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ANNEX

ANNEX

to the

Commission Implementing Regulation

on the monitoring and reporting of data relating to CO₂ emissions from passenger cars and light commercial vehicles pursuant to Regulation (EU) 2019/631 of the European Parliament and of the Council and repealing Implementing Regulations (EU) No 1014/2010, (EU) No 293/2012, (EU) 2017/1152 and (EU) 2017/1153

ANNEX

1. COLLECTION AND REPORTING OF REAL-WORLD DATA AND VINs IN ACCORDANCE WITH ARTICLES 9 AND 10

Table 1 – Data to be reported in accordance with Articles 9 and 10

Parameter	Unit	Vehicles of category M1 and N1	
		Pure internal combustion engine vehicles and not-off-vehicle charging hybrid electric vehicles ⁽¹⁾	Off-vehicle charging hybrid electric vehicles ⁽²⁾
Vehicle identification number	-	√	√
Total fuel consumed (lifetime)	l	√	√
Total distance travelled (lifetime)	km	√	√
Total fuel consumed in charge depleting operation (lifetime)	l	–	√
Total fuel consumed in driver-selectable charge increasing operation (lifetime)	l	–	√
Total distance travelled in charge depleting operation with engine off (lifetime)	km	–	√
Total distance travelled in charge depleting operation with engine running (lifetime)	km	–	√
Total distance travelled in driver-selectable charge increasing operation (lifetime)	km	–	√
Total grid energy into the battery (lifetime)	kWh	–	√

⁽¹⁾Powered exclusively by mineral diesel, biodiesel, petrol, ethanol or any combination of those fuels

⁽²⁾Powered by electricity and mineral diesel, biodiesel, petrol or ethanol

2. REPORTING OF DATA IN ACCORDANCE WITH ARTICLE 14

The following parameters shall be reported for each interpolation family, i.e. for vehicle high (VH) and, where applicable, vehicle low (VL) or vehicle M, for the Type 1 tests performed in accordance with Annex XXI to Regulation (EU) 2017/1151.

Except where otherwise indicated in Table 2, where more than one Type 1 test of vehicle high or vehicle low is performed, the test data shall be reported in accordance with the following:

- (a) in the case of two Type 1 tests, the test data for the Type 1 test with the highest measured CO₂ emissions (combined);
- (b) in the case of three Type 1 tests, the test data for the Type 1 test with the median measured CO₂ emissions (combined).

Table 2 – Type 1 test data

No.	Parameters	Unit	Source (unless otherwise specified, all references are to Regulation (EU) 2017/1151)	Remarks
1	Interpolation family identifier	-	Point 0, Section II of the type approval certificate, Appendix 4 to Annex I.	<i>Data shall be provided for each type-approved interpolation family</i>
2	Parent interpolation family identifier (where applicable)	-	-	<i>Indicate the parent interpolation family identifier, if the test data has been determined for another interpolation family</i>
3	Extension of a type approval	-	EC Type-Approval certificate	<i>0 = No / 1 = Yes – if the test is performed for the purpose of an extension of a type approval</i>
4	Propulsion type	-		<i>Pure ICEV, OVC-HEV, NOVC-HEV</i>
5	Vehicle category and class		Point 0.4, Appendix 3 to Annex I	<i>M1 or N1 Class 1, 2 or 3</i>
6	Ignition type		Point 3.2.1.1., Appendix 3 to Annex I	<i>Positive ignition or compression ignition</i>
7	Number of cylinders	-	Point 3.2.1.2., Appendix 3 to Annex I	<i>Number, if not provided default is 4</i>

