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Subject:	ANNEX to the Commission Regulation amending Commission Regulation (EU) 2017/1151 as regards the emission type approval procedures for light passenger and commercial vehicles

Delegations will find attached document [...](2022) XXX draft - D 082562/3 ANNEX I.

Encl.: [...](2022) XXX draft - D 082562/3 ANNEX I



EUROPEAN  
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ANNEX 1

## **ANNEX**

**to the**

**Commission Regulation**

**amending Commission Regulation (EU) 2017/1151 as regards the emission type  
approval procedures for light passenger and commercial vehicles**

## **ANNEX I**

List of Annexes and Annex I to Regulation (EU) 2017/1151 are amended as follows:

(1) List of Annexes is replaced by the following:

### **‘LIST OF ANNEXES**

ANNEX I	Administrative provisions for EC type-approval
Appendix 1	-
Appendix 2	-
Appendix 3	Model information document
Appendix 3a	Documentation Packages
Appendix 3b	Methodology for the assessment of AES
Appendix 4	Model of EC type-approval certificate
Appendix 5	-
Appendix 6	EC type-approval certificate numbering system
Appendix 7	Manufacturer's certificate of compliance with OBD in-use performance requirements
Appendix 8a	Test Reports
Appendix 8b	Road Load Test Report
Appendix 8c	Template for Test Sheet
Appendix 8d	Evaporative emissions test report
ANNEX II	In-service conformity methodology
Appendix 1	Criteria for vehicle selection and failed vehicles decision
Appendix 2	Rules for performing Type 4 tests during in-service conformity
Appendix 3	ISC Inspection Report
Appendix 4	Annual ISC Report by the granting type approval authority
Appendix 5	Transparency list
ANNEX IIIA	Verifying Real Driving Emissions (RDE)
Appendix 1	Reserved

Appendix 2	Reserved
Appendix 3	Reserved
Appendix 4	<u>Test procedure for vehicle emissions testing with a portable emissions measurement system (PEMS)</u>
Appendix 5	<u>Specifications and calibration of PEMS components and signals</u>
Appendix 6	Validation of PEMS and non-traceable exhaust mass flow rate
Appendix 7	<u>Determination of instantaneous emissions</u>
Appendix 8	<u>Assessment of overall trip validity using the moving averaging window method</u>
Appendix 9	<u>Assessment of excess or absence of trip dynamics</u>
Appendix 10	Procedure to determine the cumulative positive elevation gain of a PEMS trip
Appendix 11	Calculation of the final RDE emission results
Appendix 12	Manufacturer's RDE certificate of compliance
ANNEX IV	Emissions data required at type-approval for roadworthiness purposes
Appendix 1	Measuring carbon monoxide emissions at engine idling speeds (Type 2 test)
Appendix 2	Measurement of smoke opacity
ANNEX V	Verifying emissions of crankcase gases (Type 3 test)
ANNEX VI	Determination of evaporative emissions (Type 4 test)
ANNEX VII	Verifying the durability of pollution control devices (Type 5 test)
ANNEX VIII	Verifying the average exhaust emissions at low ambient temperatures (Type 6 test)
ANNEX IX	Specifications of reference fuels
ANNEX X	-
ANNEX XI	On-board diagnostics (OBD) for motor vehicles
Appendix 1	In-use performance
ANNEX XII	Type-approval of vehicles fitted with eco-innovations and Determination of CO <sub>2</sub> emissions and fuel consumption from vehicles submitted to multi-stage

	type-approval or individual vehicle approval
ANNEX XIII	EC Type-approval of replacement pollution control devices as separate technical unit
Appendix 1	Model information document
Appendix 2	Model EC type-approval certificate
Appendix 3	Model EC type-approval mark
Annex XIV	-
ANNEX XV	-
ANNEX XVI	Requirements for vehicles that use a reagent for the exhaust after-treatment system
ANNEX XVII	Amendments to Regulation (EC) No 692/2008
ANNEX XVIII	Amendments to Directive 2007/46/EC
ANNEX XIX	Amendments to Regulation (EU) No 1230/2012
ANNEX XX	Measurement of net power and the maximum 30 minutes power of electric drive trains
ANNEX XXI	Type 1 emissions test procedures
ANNEX XXII	Devices for monitoring on board the vehicle the consumption of fuel and/or electric energy

‘

(2) Annex I is amended as follows: ‘

(a) points 1.1.1. to 4.5.1.4. are replaced by the following:

1.1.1. The additional requirements for granting of type-approval for mono fuel gas vehicles, and bi-fuel gas vehicles shall be those set out in paragraph 5.9. of UN Regulation No 154. The reference to the information document in paragraph 5.9.1. of UN Regulation No 154 shall be understood as being reference to Appendix 3 of Annex I of this Regulation.

1.2. *Additional requirements for flex fuel vehicles*

The additional requirements for granting of type-approval for flex fuel vehicles shall be those set out in paragraph 5.8. of UN Regulation No 154.

2. **ADDITIONAL TECHNICAL REQUIREMENTS AND TESTS**

2.1. *Small volume manufacturers*

2.1.1. List of legislative acts referred to in Article 3(3):

Legislative Act	Requirements
The California Code of Regulations, Title 13, Sections 1961(a) and 1961(b)(1)(C)(1) applicable to 2001 and later model year vehicles, 1968.1, 1968.2, 1968.5, 1976 and 1975, published by Barclay's Publishing	Type-approval must be granted under the California Code of Regulations applicable to the most recent model year of light-duty vehicle.

## 2.2. Inlets to fuel tanks

2.2.1. The requirements for inlets to fuel tanks shall be those specified in paragraphs 6.1.5. and 6.1.6. of UN Regulation 154.

## 2.3. Provisions for electronic system security

2.3.1. The requirements for electronic system security of paragraph 6.1.7. of UN Regulation 154 shall be complied with. The effective application of these strategies in protecting the emission control systems may be tested during type approval and/or market surveillance.

2.3.2 Manufacturers shall effectively deter reprogramming of the odometer readings, in the board network, in any powertrain controller as well as in the transmitting unit for remote data exchange if applicable. Manufacturers shall include systematic tamper-protection strategies and write-protect features to protect the integrity of the odometer reading. Methods giving an adequate level of tamper protection shall be approved by the approval authority. The effective application of these strategies in protecting the odometer may be tested during type approval and/or market surveillance.

## 2.4. Application of tests

2.4.1. Figure I.2.4 illustrates the application of the tests for type-approval of a vehicle. The specific test procedures are described in Annexes II, IIIA, IV, V, VI, VII, VIII, XI, XVI, XX, XXI and XXII.

Figure I.2.4

Application of test requirements for type-approval and extensions												
Vehicle category	Vehicles with positive ignition engines including hybrids <sup>(1,2)</sup>								Vehicles with compression ignition engines including hybrids	Pure electric vehicles	Hydrogen fuel cell vehicles	
	Mono fuel				Bi-fuel <sup>(3)</sup>			Flex-fuel <sup>(3)</sup>	Mono fuel			
Reference fuel	Petrol	LPG	NG/Biomethane	Hydrogen (ICE)	Petrol LPG	Petrol NG/Biomethane	Petrol Hydrogen (ICE) <sup>4</sup>	Petrol Ethanol (E85)	Diesel	Petrol	—	Hydrogen (Fuel Cell)
Type test <sup>(7)</sup>	1	Yes	Yes <sup>(5)</sup>	Yes <sup>(4)</sup>	Yes (both	Yes (both	Yes (both	Yes (both	Yes	Yes	—	—

					fuels)	fuels)	fuels)	fuels)				
ATCT (14°C test)	Yes	Yes	Yes	Yes <sup>(4)</sup>	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes	Yes	—	—
Gaseous pollutants, RDE (Type 1A test)	Yes	Yes	Yes	Yes <sup>(4)</sup>	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes	Yes	—	—
PN, RDE (Type 1A test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (both fuels)	Yes	Yes	—	—
Idle emissions (Type 2 test)	Yes	Yes	Yes	—	Yes (both fuels)	Yes (both fuels)	Yes (petrol only)	Yes (both fuels)	—	—	—	—
Crankcase emissions (Type 3 test)	Yes	Yes	Yes	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	—	—	—	—
Evaporativ e emissions (Type 4 test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	—	Yes	—	—
Durability (Type 5 test)	Yes	Yes	Yes	Yes	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes	Yes	—	—
Low temperatur e emissions (Type 6 test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (both fuels)	—	—	—	—
In-service conformity	Yes	Yes	Yes	Yes	Yes (as at type approva l)	Yes (as at type approval)	Yes (as at type approva l)	Yes (as at type approva l)	Yes	Yes	—	—
OBD	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	—
CO <sub>2</sub> emissions, fuel consumpti on, electric energy consumpti on and electric range	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes	Yes	Yes	Yes
Smoke opacity	—	—	—	—	—	—	—	—	Yes <sup>(8)</sup>	—	—	—
Engine power	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
OBFCM	Yes	—	—	—	—	—	—	Yes	Yes	Yes	—	—

								(both fuels)				
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- <sup>1</sup> Specific test procedures for hydrogen vehicles and flex fuel biodiesel vehicles will be defined at a later stage.
- <sup>2</sup> Particulate mass and particle number limits and respective measurement procedures shall apply only to vehicles with direct injection engines.
- <sup>3</sup> When a bi-fuel vehicle is combined with a flex fuel vehicle, both test requirements are applicable.
- <sup>4</sup> Only NO<sub>x</sub> emissions shall be determined when the vehicle is running on hydrogen.
- <sup>5</sup> Particulate mass and particle number limits and respective measurement procedures shall not apply.
- <sup>6</sup> The particle number RDE test only applies to vehicles for which Euro 6 PN emission limits are defined in Table 2 of Annex I to Regulation (EC) No 715/2007.
- <sup>7</sup> For applicability of measured components to fuels and vehicle technology and therefore measurement procedures, see the emission limits as defined in Table 2 of Annex I to Regulation (EC) No 715/2007.
- <sup>8</sup> An actual test may not be necessary, see UN Regulation No. 24 for details.

### 3. EXTENSIONS TO TYPE-APPROVALS

#### 3.1. Extensions for tailpipe emissions (type 1 and type 2 tests and OBFCM)

3.1.1. The type-approval shall be extended to vehicles if they conform to the requirements of paragraph 7.4. of UN Regulation No 154. The pollutant emissions shall respect the limits set out in Table 2 of Annex I to Regulation (EC) No 715/2007.

#### 3.2. *Extensions for evaporative emissions (type 4 test)*

3.2.1. For tests performed in accordance with Annex 6 to UN/ECE Regulation No 83 [1 day NEDC] or the Annex to Regulation (EC) No 2017/1221 [2 days NEDC] the type-approval shall be extended to vehicles equipped with a control system for evaporative emissions which meet the following conditions:

- 3.2.1.1. The basic principle of fuel/air metering is the same.
- 3.2.1.2. The shape of the fuel tank is identical and the material of the fuel tank and liquid fuel hoses are technically equivalent.
- 3.2.1.3. The worst-case vehicle with regard to the cross-section and approximate hose length shall be tested. Whether non-identical vapour/liquid separators are acceptable is decided by the technical service responsible for the type-approval tests.
- 3.2.1.4. The fuel tank volume is within a range of  $\pm 10$  %.
- 3.2.1.5. The setting of the fuel tank relief valve is identical.
- 3.2.1.6. The method of storage of the fuel vapour is identical, i.e. trap form and volume, storage medium, air cleaner (if used for evaporative emission control), etc.
- 3.2.1.7. The method of purging of the stored vapour is identical (e.g. air flow, start point or purge volume over the preconditioning cycle).
- 3.2.1.8. The method of sealing and venting of the fuel metering system is identical.

3.2.2. For tests performed in accordance with Annex VI [2 days WLTP] the type-approval shall be extended to vehicles belonging to an approved evaporative emission family as defined in paragraph 6.6.3 of UN Regulation 154.

#### 3.3. *Extensions for durability of pollution control devices (type 5 test)*

3.3.1. The deterioration factors shall be extended to different vehicles and vehicle types, provided that the requirements of paragraph 7.6. of UN Regulation No 154 are complied with.



### 3.4. Extensions for on-board diagnostics

3.4.1. The type-approval shall be extended to vehicles belonging to an approved OBD family as defined in paragraph 6.8.1 of UN Regulation No 154.

### 3.5. *Extensions for low temperature test (type 6 test)*

#### 3.5.1. Vehicles with different reference masses

3.5.1.1. The type-approval shall be extended only to vehicles with a reference mass requiring the use of the next two higher equivalent inertia or any lower equivalent inertia.

3.5.1.2. For category N vehicles, the approval shall be extended only to vehicles with a lower reference mass, if the emissions of the vehicle already approved are within the limits prescribed for the vehicle for which extension of the approval is requested.

#### 3.5.2. Vehicles with different overall transmission ratios

3.5.2.1. The type-approval shall be extended to vehicles with different transmission ratios only under certain conditions.

3.5.2.2. To determine whether type-approval can be extended, for each of the transmission ratios used in the type 6 test, the proportion,

$$(E) = (V_2 - V_1) / V_1$$

shall be determined where, at an engine speed of 1000 min<sup>-1</sup>, V<sub>1</sub> is the speed of the vehicle-type approved and V<sub>2</sub> is the speed of the vehicle type for which extension of the approval is requested.

3.5.2.3. If, for each transmission ratio,  $E \leq 8 \%$ , the extension shall be granted without repeating the type 6 test.

3.5.2.4. If, for at least one transmission ratio,  $E > 8 \%$ , and if, for each gear ratio,  $E \leq 13 \%$ , the type 6 test shall be repeated. The tests may be performed in a laboratory chosen by the manufacturer subject to the approval of the technical service. The report of the tests shall be sent to the technical service responsible for the type-approval tests.

#### 3.5.3. Vehicles with different reference masses and transmission ratios

The type-approval shall be extended to vehicles with different reference masses and transmission ratios, provided that all the conditions prescribed in paragraphs 3.5.1 and 3.5.2 are fulfilled.

## 4. CONFORMITY OF PRODUCTION

### 4.1. *Introduction*

4.1.1. Every vehicle produced under a Type Approval according to this Regulation shall be so manufactured as to conform to the type approval requirements of this Regulation. The Manufacturer shall implement adequate arrangements and documented control plans and carry-out at specified intervals as given in this regulation the necessary emission, OBFCM and OBD tests to verify continued conformity with the approved type. The approval authority shall verify and agree with these arrangements and control plans of the manufacturer and perform audits and conduct emission, OBFCM and OBD tests at specific intervals, as given in this regulation, at the premises of the manufacturer, including production and test facilities as part of the product conformity and continued verification arrangements as described in Annex IV of Regulation (EU) 2018/858.

4.1.2. The manufacturer shall check the conformity of production by testing the emissions of pollutants (given in Table 2 of Annex I to Regulation (EC) No 715/2007), the emission of

CO<sub>2</sub> (along with the measurement of electric energy consumption and, where applicable, the monitoring of the OBFCM device accuracy), the crankcase emissions, evaporative emissions and the OBD in accordance with the test procedures described in Annexes V, VI, XI, XXI and XXII. The verification shall therefore include the tests of types 1, 3, 4, the tests for OBFCM and OBD, as described in section 2.4.

The type approval authority shall keep record for a period of at least 5 years of all the documentation related to the conformity of production test results and shall make it available to the Commission upon request.

The specific procedures for conformity of production are set out in paragraphs 8 and 9 and Appendixes 1 to 4 of UN Regulation No. 154, with the following exception:

Table 8/1 in paragraph 8.1.2. of UN Regulation No. 154 shall be replaced with:

*Table 8/1*

**Type 1 Applicable Type-1 CoP requirements for the different types of vehicle**

<i>Type of vehicle</i>	<i>Pollutant emissions</i>	<i>CO<sub>2</sub> emissions</i>	<i>Electric energy consumption</i>	<i>OBFCM accuracy</i>
Pure ICE	Yes	Yes	Not Applicable	Yes
NOVC-HEV	Yes	Yes	Not Applicable	Yes
OVC-HEV	Yes: CD <sup>(1)</sup> and CS	: CS only	Yes: CD only	Yes: CS
PEV	Not Applicable	Not Applicable	Yes	Not Applicable
NOVC-FCHV	Not Applicable	Not Applicable	Not Applicable	Not Applicable
OVC-FCHV	Not Applicable	Not Applicable	Exempted	Not Applicable

<sup>(1)</sup> Only if there is combustion engine operation during a valid CD Type 1 test for CoP verification

The calculation of additional values required for checking the Conformity of Production of electric energy consumption of PEVs and OVC-HEVs is set out in Appendix 8 of Annex B8 to UN Regulation 154.

4.1.8. In case of non-conformity Article 51 of Regulation (EU) 2018/858 shall apply.

#### 4.2.6. Vehicles fitted with eco-innovations

4.2.6.1. In the case of a vehicle type fitted with one or more eco-innovations, within the meaning of Article 11 of Regulation (EU) 2019/631<sup>1</sup> for M1 or for N1 vehicles, the conformity of production shall be demonstrated with respect to the eco-innovations, by checking the presence of the correct eco-innovation(s) in question.

#### 4.5. *Checking the conformity of the vehicle for a Type 3 test*

4.5.1. If a verification of the Type 3 test is to be carried out, it shall be conducted in accordance with the following requirements:

4.5.1.1. When the approval authority determines that the quality of production seems unsatisfactory, a vehicle shall be randomly taken from the family and subjected to the tests described in Annex V.

4.5.1.2. The production shall be deemed to conform if this vehicle meets the requirements of the tests described in Annex V.

