Submitted by IWG-EPPR

Informal document GRPE-93-26
93rd GRPE, 15 – 17 October 2025, item 8(a) of the provisional agenda

Proposal for amendments to document ECE/TRANS/WP.29/GRPE/2025/22

Proposal for the 02 series of amendments to UN Regulation No. 40 (Emission of gaseous pollutants by motorcycles)

This document aims to propose a new series of amendments to UN Regulation No. 40 to align with the provision of Euro 3 emission standard.

The modifications to the working document ECE/TRANS/WP.29/GRPE/2025/22 are marked in bold **red** for new or ~~**strikethrough**~~ for deleted characters.

I. Proposal

Figure 2, amend to read:

Figure 2
Flowchart for the number of Test Type I

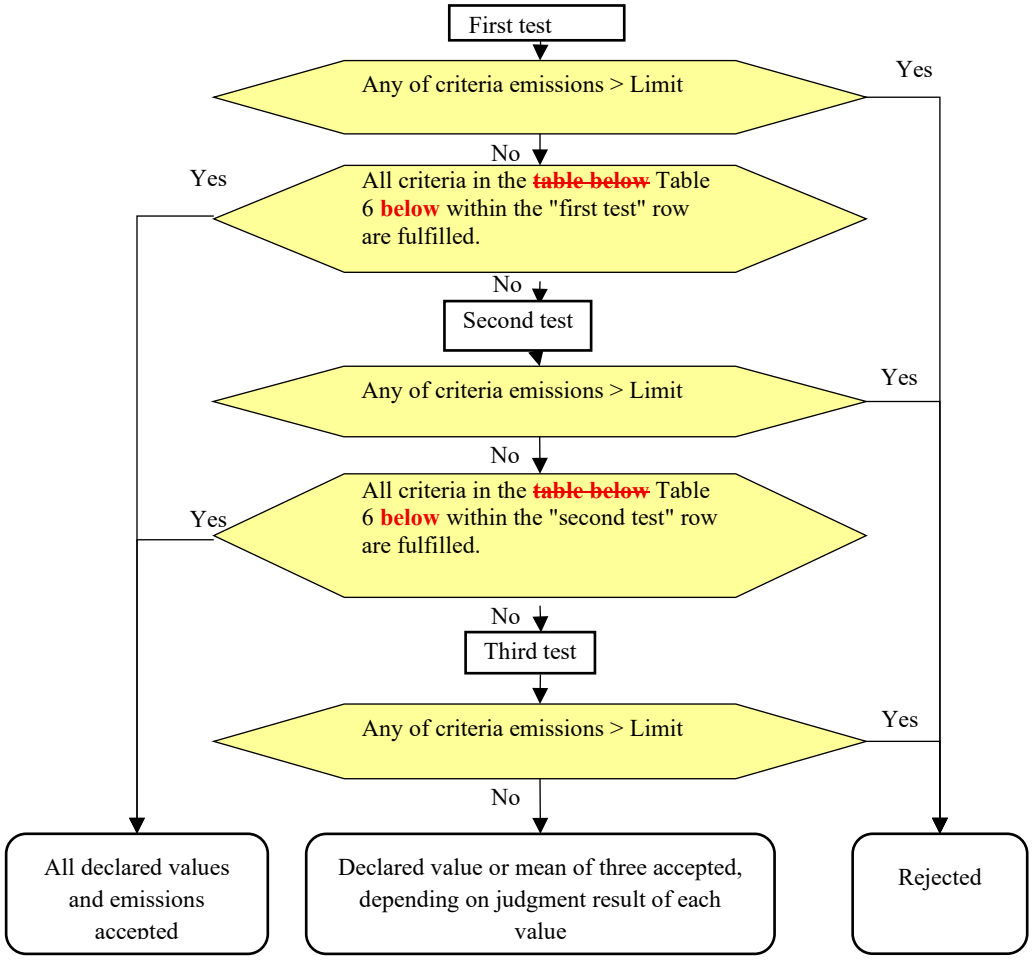
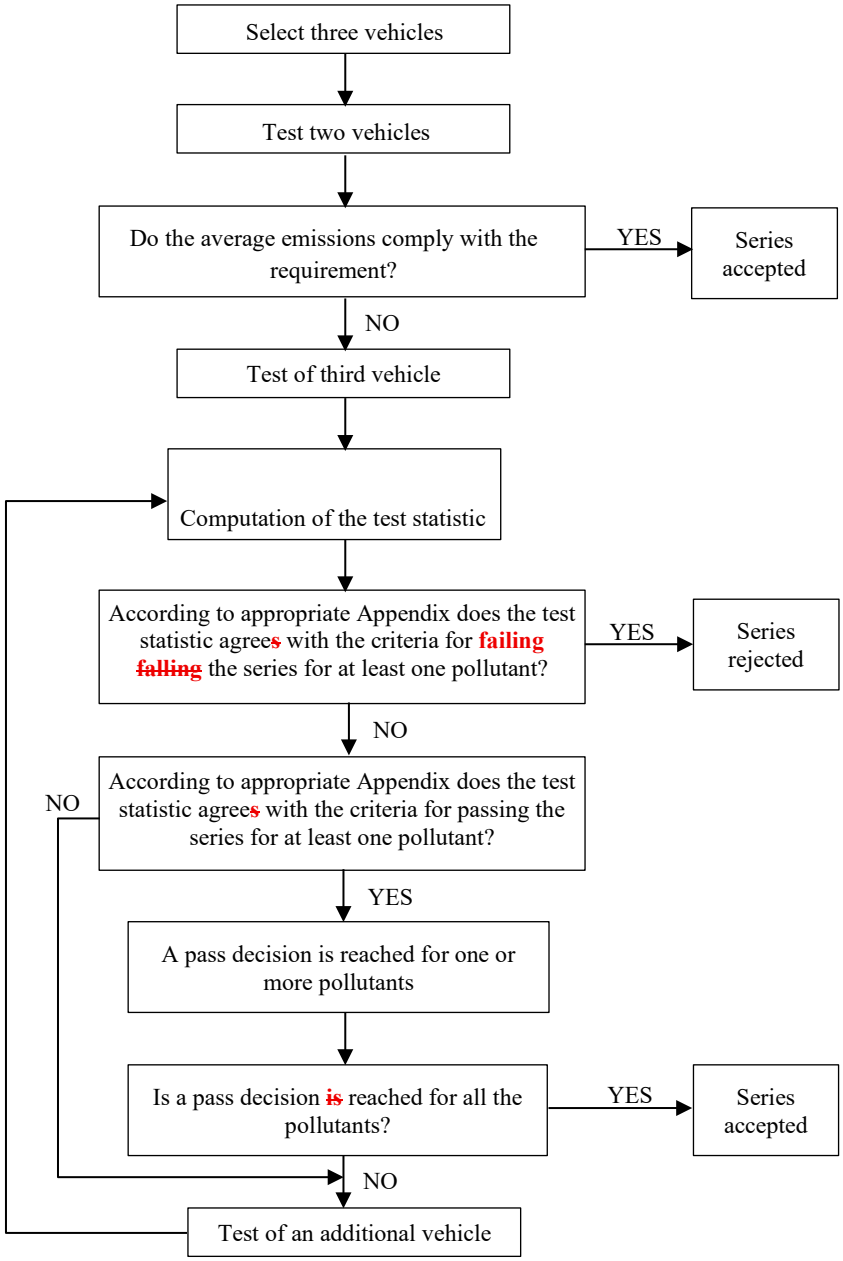