8	Engine stroke	mm	Point 3.2.1.2.2., Appendix 3 to Annex I	
9	Engine capacity	cm ³	Point 3.2.1.3., Appendix 3 to Annex I	
10	Rated engine power	kW	Point 3.2.1.8., Appendix 3 to Annex I	
11	Engine speed at rated engine power	min ⁻¹	Point 3.2.1.8., Appendix 3 to Annex I	<i>Engine speed at maximum net power</i>
12	Fuel type	-	Point 3.2.2.1. of Appendix 3 to Annex I	<i>Diesel/Petrol/LPG/NG or Biomethane/Ethanol(E85)/Bi odiesel/Hydrogen</i>
13	Bi-fuel vehicle	-	Point 3.2.2.4., Appendix 3 to Annex I	<i>0 = No / 1 = Yes In case of bi-fuel vehicles, test results shall be provided for both fuel types (2 input templates)</i>
14	Maximum power output of each electric machine (P0, P1, P2, P2 planetary, P3, or P4) ^(*)	kW	Point 3.3.1.1.1., Appendix 3 to Annex I	<i>OVC-HEV and NOVC-HEV</i>
15	Number of REESS cells	-	Point 3.3.2.1. Appendix 3 to Annex I	<i>OVC-HEV and NOVC-HEV</i>
16	Service battery capacity	Ah	Point 3.4.4.5, Appendix 3 to Annex I	<i>Low voltage battery capacity</i>
17	Nominal voltage of the alternator	V	Point 3.4.4.5, Appendix 3 to Annex I	<i>Nominal voltage of the alternator (mandatory for pure ICEV)</i>
18	Tyre dimensions (front/rear)	-	Point 3.5.7.1 Test vehicle parameters, Appendix 3 to Annex I	<i>Tyre code (e.g. P195/55R1685H) of tyres of the test vehicle</i>
19	Road load coefficient F0	N	Point 3.5.7.1. Appendix 3 to Annex I	<i>VH and VL (if applicable)</i>
20	Road load coefficient F1	N/(km/h)	Point 3.5.7.1. Appendix 3 to Annex I	<i>VH and VL (if applicable)</i>
21	Road load coefficient F2	N/(km/h) ²	Point 3.5.7.1. Appendix 3 to Annex I	<i>VH and VL (if applicable)</i>

22	Gearbox type	-	Point 4.5.1., Appendix 3 to Annex I	<i>automatic/ manual/CVT/planetary</i>
23	Internal gearbox ratios	-	Point 4.6, Appendix 3 to Annex I	<i>For each gear separately</i>
24	Final drive ratio(s)	-	Point 4.6, Appendix 3 to Annex I	<i>If the vehicle has more than one final drive, introduce values for each gear separately</i>
25	Additional safety margin (ASM) values	%	Point 4.6.1.7.1, Appendix 3 to Annex I	<i>Report values when used for gearshift calculation</i>
26	Drive wheels	-	Point 1.7, Appendix 4 to Annex I	<i>Two-wheel drive, four-wheel drive.</i>
27	Charge-depleting CO ₂ emissions (combined)	gCO ₂ /km	Point 2.5.3.2, Appendix 4 to Annex I	<i>OVC-HEV only In case of 2 or 3 tests all results shall be provided.</i>
28	CO ₂ emissions weighted combined (measured)	gCO ₂ /km	2.5.3.3., Appendix 4 to Annex I	<i>OVC-HEV only. In case of 2 or 3 tests all results shall be provided.</i>
29	CO ₂ emissions weighted combined (declared)	gCO ₂ /km	Point 2.5.3.3., Appendix 4 to Annex I	<i>OVC-HEV only</i>
30	Equivalent All Electric range (EAER) combined	km	Point 2.5.3.7.2., (EAER), Appendix 4 to Annex I	<i>OVC-HEV only</i>
31	Engine idling speed	min ⁻¹	Point 1.1.2., Appendix 8a to Annex I	<i>Idle speed in warm conditions</i>
32	Willans factors for ICE for CO ₂ emissions	gCO ₂ /MJ	Point 1.1.3., Appendix 8a to Annex I	<i>Value according to the Table A6.App2/3 used for RCB correction</i>
33	Traction REESS capacity	Ah	Point 1.1.10., Appendix 8a to Annex I	<i>OVC-HEV and NOVC-HEV</i>
34	Traction REESS technology type	-	Point 1.1.10., Appendix 8a to Annex I	<i>OVC-HEV and NOVC-HEV</i>
35	Traction REESS voltage nominal or time-series	V	Point 1.1.10., Appendix 8a to Annex I	<i>OVC-HEV and NOVC-HEV Nominal or time-series values used for the test (20Hz)</i>
36	Test mass	kg	Point 1.2.1 for VH and Point 1.3.1. for VL, Appendix 8a, Annex I	<i>VH and VL (if applicable)</i>