4.5.1.3. If the vehicle tested does not satisfy the requirements of Section 4.5.1.1, a further random sample of four vehicles shall be taken from the same family and subjected to the tests described in Annex V. The tests may be carried out on vehicles which have completed a maximum of 15000 km with no modifications.

4.5.1.4. The production shall be deemed to conform if at least three vehicles meet the requirements of the tests described in Annex V.’;

(3) Appendices 1 and 2 are deleted;

(4) Appendices 3 and 3a are replaced by the following:

‘

### **Appendix 3**

#### **MODEL**

#### **INFORMATION DOCUMENT No ...**

#### **RELATING TO EC TYPE-APPROVAL OF A VEHICLE WITH REGARD TO EMISSIONS**

The following information, if applicable, must be supplied in triplicate and include a list of contents. Any drawings must be supplied in appropriate scale and in sufficient detail on size A4 or on a folder of A4 format. Photographs, if any, must show sufficient detail.

If the systems, components or separate technical units have electronic controls, information concerning their performance must be supplied.

0 GENERAL

0.1. Make (trade name of manufacturer): ...

0.2. Type: ...

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<sup>1</sup> Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO<sub>2</sub> emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011, OJ L 111, 25.4.2019, p. 13

- 0.2.1. Commercial name(s) (if available): ...
- 0.2.2.1. Allowed Parameter Values for multistage type approval to use the base vehicle emission, consumption and/or range values (insert range if applicable):
  - Final Vehicle actual mass (in kg): ...
  - Final Vehicle technically permissible maximum laden mass (in kg): ...
  - Frontal area for final vehicle (in cm<sup>2</sup>): ...
  - Rolling resistance (kg/t): ...
  - Cross-sectional area of air entrance of the front grille (in cm<sup>2</sup>): ...
- 0.2.3. Family identifiers:
  - 0.2.3.1. Interpolation family: ...
  - 0.2.3.2. ATCT family(s): ...
  - 0.2.3.3. PEMS family: ...
  - 0.2.3.4. Roadload family
    - 0.2.3.4.1. Roadload family of VH: ...
    - 0.2.3.4.2. Roadload family of VL: ...
    - 0.2.3.4.3. Roadload families applicable in the interpolation family: ...
  - 0.2.3.5. Roadload Matrix family(s): ...
  - 0.2.3.6. Periodic regeneration family(s): ...
  - 0.2.3.7. Evaporative test family(s): ...
  - 0.2.3.8. OBD family(s): ...
  - 0.2.3.9. Durability family(s): ...
  - 0.2.3.10. ER family(s): ...
  - 0.2.3.11. Gas Fuelled Vehicle family(s): ...
  - 0.2.3.12. --
  - 0.2.3.13. K<sub>CO2</sub> correction factor family: ...
- 0.2.4. other family(s): ...
- 0.4. Category of vehicle <sup>(c)</sup>: ...
- 0.5 Name and address of the manufacturer

- 0.8. Name(s) and address(es) of assembly plant(s): ...
- 0.9. Name and address of the manufacturer's representative (if any): ...
- 1 GENERAL CONSTRUCTION CHARACTERISTICS
- 1.1. Photographs and/or drawings of a representative vehicle/component/separate technical unit <sup>(1)</sup>:
- 1.3.3. Powered axles (number, position, interconnection): ...
- 2 MASSES AND DIMENSIONS <sup>(f)</sup> <sup>(g)</sup> <sup>(7)</sup>  
(in kg and mm) (Refer to drawing where applicable)
- 2.6. Mass in running order <sup>(h)</sup>  
(a) maximum and minimum for each variant: ...
- 2.6.3. Rotational mass: 3 % of the sum of mass in running order and 25 kg or value, per axle (kg): ...
- 2.8. Technically permissible maximum laden mass stated by the manufacturer <sup>(i)</sup> <sup>(3)</sup>: ...
- 3 PROPULSION ENERGY CONVERTER <sup>(k)</sup>
- 3.1. Manufacturer of the propulsion energy converter(s): ...
- 3.1.1. Manufacturer's code (as marked on the propulsion energy converter or other means of identification): ...
- 3.2. Internal combustion engine
- 3.2.1.1. Working principle: positive ignition/compression ignition/dual fuel <sup>(1)</sup>  
Cycle: four stroke/two stroke/rotary <sup>(1)</sup>
- 3.2.1.2. Number and arrangement of cylinders: ...
- 3.2.1.2.1. Bore <sup>(1)</sup>: ... mm
- 3.2.1.2.2. Stroke <sup>(1)</sup>: ... mm
- 3.2.1.2.3. Firing order: ...
- 3.2.1.3. Engine capacity <sup>(m)</sup>: ... cm<sup>3</sup>
- 3.2.1.4. Volumetric compression ratio <sup>(2)</sup>: ...
- 3.2.1.5. Drawings of combustion chamber, piston crown and, in the case of positive ignition engines, piston rings: ...
- 3.2.1.6. Normal engine idling speed <sup>(2)</sup>: ... min<sup>-1</sup>

- 3.2.1.6.1. High engine idling speed <sup>(2)</sup>: ... min<sup>-1</sup>
- 3.2.1.8. Rated engine power <sup>(n)</sup>: ... kW at ... min<sup>-1</sup> (manufacturer's declared value)
- 3.2.1.9. Maximum permitted engine speed as prescribed by the manufacturer: ... min<sup>-1</sup>
- 3.2.1.10. Maximum net torque <sup>(n)</sup>: ... Nm at ... min<sup>-1</sup> (manufacturer's declared value)
- 3.2.1.11. The correction factor for compensating ambient conditions is set to 1, in accordance with paragraph 5.4.3 of Annex 5 to UN Regulation No. 85: yes/no <sup>(1)</sup>.
- 3.2.2. Fuel
- 3.2.2.1. Diesel/Petrol/LPG/NG or Biomethane/Ethanol (E 85)/Biodiesel/Hydrogen <sup>(1)</sup>, <sup>(6)</sup>
- 3.2.2.1.1. RON, unleaded: ...
- 3.2.2.4. Vehicle fuel type: Mono fuel, Bi fuel, Flex fuel <sup>(1)</sup>
- 3.2.2.5. Maximum amount of biofuel acceptable in fuel (manufacturer's declared value): ... % by volume
- 3.2.4. Fuel feed
- 3.2.4.1. By carburettor(s): yes/no <sup>(1)</sup>
- 3.2.4.2. By fuel injection (compression ignition or dual fuel only): yes/no <sup>(1)</sup>
- 3.2.4.2.1. System description (common rail/unit injectors/distribution pump etc.): ...
- 3.2.4.2.2. Working principle: direct injection/pre-chamber/swirl chamber <sup>(1)</sup>
- 3.2.4.2.3. Injection/Delivery pump
- 3.2.4.2.3.1. Make(s): ...
- 3.2.4.2.3.2. Type(s): ...
- 3.2.4.2.3.3. Maximum fuel delivery <sup>(1)</sup> <sup>(2)</sup>: ... mm<sup>3</sup> /stroke or cycle at an engine speed of: ... min<sup>-1</sup> or, alternatively, a characteristic diagram: ... (When boost control is supplied, state the characteristic fuel delivery and boost pressure versus engine speed)
- 3.2.4.2.4. Engine speed limitation control
- 3.2.4.2.4.2.1. Speed at which cut-off starts under load: ... min<sup>-1</sup>
- 3.2.4.2.4.2.2. Maximum no-load speed: ... min<sup>-1</sup>

- 3.2.4.2.6.            Injector(s)
- 3.2.4.2.6.1.        Make(s): ...
- 3.2.4.2.6.2.        Type(s): ...
- 3.2.4.2.8.           Auxiliary starting aid
- 3.2.4.2.8.1.        Make(s): ...
- 3.2.4.2.8.2.        Type(s): ...
- 3.2.4.2.8.3.        System description: ...
- 3.2.4.2.9.           Electronic controlled injection: yes/no <sup>(1)</sup>
- 3.2.4.2.9.1.        Make(s): ...
- 3.2.4.2.9.2.        Type(s):
- 3.2.4.2.9.3        Description of the system: ...
- 3.2.4.2.9.3.1.      Make and type of the control unit (ECU): ...
- 3.2.4.2.9.3.1.1.   Software version of the ECU: ...
- 3.2.4.2.9.3.2.      Make and type of the fuel regulator: ...
- 3.2.4.2.9.3.3.      Make and type of the air-flow sensor: ...
- 3.2.4.2.9.3.4.      Make and type of fuel distributor: ...
- 3.2.4.2.9.3.5.      Make and type of the throttle housing: ...
- 3.2.4.2.9.3.6.      Make and type or working principle of water temperature sensor: ...
- 3.2.4.2.9.3.7.      Make and type or working principle of air temperature sensor: ...
- 3.2.4.2.9.3.8.      Make and type or working principle of air pressure sensor: ...
- 3.2.4.3.            By fuel injection (positive ignition only): yes/no <sup>(1)</sup>
- 3.2.4.3.1.           Working principle: single-/multi-point/direct injection /other (specify) <sup>(1)</sup>:  
...
- 3.2.4.3.2.           Make(s): ...
- 3.2.4.3.3.           Type(s): ...
- 3.2.4.3.4.           System description (In the case of systems other than continuous injection  
give equivalent details): ...
- 3.2.4.3.4.1.        Make and type of the control unit (ECU): ...

- 3.2.4.3.4.1.1. Software version of the ECU: ...
- 3.2.4.3.4.3. Make and type or working principle of air-flow sensor: ...
- 3.2.4.3.4.8. Make and type of throttle housing: ...
- 3.2.4.3.4.9. Make and type or working principle of water temperature sensor: ...
- 3.2.4.3.4.10. Make and type or working principle of air temperature sensor: ...
- 3.2.4.3.4.11. Make and type or working principle of air pressure sensor: ...
- 3.2.4.3.5. Injectors
  - 3.2.4.3.5.1. Make: ...
  - 3.2.4.3.5.2. Type: ...
- 3.2.4.3.7. Cold start system
  - 3.2.4.3.7.1. Operating principle(s): ...
  - 3.2.4.3.7.2. Operating limits/settings <sup>(1)</sup> <sup>(2)</sup>: ...
- 3.2.4.4. Feed pump
  - 3.2.4.4.1. Pressure <sup>(2)</sup>: ... kPa or characteristic diagram <sup>(2)</sup>: ...
  - 3.2.4.4.2. Make(s): ...
  - 3.2.4.4.3. Type(s): ...
- 3.2.5. Electrical system
  - 3.2.5.1. Rated voltage: ... V, positive/negative ground <sup>(1)</sup>
  - 3.2.5.2. Generator
    - 3.2.5.2.1. Type: ...
    - 3.2.5.2.2. Nominal output: ... VA
- 3.2.6. Ignition system (spark ignition engines only)
  - 3.2.6.1. Make(s): ...
  - 3.2.6.2. Type(s): ...
  - 3.2.6.3. Working principle: ...
  - 3.2.6.6. Spark plugs
    - 3.2.6.6.1. Make: ...



- 3.2.6.6.2. Type: ...
- 3.2.6.6.3. Gap setting: ... mm
- 3.2.6.7. Ignition coil(s)
- 3.2.6.7.1. Make: ...
- 3.2.6.7.2. Type: ...
- 3.2.7. Cooling system: liquid/air <sup>(1)</sup>
- 3.2.7.1. Nominal setting of the engine temperature control mechanism: ...
- 3.2.7.2. Liquid
- 3.2.7.2.1. Nature of liquid: ...
- 3.2.7.2.2. Circulating pump(s): yes/no <sup>(1)</sup>
- 3.2.7.2.3. Characteristics: ... or
- 3.2.7.2.3.1. Make(s): ...
- 3.2.7.2.3.2. Type(s): ...
- 3.2.7.2.4. Drive ratio(s): ...
- 3.2.7.2.5. Description of the fan and its drive mechanism: ...
- 3.2.7.3. Air
- 3.2.7.3.1. Fan: yes/no <sup>(1)</sup>
- 3.2.7.3.2. Characteristics: ... or
- 3.2.7.3.2.1. Make(s): ...
- 3.2.7.3.2.2. Type(s): ...
- 3.2.7.3.3. Drive ratio(s): ...
- 3.2.8. Intake system
- 3.2.8.1. Pressure charger: yes/no <sup>(1)</sup>
- 3.2.8.1.1. Make(s): ...
- 3.2.8.1.2. Type(s): ...
- 3.2.8.1.3. Description of the system (e.g. maximum charge pressure: ... kPa; wastegate if applicable): ...

- 3.2.8.2. Intercooler: yes/no (<sup>1</sup>)
- 3.2.8.2.1. Type: air-air/air-water (<sup>1</sup>)
- 3.2.8.3. Intake depression at rated engine speed and at 100 % load (compression ignition engines only)
- 3.2.8.4. Description and drawings of inlet pipes and their accessories (plenum chamber, heating device, additional air intakes, etc.): ...
- 3.2.8.4.1. Intake manifold description (include drawings and/or photos): ...
- 3.2.8.4.2. Air filter, drawings: ... or
- 3.2.8.4.2.1. Make(s): ...
- 3.2.8.4.2.2. Type(s): ...
- 3.2.8.4.3. Intake silencer, drawings: ... or
- 3.2.8.4.3.1. Make(s): ...
- 3.2.8.4.3.2. Type(s): ...
- 3.2.9. Exhaust system
- 3.2.9.1. Description and/or drawing of the exhaust manifold: ...
- 3.2.9.2. Description and/or drawing of the exhaust system: ...
- 3.2.9.3. Maximum allowable exhaust back pressure at rated engine speed and at 100 % load (compression ignition engines only): ... kPa
- 3.2.10. Minimum cross-sectional areas of inlet and outlet ports: ...
- 3.2.11. Valve timing or equivalent data
- 3.2.11.1. Maximum lift of valves, angles of opening and closing, or timing details of alternative distribution systems, in relation to dead centres. For variable timing system, minimum and maximum timing: ...
- 3.2.11.2. Reference and/or setting ranges (<sup>1</sup>): ...
- 3.2.12. Measures taken against air pollution
- 3.2.12.1. Device for recycling crankcase gases (description and drawings): ...
- 3.2.12.2. Pollution control devices (if not covered by another heading)
- 3.2.12.2.1. Catalytic converter
- 3.2.12.2.1.1. Number of catalytic converters and elements (provide the information below for each separate unit): ...

- 3.2.12.2.1.2. Dimensions, shape and volume of the catalytic converter(s): ...
- 3.2.12.2.1.3. Type of catalytic action: ...
- 3.2.12.2.1.4. Total charge of precious metals: ...
- 3.2.12.2.1.5. Relative concentration: ...
- 3.2.12.2.1.6. Substrate (structure and material): ...
- 3.2.12.2.1.7. Cell density: ...
- 3.2.12.2.1.8. Type of casing for the catalytic converter(s): ...
- 3.2.12.2.1.9. Location of the catalytic converter(s) (place and reference distance in the exhaust line): ...
- 3.2.12.2.1.10. Heat shield: yes/no (<sup>1</sup>)
- 3.2.12.2.1.11. Normal operating temperature range: ... °C
- 3.2.12.2.1.12. Make of catalytic converter: ...
- 3.2.12.2.1.13. Identifying part number: ...
- 3.2.12.2.2. Sensors
- 3.2.12.2.2.1. Oxygen and/or lambda sensor(s): yes/no (<sup>1</sup>)
- 3.2.12.2.2.1.1. Make: ...
- 3.2.12.2.2.1.2. Location: ...
- 3.2.12.2.2.1.3. Control range: ...
- 3.2.12.2.2.1.4. Type or working principle: ...
- 3.2.12.2.2.1.5. Identifying part number: ...
- 3.2.12.2.2.2. NO<sub>x</sub> sensor: yes/no (<sup>1</sup>)
- 3.2.12.2.2.2.1. Make: ...
- 3.2.12.2.2.2.2. Type: ...
- 3.2.12.2.2.2.3. Location
- 3.2.12.2.2.3. Particulate sensor: yes/no (<sup>1</sup>)
- 3.2.12.2.2.3.1. Make: ...
- 3.2.12.2.2.3.2. Type: ...

- 3.2.12.2.2.3.3. Location: ...
- 3.2.12.2.3. Air injection: yes/no (<sup>1</sup>)
- 3.2.12.2.3.1. Type (pulse air, air pump, etc.): ...
- 3.2.12.2.4. Exhaust gas recirculation (EGR): yes/no (<sup>1</sup>)
- 3.2.12.2.4.1. Characteristics (make, type, flow, high pressure/low pressure/combined pressure, etc.): ...
- 3.2.12.2.4.2. Water-cooled system (to be specified for each EGR system e.g. low pressure/high pressure/combined pressure: yes/no (<sup>1</sup>))
- 3.2.12.2.5. Evaporative emissions control system (petrol and ethanol engines only): yes/no (<sup>1</sup>)
- 3.2.12.2.5.1. Detailed description of the devices: ...
- 3.2.12.2.5.2. Drawing of the evaporative control system: ...
- 3.2.12.2.5.3. Drawing of the carbon canister: ...
- 3.2.12.2.5.4. Mass of dry charcoal: ... g
- 3.2.12.2.5.5. Schematic drawing of the fuel tank (petrol and ethanol engines only): ...
- 3.2.12.2.5.5.1. Fuel tank system capacity, material and construction: ...
- 3.2.12.2.5.5.2. Description of vapour hose material, fuel line material and connection technique of the fuel system: ...
- 3.2.12.2.5.5.3. Sealed tank system: yes/no
- 3.2.12.2.5.5.4. Description of fuel tank relief valve setting (air ingestion and relief): ...
- 3.2.12.2.5.5.5. Description of the purge control system: ...
- 3.2.12.2.5.6. Description and schematic of the heat shield between tank and exhaust system: ...
- 3.2.12.2.5.7. Permeability factor: ...
- 3.2.12.2.6. Particulate trap (PT): yes/no (<sup>1</sup>)
- 3.2.12.2.6.1. Dimensions, shape and capacity of the particulate trap: ...
- 3.2.12.2.6.2. Design of the particulate trap: ...
- 3.2.12.2.6.3. Location (reference distance in the exhaust line): ...
- 3.2.12.2.6.4. Make of particulate trap: ...

