

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:
 - o Concurrent development of the methodology and test procedure
 - o General organisation
 - o List of vehicles to be tested
 - o Internal communication within OEM and externally (NGO, certification organisation, etc.)
- Measurement manager and technicians and workshop support
 - o Verification and preparation of tests (workshop, fitting and calibrating PEMS, etc.)
 - o Availability and reliability of test equipment
 - o Testing the vehicles on the road and rolling road testing
 - o Collection of measurement results, initial analysis (dynamics, etc.)
 - o Etc.
- Calculations manager
 - o Creation of the Excel spreadsheet
 - o Composition of families, test standard conditions (mass, CD, etc.)
 - o Detailed analysis of the results, calculation of the consumption to be published
 - o 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)
- Etc.

Certification organisation:

- Rental of vehicles
- Tamper-proofing the vehicle (fitting, removing seals)
- Conducting audits
- Verification of results
- Etc.

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.
- Particulate Filter:
 - Approval data:
 - approved particulate filter K
 - distance between two approved regenerations
 - Statistical usage data:
 - percentage of particulate 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 mileage: 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 wheelThe 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
 - o Mean outside temperature during the test: $5^{\circ} < T^{\text{ext}} < 30^{\circ}$
 - o Relative humidity $< 95\%$
 - o Wind and rain: any orange or red alert from Météo France
- Starting temperature for the test: workshop temperature
 - o This allows the PEMS to be kept warmed-up under shelter
 - o Seasonality will have a lower impact on the average consumption (the measured fuel consumption will be lower in winter and higher in summer)
 - o 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:
 - o 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
 - Etc.
 - o If manual air conditioning is fitted: set the level for the comfort of the occupants and record the setting in the test log
 - o Heating: set the temperature as required, as a customer would
 - o Etc.

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
 - o 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, etc.), 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 12 hours
- 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 Particulate filter regeneration

For diesel versions: a regeneration of the particulate 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 particulate 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 CO₂.

A test is admissible if the following two conditions are met:

- % of measurement points with negative CO₂: max = 3%
- Impact on CO₂: 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

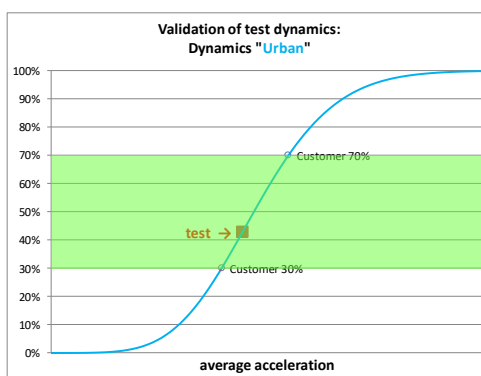
The 50% customer has:

- 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 CO₂ 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 particulate 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:

$$\frac{\text{CO}_2 \text{ PEMS} - \text{CO}_2 \text{ rolling road}}{\text{CO}_2 \text{ rolling road}}$$

- If the correlation is outside the range of $\pm 10\%$ overall and by phase (*): the test is rejected
- If the correlation is within the range of $\pm 10\%$ overall and by phase (*): the test is accepted:
 - if the correlation by phase $< \pm 3\%$: there is no correction
 - if $\pm 3\% < \text{correlation by phase}$: 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 $\pm 10\%$ overall and by phase (*): idle phases are not excluded
 - if the correlation is outside the range of $\pm 10\%$ overall and by phase (*): idle phases are excluded
 - if the correlation comes within the range of $\pm 10\%$ overall and by phase (*): the correlation is applied
 - if the correlation remains outside the range of $\pm 10\%$ 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: $\frac{1}{2} \rho SC_x V^2$ to the calculation for coast-down on the day of the test with:

- the SC_x 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

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

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

$$F^* = (f_0 - K_1 + f_1 v) \times (1 + K_0(T - 20)) + K_2 f_2 v^2 + \frac{1}{2} \rho S C_x V^2$$

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:

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

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 particulate filter regeneration

The approved particulate filter K is known, as is the approved distance between two regenerations.

The statistical customer usage data give the percentage of occurrence of particulate 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 particulate 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. Under no circumstances can the measured fuel consumption be modified following 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:

- Mass
- Urban Rural Motorway mix
- Cold phase weighting
- Particulate filter regeneration
- Dynamic conditions

11.1 Mass

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): $MLM = MAM - \text{mass of passengers}$

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 Particulate 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 Adaptation to dynamic vehicles

(e.g., Peugeot 308 GTi)

The mass, Urban Rural Motorway mix and weighting of the cold phase are the same as for conventional vehicles.

The only adjustments necessary are for speed and acceleration, as they are specific to dynamic vehicles. Customer use statistics in terms of average speed and average acceleration are available for vehicles of this type.

