PROTOCOL FOR REAL-WORLD FUEL CONSUMPTION MEASUREMENTS

1 Introduction

The aim of this protocol is to set out the equipment and method to be employed whenever required for measuring average consumption under average customer conditions.

This protocol is valid for Europe

It is carried out in three stages:
- Selection and verification of the vehicle
- Road testing the vehicle and recording measurements
- Post-processing of measurement results

2 List of participants and their roles

OEM:
- Project leader:
  - Concurrent development of the methodology and test procedure
  - General organisation
  - List of vehicles to be tested
  - Internal communication within OEM and externally (NGO, certification organisation…)

- Measurement manager and technicians and workshop support
  - Verification and preparation of tests (workshop, fitting and calibrating PEMS,…)
  - Availability and reliability of test equipment
  - Testing the vehicles on the road and rolling road testing
  - Collection of measurement results, initial analysis (dynamics…)
  - …
- Calculations manager
  - Creation of the Excel spreadsheet
  - Composition of families, test standard conditions (mass, CD…)
  - Detailed analysis of the results, calculation of the consumption to be published
  - Consistency with customer surveys

NGO:
- Concurrent development of the methodology and test procedure
- Selection of vehicles to be tested
- Validation of results
- Internal communication within NGO and externally (OEM)
- …

Certification organisation:
- Rental of vehicles
- Tamper-proofing the vehicle (fitting, removing seals)
- Conducting audits
- Verification of results
- …

3 Input data required

- "Standard" and "loaded" tyre pressures
- Mass:
  - unladen weight of trim level tested
  - average mass of options statistically purchased by customers on this trim level
  - average number of occupants for the vehicle type tested split into adults (70 kg) and children (35 kg)
  - average mass of occupants for the model tested
  - average mass of luggage for the model tested
- Coast down:
  - actual CD previously measured on a vehicle close to the test vehicle under test conditions (temperature, atmospheric pressure and mass on the day CD was tested)
  - actual CD of the model being tested under measurement conditions (temperature, atmospheric pressure, relative humidity) and vehicle characteristics (mass, aerodynamics, tyre rolling resistance) determined from the actual CD
  - CD for rolling road test with correction by calculation for the mass, weather conditions and the aerodynamic impact of the PEMS : 14°C, 100 kPa and reference mass (chapter 10.2) calculated from the measured CD.
- Route: a Route designed for "regulatory NOx RDE" with:
  - A mixture of Urban, Rural and Motorway (URM) evaluated topographically and not by speed bands (total distance about 100km)
  - An urban portion increased to be closer to the average customer behaviour
  - Altitude measurements

- Driving conditions for the model tested: normal distribution of customer usage statistics giving average speeds and accelerations for Urban, Rural and Motorway (or by speed band)

- Ambient temperature measured before testing (no test if the weather is too hot or too cold)

- Atmospheric temperature and pressure on the day of the test (mean value of data logged by the PEMS)

- Mass on the day of the test (as recorded in the test log)

- Aerodynamic impact of the PEMS on the model tested

- The Urban Rural Motorway mix achieved during the test is:
  - Urban = 22.8km (24.7% of the total distance)
  - Rural = 39.6km (42.9% of the total distance)
  - Motorway = 29.9km (32.4% of the total distance)

- The U R M mix of the 50 percentile customer of the model tested

- Statistical data for average customer driving of the model tested:
  - Mean distribution of individual journey distances
  - Average journey distance
  - Mean distribution of inter-journeys by class of duration
  - Percentage of journeys completed cold.

- Particle Filter:
  - Homologation data:
    - homologated particle filter K
    - distance between two homologated regenerations
  - Statistical usage data:
    - percentage of particle filter regeneration events by class of distance between regenerations [km]
    - weighted mean distance between regenerations in use.

For LCVs:

- Maximum Authorised Mass (MAM)
- loading distribution (light load, loaded, exceptional)
- distribution of mean distance covered under each load
- and from this is deduced the mean loading mass

4 Equipment required

- MIDTRONICS
- New, charged battery (may be required)
- Numbered seals
- Towing hitch
- Workshop equipped with welding set (for exhaust system)
- Exhaust system gas-tightness tester
- New exhaust system rear part
- PEMS
- Standard gas for calibrating PEMS
- Weather station
- Scales
- Ballast for loading vehicle (may be required)
- Emissions rolling road test

5 Stage 1: selection and verification of the vehicle

5.1 Selection of the vehicle

Rental vehicles are used, rented by the certification organisation.