Figure 3, amend to read:

Figure 3
Checking the conformity of the vehicle



Appendix 2, paragraph 6., amend to read:

6. Remarks

The following recursive formulae are useful for computing successive values of the test statistic:

$$\bar{d}_n = \left(1 - \frac{1}{n}\right)\bar{d}_{n-1} + \frac{1}{n}d_n$$

$$V_n^2 = \left(1 - \frac{1}{n}\right)V_{n-1}^2 + \frac{\left(\bar{d}_n - d_n\right)^2}{n-1}$$

$$(n = 2, 3, \ldots;\ \bar{d}_1 = d_1;\ \ V_1 = 0)$$

Table A4/1, amend to read:

Table A4/1
Applicable parts of WMTC as specified in Appendix 11 to Annex 7

Vehicle Sub classification	*Applicable Parts of WMTC as specified in Appendix 11 to Annex 7*
Class 1	part 1, reduced vehicle speed in cold condition, followed by part 1, reduced vehicle speed in warm condition
Class 2 subdivided in:	
Sub-class 2-1	part 1, reduced vehicle speed in cold condition, followed by part 2, reduced vehicle speed in warm condition
Sub-class 2-2	part 1, in cold condition, followed by part 2, in warm condition
Class 3 subdivided in:	
Sub-class 3-1	part 1, in cold condition, followed by part 2, in warm condition, followed by part 3, reduced vehicle speed in warm condition
Sub-class 3-2	part 1, in cold condition, followed by part 2, in warm condition, followed by part 3, in warm condition

Annex 4, clause 3.Test Conditions, paragraph 3.4.5.3.2., amend to read:

3.4.5.3.2. Optional provisions

The gear choice may be modified according to the following provisions:

The use of gears lower than those determined by the requirements described in paragraph 3.4.5.~~2~~3.1. is permitted in any cycle phase. Manufacturers' recommendations for gear use shall be followed if they do not result in gears higher than determined by the requirements of paragraph 3.4.5.~~2~~3.1.