13 Notion of family

Defining a type of vehicle in terms of consumption requires information on 6 aspects:

- Model
- Body style
- Degree of finishing
- Engine
- Gearbox
- Type of tyres

A vehicle family is defined by the following invariant information:

- Model
- Engine
- Type of gearbox

Based on a measurement made in accordance with the test protocol, the notion of family serves to estimate the consumption value of a vehicle of the same model, with the same engine and the same type of gearbox, but with a different body style and/or a different degree of finishing and/or a different type of tyre than those of the vehicle measured. Calculation rules are then used to estimate consumption differentials based on technical differences.

The variables can include:

- Body style: starting with the measurement for a saloon, the notion of family can be used to estimate the consumption of an estate vehicle
- The degree of finishing: starting with the measurement for a given degree of finishing, the notion of family can be used to estimate consumption with other degrees of finishing
- The type of tyres: starting with the measurement with a given type of tyre, the notion of family can be used to estimate consumption with other tyres
- Aerodynamics: starting with the measurement with given aerodynamics, the notion of family can be used to estimate consumption with other levels of aerodynamics
- Transmission length*: starting with the measurement with a given transmission length, the notion of family can be used to estimate consumption with other transmission lengths (with the same type of gearbox)

* The notion of transmission length is defined as follows:

- It is said that the gearbox is long when an engine runs “slowly” at a given speed (e.g. 2000 rpm at 90 km/h)
- It is said that the gearbox is short when an engine runs faster at the same speed (e.g. 2500 rpm at 90 km/h)

14 The online simulator

The online simulator allows customers, after answering a few simple questions, to estimate their consumption based on the following four characteristics of use:

- the number of passengers and the vehicle load
- the number of journeys per day of use and the average distance per journey
- the types of road
- the driving style of the driver

The online simulator also takes into account weather conditions as well as the percentage of cold start journeys.

The online simulator offers a finely grained estimate of the customer's consumption based on the benchmark consumption of the same model, obtained from the protocol.

The use of the online simulator is only possible for vehicle families that have been tested in accordance with the protocol.

14.1 The number of passengers and the vehicle load

The benchmark consumption takes into account the average load of the configured vehicle. To obtain the load in accordance with the customer's estimated usage, a mass must be added to or subtracted from the average load.

Neither the car, nor the engine nor the type of fuel (petrol or diesel) is specified.

The Urban Rural Motorway mix is specified using an average mix valid for all vehicles.

The impact of 100kg on urban, rural and motorway consumption is known.

The number of people, the amount of luggage and the loading frequency are taken into account in accordance with the table below:

	Never	Occasionally	Often
Driver only	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Driver with 1 or 2 passengers	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Driver with 3 or more passengers	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Luggage (more than 30 kg)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

The mass to be added or subtracted depending on the customer's estimated usage is calculated on the basis of the various possible combinations of customer responses.

Number of people on board and weight of luggage:

- Case 1: driver only
- Case 2: driver with 1 or 2 passengers → assume 1.5 passengers
- Case 3: driver with 3 or more passengers → assume 3.5 passengers
- Case 4: luggage
 - o If the luggage weighs less than 30kg, it is not taken into account
 - o If the luggage weighs more than 30kg, it is assumed to weigh 40kg

Frequency:

- Never → means 0% of the time
- Occasionally → means 25% of the time
- Often → means 75% of the time

14.2 Journeys

The benchmark consumption takes into account the average distance of a journey and the percentage of cold starts of the average customer for the configured vehicle.

To adapt the weighting of the cold phase to the customer's estimated usage, consumption must be added to or subtracted from the benchmark value.

For this, it is necessary to know the average distance of a customer journey and the number of journeys per day of use.

One journey = 1 engine start and 1 engine stop.

Example: a person goes to work, then leaves work and stops at the bakery before returning home. This adds up to 3 journeys: journey 1 = home to work, journey 2 = work to bakery, journey 3 = bakery to home.

The same example: journey 1 home to work = 15 km, journey 2 work to bakery = 13 km, journey 3 bakery to home = 2 km. Average distance per journey = 10 km.

For the percentage of journeys with a cold start, it is considered that:

- 100% of journeys involve a cold start if the customer answers "1 to 2 journeys per day of use"
- 33% (1/3) of journeys involve a cold start if the customer answers "3 to 4 journeys per day of use"
- 20% of journeys involve a cold start if the customer answers "5 to 9 journeys per day of use"
- 10% of journeys involve a cold start if the customer answers "more than 10 journeys per day of use"

14.3 Types of road

The benchmark consumption takes into account the Urban Rural Motorway mix of the average customer depending on the segment and type of fuel of the configured vehicle.