37	Number of dyno axis during the test	-	Point 2.1, Appendix 8a to Annex I	<i>Chassis Dyno configuration during Type 1 test (1-axle, 2-axle) for VH/VL</i>
38	Alternator (DC/DC converter - low voltage side – in case of NOVC- and OVC-HEVs) current	A	As measured in the Type 1 test	<i>Array: 1Hz, 0.1A resolution, external measurement device synchronised with the chassis dynamometer</i>
39	K _i Regenerative Factor multiplicative/additive	-	Point 2.1.1.2.1., Appendix 8a to Annex I	<i>CO₂ emissions; For vehicles without periodically regenerating systems this value is equal to 1.</i>
40	CO ₂ measured value low phase	gCO ₂ /km	Point 2.1.1.2.1, Appendix 8a to Annex I	<i>Uncorrected measured value M_{CO₂,p.1} of phase low (charge-sustaining value in case of NOVC- and OVC-HEVs).</i>
41	CO ₂ measured value medium phase	gCO ₂ /km	Point 2.1.1.2.1, Appendix 8a to Annex I	<i>Uncorrected measured value M_{CO₂,p.1} of phase medium (charge-sustaining value in case of NOVC- and OVC-HEVs)</i>
42	CO ₂ measured value high phase	gCO ₂ /km	Point 2.1.1.2.1, Appendix 8a to Annex I	<i>Uncorrected measured value M_{CO₂,p.1} of phase high (charge-sustaining value in case of NOVC- and OVC-HEVs)</i>
43	CO ₂ measured value extra-high phase	gCO ₂ /km	Point 2.1.1.2.1, Appendix 8a to Annex I	<i>Uncorrected measured value M_{CO₂,p.1} of phase extra-high (charge-sustaining value in case of NOVC- and OVC-HEVs).</i>
44	CO ₂ measured value (combined)	gCO ₂ /km	Point 2.1.1.2.1, Appendix 8a to Annex I	<i>Uncorrected measured value M_{CO₂,c.1} of complete cycle (charge-sustaining value in case of NOVC- and OVC-HEVs). In case of 2 and 3 tests all measured results shall be provided.</i>
45	CO ₂ measured corrected (combined)	gCO ₂ /km	Point 2.1.1.2.1., Appendix 8a to Annex I	<i>Combined measured CO₂ emissions for vehicle H and L after all applicable corrections, M_{CO₂,c.5}. In case of 2 and 3 tests all measured corrected results shall be provided. In case of OVC-HEV and NOVC-HEV this is charge-sustaining mode</i>
46	CO ₂ declared value	gCO ₂ /km	Point 2.1.1.2.1., Appendix 8a to Annex I	<i>Manufacturer declared value</i>
47	ATCT family correction factor	-	Point 2.1.1.2.2., Appendix 8a to Annex I	<i>ATCT Family correction factor (14°C correction)</i>
48	Fuel consumption over the Type 1 test as	1	Point 2.1.1.3.1., Appendix 8a to	<i>Fuel consumed during the test (charge-sustaining value</i>

