex 3, paragraph 4.

Vehicles having a technically maximum permissible laden mass exceeding 2,800 kg shall be subjected to an additional measurement of the compressed air noise with the vehicle stationary in accordance with the specifications of Annex 5, if the corresponding brake equipment is part of the vehicle.

6.2.1.2. The values measured in accordance with the provisions of paragraph 6.2.1.1. above shall be entered in the test report and a certificate corresponding to the model shown in Annex 1.

6.2.2. Sound level limits

The sound level measured in accordance with the provisions of paragraph 3.1. Annex 3 to this Regulation, mathematically rounded to the nearest integer value, shall not exceed the following limits:

¹ A test is made on a stationary vehicle in order to provide a reference value for administrations which use this method to check vehicles in use.

Vehicle category	Vehicles used for the carriage of passengers	Limit Values (dB(A))		
		Phase 1	Phase 2	Phase 3
M ₁	PMR ≤ 120	72	70	68
	120 < PMR ≤ 160	73	71	69
	PMR > 160	75	73	71
	PMR > 200, no. of seats ≤ 4, R-point height < 450mm from the ground	75	74	72
M ₂	M ≤ 2.5 t	72	70	69
	2.5 t < M ≤ 3.5 t	74	72	71
	M > 3.5 t; P _N ≤ 135 kW	75	73	72
	M > 3.5 t; P _N > 135 kW	75	74	72
M ₃	P _N ≤ 150 kW	76	74	73
	150 kW < P _N ≤ 250 kW	78	77	76
	P _N > 250 kW	80	78	77
Vehicle category	Vehicles used for the carriage of goods	Phase 1	Phase 2	Phase 3
N ₁	M ≤ 2.5 t	72	71	69
	M > 2.5 t	74	73	71
N ₂	P _N ≤ 135 kW	77	75	74
	P _N > 135 kW	78	76	75
N ₃	P _N ≤ 150 kW	79	77	76
	150 kW < P _N ≤ 250 kW	81	79	77
	P _N > 250 kW	82	81	79

- 6.2.2.1. For vehicle types of category M₁ derived from N₁ vehicle types having a technically permissible maximum laden mass above 2.5 tons and a R-point height greater than 850 mm from the ground, the limits of vehicles types of category N₁ having a technically permissible maximum laden mass above 2.5 tons apply.
- 6.2.2.2. For vehicle types designed for off-road⁵ use, the limit values shall be increased by 2 dB(A) for M₃ and N₃ vehicles category and 1 dB(A) for any other vehicle category.
- For vehicle types of category M₁ the increased limit values for off-road vehicles are only valid if the technically permissible maximum laden mass > 2 tons.
- 6.2.2.3. Limit values shall be increased by 2 dB(A) for wheelchair accessible vehicles of category M₁ constructed or converted specifically so that they accommodate one or more persons seated in their wheelchairs when travelling on the road, and armoured vehicles, as defined in paragraph 2.5.2. of R.E.3.

⁵ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.3, para. 2 - www.unece.org/trans/main/wp29/wgs/wp29gen/wp29resolutions.html

6.2.2.4. For vehicle types of category M_2 having a gasoline only engine, the applicable limit value is increased by 2 dB(A).

6.2.2.5. For vehicle types of category N_1 having a technically permissible maximum laden mass of less than or equal to 2.5 tons, the engine capacity not exceeding 660 cc and the power-to-mass ratio (PMR) calculated by using the technically permissible maximum laden mass not exceeding 35 and a horizontal distance "d" between the front axle and the driver's seat R point of less than 1,100 mm, the limits of the vehicle types of category N_1 having a technically permissible maximum laden mass above 2.5 tons apply.

N_1

6.2.3. **Real Driving** Additional Sound Emission Provisions

The **Real Driving** Additional Sound Emission Provisions (RD-ASEP) apply to vehicles of categories M_1 and N_1 equipped with:

- an internal combustion engine (ICE) for propulsion of the vehicle, or
- any other propulsion technology fitted with an exterior sound enhancement system.

6.2.3.1. Exemptions

Notwithstanding the requirements above, vehicles equipped with an ICE for propulsion, inclusive HEV are exempted from RD-ASEP, if their exhaust silencing systems have no variable geometries,

- and the vehicle has no sound enhancement systems, or
- a sound enhancement system is fitted to the vehicle solely for the purpose of fulfilling the provisions of UN Regulation No. 138, and the sound emitting device does not emit a sound pressure level of more than 75 dB(A)⁶ under any operation conditions exceeding the specification range of UN Regulation No. R138.

Manufacturer shall demonstrate compliance to the 75dB(A) by using the test set up according to UN Regulation No. R138 Annex 3 paragraph 3.3.2.2. by using the control range of RD-ASEP described in Annex 7 paragraph 3.3

Notwithstanding the requirements above, vehicles which have no ICE for propulsion are exempted from RD-ASEP, if a sound enhancement system is fitted to the vehicle solely for the purpose of fulfilling the provisions of UN Regulation No. 138, and the sound emitting device does not emit a sound pressure level of more than 75 dB(A) under any operation conditions exceeding the specification range of UN Regulation No. R138.