To calculate consumption in accordance with the customer's estimated usage, the vehicle's Urban Rural Motorway consumption measured on the protocol and the mix declared by the customer are used.

To do so, the customer must estimate the average annual distance travelled on urban roads, on rural roads and on motorways, and then estimate the percentage travelled on each type of road.

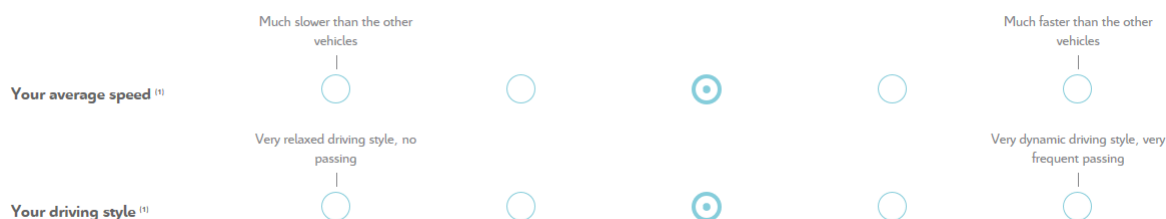
Example: a person drives 10,000 km a year, breaking down as 2,000 km on urban roads, 3,000 km on rural roads and 5,000 km on motorways. The percentages are respectively 20%, 30% and 50%.

14.4 Driving style

The benchmark consumption takes into account driving style close to that of the average customer, both at average Urban Rural Motorway speed and with average Urban Rural Motorway acceleration.

To adapt the consumption to the dynamic conditions of the customer's own use, it is necessary to make an adjustment by adding or subtracting a consumption value to or from that of the starting point.

To do so, it is necessary to know the customer's average speed compared with other motorists and his or her driving style.



Vehicle segments and fuel (petrol or diesel) are specified and the Urban Rural Motorway mix is taken into account.

There are 5 categories of customers:

- "Much slower" customers: those driving at a much lower speed than other vehicles, with very subdued driving, without overtaking. A significant adjustment is applied to these customers to reduce their consumption compared with the benchmark
- "Slower" customers: those driving at a lower speed than other vehicles, with subdued driving, with little overtaking. An adjustment is applied to reduce their consumption compared with the benchmark
- "Average" customers: those driving at the same speed as other drivers, with measured driving behaviour and an appropriate amount of overtaking. No adjustment is applied since their driving is representative of the behaviour of the benchmark customer of the protocol
- "Faster" customers: those driving at a higher speed than other vehicles, with dynamic driving and frequent overtaking. An adjustment is applied to increase their consumption compared with the benchmark
- "Much faster" customers: those driving at a much higher speed than other vehicles, with very dynamic driving, and very frequent overtaking. A significant adjustment is applied to these customers to increase their consumption compared with the benchmark

14.5 Weather conditions

Benchmark consumption takes into account the weather conditions of the average customer for the configured vehicle.

Weather conditions affect the vehicle's consumption depending on the use of air conditioning, heating and electrical accessories, as well as the effect on vehicle drag.

To adapt consumption to weather conditions during the customer's estimated usage, an adjustment may be made to account for overconsumption compared with the benchmark.

The country in which the vehicle is used is therefore an important criterion.

This criterion is automatically entered via the website of the country in which the customer connects to perform the simulation.

Countries are classified on the basis of 3 different climates:

- Cold climate represented by Helsinki
- Temperate climate represented by Paris
- Hot climate represented by Seville

Benchmark consumption is that of a temperate country.

For air conditioning, the following are applied:

- a “hot country” penalty
- no correction for a “temperate country” or a “cold country”

The penalty is calculated on the basis of:

- measurements of the difference in consumption as a function of the difference in temperature
- the average maximum temperature difference month by month between Seville and Paris

For heating and electrical accessories (heated seats, rear window, etc.), the following are applied:

- a “cold country” penalty
- no correction for a “temperate country” or a “hot country”

The penalty is calculated on the basis of the benchmark overall average annual electrical consumption, which combines heating and electrical accessories, and is adapted in accordance with the body shape of the vehicle.

For vehicle drag, the following are applied:

- a “cold country” penalty calculated on the basis of the difference between the average annual temperature in Helsinki and the benchmark temperature of 14°C
- a “hot country” bonus calculated on the basis of the difference between the average annual temperature in Seville and the benchmark temperature of 14°C
- no correction for a “temperate country”

15 Monitoring

Application of the protocol is monitored by the certification body, which has permanent access to the test facilities and to all data made available on the carmaker’s server.

The certification body performs a biannual assessment of the proper application of the protocol, as well as organisational and technical provisions, ranging from the choice and preparation of the vehicle and test instruments (including calibration) to the conduct of the test and post-processing, to ensure that the actual testing is performed in accordance with the original protocol.