For vehicles not yet on the market, the OEM supplies a pre-series vehicle. A confirmatory measurement will be carried out on a rental vehicle 6 months after production launch.

Ideal kilometre reading: between 3000 km and 20,000 km. A vehicle totalling 1000km is acceptable. If below 1000km, it should be run to reach 1000km minimum. A vehicle over 20,000km is acceptable.

In the case of a rental vehicle, the certification organisation:
- checks that the service log is up to date
- delivers the vehicle to the OEM
- watches over it until the seals are fitted
- attends the check-list
- fits the seals

5.2 Verification of the vehicle:

There is no preconditioning before the check
The vehicle must be at rest, doors closed, bonnet open, for at least an hour.
The points to be checked are: battery condition, oil level, tyre pressures
The checks are recorded by the OEM in a test log: see appendix 1

- Battery condition check:
  - battery charging must not be carried out before the test
  - check the condition of the battery using a MIDTRONICS
  - If the battery is not in good condition: charge it then run the vehicle for 30km minimum to bring it back to the regulation SOC (state of charge). Repeat the battery condition check.
  - If the battery is still not in good condition, change it for a new, charged battery then run the vehicle for 30km minimum to bring it back to the regulation SOC.

- Oil level check:
  - must be between the minimum and maximum levels, if so: do not alter it
  - if not the case: adjust to middle level

- Tyre check:
  - Check that the tyres are not worn down to the Tyre Wear Indicators
  - Check the tyre pressures
    - If 2 people + PEMS: “normal” pressures
    - If more than 2 people + PEMS: “loaded” pressures

  The tyre pressures are recorded in the Test log

- Fuel check
  The fuel left in the tank is not modified. If we need to fill the tank, we use ordinary fuel.

- The certification organisation fits seals to:
  - Bonnet
  - Diagnostic plug
  - Valve of each tyre
  - One nut on each wheel

  The certification organisation removes the seals after the road test, before the correlation rolling road test (access is required to the CAN - Controller Area Network - to obtain a speed signal as GPS is not operational on the rolling road)

- Workshop modifications before testing:
  - Fit the towing hitch
  - Modify the exhaust tail pipe and check gas-tightness of the exhaust system before fitting the PEMS
  - Fit the PEMS
  - Fit weather station and GPS (vehicle speed data are obtained from the 1Hz GPS signal, as the PEMS is not connected to the CAN)

- Calibration of the PEMS before testing.

- Vehicle mass:

The standard mass is calculated by: Standard mass = unladen weight of tested trim level + average mass of options statistically purchased by customers on this trim level + mass of occupants + mass of luggage

If the test vehicle is lighter than the standard mass: add ballast to bring the vehicle to standard mass
If the test vehicle is heavier than the standard mass: conduct the test in this condition, the consumption measured will be corrected to bring it in line with the standard mass (see “Post-processing of measurement results” stage)

6 Stage 2: Road testing the vehicle and recording measurements

6.1 The test log

The driver fills in the test log: see appendix 1

6.2 Driver:

- May be anyone, preferably not a trained driver, the aim being to drive as a customer would
- Driver identified by their name
- Two drivers minimum for every vehicle to be tested

6.3 *Weather conditions:*

- Limits beyond which the test is not conducted
  - Mean outside temperature during the test: $5° < T^{ext} < 30°$
  - Relative humidity < 95%
  - Wind and rain: … any orange or red alert from Météo France
- Starting temperature for the test: workshop temperature
  - This allows the PEMS to be kept warmed-up under shelter
  - Seasonality will have a lower impact on the average consumption (the measured fuel consumption will be lower in winter and higher in summer)
  - It allows smoothing of the results by coming nearer to standard conditions of 14°C and average usage

  Weather conditions are noted in the test log

6.4 *Driving instructions:*

- There are no specific driving instructions, but an attempt should be made to get as close as possible to the average speed and acceleration for the type of vehicle being tested (see chapter 8.3)
- All speed limits should be followed, and adjusted limits when it is raining
- Comfort equipment :
  - Where they are automatic, they should be set to “auto”
    - If automatic air conditioning is fitted: set the level to 21°C
    - Automatic head-lamp illumination
    - …
  - If manual air conditioning is fitted: set the level for the comfort of the occupants and record the setting in the test log
  - Heating: set the temperature as required, as a customer would
  - …

6.5 *Tests to be carried out:*

The following tests are carried out

- road test
- PEMS/rolling road correlation after road testing

6.5.1 *Road test:*

- Start with the engine cold (workshop temperature)
- Route : “regulatory NOx RDE” type driving
  - The Urban Rural Motorway (URM) mix is calculated topographically (total distance around 100 km)
- Whenever the route has to be modified (section closed for road-works……), the test remains valid but the U R M is recalculated

In order to validate a test series, there must be at least three tests that meet the dynamic criteria (see chapter 8.3), carried out by at least two different drivers. In order to achieve this, at least 5 tests should be planned for a series.