Annex 4, clause 4. Test procedures, paragraph 4.2.2.3.2.3., amend to read:

4.2.2.3.2.3. The set running resistance force $F_E(v_j)$ at the specified vehicle speed on the chassis dynamometer is calculated using the following equation:

$$F_E(v_j) = \frac{1}{3.6}\, m_i\, \frac{2\Delta v}{\Delta t_E} \qquad (29)$$

Annex 7- Appendix 1, amend to read:

Annex 7- Appendix 1

Symbols & Abbreviations

Table A7.App 1/1
Symbols used

Symbol	*Definition*	*Unit*
a	Coefficient of polygonal function	-
a_T	Rolling resistance force of front wheel	N
A	NG / biomethane quantity within the H_2NG mixture	per cent vol.
b	Coefficient of polygonal function	-
b_T	Coefficient of aerodynamic function	$N/(km/h)^2$
c	Coefficient of polygonal function	-
C_{CO}	Concentration of carbon monoxide	ppm
C_{CO2}	Concentration of CO_2 in the diluted exhaust gas contained in the sampling bag	percent vol.
C_{COcorr}	Corrected concentration of carbon monoxide	percent vol.
CO_{2c}	Carbon dioxide concentration of diluted gas, corrected to take account of diluent air	percent
CO_{2d}	Carbon dioxide concentration in the sample of diluent air collected in bag B	percent
CO_{2e}	Carbon dioxide concentration in the sample of diluent air collected in bag A	percent
CO_{2m}	Mass of carbon dioxide emitted during the test part	mg/km
CO_c	Carbon monoxide concentration of diluted gas, corrected to take account of diluent air	ppm
CO_d	Carbon monoxide concentration in the sample of diluent air, collected in bag B	ppm
CO_e	Carbon monoxide concentration in the sample of diluent air, collected in bag A	ppm
CO_m	Mass of carbon monoxide emitted during the test part	mg/km
C_{H2}	Concentration of hydrogen in the diluted exhaust gas contained in sampling bag	ppm
C_{H2O}	Concentration of H_2O in the diluted exhaust gas contained in the sampling bag	percent vol.
$C_{H2O\text{-}DA}$	Concentration of H_2O in the air used for dilution	percent vol.
C_{HC}	Concentration of HC in the diluted exhaust gas contained in the sampling bag	ppm (carbon equivalent)
d_0	Standard ambient relative air density	-
d_{CO}	Density of carbon monoxide	mg/cm^3
d_{CO2}	Density of carbon dioxide	g/m^3
d_{HC}	Density of hydrocarbon	mg/cm^3
D_{av}	Average distance between two battery recharges	km
D_e	Electric range of the vehicle	km
DiF	Dilution factor	-
D_{OVC}	Distance from externally chargeable vehicle	km
S / d	Distance driven in a cycle part	km

Symbol	*Definition*	*Unit*
d_{NOx}	Density of nitrogen oxide	mg/m^3
d_T	Relative air density under test condition	-
Δt	Coast-down time	s
Δta_i	Coast-down time measured in the first road test	s
Δtb_i	Coast-down time measured in the second road test	s
ΔT_E	Coast-down time corrected for the inertia mass	s
Δt_E	Mean coast-down time on the chassis dynamometer at the reference vehicle speed	s
ΔT_i	Average coast-down time at specified vehicle speed	s
Δt_i	Coast-down time at corresponding ~~s~~ vehicle speed	s
ΔT_j	Average coast-down time at specified vehicle speed	s
ΔT_{road}	Target coast-down time	s
Δt_t	Mean coast-down time on the chassis dynamometer without absorption	s
Δv	Coast-down vehicle speed interval ($2\Delta v = v1 - v2$)	km/h
ε	Chassis dynamometer setting error	percent
F	Running resistance force	N
F*	Target running resistance force	N
$F^*_{(v0)}$	Target running resistance force at reference vehicle speed on chassis dynamometer	N
$F^*_{(vi)}$	Target running resistance force at specified vehicle speed on chassis dynamometer	N
f^*_0	Corrected rolling resistance in the standard ambient condition	N
f^*_2	Corrected coefficient of aerodynamic drag in the standard ambient condition	$N/(km/h)^2$
F^*_j	Target running resistance force at specified vehicle speed	N
f_0	Rolling resistance	N
f_2	Coefficient of aerodynamic drag	$N/(km/h)^2$
F_E	Set running resistance force on the chassis dynamometer	N
$F_{E(v0)}$	Set running resistance force at the reference ~~s~~ vehicle speed on the chassis dynamometer	N
$F_{E(v2)}$	Set running resistance force at the specified vehicle speed on the chassis dynamometer	N
F_f	Total friction loss	N
$F_{f(v0)}$	Total friction loss at the reference vehicle speed	N
F_j	Running resistance force	N
$F_{j(v0)}$	Running resistance force at the reference vehicle speed	N
F_{pau}	Braking force of the power absorbing unit	N
$F_{pau(v0)}$	Braking force of the power absorbing unit at the reference vehicle speed	N
$F_{pau(vj)}$	Braking force of the power absorbing unit at the specified vehicle speed	N
F_T	Running resistance force obtained from the running resistance table	N
H	Absolute humidity	g of water / kg of dry air
HC_c	Concentration of diluted gases expressed in the carbon equivalent, corrected to take account of diluent air	ppm
HC_d	Concentration of hydrocarbons expressed in the carbon equivalent, in the sample of diluent air collected in bag B	ppm
HC_e	Concentration of hydrocarbons expressed in the carbon equivalent, in the sample of diluent air collected in bag A	ppm