- 3.2.12.2.6.5. Identifying part number: ...
- 3.2.12.2.7 On-board-diagnostic (OBD) system: yes/no (<sup>1</sup>)
- 3.2.12.2.7.1. Written description and/or drawing of the MI: ...
- 3.2.12.2.7.2. List and purpose of all components monitored by the OBD system: ...
- 3.2.12.2.7.3. Written description (general working principles) for
  - 3.2.12.2.7.3.1 Positive-ignition engines
    - 3.2.12.2.7.3.1.1. Catalyst monitoring: ...
    - 3.2.12.2.7.3.1.2. Misfire detection: ...
    - 3.2.12.2.7.3.1.3. Oxygen sensor monitoring: ...
    - 3.2.12.2.7.3.1.4. Other components monitored by the OBD system: ...
  - 3.2.12.2.7.3.2. Compression-ignition engines
    - 3.2.12.2.7.3.2.1. Catalyst monitoring: ...
    - 3.2.12.2.7.3.2.2. Particulate trap monitoring: ...
    - 3.2.12.2.7.3.2.3. Electronic fuelling system monitoring: ...
    - 3.2.12.2.7.3.2.5. Other components monitored by the OBD system: ...
- 3.2.12.2.7.4. Criteria for MI activation (fixed number of driving cycles or statistical method): ...
- 3.2.12.2.7.5. List of all OBD output codes and formats used (with explanation of each): ...
- 3.2.12.2.7.6. The following additional information shall be provided by the vehicle manufacturer for the purposes of enabling the manufacture of OBD-compatible replacement or service parts and diagnostic tools and test equipment.
  - 3.2.12.2.7.6.1. A description of the type and number of the preconditioning cycles or alternative preconditioning methods used for the original type approval of the vehicle and the reason for their usage.
  - 3.2.12.2.7.6.2. A description of the type of the OBD demonstration cycle used for the original type-approval of the vehicle for the component monitored by the OBD system.
  - 3.2.12.2.7.6.3. A comprehensive document describing all sensed components with the strategy for fault detection and MI activation (fixed number of driving cycles or statistical method), including a list of relevant secondary sensed parameters for each component monitored by the OBD system. A list of all

OBD output codes and format used (with an explanation of each) associated with individual emission related power-train components and individual non-emission related components, where monitoring of the component is used to determine MI activation, including in particular a comprehensive explanation for the data given in service \$05 Test ID \$21 to FF and the data given in service \$06.

In the case of vehicle types that use a communication link in accordance with ISO 15765-4 'Road vehicles, diagnostics on controller area network (CAN) — Part 4: requirements for emissions-related systems', a comprehensive explanation for the data given in service \$06 Test ID \$00 to FF, for each OBD monitor ID supported, shall be provided.

3.2.12.2.7.6.4. The information required above may be defined by completing a table as described below.

3.2.12.2.7.6.4.1. Light-duty vehicles

Component	Fault code	Monitoring strategy	Fault detection criteria	MI activation criteria	Secondary parameters	Preconditioning	Demonstration test
Catalyst	P0420	Oxygen sensor 1 and sensor 2 signals	Difference between sensor 1 and sensor 2 signals-	3rd cycle	Engine speed load, A/F mode, catalyst temperature	Two Type 1 cycles	Type 1

3.2.12.2.8. Other system: ...

3.2.12.2.8.2. Driver inducement system

3.2.12.2.8.2.3. Type of inducement system: no engine restart after countdown/no start after refuelling/fuel-lockout/performance restriction

3.2.12.2.8.2.4. Description of the inducement system

3.2.12.2.8.2.5. Equivalent to the average driving range of the vehicle with a complete tank of fuel: ... km

3.2.12.2.10. Periodically regenerating system: (provide the information below for each separate unit)

3.2.12.2.10.1. Method or system of regeneration, description and/or drawing: ...

3.2.12.2.10.2. The number of Type 1 operating cycles, or equivalent engine test bench cycles, between two cycles where regenerative phases occur under the conditions equivalent to Type 1 test (Distance 'D'): ...

- 3.2.12.2.10.2.1. Applicable Type 1 cycle (indicate the applicable procedure: Annex XXI or UN/ECE Regulation 83): ...
- 3.2.12.2.10.2.2. The number of complete applicable test cycles required for regeneration (distance 'd')
- 3.2.12.2.10.3. Description of method employed to determine the number of cycles between two cycles where regenerative phases occur: ...
- 3.2.12.2.10.4. Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure etc.): ...
- 3.2.12.2.10.5. Description of method used to load system: ...
- 3.2.12.2.11. Catalytic converter systems using consumable reagents (provide the information below for each separate unit) yes/no <sup>(1)</sup>
- 3.2.12.2.11.1. Type and concentration of reagent needed: ...
- 3.2.12.2.11.2. Normal operational temperature range of reagent: ...
- 3.2.12.2.11.3. International standard: ...
- 3.2.12.2.11.4. Frequency of reagent refill: continuous/maintenance (where appropriate):
- 3.2.12.2.11.5. Reagent indicator: (description and location) ...
- 3.2.12.2.11.6. Reagent tank
- 3.2.12.2.11.6.1. Capacity: ...
- 3.2.12.2.11.6.2. Heating system: yes/no
- 3.2.12.2.11.6.2.1 Description or drawing  
.
- 3.2.12.2.11.7. Reagent control unit: yes/no <sup>(1)</sup>
- 3.2.12.2.11.7.1. Make: ...
- 3.2.12.2.11.7.2. Type: ...
- 3.2.12.2.11.8. Reagent injector (make type and location): ...
- 3.2.12.2.11.9. Reagent quality sensor (make, type and location): ...
- 3.2.12.2.12. Water injection: yes/no <sup>(1)</sup>
- 3.2.13. Smoke opacity
- 3.2.13.1. Location of the absorption coefficient symbol (compression ignition engines only): ...

- 3.2.14. Details of any devices designed to influence fuel economy (if not covered by other items):....
- 3.2.15. LPG fuelling system: yes/no <sup>(1)</sup>
  - 3.2.15.1. Type-approval number according to Regulation (EC) No 661/2009 <sup>(1)</sup> or Regulation (EU) 2019/2144<sup>(8)</sup>: ...
  - 3.2.15.2. Electronic engine management control unit for LPG fuelling
    - 3.2.15.2.1. Make(s): ...
    - 3.2.15.2.2. Type(s): ...
    - 3.2.15.2.3. Emission-related adjustment possibilities: ...
  - 3.2.15.3. Further documentation
    - 3.2.15.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to LPG or back: ...
    - 3.2.15.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.): ...
    - 3.2.15.3.3. Drawing of the symbol: ...
- 3.2.16. NG fuelling system: yes/no <sup>(1)</sup>
  - 3.2.16.1. Type-approval number according to Regulation (EC) No 661/2009 or Regulation (EU) 2019/2144: ...
  - 3.2.16.2. Electronic engine management control unit for NG fuelling
    - 3.2.16.2.1. Make(s): ...
    - 3.2.16.2.2. Type(s): ...
    - 3.2.16.2.3. Emission-related adjustment possibilities: ...
  - 3.2.16.3. Further documentation
    - 3.2.16.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to NG or back: ...
    - 3.2.16.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.): ...
    - 3.2.16.3.3. Drawing of the symbol: ...
- 3.2.18. Hydrogen fuelling system: yes/no <sup>(1)</sup>
  - 3.2.18.1. EC type-approval number in accordance with Regulation (EC) No 79/2009 or Regulation (EU) 2019/2144: ...



- 3.2.18.2. Electronic engine management control unit for hydrogen fuelling
- 3.2.18.2.1. Make(s): ...
- 3.2.18.2.2. Type(s): ...
- 3.2.18.2.3. Emission-related adjustment possibilities: ...
- 3.2.18.3. Further documentation
- 3.2.18.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to hydrogen or back: ...
- 3.2.18.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.): ...
- 3.2.18.3.3. Drawing of the symbol: ...
- 3.2.19. H<sub>2</sub>NG fuelling system: yes/no <sup>(1)</sup>
- 3.2.19.1. Percentage of hydrogen in the fuel (the maximum specified by the manufacturer): ...
- 3.2.19.2. Number of the EU type-approval certificate issued in accordance with UN Regulation No 110: ...
- 3.2.19.3. Electronic engine management control unit for H<sub>2</sub>NG fuelling
- 3.2.19.3.1. Make(s): ...
- 3.2.19.3.2. Type(s): ...
- 3.2.19.3.3. Emission-related adjustment possibilities: ...
- 3.2.19.4. Further documentation
- 3.2.19.4.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.): ...
- 3.2.19.4.3. Drawing of the symbol: ...
- 3.2.20. Heat storage information
- 3.2.20.1. Active heat storage device: yes/no <sup>(1)</sup>
- 3.2.20.1.1. Enthalpy: ... (J)
- 3.2.20.2. Insulation materials: yes/no <sup>(1)</sup>
- 3.2.20.2.1. Insulation material: ...
- 3.2.20.2.2. Insulation nominal volume: ...<sup>(1)</sup>

- 3.2.20.2.3. Insulation nominal weight: ...<sup>(1)</sup>
- 3.2.20.2.4. Insulation location: ...
- 3.2.20.2.5. Worst case approach vehicle cool down: yes/no <sup>(1)</sup>
- 3.2.20.2.5.1. (not worst case approach) Minimum soaking time,  $t_{\text{soak\_ATCT}}$  (hours):...
- 3.2.20.2.5.2. (not worst case approach) Location of the engine temperature measurement: ...
- 3.2.20.2.6. Single interpolation family within the ATCT family approach: yes/no <sup>(1)</sup>
- 3.2.20.2.7. Worst case approach with regards to insulation: yes/no <sup>(1)</sup>
- 3.2.20.2.7.1. Description of the ATCT measured reference vehicle regarding insulation: ...
- 3.3. Electric powertrain (for PEV only)
- 3.3.1. General description of electric power train
- 3.3.1.1. Make: ...
- 3.3.1.2. Type: ...
- 3.3.1.3. Use (1): Monomotor/multimotors (number): ...
- 3.3.1.4. Transmission arrangement: parallel/transaxial/others, to precise: ...
- 3.3.1.5. Test voltage: ... V
- 3.3.1.6. Motor nominal speed: ...  $\text{min}^{-1}$
- 3.3.1.7. Motor maximum speed: ...  $\text{min}^{-1}$   
or by default: reducer outlet shaft/gear box speed (specify gear engaged):  
...  $\text{min}^{-1}$
- 3.3.1.9. Maximum power: ... kW
- 3.3.1.10. Maximum thirty minutes power: ... kW
- 3.3.1.11. Flexible range (where  $P > 90$  per cent of max. power):  
speed at the beginning of range: ...  $\text{min}^{-1}$   
speed at the end of range: ...  $\text{min}^{-1}$
- 3.3.2. Traction REESS
- 3.3.2.1. Trade name and mark of the REESS: ...
- 3.3.2.2. Kind of electro-chemical couple: ...
- 3.3.2.3. Nominal voltage: ... V

- 3.3.2.4. REESS maximum thirty minutes power (constant power discharge): ... kW
- 3.3.2.5. REESS performance in 2 h discharge (constant power or constant current):  
(1) .....
- 3.3.2.5.1. REESS energy: ... kWh
- 3.3.2.5.2. REESS capacity: ... Ah in 2 h
- 3.3.2.5.3. End of discharge voltage value: ... V
- 3.3.2.6. Indication of the end of the discharge that leads to a compulsory stop of  
the vehicle: <sup>(1)</sup> .....
- 3.3.2.7. REESS mass: ..... kg
- 3.3.2.8. Number of cells: .....
- 3.3.2.9. REESS position: .....
- 3.3.2.10. Type of coolant : air/liquid <sup>(1)</sup>
- 3.3.2.11. Battery management system control unit
- 3.3.2.11.1. Make: .....
- 3.3.2.11.2. Type: .....
- 3.3.2.11.3. Identification number: .....
- 3.3.3. Electric Motor
- 3.3.3.1. Working principle:
- 3.3.3.1.1. direct current/alternating current <sup>(1)</sup> /number of phases: .....
- 3.3.3.1.2. separate excitation/series/compound <sup>(1)</sup>
- 3.3.3.1.3. synchronous/asynchronous <sup>(1)</sup>
- 3.3.3.1.4. coiled rotor/with permanent magnets/with housing <sup>(1)</sup>
- 3.3.3.1.5. number of poles of the motor: .....
- 3.3.3.2. Inertia mass: .....
- 3.3.4. Power controller
- 3.3.4.1. Make : .....
- 3.3.4.2. Type : .....
- 3.3.4.2.1. Identification number: .....

- 3.3.4.3. Control principle: vectorial/open loop/closed/other (to be specified): <sup>(1)</sup>  
.....
- 3.3.4.4. Maximum effective current supplied to the motor: <sup>(2)</sup> ..... A  
during ..... seconds
- 3.3.4.5. Voltage range use: ..... V to ..... V
- 3.3.5. Cooling system:  
Motor: liquid/air <sup>(1)</sup>  
Controller: liquid/air <sup>(1)</sup>
- 3.3.5.1. Liquid-cooling equipment characteristics:
- 3.3.5.1.1. Nature of the liquid ..... circulating pumps: yes/no <sup>(1)</sup>
- 3.3.5.1.2. Characteristics or make(s) and type(s) of the pump: .....
- 3.3.5.1.3. Thermostat: setting: .....
- 3.3.5.1.4. Radiator: drawing(s) or make(s) and type(s): .....
- 3.3.5.1.5. Relief valve: pressure setting: .....
- 3.3.5.1.6. Fan: characteristics or make(s) and type(s): .....
- 3.3.5.1.7. Fan duct: .....
- 3.3.5.2. Air-cooling equipment characteristics
- 3.3.5.2.1. Blower: characteristics or make(s) and type(s): .....
- 3.3.5.2.2. Standard air ducting: .....
- 3.3.5.2.3. Temperature regulating system: yes/no <sup>(1)</sup>
- 3.3.5.2.4. Brief description: .....
- 3.3.5.2.5. Air filter: ..... make(s): ..... type(s):
- 3.3.5.3. Temperatures admitted by the manufacturer (maximum)
- 3.3.5.3.1. Motor outlet: ..... ° C
- 3.3.5.3.2. controller inlet: ..... ° C
- 3.3.5.3.3. at motor reference point(s): ..... ° C
- 3.3.5.3.4. at controller reference point(s): ..... ° C
- 3.3.6. Insulating category: .....
- 3.3.7. International protection (IP)-code: .....

- 3.3.8. Lubrication system principle: <sup>(1)</sup>  
 Bearings: friction/ball  
 Lubricant: grease/oil  
 Seal: yes/no  
 Circulation: with/without
- 3.3.9. Charger
- 3.3.9.1. Charger: on board/external <sup>(1)</sup>  
 in case of an external unit, define the charger (trademark, model):  
 .....
- 3.3.9.2. Description of the normal profile of charge:
- 3.3.9.3. Specification of mains:
- 3.3.9.3.1. Type of mains: single phase/three phase <sup>(1)</sup>
- 3.3.9.3.2. Voltage: .....
- 3.3.9.4. Rest period recommended between the end of the discharge and the start of the charge: .....
- 3.3.9.5. Theoretical duration of a complete charge: .....”
- 3.3.10. Electric energy converters
- 3.3.10.1. Electric energy converter between the electric machine and traction REESS
- 3.3.10.1.1. Make : .....
- 3.3.10.1.2. Type : .....
- 3.3.10.1.3. Declared nominal power : ..... W
- 3.3.10.2. Electric energy converter between the traction REESS and low voltage power supply
- 3.3.10.2.1. Make : .....
- 3.3.10.2.2. Type : .....
- 3.3.10.2.3. Declared nominal power : ..... W
- 3.3.10.3. Electric energy converter between the recharge-plug-in and traction REESS
- 3.3.10.3.1. Make : .....
- 3.3.10.3.2. Type : .....

- 3.3.10.3.3. Declared nominal power : ..... W
- 3.4. Combinations of propulsion energy converters
  - 3.4.1. Hybrid electric vehicle: yes/no <sup>(1)</sup>
  - 3.4.2. Category of hybrid electric vehicle: off-vehicle charging/not off-vehicle charging: <sup>(1)</sup>
  - 3.4.3. Operating mode switch: with/without <sup>(1)</sup>
    - 3.4.3.1. Selectable modes
      - 3.4.3.1.1. Pure electric: yes/no <sup>(1)</sup>
      - 3.4.3.1.2. Pure fuel consuming: yes/no <sup>(1)</sup>
      - 3.4.3.1.3. Hybrid modes: yes/no <sup>(1)</sup>  
(if yes, short description): ...
    - 3.4.4. Description of the energy storage device: (REESS, capacitor, flywheel/generator)
      - 3.4.4.1. Make(s): ...
      - 3.4.4.2. Type(s): ...
      - 3.4.4.3. Identification number: ...
      - 3.4.4.4. Kind of electrochemical couple: ...
      - 3.4.4.5. Energy: ... (for REESS: voltage and capacity Ah in 2 h, for capacitor: J, ...)
      - 3.4.4.6. Charger: on board/external/without <sup>(1)</sup>
      - 3.4.4.7. Type of coolant : air/liquid <sup>(1)</sup>
      - 3.4.4.8. Battery management system control unit
        - 3.4.4.8.1. Make: .....
        - 3.4.4.8.2. Type: .....
        - 3.4.4.8.3. Identification number: .....
  - 3.4.5. Electric machine (describe each type of electric machine separately)
    - 3.4.5.1. Make: ...
    - 3.4.5.2. Type: ...

