Attachment

The Fuel Economy Test Method for Motorcycles

1. Test items
   1.1 Fuel economy of motorcycles tested by using simulated urban driving cycle.
   1.2 Fuel economy of motorcycles tested by using simulated constant speed driving cycle.

2. Test conditions
   2.1 Motorcycle conditions:
      2.1.1 Only necessary power should be used during the test.
      2.1.2 If the motorcycle engine is equipped with engine coolant, fan control and temperature control device etc., all devices should be in normal operation conditions.
      2.1.3 Before testing, the motorcycle may run in to the minimum mileage as the manufacturer proclaimed to stabilize the fuel economy test results. For new vehicles the run in mileage muse comply with the regulated mileage by the competent authority.
      2.1.4 The previous mentioned run in process before the test may be performed on real road or on chassis dynamometer.
      2.1.5 The idle speed must be adjusted according to the recommended range by the original manufacturer and should be remarked in the test results form (Table 1).
      2.1.6 The motorcycle tires must be the same as the registered test vehicle type, the tire pressure setting should be the same as the original manufacturer's specification. If the diameter of chassis dynamometer roller is equal or less than 500 mm, or dual-rollers are used, the tire pressure may be increased by 30% to 50% and this information should be remarked in the test results form.
      2.1.7 If the motorcycle test is conducted on a chassis dynamometer, the load should be simulated by using the motorcycle's inertia mass (Equivalent Inertia Mass); The curb mass is defined as the mass of motorcycle under no load condition and its fuel tank filled to at least 90% of its capacity, engine oil, coolant, and fitted with standard equipment in accordance with the original manufacturer's specifications. The motorcycle reference mass is defined as the curb mass plus75 kg. The equivalent inertia mass should be approximated to the reference mass, the detailed correlation descriptions are as shown in Table2.

2.1.8 Ambient conditions:

Temperature: 20℃-30℃.

Absolute humidity: 5.5-12.2 gH2O/kg dry air.

2.2 The exhaust gases analysis and measurement equipment for the fuel economy test should comply with the EPA regulation of “The Exhaust Emissions Test Methods and Procedures for Motorcycles”.

2.3 The settings of chassis dynamometer and accuracy requirements for the test should comply with the requirements described in Appendix 2.

2.4 Reference ambient conditions:

Barometric pressure: 101.3kPa.

Temperature: 25°C.

2.5 Air density:

2.5.1 Air density should be calculated by using the following equation:

$$dr = 2.94 \times do \times \frac{Hr}{Tr}$$

Where:

dr : air density during the test (g/ml).

do: reference ambient air density (g/ml).

Hr: Barometric pressure during the test (kPa).

Tr: Absolute temperature during the test (K).

2.5.2 When measuring the fuel economy of motorcycle, the calculated air density by using the above equation, the result value must not deviate by more than ±7.5% from the reference ambient air density value.

3. Fuel economy calculation for the motorcycle test using simulated urban driving cycle

3.1 Simulated urban driving cycle:

3.1.1. For motorcycles applicable to the EPA regulation of the “Vehicular Pollutant Emission Standards” effective on and after Jan. 1, 2017, one test under the driving cycle as shown in Figure 1 should be conducted to get test results, the duration is 600 seconds. The motorcycle classification is based on engine capacity and maximum speed of motorcycles (Table3), the test may be performed by using normal speed mode or reduced speed mode as driving cycle selection.

3.1.2. For motorcycles applicable to the EPA regulation of the “Vehicular Pollutant Emission Standards” effective prior to Jan. 1, 2017, six consecutive operations of the driving cycle as shown in Figure 2 should be conducted to get test results, the duration is 1,170 seconds.

3.2 Fuel economy test:

3.2.1. When conducting the motorcycle urban driving cycle fuel economy test, the gear positions during acceleration, deceleration, or with constant speed, the deviation tolerance from stipulated requirements during acceleration, deceleration, constant speed, idling process and between real vehicle speed and regulated vehicle speed should be in accordance with the EPA regulation of" The Exhaust Emissions Test Methods and Procedures for Motorcycles".