Symbol	*Definition*	*Unit*
HC_m	Mass of hydrocarbon emitted during the test part	mg/km
i	gear number	-
K_0	Temperature correction factor for rolling resistance	-
K_h	Humidity correction factor	-
L	Certification limit values of gaseous pollutant emission	mg/km
m	Test vehicle mass	kg
ma	Actual mass of the test vehicle	kg
m_{corr}	PM mass corrected for buoyancy	mg
m_f i	Flywheel equivalent inertia mass	kg
mi	Equivalent inertia mass	kg
m_{mix}	molar mass of air in balance environment (28.836 $gmol^{-1}$)	$gmol^{-1}$
mr	Equivalent inertia mass of all the wheels	kg
mri	Equivalent inertia mass of all the rear wheel and vehicle parts rotating with wheel	kg
m_k	m_k is unladen mass of the vehicle	kg
m_{ref}	m_{ref} is reference mass of the vehicle	kg
m_{rid}	Rider mass	kg
m_{uncorr}	PM mass uncorrected for buoyancy	mg
M_i	Mass emission of the pollutant i in mg/km	mg
M_{2i}	Average mass emission of the pollutant i with an electrical energy/power storage device in minimum state of charge (maximum discharge of capacity)	mg/km
M_{1i}	Average mass emission of the pollutant i with a fully charged electrical energy/power storage device	mg/km
Mp	Particulate mass emission	mg/km
n	Engine speed	min^{-1}
n	Number of data regarding the emission or the test	-
N	Number of revolutions made by pump P	-
nd_{vi}	Ratio between engine speed in min^{-1} and vehicle speed in km/h in gear "i"	-
ng	Number of forward gears	-
n_{idle}	Idling engine speed	min^{-1}
$n\_max\_acc_{(1)}$	Upshift engine speed from gear 1 to gear 2 during acceleration phases	min^{-1}
$n\_max\_acc_{(i)}$	Up shift engine speed from gear i to gear i+1 during acceleration phases, i>1	min^{-1}
$n\_min\_acc_{(i)}$	Minimum engine speed for cruising or deceleration in gear 1	min^{-1}
NO_{xc}	Nitrogen oxide concentration of diluted gases, corrected to take account of diluent air	ppm
NO_{xd}	Nitrogen oxide concentration in the sample of diluent air collected in bag B	ppm
NO_{xe}	Nitrogen oxide concentration in the sample of diluent air collected in bag A	ppm
NO_{xm}	Mass of nitrogen oxides emitted during the test part	mg/km
p_0	Standard ambient pressure	kPa
p_a	Ambient/atmospheric pressure	kPa
p_{abs}	absolute pressure in balance environment	kPa
p_d	Saturated pressure of water at the test temperature	kPa
p_i	Average under-pressure during the test part in the section of pump P	kPa
p_T	Mean ambient pressure during the test	kPa