- 3.4.5.3. Primary use: traction motor/generator <sup>(1)</sup>
- 3.4.5.3.1. When used as traction motor: single-/multimotors (number) <sup>(1)</sup>: ...
- 3.4.5.4. Maximum power: ... kW
- 3.4.5.5. Working principle
- 3.4.5.5.1 Direct current/alternating current/number of phases: ...
- 3.4.5.5.2. Separate excitation/series/compound <sup>(1)</sup>
- 3.4.5.5.3. Synchronous/asynchronous <sup>(1)</sup>
- 3.4.6. Control unit
- 3.4.6.1. Make(s): ...
- 3.4.6.2. Type(s): ...
- 3.4.6.3. Identification number: ...
- 3.4.7. Power controller
- 3.4.7.1. Make: ...
- 3.4.7.2. Type: ...
- 3.4.7.3. Identification number: ...
- 3.4.9. Manufacturer's recommendation for preconditioning: ...
- 3.4.10. FCHV: yes/no <sup>(1)</sup>
- 3.4.10.1. Type of Fuel Cell
- 3.4.10.1.2. Make: ...
- 3.4.10.1.3. Type: ...
- 3.4.10.1.4. Nominal Voltage (V): ...
- 3.4.10.1.5. Type of coolant: air/liquid <sup>(1)</sup>
- 3.4.10.2. System description (working principle of the fuel cell, drawing, etc.): ...
- 3.4.11. Electric energy converters
- 3.4.11.1. Electric energy converter between the electric machine and traction REESS
- 3.4.11.1.1. Make : .....

- 3.4.11.1.2. Type : .....
- 3.4.11.1.3. Declared nominal power : ..... W
- 3.4.11.2. Electric energy converter between the traction REESS and low voltage power supply
- 3.4.11.2.1. Make : .....
- 3.4.11.2.2. Type : .....
- 3.4.11.2.3. Declared nominal power : ..... W
- 3.4.11.3. Electric energy converter between the recharge-plug-in and traction REESS
- 3.4.11.3.1. Make : .....
- 3.4.11.3.2. Type : .....
- 3.4.11.3.3. Declared nominal power : ..... W
- 3.5. Manufacturer's declared values for determination of CO<sub>2</sub> emissions/fuel consumption/electric consumption/electric range and details of eco-innovations (where applicable) (°)
- 3.5.7. Manufacturer's declared values
- 3.5.7.1. Test vehicle parameters

Vehicle	Vehicle Low (VL) if existing	Vehicle High (VH)	VM if existing	V representative (only for road load matrix family*)	Default values
Vehicle bodywork type			-		
Road load method used (measurement or calculation by road load family)			-	-	
Road load information:					
Tyres make and type, if measurement			-		
Tyre dimensions (front/rear),			-		



if measurement					
Tyre rolling resistance (front/rear) (kg/t)			-		
Tyre pressure (front/rear) (kPa), if measurement			-		
Delta $C_D \times A$ of vehicle L compared to vehicle H (IP_H minus IP_L)	-		-	-	
Delta $C_D \times A$ compared to road load family vehicle L (IP_H/L minus RL_L), if calculation by road load family			-	-	
Vehicle test mass (kg)					
Mass in running order (kg)			-	-	-
Technically permissible maximum laden mass (kg)			-	-	-
Road load coefficients					
$f_0$ (N)					
$f_1$ (N/(km/h))					
$f_2$ (N/(km/h) <sup>2</sup> )					
Frontal area m <sup>2</sup> (0.000 m <sup>2</sup> )	-	-	-		
Cycle Energy Demand (J)					
* representative vehicle is tested for the road load matrix family					

3.5.7.1.1. Fuel used for the Type 1 test and selected for the measurement of the net power in accordance with Annex XX to this Regulation (for LPG or NG vehicles only): ...

3.5.7.2. Combined CO<sub>2</sub> emissions

- 3.5.7.2.1. CO<sub>2</sub> emission for pure ICE vehicles and NOVC-HEVs
- 3.5.7.2.1.0. Minimum and maximum CO<sub>2</sub> values within the interpolation family: ... g/km
- 3.5.7.2.1.1. Vehicle high: ... g/km
- 3.5.7.2.1.2. Vehicle low (if applicable): ... g/km
- 3.5.7.2.1.3. Vehicle M (if applicable): ... g/km
- 3.5.7.2.2 Charge-Sustaining CO<sub>2</sub> emission for OVC-HEVs
- 3.5.7.2.2.1. Charge-Sustaining CO<sub>2</sub> emission vehicle high: g/km
- 3.5.7.2.2.2. Charge-Sustaining CO<sub>2</sub> emission vehicle low (if applicable): g/km
- 3.5.7.2.2.3 Charge-Sustaining CO<sub>2</sub> emission vehicle M (if applicable): g/km
- 3.5.7.2.3. Charge-Depleting CO<sub>2</sub> emission and weighted CO<sub>2</sub> emission for OVC-HEVs
- 3.5.7.2.3.1. Charge-Depleting CO<sub>2</sub> emission of Vehicle high: ... g/km
- 3.5.7.2.3.2. Charge-Depleting CO<sub>2</sub> emission of Vehicle low (if applicable): ... g/km
- 3.5.7.2.3.3. Charge-Depleting CO<sub>2</sub> emission of Vehicle M (if applicable): ... g/km
- 3.5.7.2.3.4. Minimum and maximum weighted CO<sub>2</sub> values within the OVC interpolation family : ... g/km
- 3.5.7.3. Electric range for electrified vehicles
- 3.5.7.3.1. Pure Electric Range (PER) for PEVs
- 3.5.7.3.1.1. Vehicle high: ... km
- 3.5.7.3.1.2. Vehicle low (if applicable): ... km
- 3.5.7.3.2. All Electric Range AER for OVC-HEVs and OVC-FCHVs (as applicable)
- 3.5.7.3.2.1. Vehicle high: ... km
- 3.5.7.3.2.2. Vehicle low (if applicable): ... km
- 3.5.7.3.2.3. Vehicle M (if applicable): ... km
- 3.5.7.4. Fuel consumption (FC<sub>CS</sub>) for FCHVs
- 3.5.7.4.1. Charge-Sustaining fuel consumption for NOVC-FCHVs and OVC-FCHVs (as applicable)
- 3.5.7.4.1.1. Vehicle high: ... kg/100 km

- 3.5.7.4.1.2. Vehicle low (if applicable): ... kg/100 km
- 3.5.7.4.1.3. Vehicle M (if applicable): ... kg/100 km
- 3.5.7.4.2. Charge-Depleting fuel consumption for OVC-FCHVs (as applicable)
  - 3.5.7.4.2.1. Vehicle high: ... kg/100 km
  - 3.5.7.4.2.2. Vehicle low (if applicable): ... kg/100 km
- 3.5.7.5. Electric energy consumption for electrified vehicles
  - 3.5.7.5.1. Combined electric energy consumption ( $EC_{WLTC}$ ) for Pure electric vehicles
    - 3.5.7.5.1.1. Vehicle high: ... Wh/km
    - 3.5.7.5.1.2. Vehicle low (if applicable): ... Wh/km
  - 3.5.7.5.2. UF-weighted charge-depleting electric consumption  $EC_{AC,CD}$  (combined)
    - 3.5.7.5.2.1. Vehicle high: ... Wh/km
    - 3.5.7.5.2.2. Vehicle low (if applicable): ... Wh/km
    - 3.5.7.5.2.3. Vehicle M (if applicable): ... Wh/km

- 3.5.8. Vehicle fitted with an eco-innovation within the meaning of Article 11 of Regulation (EU) No 2019/631 for M1 or N1 vehicles: yes/no <sup>(1)</sup>
- 3.5.8.1. Type/Variant/Version of the baseline vehicle as referred to in Article 5 of Regulation (EU) No 725/2011 for M1 vehicles or Article 5 of Regulation (EU) No 427/2014 for N1 vehicles (if applicable): ...
- 3.5.8.2. Existence of interactions between different eco-innovations: yes/no <sup>(1)</sup>
- 3.5.8.3. Emissions data related to the use of eco-innovations (repeat the table for each reference fuel tested) (w<sup>1</sup>)

Decision approving the eco-innovation <sup>(w2)</sup>	Code of the eco-innovation <sup>(w3)</sup>	1. CO <sub>2</sub> emissions of the baseline vehicle (g/km)	2. CO <sub>2</sub> emissions of the eco-innovation vehicle (g/km)	3. CO <sub>2</sub> emissions of the baseline vehicle under type 1 test-cycle (w4)	4. CO <sub>2</sub> emissions of the eco-innovation vehicle under type 1 test-cycle	5. Usage factor (UF), i.e. temporal share of technology usage in normal operation conditions	CO <sub>2</sub> emissions savings ((1 – 2) – (3 – 4))*5
xxx/201x							
Total WLTP CO <sub>2</sub> emissions saving (g/km)(w <sup>5</sup> )							

- 3.6. Temperatures permitted by the manufacturer
- 3.6.1. Cooling system
- 3.6.1.1. Liquid cooling  
Maximum temperature at outlet: ... K
- 3.6.1.2. Air cooling
- 3.6.1.2.1. Reference point: ...
- 3.6.1.2.2. Maximum temperature at reference point: ... K
- 3.6.2. Maximum outlet temperature of the inlet intercooler: ... K
- 3.6.3. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold or turbocharger: ... K
- 3.6.4. Fuel temperature

Minimum: ... K — maximum: ... K

For diesel engines at injection pump inlet, for gas fuelled engines at pressure regulator final stage

3.6.5. Lubricant temperature

Minimum: ... K — maximum: ... K

3.8. Lubrication system

3.8.1. Description of the system

3.8.1.1. Position of lubricant reservoir: ...

3.8.1.2. Feed system (by pump/injection into intake/mixing with fuel, etc.) <sup>(1)</sup>

3.8.2. Lubricating pump

3.8.2.1. Make(s): ...

3.8.2.2. Type(s): ...

3.8.3. Mixture with fuel

3.8.3.1. Percentage: ...

3.8.4. Oil cooler: yes/no <sup>(1)</sup>

3.8.4.1. Drawing(s): ... or

3.8.4.1.1. Make(s): ...

3.8.4.1.2. Type(s): ...

3.8.5. Lubricant specification: ...W...

4 TRANSMISSION <sup>(P)</sup>

4.3. Moment of inertia of engine flywheel: ...

4.3.1. Additional moment of inertia with no gear engaged: ...

4.4. Clutch(es)

4.4.1. Type: ...

4.4.2. Maximum torque conversion: ...

4.5. Gearbox

4.5.1. Type (manual/automatic/CVT (continuously variable transmission)) <sup>(1)</sup>

4.5.1.4. Torque rating: ...

4.5.1.5. Number of clutches: ...

4.6. Gear ratios

Gear	Internal gearbox ratios (ratios of engine to gearbox output shaft revolutions)	Final drive ratio(s) (ratio of gearbox output shaft to driven wheel revolutions)	Total gear ratios
Maximum for CVT			
1			
2			
3			
...			
Minimum for CVT			

4.6.1 Gearshift (*not applicable in case of automatic transmission*)

4.6.1.1. Gear 1 excluded: yes/no <sup>(1)</sup>

4.6.1.2.  $n_{95\_high}$  for each gear: ... min<sup>-1</sup>

4.6.1.3.  $n_{min\_drive}$

4.6.1.3.1. 1st gear: ... min<sup>-1</sup>

4.6.1.3.2. 1st gear to 2nd: ... min<sup>-1</sup>

4.6.1.3.3. 2nd gear to standstill: ... min<sup>-1</sup>

4.6.1.3.4. 2nd gear: ... min<sup>-1</sup>

4.6.1.3.5. 3rd gear and beyond: ... min<sup>-1</sup>

4.6.1.4.  $n_{min\_drive\_set}$  for acceleration/constant speed phases ( $n_{min\_drive\_up}$ ): ... min<sup>-1</sup>

4.6.1.5.  $n_{min\_drive\_set}$  for deceleration phases ( $n_{min\_drive\_down}$ ):

4.6.1.6. initial period of time

4.6.1.6.1.  $t_{start\_phase}$ : ... s

4.6.1.6.2.	$n_{\text{min\_drive\_start}}$ : ... $\text{min}^{-1}$
4.6.1.6.3.	$n_{\text{min\_drive\_up\_start}}$ : ... $\text{min}^{-1}$
4.6.1.7.	use of ASM: yes/no <sup>(1)</sup>
4.6.1.7.1.	ASM values: ... at ... $\text{min}^{-1}$
4.7.	Maximum vehicle design speed (in km/h) <sup>(9)</sup> : ...
4.12.	Gearbox lubricant: ...W...
6	SUSPENSION
6.6.	Tyres and wheels
6.6.1.	Tyre/wheel combination(s)
6.6.1.1.	Axles
6.6.1.1.1.	Axle 1: ...
6.6.1.1.1.1.	Tyre size designation
6.6.1.1.2.	Axle 2: ...
6.6.1.1.2.1.	Tyre size designation
	etc.
6.6.2.	Upper and lower limits of rolling radii
6.6.2.1.	Axle 1: ...
6.6.2.2.	Axle 2: ...
6.6.3.	Tyre pressure(s) as recommended by the vehicle manufacturer: ... kPa
9	BODYWORK
9.1.	Type of bodywork using the codes defined in Part C of Annex I of Regulation (EU) 2018/858: ...
12.	MISCELLANEOUS
12.10.	Devices or systems with driver selectable modes which influence CO <sub>2</sub> emissions, fuel consumption, electric energy consumption and/or criteria emissions and do not have a predominant mode: yes/no <sup>(1)</sup>
12.10.1.	Charge-sustaining test (if applicable) (state for each device or system)
12.10.1.0.	Predominant mode under CS condition: yes/no <sup>(1)</sup>

- 12.10.1.0.1. Predominant mode under CS condition: ... (if applicable)
- 12.10.1.1. Best case mode: ... (if applicable)
- 12.10.1.2. Worst case mode: ... (if applicable)
- 12.10.1.3. Mode which enables the vehicle to follow the reference test cycle: ... (in case no predominant mode under CS condition and only one mode is able to follow the reference test cycle)
- 12.10.2. Charge-depleting test (if applicable) (state for each device or system)
- 12.10.2.0. Predominant mode under CD condition: yes/no <sup>(1)</sup>
- 12.10.2.0.1. Predominant mode under CD condition: ... (if applicable)
- 12.10.2.1. Most energy consuming mode: ... (if applicable)
- 12.10.2.2. Mode which enables the vehicle to follow the reference test cycle: ... (in case no predominant mode under CD condition and only one mode is able to follow the reference test cycle)
- 12.10.3. Type 1 test (if applicable) (state for each device or system)
- 12.10.3.1. Best case mode: ...
- 12.10.3.2. Worst case mode: ...

#### *Explanatory notes*

- <sup>(1)</sup> Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).
- <sup>(2)</sup> Specify the tolerance.
- <sup>(3)</sup> Please fill in here the upper and lower values for each variant.
- <sup>(6)</sup> --
- <sup>(7)</sup> Optional equipment that affects the dimensions of the vehicle shall be specified.
- <sup>(c)</sup> Classified according to the definitions set out in Article 4 of Regulation (EU) 2018/858.
- <sup>(f)</sup> Where there is one version with a normal cab and another with a sleeper cab, both sets of masses and dimensions are to be stated.
- <sup>(g)</sup> Standard ISO 612: 1978 — Road vehicles — Dimensions of motor vehicles and towed vehicles — terms and definitions.
- <sup>(h)</sup> The mass of the driver is assessed at 75 kg.

The liquid containing systems (except those for used water that must remain empty) are filled to 100 % of the capacity specified by the manufacturer.



The information referred to in points 2.6(b) and 2.6.1(b) do not need to be provided for vehicle categories N2, N3, M2, M3, O3, and O4.

(i) For trailers or semi-trailers, and for vehicles coupled with a trailer or a semi-trailer, which exert a significant vertical load on the coupling device or the fifth wheel, this load, divided by standard acceleration of gravity, is included in the maximum technically permissible mass.

(k) In the case of a vehicle that can run either on petrol, diesel, etc., or also in combination with another fuel, items shall be repeated.

In the case of non-conventional engines and systems, particulars equivalent to those referred to here shall be supplied by the manufacturer.

(l) This figure shall be rounded off to the nearest tenth of a millimetre.

(m) This value shall be calculated ( $\pi = 3,1416$ ) and rounded off to the nearest  $\text{cm}^3$ .

(n) Determined in accordance with the requirements of Regulation (EC) No 715/2007 or Regulation (EC) No 595/2009 as applicable.

(o) Determined in accordance with the requirements of Council Directive 80/1268/EEC (OJ L 375, 31.12.1980, p. 36).

(p) The specified particulars are to be given for any proposed variants.

(q) With respect to trailers, maximum speed permitted by the manufacturer.