6.5.2 PEMS/rolling road correlation after road test

In order to determine the precision of the PEMS used and apply any PEMS/rolling road correlation coefficient required (see chapter 10.1), the vehicle is run on the rolling road with the PEMS, after the road test, according to the following sequence:

- Seals removed by the certification organisation (connection to the CAN)
- Vehicle maintained at 23°C for 12hours
- No regulatory preconditioning
- WLTP Cycle
- Test mass = standard mass
- Test CD = Actual CD of vehicle tested brought to standard conditions: 14°C, 100 kPa and standard mass (see chapter 10.2)
- WLTP manual gearbox gear shift pattern

7 Verification of the vehicle after testing

- Weighing the vehicle: after testing, all running mass is weighed: vehicle, driver, any passengers, PEMS. The mass is recorded on the Test log

- Calibration of the PEMS: post-test check

- Workshop modifications after test:
  - Removal of towing hitch
  - Restoration of condition of exhaust (fitting a new rear exhaust section if needed)

8 Admissibility of test

8.1 Particle filter regeneration

For diesel versions: a regeneration of the particle filter may occur during the test. To determine this, check the exhaust gas temperature measured by the PEMS. If a regeneration has occurred, a sharp rise in temperature relative to other tests will be evident.

If there has been a regeneration during the test: the test is rejected, if there has not: the test is accepted and the consumption measured is corrected upwards by the particle filter k (see chapter 10.5).

If the regeneration started mid-test, then sufficient time is deemed to have elapsed to complete the regeneration, and the following day's test will be free from regeneration.
If the regeneration started at the end of the test, sufficient time has not elapsed. In order to avoid the regeneration restarting the next day, the vehicle should be run in the evening to complete the regeneration, for around 20km.

8.2 PEMS measurement

The measurement uncertainty of a PEMS at very low flow-rates may cause recordings with negative flow-rates.
After the test, a check is made to see if any have occurred and their impact on the CO_2.

A test is admissible if the following two conditions are met:
- % of measurement points with negative CO_2: max = 3%
- Impact on CO_2: max 0.3%

8.3 Test dynamics

A test is considered admissible if the dynamics are close to the 50 percentile customer.

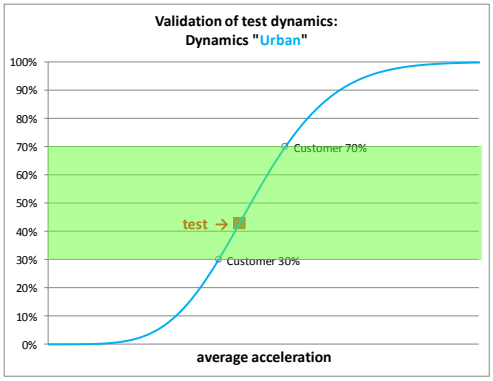
Dynamics are assessed on:
- Average speed
- Average acceleration

The 50% customer has :
- The average speed is the average of all the customers driving the same model
- The average acceleration is the average of all the customers driving the same model

The 0% customer has the lowest average accelerations for the same model
The 100% customer has the highest average accelerations for the same model

- For average speed:
  - the run is considered admissible if the average speed on Urban Rural Motorway (or for each speed segment) is within ± 3 km/h of customer usage statistics
  - extended conditions for Urban section, an average speed within ± 5 km/h is acceptable

- For average acceleration:
  - the run is considered admissible if the average positive acceleration on Urban Rural Motorway (or for each speed segment) is representative of 30 to 70 percentile customers
  - extended conditions for Motorway section, an average acceleration representative of 20 to 80 percentile customers is acceptable



9 Consumption calculations

- Coefficient for conversion of g/km of CO_2 to l/100km
  The fuel used is from the open market. It is necessary to have an analysis of the fuel composition to calculate the coefficient between CO2 and fuel
  - Diesel : is B7, the coefficient is 26.2
  - Petrol: is E10, the coefficient is 22.6

- HC and CO concentration?