	recorded on the on-board fuel consumption monitoring device (OBFCM)		Annex I	<i>in case of NOVC-HEV and OVC-HEV). In case of 2 and 3 tests all results shall be provided.</i>
49	Index number of the transition cycle	-	Point 2.1.1.4.1.4., Appendix 8a to Annex I	<i>for OVC-HEV indicate the index number of the transition cycle</i>
50	Nominal REESS voltage	V	Point 1.1.10., Appendix 8a to Annex I	<i>For low voltage battery as described in Appendix 2 to Sub-Annex 6 to Annex XXI</i>
51	RCB correction			<i>Correction performed? 0 = No / 1 = Yes</i>
52	RCB correction coefficient	(g/km) / (Wh/km)	Point 2.1.1.2.1., Appendix 8a to Annex I	<i>NOVC-HEV and OVC-HEV</i>
53	Fuel consumption	l/100km	Determined in accordance with Point 6 of Sub-Annex 7 to Annex XXI and using results for criteria emissions and CO ₂ emissions from Step 2 in Table A7/1	<i>Non-balanced fuel consumption of Type 1 test vehicle H and, where applicable, vehicle L. In case of two or three tests, all values shall be reported.</i>
54	Time	sec	As measured in the Type 1 test	<i>Array: OBD and Chassis Dynamometer data, 1Hz</i>
55	Velocity profile (theoretical)	km/h	As applied in the Type 1 test	<i>Array: 1Hz, resolution 0.1km/h. If not provided the speed profile defined in Point 6 of sub-Annex 1 to Annex XXI and in particular to tables A1/7-A1/9, A1/11, and A1/12 applies</i>
56	Velocity profile (actual)	km/h	As measured in the Type 1 test	<i>Array: OBD and Chassis Dynamometer data, 1Hz and 10 Hz, resolution 0.1km/h</i>
57	Gear (theoretical)	-	As applied in the Type 1 test based on the calculations defined in sub-Annex 2 to Annex XXI	<i>Array: 1Hz. Mandatory for manual transmission vehicles</i>
58	Engine Speed	rpm	As measured in the Type 1 test	<i>Array: 1Hz, 10 RPM resolution from OBD</i>
59	Engine Coolant Temperature	°C	As measured in the Type 1 test	<i>Array: OBD Data, 1Hz, 1 °C resolution</i>
60	Service battery current	A	As measured in the Type 1 test	<i>Array: 1Hz, 0.1A resolution, external measurement device synchronised with the chassis dynamometer</i>
61	Calculated load	-	As measured in	<i>Array: OBD data, 1Hz at</i>

			the Type 1 test	<i>least (higher frequencies possible, 1% resolution) test measurement</i>
62	Traction REESS current	A	As measured in the Type 1 test	<i>20Hz time-series values used for the test(s) resampled to 1Hz mandatory for NOVC-HEV and OVC-HEV</i>
63	Engine fuel rate	g/s	As measured in the Type 1 test	<i>Instantaneous signal recorded for test (charge-sustaining value in case of NOVC-HEV and OVC-HEV).</i>
64	Engine fuel rate	l/h	As measured in the Type 1 test	<i>Idem</i>
65	Vehicle fuel rate	g/s	As measured in the Type 1 test	<i>Idem</i>
66	Full load power curve for ICEVs	kW vs. rpm	Manufacturer declaration	<i>The full load power curve over the engine speed range from n idle to n rated or n max, or n dv (n gvmax) × v max, whichever is higher</i>
67	Traction REESS initial state of charge	%	Manufacturer declaration	<i>Initial SOC of traction REESS in charge sustaining condition (for OVC-HEV and NOVC-HEV)</i>
68	Engine idle fuel consumption	g/s	Manufacturer declaration	<i>Idle fuel consumption in warm condition</i>
69	Alternator maximum power	kW	Manufacturer declaration	
70	Efficiency of the alternator	-	Manufacturer declaration	<i>Default value=0.67</i>
71	Torque converter	-	Manufacturer declaration	<i>0=No, 1=Yes; Does the vehicle use torque converter?</i>
72	Fuel saving gear for automatic transmission	-	Manufacturer declaration	<i>0=No, 1=Yes</i>
73	Turbo- or Supercharger	-	Manufacturer declaration	<i>0 = No 1 = Yes - Is the engine equipped with any kind of charging system?</i>
74	Start-stop	-	Manufacturer declaration	<i>0 = No 1 = Yes - Does the vehicle have start-stop system?</i>
75	Brake energy Recuperation	-	Manufacturer declaration	<i>0 = No 1 = Yes - Does the vehicle have energy recuperation technologies?</i>
76	Variable valve actuation	-	Manufacturer declaration	<i>0 = No 1 = Yes - Does the engine feature variable valve actuation?</i>
77	Thermal management	-	Manufacturer declaration	<i>0 = No 1 = Yes - Does the vehicle have technologies that actively manage temperature at the gear box?</i>