(r) OJ L 200, 31.7.2009, p. 1

(s) OJ L 325, 16.12.2019, p. 1

(t) For insulation nominal volume and insulation nominal weight, state to 2 decimal places. A tolerance of +/- 10 per cent shall be applied for insulation volume and insulation weight. Not to be documented if 'no' in paragraph 3.2.20.2.5. or 3.2.20.2.7.

(w) Eco-innovations.

(w<sup>1</sup>) Expand the table if necessary, using one extra row per eco-innovation.

(w<sup>2</sup>) Number of the Commission Decision approving the eco-innovation.

(w<sup>3</sup>) Assigned in the Commission Decision approving the eco-innovation.

(w<sup>4</sup>) Under agreement of the type-approval authority, if a modelling methodology is applied instead of the type 1 test cycle, this value shall be the one provided by the modelling methodology.

(w<sup>5</sup>) Sum of the CO<sub>2</sub> emissions savings of each individual eco-innovation.'.

### **Appendix 3a**

#### **Documentation Packages**

##### ***FORMAL DOCUMENTATION PACKAGE:***

The manufacturer may use one formal documentation package for multiple emission type approvals. The formal documentation package shall include the following information:

Point	Explanation
<b>1. Emission Type Approval Number(s)</b>	List of emission type approval number(s) covered by this BES-AES declaration:  including TA reference, software reference, calibration number, checksums of each version and of each relevant Control Unit (CU) such as engine and aftertreatment ones
Method of reading of software and calibration version	E.g. scan-tool explanation
<b>2. Base Emission Strategies</b>	
BES x	Description of strategy x
BES y	Description of strategy y
<b>3. Auxiliary Emission Strategies</b>	
Presentation of the AESs	Hierarchical relations among AES: which AES takes precedence if more than one are present
AES x	<ul style="list-style-type: none"> <li>• AES description and justification</li> <li>• Measured and/or modelled parameters for AES activation</li> <li>• Other parameters used to activate the AES</li> <li>• Increase of pollutants and CO<sub>2</sub> during the use of AES compared to BES</li> </ul>
AES y	As above

### ***EXTENDED DOCUMENTATION PACKAGE***

The extended documentation package shall include the following information on all AES:

- (a) a declaration of the manufacturer that the vehicle does not contain any defeat device not covered by one of the exceptions in Article 5(2) of Regulation (EC) No 715/2007;
- (b) a description of the engine and the emission control strategies and devices employed, whether software or hardware, and any condition(s) under which the strategies and devices will not operate as they do during testing for TA;
- (c) a declaration of the software versions used to control these AES/BES, including the appropriate checksums or reference values of these software versions and instructions to the authority on how to read the checksums or reference values; the declaration shall be updated and sent to the type approval authority that holds this extended documentation package each time there is a new software version that has an impact to the AES/BES. Manufacturers may request to use an alternative to a checksum as long as it provides an equivalent level of traceability for software version changes;

- (d) detailed technical reasoning of any AES estimating the impact with the AES and without it, and information on the following:
- (i) why any of the exception clauses from the defeat device prohibition in Article 5(2) of Regulation (EC) No 715/2007 apply;
  - (ii) hardware element(s) that need to be protected by the AES, where applicable;
  - (iii) proof of sudden and irreparable engine damage that cannot be prevented by regular maintenance and would occur in the absence of the AES, where applicable;
  - (iv) a reasoned explanation on why there is a need to use an AES upon engine start, where applicable;
- (e) a description of the fuel system control logic, timing strategies and switch points during all modes of operation;
- (f) a description of the hierarchical relations among the AES (i.e., when more than one AES can be active concurrently, an indication of which AES is primary in responding, the method by which strategies interact, including data flow diagrams and decision logic and how does the hierarchy assure emissions from all AES are controlled to the lowest practical level;
- (g) a list of parameters which are measured and/or calculated by the AES, along with the purpose of every parameter measured and/or calculated and how each of those parameters relates to engine damage; including the method of calculation and how well these calculated parameters correlate with the true state of the parameter being controlled and any resulting tolerance or factor of safety incorporated into the analysis;
- (h) a list of engine/emission control parameters which are modulated as a function of the measured or calculated parameter(s) and the range of modulation for each engine/emission control parameter; along with the relationship between engine/emission control parameters and measured or calculated parameters;
- (i) an evaluation of how the AES will control real-driving emissions to the lowest practical level, including a detailed analysis of the expected increase of total regulated pollutants and CO<sub>2</sub> emissions by using the AES, compared to the BES.

The extended documentation package shall be limited to 100 pages and shall include all the main elements to allow the type approval authority to assess the AES. The package may be complemented with annexes and other attached documents, containing additional and complementary elements, if necessary. The manufacturer shall send a new version of the extended documentation package to the type approval authority every time changes are introduced to the AES. The new version shall be limited to the changes and their effect. The new version of the AES shall be evaluated and approved by the type approval authority.

The extended documentation package shall be structured as follows:

***Extended Documentation Package for AES Application No. YYY/OEM in accordance with Regulation (EU) 2017/1151***

Parts	Paragraph	Point	Explanation
Introduction		Introduction letter to TAA	Reference of the document with the version, the date of

documents			issuing the document, signature by the relevant person in the manufacturer organisation
		Versioning table	Content of each version modifications: and with part is modified
		Description of the (emission) types concerned	
		Attached documents table	List of all attached documents
		Cross references	link to paragraph (a) to (i) of Appendix 3a (where to find each requirement of the regulation)
		Absence of defeat device declaration	+ signature
Core document	0	Acronyms/abbreviations	
	1	GENERAL DESCRIPTION	
	1.1	Engine general presentation	Description of main characteristics: displacement, after treatment,...
	1.2	General system architecture	System bloc diagram: list of sensors and actuators, explanation of engine general functions
	1.3	Reading of software and calibration version	E.g. scan-tool explanation
	2	Base Emission Strategies	
	2.x	BES x	Description of strategy x
	2.y	BES y	Description of strategy y
	3	Auxiliary Emission Strategies	
	3.0	Presentation of the AESs	Hierarchical relations among AES: description and justification (e.g. safety, reliability, etc.)

	3.x	AES x	3.x.1 AES justification 3.x.2 measured and/or modelled parameters for AES characterization 3.x.3 Action mode of AES - Parameters used 3.x.4 Effect of AES on pollutants and CO <sub>2</sub>
	3.y	AES y	3.y.1 3.y.2 etc.
	100 page limit ends here		
	Annex		List of types covered by this BES-AES: including TA reference, software reference, calibration number, checksums of each version and of each CU (engine and/or after-treatment if any)
Attached documents		Technical note for AES justification n° xxx	Risk assessment or justification by testing or example of sudden damage, if any
		Technical note for AES justification n° yyy	
		Test report for specific AES impact quantification	test report of all specific tests done for AES justification, test conditions details, description of the vehicle, date of the tests, emission and/or CO <sub>2</sub> impact with or without AES activation

- (5) In Appendix 4 the Model of EC Type-Approval Certificate without the addendum, is replaced by the following:

## ***‘MODEL OF EC TYPE-APPROVAL CERTIFICATE***

**(Maximum format: A4 (210 × 297 mm))**

### ***EC TYPE-APPROVAL CERTIFICATE***

*Stamp of administration*

Communication concerning the:

- EC type-approval <sup>(1)</sup>,
- extension of EC type-approval <sup>(1)</sup>,
- refusal of EC type-approval <sup>(1)</sup>,
- withdrawal of EC type-approval <sup>(1)</sup>,
- of a type of system/type of a vehicle with regard to a system <sup>(1)</sup> with regard to Regulation (EC) No 715/2007 <sup>(2)</sup> and Regulation (EU) 2017/1151 <sup>(3)</sup>

EC type-approval number: ...

Reason for extension: ...

#### ***SECTION I***

- 0.1. Make (trade name of manufacturer): ...
- 0.2. Type: ...
  - 0.2.1. Commercial name(s) (if available): ...
- 0.3. Means of identification of type if marked on the vehicle <sup>(4)</sup>
  - 0.3.1. Location of that marking: ...
- 0.4. Category of vehicle <sup>(5)</sup>
  - 0.4.2. Base vehicle <sup>(5a)</sup> <sup>(1)</sup>: yes/no <sup>(1)</sup>
- 0.5. Name and address of manufacturer: ...
- 0.8. Name(s) and address(es) of assembly plant(s): ...
- 0.9. If applicable, name and address of manufacturer's representative: ...

#### ***SECTION II***

- 0. Interpolation family identifier as defined in paragraph 6.2.6. of UN Regulation No. 154
- 1. Additional information (where applicable): (see addendum)
- 2. Technical service responsible for carrying out the tests: ...
- 3. Date of type 1 test report: ...
- 4. Number of the type 1 test report: ...
- 5. Remarks (if any): (see Section 3 of addendum)
- 6. Place: ...
- 7. Date: ...
- 8. Signature: ...

<i>Attachments:</i>	Information package <sup>(6)</sup> Test report(s)
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(6) ; Appendix 5 is deleted;

(7) Appendix 6 is amended as follows:

(1) In point 1. Table 1 is amended as follows:

(1) the rows AP to AR are replaced by the following:

AP	Euro 6d-ISC-FCM	Euro 6-2	M, N1 class I	PI, CI	1.1.2020	1.1.2021	31.8.2024
AQ	Euro 6d-ISC-FCM	Euro 6-2	N1 class II	PI, CI	1.1.2021	1.1.2022	31.8.2024
AR	Euro 6d-ISC-FCM	Euro 6-2	N1 class III, N2	PI, CI	1.1.2021	1.1.2022	31.8.2024

(2) after row AR the following rows are inserted:

EA	Euro 6e	Euro 6-2	M, N1, N2	PI, CI	1.9.2023	1.9.2024	31.12.2025
EB	Euro 6e - bis	Euro 6-2	M, N1, N2	PI, CI	1.1.2025	1.1.2026	31.12.2027
EC	Euro 6e-bis-FCM	Euro 6-2	M, N1, N2	PI, CI	1.1.2027	1.1.2028	

(2) after Table 1, the following text is added after the 'key' regarding Euro 6d-ISC-FCM' RDE:

'Euro 6e'	=	As above + RDE compliance considering updated PEMS margins, OBFCM for N2 vehicles;
'Euro 6e-bis'	=	As above + increased extended ambient conditions for RDE compliance + AES Flag + utility factor based on $d_{neb}$ (see point 3.2 of Annex XXI)
'Euro 6e-bis-	=	As above + utility factor based on $d_{nec}$ (see point 3.2. of Annex

FCM'		XXI). <sup>2</sup>
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(3) point 2. is replaced by the following:

## ‘2. EXAMPLES OF TYPE-APPROVAL CERTIFICATE NUMBERS

2.1 An example is provided below of a type-approval of a Euro 6 light passenger car to the 'Euro 6d' emission standard and 'Euro 6-2' OBD standard, identified by the characters 'AJ' according to Table 1. The approval was granted for the base Regulation (EC) 715/2007 and its implementing Regulation (EU) 2017/1151. It is the 17<sup>th</sup> approval of this kind issued by Luxembourg, identified by the code 'e13', without any extension. So the fourth and fifth sections of the approval number are '0017' and '00', respectively.

e13\*715/2007\*2017/1151AJ\*0017\*00

2.2 This second example shows a type-approval of a Euro 6 N1 class II light commercial vehicle to the 'Euro 6d-TEMP' emission standard and 'Euro 6-2' OBD standard, identified by the characters 'AH' according to Table 1. The approval was granted for the base Regulation (EC) 715/2007 and its implementing legislation (as amended by Regulation (EU) 2018/1832). It is the 1<sup>st</sup> approval of this kind issued by Romania, identified by the code 'e19', without any extension. So the fourth and fifth sections of the approval number are '0001' and '00', respectively.

e19\*715/2007\*2018/1832AH\*0001\*00

2.3 This third example shows a type-approval of a Euro 6 light passenger car to the 'Euro 6e' emission standard and 'Euro 6-2' OBD standard, identified by the characters 'EA' according to Table 1. The approval was granted for the base Regulation (EC) 715/2007 and its implementing legislation (as amended by this Regulation (EU) 2022/xxxx). It is a second extension to the 7<sup>th</sup> approval of this kind issued by the Netherlands, identified by the code 'e4'. So the fourth and fifth sections of the approval number are '00007' and '02', respectively.

e4\*715/2007\*2022/xxxxEA\*00007\*02

‘;

(8) Appendices 8a, 8b and 8c are replaced by the following ,:

## ‘Appendix 8a

### **TEST REPORTS**

A Test Report is the report issued by the technical service responsible for conducting the tests according this regulation.

<sup>2</sup> In case the value of  $d_{nec}$  changes following the review of 2024, a different character will be assigned to the vehicles types approved with the revised  $d_{nec}$ .



## PART I

The following information, if applicable, is the minimum data required for the Type 1 test.

*REPORT number*

APPLICANT			
<i>Manufacturer</i>			
SUBJECT	...		
<i>Roadload family identifier(s)</i>	:		
<i>Interpolation family identifier(s)</i>	:		
<i>Object submitted to tests</i>			
	Make	:	
	IP identifier	:	
CONCLUSION	The object submitted to tests complies with the requirements mentioned in the subject.		

PLACE,	DD/MM/YYYY
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### **General notes:**

If there are several options (references), the one tested should be described in the test report

If there are not, a single reference to the information document at the start of the test report may be sufficient.

Every Technical Service is free to include some additional information

Characters are included in the sections of the test report relating to specific vehicle types, as follows:

- "(a)"      Specific to positive ignition engine vehicles.
- "(b)"      Specific to compression ignition engine vehicles.

### **1. DESCRIPTION OF TESTED VEHICLE(S): HIGH, LOW AND M (IF APPLICABLE)**

#### **1.1. General**

Vehicle numbers	:	Prototype number and VIN
Category	:	

Bodywork	:	
Drive wheels	:	

#### 1.1.1. *Powertrain Architecture*

Powertrain architecture	:	pure ICE, hybrid, electric or fuel cell
-------------------------	---	---

#### 1.1.2. *INTERNAL COMBUSTION ENGINE (if applicable)*

For more than one ICE, please repeat the point

Make	:						
Type	:						
Working principle	:	two/four stroke					
Cylinders number and arrangement	:						
Engine capacity (cm <sup>3</sup> )	:						
Engine idling speed (min <sup>-1</sup> )	:			+			
High engine idling speed (min <sup>-1</sup> ) (a)	:			+			
Rated engine power	:		kW		at		rpm
Maximum net torque	:		Nm		at		rpm
Engine lubricant	:	make and type					
Cooling system	:	Type: air/water/oil					
Insulation	:	material, amount, location, nominal volume and nominal weight*					

\* a tolerance of +/- 10 per cent is permitted for volume and weight

#### 1.1.3. *TEST FUEL for Type 1 test (if applicable)*

For more than one test fuel, please repeat the point

Make	:	
Type	:	Petrol E10 - Diesel B7 – LPG – NG - ...
Density at 15 °C	:	
Sulphur content	:	Only for Diesel B7 and Petrol E10

Batch number	:	
Willans factors (for ICE) for CO <sub>2</sub> emission (gCO <sub>2</sub> /MJ)	:	

#### 1.1.4. *FUEL FEED SYSTEM (if applicable)*

For more than one fuel feed system, please repeat the point

Direct injection	:	yes/no or description
Vehicle fuel type	:	Monofuel / bifuel / flex fuel
Control unit	:	
Part reference	:	same as information document
Software tested	:	read via scantool, for example
Air flowmeter	:	
Throttle body	:	
Pressure sensor	:	
Injection pump	:	
Injector(s)	:	

#### 1.1.5. *INTAKE SYSTEM (if applicable)*

For more than one intake system, please repeat the point

Pressure charger	:	Yes/no make & type (1)
Intercooler	:	yes/no type (air/air – air/water) (1)
Air filter (element) (1)	:	make & type
Intake silencer (1)	:	make & type

#### 1.1.6. *EXHAUST SYSTEM AND ANTI-EVAPORATIVE SYSTEM (if applicable)*

For more than one, please repeat the point

First catalytic converter	:	make & reference (1)
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		principle: three way / oxidising / NO <sub>x</sub> trap / NO <sub>x</sub> storage system / Selective Catalyst Reduction...
Second catalytic converter	:	make & reference (1) principle: three way/oxidising / NO <sub>x</sub> trap / NO <sub>x</sub> storage system / Selective Catalyst Reduction...
Particulate trap	:	with/without/not applicable catalysed: yes/no make & reference (1)
Reference and position of oxygen sensor(s)	:	before catalyst/after catalyst
Air injection	:	with/without/not applicable
Water injection	:	with/without/not applicable
EGR	:	with/without/not applicable cooled/non-cooled HP/LP
Evaporative emission control system	:	with/without/not applicable
Reference and position of NO <sub>x</sub> sensor(s)	:	Before/after
General description (1)	:	

#### 1.1.7. HEAT STORAGE DEVICE (if applicable)

For more than one Heat Storage System, please repeat the point

Heat storage device	:	yes/no
Heat capacity (enthalpy stored J)	:	
Time for heat release (s)	:	

#### 1.1.8. TRANSMISSION (if applicable)

For more than one Transmission, please repeat the point

Gearbox	:	manual / automatic / continuous variation
Gear shifting procedure		

Predominant mode <sup>3</sup>	:	yes/no normal / drive / eco/...
Best case mode for CO <sub>2</sub> emissions and fuel consumption (if applicable)	:	
Worst case mode for CO <sub>2</sub> emissions and fuel consumption (if applicable)	:	
Highest electric energy consumption mode (if applicable)	:	
Control unit	:	
Gearbox lubricant	:	make and type
Tyres		
Make	:	
Type	:	
Dimensions front/rear	:	
Dynamic circumference (m)	:	
Tyre pressure (kPa)	:	

Transmission ratios (R.T.), primary ratios (R.P.) and (vehicle speed (km/h)) / (engine speed (1000 (min<sup>-1</sup>)) (V<sub>1000</sub>) for each of the gearbox ratios (R.B.).