  Experience has shown that the carbon content in HC and CO is negligible for petrol and diesel vehicles.

10 Post-processing of measurement results

Post-processing is carried out in the following chronological order:
- Correction for PEMS/rolling road correlation
- Correction for weather conditions, vehicle mass and aerodynamic drag of the PEMS
- Correction for U, R, M mix
- Weighting for the cold phase
- Accounting for particle filter regeneration

10.1 Correction for PEMS/rolling road correlation

- The correlation factor is calculated for the global WLTP cycle and for the four phases of the WLTP cycle (Low, Mid, High, Extra High) from the CO2 measurements of the PEMS and the rolling road by the formula :

$$\frac{\text{CO2 PEMS} - \text{CO2 rolling road}}{\text{CO2 rolling road}}$$

- If the correlation is outside the range of ± 10 % overall and by phase (*): the test is rejected

- If the correlation is within the range of ± 10 % overall and by phase (*): the test is accepted:
  - if the correlation by phase < ± 3 % : there is no correction
  - if ± 3 % < correlation by phase: the measurement by phase is corrected bringing it to 0%

- Special case for low cylinder-capacity petrol engines (≤ 1.2 l):
  - if the correlation is within the range of ± 10 % overall and by phase (*): idle phases are not excluded
  - if the correlation is outside the range of ± 10 % overall and by phase (*): idle phases are excluded
    - if the correlation comes within the range of ± 10 % overall and by phase (*): the correlation is applied
    - if the correlation remains outside the range of ± 10 % overall and by phase (*): all is discarded and we start again with another PEMS

(*) range extended to 12% on the Low for petrol engines

10.2 Correction for weather conditions, mass and drag of the PEMS

Using the WLTP formula, the impact of outside temperature, atmospheric pressure, vehicle mass and aerodynamic impact of the PEMS on the resistance of the vehicle are corrected by calculation to bring the consumption measured to the following conditions: 14°C, 100 kPa, standard test mass.

PEMS drag: a drag coefficient is applied in the WLTP formula used to correct for weather conditions and mass by adding: ½ ρ SCx V^2 to the calculation for coast-down on the day of the test with:

- the SCx value which is the impact on the model tested
- a value of ρ dependent on the conditions on the day of the test (**) according to the following formula

$$\rho(\varphi,\vartheta,p) = \frac{1}{287,06(\vartheta+273,15)}\left(p - 230,617\cdot\varphi\cdot\exp\left[\frac{17,5043\cdot\vartheta}{241,2\,°\mathrm{C}+\vartheta}\right]\right)$$

With

- φ Relative humidity
- ϑ Temperature in °C
- p Pressure in Pa

(**) under standard conditions of 14° and 100kPa, the value of ρ is 1,214

Using the WLTP formula below, calculations are made for:

- The CD on the day of the test
- The CD under standard conditions

WLTP Formula

$F^* = (f0 - K1 + f_1 v) \times \left(1 + K_0(T - 20)\right) + K_2 f_2 v^2$ + ½ ρ SCx V^2

F^* is the corrected road load, N;

f_0 is the constant term, N;

f_1 is the coefficient of the first order term, N·(h/km);

f_2 is the coefficient of the second order term, N·(h/km)^2;

K_0 is the correction factor for rolling resistance; $K_0 = 8.6 \times 10^{-3}$

K_1 is the test mass correction: $K_1 = f_0 \times \left(1 - \frac{M_{test\ veh}}{M_{veh\ coast\ down}}\right)$

$M_{test\ veh}$ is mass of the test vehicle kg;

$M_{veh\ coast\ down}$ is the mass of vehicle for the measure of the coast down kg.

K_2 is the correction factor for air resistance: $K_2 = \frac{T}{293} \times \frac{100}{P}$

T is the mean atmospheric temperature, Kelvin (K)

P is the mean atmospheric pressure, kPa

T is the mean atmospheric temperature, °C;

v is vehicle velocity, km/h;

- Energy is calculated for all runs (total energy for CD + acceleration + slope):
  - On the day of the test
  - Under standard conditions

- Energy is calculated for urban, rural and motorway:
  - On the day of the test
  - Under standard conditions

- Three CO2 graphs are prepared = f(energy) for urban, rural and motorway for a 1km window with a 20m pitch, from which the three U, R, M slopes are obtained

- The U slope is applied to the U energy difference, the R slope to the R energy difference and the M slope to the M energy difference, the % consumption corrections to be applied to the U, R, M consumptions is deduced.