Monitoring can be done on a scheduled or random basis.

From this point onwards, the Protocol covers vehicles approved in accordance with the Euro 6c regulation, for which emissions and consumption are measured.

For the consumption of these vehicles, the Protocol is used in full, notably the weighting of the cold phase (chapter 10.4) with the add-on adjustment values that there is no need to remeasure. The only modification relates to the regeneration of the particulate filter (chapters 8.1 and 10.5) for diesel versions, which is specified in chapter 21.

16 Emissions measurements – General provisions

These measurements cover NOx (nitrogen oxides) and PN (particles – in number).

The previous chapters, based on the measurement of consumption, are included in full for emissions: 1, 2, 3, 4, 5, 6, 7, 8 except 8.1, 10.3, 11, 12 and 15.

The emission-specific chapters are described below (chapters 16 to 21).

Vehicles measured:

Unlike fuel consumption, NOx emissions increase with mileage and vary according to actual driving conditions.

Measurements made since September 2017 have been conducted on vehicles with low mileage, for the following reasons:

- Vehicles for which emissions are measured meet the Euro 6.d-temp standard. These vehicles have only been on the market since the end of 2017. Vehicles with mileage representative of the average customer are therefore not yet available for hire.
- It is difficult to ensure repeatable and reproducible ageing of these vehicles while maintaining auditability by Bureau Veritas. There are also material difficulties involved in driving a vehicle 100,000 km without removing the seals (for servicing, etc.).
- Even if a vehicle with a reading of 100,000 km were available, it would be hard to determine whether its ageing is representative of average ageing.

For these reasons, it is not possible in early 2018 to give emissions at the vehicle's average mileage with average ageing (i.e., representative of average actual driving conditions).

The figure published will therefore be representative of the average customer on a vehicle with low mileage (between 1,000 and 20,000 km). The following explanatory note is provided with the results: "NOx emissions increase with mileage and vary according to the vehicle's actual driving conditions."

Tests on vehicles with average mileage and average ageing could be performed in the future, but on the condition that the Protocol is changed to include the following details:

- Average mileage by segment and by engine
- The ageing procedure, which should be reproducible, auditable and representative of average ageing

The treatment of exhaust gas to reduce emissions differs according to the type of engine. It is necessary to specify whether the vehicle is:

- Diesel (with particulate filter)
- Petrol indirect injection without particulate filter
- Petrol direct injection with particulate filter

17 Measuring NOx emissions

Depending on the type of engine, the Protocol takes into account the following elements for post-processing calculations:

- Diesel (with particulate filter)
 - o PEMS/test bench correlation and correction after correlation: yes, see chapter 19.1
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: yes, see chapter 20.1
 - o particulate filter k: no use of particulate filter k because tests with regeneration are taken into account, see chapter 21
- Petrol indirect injection without particulate filter
 - o PEMS/test bench correlation and correction after correlation: yes, see chapter 19.1
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: not necessary
- Petrol direct injection with particulate filter
 - o PEMS/test bench correlation and correction after correlation: yes, see chapter 19.1
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: yes, see chapter 20.1

18 Calculating PN emissions

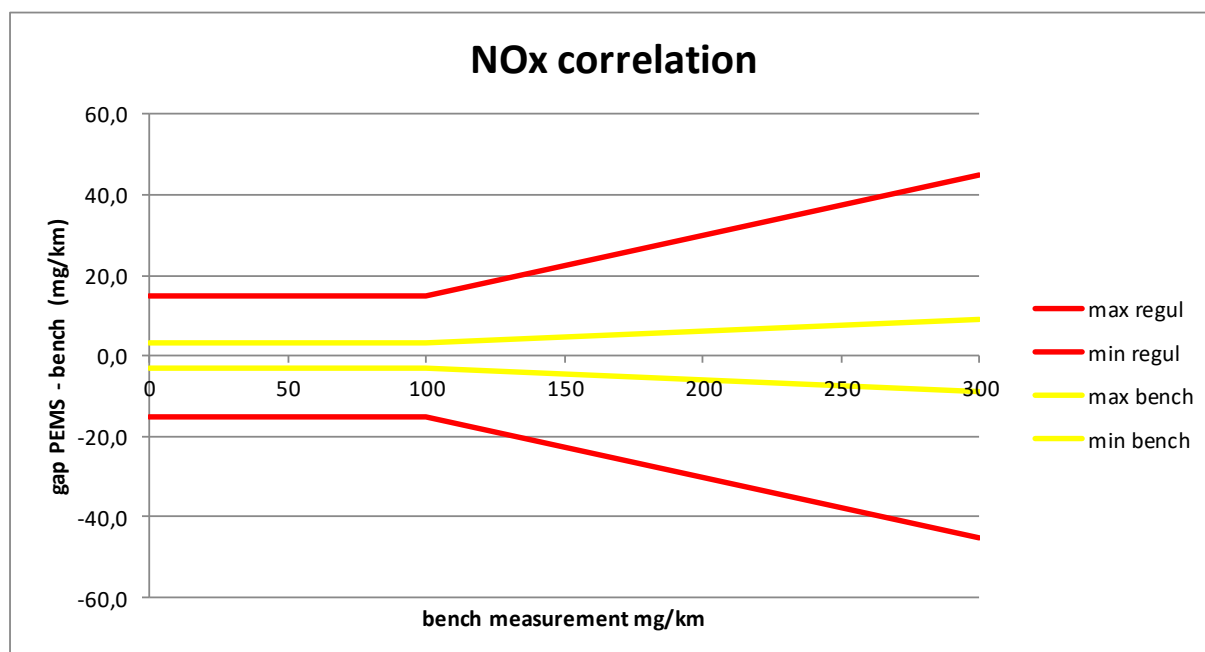
Depending on the type of engine, the Protocol takes into account the following elements for post-processing calculations:

- Diesel (with particulate filter)
 - o PEMS/test bench correlation and correction after correlation: yes, see section 19.2
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: not necessary
 - o particulate filter k: no use of particulate filter k because tests with regeneration are taken into account, see chapter 21
- Petrol indirect injection without particulate filter
 - o PEMS/test bench correlation and correction after correlation: yes, see chapter 19.2
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: yes, see chapter 20.2

- Petrol direct injection with particulate filter
 - o PEMS/test bench correlation and correction after correlation: yes, see chapter 19.2
 - o Weather, mass and PEMS impact correction: not necessary
 - o Correction of the Urban Rural Motorway topographic mix: yes, see chapter 10.3
 - o Cold phase weighting: yes, see chapter 20.2

19 PEMS/test bench correlation and correction

19.1 For NOx



The red funnel represents the maximum regulatory threshold:

- if NOx > 100, it is 15%; it is corrected in % with a maximum of 15%; the test is rejected above 15%
- if NOx < 100, it is 15mg; it is corrected in mg with a maximum of 15mg; the test is rejected above 15mg

The yellow funnel represents the maximum tolerance of the test bench:

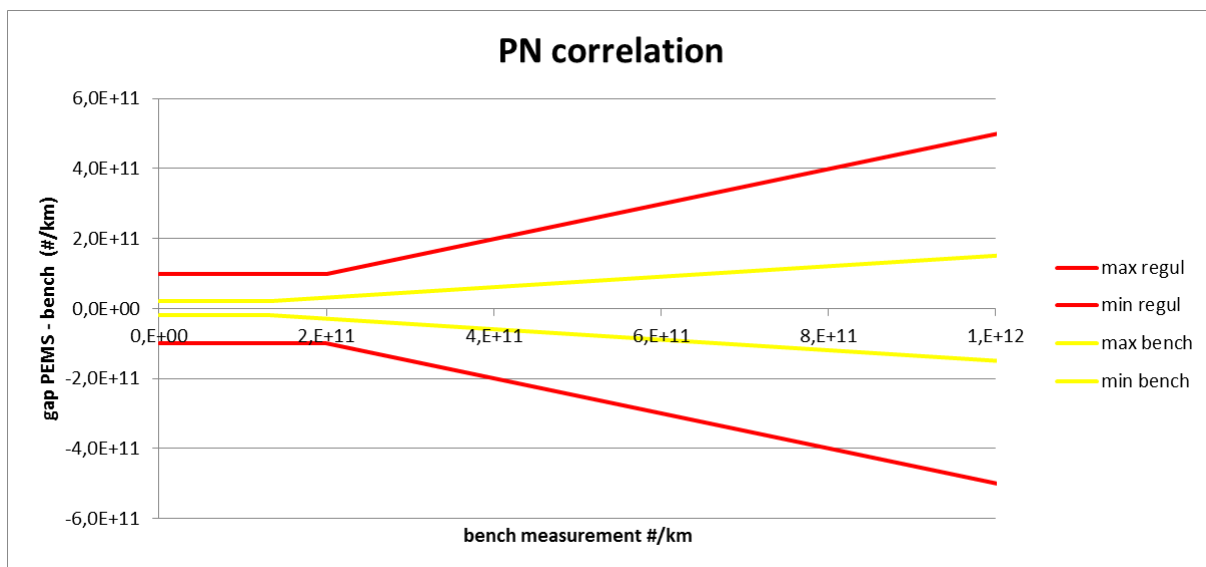
- if NOx > 100, it is 3%; it is not corrected below 3%
- if NOx < 100, it is 3mg; it is not corrected below 3mg

The correlation is measured between the values obtained by the PEMS and those obtained by the test bench for each of the four phases of the WLTP cycle (Low, Mid, High, Extra High) and a regression line is drawn based on these four values.