78	Direct injection / Port Fuel Injection	-	Manufacturer declaration	$0 = PFI / 1 = DI$
79	Lean burn	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the engine use lean burn?
80	Cylinder deactivation	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the engine use a cylinder deactivation system? If yes please also provide active cylinder ratios
81	Exhaust gas recirculation	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the vehicle have an external EGR system?
82	Particulate filter	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the vehicle have a particulate filter?
83	Selective Catalytic Reduction	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the vehicle have an SCR system?
84	NOx storage catalyst	-	Manufacturer declaration	$0 = No / 1 = Yes$ - Does the vehicle have a NOx storage catalyst?
85	Hybrid Vehicle Configuration (P0, P1, P2, P2 planetary, P3, or P4) ^(*)	-	Manufacturer declaration	Does the vehicle have an electric machine used for vehicle propulsion and electric energy generation in P0, P1, P2, P2 planetary, P3, or P4 position, or a combination thereof?
86	Maximum torque output of each electric machine (P0, P1, P2, P2 planetary, P3, or P4) ^(*)	Nm	Manufacturer declaration	
87	For each electric machine, the ratio between the electric machine rotational speed and the reference rotational speed (P0, P1, P2, P2 planetary, P3, or P4) ^(*)	-	Manufacturer declaration	
88	Engine-on coasting function	-	Manufacturer declaration	Yes/No. Does the vehicle have the engine idle coasting function (allow the engine to idle during vehicle coasting in order to save fuel)?
89	Engine-off coasting function	-	Manufacturer declaration	Yes/No. Does the vehicle have the engine-stop coasting function (allow the engine to switch off during vehicle coasting in order to save fuel)?

90	Vehicle is incomplete	-	Manufacturer declaration	<i>0 = No / 1 = Yes – Is the vehicle incomplete?</i>
91	Mass of the vehicle in running order	kg	Point 1.1, Appendix 4 to Annex I	<i>MRO for VH and VL (if applicable)</i>
92	Capped vehicle speed	km/h	Cycle selection parameters point 1.2.3, Appendix 8a to Annex I	<i>Indicate if capped speed (and the value) was used in Type 1 test for VH and VL (if applicable)</i>
93	Maximum speed of the vehicle	km/h	Cycle selection parameters point 1.2.3, Appendix 8a to Annex I	<i>Indicate maximum speed of the vehicle for VH and VL (if applicable)</i>
94	Additional information for gearshift calculation	min ⁻¹	Gearshift point 1.2.4, Appendix 8a to Annex I	<i>For manual transmission vehicles only. Information about n_min drive.</i>

(*) P0: the electric machine is connected to the engine service belt and therefore has the engine speed as reference speed;

P1: the electric machine is connected to the engine crankshaft and therefore has the engine speed as reference speed;

P2: the electric machine is mounted right upstream the transmission (gearbox or continuously variable transmission), and therefore has the transmission input speed as reference speed;

P2 planetary: the electric machine is connected to the gear of a planetary gear set that is not connected to the internal combustion engine or the final drive sides, here referred to as the planetary side. In this case the speed ratio to be specified is the ratio between the electric machine and planetary side rotational speed (reference speed) reflecting the speed multiplication/reduction effect of a reduction gear;

P3: the electric machine is right upstream the final drive of a driven axle therefore has the final drive input rotational speed as reference speed (this includes electric machines mounted on the gear of a planetary gear set on the final drive side). A vehicle can have up to two P3 machines (one for the front (P3a) and one for the rear (P3b) axle);

P4: the electric machine is downstream the final drive, and therefore has the wheel speed as reference speed. A vehicle can have up to four P4 motors (one for each wheel, where P4a indicates front wheels and P4b rear wheels).