Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and
amending Regulation (EC) No 715/2007 of the European Parliament and of
the Council on type-approval of motor vehicles with respect to emissions from
light passenger and commercial vehicles (Euro 5 and Euro 6) and on access
to vehicle repair and maintenance information (Text with EEA relevance)

[F1ANNEX IIIA

VERIFYING REAL DRIVING EMISSIONS

Textual Amendments

F1   Inserted by Commission Regulation (EU) 2016/427 of 10 March 2016 amending Regulation (EC) No 692/2008 as regards emissions from light passenger and commercial vehicles (Euro 6) (Text with EEA relevance).

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1.   INTRODUCTION, DEFINITIONS AND ABBREVIATIONS

1.1.   Introduction

This Annex describes the procedure to verify the Real Driving Emissions (RDE) performance of light passenger and commercial vehicles.

1.2.   Definitions

1.2.1.   'Accuracy' means the deviation between a measured or calculated value and a traceable reference value.

1.2.2.   'Analyser' means any measurement device that is not part of the vehicle but installed to determine the concentration or the amount of gaseous or particle pollutants.

1.2.3.   'Axis intercept' of a linear regression (a_0) means:

$$a_0 = \bar{y} - (a_1 \times \bar{x})$$

where:

a_1	is the slope of the regression line
$\bar{x}$	is the mean value of the reference parameter
$\bar{y}$	is the mean value of the parameter to be verified.

1.2.4.   'Calibration' means the process of setting the response of an analyser, flow-measuring instrument, sensor, or signal so that its output agrees with one or multiple reference signals.

1.2.5.   'Coefficient of determination' (r^2) means:

$$r^2 = 1 - \frac{\sum_n^{i-1} [y_i - a_0 - (a_1 \times x_i)]^2}{\sum_n^{i-1} (y_i - \bar{y})^2}$$

where:

a_0	is the axis intercept of the linear regression line
a_1	is the slope of the linear regression line
x_i	is the measured reference value
y_i	is the measured value of the parameter to be verified
$\bar{y}$	is the mean value of the parameter to be verified
n	is the number of values

1.2.6.   'Cross-correlation coefficient' (r) means:

$$r = \frac{\sum_{n-1}^{i-1} (x_i - \bar{x}) \times (y_i - \bar{y})}{\sqrt{\sum_{n-1}^{i-1} (x_i - \bar{x})^2} \times \sqrt{\sum_{n-1}^{i-1} (y_i - \bar{y})^2}}$$

Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation...
ANNEX IIIA
Document Generated: 2024-05-17

3

where:

x_i	is the measured reference value
y_i	is the measured value of the parameter to be verified
$\bar{x}$	is the mean reference value
$\bar{y}$	is the mean value of the parameter to be verified
n	is the number of values

1.2.7. 'Delay time' means the time from the gas flow switching (t_0) until the response reaches 10 per cent (t_{10}) of the final reading.

1.2.8. 'Engine control unit (ECU) signals or data' means any vehicle information and signal recorded from the vehicle network using the protocols specified in point 3.4.5.of Appendix 1.

1.2.9. 'Engine control unit' means the electronic unit that controls various actuators to ensure the optimal performance of the powertrain.

1.2.10. 'Emissions' also referred to as 'components', 'pollutant components' or 'pollutant emissions' means the regulated gaseous or particle constituents of the exhaust.

1.2.11. 'Exhaust', also referred to as exhaust gas, means the total of all gaseous and particulate components emitted at the exhaust outlet or tailpipe as the result of fuel combustion within the vehicle's internal combustion engine.

1.2.12. 'Exhaust emissions' means the emissions of particles, characterised as particulate matter and particle number, and of gaseous components at the tailpipe of a vehicle.

1.2.13. 'Full scale' means the full range of an analyser, flow-measuring instrument or sensor as specified by the equipment manufacturer. If a sub-range of the analyser, flow-measuring instrument or sensor is used for measurements, full scale shall be understood as the maximum reading.

1.2.14. 'Hydrocarbon response factor' of a particular hydrocarbon species means the ratio between the reading of a FID and the concentration of the hydrocarbon species under consideration in the reference gas cylinder, expressed as $ppmC_1$.

1.2.15. 'Major maintenance' means the adjustment, repair or replacement of an analyser, flow-measuring instrument or sensor that could affect the accuracy of measurements.

1.2.16. 'Noise' means two times the root mean square of ten standard deviations, each calculated from the zero responses measured at a constant recording frequency of at least 1,0 Hz during a period of 30 seconds.

1.2.17. 'Non-methane hydrocarbons' (NMHC) means the total hydrocarbons (THC) excluding methane (CH_4).

1.2.18. 'Particle number' (PN) means as the total number of solid particles emitted from the vehicle exhaust as defined by the measurement procedure provided for by this Regulation for assessing the respective Euro 6 emission limit defined in Table 2 of Annex I to Regulation (EC) No 715/2007.

1.2.19. 'Precision' means 2,5 times the standard deviation of 10 repetitive responses to a given traceable standard value.

1.2.20.   'Reading' means the numerical value displayed by an analyser, flow-measuring instrument, sensor or any other measurement devise applied in the context of vehicle emission measurements.

1.2.21.   'Response time' (t_{90}) means the sum of the delay time and the rise time.

1.2.22.   'Rise time' means the time between the 10 per cent and 90 per cent response ($t_{90} - t_{10}$) of the final reading.