The correction is made by the method of 3 km windows and interpolation by the regression line:

- From the recording of NO_x during the road test, windows of 3 km are created
- From the measured correlation, a correlation with the regression line is interpolated for each 3 km window
- The correlation is calculated as a % of each 3 km window, which is applied to all of the 3 km measurement points
- When the regression line enters the yellow funnel, no correction is applied
- If the correction results in NO_x < 0, a correlation of 0% is applied (i.e., NO_x = 0 on this window)

19.2 For PN



The red funnel represents the maximum regulatory threshold:

- if PN > 2 10^{E11}, it is 50%; it is corrected in % with a maximum limit of 50%; the test is rejected above 50%
- if PN < 2 10^{E11}, it is 1 10^{E11}; it is corrected in number with a maximum limit of 1 10^{E11}; the test is rejected above 1 10^{E11}

The yellow funnel represents the maximum tolerance of the test bench:

- if PN > 1^{E+11}, it is 15%; it is not corrected below 15%
- if PN < 1^{E+11}, it can vary from 150% to 20% depending on the absolute value of the PN measured. It is considered that it is 2^{E+10} between 0# and 1^{E+11}#; no correction is made below 2^{E+10}

The correlation is measured between the values obtained by the PEMS and those obtained by the test bench for each of the four phases of the WLTP cycle (Low, Mid, High, Extra High) and one or two regression lines are drawn as appropriate (see below).

The correction is made by the method of 1 km windows (*) and interpolation by one or two regression lines:

- From the recording of PN during the road test, windows of 1 km are created
- From the measured correlation, a correlation with the regression line is interpolated for each 1 km window
- The correlation is calculated as a % of each 1 km window, which is applied to all measurement points of this km
- If the regression line drawn from the 4 values Low, Mid, High, Extra High
 - o stays in the red funnel, a single regression line is used
 - o goes outside the red funnel, two regression lines are used, the second being drawn from the 3 values Mid, High, Extra High
- If the second regression line also goes outside the red funnel, no correction is applied in the zone where it is outside the red funnel
- When the regression line(s) enter(s) the yellow funnel, no correction is applied

(*) for PN, windows of 1 km are chosen because a lot of PN is produced at the start-up and the very beginning of the test, so it is more representative to average over 1 km instead of 3 km as for NOx.

Note for diesel versions:

- if the 4 measured values Low, Mid, High, Extra High are deemed sufficiently spaced, the regression line allows a robust correction
- if the 4 measured values Low, Mid, High, Extra High are deemed sufficiently close, the regression line:
 - o Provides a robust correction for low PN values
 - o But does not allow a robust correction for high PN values that can be measured on the road during a test with regeneration. This makes it necessary to perform a second correlation by triggering a regeneration. This regeneration takes place by acting on the engine control in order to measure on the Low phase PN values close to those obtained under regeneration during a test on the road.

The first correlation without regeneration is applied to road tests without regeneration and the second correlation with regeneration to road tests with regeneration.

20 Weighting of the cold phase

20.1 For NOx

A Cold/Hot weighting is determined to add to the measurement for each application (body shape, engine, gearbox) by doing several tests for a given application.

The cumulative NOx is recorded both Cold and Hot, depending on the distance travelled, and the difference is calculated. In the event there is a correction after PEMS/test bench correlation (if the regression line is between the red and yellow funnels), the cumulative Cold/Hot NOx difference must be the corrected outcome.

The same formula as for consumption is then applied:

$$\text{Weighting to be added} = \frac{\text{cumulative NOx difference in mg}}{3} \left(\frac{1}{\text{Average journey}} - \frac{1}{92} \right)$$

20.2 For PN

A Cold/Hot weighting is determined to add to the measurement for each application (body shape, engine, gearbox) by doing several tests for a given application.

The cumulative PN is recorded both Cold and Hot, depending on the distance travelled, and the difference is calculated. In the event there is a correction after PEMS/test bench correlation, the cumulative Cold/Hot PN difference must be the corrected outcome.

PN emissions are dependent on temperature, so an additional correction must be applied to bring the cumulative Cold/Heat differential back to 14°C if the tests were run at different temperatures.

To do this, it is necessary, prior to the road tests, to perform bench tests with a real calibration on a WLTP cycle. Tests are conducted at different temperatures – 0°C, 10°C, 20°C and 30°C. – starting with a Cold WLTP and then moving on to a Low hot phase. The slope of variation of PN as a function of temperature is thus determined on the Low phase expressed in #/km/°C. The slope is measured once for each motor/gearbox pair.