Symbol	*Definition*	*Unit*
Pn	Rated power	kW
Q	Electric energy balance	Ah
ρ_0	Standard relative ambient air volumetric mass	mg/cm^3
ρ_{air}	density of air in balance environment	mg/cm^3
ρ_{weight}	density of calibration weight used to span balance	mg/cm^3
ρ_{media}	density of PM sample medium (filter) with filter medium Teflon coated glass fibre (e.g. TX40): ρ_{media} = 2 300 kg/m^3	mg/cm^3
r(i)	Gear ratio in gear i	-
R	molar gas constant (8 314 $Jmol^{-1}K^{-1}$)	$Jmol^{-1}K^{-1}$
R_f	Response factor to calibrate HC analyser	-
R_F	Final test result of pollutant emissions, carbon dioxide emission or fuel consumption	mg/km g/km, l/100km
R_1	Test results of pollutant emissions, carbon dioxide emission or fuel consumption for cycle part 1 with cold start	mg/km g/km, l/100km
R_2	Test results of pollutant emissions, carbon dioxide emission or fuel consumption for cycle part 2 with warm condition	mg/km g/km, l/100km
R_3	Test results of pollutant emissions, carbon dioxide emission or fuel consumption for cycle part 1 with warm condition	mg/km g/km, l/100km
Ri_1	First Test Type I results of pollutant emissions	mg/km
Ri_2	Second Test Type I results of pollutant emissions	mg/km
Ri_3	Third Test Type I results of pollutant emissions	mg/km
RS	Reduced speed	-
s	Rated engine speed	min^{-1}
S	Accumulated distance in test cycle (paragraph 5.1.1.3. of Annex 1)	km
T_{amb}	absolute ambient temperature of balance environment	°C
T_C	Temperature of the coolant	°C
T_O	Temperature of the engine oil	°C
T_P	Temperature of the spark-plug seat/gasket	°C
T_0	Standard ambient temperature	°C
T_p	Temperature of the diluted gases during the test part, measured in the intake section of pump P	°C
T_T	Mean ambient temperature during the test	°C
U	Relative humidity	percent
v	Specified vehicle speed	km/h
V	Total volume of diluted gas	m^3
v_{max}	Maximum design vehicle speed of test vehicle	km/h
v_0	Reference vehicle speed	km/h
V_0	Volume of gas displaced by pump P during one revolution	m^3/rev.
v_1	Vehicle speed at which the measurement of the coast-down time begins	km/h
v_2	Vehicle speed at which the measurement of the coast-down time ends	km/h
vi	Specified vehicle speed selected for the coast-down time measurement	km/h
w_1	Weighting factor of cycle part 1 with cold start	-
w_{1warm}	Weighting factor of cycle part 1 with warm condition	-

Symbol	*Definition*	*Unit*
w_2	Weighting factor of cycle part 2 with warm condition	-
w_3	Weighting factor of cycle part 3 with warm condition	-

Annex 7- Appendix 5b, paragraph 3.1.2.8, amend to read:

3.1.2.8. The running resistance determined on the track shall be corrected to the reference ambient conditions as follows:

Equation A7.App5b/5:

$F_{corrected} = k \cdot F_{measured}$

Equation A7.App5b/6:

$$k = \frac{R_R}{R_T} \cdot \left[1 + K_R \cdot (t - t_0)\right] + \frac{R_{AERO} \cdot d_0}{R_T \cdot d_t}$$

Where:

R_R is the rolling resistance at vehicle speed v (N);

R_{AERO} is the aerodynamic drag at vehicle speed v (N);

R_T is the total road load = R_R+R_{AERO} (N);

K_R is the temperature correction factor of rolling resistance, taken to be equal to: $3.6 \cdot 10^{-3}$/K;

t is the road test ambient temperature in K;

t_0 is the reference ambient temperature (293.~~2~~15 K);

d_t is the air density at the test conditions (kg/m^3);

d_0 is the air density at the reference conditions (293.~~2~~15 K, 101.3 kPa) = 1.189 kg/m^3

The ratios R_R/R_T and R_{AERO}/R_T shall be specified by the vehicle manufacturer on the basis of the data normally available to the company and to the satisfaction of the technical service. If these values are not available or if the technical service or responsible authority do not accept these values, the following figures for the rolling/total resistance ratio given by the following formula may be used:

Equation A7.App5b/7:

$$\frac{R_R}{R_T} = a \cdot m_{HP} + b$$

where:

m_{HP} is the test mass and for each vehicle speed the coefficients a and b are as shown in the following table:

Annex 7 – Appendix 11, paragraph 1.2., amend to read:

1.2. WMTC, cycle part 1
Figure A7.App11/2
WMTC, **cycle** part 1

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/3, amend to read:

Table A7.App11/3
WMTC~~,~~ cycle part 1~~,~~ reduced vehicle speed for vehicle classes 1 and 2-1. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/4, amend to read:

Table A7.App11/4
WMTC~~,~~ cycle part 1~~,~~ reduced vehicle speed for vehicle classes 1 and 2-1. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/5, amend to read:

Table A7.App11/5
WMTC~~,~~ cycle part 1, for vehicle classes 2-2 and 3. 0 to 180 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/6, amend to read:

Table A7.App11/6
WMTC~~,~~ cycle part 1, for vehicle classes 2-2 and 3. 181 to 360 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/7, amend to read:

Table A7.App11/7
WMTC~~,~~ cycle part 1, for vehicle classes 2-2 and 3. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/8, amend to read:

Table A7.App11/8
WMTC~~,~~ cycle part 1, for vehicle classes 2-2 and 3. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 11, paragraph 1.3., amend to read:

1.3. WMTC~~,~~ **cycle** part 2
Figure A7.App11/3

[Figure unchanged]

Annex 7 – Appendix 11, paragraph 1.3.1., amend to read:

1.3.1. The characteristic desired vehicle speed versus test time of WMTC~~,~~ **cycle** part 2 is set out in the following tables.