R.B.	R.P.	R.T.	V <sub>1000</sub>
1st	1/1		
2nd	1/1		
3rd	1/1		
4th	1/1		
5th	1/1		
...			

<sup>3</sup> for OVC-HEV, specify for charge-sustaining and for charge-depleting operating conditions.

#### 1.1.9. *ELECTRIC MACHINE (if applicable)*

For more than one Electric Machine, please repeat the point

Make	:	
Type	:	
Peak Power (kW)	:	

#### 1.1.10. *TRACTION REESS (if applicable)*

For more than one Traction REESS, please repeat the point

Make	:	
Type	:	
Capacity (Ah)	:	
Nominal Voltage (V)	:	

#### 1.1.11. *FUEL CELL (if applicable)*

For more than one Fuel Cell, please repeat the point

Make	:	
Type	:	
Maximum Power (kW)	:	
Nominal Voltage (V)	:	

#### 1.1.12. *POWER ELECTRONICS (if applicable)*

Can be more than one PE (propulsion converter, low voltage system or charger)

Make	:	
Type	:	
Power (kW)	:	

### 1.2. *Vehicle high description*

#### 1.2.1. *MASS*

Test mass of VH (kg)	:	
----------------------	---	--

### 1.2.2. ROAD LOAD PARAMETERS

$f_0$ (N)	:	
$f_1$ (N/(km/h))	:	
$f_2$ (N/(km/h) <sup>2</sup> )	:	
Cycle energy demand (J)	:	
Road load test report reference	:	
Road load family's identifier	:	

### 1.2.3. CYCLE SELECTION PARAMETERS

Cycle (without downscaling)	:	Class 1 / 2 / 3a / 3b
Ratio of rated power to mass in running order (PMR)(W/kg)	:	(if applicable)
Capped speed process used during measurement	:	yes/no
Maximum speed of the vehicle (km/h)	:	
Downscaling (if applicable)	:	yes/no
Downscaling factor $fd_{sc}$	:	
Cycle distance (m)	:	
Constant speed (in the case of the shortened test procedure)	:	if applicable

### 1.2.4. GEAR SHIFT POINT (IF APPLICABLE)

Version of Gear Shift calculation		(indicate the applicable amendment to Regulation (EU) 2017/1151)
Gear shifting	:	Average gear for $v \geq 1$ km/h, x.xxxx
$n_{min}$ drive		
1st gear	:	...min <sup>-1</sup>
1st gear to 2nd	:	...min <sup>-1</sup>
2nd gear to standstill	:	...min <sup>-1</sup>
2nd gear	:	...min <sup>-1</sup>

3rd gear and beyond	:	...min <sup>-1</sup>
Gear 1 excluded	:	yes/no
n_95_high for each gear	:	...min <sup>-1</sup>
n_min_drive_set for acceleration/constant speed phases (n_min_drive_up)	:	...min <sup>-1</sup>
n_min_drive_set for deceleration phases (nmin_drive_down)	:	...min <sup>-1</sup>
t_start_phase	:	...s
n_min_drive_start	:	...min <sup>-1</sup>
n_min_drive_up_start	:	...min <sup>-1</sup>
use of ASM	:	yes/no
ASM values	:	

### 1.3. *Vehicle low description (if applicable)*

#### 1.3.1. *MASS*

Test mass of VL(kg)	:	
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#### 1.3.2. *ROAD LOAD PARAMETERS*

f <sub>0</sub> (N)	:	
f <sub>1</sub> (N/(km/h))	:	
f <sub>2</sub> (N/(km/h) <sup>2</sup> )	:	
Cycle energy demand (J)	:	
Δ(C <sub>D</sub> × A <sub>f</sub> ) <sub>LH</sub> (m <sup>2</sup> )	:	
Road load test report reference	:	
Road load family's identifier	:	

#### 1.3.3. *CYCLE SELECTION PARAMETERS*

Cycle (without downscaling)	:	Class 1 / 2 / 3a / 3b
-----------------------------	---	-----------------------



Ratio of rated power to mass in running order – 75kg (PMR)(W/kg)	:	(if applicable)
Capped speed process used during measurement	:	yes/no
Maximum speed of the vehicle	:	
Downscaling (if applicable)	:	yes/no
Downscaling factor fdsc	:	
Cycle distance (m)	:	
Constant speed (in the case of the shortened test procedure)	:	if applicable

#### 1.3.4. GEAR SHIFT POINT (IF APPLICABLE)

Gear shifting	:	Average gear for $v \geq 1$ km/h, x.xxxx
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#### 1.4. Vehicle M description (if applicable)

##### 1.4.1. MASS

Test mass of VL(kg)	:	
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##### 1.4.2. ROAD LOAD PARAMETERS

$f_0$ (N)	:	
$f_1$ (N/(km/h))	:	
$f_2$ (N/(km/h) <sup>2</sup> )	:	
Cycle energy demand (J)	:	
$\Delta(C_D \times A_f)_{LH}$ (m <sup>2</sup> )	:	
Road load test report reference	:	
Road load family's identifier	:	

##### 1.4.3. CYCLE SELECTION PARAMETERS

Cycle (without downscaling)	:	Class 1 / 2 / 3a / 3b
Ratio of rated power to mass in running order -75kg (PMR)(W/kg)	:	(if applicable)

Capped speed process used during measurement	:	yes/no
Maximum speed of the vehicle	:	
Downscaling (if applicable)	:	yes/no
Downscaling factor fdsc	:	
Cycle distance (m)	:	
Constant speed (in the case of the shortened test procedure)	:	if applicable

#### 1.4.4. GEAR SHIFT POINT (IF APPLICABLE)

Gear shifting	:	Average gear for $v \geq 1$ km/h, x,xxxx
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## 2. TEST RESULTS

### 2.1. Type 1 test

Method of chassis dyno setting	:	Fixed run / iterative / alternative with its own warmup cycle
Dynamometer in 2WD/4WD operation	:	2WD/4WD
For 2WD operation, was the non-powered axle rotating	:	yes/no/not applicable
Dynamometer operation mode		yes/no
Coastdown mode	:	yes/no
Additional preconditioning	:	yes/no description
Deterioration factors	:	assigned / tested

#### 2.1.1. Vehicle high

Date(s) of test(s)	:		(day/month/year)
Place of the test(s)	:	Chassis dyno, location, country	
Height of the lower edge above ground of cooling fan (cm)	:		
Lateral position of fan centre (if modified as request by the manufacturer)	:	in the vehicle centre-line/...	

Distance from the front of the vehicle (cm)	:			
IWR: Inertial Work Rating (%)	:	x,x		
RMSSE: Root Mean Squared Speed Error (km/h)	:	x,xx		
Description of the accepted deviation of the driving cycle	:	PEV before break off criteria or Fully operated acceleration pedal		

#### 2.1.1.1.1. Pollutant emissions (if applicable)

##### 2.1.1.1.1.1. Pollutant emissions of vehicles with at least one combustion engine, of NOVC-HEVs and of OVC-HEVs in case of a charge-sustaining Type 1 test

For each driver selectable mode tested the points below shall be repeated (predominant mode or best case mode and worst case mode, if applicable)

#### Test 1

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	Particulate Matter	Particle Number
	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)
Measured values							
Regeneration factors (Ki)(2) Additive							
Regeneration factors (Ki)(2) Multiplicative							
Deterioration factors (DF) additive							

Deterioration factors (DF) multiplicative							
Final values							
Limit values							

(2) See Ki family report(s)	:	
Type 1/I performed for Ki determination	:	in accordance with Annex B4 to UN Regulation No. 154 or UN/ECE Regulation No 83 <sup>4</sup>
Regeneration family's identifier	:	

*Test 2* if applicable: for CO<sub>2</sub> reason (dCO<sub>2</sub><sup>1</sup>) / for pollutants reason (90 % of the limits) / for both

Record test results in accordance with the table of Test 1

*Test 3* if applicable: for CO<sub>2</sub> reason (dCO<sub>2</sub><sup>2</sup>)

Record test results in accordance with the table of Test 1

2.1.1.1.2. Pollutant emissions of OVC-HEVs in case of a charge-depleting Type 1 test

*Test 1*

Pollutant emission limits have to be fulfilled and the following point has to be repeated for each driven test cycle.

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	Particulate Matter	Particle Number
	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)
Measured single cycle values							
Limit single							

<sup>4</sup> Indicate as applicable

cycle values							
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*Test 2* (if applicable): for CO<sub>2</sub> reason ( $d_{CO_2}^1$ ) / for pollutants reason (90 % of the limits) / for both

Record test results in accordance with the table of Test 1

*Test 3* (if applicable): for CO<sub>2</sub> reason ( $d_{CO_2}^2$ )

Record test results in accordance with the table of Test 1

#### 2.1.1.1.3. UF-WEIGHTED POLLUTANT EMISSIONS OF OVC-HEVS

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	Particulate Matter	Particle Number
	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)
Calculated values							

#### 2.1.1.2. CO<sub>2</sub> emission (if applicable)

2.1.1.2.1. CO<sub>2</sub> emission of vehicles with at least one combustion engine, of NOVC-HEV and of OVC-HEV in the case of a charge-sustaining Type 1 test

For each driver selectable mode tested the points below have to be repeated (predominant mode or best case mode and worst case mode, if applicable)

##### *Test 1*

CO <sub>2</sub> emission	Low	Medium	High	Extra High	Combined
Measured value $M_{CO_2,p,1} / M_{CO_2,c,2}$					
Speed and distance corrected value $M_{CO_2,p,2b} / M_{CO_2,c,2b}$					
RCB correction coefficient: (5)					
$M_{CO_2,p,3} / M_{CO_2,c,3}$					
Regeneration factors (Ki) Additive					
Regeneration factors (Ki) Multiplicative					
$M_{CO_2,c,4}$	—				

$AF_{Ki} = M_{CO_2,c,3} / M_{CO_2,c,4}$	—				
$M_{CO_2,p,4} / M_{CO_2,c,4}$					—
ATCT correction (FCF) (4)					
<i>Temporary values</i> $M_{CO_2,p,5} / M_{CO_2,c,5}$					
<i>Declared value</i>	—	—	—	—	
$d_{CO_2}^1 * \text{declared value}$	—	—	—	—	

(4) FCF: family correction factor for correcting for representative regional temperature conditions (ATCT)		
See ATCT family report(s)	:	
ATCT family's identifier	:	
(5) correction as referred to in Annex B6 - Appendix 2 of UN Regulation No. 154 for pure ICE vehicles, and Annex B8 - Appendix 2 of UN Regulation No. 154 for HEVs ( $K_{CO_2}$ )		

*Test 2* (if applicable)

Record test results in accordance with the table of Test 1

*Test 3* (if applicable)

Record test results in accordance with the table of Test 1

*Conclusion*

CO <sub>2</sub> emission (g/km)	Low	Medium	High	Extra High	Combined
Averaging $M_{CO_2,p,6} / M_{CO_2,c,6}$					
Alignment $M_{CO_2,p,7} / M_{CO_2,c,7}$					
<i>Final values</i> $M_{CO_2,p,H} / M_{CO_2,c,H}$					

Information for Conformity of Production for OVC-HEV

	Combined
CO <sub>2</sub> emission (g/km) $M_{CO_2,CS,COP}$	
$AF_{CO_2,CS}$	

#### 2.1.1.2.2. CO<sub>2</sub> emission of OVC-HEVs in case of a charge-depleting Type 1 test

##### Test 1

CO <sub>2</sub> emission (g/km)	Combined
Calculated value $M_{CO_2,CD}$	
Declared value	
$d_{CO_2}$ <sup>1</sup>	

##### Test 2 (if applicable)

Record test results in accordance with the table of Test 1

##### Test 3 (if applicable)

Record test results in accordance with the table of Test 1

##### Conclusion

CO <sub>2</sub> emission (g/km)	Combined
Averaging $M_{CO_2,CD}$	
<i>Final value</i> $M_{CO_2,CD}$	

#### 2.1.1.2.3. UF-WEIGHTED CO<sub>2</sub> emission of OVC-HEVs

CO <sub>2</sub> emission (g/km)	Combined
Calculated value $M_{CO_2,weighted}$	

#### 2.1.1.3 FUEL CONSUMPTION (IF APPLICABLE)

##### 2.1.1.3.1. Fuel consumption of vehicles with only a combustion engine, of NOVC-HEVs and of OVC-HEVs in case of a charge-sustaining Type 1 test

For each driver selectable mode tested the points below has to be repeated (predominant mode or best case mode and worst case, mode if applicable)

Fuel consumption (l/100 km)	Low	Medium	High	Extra High	Combined
Final values $FC_{p,H} / FC_{c,H}$ <sup>5</sup>					

<sup>5</sup> Calculated from aligned CO<sub>2</sub> values

A- On-board Fuel and/or Energy Consumption Monitoring for vehicles referred to in Article 4a

a. Data accessibility

The parameters listed in point 3 of Annex XXII are accessible: yes/not applicable

b. Accuracy (if applicable)

Fuel_Consumed <sub>WLTP</sub> (litres) <sup>6</sup>	Vehicle HIGH - Test 1	x,xxx
	Vehicle HIGH - Test 2 (if applicable)	x,xxx
	Vehicle HIGH - Test 3 (if applicable)	x,xxx
	Vehicle LOW - Test 1 (if applicable)	x,xxx
	Vehicle LOW Test 2 (if applicable)	x,xxx
	Vehicle LOW - Test 3 (if applicable)	x,xxx
	Total	x,xxx
Fuel_Consumed <sub>OBFCM</sub> (litres) <sup>7</sup>	Vehicle HIGH - Test 1	x,xxx(*)
	Vehicle HIGH - Test 2 (if applicable)	x,xxx(*)
	Vehicle HIGH - Test 3 (if applicable)	x,xxx(*)
	Vehicle LOW - Test 1 (if applicable)	x,xxx(*)
	Vehicle LOW Test 2 (if applicable)	x,xxx(*)
	Vehicle LOW - Test 3 (if applicable)	x,xxx(*)
	Total	x,xxx(*)
Accuracy <sup>8</sup>		x,xxx

\* In the case that the OBFCM signal can only be read-out to 2 decimal places, the third decimal place shall be introduced as a zero

2.1.1.3.2. Fuel consumption of OVC-HEVs and OVC-FCHVs in case of a charge-depleting Type 1 test

Test 1:

Fuel consumption (l/100 km or kg/100 km)	Combined
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<sup>6</sup> in accordance with Annex XXII

<sup>7</sup> in accordance with Annex XXII

<sup>8</sup> in accordance with Annex XXII



Calculated value FC <sub>CD</sub>	
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*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

*Conclusion*

Fuel consumption (l/100km or kg/100 km)	Combined
Averaging FC <sub>CD</sub>	
<i>Final value</i> FC <sub>CD</sub>	

2.1.1.3.3. UF-Weighted Fuel consumption of OVC-HEVs and OVC-FCHVs

Fuel consumption (l/100 km or kg/100 km)	Combined
Calculated value FC <sub>weighted</sub>	

2.1.1.3.4. Fuel consumption of vehicles of NOVC-FCHVs and OVC-FCHVs in case of a charge-sustaining Type 1 test

For each driver selectable mode tested the points below has to be repeated (predominant mode or best case mode and worst case, mode if applicable)

Fuel consumption (kg/100 km)	Combined
Measured values	
RCB correction coefficient	
Final values FC <sub>c</sub>	

2.1.1.4. RANGES (IF APPLICABLE)

2.1.1.4.1. Ranges for OVC-HEVs and OVC-FCHVs (if applicable)

2.1.1.4.1.1. All electric range

*Test 1*

AER (km)	City	Combined
----------	------	----------

Measured/Calculated values AER		
<i>Declared value</i>	—	

*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

*Conclusion*

AER (km)	City	Combined
Averaging AER (if applicable)		
<i>Final values AER</i>		

#### 2.1.1.4.1.2. Equivalent All electric Range

EAER (km)	Low	Medium	High	Extra High	City	Combined
<i>Final values EAER</i>						

#### 2.1.1.4.1.3. Actual Charge-Depleting Range

R <sub>CDA</sub> (km)	Combined
<i>Final value R<sub>CDA</sub></i>	

#### 2.1.1.4.1.4. Charge-Depleting Cycle Range

*Test 1*

R <sub>CDC</sub> (km)	Combined
<i>Final value R<sub>CDC</sub></i>	
Index Number of the transition cycle	
REEC of confirmation-cycle (%)	

*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

2.1.1.4.2. Ranges for PEVs - Pure electric range (if applicable)

*Test 1*

PER (km)	Low	Medium	High	Extra High	City	Combined
Calculated values PER						
<i>Declared value</i>	—	—	—	—	—	

*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

*Conclusion*

PER (km)	City	Combined
Averaging PER		
Final values PER		

2.1.1.5. ELECTRIC CONSUMPTION (IF APPLICABLE)

2.1.1.5.1. Electric consumption of OVC-HEVs and OVC-FCHVs (if applicable)

2.1.1.5.1.1. Recharged electric energy ( $E_{AC}$ )

$E_{AC}(Wh)$	
--------------	--

2.1.1.5.1.2. Electric consumption (EC)

EC (Wh/km)	Low	Medium	High	Extra High	City	Combined
Final values EC						

2.1.1.5.1.3. UF-weighted charge-depleting electric consumption

*Test 1*

$EC_{AC,CD}$ (Wh/km)	Combined
Calculated value $EC_{AC,CD}$	

*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

*Conclusion (if applicable)*

EC <sub>AC,CD</sub> (Wh/km)	Combined
Averaging EC <sub>AC,CD</sub>	
Final value	

#### 2.1.1.5.1.4. UF-weighted electric consumption

*Test 1*

EC <sub>AC,weighted</sub> (Wh)	Combined
Calculated value EC <sub>AC,weighted</sub>	

*Test 2 (if applicable)*

Record test results in accordance with the table of Test 1

*Test 3 (if applicable)*

Record test results in accordance with the table of Test 1

*Conclusion (if applicable)*

EC <sub>AC,weighted</sub> (Wh/km)	Combined
Averaging EC <sub>AC,weighted</sub>	
<i>Final value</i>	

#### 2.1.1.5.1.5. Information for COP

	Combined
Electric consumption (Wh/km) EC <sub>DC,CD,COP</sub>	
AF <sub>EC,AC,CD</sub>	

#### 2.1.1.5.2. Electric consumption of PEVs (if applicable)

##### Test 1

EC (Wh/km)	City	Combined
Calculated values EC		
<i>Declared value</i>	—	

##### Test 2 (if applicable)

Record test results in accordance with the table of Test 1

##### Test 3 (if applicable)

Record test results in accordance with the table of Test 1

EC (Wh/km)	Low	Medium	High	Extra High	City	Combined
Averaging EC						
<i>Final values EC</i>						

##### Information for COP

	Combined
Electric Consumption (Wh/km) $EC_{DC,COP}$	
$AF_{EC}$	

#### 2.1.2. VEHICLE LOW (IF APPLICABLE)

Repeat § 2.1.1.

