



Emission Test Procedure by New ECE15Mode

KES T – E059

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1. Scope of Application

This shall apply to ECE-15 Mode (hereinafter referred as New ECE-15 Mode) including high-speed mode enacted from July. 1, 1992 out of Emission Attestations of gasoline car for exporting to EC province.

2. Purpose

This shall intend to promote efficiency of test by standardizing procedure of emission test with new ECE-15 mode.

3. Test Car and Test Fuel

3.1 Test car

3.1.1 A test car should be driven at least more than 3000 km before the test.

It is not specified on regulations and it should be maintained periodically by the method recommended by a manufacturer during driving.

3.1.2 In case of testing on Chassis Dynamo, it can test with pressurizing the tire pressure of driving wheel up to 1.5 times of specified value for setting same condition with driving condition on roads.

3.1.3 A test car should be under the Soaking condition in the room where environmental temperature is 25 ± 5 C for more than 6 hours before the test.

3.2 Fuel for testing

The standard of fuel for the unleaded test of a gasoline car is same with table 1.

Table 1

	Limits and Unit		ASTM Method
	Minimum	Maximum	
Research Octane Number	95.0		D 2699
Motor Octane Number	85.0		D 2700
Density at 15 °C	0.748	0.762	D 1298
Reid Vapout Pressure	0.56bar	0.64bar	D 323
Distillation (4)			
– Initial Boling Point	24 °C	40 °C	D 86
– 10% Vol Point	42 °C	58 °C	
– 50% Vol Point	90 °C	110 °C	
– 90% Vol Point	155 °C	180 °C	
– Final boling Point	190 °C	215 °C	
Residue		2%	D 86
Hydrocarbon Analysis :			
– Olefins		20% Vol	D 1319
– Aromatics	(Including Max 5% Vol Benzene(*)	45% Vol	(*) D 3606/ D 2267
– Saturates	Balance		D 1319
Carbon / Hydrogen Ratio		Ratio	
Oxidation Stability (5)	480min		D 525
Existent gun		4 mg/ 100 mℓ	D 381
Sulphur Content		0.04% mass	D 1266/ D 2622/ D 2785
Copper Corrosion at 50 °C		1	D 130
Lead Content		0.005 g/ ℓ	D 3237
Phosphorous Content		0.0013 g/ ℓ	D 3231
*) Addition of Oxygenates Prohibited			

4. Equipment and Instrument

4.1 Chassis Dynamo

4.1.1 A Chassis dynamo should be able to simulate on-road driving resistance as below.

- (1) It should be one that characteristics of driving resistance is fixed type or can be adjusted by more than 2 parameters
- (2) As time goes on, characteristics of dynamo should not change and there should not be any degree of vibration that can effect to the operation condition of engine.
- (3) It should have inertia simulating system that can simulate driving inertia of a car and should be connected to the front roller in case of two rollers.

4.1.2 Precision

- (1) Measuring precision of driving resistance should be less than $\pm 5\%$. In case that driving resistance is fixed type, setting should be $\pm 5\%$ for 80 km/h, in case that it is variable type, setting should be 5% for 40, 50, 60, 80, 100 km/h, 10% for 20 km/h and positive value for something below. (refer to KES T-E023 content 8)
- (2) Total inertia from rotating parts should be less than ± 20 kg of test inertia grade.
- (3) Speed of car should be measured with precision of ± 1 km/h at more than 10 km/h and in case of two rollers, measured by the front roller.

4.1.3 Setting load and inertia

- (1) One point fixed type : Check absorbing HP at uniform speed driving of 80 KPH and 50 KPH.
- (2) Multi point set type : Check absorbing HP at uniform speed driving of 100, 80, 60, 50, 40 KPH and 20 KPH.

4.2 Exhaust sampling system

- (1) As CVS method, it should be able to measure total produced amount of toxic material by concentration of sample extracted consecutively with regular period and total diluted

air volume produced during mode driving by mixing exhaust of car and air continuously

(Precision of measuring volume should be $\pm 2.0\%$)

(2) Flow rate of this system should be sufficient so that water is not condensed no matter how condition.

(3) Change in constant pressure applied to exhaust outlet of car should be less than ± 1.25 Kpa

(4) A bag for trap of sample gas should be one that doesn't make concentration of toxic material change more than 2 %.

4.3 Analyzing equipment

4.3.1 Analyzing equipment

(1) CO, CO₂

NDIR (Non – Dispersive Infra-Red Type)

(2) HC

FID (Gasoline : Flame Ionization Type)

HFID (190 ± 10 °C) (Diesel : Heated Flame Ionization Type)

FID Analyzer should be able to correct the precision with propane gas.

(3) Nox

It should be one that has NO_x-No Converter with CLD (Chemiluminescent) type or

NDUVR (Non-Dispersive Ultraviolet Resonance Absorption) type

4.3.2 Precision

(1) Analyzing precision

It should be less than ± 3 % without regard to concentration of correcting gas. At measuring in below 100 ppm it should be less than ± 3 ppm

(2) Also at measuring Background (Background : Ambient air Sample) concentration, the same range and analyzer with the time of analyzing sample shall be used.

- (3) HC analysis for Diesel shall measure by using HFID type through continuous HC concentration analysis and integration and detail content refer to ECE-R15, Annex 4, 4.3.2. Measuring precision of Particulates should be less than $\pm 1 \mu\text{g}$.
- (4) When correction of analyzer is required, it shall be executed at a month before formal attestation and every 6 month. Detail method refer to -----

4.4 Standard gas

- (1) Pure nitrogen (Degree of purity : $\leq 1\text{ppm C}$, $\leq 1\text{ppm CO}$, $\leq 400\text{ppm CO}_2 \leq 0.1\text{ppm NO}$)
- (2) Mixed air (Degree of purity : $\leq 1\text{ppm C}$, $\leq 1\text{ppm CO}$, $\leq 400\text{ppm CO}_2 \leq 0.1\text{ppm NO}$)
- Mixture of nitrogen and oxygen (Oxygen should be included with 18-21 % Vol)
- (3) Pure oxygen (Oxygen that degree of purity is more than 95 %)
- (4) Pure hydrogen (Degree of purity : $\leq 1\text{ppm C}$, $\leq 400\text{ppm CO}_2$)
- (5) Correcting gas : $\text{C}_3\text{H}_8/\text{AIR}$, CO/N_2 , CO_2/N_2 , NO/N_2 (NO_2 is less than $\pm 2 \%$)

4.5 Other equipment

- (1) Temperature
- Measuring precision $\pm 1.5 \text{ }^\circ\text{C}$
- (2) Atmospheric pressure
- Measuring precision $\pm 0.1 \text{ KPa}$
- (3) Absolute humidity
- Measuring precision $\pm 5 \%$

5. Test Driving Mode

5.1 Setting inertia weight

- (1) Set equivalent inertia weight of Chassis Dynamo according to below table 2 as reference weight.

Table 2

Reference weight (kg)	Equivalent inertia weight
Less than 750	680kg/1499.1 l b
More than 750 Less than 850	800kg/1763.7 l b
More than 850 Less than 1020	910kg/2006.2 l b
More than 1020 Less than 1250	1130kg/2491.2 l b
More than 1250 Less than 1470	1360kg/2998.3 l b
More than 1470 Less than 1700	1590kg/3505.4 l b
More than 1700 Less than 1930	1810kg/3990.4 l b
More than 1930 Less than 2150	2040kg/4497.4 l b
More than 2150 Less than 2380	2270kg/5004.5 l b
More than 2380 Less than 2610	2270kg/5004.5 l b
More than 2610	2270kg/5004.5 l b

(2) When setting with kg unit as equivalent inertia weight is impossible, set with less than ±20 kg for responsible equivalent inertia weight.

5.2 Setting absorbing HP of Chassis Dynamometer

5.2.1 Setting method

Setting method shall be executed according to below 5 methods.

- (1) Method of simulating on-road intake negative pressure
- (2) Method of simulating on-road driving resistance
- (3) Method by simulating driving torque
- (4) Method by simulating deceleration
- (5) Method by using regulation specified power table.

5.2.2 Method of simulating on-road intake negative pressure

(1) Test condition

(a) Negative pressure

Negative pressure of intake manifold should be data of which precision is less than ± 0.25 KPa

(b) Speed of car

It should be data of which precision is less than ± 0.4 KPH

(c) Air condition

As standard condition of atmospheric pressure 100 KPa, temperature 20 C, it should not get out of more than ± 7.5 %

(d) Test road

The road used at coasting test should have sufficient length(1~2km) and gradient of it should be less than ± 0.1 %. Also, surface of road should be dry during all preceding of this test.

(e) Wind

Speed of wind should be less than 3 m/s and maximum speed of wind should be less than 5 m/s. And, Speed of component of wind perpendicular to driving road should be less than 2 m/s and measuring speed of wind at that time should be taken at the point above 0.7 m from surface of road.

(2) Preparation of test car

(a) A test car should be driven at least more than 3000 km. Also, tires of a test car should be taken driving for the same time or 90 – 50 % of initial thread depth should remain.

(b) Adjust weight of test car so as to be reference weight for emission test.

For fuel consumption rate test, adjust it that is added with 50 % of deference between total weight of car and weight of empty car (it should not more than 180 kg)

or 180 kg

(c) Close windows of car during on-road test, do not attach accessory parts of head lamp · air-con etc.

(d) Keep interior and exterior of car clean.

(e) Preheat test car sufficiently before starting the test.

(f) Measure atmospheric temperature before starting the test by a reasonable method.

(3) test executing method on road

(a) As it drives at the uniform speed of 80 KPH, measure the speed of the car and intake negative pressure according to the condition of content (2)-(a).

(b) Measure total 6 times under the same condition as it drives toward each other direction. These test of 6 times should be completed in 4 hours.

(c) Data processing and evaluation of applicability

- ① The speed of the car should not be less than 79.5 KPH and more than 80.5 KPH
- ② Obtain standard deviation from each negative pressure measured at the period of a second. This calculation should use at least more than 10 negative pressure data.
- ③ At the moment standard deviation of each test result should not be more than 10 % of average of them.
- ④ Take an average by gathering averaging value of each directional negative pressure of 6 times.

(4) Setting load of Chassis Dynamometer

(a) Preparation

- ① Install a car on Dynamo.
- ② Adjust the air pressure of tires according to regulation.
- ③ Adjust equivalent inertia weight of Dynamo.

(a) Setting load