3.2.2. Before the urban driving cycle test can be conducted, the motorcycle should be soaked 6~36 hours in a soaking room or when the difference between its engine oil or coolant temperature and the ambient temperature is within ±2℃. The ambient temperature of the soaking room should be between 20℃ and 30℃.

3.3 Calculation of test results

The fuel economy of driving cycle test should be calculated by using the following equation:

3.3.1. For motorcycles applicable to the EPA regulation of the "Vehicular Pollutant Emission Standards" effective on and after Jan. 1, 2017.

$C=100\times D/(0.118\times(0.848\times HC+0.429\times CO+0.273\times CO_2))$

3.3.2. For motorcycles applicable to the EPA regulation of the "Vehicular Pollutant Emission Standards" effective prior to Jan. 1, 2017.

$$C=\frac{3179\times 10^4\times CWF\times S_g}{(CWF\times HC+0.429\times CO+0.273\times CO_2)\times(0.6\times S_g\times NHV+12722)}$$

Where:

C: Energy efficiency (km/L).

D: Test fuel density at 15℃ ambient temperature.

HC: From sampled emissions and according to provision 3.2.1 calculated HC value in g/km, and rounded to three decimal places.

CO: From sampled emissions and according to provision 3.2.1 calculated CO value in g/km, and rounded to two decimal places.

CO_2: From sampled emissions and according to provision 3.2.1 calculated CO_2 value in g/km, and rounded to one decimal place.

CWF: Carbon weight fraction of test fuel.

NHV: Net heating value of test fuel (J/g).

Sg: Specific weight of test fuel.

4. Fuel economy calculation for the test using simulated constant speed driving cycle

4.1 Motorcycles with engine capacities of 50 cc and under should be tested by using constant vehicle speed of 40 km/h. If the motorcycle's maximum speed could not reach to 40 km/h, then using its maximum speed for the test and remarked in the test report. Motorcycles with other engine capacity classes, a constant vehicle speed of 50 km/h should be used for the fuel economy test.

4.2 When conducting the motorcycle constant speed fuel economy test, the gear shifting positions should be in accordance with the original manufacturer's recommendations.

4.3 Fuel economy test:

4.3.1. Before the fuel economy test, the motorcycle should be driven for at least 10 kilometers (warm-up) with designated speed as stipulated in provision 1.

4.3.2. After warm-up, the motorcycle should be conducted three times the fuel economy measurements and calculations with the designated vehicle speed as stipulated in provision 1. For each fuel economy measurement, the travel distance should be at least 2 kilometers.

4.4 For each of the previous mentioned constant speed fuel economy test, the fuel economy value should be calculated by using the equation described in 3.3, and the calculated arithmetic mean value should be utilized as the fuel economy test result.

Appendix 1 Test fuel specifications

The test fuel must comply with the specifications that prescribed in the EPA regulation of "The Exhaust Emissions Test Methods and Procedures for Motorcycles" .

Appendix 2 Chassis dynamometer

1. The chassis dynamometer should be able to simulate the driving resistance on the road, the reference mass and provide cooling function for component parts of the motorcycle.
2. The driving resistance provided by the Chassis Dynamometer should be calculated by using the following equation:

   $F = a + bV^2$

   Where:

   F: Driving resistance provided by the chassis dynamometer (N).

   a: Front wheel rolling resistance (N), the values are as shown in Table 2.

   b: Air resistance coefficient (N/ (km/h) ^{2}) , the values are as shown in Table 2.