Annex 7 – Appendix 11, Table A7.App11/9, amend to read:

Table A7.App11/9
WMTC~~,~~ cycle part 2~~,~~ reduced vehicle speed for vehicle class 2-1. 0 to 180 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/10, amend to read:

Table A7.App11/10
WMTC~~,~~ cycle part 2~~,~~ reduced vehicle speed for vehicle class 2-1. 181 to 360 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/11, amend to read:

Table A7.App11/11
WMTC~~,~~ cycle part 2~~,~~ reduced vehicle speed for vehicle class 2-1. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/12, amend to read:

Table A7.App11/12
WMTC~~,~~ cycle part 2~~,~~ reduced vehicle speed for vehicle class 2-1. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/13, amend to read:

Table A7.App11/13
WMTC~~,~~ cycle part 2, for vehicle classes 2-2 and 3. 0 to 180 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/14, amend to read:

Table A7.App11/14
WMTC~~,~~ cycle part 2, for vehicle classes 2-2 and 3. 181 to 360 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/15, amend to read:

Table A7.App11/15
WMTC~~,~~, cycle part 2, for vehicle classes 2-2 and 3. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/16, amend to read:

Table A7.App11/16
WMTC~~,~~, cycle part 2, for vehicle classes 2-2 and 3. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 11, paragraph 1.4., amend to read:

1.4. WMTC~~,~~ cycle part 3
Figure A7.App11/4
WMTC~~,~~ cycle part 3~~.~~

[Figure unchanged]

Annex 7 – Appendix 11, paragraph 1.4.1., amend to read:

1.4.1. The characteristic desired vehicle speed versus test time of WMTC~~,~~ cycle part 3 is set out in the following tables.

Annex 7 – Appendix 11, Table A7.App11/17, amend to read:

Table A7.App11/17
WMTC~~,~~, cycle part 3~~,~~, reduced vehicle speed for vehicle class 3-1. 0 to 180 s

time in s	roller speed in km/h	phase indicators				time in s	roller speed in km/h	phase indicators				time in s	roller speed in km/h	phase indicators			
		stop	acc	cruise	dec			stop	acc	cruise	dec			stop	acc	cruise	dec
0	0.0	X				33	68.1		X			66	80.4		X		
1	0.0	X				34	69.1		X			67	81.7		X		
2	0.0	X				35	69.5		X			68	82.6		X		
3	0.0	X				36	69.9		X			69	83.5		X		
4	0.0	X				37	70.6		X			70	84.4		X		
5	0.0	X				38	71.3		X			71	85.1		X		
6	0.0	X				39	72.2		X			72	85.7		X		
7	0.0	X				40	72.8		X			73	86.3		X		
8	0.9		X			41	73.2		X			74	87.0		X		
9	3.2		X			42	73.4		X			75	87.9		X		
10	7.3		X			43	73.8		X			76	88.8		X		
11	12.4		X			44	74.8		X			77	89.7		X		
12	17.9		X			45	76.7		X			78	90.3			X	
13	23.5		X			46	79.1		X			79	90.6			X	

14	29.1		X			47	81.1		X			80	90.6			X	
15	34.3		X			48	82.1				X	81	90.5			X	
16	38.6		X			49	81.7				X	82	90.4			X	
17	41.6		X			50	80.3				X	83	90.1			X	
18	43.9		X			51	78.8				X	84	89.7			X	
19	45.9		X			52	77.3				X	85	89.3			X	
20	48.1		X			53	75.9				X	86	89.0			X	
21	50.3		X			54	75.0				X	87	88.8			X	
22	52.6		X			55	74.7				X	88	88.9			X	
23	54.8		X			56	74.7				X	89	89.1			X	
24	55.8		X			57	74.7				X	90	89.3			X	
25	55.2		X			58	74.6				X	91	89.4			X	
26	53.9		X			59	74.4				X	92	89.4			X	
27	52.7		X			60	74.1				X	93	89.2			X	
28	52.8		X			61	73.9				X	94	88.9			X	
29	55.0		X			62	74.1		X			95	88.5			X	
30	58.5		X			63	75.1		X			96	88.0			X	
31	62.3		X			64	76.8		X			97	87.5			X	
32	65.7		X			65	78.7		X			98	87.2			X	

time in s	*roller speed in km/h*	*phase indicators*				*time in s*	*roller speed in km/h*	*phase indicators*				*time in s*	*roller speed in km/h*	*phase indicators*			
		stop	*acc*	*cruise*	*dec*			*stop*	*acc*	*cruise*	*dec*			*stop*	*acc*	*cruise*	*dec*
99	87.1			X		126	50.3		X			154	94.6		X		
100	87.2			X		127	50.6		X			155	96.0		X		
101	87.3			X		128	51.2		X			156	97.5		X		
102	87.4			X		129	51.8		X			157	99.0		X		
103	87.5			X		130	52.5		X			158	99.8				X
104	87.4			X		131	53.4		X			159	99.0				X
105	87.1			X		132	54.9		X			160	96.7				X
106	86.8			X		133	57.0		X			161	93.7				X
107	86.4			X		134	59.4		X			162	91.3				X
108	85.9			X		135	61.9		X			163	90.4				X
109	85.2				X	136	64.3		X			164	90.6				X