The same formula as for consumption is then applied:

$$\text{Weighting to be added} = \frac{\text{cumulative PN difference in \#}}{3} \left(\frac{1}{\text{Average journey}} - \frac{1}{92} \right)$$

21 Regeneration of the diesel particulate filter

Tests with regeneration of the particulate filter are taken into account in the treatment of the result.

To do this, it is first necessary to determine the regeneration frequency for each application (body shape, engine, gearbox), so there must be at least 2 tests with regeneration during a test campaign. This requires a significant number of tests during a campaign. When a large number of campaigns have been conducted, it may be possible to deduce a rule on the frequency of regenerations to avoid doing as many tests per campaign.

The average of the tests without regeneration and the average of the tests with regeneration is calculated; the final result is the weighted average of the regeneration frequency.

This is valid for diesel for NOx, PN and consumption.

Appendix 1

Test log

organisation logo		Test Log EMISSIONS MEASUREMENTS USING PEMS EQUIPMENT DURING ROAD TEST		Version 0																																	
				Page 1/1																																	
<p>Requirements :</p> <ul style="list-style-type: none"> 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. 																																					
<p>Identification of signatory The signatory agrees to complete accurately all fields of the log.</p> <p>Name/ Forename: <input type="text"/> Signature: <input type="text"/></p>		<p>Identification of occupants</p> <p>Name / Forename of driver: <input type="text"/></p> <p>Name / Forename of passengers: <input type="text"/></p>																																			
<p>Test identification</p> <p>Date & Time: <input type="text"/></p> <p>Name of test: <input type="text"/></p> <p>Data stored under reference xxx: <input type="text"/></p>		<p>Soaking of vehicle before road test</p> <p><input type="checkbox"/> Inside a building</p> <p><input type="checkbox"/> Outside</p> <p>Soaking time since engine was last started (in h): <input type="text"/></p>																																			
<p>Vehicle identification</p> <p>VIN: <input type="text"/></p> <p>Vehicle registration: <input type="text"/></p> <p>W (trade) plate: <input type="text"/></p>		<p>Commercial description</p> <p>Silhouette: <input type="text"/></p> <p>Engine: <input type="text"/></p> <p>Gearbox: <input type="text"/></p>		<p>Internal description</p> <p>Silhouette: <input type="text"/></p> <p>Engine: <input type="text"/></p> <p>Gearbox: <input type="text"/></p>																																	
<p>Tyres</p> <p>Commercial description: <input type="text"/></p> <p>Dimensions : <input type="text"/></p> <p><input type="checkbox"/> Normal load (<=2 passengers)</p> <p><input type="checkbox"/> Loaded (>2 passengers)</p> <p>Pressure applied, cold (bar): Front: <input type="text"/> Rear: <input type="text"/></p>		<p>Vehicle weight</p> <p><input type="checkbox"/> All occupants on board during weighing</p> <p><input type="checkbox"/> PEMS fitted during weighing</p> <p>Fuel level in tank (to nearest 1/8th): <input type="text"/></p> <p>Weight of ballast added to approach target mass: <input type="text"/></p> <p>Target mass in kg: <input type="text"/> Measured, in kg: <input type="text"/></p>																																			
<p>Identification of measurement equipment (PEMS)</p> <table border="1" style="width: 100%;"> <tr> <td>Serial number SCS</td> <td><input type="text"/></td> <td>Serial number EFM</td> <td><input type="text"/></td> </tr> <tr> <td>Serial number GAS</td> <td><input type="text"/></td> <td>Pitot tube diameter (EFM)</td> <td><input type="text"/></td> </tr> <tr> <td>Reference of calibration gas bottle</td> <td><input type="text"/></td> <td>Serial number Cab module</td> <td><input type="text"/></td> </tr> <tr> <td>Calibration gas value CO2 (%)</td> <td><input type="text"/></td> <td>Serial number GPS</td> <td><input type="text"/></td> </tr> <tr> <td>Calibration gas value CO (%)</td> <td><input type="text"/></td> <td>Serial number Probe</td> <td><input type="text"/></td> </tr> <tr> <td>Calibration gas value NO (ppm)</td> <td><input type="text"/></td> <td>Host software version of PEMS</td> <td><input type="text"/></td> </tr> <tr> <td>Calibration gas value NO2 (ppm)</td> <td><input type="text"/></td> <td>SENSOR Tech-CT LDV software version</td> <td><input type="text"/></td> </tr> <tr> <td>For petrol engines, damper fitted (yes/no)</td> <td><input type="text"/></td> <td></td> <td></td> </tr> </table>						Serial number SCS	<input type="text"/>	Serial number EFM	<input type="text"/>	Serial number GAS	<input type="text"/>	Pitot tube diameter (EFM)	<input type="text"/>	Reference of calibration gas bottle	<input type="text"/>	Serial number Cab module	<input type="text"/>	Calibration gas value CO2 (%)	<input type="text"/>	Serial number GPS	<input type="text"/>	Calibration gas value CO (%)	<input type="text"/>	Serial number Probe	<input type="text"/>	Calibration gas value NO (ppm)	<input type="text"/>	Host software version of PEMS	<input type="text"/>	Calibration gas value NO2 (ppm)	<input type="text"/>	SENSOR Tech-CT LDV software version	<input type="text"/>	For petrol engines, damper fitted (yes/no)	<input type="text"/>		