10.3 Correction of Urban Rural Motorway mix

Using the U R M consumptions measured with the PEMS, the mix achieved during the test and the 50 percentile customer mix of the model tested, we can work out the consumption for the 50 percentile customer mix

10.4 Weighting for the cold phase

The consumption road-test is around 100km but the average customer journey is shorter. The measurements include one cold start but the cold phase over-consumption is understated, and must be increased (weighted) to be representative of real-world usage.

To do this, we have to answer the following two questions:

- Question 1: when does the engine warm up, and how much is the over-consumption to warm it up?
- Question 2: how should statistical client data be used to weight this over-consumption?

- **For question 1**

The vehicle is run cold, followed immediately by the same run repeated hot.
The engine is hot when the instantaneous consumption during the cold run is the same as the consumption on the hot run.
The parameter to be considered is the rolling energy.
The cumulative difference in consumption cold/hot is calculated expressed in g of CO2 as a function of forward movement energy of the vehicle expressed in MJ calculated in steps of 2kJ.
Once this difference is constant, the engine is hot.
We therefore know how much dynamic energy was required to warm up the engine, what distance this corresponds to and over what time.
So we can calculate the penalty due to a cold start in l/100km over this distance.

- **For question 2:**

We use the statistical running data for the average customer of the model tested:

- Mean distribution of individual journey lengths
- Mean journey distance
- Mean distribution of inter-journey by class of duration
- Percentage of journeys run cold.

The weighting (over-consumption to be added to the measurements despite the cold start already included in the measurements) is thus:

$$RDE\ cold\ penalty\left(\frac{l}{100km}\right) \times cold\ \ RDE\ distance(km) \times Percentage\ of\ journeys\ run\ cold \times \left(\frac{1}{\frac{Mean\ journey}{istance\ (km)}} - \frac{1}{RDE\ journey\ distance\ (km)}\right)$$

This measurement is carried out once only for each engine and it is then considered that the energy to warm up an engine is independent of the vehicle. An add-on is made in the Excel spreadsheet

10.5 Accounting for particle filter regeneration

The homologated particle filter K is known, as is the homologated distance between two regenerations.

The statistical customer usage data give the percentage of occurrence of particle filter regenerations by class of inter-regeneration distance [km]. From this we can deduce the weighted mean distance between two regenerations in use.

We then deduce the percentage consumption to be added to the measured consumption to take account of the fact that the customer will experience a particle filter regeneration from time to time.

10.6 Validation of the fuel consumption value

The final fuel consumption value determined by the average of the valid test runs is compared to values from customer surveys and other internal and external data. The value from the trip computer is also compared to check coherence of test results. In no circulstances can the measured fuel consumption be modified follwing these comparisons.

11 Application to LCVs

All of the above is valid for passenger cars. This chapter is specific to LCVs for which the protocol has to be adapted.

The adaptation concerns:

- Masses
- Urban Rural Motorway mix
- Cold phase weighting
- Particle filter regeneration
- Dynamic conditions

11.1 Masses

The average number of passengers is known.
The Maximum Authorised Mass (MAM), which is OEM information, is known.

We can work out the Maximum Laden Mass (MLM): MLM = MAM – mass of passengers

We know the loading distribution:

- Light load = xx% of MLM
- Loaded = xx% of MLM
- Exceptional load = xx% of MLM

We know the mean distribution in kilometres by load, from which we get the mean loading mass.

Standard mass = unladen weight of tested trim level + average mass of options statistically purchased by customers on this trim level + mass of passengers + loading mass.

11.2 Urban Rural Motorway mix

We know the URM of the LCV tested.

11.3 Weighting of the cold phase

We know the average journey and inter-journey time of the LCV tested.
From which we get the weighting to be added to the measured consumption.

11.4 Particle filter regeneration

Take the same value as for passenger cars.

11.5 Dynamic conditions

We know the customer usage statistics in terms of average speed and average acceleration for the LCV tested.

12 Monitoring

Application of the protocol is subject to monitoring by the certification organisation who have permanent access to data made available on the OEM's server.

The certification organisation carries out a six-monthly assessment covering the correct application of the protocol including the organisational and technical arrangements from selection and preparation of the vehicle and test instruments (including calibration), conducting the test and the post-processing. This ensures that actual testing is carried out in accordance with the initially established protocol.

Monitoring may be either pre-arranged or unexpected.