#### 2.1.3. VEHICLE M (IF APPLICABLE)

Repeat § 2.1.1.

#### 2.1.4. FINAL CRITERIA EMISSIONS VALUES (IF APPLICABLE)

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	PM	PN
	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)

Highest values <sup>9</sup>							
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## 2.2. Type 2 (a) test

Included the emissions data required for roadworthiness testing

Test	CO ( % vol)	Lambda <sup>10</sup>	Engine speed (min <sup>-1</sup> )	Oil temperature (°C)
Idle		—		
High idle				

## 2.3. Type 3 (a) test

Emission of crankcase gases into the atmosphere: none

## 2.4. Type 4 (a) test

Family's identifier	:	
See report(s)	:	

## 2.5. Type 5 test

Family's identifier	:	
See durability family report(s)	:	
Type 1/I cycle for criteria emissions testing	:	According to UN Regulation 154 Annex B4 or UN/ECE Regulation No 83 <sup>11</sup>

## 2.6. RDE test (type 1a)

RDE family number	:	MSxxxx
See family report(s)	:	

## 2.7. Type 6 test (a)

Family's identifier		
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<sup>9</sup> Indicate for each pollutant the highest among the average test results of VH, VL (if applicable) and VM (if applicable)

<sup>10</sup> Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

<sup>11</sup> Indicate as applicable

Date of tests	:	(day/month/year)
Place of tests	:	
Method of setting of the chassis dyno	:	coast down (road load reference)
Inertia mass (kg)	:	
If deviation from the vehicle of Type 1 test	:	
Tyres	:	
Make	:	
Type	:	
Dimensions front/rear	:	
Dynamic circumference (m)	:	
Tyre pressure (kPa)	:	

Pollutants		CO (g/km)	HC (g/km)
Test	1		
	2		
	3		
Average			
Limit			

2.8. *On board diagnostic system*

Family's identifier	:	
See family report(s)	:	

2.9. *Smoke opacity test (b)*

2.9.1. *STEADY SPEEDS TEST*

See family report(s)	:	
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### 2.9.2. FREE ACCELERATION TEST

Measured absorption value ( $\text{m}^{-1}$ )	:	
Corrected absorption value ( $\text{m}^{-1}$ )	:	

### 2.10. Engine power

See report(s) or approval number	:	
----------------------------------	---	--

### 2.11. Temperature information related to vehicle high (VH)

Worst case approach with regards to vehicle insulation	:	yes/no <sup>(12)</sup>
Worst case approach vehicle cool down	:	yes/no <sup>(10)</sup>
ATCT family composed of a single Interpolation family	:	yes/no <sup>(10)</sup>
Engine coolant temperature at the end of soaking time (°C)	:	
Average soak area temperature over the 3 last hours (°C)	:	
Difference between engine coolant end temperature and average soak area temperature of the last 3 hours $\Delta T_{\text{ATCT}}$ (°C)	:	
The minimum soaking time $t_{\text{soak\_ATCT}}$ (s)	:	
Location of temperature sensor	:	
Measured engine temperature	:	oil/coolant

### 2.12. Exhaust after-treatment system using reagent

Family's identifier	:	
See family report(s)	:	

## PART II

The following information, if applicable, is the minimum data required for the ATCT test.

*Report number*

APPLICANT				
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<sup>12</sup> if 'yes' then the six last lines are not applicable



<i>Manufacturer</i>				
<i>SUBJECT</i>	...			
<i>Roadload family identifier(s)</i>	:			
<i>Interpolation family identifier(s)</i>	:			
<i>ATCT identifier(s)</i>	:			
<i>Object submitted to tests</i>				
	Make	:		
	IP identifier	:		
<i>CONCLUSION</i>	The object submitted to tests complies with the requirements mentioned in the subject.			

PLACE,	DD/MM/YYYY
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### ***General notes:***

If there are several options (references), the one tested should be described in the test report

If there are not, a single reference to the information document at the start of the test report may be sufficient.

Every Technical Service is free to include some additional information

Characters are included in the sections of the test report relating to specific vehicle types, as follows:

“(a)” Specific to positive ignition engine vehicles.

“(b)” Specific to compression ignition engine vehicles.

## ***1. DESCRIPTION OF TESTED VEHICLE***

### ***1.1. GENERAL***

Vehicle numbers	:	Prototype number and VIN
Category	:	
Bodywork	:	
Drive wheels	:	

### 1.1.1. Powertrain Architecture

Powertrain architecture	:	pure ICE, hybrid, electric or fuel cell
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### 1.1.2. INTERNAL COMBUSTION ENGINE (if applicable)

For more than one ICE, please repeat the point

Make	:						
Type	:						
Working principle	:	two/four stroke					
Cylinders number and arrangement	:	...					
Engine capacity (cm <sup>3</sup> )	:						
Engine idling speed (min <sup>-1</sup> )	:			±			
High engine idling speed (min <sup>-1</sup> ) (a)	:			±			
Rated engine power	:		kW		at		rpm
Maximum net torque	:		Nm		at		rpm
Engine lubricant	:	make and type					
Cooling system	:	Type: air/water/oil					
Insulation	:	material, amount, location, nominal volume and nominal weight <sup>*</sup>					

\* a tolerance of +/- 10 per cent is permitted for volume and weight

### 1.1.3. TEST FUEL for type 1 test (if applicable)

For more than one test fuel, please repeat the point

Make	:	
Type	:	Petrol E10 - Diesel B7 – LPG – NG - ...
Density at 15 °C	:	
Sulphur content	:	Only for Diesel and Petrol
Annex IX	:	
Batch number	:	

Willans factors (for ICE) for CO <sub>2</sub> emission (gCO <sub>2</sub> /MJ)	:	
Direct injection	:	yes/no or description
Vehicle fuel type	:	Monofuel / bifuel / flex fuel
Control unit		
Part reference	:	same as information document
Software tested	:	read via scantool, for example
Air flowmeter	:	
Throttle body	:	
Pressure sensor	:	
Injection pump	:	
Injector(s)	:	

#### 1.1.4. FUEL FEED SYSTEM (if applicable)

For more than one fuel feed system, please repeat the point

#### 1.1.5. INTAKE SYSTEM (if applicable)

For more than one intake system, please repeat the point

Pressure charger	:	Yes/no make & type (1)
Intercooler	:	yes/no type (air/air – air/water) (1)
Air filter (element) (1)	:	make & type
Intake silencer (1)	:	make & type

#### 1.1.6. EXHAUST SYSTEM AND ANTI-EVAPORATIVE SYSTEM (if applicable)

For more than one, please repeat the point

First catalytic converter	:	make & reference (1) principle: three way / oxidising / NO <sub>x</sub> trap / Nox storage system / Selective Catalyst Reduction...
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Second catalytic converter	:	make & reference (1) principle: three way / oxidising / NO <sub>x</sub> trap / Nox storage system / Selective Catalyst Reduction...
Particulate trap	:	with/without/not applicable catalysed: yes/no make & reference (1)
Reference and position of oxygen sensor(s)	:	before catalyst / after catalyst
Air injection	:	with/without/not applicable
EGR	:	with/without/not applicable cooled/non-cooled HP/LP
Evaporative emission control system	:	with/without/not applicable
Reference and position of NO <sub>x</sub> sensor(s)	:	Before/ after
General description (1)	:	

#### 1.1.7. HEAT STORAGE DEVICE (if applicable)

For more than one Heat Storage System, please repeat the point

Heat storage device	:	yes/no
Heat capacity (enthalpy stored J)	:	
Time for heat release (s)	:	

#### 1.1.8. TRANSMISSION (if applicable)

For more than one Transmission, please repeat the point

Gearbox	:	manual / automatic / continuous variation
Gear shifting procedure		
Predominant mode	:	yes/no normal / drive / eco/...

Best case mode for CO <sub>2</sub> emissions and fuel consumption (if applicable)	:	
Worst case mode for CO <sub>2</sub> emissions and fuel consumption (if applicable)	:	
Control unit	:	
Gearbox lubricant	:	make and type
Tyres		
Make	:	
Type	:	
Dimensions front/rear	:	
Dynamic circumference (m)	:	
Tyre pressure (kPa)	:	

Transmission ratios (R.T.), primary ratios (R.P.) and (vehicle speed (km/h)) / (engine speed (1000 (min<sup>-1</sup>)) (V<sub>1000</sub>)) for each of the gearbox ratios (R.B.).

R.B.	R.P.	R.T.	V <sub>1000</sub>
1st	1/1		
2nd	1/1		
3rd	1/1		
4th	1/1		
5th	1/1		
...			

#### 1.1.9. ELECTRIC MACHINE (if applicable)

For more than one electric machine, please repeat the point

Make	:	
Type	:	
Peak Power (kW)	:	

#### 1.1.10. TRACTION REESS (if applicable)

For more than one traction REESS, please repeat the point

Make	:	
Type	:	
Capacity (Ah)	:	
Nominal Voltage (V)	:	

#### 1.1.11. -

#### 1.1.12. POWER ELECTRONICS (if applicable)

Can be more than one PE (propulsion converter, low voltage system or charger)

Make	:	
Type	:	
Power (kW)	:	

### 1.2. VEHICLE DESCRIPTION

#### 1.2.1. MASS

Test mass of VH (kg)	:	
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#### 1.2.2. ROAD LOAD PARAMETERS

$f_0$ (N)	:	
$f_1$ (N/(km/h))	:	
$f_2$ (N/(km/h) <sup>2</sup> )	:	
$f_{2\_TReg}$ (N/(km/h) <sup>2</sup> )	:	
Cycle energy demand (J)	:	
Road load test report reference	:	
Road load family's identifier	:	

### 1.2.3. CYCLE SELECTION PARAMETERS

Cycle (without downscaling)	:	Class 1 / 2 / 3a / 3b
Ratio of rated power to mass in running order – 75kg (PMR)(W/kg)	:	(if applicable)
Capped speed process used during measurement	:	yes/no
Maximum speed of the vehicle (km/h)	:	
Downscaling (if applicable)	:	yes/no
Downscaling factor fdsc	:	
Cycle distance (m)	:	
Constant speed (in the case of the shortened test procedure)	:	if applicable

### 1.2.4. GEAR SHIFT POINT (IF APPLICABLE)

Version of Gear Shift calculation		(indicate the applicable amendment to Regulation (EU) 2017/1151)
Gear shifting	:	Average gear for $v \geq 1$ km/h, rounded to four places of decimal
$n_{\min}$ drive		
1st gear	:	...min <sup>-1</sup>
1st gear to 2nd	:	...min <sup>-1</sup>
2nd gear to standstill	:	...min <sup>-1</sup>
2nd gear	:	...min <sup>-1</sup>
3rd gear and beyond	:	...min <sup>-1</sup>
Gear 1 excluded	:	yes/no
$n_{95\_high}$ for each gear	:	...min <sup>-1</sup>
$n_{\min\_drive\_set}$ for acceleration/constant speed phases ( $n_{\min\_drive\_up}$ )	:	...min <sup>-1</sup>
$n_{\min\_drive\_set}$ for deceleration phases ( $n_{\min\_drive\_down}$ )	:	...min <sup>-1</sup>
$t_{start\_phase}$	:	...s

n_min_drive_start	:	...min <sup>-1</sup>
n_min_drive_up_start	:	...min <sup>-1</sup>
use of ASM	:	yes/no
ASM values	:	

## 2. TEST RESULTS

Method of chassis dyno setting	:	Fixed run / iterative / alternative with its own warmup cycle
Dynamometer in 2WD/4WD operation	:	2WD/4WD
For 2WD operation, was the non-powered axle rotating	:	yes/no/not applicable
Dynamometer operation mode		yes/no
Coastdown mode	:	yes/no

### 2.1 TEST AT 14 °C

Date(s) of test(s)	:		(day/month/year)
Place of the test(s)	:		
Height of the lower edge above ground of cooling fan (cm)	:		
Lateral position of fan centre (if modified as request by the manufacturer)	:	in the vehicle centre-line/...	
Distance from the front of the vehicle (cm)	:		
IWR: Inertial Work Rating (%)	:	x,x	
RMSSE: Root Mean Squared Speed Error (km/h)	:	x,xx	
Description of the accepted deviation of the driving cycle	:	Fully operated acceleration pedal	

#### 2.1.1. Pollutant emissions of vehicle with at least one combustion engine, of NOVC-HEVs and of OVC-HEVs in case of a charge-sustaining test

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	Particulate Matter	Particle Number
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	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)
Measured values							
Limit values							

2.1.2. CO<sub>2</sub> emission of vehicle with at least one combustion engine, of NOVC-HEV and of OVC-HEV in case of a charge-sustaining test

CO <sub>2</sub> emission (g/km)	Low	Medium	High	Extra High	Combined
Measured value M <sub>CO2,p,1</sub> / M <sub>CO2,c,2</sub>					
Measured Speed and distance corrected value M <sub>CO2,p,2b</sub> / M <sub>CO2,c,2b</sub>					
RCB correction coefficient <sup>13</sup>					
M <sub>CO2,p,3</sub> / M <sub>CO2,c,3</sub>					

2.2 TEST AT 23 °C

Provide information or refer to type 1 test report

Date of tests	:	(day/month/year)		
Place of the test	:			
Height of the lower edge above ground of cooling fan (cm)	:			
Lateral position of fan centre (if modified as request by the manufacturer)	:	in the vehicle centre-line/...		
Distance from the front of the vehicle (cm)	:			
IWR: Inertial Work Rating (%)	:	x,x		
RMSSE: Root Mean Squared Speed Error (km/h)	:	x,xx		
Description of the accepted deviation of the driving cycle	:	Fully operated acceleration pedal		

<sup>13</sup> correction as referred to in Annex B6 - Appendix 2 of UN Regulation No. 154 for ICE vehicles, K<sub>CO2</sub> for HEVs

2.2.1. Pollutant emissions of vehicle with at least one combustion engine, of NOVC-HEVs and of OVC-HEVs in case of a charge-sustaining test

Pollutants	CO	THC (a)	NMHC (a)	NO <sub>x</sub>	THC + NO <sub>x</sub> (b)	Particulate Matter	Particle Number
	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(mg/km)	(#.10 <sup>11</sup> /km)
Final values							
Limit values							

2.2.2. CO<sub>2</sub> emission of vehicle with at least one combustion engine, of NOVC-HEV and of OVC-HEV in case of a charge-sustaining test

CO <sub>2</sub> emission (g/km)	Low	Medium	High	Extra High	Combined
Measured value $M_{CO_2,p,1} / M_{CO_2,c,2}$					
Measured Speed and distance corrected value $M_{CO_2,p,2b} / M_{CO_2,c,2b}$					
RCB correction coefficient <sup>14</sup>					
$M_{CO_2,p,3} / M_{CO_2,c,3}$					

2.3 CONCLUSION

CO <sub>2</sub> emission (g/km)	Combined
ATCT (14 °C) $M_{CO_2,Treg}$	
Type 1 (23 °C) $M_{CO_2,23^\circ}$	
<i>Family correction factor (FCF)</i>	

2.4. TEMPERATURE INFORMATION OF THE REFERENCE VEHICLE AFTER 23 °C TEST

Worst case approach with regards to vehicle insulation	:	yes/no <sup>(15)</sup>
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<sup>14</sup> correction as referred to in Appendix 2 of Annex B6 to UN Regulation No. 154 for ICE vehicles, and Appendix 2 of Annex B6 to UN Regulation No. 154 for HEVs ( $K_{CO_2}$ )

Worst case approach vehicle cool down	:	yes/no <sup>(13)</sup>
ATCT family composed of a single Interpolation family	:	yes/no <sup>(13)</sup>
Engine coolant temperature at the end of soaking time (°C)	:	
Average soak area temperature over the 3 last hours (°C)	:	
Difference between engine coolant end temperature and average soak area temperature of the last 3 hours $\Delta_{T\_ATCT}$ (°C)	:	
The minimum soaking time $t_{soak\_ATCT}$ (s)	:	
Location of temperature sensor	:	
Measured engine temperature	:	oil/coolant

### **Appendix 8b**

#### ***ROAD LOAD TEST REPORT***

The following information, if applicable, is the minimum data required for the road load determination test.