   V: Driving speed (km/h).
3. Equivalent inertia mass of the vehicle: The motorcycle's reference mass should be simulated by the inertia mass when testing on chassis dynamometer; the correlations between reference mass and equivalent inertia mass are as shown in Table 2.
4. When performing the motorcycle test on a chassis dynamometer, a cooling fan should be located and facing the opposite of vehicle driving direction. The outlet area of the cooling fan should be at least 0.4m^2, its wind speed should be simultaneously varied with vehicle speed; when the vehicle speed is above 10km/h, and the accuracy of wind speed should be within ±10%. The distance between the lowest edge of fan outlet and flour should be between 0.05m to 0.2m. The distance between fan outlet and front wheel of the motorcycle should be between 0.3m to 0.45m.
5. Accuracy: When simulates driving resistance for conducting the motorcycle test on a chassis dynamometer, if the vehicle speed is greater than or equal to 50 km/h, the deviation should be less than or equal to 2%, when the vehicle speed is greater than or equal to 30 km/h but lower than 50 km/h, the deviation should be less than or equal to 3%, when the vehicle speed is lower than 30 km/h, the deviation should be less than or equal to 10%.
6. The mass of the driver must be within 75±5 kg.

Appendix 3 Standard Urban Driving Cycle

1. The definition of Urban Driving Cycle

   Motorcycle test on a chassis dynamometer should be in accordance with correlation

between vehicle speed and time is as shown in **Table 4 or Table 5**, the driving cycles is as shown in **Figure 1 or Figure2**.

2. Gear shifting timing

   The motorcycle gear shifting should comply with the EPA regulation of “The Exhaust Emissions Test Methods and Procedures for Motorcycles”; when in acceleration, the acceleration should be as smooth as possible.

3. Deviation tolerance

   When driving motorcycle on a chassis dynamometer, the speed difference between the vehicle and Driving Cycle setting should be less than ±3.2 km/h, and the time difference should be within 1 second, as shown in figure 1; when driving by following the driving cycle as shown in figure 2, the speed difference should be less than 1 km/h and within 0.5 seconds for time difference.

4. Idle Speed

   When in idling, the principle is to release the clutch, gear in neutral position, and throttle in closed idle position.

5. Acceleration

   5.1 During acceleration, try to maintain constant acceleration.

   5.2 If the maximum acceleration of the motorcycle could not reach the settings of the Driving Cycle, then full throttle should be used to accelerate the motorcycle to the final speed of that acceleration period of driving cycle. The time increased should be compensated by the time deduction from the following constant speed driving cycle duration.

6. Deceleration

   6.1 During deceleration, try to maintain constant deceleration. For the following conditions, the clutch should be released.

   6.1.1 Vehicle speed has decreased to less than 10 km/h.

   6.1.2 Engine speed has decreased to less than $n_{idle}+0.03\times(s\_n_{idle})$:

   Where:

   n_{idle}: engine idle speed

   s: nominal engine speed

   6.1.3 In cold start condition during which there is a risk of engine stall.

   6.2 If the deceleration time exceeds the driving cycle deceleration setting, then use brake properly.

   6.3 For motorcycle to reach the driving cycle designated constant speed or idling duration by release the throttle pedal or by using brake. If the above mentioned necessary deceleration time is less than the driving cycle stipulated time, the reduced time should be compensated by adding the following driving cycle’s

constant speed or idling duration time, or by using throttle pedal or brake to follow the pattern of driving cycle.

6.4 When the motorcycle is decelerated to zero vehicle speed, its gear position should be in neutral and with clutch released.

7. Constant speed

In the middle of motorcycle testing, when the driving pattern is changed from acceleration to constant speed duration, the increase of vehicle speed should not exceed the allowed tolerance.