Manufacturer shall demonstrate compliance to the 75dB(A) by using the test set up according to UN Regulation No. R138 Annex 3 paragraph 3.3.2.2. by using the control range of RD-ASEP described in Annex 7 paragraph 3.3

6.2.3.2. Specifications

6.2.3.2.1. The vehicle shall meet the requirements of Annex 7 to this Regulation.

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⁶ See footnote 3 in paragraph 6.2.7 of UN Regulation No. 138 "The maximum overall sound pressure level of 75 dB(A) measured at a distance of 2 m is corresponding to the overall sound pressure level of 66 dB(A) measured at a distance of 7,5 m."

6.2.3.2.2. The vehicle manufacturer shall not intentionally alter, adjust, or introduce any mechanical, electrical, thermal, or other device or procedure solely for the purpose of fulfilling the sound emission requirements as specified under this Regulation which is not operational during typical on-road operation.

6.2.3.2.3. **Regardless of the specifications above**, the sound emissions of the vehicle under other driving conditions not subject to the measuring conditions of the Annex 3 and Annex 7, shall not deviate from the evaluation principles outlined by Annex 7 in a significant manner.

6.2.3.3. Provisions against manipulation

6.2.3.3.1. Software manipulation

6.2.3.3.1.1. Requirements for software identification

For the purpose of ensuring the software of the System can be identified, an RXSWIN may be implemented by the vehicle manufacturer.

6.2.3.3.1.2. If the manufacturer implements an RXSWIN the following shall apply:

6.2.3.3.1.2.1. The vehicle manufacturer shall have a valid approval according to UN Regulation No. 156.

6.2.3.3.1.2.2. The vehicle manufacturer shall provide the following information in the communication form of this Regulation:

- the RXSWIN
- how to read the RXSWIN or software version(s) in case the RXSWIN is not held on the vehicle

6.2.3.3.1.2.3. The vehicle manufacturer may provide in the communication form of this Regulation a list of the relevant parameters that will allow the identification of those vehicles that can be updated with the software represented by the RXSWIN. The information provided shall be declared by the vehicle manufacturer and may not be verified by an Approval Authority.

6.2.3.3.1.3. The vehicle manufacturer may obtain a new vehicle approval for the purpose of differentiating software versions intended to be used on vehicles already registered in the market from the software versions that are used on new vehicles. This may cover the situations where type approval regulations are updated, or hardware changes are made to vehicles in series production. In agreement with the testing agency duplication of tests shall be avoided where possible. *(new document for Reference only to be updated)*

6.2.3.3.2. Hardware manipulation

All exhaust silencing systems shall be designed, constructed and assembled in a way that does not easily permit removal of baffles, exit-cones and other parts whose primary function is as part of the silencing/expansion chambers. It also applies to control units for active systems and to components like exhaust or intake flaps, or to vacuum tubes controlling the flaps, whose removal for purposes of maintenance, repair, or replacement is only possible by special tools and expertise.

- 6.3. Specifications regarding exhaust systems containing fibrous materials.
- 6.3.1. Requirements of Annex 4 shall be applied.

7. Modification and extension of approval of a vehicle type

- 7.1. Every modification of the vehicle type shall be notified to the Type Approval Authority which approved the vehicle type. The Type Approval Authority may then either:
 - 7.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still complies with the requirements, or
 - 7.1.2. Require a further test report from the Technical Service responsible for conducting the tests.
- 7.2. Confirmation or refusal of approval, specifying the alterations shall be communicated by the procedure specified in paragraph 5.3. above to the Parties to the Agreement applying this Regulation.
- 7.3. The Type Approval Authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

8. Conformity of production

- 8.1. The conformity of production procedures shall comply with those set out in the Agreement Schedule 1 (E/ECE/TRANS/505/Rev.3).
- 8.2. Control procedures carried out by the manufacturer for conformity of production according to paragraph 2.3 of Schedule 1 of the Agreement (see 8.1 above) shall at least comply with the requirements of Annex 6 to this Regulation.
- 8.3. Whenever measurements on Conformity of Production according to paragraph 3. of Schedule 1 of the Agreement (see 8.1 above) or measurements other than type approval or conformity of production initiated by an authority to evaluate the conformity of the vehicle with regard to this Regulation are carried out, the setup of the vehicle and the assessment methods as established during type approval shall be taken as reference for the conformity assessment

Notwithstanding this provision, the requirements of 6.2.1.1 remain valid.

9. Penalties for non-conformity of production

- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements set forth above are not met.
- 9.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other

Contracting Parties applying this Regulation, by means of a communication form conforming to the model in Annex 1 to this Regulation.

10. Production definitively discontinued

- 10.1. If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

11. Transitional provisions

- 11.1. **As from the official date of entry into force of the 04 series of amendments to this Regulation, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept type-approvals under this Regulation as amended by the 04 series of amendments.**

[Further transitional provisions to be completed]

12. Names and addresses of Technical Services responsible for conducting approval tests and of Type Approval Authorities

The Contracting Parties to the 1958 Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.