#### ***Report number***

<i>APPLICANT</i>			
<i>Manufacturer</i>			
<i>SUBJECT</i>	Determination of a vehicle road load /...		
<i>Roadload family identifier(s)</i>	:		
<i>Object submitted to tests</i>			
	Make	:	
	Type	:	
<i>CONCLUSION</i>	The object submitted to tests complies with the requirements mentioned in the subject.		

PLACE,	DD/MM/YYYY
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<sup>15</sup> if 'yes' then the six last lines are not applicable

## 1. CONCERNED VEHICLE(S)

Make(s) concerned	:	
Type(s) concerned	:	
Commercial description	:	
Maximal speed (km/h)	:	
Powered axle(s)	:	

## 2. DESCRIPTION OF TESTED VEHICLES

If no interpolation: the worst-case vehicle (regarding energy demand) shall be described

### 2.1. Wind tunnel method

Combination with	:	Flat belt dynamometer / chassis dynamometer
------------------	---	---

#### 2.1.1. General

	Wind tunnel		Dynamometer	
	H <sub>R</sub>	L <sub>R</sub>	H <sub>R</sub>	L <sub>R</sub>
Make				
Type				
Version				
Cycle energy demand over a complete WLTC Class 3 cycle (kJ)				
Deviation from production series	—	—		
Mileage (km)	—	—		

Or (in case of roadload matrix family):

Make	:	
Type	:	
Version	:	
Cycle energy demand over a complete WLTC (kJ)	:	

Deviation from production series	:	
Mileage (km)	:	

### 2.1.2 Masses

	Dynamometer	
	H <sub>R</sub>	L <sub>R</sub>
Test mass (kg)		
Average mass m <sub>av</sub> (kg)		
Value of m <sub>r</sub> (kg per axle)		
Category M vehicle: proportion of the vehicle mass in running order on the front axle (%)		
Category N vehicle: weight distribution (kg or %)		

Or (in case of roadload matrix family):

Test mass (kg)	:	
Average mass m <sub>av</sub> (kg)	:	(average before and after the test)
Technically permissible maximum laden mass	:	
Estimated arithmetic average of the mass of optional equipment	:	
Category M vehicle: proportion of the vehicle mass in running order on the front axle (%)	:	
Category N vehicle: weight distribution (kg or %)	:	

### 2.1.3 Tyres

Wind tunnel		Dynamometer	
H <sub>R</sub>	L <sub>R</sub>	H <sub>R</sub>	L <sub>R</sub>

Size designation				
Make				
Type				
Rolling resistance				
Front (kg/t)	-	-		
Rear (kg/t)	-	-		
Tyre pressure				
Front (kPa)	-	-		
Rear (kPa)	-	-		

Or (in case of roadload matrix family):

Size designation		
Make	:	
Type	:	
Rolling resistance		
Front (kg/t)	:	
Rear (kg/t)	:	
Tyre pressure		
Front (kPa)	:	
Rear (kPa)	:	

#### 2.1.4. Bodywork

	Wind tunnel	
	$H_R$	$L_R$
Type	AA/AB/AC/AD/AE/AF BA/BB/BC/BD	
Version		
Aerodynamic devices		
Movable aerodynamic body parts	y/n and list if applicable	
Installed aerodynamic options list		
Delta $(C_D \times A_f)_{LH}$ compared to $H_R$ (m <sup>2</sup> )	—	

Or (in case of roadload matrix family):

Body shape description	:	Square box (if no representative body shape for a complete vehicle can be determined)
Frontal area $A_{fr}$ (m <sup>2</sup> )	:	

## 2.2. ON ROAD

### 2.2.1. General

	H <sub>R</sub>	L <sub>R</sub>
Make		
Type		
Version		
Cycle energy demand over a complete WLTC Class 3 cycle (kJ)		
Deviation from production series		
Mileage		

Or (in case of roadload matrix family):

Make	:	
Type	:	
Version	:	
Cycle energy demand over a complete WLTC (kJ)	:	
Deviation from production series	:	
Mileage (km)	:	

### 2.2.2. Masses

	H <sub>R</sub>	L <sub>R</sub>
Test mass (kg)		

Average mass $m_{av}$ (kg)		
Value of $m_r$ (kg per axle)		
Category M vehicle: proportion of the vehicle mass in running order on the front axle (%)		
Category N vehicle: weight distribution (kg or %)		

Or (in case of roadload matrix family):

Test mass (kg)	:	
Average mass $m_{av}$ (kg)	:	(average before and after the test)
Technically permissible maximum laden mass	:	
Estimated arithmetic average of the mass of optional equipment	:	
Category M vehicle: proportion of the vehicle mass in running order on the front axle (%)		
Category N vehicle: weight distribution (kg or %)		

### 2.2.3. Tyres

	$H_R$	$L_R$
Size designation		
Make		
Type		
Rolling resistance		
Front (kg/t)		
Rear (kg/t)		
Tyre pressure		



Front (kPa)		
Rear (kPa)		

Or (in case of roadload matrix family):

Size designation	:	
Make	:	
Type	:	
Rolling resistance		
Front (kg/t)	:	
Rear (kg/t)	:	
Tyre pressure		
Front (kPa)	:	
Rear (kPa)	:	

#### 2.2.4. Bodywork

	$H_R$	$L_R$
Type	AA/AB/AC/AD/AE/AF BA/BB/BC/BD	
Version		
Aerodynamic devices		
Movable aerodynamic body parts	y/n and list if applicable	
Installed aerodynamic options list		
Delta $(C_D \times A_f)_{LH}$ compared to $H_R$ (m <sup>2</sup> )	—	

Or (in case of roadload matrix family):

Body shape description	:	Square box (if no representative body shape for a complete vehicle can be determined)
Frontal area $A_{fr}$ (m <sup>2</sup> )	:	

## 2.3. POWERTRAIN

### 2.3.1. Vehicle High

Engine code	:			
Transmission type	:	manual, automatic, CVT		
Transmission model (manufacturer's codes)	:	(torque rating and no of clutches → to be included in info doc)		
Covered transmission models (manufacturer's codes)	:			
Engine rotational speed divided by vehicle speed	:	Gear	Gear ratio	N/V ratio
		1st	1/..	
		2nd	1/..	
		3rd	1/..	
		4th	1/..	
		5th	1/..	
		6th	1/..	
		..		
		..		
Electric machine(s) coupled in position N	:	n.a. (no electric machine or no coastdown mode)		
Type and number of electric machines	:	construction type: asynchronous/ synchronous...		
Type of coolant	:	air, liquid, ...		

### 2.3.2. Vehicle Low

Repeat §2.3.1. with VL data

## 2.4. TEST RESULTS

### 2.4.1. Vehicle High

Dates of tests	:	dd/mm/yyyy (wind tunnel) dd/mm/yyyy (dynamometer) or
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		dd/mm/yyyy (on road)
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### ON ROAD

Method of the test	:	coastdown or torque meter method
Facility (name / location / track's reference)	:	
Coastdown mode	:	y/n
Wheel alignment	:	Toe and camber values
Ground clearance <sup>16</sup>	:	
Vehicle height <sup>17</sup>	:	
Drivetrain lubricants	:	
Wheel bearing lubricants	:	
Brake adjustment to avoid unrepresentative parasitic drag	:	
Maximum reference speed (km/h)	:	
Anemometry	:	stationary or on board: influence of anemometry ( $C_D \times A$ ) and if it was corrected.
Number of split(s)	:	
Wind	:	average, peaks and direction in conjunction with direction of the test track
Air pressure	:	
Temperature (mean value)	:	
Wind correction	:	y/n
Tyre pressure adjustment	:	y/n
Raw results	:	Torque method: $c_0 =$

<sup>16</sup> As defined in point 4.2. of Appendix 1 of Annex I to Regulation (EU) 2018/858.

<sup>17</sup> The dimension defined in point 6.3 of Standard ISO 612:1978.

	$c_1 =$ $c_2 =$ Coastdown method: $f_0$ $f_1$ $f_2$
Final results	Torque method: $c_0 =$ $c_1 =$ $c_2 =$ and $f_0 =$ $f_1 =$ $f_2 =$ Coastdown method: $f_0 =$ $f_1 =$ $f_2 =$

Or

#### *WIND TUNNEL METHOD*

Facility (name/location/dynamometer's reference)	:		
Qualification of the facilities	:	Report reference and date	
Dynamometer			
Type of dynamometer	:	flat belt or chassis dynamometer	
Method	:	stabilised speeds or deceleration method	
Warm up	:	warm-up by dyno or by driving the vehicle	
Correction of the roller curve	:	(for chassis dynamometer, if applicable)	
Method of chassis dynamometer setting	:	Fixed run / iterative / alternative with its own warmup cycle	

Measured aerodynamic drag coefficient multiplied by the frontal area	:	Velocity (km/h)	$C_D \times A$ (m <sup>2</sup> )
		...	...
		...	...
Result	:	$f_0 =$ $f_1 =$ $f_2 =$	

Or

#### *ROAD LOAD MATRIX ON ROAD*

Method of the test	:	coastdown or torque meter method
Facility (name/location/track's reference)	:	
Coastdown mode	:	y/n
Wheel alignment	:	Toe and camber values
Ground clearance <sup>18</sup>	:	
Vehicle height <sup>19</sup>	:	
Drivetrain lubricants	:	
Wheel bearing lubricants	:	
Brake adjustment to avoid unrepresentative parasitic drag	:	
Maximum reference speed (km/h)	:	
Anemometry	:	stationary or on board: influence of anemometry ( $C_D \times A$ ) and if it was corrected.
Number of split(s)	:	
Wind	:	average, peaks and direction in conjunction with direction of the test track

<sup>18</sup> As defined in point 4.2. of Appendix 1 of Annex I to Regulation (EU) 2018/858.

<sup>19</sup> The dimension defined in point 6.3 of Standard ISO 612:1978.

Air pressure	:	
Temperature (mean value)	:	
Wind correction	:	y/n
Tyre pressure adjustment	:	y/n
Raw results	:	<p>Torque method:</p> <p><math>c_{0r} =</math></p> <p><math>c_{1r} =</math></p> <p><math>c_{2r} =</math></p> <p>Coastdown method:</p> <p><math>f_{0r} =</math></p> <p><math>f_{1r} =</math></p> <p><math>f_{2r} =</math></p>
Final results	:	<p>Torque method:</p> <p><math>c_{0r} =</math></p> <p><math>c_{1r} =</math></p> <p><math>c_{2r} =</math></p> <p>and</p> <p><math>f_{0r}</math> (calculated for vehicle <math>H_M</math>) =</p> <p><math>f_{2r}</math> (calculated for vehicle <math>H_M</math>) =</p> <p><math>f_{0r}</math> (calculated for vehicle <math>L_M</math>) =</p> <p><math>f_{2r}</math> (calculated for vehicle <math>L_M</math>) =</p> <p>Coastdown method:</p> <p><math>f_{0r}</math> (calculated for vehicle <math>H_M</math>) =</p> <p><math>f_{2r}</math> (calculated for vehicle <math>H_M</math>) =</p> <p><math>f_{0r}</math> (calculated for vehicle <math>L_M</math>) =</p> <p><math>f_{2r}</math> (calculated for vehicle <math>L_M</math>) =</p>

Or

*ROAD LOAD MATRIX WIND TUNNEL METHOD*

Facility (name/location/dynamometer 's reference)	:		
Qualification of the facilities	:	Report reference and date	

Dynamometer			
Type of dynamometer	:	flat belt or chassis dynamometer	
Method	:	stabilised speeds or deceleration method	
Warm up	:	warm-up by dyno or by driving the vehicle	
Correction of the roller curve	:	(for chassis dynamometer, if applicable)	
Method of chassis dynamometer setting	:	Fixed run / iterative / alternative with its own warmup cycle	
Measured aerodynamic drag coefficient multiplied by the frontal area	:	Velocity (km/h)	$C_D \times A \text{ (m}^2\text{)}$
		...	...
		...	...
Result	:	$f_{0r} =$ $f_{1r} =$ $f_{2r} =$ $f_{0r} \text{ (calculated for vehicle } H_M) =$ $f_{2r} \text{ (calculated for vehicle } H_M) =$ $f_{0r} \text{ (calculated for vehicle } L_M) =$ $f_{2r} \text{ (calculated for vehicle } L_M) =$	

#### 2.4.2. Vehicle Low

Repeat §2.4.1. with VL data’;

‘

### Appendix 8c

#### **TEMPLATE FOR TEST SHEET**

The test sheet shall include the test data that are recorded, but not included in any test report.

The test sheet(s) shall be retained by the technical service or the manufacturer for at least 10 years.

The following information, if applicable, is the minimum data required for test sheets.

<i>Information from Annex B4 to UN Regulation No. 154</i>		
The coefficients, $c_0$ , $c_1$ and $c_2$	:	$c_0 =$ $c_1 =$ $c_2 =$

The coastdown times measured on the chassis dynamometer	:	Reference speed (km/h)	Coastdown time (s)
		130	
		120	
		110	
		100	
		90	
		80	
		70	
		60	
		50	
		40	
		30	
		20	
Additional weight may be placed on or in the vehicle to eliminate tyre slippage	:	weight (kg) on/in the vehicle	
The coastdown times after performing the vehicle coast down procedure	:	Reference speed (km/h)	Coastdown time (s)
		130	
		120	
		110	
		100	
		90	
		80	
		70	
		60	
		50	
		40	



		30	
		20	
<i>Information from Annex B5 to UN Regulation No. 154</i>			
<b><i>NO<sub>x</sub> converter efficiency</i></b> Indicated concentrations (a); (b), (c), (d), and the concentration when the NO <sub>x</sub> analyser is in the NO mode so that the calibration gas does not pass through the converter	:	(a) = (b) = (c) = (d) = Concentration in NO mode =	
<i>Information from Annex B6 to UN Regulation No. 154</i>			
The distance actually driven by the vehicle	:		
For manual shift transmission vehicle, MT vehicle that cannot follow the cycle trace: The deviations from the driving cycle	:		
<i>Drive trace indices:</i>			
The following indices shall be calculated in accordance with the standard SAE J2951(Revised Jan-2014):	: :		
IWR: Inertial Work Rating	:		
RMSSE: Root Mean Squared Speed Error	: : :		
<i>Particulate sample filter weighing</i>			
Filter before the test	:		
Filter after the test	:		
Reference filter	:		
Content of each of the compounds measured after stabilization of the measuring device	:		
<i>Regeneration factor determination</i>			
The number of cycles D between two WLTCs where regeneration events occur	:		
The number of cycles over which emission	:		

measurements are made n		
The mass emissions measurement $M'_{sij}$ for each compound i over each cycle j	:	
<b>Regeneration factor determination</b> The number of applicable test cycles d measured for complete regeneration	:	
<i>Regeneration factor determination</i>		
Msi	:	
Mpi	:	
Ki	:	
<i>Information from Annex B6a to UN Regulation No. 154</i>		
<b>ATCT</b> The air temperature and humidity of the test cell measured at the vehicle cooling fan outlet at a minimum frequency of 0,1 Hz.	:	Temperature set point = $T_{reg}$ Actual temperature value $\pm 3\text{ }^{\circ}\text{C}$ at the start of the test $\pm 5\text{ }^{\circ}\text{C}$ during the test
The temperature of the soak area measured continuously at a minimum frequency of 0,033 Hz.	:	Temperature set point = $T_{reg}$ Actual temperature value $\pm 3\text{ }^{\circ}\text{C}$ at the start of the test $\pm 5\text{ }^{\circ}\text{C}$ during the test
The time of transfer from the preconditioning to the soak area	:	$\leq 10$ minutes
The time between the end of the Type 1 test and the cool down procedure	:	$\leq 10$ minutes
The measured soaking time, and shall be recorded in all relevant test sheets.	:	time between the measurement of the end temperature and the end of the Type 1 test at $23\text{ }^{\circ}\text{C}$
<i>Information from Annex C3 to UN Regulation No. 154</i>		
<b>Diurnal testing</b> Ambient temperature during the two diurnal cycles (recorded at least every minute)	:	
<b>Carbon canister puff loss loading</b> Ambient temperature during the first 11-hour profile (recorded at least every 10 minutes)	:	

’;

(9) Appendix 8d is amended as follows:

(1) the title ‘Evaporative emission test report’ is replaced by ‘Evaporative emissions test report’;

(2) point 2.1 is replaced by the following:

‘Carbon canister bench ageing

Date of tests	:	(day/month/year)
Place of the test	:	
Carbon canister ageing test report	:	
Loading rate	:	
Fuel specification		
Make	:	
Type	:	name of reference fuel ...
Density at 15 °C (kg/m <sup>3</sup> )	:	
Ethanol content (%)	:	
Batch number	:	

‘

(3) point 2.3.5, the last row is deleted;

(4) the following point 2.3.6. is added:

‘2.3.6. Demonstrated procedures for alternative conformity of production testing where applicable:

Test for leakage	:	Alternative pressures and/or time or alternative test procedure
Test for venting	:	Alternative pressure and/or time or alternative test procedure
Purge test	:	Alternative flow rate or test procedure

Sealed tank	:	Alternative test procedure
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