Table 1 Test Results Form

Test Report Number		Client		Test Date	Yr Mo Day	Tester	
Vehicle		Engine		Transmission			
Make		Engine Type		Transmission Type			
Country of Manufacture		Engine Identification No.		Gear Type			
Vehicle Type		Engine Capacity	L	gear ratio	1st		
Vehicle Category		Bore × Stroke	mm×mm		2^{nd}		
Year of Production		Cylinder Numbers			3^{rd}		
Vehicle Condition		Idle Speed	rpm		4^{th}		
Width	cm	Maximum Power	kW ,at rpm		5^{th}		
Height	cm	Maximum Torque	Nm ,at rpm		6^{th}		
Wheelbase	cm	Fuel			7^{th}		
Curb Mass	kg	Fuel Supply Method			8^{th}		
Reference Mass	kg	Turbo-Charge Device			9^{th}		
Equivalent Inertia Mass	kg			Remark			
Resistance				Test Results			
Tire Brand				Simulated Driving Cycle			
Front/Rear Tire Spec.				CO(Carbon Monoxide)		□mg/km □g/km	
Tire Pressure	Fr： kg/cm^2 , Re： kg/cm^2			HC(Hydrocarbons)		□mg/km □g/km	
Travel Mileage	km			NMHC(Non-Methane Hydrocarbons)		□mg/km □g/km	
				NO_x (Nitrogen Oxides)		□mg/km □g/km	
				Urban Energy Efficiency		km/l	
				Constant Speed Energy Efficiency		km/l	
				Combined Energy Efficiency		km/l	
				Urban CO_2 Test Result		□g/km	

				Constant Speed CO_2 Test Result	□g/km
				Combined CO_2 Test Result	□g/km

Table 2 Correlation between vehicle reference mass and equivalent inertia mass

Reference Mass m_{ref}（kg）	Equivalent Inertia Mass m_i（kg）	Front Wheel Rolling Resistance 'a'（N）	Coefficient of Air Resistance (remark) 'b'（N/（km/h）^{2}）
$95 < m_{ref} \leqq 105$	100	8.8	0.0215
$105 < m_{ref} \leqq 115$	110	9.7	0.0217
$115 < m_{ref} \leqq 125$	120	10.6	0.0218
$125 < m_{ref} \leqq 135$	130	11.4	0.0220
$135 < m_{ref} \leqq 145$	140	12.3	0.0221
$145 < m_{ref} \leqq 155$	150	13.2	0.0223
$155 < m_{ref} \leqq 165$	160	14.1	0.0224
$165 < m_{ref} \leqq 175$	170	15.0	0.0226
$175 < m_{ref} \leqq 185$	180	15.8	0.0227
$185 < m_{ref} \leqq 195$	190	16.7	0.0229
$195 < m_{ref} \leqq 205$	200	17.6	0.0230
$205 < m_{ref} \leqq 215$	210	18.5	0.0232
$215 < m_{ref} \leqq 225$	220	19.4	0.0233
$225 < m_{ref} \leqq 235$	230	20.2	0.0235
$235 < m_{ref} \leqq 245$	240	21.1	0.0236
$245 < m_{ref} \leqq 255$	250	22.0	0.0238
$255 < m_{ref} \leqq 265$	260	22.9	0.0239
$265 < m_{ref} \leqq 275$	270	23.8	0.0241
$275 < m_{ref} \leqq 285$	280	24.6	0.0242
$285 < m_{ref} \leqq 295$	290	25.5	0.0244
$295 < m_{ref} \leqq 305$	300	26.4	0.0245
$305 < m_{ref} \leqq 315$	310	27.3	0.0247
$315 < m_{ref} \leqq 325$	320	28.2	0.0248
$325 < m_{ref} \leqq 335$	330	29.0	0.0250
$335 < m_{ref} \leqq 345$	340	29.9	0.0251