Appendix 1: test log

orgnisation logo	Test Log **EMISSIONS MEASUREMENTS USING PEMS EQUIPMENT DURING ROAD TEST**	Version 0 Date applicable: xx/xx/2016 Document manager: xxx	Page 1/1

Requirements :

- The driver must be authorised to drive the test vehicle
- For any external person, the contract between the OEM and the employee's own company must stipulate the authorisation to drive test vehicles
- The vehicle must be fitted with W (trade) plates and the driver must have authorisation to drive under W (trade) plates (valid for 1 day)
- The driver is in possession of the document referring to authorisation to conduct testing on the open road with a PEMS device.
- The Code de la Route (Highway Code) must be diligently followed during testing.

Identification of signatory
The signatory agrees to complete accurately all fields of the log.
Name/ Forename: Signature:

Identification of occupants
Name / Forename of driver:
Name / Forename of passengers:

Test identification
Date & Time:
Name of test:
Data stored under reference xxx:

Soaking of vehicle before road test
☐ Inside a building
☐ Outside
Soaking time since engine was last started (in h):

Vehicle identification
VIN:
Vehicle registration:
W (trade) plate:

Commercial description
Silhouette:
Engine:
Gearbox:

Internal description
Silhouette:
Engine:
Gearbox:

Tyres
Commercial description:
Dimensions :
☐ Normal load (<=2 passengers)
☐ Loaded (>2 passengers)
Pressure applied, cold (bar): Front: Rear:

Vehicle weight
☐ All occupants on board during weighing
☐ PEMS fitted during weighing
Fuel level in tank (to nearest 1/8th):
Weight of ballast added to approach target mass:
Target mass in kg: Measured, in kg:

Identification of measurement equipment (PEMS)

Serial number SCS		Serial number EFM	
Serial number GAS		Pitot tube diameter(EFM)	
Reference of calibration gas bottme		Serial number Cab module	
Calibration gas value CO2 (%)		Serial number GPS	
Calibration gas value CO (%)		Serial number Probe	
Calibration gas value NO (ppm)		Host software version of PEMS	
Calibration gas value NO2 (ppm)		SENSOR Tech-CT LDV software version	
For petrol engines, damper fitted (yes/no)			

Preparation of mesurement equipment
☐ PEMS heating phase completed.
☐ Set up a new recording using the pre-defined test name.
☐ Calibration of flowmeter and analysers according to manufacturer's reccommendations.
☐ Configuration of PEMS for petrol/diesel according to vehicle being tested has been checked.
☐ Concentration of content of calibration bottles in accordance with values entered into the PEMS for calibration phase has been checked.
☐ Restart recording in Sample mode, (with the engine stopped). Start engine and conduct test, pause recording at the end of the road test.
☐ Conduct check of PEMS analysers (Calibration mode), stop recording.

Temperature (start of test)
Soaking building:
Outside:

Traffic density

	Light	Heavy	Jams	Comments (diversions, disturbances,...)
Urban	☐	☐	☐	
Rural	☐	☐	☐	
Motorway	☐	☐	☐	

Weather conditions
Rain intensity to be determined according to windscreen wiper speed

	None	Intermittent	Continuous slow	Continuous fast	Comments
Urban	☐	☐	☐	☐	
Rural	☐	☐	☐	☐	
Motorway	☐	☐	☐	☐	

Wind
☐ No wind
☐ Light
☐ Strong
☐ Very strong (in theory, prohibits testing)

Road conditions

	Dry	Damp	Wet	Comments
Urban	☐	☐	☐	
Rural	☐	☐	☐	
Motorway	☐	☐	☐	

Vehicle parameters

Air-con / heating
☐ Vehicle fitted with automatic climate control (temperature regulation)
☐ Vehicle fitted with manual air-conditioning
☐ If regulated air-con: "A/C" and "Auto" set to 21°C
☐ If manual air-con: set to ensure passenger comfort

Demisting
☐ A windscreen demisting cycle was carried out during the test

Steering column stalks
☐ Automatic windscreen wiping activated
☐ Automatic headlamp illumination activated

Gear ratios
Enter the mode active during the test (for example Sport mode):

Stop & Start
☐ Vehicle fitted with a Stop & Start system
☐ Stop & Start active during road test
Stop & Start activation time, recorded at end of test (in s):

On-board computer
☐ Trip counter reset at start of test
Fuel consumption measured at end of test (l/100km):

General route data

Distance covered
Kilometres at start:
Kilometres at return:
Distance covered:

Time
Start time:
Return time: