Attachment 42

MEASUREMENT PROCEDURE FOR EXHAUST EMISSION OF LIGHT- AND MEDIUM-DUTY MOTOR VEHICLES

1. Scope

This Technical Standard shall apply to the measurements made to determine emission amounts of carbon monoxide (hereinafter referred to as the "CO"), total hydrocarbon (hereinafter referred to as the "THC"), nonmethane hydrocarbons (hereinafter referred to as the "NMHC"), methane (hereinafter referred to as the "CH_4"), oxides of nitrogen (hereinafter referred to as the "NOx"), carbon dioxide (hereinafter referred to as the "CO_2"), and particulate matters (hereinafter referred to as the "PM"), that are contained in the exhaust gas emitted to the atmosphere from the tail pipes concerned of ordinary- and small-sized motor vehicles (except unloaded with or without sidecars (hereinafter the same)) fueled by gasoline or liquefied petroleum gas (hereinafter referred to as "LPG"), compressed natural gas (hereinafter referred to as "CNG") or diesel oil, with a gross vehicle weight of 3.5 tons or less or used exclusively for carriage of passengers with a riding capacity of 10 persons or less, as well as mini-sized motor vehicles (except unloaded), when these motor vehicles are operated under the JC08H-mode method of Paragraph 7–1 or JC08C-mode method of Paragraph 7–2.

Furthermore, as for measurements of emission amounts from vehicles which use fuel other than gasoline, LPG, CNG, or diesel oil, they shall be separately specified as necessary, when the relevant vehicles are available for use.

2. Terms and Abbreviations

The terms and abbreviations used in this Technical Standard shall be based on Attached Table 1 and Attached Table 2, respectively.

3. Test Vehicle

The test vehicle shall be under the following conditions.

(1) The test vehicle shall be in a serviced condition in accordance with the requirements set forth in the Motor Vehicle Checking Standards.

(2) The engine hood shall be closed.

(3) The tire air pressure of the test vehicle shall be set to the pressure specified in the Specification Table. The tire air pressure shall be measured before the test vehicle is operated (while cold), with the test vehicle stationary on a level surface.

However, if the roller diameter of the chassis dynamometer is less than 500 mm, the tire air pressure of the test vehicle may be increased up to a maximum of 1.5 times the air pressure specified in the Specification Table, if such adjustment of tire air pressure is necessary to closely simulate the conditions of the test vehicle on a level, paved road surface (hereinafter referred to as “level paved road”).

4. Test Fuel

The standard specifications of fuel used for the test vehicle shall be as specified in Attached Sheet 1.

5. Adjustment, etc. of Measuring Devices

5−1 Accuracy, calibration, etc. of measuring devices

The measuring devices shall have the accuracies specified in 5−1−1, and shall be serviced and maintained based on the handling procedures designated by the manufacturers of the devices, and verified and calibrated as necessary.

5−1−1 Accuracies of measuring devices

Accuracies of measuring devices shall be in accordance with the following.

(1) The accuracy of the thermometer shall be within ± 1 K (± 1°C).

(2) The accuracy of the barometer shall be within ± 0.1 kPa.

(3) The accuracy of the anemometer shall be within ± 1 m/s.

(4) The accuracy of the speedometer shall be within ± 0.5 km/h.

(5) The accuracy of the device for measuring coasting time shall be within ± 0.1 second.

(6) The accuracy of the wheel torque meter shall be within ± 2% of the full scale.

(7) The analyzer shall have the accuracy specified in Attached Sheet 2.

(8) The accuracy of the constant volume sampler (hereinafter referred to as “CVS system”) shall be within ± 2% of measured flow volume.

(9) The accuracy of the sample flowmeter of the diluted exhaust gas (referring to the mixture of the exhaust gas and dilution air of the necessary amount for the exhaust gas analysis. Hereinafter the same.) shall be within ± 2% of measured flow volume.

(10) The PM measuring device shall have the accuracy specified in Attached Sheet 9.

5−1−2 Calibration gas, fuel gas, and ozone generating gas

The calibration gas used to calibrate the analyzer, and fuel gas and ozone generating gas used in measurement shall be as specified in Attached Sheet 3.

5−2 Setting of equivalent inertia weight

The equivalent inertia weight of the chassis dynamometer shall be set to the standard value of equivalent inertia weight specified in the right column of Table 1 according to the relative test vehicle weight (vehicle weight + 110 kg) specified in the left column of the table. Furthermore, if the standard value of the equivalent inertia weight in the right column of the said Table cannot be set, it is permissible to set the equivalent inertia weight within a range between the said standard value and the said standard value +10%.

Table 1

Test vehicle weight (kg)	Standard value of equivalent inertia weight (kg)
- 480	455
481 - 540	510
541 - 595	570
596 - 650	625
651 - 710	680
711 - 765	740
766 - 850	800
851 - 965	910
966 - 1080	1020
1081 - 1190	1130
1191 - 1305	1250
1306 - 1420	1360
1421 - 1530	1470
1531 - 1640	1590
1641 - 1760	1700
1761 - 1870	1810
1871 - 1980	1930
1981 - 2100	2040
2101 - 2210	2150
2211 - 2380	2270
2381 - 2625	2500
2626 - 2875	2750
2876 - 3250	3000
3251 - 3750	3500
Continued in increments of 500 kg	Continued in increments of 500 kg

5−3 Setting of test vehicle, etc.

When the test vehicle is placed on the chassis dynamometer, care must be taken regarding the following.

(1) One person shall ride on the test vehicle. Under this condition, the vehicle weight need not be the same as the specified test vehicle weight.

(2) Water, gravel, etc. which may cause slipping of the test vehicle or any other matter which may constitute a potential hazard shall be removed from the tires of the driving wheels of the test vehicle.

(3) The test vehicle shall be set in such a way that rolling, etc. of the test vehicle is kept to a minimum during the operation.

(4) If there is a possibility of the tires slipping in the mode operation on the chassis dynamometer, appropriate measures shall be taken to

prevent such slipping, by adjusting the weight in the range of the total vehicle weight of the relevant test vehicle.

(5) During the run, the test vehicle shall be cooled with a blower, etc., so that the running conditions are equivalent to the actual conditions.

5–4 Setting of chassis dynamometer load

The chassis dynamometer load shall be set, after measuring the running resistance of the test vehicle on a test road as specified in Attached Sheet 4, in such a way that the running resistance value of the test vehicle will be reproduced. In this case, the test vehicle and chassis dynamometer shall be warmed up thoroughly by operating the test vehicle continuously on the chassis dynamometer at a speed of 60 km/h or more.

5–5 Connection, etc. of measuring devices

When the exhaust gas sampling section of the CVS system is connected to the exhaust pipe outlet of the test vehicle, it shall be done as follows.

Additionally, for a test vehicle for which the emission amount of PM is measured, the dilution tunnel system as specified in Attached Sheet 9 shall be connected.

(1) The connection shall be performed so that there is no adverse effect on the exhaust gas sampling.

(2) The connecting sections shall be installed securely so that they will not break or disengage due to vibration, etc. Moreover, there shall be no exhaust gas leakage at the connecting sections.

(3) If the test vehicle is equipped with an exhaust emission control device which performs control using the back-pressure of the exhaust gas, some appropriate measures, such as a method to lessen the change of pulsation state, shall be taken so that the functions of the emission control device are not adversely affected by using the CVS system.

In this case, the tolerable difference between the static pressure at the exhaust pipe outlet of the test vehicle running at a constant speed of 70 ± 2 km/h and the static pressure at the connection when the exhaust pipe outlet is connected to the exhaust gas sampling port of the CVS system shall be within ± 0.10 kPa.

6. Test Room

During the exhaust emission test, the test room shall be maintained under the following conditions.

(1) The temperature of the test room shall be kept at 298 ± 5 K (25 ± 5°C), and the relative humidity (hereinafter referred to as "humidity") shall be in the range of 30% to 75%. The temperature measuring point shall be close to the cooling fan. Furthermore, the temperature shall be measured before the running mode described in Attached Sheet 6 is started and again after the mode is completed.

(2) The concentrations of CO, THC, NMHC, CH_4, NOx and CO_2 (hereinafter referred to as "CO, etc.") in the test room shall be stable.

7. Driving Schedule of Test Vehicle

7–1 JC08H-mode method

This refers to an operating method by which the setting of the vehicle conditions is performed before the test as specified in Attached Sheet 5, and the running is carried out using the method specified in Attached Sheet 6–1 (hereinafter referred to as the "JC08H-mode method").

7–2 JC08C-mode method

This refers to an operating method by which the setting of the vehicle conditions is performed before the test as specified in Attached Sheet 5, and the running is carried out using the method specified in Attached Sheet 6–2 (hereinafter referred to as the "JC08C-mode method").

8. Exhaust Emission Measurement

The exhaust emission measurement shall be carried out, using the method provided for in Paragraphs 8–1 through 8–3. Moreover, the emission weight of the respective exhaust emissions shall be corrected and calculated according to Attached Sheet 10 in the case of electric hybrid motor vehicles; and according to Attached Sheet 11 in the case of periodic control motor vehicles.

8–1 Exhaust emission measurement while idling

For vehicles fueled by gasoline or LPG, the concentration of exhaust emission while idling shall be measured as specified in Attached Sheet 7.

8−2 Exhaust emission measurement under JC08H-mode method

For measuring the exhaust emissions under the JC08H-mode method, collect CO, etc. and PM from the start to the end of exhaust emission collection as specified in Attached Sheet 6–1, and calculate their emission amounts after the measurement according to the method specified in Attached Sheets 8 and 9, respectively.

8−3 Exhaust emission measurement under JC08C-mode method

For measuring the exhaust emissions under the JC08C-mode method, collect CO, etc. and PM from the start to the end of exhaust emission collection as specified in Attached Sheet 6–2, and calculate their emission amounts after the measurement according to the method specified in Attached Sheets 8 and 9, respectively.

Attached Table 1 (Related to Paragraph 2)

Reference	Terms	Definition
Attached Sheet 9	PM	All substances obtained by sampling the diluted exhaust gas on a filter
	PMb	All substances in the dilution air sampled on a filter at the time of the measurement running or all substances in the dilution air sampled on a filter, using the PM sampling system, under a condition that the exhaust gas is not introduced to the dilution tunnel before the start of the test or after completion of the test
Attached Sheet 10	Electric hybrid motor vehicle	Motor vehicles fueled by gasoline, LPG, CNG or diesel fuel, equipped with an internal combustion engine and an electric motor as prime movers as well as with a function to convert the kinetic energy of the motor vehicle concerned into the electric energy and to charge the electric storage device for driving the electric motor (hereinafter referred to as the "electric storage device") (except motor vehicles equipped with an external charger for charging the electric storage device)
	Current balance of electric storage device	Difference, expressed in Ah, between the total charged amount and the total discharged amount of the electric storage device in a certain period of time, which is obtained by a continuous measurement of the balance of the current into the electric storage device
	Emission amount correction factor	Factor to be used for correcting the effect of the current balance of the electric storage device on the emission amount of the exhaust emissions, etc.
	Each exhaust emission mode method	Operating method for determining the emission amount correction factor according to the JC08H-mode method and JC08C-mode method
Attached Sheet 11	Periodic control motor vehicle	Motor vehicles in which a control that may affect the emission amount of the exhaust emissions, etc. is periodically carried out (such as motor vehicles equipped with a DPF or catalyst in which the forced regeneration control is carried out or forced charging is periodically performed to protect the battery), except motor vehicles in which the said control is carried out one or more times during the exhaust emission measurement according to the JC08C-mode method and JC08H-mode method

Reference	Terms	Definition
	Basic cycle	Operating cycle where the running according to the JC08C-mode method (in this case, as regards the vehicle condition setting prior to the running according to the JC08C-mode method provided for in Attached Sheet 5, “after driving once according to the JC08-mode method posted in Attached Sheet 6, using the test motor vehicle on a chassis dynamometer, soak the engine in a stopped condition for between 6 hours and 36 hours in a room at a temperature of 298 ± 5 K (25 ± 5°C)” shall read as “soak the engine in a stopped condition for 6 hours or more in a room at a temperature of 298 ± 5 K (25 ± 5°C)”) is followed by the running according to the JC08-mode continually performed 3 times.

Attached Table 2 (Related to Paragraph 2)

Refer-ence	Symbol	Unit	Definition
Attached Sheet 4	F	N	Running resistance at respective designated speeds
	W	kg	Test vehicle weight (when measuring running resistance)
	W_4	kg	Equivalent inertia weight of revolving part of test vehicle
	t	s	Average coasting time at respective specified speeds
	a	N	Value equivalent to rolling resistance to be used when the running resistance is measured according to the coast-down method
	b	$N/(km/h)^2$	Value equivalent to coefficient of air resistance to be used when the running resistance is measured according to the coast-down method
	V	km/h	Speed
	F_0	N	Target running resistance
	v	km/h	Average value of wind speed components parallel to test road
	a_0	N	Value equivalent to rolling resistance under standard conditions, to be used when the running resistance is measured according to the coast-down method
	b_0	$N/(km/h)^2$	Value equivalent to coefficient of air resistance under standard conditions, to be used when the running resistance is measured according to the coast-down method
	Te	K	Average air temperature at the test road
	P	kPa	Average atmospheric pressure at the test road
	T	N·m	Running torque
	c	N·m	Value equivalent to rolling resistance to be used when the running resistance is measured according to the wheel torque method
	d	$N·m/(km/h)^2$	Value equivalent to coefficient of air resistance to be used when the running resistance is measured according to the wheel torque method
	T_0	N·m	Target torque
	c_0	N·m	Value equivalent to rolling resistance under standard conditions, to be used when the running resistance is measured according to the wheel torque method
	d_0	$N·m/(km/h)^2$	Value equivalent to coefficient of air resistance under standard conditions, to be used when the running resistance is measured according to the wheel torque method
	Fc	N	Set running resistance
	IW	kg	Equivalent inertia weight
	W_2	kg	Equivalent inertia weight of revolving part in driving system of test vehicle
	tc	s	Average coasting time
Attached Sheet 7	COm	%	Measured concentration of CO
	HCm	ppm	Measured concentration of HC
	CO_2m	%	Measured concentration of CO_2
Attached Sheet 8	DF		Dilution rate
	CO_2e	%	CO_2 concentration of diluted exhaust gas
	THCe	ppmC	THC concentration of diluted exhaust gas

Refer-ence	Symbol	Unit	Definition
	COe	ppm	CO concentration of diluted exhaust gas
	Vmix	ℓ/km	Diluted exhaust gas volume per km running under standard conditions
	V_e	ℓ/rev	Whole volume of diluted exhaust gas pumped by positive displacement pump per revolution
	N		Total number of revolutions of positive displacement pump during sampling of the diluted exhaust gas into sampling bags
	Pp	kPa	Absolute pressure of diluted exhaust gas at positive displacement pump inlet (which is atmospheric pressure minus pressure depression of mixture entering the positive displacement pump)
	Tp	K	Average absolute temperature of diluted exhaust gas at positive displacement pump inlet
	Vp	ℓ	Diluted exhaust gas sample amount under mode running under standard conditions
	K_2		Venturi calibration coefficient
	Qc	ℓ/s	Measured gas flow rate
	Pc	kPa	Measured atmospheric pressure
	Tc	K	Measured atmospheric absolute temperature
	T_0	K	Absolute temperature at venturi inlet
	P_0	kPa	Absolute pressure at venturi inlet
	te	s	Total running time in mode operation
	Pv (t)	kPa	Absolute pressure of diluted exhaust gas at venturi inlet
	Tv (t)	K	Absolute temperature of diluted exhaust gas at venturi inlet
	t	s	Time
	COmass	g/km	CO emission weight
	COdensity	g/ℓ	CO mass (g) per liter under standard conditions
	COconc	ppm	Net concentration of CO
	COd	ppm	CO concentration of dilution air
	R	%	Relative humidity of dilution air
	COem	ppm	CO concentration of diluted exhaust gas when an absorbent is used
	COdm	ppm	CO concentration of dilution air when an absorbent is used
	THCmass	g/km	HC emission weight
	THCdensity	g/ℓ	THC mass per liter under standard conditions
	THCconc	ppmC	Net concentration of THC
	THCd	ppmC	HC concentration of dilution air
	CH_4e	ppmC	CH_4 concentration in diluted exhaust emission
	CH_4d	ppmC	CH_4 concentration in dilution air
	HC_{NMC}	ppmC	HC concentration measured with NMC-FID analyzer
	THC	ppmC	THC concentration measured with FID analyzer
	CE_M		Methane efficiency
	CH_{4W}	ppmC	CH_4 concentration measured with NMC-FID analyzer
	$CH_{4W/O}$	ppmC	CH_4 concentration measured with FID analyzer
	CE_E		Ethane efficiency
	C_2H_{6W}	ppmC	C_2H_6 concentration measured with NMC-FID analyzer
	$C_2H_{6W/O}$	ppmC	C_2H_6 concentration measured with FID analyzer

Refer-ence	Symbol	Unit	Definition
	NMHCmass	g/km	Emission amount of NMHC
	NMHCdensity	g/l	NMHC mass per liter under standard conditions
	NMHCconc	ppmC	Net concentration of NMHC
	CH_4conc	ppmC	Net concentration of CH_4
	γ		Sensitivity coefficient of analyzer (FID) for CH_4
	e	kPa	Water vapor pressure in air
	e's	kPa	Saturated water vapor pressure at T_2
	T_1	K	Dry-bulb temperature in the test room, which is the mean value of measured absolute temperature at the start and finish of the mode operation
	T_2	K	Wet-bulb temperature in the test room, which is the mean value of measured absolute temperature at the start and finish of the mode operation
	Pa	kPa	Atmospheric pressure of the test room
	KH		Humidity correction factor
	H		Mass ratio of water (g) to dry air (kg) in the test room air
	NOxmass	g/km	NOx emission weight
	NOxdensity	g/ℓ	NOx mass (g) per liter under standard conditions, assuming that the whole amount of NOx is NO_2 (1.91 g/A).
	NOxconc	ppm	Net concentration of NOx
	NOxe	ppm	NOx concentration of diluted exhaust gas
	NOxd	ppm	NOx concentration of dilution air
	CO_2mass	g/km	CO_2 emission weight
	CO_2density	g/ℓ	CO_2 mass (g) per liter under standard conditions
	CO_2conc	%	Net concentration of CO_2
	CO_2d	%	CO_2 concentration of dilution air
Attached Sheet 9	PMmass	g/km	PM emission weight
	Vp	ℓ	Diluted exhaust gas sample amount under mode running under standard conditions
	Vb	ℓ	Dilution air sample amount of PMb under mode running under standard conditions
Attached Sheet 10	K_{EW}	g/km/Ah	Emission amount correction factor
	E_{Wi}	g/km	Emission amount of exhaust emission component according to each exhaust emission mode method
	C_i	Ah	Current balance according to each exhaust emission mode method
	n		Number of data
	E_{W0}	g/km	Corrected emission amount when current balance is zero
	E_{WS}	g/km	Emission amount of each exhaust emission component in basic test
	C_S	Ah	Current balance in basic test
Attached Sheet 11	Ki	g/km	Periodic control corrected value of each substance measured (i)
	Mpi	g/km	Weighted average value of emission weight of the substance measured (i) during normal running and during periodic control running

Refer-ence	Symbol	Unit	Definition
	Msi(m)	g/km	Emission weight of the substance measured (i) in the measurement cycle during a normal running period immediately after the completion of a periodic control running
	Msi	g/km	Average emission weight of the substance measured (i) in the measurement cycle during normal running
	Msij	g/km	Average emission weight of the substance measured (i) in the measurement cycle during normal running for each basic cycle
	Mri	g/km	Average emission weight of the substance measured (i) in the measurement cycle during periodic control running
	Mrij	g/km	Average emission weight of the substance measured (i) in the measurement cycle during periodic control running for each basic cycle
	D	km	Total running distance of normal running
	d	km	Total running distance of periodic control running
	n_s		Number of tests of basic cycle during normal running
	n_r		Number of tests of basic cycle during periodic control running

Attached Sheet 1

PROPERTIES, ETC. OF TEST FUEL (RELATED TO 4)

1. Gasoline

The standard specifications of gasoline used for the test vehicle shall be as specified in Attached Sheet 1.

Table 1

Fuel property or substance name		Standard		Testing method
		Regular	Premium	
Lead		Not to be detected		JIS K2255
Sulfur content		10 Wt-ppm or less		JIS K2541–1 JIS K2541–2 JIS K2541–6 JIS K2541–7
All aromatic series		20 - 45 vol%		JIS K2536–1 JIS K2536–2 JIS K2536–3
Olefin		15 - 25 vol%		JIS K2536–1 JIS K2536–2
Benzene		1.0 vol% or less		JIS K2536–2 JIS K2536–3 JIS K2536–4
Oxygen concentration		Not to be detected		JIS K2536–2 JIS K2536–4 JIS K2536–6
MTBE		Not to be detected		JIS K2536–2 JIS K2536–4 JIS K2536–5 JIS K2536–6
Methanol		Not to be detected		JIS K2536–2 JIS K2536–4 JIS K2536–5 JIS K2536–6
Ethanol		Not to be detected		JIS K2536–2 JIS K2536–4 JIS K2536–6
Existent gum		5 mg/100mℓ or less		JIS K2261
Kerosene		Not to be detected		JIS K2536–2 JIS K2536–4
Octane number	RON	90 - 92	99 - 101	JIS K2280
	MON	80 - 82	86 - 88	

Fuel property or substance name	Standard		Testing method
	Regular	Premium	
Density	0.72 - 0.77 g/cm^3		JIS K2249
Distillation properties 10% distillation temperature 50% distillation temperature 90% distillation temperature Final distillation temperature	 318 - 328 K (45 - 55°C) 363 - 373 K (90 - 100°C) 413 - 443 K (140 - 170°C) 488 K (215°C) or less		JIS K2254
Vapor pressure	56 - 60 kPa		JIS K2258

2. LPG

LPG used for the test vehicle shall have properties, etc. equivalent to JIS K2240, and the composition of 20 mol% or more, but 30 mol% or less, of propane + propylene, and 70 mol% or more, but 80 mol% or less, of butane + butylene, respectively.

3. CNG

The standard specifications of CNG used for the test vehicle shall be equivalent to “13A” and as given in Table 2.

Table 2

Fuel property or substance name	Specification
Gross calorific value (kcal/Nm^3)	10,410 - 11,050
Wobbe index (WI)	13,260 - 13,730
Maximum combustion speed (MCP)	36.8 - 37.5
Methane (mol%)	85.0 or more
Ethane (mol%)	10.0 or less
Propane (mol%)	6.0 or less
Butane (mol%)	4.0 or less
HC of C3+C4 (mol%)	8.0 or less
HC of C5 or more (mol%)	0.1 or less
Other gases ($H2+O_2+N_2+CO+CO_2$) (mol%)	1.0 or less
Sulfur (mg/Nm^3)	10 or less

4. Diesel Oil

The standard specifications of diesel oil used for the test vehicle shall be as given in Table 3.

Table 3

Fuel property or substance name	Specification	Testing method
Sulfur content	10 Wt-ppm or less	JIS K2541–1 JIS K2541–2 JIS K2541–6 JIS K2541–7
Cetane number	53 - 57	JIS K2280
Density	0.824 - 0.840 g/cm^3	JIS K2249
Distillation properties 50% distillation temperature 90% distillation temperature Final distillation temperature	 528 - 568 K (255 - 295°C) 573 - 618 K (300 - 345°C) 643 K or less (370°C or less)	JIS K2254
All aromatic series	25 vol% or less	JIS method HPLC
Polycyclic aromatic series	5.0 vol% or less	JIS method HPLC
Fatty acid methyl ester	0.1% or less	Method prescribed in the Concentration Measurement Procedure Announcement
Triglyceride	0.01% or less	Method prescribed in the Concentration Measurement Procedure Announcement
Flash point	331 K (58°C) or more	JIS K2265–3
Kinematic viscosity (test temperature 303K (30°C))	3.0 - 4.5 mm^2/s	JIS K2283

Attached Sheet 2

ANALYZER (RELATED TO 5)

1. Analyzer

Except for the measurements given in Attached Sheet 7, measurements of exhaust emission concentration shall be in accordance with the following.

(1) Exhaust emission concentrations shall be measured for the exhaust emission components, posted in the middle column of Table 1, corresponding to the fuel used given in the left column of the same Table, by the analyzer given in the right column of the table.

Table 1

Fuel	Exhaust emission component	Analyzer
Gasoline LPG CNG	CO	Nondispersive infrared analyzer (NDIR)
	THC	Hydrogen flame ionization detector (FID)
	CH_4	Selective combustion methane analyzer (NMC-FID) or gas chromatograph spectrometer (GC-FID)
	NO_x	Chemiluminescence detector (CLD)
	CO_2	Nondispersive infrared analyzer (NDIR)
Diesel oil	CO	Nondispersive infrared analyzer (NDIR)
	THC	Heated flame ionization detector (HFID)
	CH_4	Selective combustion methane analyzer (NMC-FID) or gas chromatograph spectrometer (GC-FID)
	NO_x	Chemiluminescence detector (CLD)
	CO_2	Nondispersive infrared analyzer (NDIR)

(2) Heating temperature of the sampling channel of THC in the heated flame ionization detector (HFID) shall be 463 ± 10 K (190 ± 10°C).

(3) The analyzers shall have the following accuracies.

① As for the response speed, when calibration gas is flowed, the time to reach 90% of the indicated value of the concentration of the calibration gas concerned shall be 3.0 seconds or less (except when using GC-FID).

② As for safety, in all ranges used, the fluctuation of the indicated value within 80 ± 20% of zero and full scale shall be within 2% of the full scale for 15 minutes after the analyzer reached the indicated value (except when using GC-FID).

③ As for reproducibility, in all ranges used, the standard deviation

at 80 ± 20% of zero and full scale shall be within 1% of the full scale.

Attached Sheet 3

CALIBRATION GAS, ETC. (RELATED TO 5)

1. Calibration Gas, Fuel Gas, and Ozone Generating Gas

(1) Components of calibration gas, fuel gas, and ozone generating gas shall be as given in Table 1, corresponding to the components of exhaust emission.

Table 1

Exhaust emission components	Type of gas		Gas components	
CO	Calibration gas	In zero adjustment	N_2	High-purity N_2 (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower)
		In span adjustment	CO, N_2 balance	
THC (FID, HFID)	Calibration gas	In zero adjustment	Air	High-purity air (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower, oxygen content: 18 to 21 vol%)
		In span adjustment	C_3H_8, air balance	
	Fuel gas		H_2: 40±2%, balance gas: He (HC: 1ppmC equivalent or lower, CO_2: 400ppm or lower)	
HC (NDIR)	Calibration gas	In zero adjustment	N_2	High-purity N_2 (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower)
		In span adjustment	C_6H_{14}, N_2 balance (If propane/hexane sensitivity coefficient of the analyzer is known, C_3H_8, N_2 balance)	
NOx	Calibration gas	In zero adjustment	N_2	High-purity N_2 (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower)
		In span adjustment	NO, N_2 balance	
	Ozone generating gas		Oxygen (purity 99.5 vol% or more) or high-purity air (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower, oxygen content: 18 to 21 vol%) * Based on the principle of ozone generator.	

Exhaust emission components	Type of gas		Gas components	
CH_4	Calibration gas	In zero adjustment	Air	High-purity air (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower, oxygen content: 18 to 21 vol%)
		In span adjustment	CH_4, air balance (in case of GC-FID)	
			C_3H_8, air balance (In case of NMC-FID)	
	Fuel gas		H_2: 40±2%, balance gas: He (HC: 1ppmC equivalent or lower, CO_2: 400ppm or lower)	
	Gas for calculating methane efficiency		CH_4, air balance	
	Gas for calculating ethane efficiency		C_2H_6, air balance	
CO_2	Calibration gas	In zero adjustment	N_2	High-purity N_2 (HC: 1ppmC equivalent or lower, CO: 1ppm or lower, CO_2: 400ppm or lower, NO: 0.1ppm or lower)
		In span adjustment	CO, N_2 balance	

(2) The calibration gas may depend on a gas divider.

(3) The accuracy of concentration indication of calibration gas shall be within ±2% of the indicated concentration.

Also, if it depends on a gas divider, it shall be within ±2% of divided concentration.

(4) The concentration of calibration gas used for span adjustment of the analyzer shall be approximately 70% or more, but 100% or less, of the full scale of the analyzer.

(5) The concentration of calibration gas of THC (FID, HFID) and CH_4 (NMC-FID, GC-FID) shall be expressed in equivalent carbon concentration ppmC, which shall represent values of concentration of C_3H_8 or CH_4 in ppm multiplied by 3.

Attached Sheet 4

METHOD OF MEASURING RUNNING RESISTANCE AND SETTING THE LOAD ON THE CHASSIS DYNAMOMETER (RELATED TO 5)

1. Outline of Running Resistance Measurement Procedure, Etc.

When setting the load on the chassis dynamometer, using the test vehicle and test instruments, etc. in this Attached Sheet 2 (hereinafter the Paragraph numbers shall refer to those in the relevant Attached Sheet unless specified otherwise), based on the running resistance measurement procedure shown in Paragraph 3., calculate the target running resistance under standard atmospheric conditions (air temperature 293 K (20°C), atmospheric pressure 101.3 kPa, without wind) on the basis of the running resistance measured ion the test road, and set the load equivalent to the target running resistance on the chassis dynamometer, in which the test vehicle is installed, by the load setting method shown in Paragraph 4

2. Test Vehicle, Etc.

When measuring the running resistance on the test road, the test vehicle, etc. shall be in the conditions shown below.

2–1 Test vehicles

(1) The test vehicle, with the test instruments, etc. necessary for running resistance measurement mounted and the driver seated, shall be of the weight obtained when two persons (assuming that the weight of one person is 55 kg), or weights total 110 kg, are loaded on the test vehicle which is in an “unloaded state” prescribed in Item (3) of Paragraph 1 of Article 1 of the Safety Regulations for Road Vehicles (1951 MOT Ordinance 67).

(2) The test vehicle shall be sufficiently warmed up.

2–2 Test road

(1) The test road shall be a dry, straight, and level paved road, and there shall not be discontinuous windbreaks, etc.

(2) There shall be facilities for observing the atmospheric pressure, air temperature, and wind condition on the test road.

For the atmospheric pressure and air temperature, the average values at

the start and end of the running resistance measurement, and for the wind speed, the wind speed components parallel and perpendicular to the test road, shall be observed or recorded as needed.

(3) Regarding the wind condition on the test road, when measuring the running resistance, the wind speed component parallel to the test road shall be 5 m/s or lower on average, and that perpendicular to the test road shall be the 2 m/s average.

3. Running Resistance Measurement Procedure

The running resistance shall be measured by either the coast-down method of Paragraph 3−1 or the wheel torque method of Paragraph 3−2.

3−1 Coast-down method

3−1−1 Measuring the running resistance on the test road

(1) Speeds at which the running resistance shall be measured (hereinafter referred to as “designated speeds”), shall be 20 km/h, 30 km/h, 40 km/h, 50 km/h, 60 km/h, 70 km/h, 80 km/h and 90 km/h.

(2) The running resistance shall be measured performed by coasting down the test vehicle, putting the transmission into neutral from the speed exceeding the designated speed by +5 km/h, and measuring the time of coast-down in units of 0.1 second or less from +5 km/h to –5 km/h of the designated speed.

While measuring the time of coast-down, neither the brake nor steering wheel shall be manipulated, and the clutch shall be engaged.

(3) Measurements of the coast-down time shall be performed three times outward and three times homeward at each designated speed, and the average values (hereinafter referred to as “average coast-down time”) shall be calculated.

Furthermore, the ratio of the maximum and minimum values of the outward coast-down time and homeward coast-down time shall be 1.1 or lower.

3−1−2 Calculating the target running resistance

(1) The running resistance at each designated speed shall be calculated using the following formula:

$$F = \frac{W + W_4}{0.36t}$$

F : Running resistance at respective designated speeds N

W : Test vehicle weight (when measuring running resistance) kg

W_4 : Equivalent inertia weight of revolving part of test vehicle kg (Normally, it shall be 3.5% of the vehicle weight stated in the specification table. It may be actually measured or calculated.)

t : Average coasting time at respective designated speeds s

(2) Based on the running resistance at the respective designated speeds determined in Item (1), the running resistance shall be expressed as a function of the square of the speed by the least squares method:

$$F = a + bV^2$$

$$a = \frac{\sum K_i^2 \sum F_i - \sum K_i \sum K_i F_i}{n\sum K_i^2 - \left(\sum K_i\right)^2}$$

$$b = \frac{n\sum K_i F_i - \sum K_i \sum F_i}{n\sum K_i^2 - \left(\sum K_i\right)^2}$$

$$K = V^2$$

F : Running resistance N

a : Value equivalent to rolling resistance N

b : Value equivalent to coefficient of air resistance $N/(km/h)^2$

V : Speed km/h

(3) Each coefficient determined in Item (2) shall be corrected to the standard atmospheric conditions using the following formulas. Its result shall be regarded as the target running resistance:

$$F_0 = a_0 + b_0 V^2$$

$$a_0 = (a - b\upsilon^2)[1 + 0.00864(Te - 293)]$$

$$b_0 = 0.346b \frac{Te}{P}$$

F_0 : Target running resistance N

υ : Average value of wind speed components parallel to test road km/h

a_0 : Value equivalent to rolling resistance under standard conditions N

b_0 : Value equivalent to coefficient of air resistance under standard conditions $N/(km/h)^2$

Te : Average air temperature at the test road K
In case of average air temperature: in °C $Te=Te_0+273$

Te_0 : Average air temperature at the test road °C

P : Average atmospheric pressure at the test road kPa

3−2 Wheel torque method

3−2−1 Adjustment, etc. of wheel torque meter

(1) The wheel torque meter shall be installed in the right and left driving wheels of the test vehicle.

(2) The wheel torque meter used to measure the running resistance on the test road and the wheel torque meter used to set load on the chassis dynamometer shall be the same.

(3) For the wheel torque meter installed on the test vehicle, zero adjustment and span adjustment shall be performed immediately before measuring the running resistance on the test road and immediately before setting the load of the chassis dynamometer.

3−2−2 Measuring the running resistance on the test road

(1) The designated speeds shall be 20 km/h, 30 km/h, 40 km/h, 50 km/h,

60 km/h, 70 km/h, 80 km/h and 90 km/h.

(2) When the test vehicle is running steadily at each designated speed, simultaneously measure the test vehicle speed and the sum of the right and left wheel torques in the sampling cycle of 0.25 second or less for five second or more.

(3) Determine the average value of the test vehicle speed during measurement (hereinafter referred to as “measured vehicle speed”) and the average value of the sum of the right and left wheel torques during measurement (hereinafter referred to as “running torque”).

(4) The difference between the speed of the test vehicle at the start and end of measurement shall be 0.5 km/h or less, and the difference between the maximum value and minimum value during measurement shall be 5% or less of the designated speed.

Also, the difference between the measured vehicle speed and the designated speed shall be within ±2 km/h.

(5) As for the sum of the right and left wheel torques, the difference between the maximum value and minimum value during measurement shall be 5% or less of the maximum value.

(6) The vehicle speed and running torque at each designated speed shall be measured once outward and once homeward.

3−2−3 Calculating the target running resistance

(1) Based on the running torque at respective designated speeds determined in Paragraph 3−2−2, the running torque shall be expressed as a function of the square of the speed by the least squares method.

Also, the running torques in the outward and homeward directions shall be substituted for Ti respectively, and the measured vehicle speeds in the outward and homeward directions shall be squared and substituted for Ki.

$$T = c + dV^2$$

$$c = \frac{\sum K_i^2 \sum T_i - \sum K_i \sum K_i T_i}{n\sum K_i^2 - \left(\sum K_i\right)^2}$$

$$d = \frac{n\sum K_i T_i - \sum K_i \sum T_i}{n\sum K_i^2 - \left(\sum K_i\right)^2}$$

$$K = V^2$$

T : Running torque N·m

c : Value equivalent to rolling resistance N·m

d : Value equivalent to coefficient of air resistance $N \cdot m/(km/h)^2$

V : Speed km/h

(2) Each coefficient determined in Item (1) shall be corrected to the standard atmospheric conditions using the following formulas. Its results shall be regarded as being equivalent to the target running resistance (hereinafter referred to as "target torque"):

$$T_0 = c_0 + d_0 V^2$$

$$c_0 = (c - d\upsilon^2)[1 + 0.00864(Te - 293)]$$

$$d_0 = 0.346d\frac{Te}{P}$$

T_0 : Target torque N·m

υ : Average value of wind speed components parallel to test road km/h

c_0 : Value equivalent to rolling resistance at standard conditions N·m

d_0 : Value equivalent to coefficient of air resistance at standard conditions $N \cdot m/(km/h)^2$

Te : Average air temperature at the test road K

In case of average air temperature: in °C $Te = Te_0 + 273$

Te_0 : Average air temperature at the test road °C

P : Average atmospheric pressure at the test road kPa

4. Setting of the Chassis Dynamometer Load

The chassis dynamometer's load shall be set to simulate the running resistance that the test vehicle would encounter while running on a level paved road, by the coast-down method, wheel torque method, or other methods. Also, if the running resistance is measured using the coast-down method, the load shall be set by the coast-down method, and if the running resistance is measured using the wheel torque method, the load shall be set by the wheel torque method.

4−1 Coast-down method

4−1−1 Adjusting the chassis dynamometer

Install the test vehicle on the chassis dynamometer, determine the sum of the friction resistance of the driving system of the test vehicle and the friction resistance of the chassis dynamometer (hereinafter referred to as "total friction loss"), and adjust the chassis dynamometer so that the braking power of the chassis dynamometer is equivalent to the difference between the target running resistance, calculated in Paragraph 3−1−2, and the total friction loss.

The braking power at 0 km/h in the multipoint setting system chassis dynamometer shall be the same as that at 10 km/h.

4−1−2 Verifying the set load

The set load (hereinafter referred to as "set running resistance") shall be verified as follows, assuming that it is equivalent to the target running resistance.

(1) The speeds at which verification is performed (hereinafter referred to as "verification speeds") shall be as follows, corresponding to the kinds of the chassis dynamometer:

① In case of the multipoint setting system, they shall be 10 km/h, 20 km/h, 30 km/h, 40 km/h, 50 km/h, 60 km/h, 70 km/h, 80 km/h and 90 km/h.

② In case of the coefficient setting system, they shall be 20 km/h, 50 km/h, and 80 km/h.

(2) Coast down the test vehicle, put the transmission into neutral from the speed exceeding the verification speed by +5 km/h, and measure the coast-down time from +5 km/h to –5 km/h of the verification speed in units of 0.1 second or less. While coasting down, the brake shall not be manipulated, and the clutch shall be engaged.

Measurement of the coast-down time shall be performed twice at each verification speed, and the average value shall be calculated.

(3) From the average value of coast-down time calculated in Item (2), calculate the set running resistance of the chassis dynamometer, using the formula:

$$Fc = \frac{IW + W_2}{0.36tc}$$

Fc : Set running resistance N

IW : Equivalent inertia weight kg

W_2 : Equivalent inertia weight of revolving part in driving system of test vehicle kg
(Normally, it shall be 1.8% of the vehicle weight stated in the specification table. It may be actually measured or calculated.)

tc : Average coasting time s

(4) The difference between the set running resistance at each verification speed and the target running resistance at the relevant speed must be within ±5% of the relevant target running resistance.

4–2 Wheel torque method

4–2–1 Adjusting the chassis dynamometer

Install the test vehicle on the chassis dynamometer, and adjust the chassis dynamometer so that the sum of the right and left wheel torques is equivalent to the target torque calculated in Paragraph 3–2–3.

The braking power at 0 km/h in the multipoint setting system chassis dynamometer shall be the same as that at 10 km/h.

4–2–2 Verifying the set load

Verify the set load is equivalent to the target torque by the following method.

(1) The speeds at which verification is performed shall be as follows, corresponding to the kind of chassis dynamometer.

① In case of the multipoint setting system, they shall be 10 km/h, 20 km/h, 30 km/h, 40 km/h, 50 km/h, 60 km/h, 70 km/h, 80 km/h and 90 km/h.

② In case of the coefficient setting system, they shall be 20 km/h, 50 km/h, and 80 km/h.

(2) When the test vehicle is running steadily at each verification speed, simultaneously measure the test vehicle speed and the sum of the right and left wheel torques in the sampling cycle of 0.25 second or less for five second or more.

(3) Determine the average value of the test vehicle speed during measurement (hereinafter referred to as “verification actual vehicle speed”) and the average value of the sum of the right and left wheel torques during measurement (hereinafter referred to as “set torque”).

(4) The difference between the speed of the test vehicle at the start and end of measurement shall be 0.5 km/h or less, and the difference between the maximum value and minimum value during measurement shall be 5% or less of the verification speed. Also, the difference between the verification actual vehicle speed and the verification speed shall be within ±1 km/h.

(5) As for the sum of the right and left wheel torques, the difference between the maximum value and minimum value during measurement shall be 5% or less of the maximum value.

(6) The difference between the set torque at each verification speed and the target torque at the relevant speed shall be within ±5% of the relevant target torque.

Attached Sheet 5

VEHICLE CONDITION SETTING BEFORE MODE OPERATION (RELATED TO 7)

1. JC08H-Mode Method

1−1 When gasoline or LPG is used as fuel

The vehicle condition setting before the running according to the JC08H-mode method shall be returned to the idling condition immediately after the test vehicle on the chassis dynamometer has been warmed up at the constant speed of 60 ± 2 km/h for 15 minutes or longer.

However, in the case of setting the condition before the running according to the JC08H-mode method immediately after measuring the exhaust emission in the idling operation prescribed in Attached Sheet 7, “15 minutes or longer” may be changed to “5 minutes or longer”.

1−2 When diesel oil or CNG is used as fuel

The vehicle condition setting before the running according to the JC08H-mode method shall be returned to the idling condition immediately after the test vehicle on the chassis dynamometer has been warmed up at the constant speed of 60 ± 2 km/h for 15 minutes or longer.

2. JC08C-Mode Method

The vehicle condition before the running according to the JC08C-mode method shall be set by soaking the vehicle with the engine stopped for at least 6 hours, but less than 36 hours, in a room at 298 ± 5 K (25 ± 5°C) after running the test vehicle on the chassis dynamometer once according to the JC08-mode posted in the Attached Sheet 6.

In this case, the room temperature shall be approximately uniform, and no adjustment or maintenance shall be performed on the test vehicle while it is left standing. Also, when moving the test vehicle after setting the condition, the engine concerned shall not be operated.

Attached Sheet 6

MODE OPERATION METHOD, ETC. (RELATED TO 7 AND 8)

Attached Sheet 6–1

JC08H-MODE METHOD

1. Driving Schedule, Etc. of Test Vehicle

1–1 Operation and driving schedule

(1) The test motor vehicle shall be driven on the chassis dynamometer from the 1032nd second to the 1204th second of the JC08-mode posted in the Attached Table. Then, the operation shall be conducted continuously according to the JC08-mode posted in the Attached Table. Furthermore, if the motor vehicle cannot attain the speed specified in the Attached Table during the acceleration, the operation shall be performed with the accelerator pedal fully depressed.

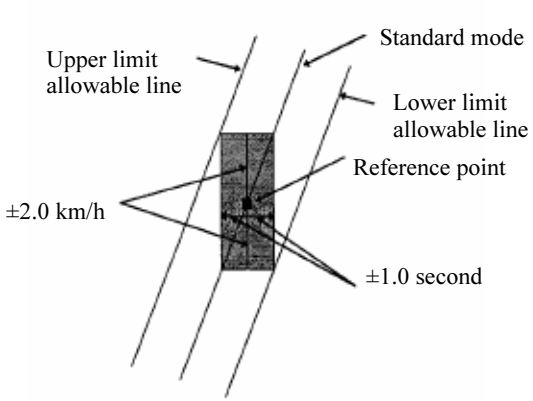
(2) Allowable errors in speed and time when driving the test motor vehicle shall be, at any point in all driving conditions enumerated the Attached Table, within ±2.0 km/h in speed and within ±1.0 second in time, and shall be within the range of the coloured section in Figure 1. Moreover, if errors are within the allowable value according to the set items posted in the left column of Table 1, they shall be regarded as being within the allowable errors. However, the deviated time at the time of starting-off and at the time of gear change operation shall not be included in the total cumulative time.

In addition, this provision shall not apply to motor vehicles that cannot attain the speeds specified in the Attached Table with their accelerator pedals fully depressed during the acceleration.

Table 1

Set items	Allowable time
1. Allowable time per deviation	1.0 second
2. Allowable time of total cumulative time of deviation time	2.0 seconds

Fig. 1



(3) Gear-changing in the operation of Item (1) shall be performed smoothly and quickly as follows.

① Motor vehicles with a manual transmission (in which the power train has no torque converter and gear shifting is performed manually):

(a) During the idling operation, the accelerator pedal shall not be operated.

(b) The speed at which a gear-changing operation is performed and shifting position shall be as follows, in addition to the Attached Table.

i. In the case of 4-speed transmissions, “5” and “6” in the gear position column of the Attached Table shall read as “4”; and in the case of 5-speed transmissions, “6” in the said column shall read as “5”.

ii. In cases where the engine revolution speed of the test motor vehicle drops below the idling speed of the motor vehicle concerned during the decelerating operation, the clutch may be disengaged at a vehicle speed of the idling speed.

iii. In cases where the engine revolution speed of the motor vehicle concerned exceeds 90% of the engine speed at which the engine produces the maximum output during the

operation of the test motor vehicle, it is permissible to use the shift gear 1 position higher than the shift gear that is being used at this time. In this case, the vehicle speed at which the gear-changing operation is performed shall be the vehicle speed at which the engine revolution speed is 90% of the engine speed at the time when the engine produces the maximum output.

(c) The standard gear position shall be the standard gear position in the Attached Table according to the "Category of motor vehicle" column of Table 2.

However, in the case of motor vehicles posted in Item 2 of Table 2, which fall under the following items, the standard gear position A shall be used.

i. The value obtained by dividing the maximum loading capacity by the gross vehicle weight is 0.3 or less.

ii. The riding accommodation and goods-loading accommodation are provided in the same vehicle compartment, and the said vehicle compartment is partitioned from the vehicle exterior by a bulkhead, such as a roof and window glass.

iii. The engine is located in front of the driver's compartment.

Table 2

Category of motor vehicle	Standard gear position in Attached Table
1. Motor vehicles posted in Item A of Table in Item (3), Paragraph 1 of Article 41 of the Details Announcement	A
2. Motor vehicles posted in Items B, C and D of Table in Item (3), Paragraph 1 of Article 41 of the Details Announcement	B
3. Motor vehicles mounted with a 3-speed + OD manual transmission	C

② Motor vehicles with an automatic transmission (referring to a transmission in which gear shift is performed automatically) or an automatic no-stage transmission (referring to an automatic transmission with no shift gear)

The selector position shall remain in the drive position. No further manipulation shall be necessary.

③ Motor vehicles with transmissions other than that specified above

The gear changes shall be made after taking the running characteristics of the test vehicle into consideration.

1–2 Period for Sampling or collecting period of exhaust emission

Sampling of CO, etc. exhaust emission or collection of PM and PMb shall be started at the end of the first operation from the 1032nd second to the 1204th second of the JC08-mode prescribed in Item (1) of Paragraph 1–1. Then, the operation shall be conducted continuously according to the JC08-mode.

Attached Sheet 6–2

JC08C-MODE METHOD

1. Driving Schedule, Etc. of Test Vehicle

1–1 Operation and driving schedule

(1) After starting the engine with the transmission in the neutral or parking position, the test vehicle shall be driven according to the JC08-mode shown in the Attached Table.

In this case, the method of starting the engine, such as manipulating the choke valve or accelerator pedal, shall be as specified by the manufacturer of the test vehicle.

Moreover, if the motor vehicle cannot attain the speed specified in the Attached Table during the acceleration, the operation shall be performed with the accelerator pedal fully depressed.

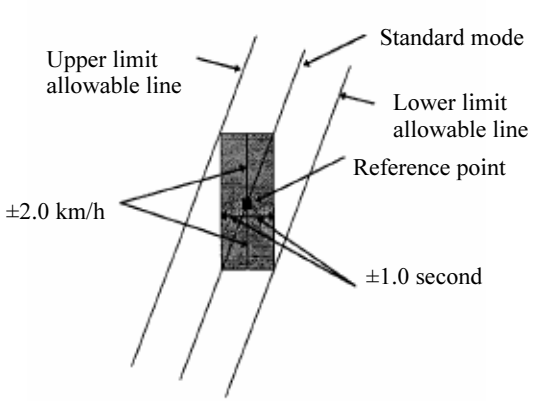
(2) Allowable errors in speed and time when driving the test motor vehicle shall be, at any point in all driving conditions enumerated the Attached Table, within ±2.0 km/h in speed and within ±1.0 second in time, and shall be within the range of the coloured section in Figure 1. Moreover, if errors are within the allowable value according to the set items posted in the left column of Table 1, they shall be regarded as being within the allowable errors. However, the deviated time at the time of starting-off and at the time of gear change operation shall not be included in the total cumulative time.

In addition, this provision shall not apply to motor vehicles that cannot attain the speeds specified in the Attached Table with their accelerator pedals fully depressed during the acceleration.

Table 1

Set items	Allowable time
1. Allowable time per deviation	1.0 second
2. Allowable time of total cumulative time of deviation time	2.0 seconds

Fig. 1



(3) Gear-changing in the operation of Item (1) shall be performed smoothly and quickly as follows.

① Motor vehicles with a manual transmission (in which the power train has no torque converter and gear shifting is performed manually):

(a) During the idling operation, the accelerator pedal shall not be operated.

(b) The speed at which a gear-changing operation is performed and shifting position shall be as follows, in addition to the Attached Table.

i. In the case of 4-speed transmissions, “5” and “6” in the gear position column of the Attached Table shall read as “4”; and in the case of 5-speed transmissions, “6” in the said column shall read as “5”.

ii. In cases where the engine revolution speed of the test motor vehicle drops below the idling speed of the motor vehicle concerned during the decelerating operation, the clutch may be disengaged at a vehicle speed of the idling speed.

iii. In cases where the engine revolution speed of the motor vehicle concerned exceeds 90% of the engine speed at which the engine produces the maximum output during the

operation of the test motor vehicle, it is permissible to use the shift gear 1 position higher than the shift gear that is being used at this time. In this case, the vehicle speed at which the gear-changing operation is performed shall be the vehicle speed at which the engine revolution speed is 90% of the engine speed at the time when the engine produces the maximum output.

(c) The standard gear position shall be the standard gear position in the Attached Table according to the "Category of motor vehicle" column of Table 2.

However, in the case of motor vehicles posted in Item 2 of Table 2, which fall under the following items, the standard gear position A shall be used.

i. The value obtained by dividing the maximum loading capacity by the gross vehicle weight is 0.3 or less.

ii. The riding accommodation and goods-loading accommodation are provided in the same vehicle compartment, and the said vehicle compartment is partitioned from the vehicle exterior by a bulkhead, such as a roof and window glass.

iii. The engine is located in front of the driver's compartment.

Table 2

Category of motor vehicle	Standard gear position in Attached Table
1. Motor vehicles posted in Item A of Table in Item (3), Paragraph 1 of Article 41 of the Details Announcement	A
2. Motor vehicles posted in Items B, C and D of Table in Item (3), Paragraph 1 of Article 41 of the Details Announcement	B
3. Motor vehicles mounted with a 3-speed + OD manual transmission	C

② Motor vehicles with an automatic transmission (referring to a transmission in which gear shift is performed automatically) or an automatic no-stage transmission (referring to an automatic transmission with no shift gear

After the engine has been started, the selector position shall remain in the drive position at the time of the 21st second of the JC08-mode posted in the Attached Table. No further manipulation shall be necessary afterwards.

③ Motor vehicles with transmissions other than that specified above

The gear changes shall be made by taking particular the running characteristics of the test vehicle into consideration.

1−2 Period for sampling or collecting period of exhaust emission

Sampling of CO, etc. exhaust emission or collection of PM and PMb shall be started immediately after the engine of the test vehicle, prescribed in Item (1) of Paragraph 1−1, is started, and shall be ended at the 1204th second of the JC08-mode posted in the Attached Table.

Attached Sheet JC08 Mode

Elapsed time (s)	Speed (km/h)	Standard gear position		
		A	B	C
1	0.0	N	N	N
2	0.0	N	N	N
3	0.0	N	N	N
4	0.0	N	N	N
5	0.0	N	N	N
6	0.0	N	N	N
7	0.0	N	N	N
8	0.0	N	N	N
9	0.0	N	N	N
10	0.0	N	N	N
11	0.0	N	N	N
12	0.0	N	N	N
13	0.0	N	N	N
14	0.0	N	N	N
15	0.0	N	N	N
16	0.0	N	N	N
17	0.0	N	N	N
18	0.0	N	N	N
19	0.0	N	N	N
20	0.0	N	N	N
21	0.0	1	1	1
22	0.0	1	1	1
23	0.0	1	1	1
24	0.0	1	1	1
25	0.0	1	1	1
26	0.0	1	1	1
27	4.9	1	1	1
28	9.8	1	1	1
29	13.8	1	1	1
30	16.6	1	2	1
31	18.4	1	2	1
32	20.1	2	2	1
33	21.7	2	2	1
34	22.7	2	2	2
35	23.5	2	2	2
36	24.7	2	2	2
37	26.1	2	2	2
38	27.6	2	2	2
39	29.9	2	3	2
40	32.8	2	3	2
41	37.1	3	3	2
42	37.8	3	3	3
43	36.6	3	3	3
44	36.5	3	3	3
45	37.7	3	3	3
46	38.9	3	3	3
47	39.2	3	3	3
48	37.3	3	3	3
49	34.1	3	3	3
50	32.8	3	3	3
51	32.4	3	3	3
52	31.7	3	3	3
53	30.4	3	3	3
54	29.1	3	3	3
55	28.6	3	3	3
56	28.6	3	3	3
57	28.6	3	3	3
58	28.7	3	3	3
59	29.1	3	3	3
60	29.8	3	3	3
61	30.9	3	3	3
62	32.5	3	3	3
63	35.1	3	3	3
64	37.5	3	3	3
65	38.9	3	3	3

66	39.0	3	3	3
67	37.7	3	3	3
68	35.1	3	3	3
69	32.9	3	3	3
70	32.1	3	3	3
71	31.0	3	3	3
72	27.4	3	3	3
73	23.7	3	3	N
74	20.2	3	3	N
75	17.5	N	3	N
76	15.9	N	N	N
77	14.5	N	N	N
78	12.7	N	N	N
79	10.9	N	N	N
80	9.5	N	N	N
81	8.1	N	N	N
82	6.9	N	N	N
83	5.8	N	N	N
84	4.5	N	N	N
85	2.5	N	N	N
86	0.0	N	N	N
87	0.0	N	N	N
88	0.0	1	1	1
89	0.0	1	1	1
90	0.0	1	1	1
91	0.0	1	1	1
92	0.0	1	1	1
93	0.0	1	1	1
94	2.6	1	1	1
95	6.7	1	1	1
96	10.6	1	1	1
97	14.6	1	1	1
98	19.7	1	2	1
99	24.4	1	2	1
100	27.5	2	2	2
101	30.2	2	2	2

102	33.4	2	3	2
103	35.6	3	3	2
104	35.9	3	3	3
105	35.4	3	3	3
106	35.3	3	3	3
107	35.8	3	3	3
108	37.1	3	3	3
109	38.8	3	3	3
110	40.3	3	3	3
111	41.8	3	3	3
112	43.7	3	4	3
113	45.1	3	4	3
114	46.1	3	4	3
115	47.9	3	4	3
116	50.1	3	4	3
117	51.2	4	4	3
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119	54.1	4	4	3
120	56.1	4	4	OD
121	56.9	4	5	OD
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125	61.8	5	5	OD
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133	58.5	5	5	OD
134	57.0	5	5	OD
135	55.6	5	5	OD
136	54.2	5	5	OD
137	52.9	5	5	OD

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141	52.6	5	5	OD
142	54.3	5	5	OD
143	56.0	5	5	OD
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168	47.5	5	5	OD
169	45.9	5	5	OD
170	44.1	5	5	OD
171	41.8	5	5	OD
172	39.6	5	5	OD
173	37.8	5	5	OD

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175	31.9	5	5	OD
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177	28.2	5	5	OD
178	26.7	5	5	OD
179	25.0	5	5	OD
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182	18.2	5	5	OD
183	14.9	5	5	OD
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186	12.4	2	2	2
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208	26.1	2	3	2
209	25.1	2	3	2

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212	19.2	2	3	2
213	19.0	2	3	2
214	17.9	2	3	2
215	16.1	2	3	2
216	15.4	2	N	2
217	15.1	2	N	2
218	13.6	2	N	N
219	12.1	2	N	N
220	12.1	N	N	N
221	11.1	N	N	N
222	7.5	N	N	N
223	3.5	N	N	N
224	1.6	N	N	N
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226	0.0	N	N	N
227	0.0	N	N	N
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239	7.9	1	1	1
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242	21.3	2	2	1
243	22.6	2	2	2
244	23.5	2	2	2
245	23.7	2	3	2

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248	17.1	2	3	2
249	16.7	2	3	2
250	16.4	2	3	2
251	15.7	2	3	2
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253	14.2	2	3	2
254	13.5	2	3	2
255	13.0	2	3	2
256	12.4	2	3	2
257	11.9	2	3	2
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259	11.7	2	3	2
260	12.4	2	3	2
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262	20.1	2	3	2
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266	37.1	3	3	2
267	39.1	3	3	3
268	39.7	3	3	3
269	39.2	3	3	3
270	39.0	3	3	3
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276	44.9	3	4	3
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284	50.5	4	4	3
285	51.3	4	4	OD
286	50.8	4	4	OD
287	49.5	4	4	OD
288	48.0	4	4	OD
289	45.8	4	4	OD
290	43.2	4	4	OD
291	42.1	4	4	OD
292	43.0	4	4	OD
293	43.9	4	4	OD
294	42.5	4	4	OD
295	38.2	4	4	OD
296	34.6	4	4	OD
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312	54.9	4	5	OD
313	55.2	4	5	OD
314	55.6	4	5	OD
315	55.3	4	5	OD
316	54.0	4	5	OD
317	52.5	4	5	OD

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320	48.7	4	5	OD
321	46.2	4	5	OD
322	42.5	4	5	OD
323	38.6	4	5	OD
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325	32.2	4	5	OD
326	29.7	4	5	N
327	27.6	4	N	N
328	25.5	4	N	N
329	23.2	N	N	N
330	20.5	N	N	N
331	17.9	N	N	N
332	15.4	N	N	N
333	12.8	N	N	N
334	9.9	N	N	N
335	6.9	N	N	N
336	4.2	N	N	N
337	2.5	N	N	N
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375	6.9	1	1	1
376	12.5	1	1	1
377	17.2	1	1	1
378	21.4	1	2	1
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381	31.2	2	3	2
382	34.2	2	3	2
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422	55.1	4	4	OD
423	56.9	4	4	OD
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497	52.9	4	5	OD

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513	46.3	4	5	OD
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515	42.2	4	5	OD
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518	39.6	4	4	OD
519	40.4	4	4	OD
520	40.3	4	4	OD
521	38.9	4	4	OD
522	36.2	4	4	OD
523	32.2	4	4	OD
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525	25.2	4	4	N
526	22.9	N	N	N
527	19.4	N	N	N
528	16.7	N	N	N
529	14.2	N	N	N
530	10.7	N	N	N
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637	32.2	4	4	OD
638	29.7	4	4	N
639	27.6	4	4	N
640	25.5	4	4	N
641	23.2	N	N	N

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643	17.9	N	N	N
644	15.4	N	N	N
645	12.8	N	N	N
646	9.9	N	N	N
647	6.9	N	N	N
648	4.2	N	N	N
649	2.5	N	N	N
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656	3.0	1	1	1
657	4.7	1	1	1
658	6.1	1	1	1
659	8.6	1	1	1
660	11.1	1	1	1
661	11.9	1	2	1
662	11.9	1	2	1
663	12.7	1	2	1
664	13.7	1	2	1
665	13.3	1	2	1
666	11.7	1	2	1
667	9.7	1	N	1
668	7.7	N	N	N
669	5.6	N	N	N
670	3.3	N	N	N
671	1.2	N	N	N
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718	2.7	1	1	1
719	5.0	1	1	1
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721	6.0	1	1	1
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724	8.0	1	1	1
725	9.1	1	1	1
726	8.8	1	1	1
727	8.0	1	1	1
728	8.9	1	1	1
729	11.2	1	1	1
730	13.1	1	2	1
731	14.3	1	2	1
732	15.5	1	2	1
733	16.7	1	2	1
734	17.6	1	2	1
735	18.2	2	2	2
736	18.9	2	2	2
737	19.5	2	2	2
738	19.2	2	2	2
739	17.4	2	2	2
740	15.5	2	2	2
741	13.8	2	2	2
742	12.5	2	2	2
743	12.3	2	2	2
744	13.3	2	2	2
745	15.6	2	2	2
746	19.2	2	2	2
747	23.0	2	2	2
748	26.4	2	2	2
749	29.1	2	3	2

750	29.4	2	3	2
751	27.9	2	3	2
752	26.0	2	3	2
753	23.2	2	3	2
754	19.6	2	3	2
755	16.3	2	N	2
756	13.6	N	N	N
757	10.6	N	N	N
758	8.1	N	N	N
759	6.9	N	N	N
760	6.3	N	N	N
761	5.4	N	N	N
762	4.4	N	N	N
763	3.1	N	N	N
764	1.5	N	N	N
765	0.0	N	N	N
766	0.0	N	N	N
767	0.0	N	N	N
768	0.0	N	N	N
769	0.0	N	N	N
770	0.0	N	N	N
771	0.0	N	N	N
772	0.0	N	N	N
773	0.0	N	N	N
774	0.0	N	N	N
775	0.0	N	N	N
776	0.0	N	N	N
777	0.0	N	N	N
778	0.0	N	N	N
779	0.0	N	N	N
780	0.0	N	N	N
781	0.0	N	N	N
782	0.0	N	N	N
783	0.0	N	N	N
784	0.0	N	N	N
785	0.0	N	N	N

786	0.0	N	N	N
787	0.0	N	N	N
788	0.0	N	N	N
789	0.0	N	N	N
790	0.0	N	N	N
791	0.0	N	N	N
792	0.0	N	N	N
793	0.0	N	N	N
794	0.0	N	N	N
795	0.0	N	N	N
796	0.0	N	N	N
797	0.0	N	N	N
798	0.0	N	N	N
799	0.0	N	N	N
800	0.0	N	N	N
801	0.0	N	N	N
802	0.0	N	N	N
803	0.0	N	N	N
804	0.0	N	N	N
805	0.0	N	N	N
806	0.0	N	N	N
807	0.0	N	N	N
808	0.0	N	N	N
809	0.0	N	N	N
810	0.0	N	N	N
811	0.0	N	N	N
812	0.0	N	N	N
813	0.0	N	N	N
814	0.0	N	N	N
815	0.0	N	N	N
816	0.0	N	N	N
817	0.0	N	N	N
818	0.0	N	N	N
819	0.0	N	N	N
820	0.0	N	N	N
821	0.0	N	N	N

822	0.0	N	N	N
823	0.0	N	N	N
824	0.0	N	N	N
825	0.0	N	N	N
826	0.0	N	N	N
827	0.0	N	N	N
828	0.0	N	N	N
829	0.0	N	N	N
830	0.0	N	N	N
831	0.0	N	N	N
832	0.0	N	N	N
833	0.0	N	N	N
834	0.0	N	N	N
835	0.0	N	N	N
836	0.0	1	1	1
837	0.0	1	1	1
838	0.0	1	1	1
839	0.0	1	1	1
840	0.0	1	1	1
841	0.0	1	1	1
842	2.5	1	1	1
843	5.1	1	1	1
844	9.4	1	1	1
845	11.2	1	1	1
846	11.7	1	1	1
847	11.4	1	1	1
848	10.4	1	1	1
849	9.6	1	1	1
850	9.2	1	1	1
851	8.9	1	1	1
852	8.7	1	1	1
853	8.7	1	1	1
854	8.7	1	1	1
855	8.7	1	1	1
856	8.6	1	1	1
857	8.6	1	1	1

858	8.4	1	1	1
859	8.7	1	1	1
860	9.7	1	1	1
861	11.2	1	1	1
862	13.3	1	2	1
863	14.8	1	2	1
864	15.7	1	2	1
865	16.4	1	2	1
866	18.0	1	2	1
867	20.5	1	2	1
868	22.2	2	2	2
869	22.1	2	2	2
870	21.0	2	2	2
871	19.9	2	2	2
872	19.2	2	2	2
873	20.0	2	2	2
874	22.5	2	2	2
875	25.0	2	2	2
876	26.5	2	2	2
877	27.7	2	3	2
878	28.5	2	3	2
879	28.5	2	3	2
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887	28.0	2	3	2
888	30.5	2	3	2
889	30.4	2	3	2
890	28.3	2	3	2
891	25.5	2	3	2
892	23.2	2	3	2
893	20.5	2	3	2

894	17.9	2	3	2
895	15.4	2	N	N
896	12.8	N	N	N
897	9.9	N	N	N
898	6.9	N	N	N
899	4.2	N	N	N
900	2.5	N	N	N
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902	0.0	N	N	N
903	0.0	N	N	N
904	0.0	N	N	N
905	0.0	N	N	N
906	0.0	N	N	N
907	0.0	N	N	N
908	0.0	N	N	N
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910	0.0	N	N	N
911	0.0	N	N	N
912	0.0	N	N	N
913	0.0	N	N	N
914	0.0	N	N	N
915	0.0	N	N	N
916	0.0	N	N	N
917	0.0	N	N	N
918	0.0	N	N	N
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920	0.0	N	N	N
921	0.0	N	N	N
922	0.0	N	N	N
923	0.0	N	N	N
924	0.0	N	N	N
925	0.0	N	N	N
926	0.0	N	N	N
927	0.0	N	N	N
928	0.0	N	N	N
929	0.0	N	N	N

930	0.0	N	N	N
931	0.0	N	N	N
932	0.0	N	N	N
933	0.0	N	N	N
934	0.0	N	N	N
935	0.0	N	N	N
936	0.0	N	N	N
937	0.0	N	N	N
938	0.0	N	N	N
939	0.0	N	N	N
940	0.0	N	N	N
941	0.0	N	N	N
942	0.0	N	N	N
943	0.0	N	N	N
944	0.0	N	N	N
945	0.0	N	N	N
946	0.0	N	N	N
947	0.0	N	N	N
948	0.0	N	N	N
949	0.0	N	N	N
950	0.0	N	N	N
951	0.0	N	N	N
952	0.0	N	N	N
953	0.0	N	N	N
954	0.0	N	N	N
955	0.0	N	N	N
956	0.0	N	N	N
957	0.0	N	N	N
958	0.0	N	N	N
959	0.0	N	N	N
960	0.0	N	N	N
961	0.0	1	1	1
962	0.0	1	1	1
963	0.0	1	1	1
964	0.0	1	1	1
965	0.0	1	1	1

966	0.0	1	1	1
967	1.2	1	1	1
968	3.2	1	1	1
969	4.4	1	1	1
970	4.9	1	1	1
971	6.5	1	1	1
972	9.0	1	1	1
973	10.8	1	1	1
974	11.4	1	1	1
975	11.3	1	1	1
976	10.2	1	1	1
977	7.8	N	1	N
978	5.5	N	N	N
979	4.3	N	N	N
980	3.5	N	N	N
981	1.9	N	N	N
982	0.0	N	N	N
983	0.0	N	N	N
984	0.0	N	N	N
985	0.0	N	N	N
986	0.0	N	N	N
987	0.0	N	N	N
988	0.0	N	N	N
989	0.0	N	N	N
990	0.0	N	N	N
991	0.0	N	N	N
992	0.0	N	N	N
993	0.0	N	N	N
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998	0.0	1	1	1
999	0.0	1	1	1
1000	0.0	1	1	1
1001	2.9	1	1	1

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1003	13.6	1	1	1
1004	17.9	1	2	1
1005	22.2	1	2	1
1006	23.6	2	2	2
1007	21.9	2	2	2
1008	21.4	2	2	2
1009	23.0	2	2	2
1010	23.0	2	2	2
1011	20.6	2	2	2
1012	18.9	2	2	2
1013	18.4	2	2	2
1014	18.1	2	2	2
1015	18.3	2	2	2
1016	20.0	2	2	2
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1018	27.3	2	2	2
1019	30.5	2	3	2
1020	32.6	2	3	2
1021	33.8	3	3	3
1022	31.8	3	3	3
1023	28.6	3	3	3
1024	24.9	3	3	3
1025	22.6	3	3	N
1026	19.4	N	3	N
1027	16.7	N	N	N
1028	14.2	N	N	N
1029	10.7	N	N	N
1030	6.7	N	N	N
1031	3.5	N	N	N
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1033	0.0	N	N	N
1034	0.0	N	N	N
1035	0.0	N	N	N
1036	0.0	N	N	N
1037	0.0	N	N	N

1038	0.0	N	N	N
1039	0.0	N	N	N
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1048	7.5	1	1	1
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1050	14.8	1	1	1
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1053	23.1	2	2	1
1054	25.9	2	2	1
1055	28.6	2	2	2
1056	30.8	2	3	2
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1064	46.2	3	4	3
1065	48.1	3	4	3
1066	50.2	3	4	3
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1068	53.6	4	4	OD
1069	55.4	4	4	OD
1070	56.9	4	5	OD
1071	58.2	4	5	OD
1072	59.7	4	5	OD
1073	61.8	4	5	OD

1074	63.9	4	5	OD
1075	65.5	5	5	OD
1076	66.7	5	5	OD
1077	67.8	5	5	OD
1078	69.1	5	5	OD
1079	70.1	5	5	OD
1080	71.0	5	5	OD
1081	72.1	5	6	OD
1082	73.3	5	6	OD
1083	74.2	5	6	OD
1084	75.0	5	6	OD
1085	75.9	5	6	OD
1086	76.7	5	6	OD
1087	77.1	5	6	OD
1088	76.4	5	6	OD
1089	75.2	5	6	OD
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1093	69.3	5	6	OD
1094	69.4	5	6	OD
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1096	69.7	5	6	OD
1097	69.6	5	6	OD
1098	69.6	5	6	OD
1099	69.8	5	6	OD
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1102	70.5	5	6	OD
1103	70.3	5	6	OD
1104	69.9	5	6	OD
1105	70.0	5	6	OD
1106	70.8	5	6	OD
1107	71.8	5	6	OD
1108	72.8	5	6	OD
1109	73.8	5	6	OD

1110	74.8	5	6	OD
1111	75.6	5	6	OD
1112	76.3	5	6	OD
1113	77.1	5	6	OD
1114	77.8	5	6	OD
1115	78.3	6	6	OD
1116	78.8	6	6	OD
1117	79.3	6	6	OD
1118	79.7	6	6	OD
1119	80.2	6	6	OD
1120	80.4	6	6	OD
1121	80.4	6	6	OD
1122	80.6	6	6	OD
1123	81.0	6	6	OD
1124	81.1	6	6	OD
1125	81.3	6	6	OD
1126	81.6	6	6	OD
1127	81.5	6	6	OD
1128	80.6	6	6	OD
1129	79.7	6	6	OD
1130	79.2	6	6	OD
1131	78.8	6	6	OD
1132	78.2	6	6	OD
1133	77.8	6	6	OD
1134	77.4	6	6	OD
1135	74.2	6	6	OD
1136	71.7	6	6	OD
1137	69.0	6	6	OD
1138	65.6	6	6	OD
1139	63.2	6	6	OD
1140	60.0	6	6	OD
1141	57.4	6	6	OD
1142	54.9	6	6	OD
1143	51.4	6	6	OD
1144	47.4	6	6	OD
1145	44.1	6	6	OD

1146	41.6	6	6	OD
1147	38.7	6	6	OD
1148	37.2	6	6	OD
1149	35.4	6	6	OD
1150	33.8	6	6	OD
1151	30.7	6	6	OD
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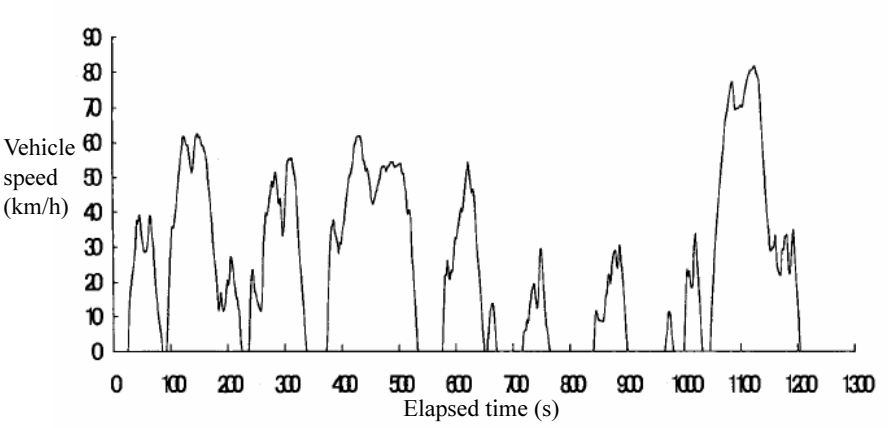
1153	28.7	3	3	2
1154	29.1	3	3	2
1155	29.1	3	3	2
1156	29.4	3	3	2
1157	29.8	3	3	2
1158	29.6	3	3	2
1159	29.7	3	3	2
1160	31.4	3	3	2
1161	33.2	3	3	2
1162	32.4	3	3	2
1163	29.1	3	3	2
1164	25.7	3	3	2
1165	24.0	3	3	2
1166	23.4	3	3	2
1167	22.8	3	3	2
1168	22.1	3	3	2
1169	21.8	3	3	2
1170	21.7	2	3	2
1171	22.3	2	3	2
1172	24.4	2	3	2
1173	27.5	2	3	2
1174	29.2	2	3	2
1175	29.0	2	3	2

1176	29.1	2	3	2
1177	31.1	2	3	2
1178	32.9	2	3	2
1179	33.0	3	3	2
1180	32.9	3	3	2
1181	33.5	3	3	2
1182	32.9	3	3	2
1183	29.4	3	3	2
1184	25.1	3	3	2
1185	22.6	3	3	2
1186	22.2	2	3	2
1187	22.6	2	3	2
1188	23.7	2	3	2
1189	25.9	2	3	2
1190	28.5	2	3	2
1191	30.9	2	3	2
1192	33.3	2	3	2
1193	34.7	3	3	2
1194	31.8	3	3	2
1195	28.1	3	3	2
1196	24.9	3	3	2
1197	22.6	3	3	2
1198	19.4	N	3	2
1199	16.7	N	N	N
1200	14.2	N	N	N
1201	10.7	N	N	N
1202	6.7	N	N	N
1203	3.5	N	N	N
1204	0.0	N	N	N

(Note) The “N” in the standard gear position denotes the neutral position, whereas the figures 1 through 6 and OD denote the gear position of the transmission, respectively.



(Reference diagram)　JC08-mode

Attached Sheet 7

EXHAUST EMISSION MEASUREMENT WHILE IDLING (RELATED TO 8)

1. Exhaust Emission Measurement while Idling

(1) The emission amounts while idling shall be measured as follows: The test vehicle placed on the chassis dynamometer shall be warmed up for about 15 minutes by operating it at a constant speed of 60 ± 2 km/h. Then, immediately placing the gear in neutral or parking, the concentrations of CO, HC and CO_2 contained in the exhaust gas emitted to the atmosphere shall be measured by a nondispersive infrared analyzer (NDIR)

The engine revolution speed during this period shall be measured, as well as the intake manifold inner pressure.

During the measurement, the exhaust gas shall be sampled directly from the exhaust pipe, not through the CVS system.

(2) If the test vehicle is equipped with an exhaust emission control device using the secondary air, the measured concentrations of CO and HC shall be corrected, using the following formula:

$$\text{CO or HC corrected concentration} = \text{COm or HCm} \times \frac{14.5}{1.8 \times 6\text{HCm} \times 10^{-4} + 0.5\text{COm} + \text{CO}_2\text{m}}$$

COm	:	Measured concentration of CO	%
HCm	:	Measured concentration of HC	ppm
CO_2m	:	Measured concentration of CO_2	%

Attached Sheet 8

METHOD OF MEASURING CO, ETC. AND CALCULATING THE EMISSION WEIGHT (RELATED TO 8.)

1. Method of Measuring the Emission Weight of CO, etc.

(1) As for CO, etc. (except for THC when diesel oil is used as fuel), the whole exhaust emission emitted from the test vehicle shall be introduced into the CVS system or the dilution tunnel system, after sampling the diluted exhaust gas and dilution air into separate sampling bags of CVS system. They shall be separately measured using the analyzers shown in the right column of Table 1, Attached Sheet 2, to determine the concentrations of exhaust gas components shown in the said table in the said sampled diluted exhaust gas and dilution air.

Furthermore, sampling of diluted exhaust gas and dilution air shall be started at the sampling start time and ended at the sampling end time prescribed in Attached Sheet 6–1 for the JC08H-mode method (Attached Sheet 6–2 for the JC08C-mode method).

(2) As for THC when diesel oil is used as fuel, the whole exhaust gas emitted from the test vehicle shall be introduced into the dilution tunnel system. The THC concentration in the diluted exhaust gas shall be continuously measured using the analyzers shown in the right column of Table 1, Attached Sheet 2, and, by integrating the concentration, the average THC concentration shall be measured.

Furthermore, continuous measurement of the HC concentration in the diluted exhaust gas shall be started at the sampling start time and ended at the sampling end time prescribed in Attached Sheet 6–1 for the JC08H-mode method (Attached Sheet 6–2 for the JC08C-mode method).

2. Procedure for Measuring CO, etc.

2–1 Warming up the analyzer

The analyzer to be used shall be warmed up prior to the test, following the method recommended by the manufacturer of the device.

2–2 Checking, etc. the analyzer

Before starting the measurement, the zero and span response of the analyzer to be used shall be checked using the calibration gas prescribed in Attached Sheet 3

When sampling the diluted exhaust gas by the dilution measurement, using a sampling bag, the sampling bag must be emptied in advance, using a vacuum pump, etc.

3. Method of Calculating the Emission Weight of CO, etc.

The emission amount of CO, etc. shall be calculated according to the following methods. However, when the concentration of the CO, etc. in the measured dilution air becomes negative, the concentration of the CO, etc. in the dilution air shall be regarded as zero.

3−1 Dilution rate

The dilution rate shall be determined using the following formulas.

3−1−1 In case of gasoline and LPG:

$$DF = \frac{13.4}{CO_2e + (THCe + COe) \times 10^{-4}}$$

where:

DF : Dilution factor

CO_{2e} : CO_2 concentration in diluted exhaust gas (%)

THC_e : THC concentration in diluted exhaust gas (ppmC)

CO_e : CO concentration in diluted exhaust gas (ppm)

3−1−2 In case of CNG:

$$DF = \frac{9.9}{CO_2e + (THCe + COe) \times 10^{-4}}$$

3−1−3 In case of diesel oil:

$$DF = \frac{13.3}{CO_2e + (THCe + COe) \times 10^{-4}}$$

3−2 Diluted exhaust gas volume

The diluted exhaust gas volume shall be calculated, using the following methods in accordance with the types of CVS system.

3−2−1 In case of a positive displacement pump (PDP) type CVS system:

(1) The diluted exhaust gas volume per km running under standard conditions (at 293 K (20°C), 101.3 kPa, hereinafter the same) shall be calculated, using the formula:

$$Vmix = K_1 \times Ve \times N \times \frac{Pp}{Tp} \times \frac{1}{8.172}$$

$$K_1 = \frac{293K}{101.3kPa} = 2.892$$

Vmix : Diluted exhaust gas volume per km running under standard conditions ℓ/km

Ve : Whole volume of diluted exhaust gas pumped by positive displacement pump per revolution ℓ/rev

N : Total number of revolutions of positive displacement pump during sampling of the diluted exhaust gas into sampling bags

Pp : Absolute pressure of diluted exhaust gas at positive displacement pump inlet, (which is atmospheric pressure minus pressure depression of mixture entering the positive displacement pump) kPa

Tp : Average absolute temperature of diluted exhaust gas at positive displacement pump inlet K

However, in cases where the diluted exhaust gas that has passed through the collecting filter is returned to the rear end of the main dilution tunnel and the double-stage dilution method in Attached Sheet 9 is used, the calculation shall be performed using the following formula:

$$Vmix = \{K_1 \times Ve \times N \times \frac{Pp}{Tp} - Vsec\} \times \frac{1}{8.172}$$

where:

Vsec : Volume of secondary dilution air under mode running under standard conditions ℓ

(2) If the diluted exhaust gas which has passed through the collecting filter is not returned to the rear end of the main dilution tunnel, the diluted exhaust gas volume per km running under standard conditions (Vmix) shall be calculated using the following formula, instead of using the formula in Item (1) above:

$$Vmix = \left\{ K_1 \times Ve \times N \times \frac{Pp}{Tp} + Vp \right\} \times \frac{1}{8.172}$$

Vp : Diluted exhaust gas sample volume under mode running under standard conditions ℓ

However, in the case of the double-stage dilution method in Attached Sheet 9, Vp shall be replaced by the following formula:

Vp = Vtot – Vsec

Vtot : Volume of secondary diluted exhaust gas that has passed through PM collecting filter under mode running under standard conditions ℓ

Vsec : Volume of secondary dilution air under mode running under standard conditions ℓ

3–2–2 In the case of a critical flow venturi (CFV) type CVS systems:

(1) The coefficient of venturi calibration shall be determined using the formula:

$$K_2 = K_1 \times Qc \times \frac{Pc}{Tc} \times \frac{\sqrt{T_0}}{P_0}$$

$$K_1 = \frac{293K}{101.3kPa} = 2.892$$

K_2 : Coefficient of venturi calibration

Qc : Actual measured gas flow

Pc : Actual measured atmospheric pressure kPa

Tc : Actual measured atmospheric absolute temperature K

T_0 : Absolute temperature at venturi inlet K

P_0 : Absolute pressure at venturi inlet kPa

(2) The diluted exhaust gas volume per km running under standard conditions shall be calculated using the following formula:

$$Vmix = K_2 \int_0^{te} \frac{Pv(t)}{\sqrt{Tv(t)}} dt \times \frac{1}{8.172}$$

Vmix : Diluted exhaust gas volume per km running under standard condition ℓ/km

K_2 : Coefficient of venturi calibration

Te : Total running time in mode operation s

Pv(t) : Absolute pressure of diluted exhaust gas at venturi inletkPa

Tv(t) : Absolute temperature of diluted exhaust gas at venturi inlet K

t : Time s

However, in cases where the diluted exhaust gas that has passed through the collecting filter is returned to the rear end of the main dilution tunnel and the double-stage dilution method in Attached Sheet 9 is used, the calculation shall be performed using the following formula:

$$Vmix = \{K_2 \int_0^{te} \frac{Pv(t)}{\sqrt{Tv(t)}} dt - Vsec\} \times \frac{1}{8.172}$$

where:

Vsec : Volume of secondary dilution air under mode running

under standard conditions ℓ

(3) If the diluted exhaust gas which has passed through the collecting filter is not returned to the rear end of the main dilution tunnel, the diluted exhaust gas volume per km running under standard conditions (Vmix) shall be calculated using the following formula, instead of using the formula given in (2) above:

$$Vmix = \left\{ K_2 \int_0^{te} \frac{Pv(t)}{\sqrt{Tv(t)}} dt + Vp \right\} \times \frac{1}{8.172}$$

Vp : Diluted exhaust gas sample volume under mode running under standard conditions ℓ

However, in the case of the double-stage dilution method in Attached Sheet 9, Vp shall be replaced by the following formula:

Vp = Vtot – Vsec

Vtot : Volume of secondary diluted exhaust gas that has passed through PM collecting filter under mode running under standard conditions ℓ

Vsec : Volume of secondary dilution air under mode running under standard conditions ℓ

3–2–3 In the case of a subsonic venturi (SSV) type CVS systems:

(1) The coefficient of discharge of the venturi shall be determined by the following formulas:

$$C_d = \frac{K_1 \times Qc \times \frac{Pc}{Tc}}{0.10182 \times {d_v}^2 \times P_0 \times \sqrt{\frac{1}{T_0} \times ({r_x}^{1.4286} - {r_x}^{1.7143}) \times \left(\frac{1}{1 - {r_y}^4 \times {r_x}^{1.4286}} \right)}}$$

$$K_1 = \frac{293K}{101.3kPa} = 2.892$$

where:

C_d : Coefficient of discharge of venturi

Qc : Actually-measured gas flow rate (ℓ/s)

Pc : Actually-measured atmospheric pressure (kPa)

Tc : Actually-measured atmospheric absolute temperature (K)

T_0 : Absolute temperature at venturi inlet (K)

P_0 : Absolute pressure at venturi inlet (kPa)

d_v : Inner diameter of throat section (mm)

r_x : Ratio of absolute pressure at throat section to absolute pressure at venturi inlet ($1 - \Delta p/P_0$ (Δp is a difference in pressure between venturi inlet and throat section (kPa)))

r_y : Ratio of inner diameter (d_v) of throat section to inner diameter (D) of pipe at venturi inlet (d_v / D)

(2) The diluted exhaust gas volume per km running under the standard conditions shall be calculated using the following formulas:

$$Vmix = \int_0^{te} Q_{SSV}(t)dt \times \frac{1}{8.172}$$

$$Q_{SSV}(t) = 0.10182 \times d_v^{\,2} \times C_d \times Pv(t) \times \sqrt{\frac{1}{Tv(t)} \times (r_x(t)^{1.4286} - r_x(t)^{1.7143}) \times \left(\frac{1}{1 - r_y^{\,4} \times r_x(t)^{1.4286}}\right)}$$

Vmix : Diluted exhaust gas volume per km running under standard condition ℓ/km

Te : Total running time in mode operation s

t : Time s

Q_{SSV} : Measured flow rate under standard conditions ℓ/s

Pv : Absolute pressure of diluted exhaust gas at venturi inlet kPa

Tv : Absolute temperature of diluted exhaust gas at venturi inlet K

However, in cases where the diluted exhaust gas that has passed through the collecting filter is returned to the rear end of the main dilution tunnel and the double-stage dilution method in Attached Sheet 9 is used, the calculation shall be performed using the following formula:

$$Vmix = \left\{ \int_0^{te} Q_{SSV}(t)dt - Vsec \right\} \times \frac{1}{8.172}$$

where:

Vsec : Volume of secondary dilution air under mode running under standard conditions ℓ

(3) If the diluted exhaust gas which has passed through the collecting filter is not returned to the rear end of the main dilution tunnel, the diluted exhaust gas volume per km running under standard conditions (Vmix) shall be calculated using the following formula, instead of using the formula given in (2) above:

$$Vmix = \left\{ \int_0^{te} Q_{SSV}(t)dt + Vp \right\} \times \frac{1}{8.172}$$

Vp : Diluted exhaust gas sample volume under mode running under standard conditions ℓ

However, in the case of the double-stage dilution method in Attached Sheet 9, Vp shall be replaced by the following formula:

$Vp = Vtot - Vsec$

Vtot : Volume of secondary diluted exhaust gas that has passed through PM collecting filter under mode running under standard conditions ℓ

Vsec : Volume of secondary dilution air under mode running under standard conditions ℓ

3–3 CO emission weight

The CO emission weight shall be determined using the formula:

$$\text{COmass} = \text{Vmix} \times \text{CO density} \times \text{COconc} \times 10^{-6}$$

$$\text{COconc} = \text{COe} - \text{COd}\left(1 - \frac{1}{\text{DF}}\right)$$

COmass : CO emission weight g/km

CO density : 1.17 (CO weight per liter under standard conditions) g/ℓ

COconc : Net concentration of CO ppm

COe : CO concentration of diluted exhaust gas ppm

COd : CO concentration of dilution air ppm

However, when an absorbent is used for extracting water vapor, etc. and CO_2, COe and COd shall be corrected using the formula:

$$\text{COe} = (1 - 0.01925\text{CO}_2\text{e} - 0.000323\text{R})\text{COem}$$
$$\text{COd} = (1 - 0.000323\text{R})\text{COdm}$$

CO_2e : CO_2 concentration of diluted exhaust gas %

R : Relative humidity of dilution air %

COem : CO concentration of diluted exhaust gas when an absorbent is used ppm

COdm : CO concentration of dilution air when an absorbent is used ppm

3–4 HC emission weight

The HC emission weight shall be determined using the following

formula:

However, if the HC concentration is expressed in units of ppm, the concentration shall be converted to units of ppmC.

3−4−1 THC measurements

$$THCmass = Vmix \times THC\ density \times THCconc \times 10^{-6}$$

$$THCconc = THCe - THCd\left(1 - \frac{1}{DF}\right)$$

THCmass : THC emission weight g/km

THCdensity : THC weight per liter under standard condition, as indicated below, depending on the kind of fuel

Gasoline and LPG : 0.577 g/ℓ
(When ratio of C to H is 1:185)

CNG : 0.653 g/ℓ
(When ratio of C to H is 1:3.66)

Diesel oil : 0.579 g/ℓ
(When ratio of C to H is 1:1.90)

THCconc : Net concentration of THC ppmC

THCe : THC concentration of diluted exhaust gas ppmC

THCd : THC concentration of dilution air ppmC

3−4−2 NMHC measurement

3−4−2−1 Correction of CH_4 concentration

The CH_4 concentration measured by analyzer shall be corrected as follows: However, when the measured CH_4 concentration becomes negative or no measurement is conducted for CH_4, the CH_4 concentration shall be regarded as zero.

(1) When using an NMC-FID analyzer

Measured CH_4 concentration shall be corrected using the formula:

$$CH_4e \text{ or } CH_4d = \{HC_{NMC} - THC \times (1 - CE_E)\} / \{CE_E - CE_M\}$$

CH_4e : CH_4 concentration in diluted exhaust gas ppmC

CH_4d : CH_4 concentration in dilution air ppmC

HC_{NMC} : HC concentration measured with NMC-FID analyzerppmC

THC : THC concentration measured with FID analyzer ppmC

CE_M : Methane efficiency
$CE_M=1-CH_{4W}/CH_{4W/O}$

CH_{4W} : CH_4 concentration measured with NMC-FID analyzerppmC

$CH_{4W/O}$: CH_4 concentration measured with FID analyzer ppmC

* Because CE_M is a value decided by the analyzer, it must be determined in advance.

CE_E : Ethane efficiency
$CE_E=1-C_2H_{6W}/C_2H_{6W/O}$

C_2H_{6W} : C_2H_6 concentration measured with NMC-FID analyzerppmC

$C_2H_{6W/O}$: C_2H_6 concentration measured with FID analyzer ppmC

* Because CE_E is a value decided by the analyzer, it must be determined in advance.

(2) When using a GC-FID analyzer

The measured CH_4 concentration shall be used as is.

CH_4e : CH_4 concentration in diluted exhaust gas ppmC

CH_4d : CH_4 concentration in dilution air ppmC

3−4−2−2 The emission weight of NMHC shall be determined using the following formulas:

$$NMHCmass = Vmix \times NMHCdensity \times NMCHconc \times 10^{-6}$$

$$NMHCconc = THCconc - \gamma \times CH_4conc$$

$CH_4conc=CH_4e-CH_4d\times(1-1/DF)$

NMHCmass	:	Emission amount of NMHC	g/km
NMHC density	:	it is the mass per liter of NMHC under standard condition, and shall be as follows, depending on the type of fuel.	
Gasoline and LPG	:	0.577 (when the ratio of C and H is 1:1.85)	g/ℓ
CNG	:	0.615 (when the ratio of C and H is 1:2.75)	g/ℓ
Diesel oil	:	0.579 (when the ratio of C and H is 1:1.90)	g/ℓ
NMHCconc	:	Net concentration of NMHC	ppmC
THCconc	:	Net concentration of THC (referred to Paragraph 3.41 of this Attached Sheet)	ppmC
CH_4conc	:	Net concentration of CH_4	ppmC
γ	:	Sensitivity coefficient of analyzer (FID) for CH_4	

It is a value decided by the analyzer, and it must be determined in advance, using calibration gas (CH_4 and air balance) and the following formula.

γ = FID measurement value (ppmC)/calibration gas concentration value (ppmC)

With the NMC-FID analyzer, $\gamma = 1.00$.

CH_4e	:	CH_4 concentration in diluted exhaust emission	ppmC
CH_4d	:	CH_4 concentration in dilution air	ppmC

3−5 NOx emission weight

(1) The water vapor pressure in air shall be calculated by a psychrometer using the following formula:

$$e = e's - 0.5(T_1 - T_2)\frac{Pa}{755}$$

e : Water vapor pressure in air kPa

e′s : Saturated water vapor pressure at T_2 (referred to Table) kPa

T_1 : Mean absolute temperature of measured dry-bulb temperature in the test room at the start and end of mode operation K

T_2 : Mean absolute temperature of measured wet-bulb temperature in the test room at the start and end of mode operation K

Pa : Atmospheric pressure of the test room kPa

(2) The humidity correction factor shall be calculated using the formula:

In case of gasoline, LPG and CNG:

$$KH = \frac{1}{1 - 0.0329(H - 10.71)}$$

$$H = \frac{622e}{Pa - e}$$

In case of diesel oil:

$$KH = \frac{1}{1 - 0.0182(H - 10.71)}$$

$$H = \frac{622e}{Pa - e}$$

KH : Humidity correction factor

H : Mass ratio of water (g) to dry air (kg) in the test room air

e : Water vapor pressure in air kPa

Pa : Atmospheric pressure of the test room kPa

(3) The NOx emission weight shall be determined using the following formulas:

$$NOxmass = Vmix \times NOx\ density \times NOxconc \times KH \times 10^{-6}$$

$$NOxconc = NOxe - NOxd\left(1 - \frac{1}{DF}\right)$$

NOxmass : NOx emission weight g/km

NOxdensity : 1.91 (NOx mass per liter under standard condition, assuming that the whole amount of NOx is NO_2) g/ℓ

NOxconc : Net concentration of NOx ppm

NOxe : NOx concentration of diluted exhaust gas ppm

NOxd : NOx concentration of dilution air ppm

3−6 CO_2 emission weight

The CO_2 emission weight shall be determined using the following formulas:

$$CO_2mass = Vmix \times CO_2\ density \times CO_2conc \times 10^{-2}$$

$$CO_2conc = CO_2e - CO_2d\left(1 - \frac{1}{DF}\right)$$

CO_2mass : CO_2 emission weight g/km

CO_2 density : 1.83 (CO_2 weight per liter under standard condition)g/ℓ

CO_2conc : Net concentration of CO_2 %

CO_2e : CO_2 concentration of diluted exhaust gas %

CO_2d : CO_2 concentration of dilution air %

Table
Table of saturation steam pressure of water

Unit: kPa

Temperature K (℃)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
273 (0)	0.61121	0.61567	0.62015	0.62467	0.62921	0.63378	0.63838	0.64301	0.64767	0.65236
274 (1)	0.65708	0.66183	0.66661	0.67142	0.67626	0.68114	0.68604	0.69098	0.69594	0.70094
275 (2)	0.70597	0.71103	0.71613	0.72126	0.72641	0.73161	0.73683	0.74209	0.74738	0.75270
276 (3)	0.75806	0.76345	0.76888	0.77434	0.77983	0.78536	0.79092	0.79652	0.80215	0.80782
277 (4)	0.81352	0.81926	0.82503	0.83084	0.83669	0.84257	0.84849	0.85445	0.86044	0.86647
278 (5)	0.87254	0.87864	0.88479	0.89097	0.89719	0.90344	0.90974	0.91607	0.92245	0.92886
279 (6)	0.93531	0.94180	0.94834	0.95491	0.96152	0.96817	0.97486	0.98160	0.98837	0.99519
280 (7)	1.0020	1.0089	1.0159	1.0299	1.0299	1.0370	1.0441	1.0512	1.0584	1.0657
281 (8)	1.0729	1.0803	1.0876	1.0951	1.1025	1.1100	1.1176	1.1252	1.1328	1.1405
282 (9)	1.1482	1.1560	1.1638	1.1717	1.1796	1.1876	1.1956	1.2037	1.2118	1.2199
283 (10)	1.2281	1.2364	1.2447	1.2530	1.2614	1.2699	1.2784	1.2869	1.2955	1.3042
284 (11)	1.3129	1.3217	1.3305	1.3393	1.3482	1.3572	1.3662	1.3753	1.3844	1.3935
285 (12)	1.4028	1.4121	1.4214	1.4308	1.4402	1.4497	1.4593	1.4689	1.4785	1.4882
286 (13)	1.4980	1.5078	1.5177	1.5277	1.5377	1.5477	1.5579	1.5680	1.5783	1.5886
287 (14)	1.5989	1.6093	1.6198	1.6303	1.6409	1.6516	1.6623	1.6730	1.6839	1.6948
288 (15)	1.7057	1.7167	1.7278	1.7390	1.7502	1.7614	1.7728	1.7842	1.7956	1.8071
289 (16)	1.8187	1.8304	1.8421	1.8539	1.8658	1.8777	1.8897	1.9017	1.9138	1.9260
290 (17)	1.9383	1.9506	1.9630	1.9755	1.9880	2.0006	2.0133	2.0260	2.0388	2.0517
291 (18)	2.0647	2.0777	2.0908	2.1040	2.1172	2.1305	2.1439	2.1574	2.1709	2.1845
292 (19)	2.1982	2.2120	2.2258	2.2397	2.2537	2.2678	2.2819	2.2961	2.3104	2.3248
293 (20)	2.3392	2.3538	2.3684	2.3831	2.3978	2.4127	2.4276	2.4426	2.4577	2.4729
294 (21)	2.4882	2.5035	2.5189	2.5344	2.5500	2.5657	2.5814	2.5973	2.6132	2.6292
295 (22)	2.6453	2.6615	2.6777	2.6941	2.7105	2.7271	2.7437	2.7604	2.7772	2.7941
296 (23)	2.8110	2.8281	2.8452	2.8625	2.8798	2.8972	2.9148	2.9324	2.9501	2.9679
297 (24)	2.9858	3.0037	3.0218	3.0400	3.0583	3.0766	3.0951	3.1136	3.1323	3.1511
298 (25)	3.1699	3.1889	3.2079	3.2270	3.2463	3.2656	3.2851	3.3046	3.3243	3.3440
299 (26)	3.3639	3.3838	3.4039	3.4240	3.4443	3.4647	3.4852	3.5057	3.5264	3.5472
300 (27)	3.5681	3.5891	3.6102	3.6315	3.6528	3.6742	3.6958	3.7174	3.7392	3.7611
301 (28)	3.7831	3.8052	3.8274	3.8497	3.8722	3.8947	3.9174	3.9402	3.9631	3.9861
302 (29)	4.0092	4.0325	4.0558	4.0793	4.1029	4.1266	4.1505	4.1744	4.1985	4.2227
303 (30)	4.2470	4.2715	4.2960	4.3207	4.3455	4.3705	4.3955	4.4207	4.4460	4.4715
304 (31)	4.4970	4.5227	4.5485	4.5745	4.6005	4.6267	4.6531	4.6795	4.7061	4.7328
305 (32)	4.7597	4.7867	4.8138	4.8410	4.8684	4.8959	4.9236	4.9514	4.9793	5.0074
306 (33)	5.0356	5.0639	5.0924	5.1210	5.1497	5.1786	5.2077	5.2368	5.2662	5.2956
307 (34)	5.3252	5.3550	5.3848	5.4149	5.4451	5.4754	5.5059	5.5365	5.5672	5.5981
308 (35)	5.6292	5.6604	5.6918	5.7233	5.7549	5.7868	5.8187	5.8508	5.8831	5.9155
309 (36)	5.9481	5.9808	6.0137	6.0468	6.0800	6.1133	6.1469	6.1805	6.2144	6.2484
310 (37)	6.2825	6.3169	6.3513	6.3860	6.4208	6.4558	6.4909	6.5262	6.5617	6.5973
311 (38)	6.6331	6.6691	6.7052	6.7415	6.7780	6.8147	6.8515	6.8885	6.9256	6.9630
312 (39)	7.0005	7.0382	7.0760	7.1141	7.1523	7.1907	7.2292	7.2680	7.3069	7.3460
313 (40)	7.3853	7.4248	7.4644	7.5042	7.5443	7.5845	7.6248	7.6654	7.7062	7.7471
314 (41)	7.7882	7.8296	7.8711	7.9128	7.9546	7.9967	8.0390	8.0815	8.1241	8.1670
315 (42)	8.2100	8.2532	8.2967	8.3403	8.3841	8.4282	8.4724	8.5168	8.5615	8.6063
316 (43)	8.6513	8.6965	8.7420	8.7876	8.8335	8.8795	8.9258	8.9723	9.0189	9.0658
317 (44)	9.1129	9.1602	9.2077	9.2555	9.3034	9.3516	9.3999	9.4485	9.4973	9.5463
318 (45)	9.5956	9.6450	9.6947	9.7446	9.7947	9.8450	9.8956	9.9464	9.9974	10.049
319 (46)	10.100	10.152	10.204	10.256	10.308	10.361	10.414	10.467	10.520	10.573
320 (47)	10.627	10.681	10.735	10.790	10.845	10.899	10.955	11.010	11.066	11.122
321 (48)	11.178	11.234	11.291	11.348	11.405	11.462	11.520	11.578	11.636	11.694
322 (49)	11.753	11.812	11.871	11.930	11.990	12.049	12.110	12.170	12.231	12.292
323 (50)	12.353	12.414	12.476	12.538	12.600	12.663	12.725	12.788	12.852	12.915

Attached Sheet 9

METHOD OF MEASURING PM AND CALICULATING THE EMISSION AMOUNT (RELATED TO 8.)

1. Measurement Method for PM

The measurement for PM shall be carried out either by the full flow single-stage dilution method (hereinafter referred to as the "single-stage dilution method") in which, after the full flow of the dilution air and exhaust gas are mixed, part of the diluted exhaust gas is diverted and passed through the PM collecting system, or by the full flow double-stage dilution method (hereinafter referred to as the "double-stage dilution method") in which part of the diluted exhaust gas is diluted again and passed through the PM collecting system.

1–1 In the case of single-stage dilution method

In the case of the single-stage dilution method, PM is collected as follows: The diluted exhaust gas inside the main dilution tunnel is passed through the filter holder incorporating the PM collecting filter from the PM sampling probe. The diluted exhaust gas is sucked by the sampling suction pump and the sample flow rate shall be measured by means of the sample flow rate meter.

1–2 In the case of double-stage dilution method

In the case of the double-stage dilution method, PM is collected as follows: The diluted exhaust gas inside the main dilution tunnel is introduced into the secondary dilution tunnel from the sampling transfer tube. There, the full flow of the secondary diluted exhaust gas that has been diluted by air again is passed through the filter holder incorporating the PM collecting filter from the PM sampling probe. Furthermore, the flow rate of the secondary diluted exhaust gas sucked by the sampling suction pump shall be measured by means of the sample flow rate meter.

2. Structure, Performance, Etc. of Measuring Devices, Equipment, Etc.

2–1 Weighing room

The weighing room in which the measurement of mass of the filter (hereinafter referred to as the "collecting filter") used for collecting PM and PMb is conducted shall be maintained under the following conditions:

(1) The temperature of the weighing room shall be kept at 295 ± 3 K (22 ± 3°C).

(2) The humidity of the weighing room shall be 45 ± 8%.

(3) Airborne dust inside the weighing room shall be kept to a minimum.

2–2 Main dilution tunnel

The main dilution tunnel, where the exhaust gas and the air diluting the gas are mixed, shall comply with the following requirements:

(1) The main dilution tunnel shall be a straight pipe and be placed in the test room.

(2) The inner diameter of the main dilution tunnel shall be 200 mm or more in the case of the single-stage dilution method; and 75 mm or more in the case of the double-stage dilution method.

(3) The inner surface of the main dilution tunnel shall be smooth without any irregularities at the flange joint sections.

(4) The flange joint sections of the main dilution tunnel shall not leak the diluted exhaust gas.

(5) A mixing orifice that promotes full mixing of the diluted exhaust gas shall be provided in close proximity to the exhaust inlet section of the main dilution tunnel.

(6) The main dilution tunnel (including the sampling probe for PM and the mixing orifice, etc.) shall be electrically conductive and corrosion-resistant. Moreover, the main dilution tunnel shall be grounded.

(7) The Reynolds number of the diluted exhaust gas inside the main dilution tunnel shall be much greater than 4000.

(8) The sampling probe for THC and the sampling probe for PM which are to be installed in the main dilution tunnel shall be located at a position such that the distance from the exhaust inlet section of the main dilution tunnel is about ten times the inner diameter of the main dilution tunnel.

(9) The sampling probe for THC and sampling probe for PM to be

installed in the main dilution tunnel shall be provided in such a way that the forward ends thereof face toward the upstream of the flow of the diluted exhaust gas and are located within a circle (concentric with the tunnel cross section) whose diameter is half the inner diameter of the main dilution tunnel.

(10) The sampling probe for PM to be installed in the main dilution tunnel shall measure 12 mm or more in inner diameter. Furthermore, it shall measure 1020 mm or less in length (distance from the forward end of the said sampling probe for PM to the filter holder). Its bend section shall have the largest possible curvature.

(11) A dust-proof filter shall be provided at the dilution air inlet section of the main dilution tunnel. Moreover, in addition to this, the following filter may be installed:

(a) Filter having the HEPA performance or higher; and

(b) Active carbon filter.

(12) When a sampling probe for PMb is to be provided, it shall be installed at the front end of the main dilution tunnel. Furthermore, a flowmeter shall be connected to the said sampling probe for PMb, which measures the flow rate of the dilution air sucked by the sampling suction pump for PMb (hereinafter referred to as the “dilution air sample flow rate”).

(13) The temperature of the dilution air shall be 288 K (15°C) or above.

(14) Necessary measures shall be taken so that no water condensation will take place inside the main dilution tunnel.

2–3 Secondary dilution tunnel

The secondary dilution tunnel where the diluted exhaust gas and secondary dilution air diluting it are mixed shall comply with the following requirements:

(1) The secondary dilution tunnel shall be of a straight pipe and placed indoor, for example, inside the test room, but outside the main dilution tunnel.

(2) The secondary dilution tunnel shall have such a length that the time required for the secondary diluted exhaust gas (referring to the mixture

of the diluted exhaust gas and secondary dilution air. Hereinafter the same.) to pass through the tunnel may be 0.25 second or more. The inner diameter thereof shall be at least 75 mm.

(3) The sampling probe for PM by which the secondary diluted exhaust gas is taken from the secondary dilution tunnel to the filter holder shall have an inner diameter of at least 12 mm and a length (referring to the distance from the outlet of the secondary dilution tunnel, or the outlet of the classifier in cases where a classifier is provided, to the filter holder) of 300 mm or less. The bend section thereof shall have the largest possible curvature.

(4) The secondary dilution tunnel and sampling probe for PM shall have electric conductivity and corrosion-resistance. Moreover, they shall be grounded.

2–4 Sampling transfer tube

The sampling transfer tube which takes the diluted exhaust gas from the main dilution tunnel to the exhaust gas introducing section of the secondary dilution tunnel shall comply with the following requirements:

(1) The length (referring to the distance from the forward end of the main dilution tunnel to the exhaust gas introducing section of the secondary dilution tunnel) of the sampling transfer tube shall not exceed 915 mm and the inner diameter shall be 12 mm or more.

(2) The bend section of the sampling transfer tube shall have the largest possible curvature.

(3) The sampling transfer tube shall have electric conductivity and corrosion-resistance. Moreover, it shall be grounded.

2–5 Exhaust gas inlet pipe

The exhaust gas inlet pipe that introduces the exhaust gas into the exhaust gas introducing section of the dilution tunnel shall comply with the following requirements:

(1) The length from the outlet of the exhaust pipe of the test vehicle to the exhaust gas introducing section of the dilution tunnel shall not exceed 6.1 m and shall be kept as short as possible.

(2) The inner diameter of the exhaust gas inlet pipe shall not exceed 105

mm.

(3) The exhaust gas inlet pipe shall be made of stainless steel, and its inner surface shall be smooth.

(4) The exhaust gas inlet pipe shall be installed in such a way that its forward end faces toward the downstream of the exhaust gas and dilution air. Also, it shall be installed at the centre of the cross section of the dilution tunnel.

(5) The flexible pipe of the exhaust gas inlet pipe shall be kept as short as possible.

The flexible pipe shall be used at the connecting section with the exhaust pipe of the test vehicle.

(6) Insulating materials shall be wound around the exhaust gas inlet pipe (including the flexible pipe).

The insulating materials shall have a thickness of 25 mm or more and a thermal conductivity not exceeding 0.1 W/(m·K) (W/(m·°C)) at 673 K (400°C).

2–6 Filter holder

The filter holder on which the collecting filters are mounted shall comply with the following requirements:

(1) The filter holder shall be provided outside the dilution tunnel.

(2) The filter holders of the same construction shall be used for the sampling probe for PM and sampling probe for PMb.

(3) When the collecting filter is mounted on the filter holder, the collecting filter shall be firmly secured so that no leakage of diluted exhaust gas may occur during PM collection and no leakage of dilution air may occur during PMb collection.

2–7 Sampling suction pump

The sampling suction pump that sucks the diluted exhaust gas, secondary diluted exhaust gas and dilution air shall comply with the following requirements:

(1) The sampling suction pump shall be mounted on the PM filter holder and PMb filter holder. In this case, the PM filter holder to be installed for the single-stage dilution method can be shared in common with the one to be installed for the double-stage dilution method.

(2) When the sampling suction pump is mounted, care shall be taken to ensure that no vibration may be transmitted to the mail dilution tunnel, secondary dilution tunnel and filter holder.

(3) In the case of the sample flow rate control, the PM sampling pump shall be adjusted so that the sample flow rate in the sampling probe for PM or in the sampling transfer tube may be within ±5% in relation to the set flow rate.

(4) In the case of the sample flow rate proportional control, the sampling pump for PM shall be adjusted so that the ratio of the diluted exhaust gas flow rate in the main dilution tunnel to the PM sample flow rate (the difference between the flow rate that passes through the PM collecting filter and the secondary dilution air flow rate) may be within ±5% in relation to the set ratio of flow rate.

(5) The pipe downstream of the sampling suction pump for PM for the diluted exhaust gas shall be returned to the rear end of the main dilution tunnel. This shall not apply to cases provided for in Item (2) of Paragraph 3–2–1, Item (3) of Paragraph 3–2–2 and Item (3) Paragraph 3–2–3 of Attached Sheet 8.

The pipes concerned shall be mounted in such a way that they do not affect the collection of PM and sampling of THC.

2–8 Diluted exhaust gas sample flow rate meter and secondary diluted exhaust gas flow rate meter

The flow rate meter which measures the flow rate of the diluted exhaust gas sample sucked by the sampling suction pump for PM (hereinafter referred to as the “diluted exhaust gas sample flow rate”) or the flow rate of the secondary diluted exhaust gas shall comply with the following requirements:

(1) The flow rate meter shall be installed in the sampling suction pump for PM.

(2) The fluctuation of the inlet gas temperature (outlet gas temperature in the case of the venturi type) of the flow rate meter shall be within ±3 K (3°C) of the mean measured value.

2–9 Secondary dilution air flow rate meter

The flow rate meter for measuring the secondary dilution air flow rate in the case of the double-stage dilution method shall comply with the following requirements:

(1) The flow rate meter shall be installed at the secondary dilution tunnel inlet side.

(2) The width of fluctuation of the flow rate meter inlet air temperature (the outlet air temperature in the case of the venturi type flow rate meter. Hereinafter the same.) shall not exceed ±5K (±5°C) in relation to the mean measured value during the test.

Moreover, the flow rate meter inlet air temperature shall be 288K (15°C) or above.

(3) A dust-proof filter shall be installed at the secondary dilution air introducing section. However, in cases where a fluorine carbide-coated glass fiber filter is used as a collecting filter and no PM sampling system is used for the measurement of PMb, an HEPA filter and active carbon filter shall be installed.

2–10 Secondary dilution air pump

The secondary dilution air pump shall be arranged in such a way that it can supply the secondary dilution air at a temperature of 288K (15°C) or above.

2–11 Classifier

When a classifier is installed, the following requirements shall be satisfied:

(1) The classifier shall be such one that the diameter of particles is from 2.5 μm to 10 μm where the sampling efficiency is 50%.

(2) The classifier shall be installed immediately before the filter holder at the upstream side.

(3) The classifier shall be of a cyclone type or impactor type.

2–12 Collecting filter

2–12–1 Requirements

The collecting filter shall comply with the following requirements:

(1) The collecting filter shall be a fluorine carbide-coated glass fiber or Polytetrafluoroethylene (hereinafter referred to as the “PTFE”) film filter.

(2) The collecting filter shall have 99% or higher efficiency of collecting dioctyl phthalate (DOP) with a particle diameter of 0.3 μm in the range of gas surface velocity of 35 cm/s or more, but 100 cm/s or less.

(3) The diameter of the collecting filter shall be 47 mm (the effective diameter of 37 mm) or more.

2–12–2 Handling of collecting filter

Before and after the collection of PM as well as before and after the collection of PMb, provided for in Paragraphs 8–2 and 8–3 of this Measurement Procedure, the collecting filter shall be soaked and its weight shall be measured in the weighing room, by the following procedures:

2–12–2–1 Before collection of PM and PMb

(1) The collecting filter shall be soaked in the weighing room for at least 24 hours.

(2) After completion of the soaking according to Item (1), the weight of the collecting filter shall be measured in the weighing room.

Then, the collecting filter for which the measurement of the weight has been conducted shall be used immediately for collecting PM and PMb.

2–12–2–2 After collection of PM and PMb

(1) The collecting filter that has been used for collecting PM and PMb shall be soaked in the weighing room for 1 to 80 hours immediately after the collection of PM and PMb.

(2) After completion of the soaking according to Item (1), the weight of the collecting filter shall be measured in the weighing room.

2−13 CVS system

The CVS system shall comply with the following requirements:

(1) The CVS system shall have a heat exchanger.

(2) The width of fluctuation of the pump inlet gas temperature of the positive displacement pump (PDP) type CVS system shall be within ±6 K (±6°C) in relation to the mean measured value.

(3) The width of fluctuation of the venturi inlet gas temperature of the critical flow venturi (CFV) type CVS system shall be within ±11 K (±11°C) in relation to the mean measured value.

Furthermore, the nozzle of the CFV type CVS system shall have been cleaned thoroughly.

(4) The width of fluctuation of the venturi inlet gas temperature of the subsonic speed venturi (SSV) type CVS system shall be within ±11 K (±11°C) in relation to the mean measured value.

2−14 Weighing balance

The weighing balance to be used for measuring the weight of the collecting filter shall comply with the following requirements:

(1) The weighing balance shall be installed inside the weighing room in such a way that it is not affected by vibration.

(2) The readable limit of the weighing balance shall be 0.1 μg or less, and the standard deviation shall be 0.25 μg or less.

(3) The weighing balance shall be calibrated before measuring the weight of the collecting filter, using an internal calibration method (sensitivity calibration by internal calibration weights) or an external calibration method (sensitivity calibration by external standard weights).

In addition, the external standard weights to be used shall be of E2 or higher.

(4) Prior to the weighing of the collecting filter, static electricity shall be eliminated using a Polonium static eliminator or a device with the similar effect.

3. PM and PMb Collection

(1) The collection of PMb may be conducted during the test measurement, before the start of the test or after completion of the test.

(2) The whole exhaust gas shall be introduced into the dilution tunnel system, and PM in the diluted exhaust gas sucked by the PM sampling pump and PMb in the dilution air shall be collected in separate collecting filters.

Furthermore, PM and PMb collection shall be started at the sampling start time and ended at the sampling end time prescribed in Attached Sheet 6.

Moreover, in cases where PMb is measured, using the PM sampling device, the measurement shall be conducted by collecting the dilution air for the same length of period as that of the collection of PM before the start of the test or after completion of the test under a condition that the exhaust gas is not allowed to flow into the dilution tunnel for the same length of period as that of the collection of PM. In cases where the measurement has been conducted both before the start of the test and after completion of the test, the mean value of the respective measured values shall be determined.

(3) The flow velocity of the diluted exhaust gas passing through the PM collecting filter shall be 35 cm/s or more and 100 cm/s or less. In this case, the increase of the pressure loss by the PM collecting filter at the end of the measurement from that at the start of the measurement shall not exceed 25 kPa.

(4) The temperature of the diluted exhaust gas immediately before the PM collecting filter shall be 325 K (52 °C) (464 K (191 °C) in the case of the measurement of the exhaust gas during the periodic control operation of Attached Sheet 11) or below.

4. Standard Filter

As regards the standard filter, two unused filters shall be soaked in the weighing room in advance. Then, weighing shall be conducted at the same time before and after the test when the collecting filter is measured. At this time, in cases where the mean weight of the two standard filters has changed more than 10μg, the collecting filter concerned shall be disposed and the exhaust gas test shall be conducted again. Moreover, the standard filter shall have the same diameter and same material as those of the collecting filter.

However, the standard filter shall be replaced at an interval of once or more a month.

5. Calculation of PM Emission Mass

5–1 Calculation of collection mass of PM and PMb

5–1–1 Correction of buoyancy of filter weight

Before the masses of PM and PMb are determined, the buoyancy shall be corrected, using the following formula, for the filter weight before and after the collection, respectively.

$$W_{corr} = W_{uncorr} \times \left(\frac{1 - \frac{\rho_{air}}{\rho_{wei}}}{1 - \frac{\rho_{air}}{\rho_{med}}} \right)$$

where:

W_{corr} : Weight of collecting filter for PM or PMb after correction of buoyancy (μg)

W_{uncorr} : Weight of collecting filter for PM or PMb before correction of buoyancy (μg)

ρ_{air} : Air density in scaling room (g/ℓ)

ρ_{wei} : Density of calibration weights to be used for calibration of scale (g/ℓ)

The density of calibration weights shall be in accordance with the specifications specified by the manufacturer of the equipment concerned. However, the density of stainless steel calibration weights shall be 8,000 g/ℓ.

ρ_{med} : Density of collecting filter

(1) Fluorine carbide-coated glass fiber filter: 2,300 g/ℓ

(2) PTFE film media with polymethylpentene support ring that accounts for 95% of filter mass: 920 g/ℓ

(3) PTFE film filter with PTFE support ring: 2,144 g/ℓ

$$\rho_{air} = \frac{p_{abs} \times M_{mix}}{R \times T_{amb}}$$

p_{abs} : Absolute pressure in scaling room (kPa)

M_{mix} : Molecular mass of air under standard humidity condition (saturated humidity at temperature of 282.65K) in scaling room: 28.836 (g/mol)

R : Constant number of molecular gas: 8.3144

T_{amb} : Absolute temperature in scaling room (K)

5–1–2 Collection mass of PM and PMb

The masses of PM and PMb shall be determined, using the following formula

Wp = Wpa – Wpb

Wb = Wba – Wbb

Wp : Collection mass of PM in diluted exhaust gas after correction of buoyancy (μg)

Wb : Collection mass of PMb after correction of buoyancy (μg)

Wpb : Filter weight after completion of soaking before collection of PM after correction of buoyancy (μg)

Wbb : Filter weight after completion of soaking before collection of PMb after correction of buoyancy (μg)

Wpa : Filter weight after completion of soaking after collection of PM after correction of buoyancy (μg)

Wba : Filter weight after completion of soaking after collection of PMb after correction of buoyancy (μg)

5–2 PM emission mass

(1) In the case of single-stage dilution method

The PM emission mass in the case of the single-stage dilution method shall be determined, using the following formula:

However, when the measured collection mass of PMb (Wb) becomes negative or no collection of PMb is conducted, the collection mass of PMb (Wb) shall be regarded as zero.

$$PMmass = Vmix \times \left\{ \frac{Wp}{Vp} - \frac{Wb}{Vb}\left(1 - \frac{1}{DF}\right) \right\} \times 10^{-6}$$

where:

PMmass	:	PM emission mass	(g/km)
Vmix	:	Diluted exhaust gas volume per km running under standard conditions (Refer to Paragraph 3–2 of Attached Sheet 8.)	(ℓ/km)
Vp	:	Diluted exhaust gas sample volume under mode running under standard conditions	(ℓ)
Vb	:	Dilution air sample volume of PMb under mode running under standard conditions	(ℓ)
DF	:	Dilution rate	

(2) In the case of double-stage dilution method

With regard to the PM emission mass in the case of the double-stage dilution method, Vp in the formula in Item (1) shall be replaced by the following formula:

$$Vp = Vtot - Vsec$$

Vtot	:	Volume of secondary diluted exhaust gas that has passed through PM collecting filter under mode running under standard conditions	(ℓ)
Vsec	:	Volume of secondary dilution air under mode running under standard conditions	(ℓ)

Attached Sheet 10

MEASUREMENT METHOD FOR EXHAUST EMISSIONS OF ELECTRIC HYBRID MOTOR VEHICLES (RELATED TO 8)

The following procedure prescribes the measurement method for exhaust emissions of electric hybrid motor vehicles. Moreover, other provisions related to the measurement of exhaust emissions shall apply in the same way as motor vehicles other than electric hybrid motor vehicles.

However, for motor vehicles subjected to the application of Items (2), (4) and (6), Paragraph 1 of Article 119, the measurement shall be conducted, following the procedure prescribed separately.

1. Test Vehicle

1–1 Test vehicles shall be equipped with an ampere meter and a charging state monitor in advance.

However, in cases where the motor vehicle is equipped with a device indicating the charging state of the electric storage device, the said device may be used, instead of using the charging state monitor.

1–2 The ampere meter shall be capable of indicating the integrated value of the measured electric current. Furthermore, the measurement accuracy shall be within ±1% of the full scale. The minimum measurable integration amount shall be 0.0001 Ah in the case of the measurement of the electric current of the maximum 50A or less; and 0.001 Ah in the case of the measurement of the electric current of the maximum exceeding 50A.

1–3 The charging state monitor shall be capable of indicating the charging level (referring to the ratio determined by dividing the electric charge (Ah) that can be taken out from the electric storage device under a certain charged state by the electric charge (Ah) under the fully-charged state) of the electric storage device, based on the current balance of the electric storage device, terminal voltage, temperature of the electric storage device.

2. Condition of Electric storage device

2–1 The electric storage device shall be charged by the method prescribed by the motor vehicle manufacturer.

However, this provision shall not apply to the condition of the electric

storage device in each exhaust emission mode method for determining the emission amount correction factor pursuant to the provisions of Paragraphs 4–2 and 5–1.

2–2 The condition of the electric storage device in each exhaust emission mode method shall be within the range of the normal charging level (charging level that is set under the assumed normal condition of use of the motor vehicle concerned).

2–3 The charging and discharging efficiency (referring to the ratio of the discharging quantity of electricity to the charging quantity of electricity. Hereinafter referred to as the "ampere hour efficiency") of the current into the electric storage device shall be 98% or more within the range of the normal charging level.

However, even if the ampere hour efficiency is less than 98%, it is possible to apply this measurement method by correcting the current balance by the method prescribed by the motor vehicle manufacturer.

3. Load Setting, etc. by Coast-Down Method (Attached Sheet 4)

3–1 In cases where the running resistance cannot be measured under the normal condition, it can be measured by a method by which a stable coasting time can be obtained and the running resistance under the normal condition can be reproduced.

3–2 In cases where the running resistance is measured by the method in Paragraph 3–1, the load setting to the chassis dynamometer shall be conducted under the same condition.

4. Each Exhaust Emission Mode Method

4–1 Range of charging level and current balance, etc.

In cases where the charging level and current balance of the electric storage device exceeds the range prescribed by the motor vehicle manufacturer while running according to each exhaust emission mode method, the test shall be carried out again according to the said exhaust emission mode method.

4–2 Correction, etc.

4–2–1 The emission amount of each exhaust emission component when the charging level and current balance of the electric storage device exceed the

range prescribed by the motor vehicle manufacturer, shall be corrected by any of the following methods:

However, when the charging level and current balance of the electric storage device are within the range prescribed by the motor vehicle manufacturer, no correction shall be performed for exhaust emission components of Paragraph 5–1, whose emission amount correction factor indicates no statistical significance.

(1) Method in which, in order to determine the emission amount correction factor after completion of the running according to each exhaust emission mode method, the exhaust emission test is conducted several times according to the said mode method, thus determining the emission amount correction factor provided for in Paragraph 5–1. Then, the emission amount under a condition that the current balance is zero shall be determined by conducting the correction by the current balance provided for in Paragraph 5–2.

(2) Method in which the emission amount correction factor provided for in Paragraph 5–1 is determined from the results of the measurement according to each exhaust emission mode method for determining the emission amount correction factor conducted by the motor vehicle manufacturer several times in advance. Then, the emission amount under a condition that the current balance is zero by conducting the correction by the current balance provided for in Paragraph 5–2.

4–2–2 It is permissible to conduct the exhaust emission tests for determining the emission amount correction factor in the following methods, as required, in order to differentiate the current balance of the electric storage device.

(1) Case of JC08H-mode method

Only when the test equipment and test vehicle are in a warmed-up condition, the operation other than the period from the start to the end provided for in Paragraph 1–2 of the Attached Sheet 6–1 as well as the operation of the Attached Sheet 5 shall be omitted or added.

(2) Case of JC08C-mode method

When the running under different electric storage device conditions, etc. is conducted, it is deemed that the running according to the JC08-mode provided for in the Attached Sheet 6 has been conducted once.

5. Correction Calculation Formula, etc.

5–1 Emission amount correction factor (K_{Ew})

The emission amount correction factor shall be determined, using the following formula, for each exhaust emission component of the CO, etc. and PM during the exhaust emission test according to each exhaust emission mode method.

$$K_{EW} = \frac{n \times \Sigma C_i \times E_{Wi} - \Sigma C_i \times \Sigma E_{Wi}}{n \times \Sigma C_i^{\,2} - (\Sigma C_i)^2}$$

where:

K_{EW} : Emission amount correction factor g/km/Ah

E_{Wi} : Emission amount of each exhaust emission component according to each exhaust emission mode method g/km

C_i : Current balance according to each exhaust emission mode method Ah

(To be used down to the minimum unit described in Paragraph 1–2)

n : Number of data

5–2 Corrected emission amount when current balance is zero (E_{W0})

The corrected emission amount of each exhaust emission component under a condition that the current balance is zero shall be determined by the following formula.

$$E_{W0} = E_{Ws} - K_{EW} \times C_S$$

where:

E_{W0} : Corrected emission amount when current balance is zero g/km

E_{Ws} : Emission amount of each exhaust emission component during basic test g/km

C_S : Current balance during basic test Ah

(To be used down to the minimum unit described in Paragraph 1–2)

6. Idling Test (Attached Sheet 7)

When the idling test of a test vehicle cannot be conducted under the normal condition, it is permissible to perform the idling test under a pseudo-idling condition.

Attached Sheet 11

MEASUREMENT METHOD FOR EXHAUST EMISSIONS OF PERIODIC CONTROL MOTOR VEHICLES (RELATED TO 8)

The measurement of exhaust emissions of periodic control motor vehicles shall be conducted, following the procedures given below. Moreover, other provisions related to the measurement of exhaust emissions shall apply in the same way as motor vehicles other than periodic control motor vehicles.

However, for motor vehicles subjected to the application of Items (2), (4) and (6), Paragraph 1 of Article 119, the measurement shall be conducted, following the procedure prescribed separately.

1. Measurement Procedure for Periodic Control Correction Value (Ki)

The periodic control correction value (Ki) shall be obtained from the emission amount of each exhaust emission component during the driving for accumulating PM, etc. into the after-treatment device or the driving where the battery is in the normal charging state or other normal driving (hereinafter referred to as the "normal driving") and the driving for returning the after-treatment device to the initial state or the driving where the battery is in the forced charging state or other periodic control driving (hereinafter referred to as the "periodic control driving"). Moreover, the driving method and the exhaust gas measurement during the normal driving and the periodic control driving shall be in accordance with the following:

(1) The normal driving shall be performed in either of the following methods: In addition, it may be handled in such a way that the periodic control driving is not performed at the end of the normal driving.

① Driving repeating the basic cycle accordingly; or

② Driving according to a running mode which is proved to be comparable to the driving of Item ① (except for the driving by the basic cycle immediately after the start of the driving and by that immediately before the end of the driving) in the running distance and the level of PM accumulation, etc.

(2) The calculation method of the mean emission amount of the exhaust emissions during the normal driving shall be either of the following methods: In this case, the emission amount of the exhaust emissions in the basic cycle may be the weighted exhaust emission value (exhaust

emission value at the time of the first running according to the JC08-mode (g/km) × 0.25 + exhaust emission value at the time of the second running according to the JC08-mode (g/km) × 0.75) of the emission amount of the exhaust emissions measured for the first and second JC08-mode running.

① In the case of Item (1) ①, the mean value of the emission amount of the exhaust emissions which are measured for all basic cycles (g/km); or

② The mean value of the emission amount of the exhaust emissions which are measured for the basic cycle immediately after the start of the normal driving and for that immediately before the end of the normal driving (g/km).

(3) In the measurement of the mean emission mass of the exhaust emission during the periodic control driving, the basic cycle shall be the minimum unit.

(4) The mean emission mass of the exhaust emission during the periodic control driving shall be the mean value (g/km) of the emission mass of the exhaust emission measured for all basic cycles of the said driving. Furthermore, in cases where the periodic control finishes during the driving in the basic cycle, in the JC08-mode constituting the said basic cycle, the mean emission mass of the exhaust emission of the cycle concerned can be calculated by assuming that the emission mass of the exhaust emission measured during the running according to the JC08-mode, including the end of the periodic control, is the same as that measured during the running according to the JC08-mode which is immediately before that.

(5) In cases where the running according to the JC08-mode cannot be continuously conducted during the basic cycle due to the exhaust emission analysis, etc., the engine may be stopped or set to the idling operation condition at the time when the running according to the JC08-mode finishes.

2. Calculation Methods of Periodic Control Correction Value and Corrected Exhaust Emission Amount

(1) Periodic control correction value (Ki) shall be calculated by using the following formulas:

$$Ki = Mpi - Msi(m)$$

where:

Ki : Periodic control correction value of each measured substance (i) g/km

Mpi : Weighted mean emission amount of measured substance (i) at times of normal driving and periodic control driving g/km

Msi (m) : Emission amount of measured substance (i) at time of normal driving immediately after end of periodic control driving g/km

$$Mpi = \frac{Msi \times D + Mri \times d}{D + d}$$

$$Msi = \frac{\sum_{j=1}^{n_s} Msij}{n_s}$$

$$Mri = \frac{\sum_{j=1}^{n_r} Mrij}{n_r}$$

where:

Msi : Mean emission amount of measured substance (i) during normal driving g/km

Msij : Mean emission amount of measured substance (i) for each basic cycle during normal driving g/km

Mri : Mean emission amount of measured substance (i) during periodic control driving g/km

Mrij : Mean emission amount of measured substance (i) for each basic cycle during periodic control driving g/km

D : Total travel distance of normal driving km

d : Total travel distance of periodic control driving km

i : Each measured substance (CO, THC, NMHC, NOx, CO_2, PM)

n_s : Number of tests of basic cycles in normal driving

n_r : Number of tests of basic cycle in periodic control driving

(2) The corrected exhaust emission amount shall be calculated by the following formulas, which shall become the emission amount of the exhaust emissions, etc. from the motor vehicle concerned:

Corrected $COmass_k = COmass_k + K_{co}$

Corrected $THCmass_k = THCmass_k + K_{THC}$

Corrected $NMHCmass_k = NMHCmass_k + K_{NMHC}$

Corrected $NOxmass_k = NOxmass_k + K_{NOx}$

Corrected $CO_2mass_k = CO_2mass_k + K_{CO2}$

Corrected $PMmass_k = PMmass_k + K_{PM}$

where:

$COmass_k$, $THCmass_k$, $NMHCmass_k$, $NOxmass_k$, CO_2mass_k, $PMmass_k$: Emission amount of each measured substance during normal driving in each exhaust emission mode method (k) according to Attached Sheet 8 or Attached Sheet 9 g/km

K_{co}, K_{THC}, K_{NMHC}, K_{NOx}, K_{CO2}, K_{PM} : Periodic control correction value of each measured substance calculated pursuant to Item (1) g/km

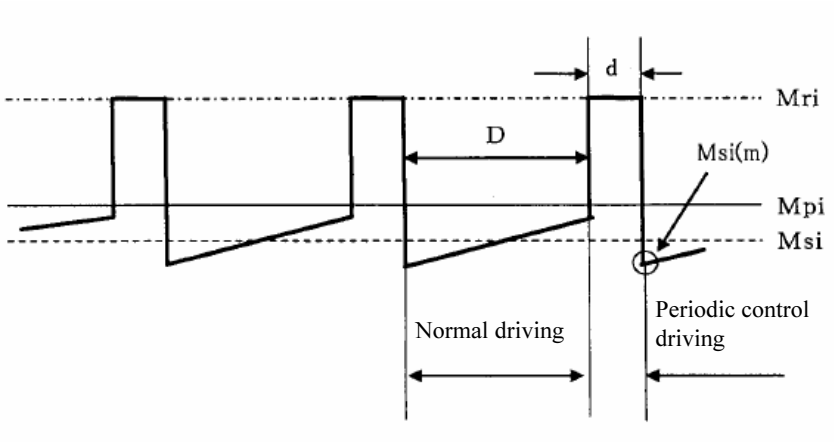


Fig. 1 Image of change in exhaust gas mass from periodic control motor vehicles

3. Others

The measurement of Msi and D may be omitted, and the value of Mri may be regarded as the corrected exhaust emission amount in Item (2) of Paragraph 2.