110	84.0				X	137	66.4		X			165	91.1				X
111	82.2				X	138	68.1		X			166	90.9				X
112	80.3				X	139	69.6		X			167	89.0				X
113	78.6				X	140	70.7		X			168	85.6				X
114	77.2				X	141	71.4		X			169	81.6				X
115	75.9				X	142	71.8		X			170	77.6				X
116	73.8				X	143	72.8		X			171	73.6				X
117	70.4				X	144	75.0		X			172	69.7				X
118	65.7				X	145	77.8		X			173	66.0				X
119	60.5				X	146	80.7		X			174	62.7				X
120	55.9				X	147	83.3		X			175	60.0				X
						148	~~78~~5.4		X			176	58.0				X
121	53.0				X	149	87.3		X			177	56.4				X
122	51.6				X	150	89.1		X			178	54.8				X
123	50.9				X	151	90.6		X			179	53.3				X
124	50.5				X	152	91.9		X			180	51.7				X
125	50.2				X	153	93.2		X								

Annex 7 – Appendix 11, Table A7.App11/18, amend to read:

Table A7.App11/18
WMTC~~.~~, cycle part 3~~.~~, reduced vehicle speed for vehicle class 3-1. 181 to 360 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/19, amend to read:

Table A7.App11/19
WMTC~~.~~, cycle part 3~~.~~, reduced vehicle speed for vehicle class 3-1. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/20, amend to read:

Table A7.App11/20
WMTC~~.~~, cycle part 3~~.~~, reduced vehicle speed for vehicle class 3-1. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/21, amend to read:

Table A7.App11/21
WMTC~~,~~ cycle part, 3 for vehicle class 3-2. 0 to 180 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/22, amend to read:

Table A7.App11/22
WMTC~~,~~ cycle part 3, for vehicle class 3-2. 181 to 360 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/23, amend to read:

Table A7.App11/23
WMTC~~,~~ cycle part 3, for vehicle class 3-2. 361 to 540 s

[Table unchanged]

Annex 7 – Appendix 11, Table A7.App11/24, amend to read:

Table A7.App11/24
WMTC~~,~~ cycle part 3, for vehicle class 3-2. 541 to 600 s

[Table unchanged]

Annex 7 – Appendix 12, clause 1., amend to read:

1. Introduction

This explanatory note explains matters specified or described in this Regulation~~,~~ including its Annexes or Appendices~~,~~ and matters related thereto with regard to the gearshift procedure.

Annex 7 – Appendix 12, paragraph 2.1., amend to read:

2.1. The development of the gearshift procedure was based on an analysis of the gearshift points in the in-use data. In order to establish generalised correlations between technical specifications of the vehicles and desired vehicle speeds to shift gears~~,~~ the engine speeds were normalised to the utilisable band between rated engine speed and idling engine speed.

Annex 7 – Appendix 12, paragraph 2.2., amend to read:

2.2. In a second step~~,~~ the end speeds (vehicle speed as well as normalised engine speed) for upshifts and downshifts were determined and recorded in a separate table. The averages of these speeds for each gear and vehicle were calculated and correlated with the vehicles' technical specifications.

Annex 7 – Appendix 12, paragraph 2.4., amend to read:

2.4. In order to find a balanced compromise between the three regions~~,~~ a new approximation function for normalised upshift engine speeds versus power-to-mass ratio was calculated as a weighted average of the EU/USA curve (with 2/3 weighting) and the Japanese curve (with 1/3 weighting)~~,~~ resulting in the following equations for normalised upshift engine speeds:

Equation (1): Normalised upshift engine speed in 1st gear (gear 1)

$$n\_max\_acc(1) = (0.5753 \times e^{(-1.9 \times \frac{P_n}{m_k + 75})} - 0.1) \times (s - n_{idle}) + n_{idle} \quad (1)$$

Equation (2): Normalised upshift engine speed in gears > 1

$$n\_max\_acc(i) = (0.5753 \times e^{(-1.9 \times \frac{P_n}{m_k + 75})}) \times (s - n_{idle}) + n_{idle} \quad (2)$$

Annex 7 – Appendix 12, paragraph 3.1., amend to read:

3.1. Figure A7.App12/1 shows an example of gearshift use for a small vehicle:
(a) the lines in bold show the gear use for acceleration phases;
(b) the dotted lines show the downshift points for deceleration phases;
(c) in the cruising phases~~,~~ the whole engine speed range between downshift engine speed and upshift engine speed may be used.