1.2.23.   'Root mean square' (x_{rms}) means the square root of the arithmetic mean of the squares of values and defined as:

$$x_{rms} = \sqrt{\frac{1}{n}\left(x_2^1 + x_2^2 + \ldots + x_2^n\right)}$$

where:

x	is the measured or calculated value
n	is the number of values

1.2.24.   'Sensor' means any measurement device that is not part of the vehicle itself but installed to determine parameters other than the concentration of gaseous and particle pollutants and the exhaust mass flow.

1.2.25.   'Span' means the calibration of an analyser, flow-measuring instrument, or sensor so that it gives an accurate response to a standard that matches as closely as possible the maximum value expected to occur during the actual emissions test.

1.2.26.   'Span response' means the mean response to a span signal over a time interval of at least 30 seconds.

1.2.27.   'Span response drift' means the difference between the mean response to a span signal and the actual span signal that is measured at a defined time period after an analyser, flow-measuring instrument or sensor was accurately spanned.

1.2.28.   'Slope' of a linear regression (a_1) means:

$$a_1 = \frac{\sum_n^{i=1}(y_i - \bar{y}) \times (x_i - \bar{x})}{\sum_n^{i=1}(x_i - \bar{x})^2}$$

where:

$\bar{x}$	is the mean value of the reference parameter
$\bar{y}$	is the mean value of the parameter to be verified
x_i	is the actual value of the reference parameter
y_i	is the actual value of the parameter to be verified
n	is the number of values

1.2.29.   'Standard error of estimate' (*SEE*) means:

$$SEE = \frac{1}{x_{max}} \times \sqrt{\frac{\sum_n^{i=1}\left(y_i - \acute{y}\right)^2}{(n-2)}}$$

where:

$\acute{y}$	is the estimated value of the parameter to be verified
y_i	is the actual value of the parameter to be verified
x_{max}	is the maximum actual value of the reference parameter

Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation...
ANNEX IIIA
Document Generated: 2024-05-17

5

n is the number of values

1.2.30. 'Total hydrocarbons' (THC) means the sum of all volatile compounds measurable by a flame ionisation detector (FID).

1.2.31. 'Traceable' means the ability to relate a measurement or reading through an unbroken chain of comparisons to a known and commonly agreed standard.

1.2.32. 'Transformation time' means the time difference between a change of concentration or flow (t_0) at the reference point and a system response of 50 per cent of the final reading (t_{50}).

1.2.33. 'Type of analyser', also referred to as 'analyser type' means a group of analysers produced by the same manufacturer that apply an identical principle to determine the concentration of one specific gaseous component or the number of particles.

1.2.34. 'Type of exhaust mass flow meter' means a group of exhaust mass flow meters produced by the same manufacturer that share a similar tube inner diameter and function on an identical principle to determine the mass flow rate of the exhaust gas.

1.2.35. 'Validation' means the process of evaluating the correct installation and functionality of a Portable Emissions Measurement System and the correctness of exhaust mass flow rate measurements as obtained from one or multiple non-traceable exhaust mass flow meters or as calculated from sensors or ECU signals.

1.2.36. 'Verification' means the process of evaluating whether the measured or calculated output of an analyser, flow-measuring instrument, sensor or signal agrees with a reference signal within one or more predetermined thresholds for acceptance.

1.2.37. 'Zero' means the calibration of an analyser, flow-measuring instrument or sensor so that it gives an accurate response to a zero signal.

1.2.38. 'Zero response' means the mean response to a zero signal over a time interval of at least 30 seconds.

1.2.39. 'Zero response drift' means the difference between the mean response to a zero signal and the actual zero signal that is measured over a defined time period after an analyser, flow-measuring instrument or sensor has been accurately zero calibrated.

1.3. Abbreviations

Abbreviations refer generically to both the singular and the plural forms of abbreviated terms.

CH_4	— Methane
CLD	— Chemiluminescence Detector
CO	— Carbon Monoxide
CO_2	— Carbon Dioxide
CVS	— Constant Volume Sampler
DCT	— Dual Clutch Transmission
ECU	— Engine Control Unit
EFM	— Exhaust mass Flow Meter
FID	— Flame Ionisation Detector
FS	— full scale
GPS	— Global Positioning System
H_2O	— Water
HC	— Hydrocarbons
HCLD	— Heated Chemiluminescence Detector

HEV	— Hybrid Electric Vehicle
ICE	— Internal Combustion Engine
ID	— identification number or code
LPG	— Liquid Petroleum Gas
MAW	— Moving Average Window
max	— maximum value
N_2	— Nitrogen
NDIR	— Non-Dispersive Infrared
NDUV	— Non-Dispersive Ultraviolet
NEDC	— New European Driving Cycle
NG	— Natural Gas
NMC	— Non-Methane Cutter
NMC-FID	— Non-Methane Cutter in combination with a Flame-Ionisation Detector
NMHC	— Non-Methane Hydrocarbons
NO	— Nitrogen Monoxide
No	— number
NO_2	— Nitrogen Dioxide
NO_X	— Nitrogen Oxides
NTE	— Not-to-exceed
O_2	— Oxygen
OBD	— On-Board Diagnostics
PEMS	— Portable Emissions Measurement System
PHEV	— Plug-in Hybrid Electric Vehicle
PN	— particle number
RDE	— Real Driving Emissions
SCR	— Selective Catalytic Reduction
SEE	— Standard Error of Estimate
THC	— Total Hydrocarbons
UN/ECE	— United Nations Economic Commission for Europe
VIN	— Vehicle Identification Number
WLTC	— Worldwide harmonised light vehicles test cycle
WWH-OBD	— Worldwide Harmonised On-Board Diagnostics]

Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation...
Document Generated: 2024-05-17

7

Changes to legislation:
There are currently no known outstanding effects for the Commission Regulation (EC) No 692/2008, Division 1..