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<p>Preparation of measurement equipment</p> <p><input type="checkbox"/> PEMS heating phase completed.</p> <p><input type="checkbox"/> Set up a new recording using the pre-defined test name.</p> <p><input type="checkbox"/> Calibration of flowmeter and analysers according to manufacturer's recommendations.</p> <p><input type="checkbox"/> Configuration of PEMS for petrol/diesel according to vehicle being tested has been checked.</p> <p><input type="checkbox"/> Concentration of content of calibration bottles in accordance with values entered into the PEMS for calibration phase has been checked.</p> <p><input type="checkbox"/> Restart recording in Sample mode, (with the engine stopped). Start engine and conduct test, pause recording at the end of the road test.</p> <p><input type="checkbox"/> Conduct check of PEMS analysers (Calibration mode), stop recording.</p>					<p>Temperature (start of test)</p> <p>Soaking building: <input type="text"/></p> <p>Outside: <input type="text"/></p>																																
<p>Traffic density</p> <table border="1" style="width: 100%;"> <thead> <tr> <th></th> <th>Light</th> <th>Heavy</th> <th>Jams</th> <th>Comments (diversions, disturbances,...)</th> </tr> </thead> <tbody> <tr> <td>Urban </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Rural </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Motorway </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> </tbody> </table>							Light	Heavy	Jams	Comments (diversions, disturbances,...)	Urban	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Rural	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Motorway	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>													
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<p>Weather conditions</p> <p>Rain intensity to be determined according to windscreen wiper speed</p> <table border="1" style="width: 100%;"> <thead> <tr> <th></th> <th>None </th> <th>Intermittent </th> <th>Continuous slow </th> <th>Continuous fast </th> <th>Comments</th> </tr> </thead> <tbody> <tr> <td>Urban </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Rural </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> <tr> <td>Motorway </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> </tbody> </table> <p>Wind</p> <p><input type="checkbox"/> No wind</p> <p><input type="checkbox"/> Light</p> <p><input type="checkbox"/> Strong</p> <p><input type="checkbox"/> Very strong (in theory, prohibits testing)</p>							None	Intermittent	Continuous slow	Continuous fast	Comments	Urban	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Rural	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Motorway	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
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<p>Vehicle parameters</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Air-con / heating</p> <p><input type="checkbox"/> Vehicle fitted with automatic climate control (temperature regulation)</p> <p><input type="checkbox"/> Vehicle fitted with manual air-conditioning</p> <p><input type="checkbox"/> If regulated air-con: "A/C" and "Auto" set to 21°C</p> <p><input type="checkbox"/> If manual air-con: set to ensure passenger comfort</p> <p>Demisting</p> <p><input type="checkbox"/> A windscreen demisting cycle was carried out during the test</p> <p>Steering column stalks</p> <p><input type="checkbox"/> Automatic windscreen wiping activated</p> <p><input type="checkbox"/> Automatic headlamp illumination activated</p> </div> <div style="width: 45%;"> <p>Gear ratios</p> <p>Enter the mode active during the test (for example Sport mode): <input type="text"/></p> <p>Stop & Start</p> <p><input type="checkbox"/> Vehicle fitted with a Stop & Start system</p> <p><input type="checkbox"/> Stop & Start active during road test</p> <p>Stop & Start activation time, recorded at end of test (in s): <input type="text"/></p> <p>On-board computer</p> <p><input type="checkbox"/> Trip counter reset at start of test</p> <p>Fuel consumption measured at end of test (l/100km): <input type="text"/></p> </div> </div>																																					
<p>General route data</p> <table border="1" style="width: 100%;"> <thead> <tr> <th>Distance covered</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Kilometres at start: <input type="text"/></td> <td>Start time: <input type="text"/></td> </tr> <tr> <td>Kilometres at return: <input type="text"/></td> <td>Return time: <input type="text"/></td> </tr> <tr> <td>Distance covered: <input type="text"/></td> <td></td> </tr> </tbody> </table>						Distance covered	Time	Kilometres at start: <input type="text"/>	Start time: <input type="text"/>	Kilometres at return: <input type="text"/>	Return time: <input type="text"/>	Distance covered: <input type="text"/>																									
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