Annex 7 – Appendix 12, paragraph 3.2., amend to read:

3.2. Where vehicle speed increases gradually during cruise phases~~,~~ upshift ~~engine~~ **vehicle** speeds (v1→2~~.~~, v2→3 and vi→i+1) in km/h may be calculated using the following equations:

$$v_{1\to 2} = [0.03 \times (s - n_{idle}) + n_{idle}] \times \frac{1}{ndv_2} \quad (3)$$

$$v_{\sout{1\to 2}\,2\to 3} = \left[\left(0.5753 \times e^{\left(-1.9 \times \frac{P_n}{m_{ref}}\right)} - 0.1\right) \times (s - n_{idle}) + n_{idle}\right] \times \frac{1}{ndv_1} \quad (4)$$

$$v_{i\to i+1} = \left[\left(0.5753 \times e^{\left(-1.9 \times \frac{P_n}{m_{ref}}\right)}\right) \times (s - n_{idle}) + n_{idle}\right] \times \frac{1}{ndv_{i-1}}, i = 3 \text{ to ng} \quad (5)$$

Annex 7 – Appendix 12, paragraph 3.3., amend to read:

3.3. In order to allow the technical service more flexibility and to ensure driveability~~,~~ the gearshift regression functions should be considered as lower limits. Higher engine speeds are permitted in any cycle phase.

Annex 7 – Appendix 12, paragraph 4.1., amend to read:

4.1. In order to avoid different interpretations in the application of the gearshift equations and thus to improve the comparability of the test~~,~~ fixed-phase indicators are assigned to the vehicle speed pattern of the cycles. The specification of the phase indicators is based on the definition from the Japan Automobile Research Institute (JARI) of the four driving modes as shown in the following table:

II. Justification

1. In April 2024, at the 63rd session of the IWG-EPPR, IMMA promoted the principle of the transposition work of the Regulation UN-GTR No. 2 in incremental steps, starting from the Euro 3 level. The representative of South Africa, Co-Chair of the IWG at the time of the discussions, appreciated the concept and supported the transposition activity in incremental steps, noting that this may offer a basic environmental regulatory instrument to the African Region, where fuel quality challenges persist.
   On the other hand, the transposition may contribute to promoting a broader regional adoption of the UNECE WP.29 legal framework, thus fostering technical harmonization and facilitating cross-border trade.

2. In Autumn 2024, IMMA shared with the IWG-EPPR the first draft of the 02 series of amendments to UN-Regulation No. 40, that after some revisions by the group, was finally submitted as an informal document to the 92nd session of GRPE (GRPE-92-12), in March 2025. Due to the outdated format and structure of the 01 series of amendments, the submitted informal document could not show the changes between the 01 and the 02 series of amendments.

3. The scope of the UN-Regulation No. 40 remained consistent with that of its preceding 01 series of amendments. Following a suggestion from France, the wording of the scope was amended to include the energy efficiency and the readability of the Figure 1 was improved. The technical annexes and appendices were carried over from the UN Regulation GTR No. 2. The Conformity of Production provisions were based on the Regulation EU 44/2014 and the 07 series of amendments to the UN-Regulation No. 83.

4. During Spring 2025, after further revisions and minor editorial corrections, the IWG-EPPR, at its 69th session on 30 June, judged the document mature for the formal submission to the 93rd session of GRPE.

5. Following the submission of the working document, editorial oversights were corrected in Figures 2 and 3, and Table A4/1. In Annex 4, paragraph 3.4.5.3.2 was updated to correctly reference paragraph 3.4.5.2.1. Further editorial improvements were made in Annex 7 – Appendix 1, with improved wording consistency and punctuation correction in Appendices 11 and 12. Furthermore, the roller speed value at 148 s in Table A7.App11/17 was corrected.

6. The recursive formula calculating pass/fail criteria of CoP in Appendix 2 - paragraph 6, was corrected to be aligned with the corresponding formula in UN Regulation No. 83 (as per GRPE-85-09).

7. The readability of the formula defining the set running resistance force $F_E(v_j)$ on the chassis dynamometer was improved without any modification to the formula itself.

8. Inconsistencies in the reference ambient temperature were identified, resulting from variations in rounding. Therefore, all the references were aligned to 293.15 K (replacing 293.2 K in Annex 7 – Appendix 5b).

9. In the Annex 7- Appendix 12, paragraph 3.2., the subscript of the equation (4) calculating the upshift speed was corrected.