Reference Mass m_{ref}（kg）	Equivalent Inertia Mass m_i（kg）	Front Wheel Rolling Resistance 'a'（N）	Coefficient of Air Resistance (remark) 'b'（N/（km/h）^{2}）
$345 < m_{ref} \leqq 355$	350	30.8	0.0253
$355 < m_{ref} \leqq 365$	360	31.7	0.0254
$365 < m_{ref} \leqq 375$	370	32.6	0.0256
$375 < m_{ref} \leqq 385$	380	33.4	0.0257
$385 < m_{ref} \leqq 395$	390	34.3	0.0259
$395 < m_{ref} \leqq 405$	400	35.2	0.0260
$405 < m_{ref} \leqq 415$	410	36.1	0.0262
$415 < m_{ref} \leqq 425$	420	37.0	0.0263
$425 < m_{ref} \leqq 435$	430	37.8	0.0265
$435 < m_{ref} \leqq 445$	440	38.7	0.0266
$445 < m_{ref} \leqq 455$	450	39.6	0.0268
$455 < m_{ref} \leqq 465$	460	40.5	0.0269
$465 < m_{ref} \leqq 475$	470	41.4	0.0271
$475 < m_{ref} \leqq 485$	480	42.2	0.0272
$485 < m_{ref} \leqq 495$	490	43.1	0.0274
$495 < m_{ref} \leqq 505$	500	44.0	0.0275
Class increment per 10kg	Class increment per 10kg	$a = 0.088m_i$ Rounded to 2 decimal places	$b = 0.000015m_i + 0.0200$ Rounded to 5 decimal places
Remark: regarding the b values as mentioned about, its adjustments should be in accordance with the EPA regulation of "The Exhaust Emissions Test Methods and Procedures for Motorcycles".			

Table 3 Applicable driving cycle modes for different motorcycle classes

Vehicle Classification				Mode	
Class		Engine Capacity (ec)	Maximum Speed (Vmax)	Reduced Speed	Normal Speed
CLASS 1		ec<150c.c.	Vmax<100kph	※	
CLASS 2	subclass 2-1	ec<150c.c.	100kph≦Vmax<115kph	※	
		ec≧150c.c.	Vmax<115kph		
	subclass 2-2		115kph≦Vmax<130kph		※
CLASS 3	subclass 3-1		130kph≦Vmax<140kph		※
	subclass 3-2		Vmax≧140kph		※
		ec>1,500c.c.			※

Table 4 Motorcycle Urban Driving Cycle (For motorcycles applicable to the emission standards effective on and after Jan. 1, 2017)

T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h	T (s)	N km/h	R km/h
0	0,0	0,0	61	29,7	29,6	122	32,8	33,0	183	2,0	0,0	244	32,7	40,9	305	26,9	26,9	366	27,3	27,3	427	40,7	40,7	488	8,8	8,8	549	43,1	33,1
1	0,0	0,0	62	27,0	26,9	123	34,3	34,4	184	6,0	0,0	245	30,6	36,9	306	26,5	26,5	367	28,4	28,3	428	41,5	41,4	489	13,4	13,4	550	44,6	35,7
2	0,0	0,0	63	23,0	23,0	124	35,1	35,2	185	12,4	0,4	246	28,1	32,1	307	26,1	26,1	368	29,2	29,2	429	41,7	41,7	490	17,3	17,3	551	45,2	38,3
3	0,0	0,0	64	18,7	18,6	125	35,3	35,4	186	21,4	1,8	247	25,5	26,6	308	25,7	25,7	369	29,5	29,5	430	41,5	41,4	491	19,2	19,2	552	45,3	41,0
4	0,0	0,0	65	14,2	14,1	126	35,1	35,2	187	30,0	5,4	248	23,1	21,8	309	25,5	25,5	370	29,5	29,4	431	41,0	40,9	492	19,7	19,7	553	45,4	43,6
5	0,0	0,0	66	9,4	9,3	127	34,6	34,7	188	37,1	11,1	249	21,2	17,2	310	25,7	25,7	371	29,0	28,9	432	40,6	40,5	493	19,8	19,8	554	45,5	43,7
6	0,0	0,0	67	4,9	4,8	128	33,7	33,9	189	42,5	16,7	250	19,5	13,7	311	26,4	26,4	372	28,1	28,1	433	40,3	40,2	494	20,7	20,7	555	45,6	43,8
7	0,0	0,0	68	2,0	1,9	129	32,2	32,4	190	46,6	21,3	251	17,8	10,3	312	27,3	27,3	373	27,2	27,1	434	40,2	40,1	495	23,6	23,7	556	45,7	43,9
8	0,0	0,0	69	0,0	0,0	130	29,6	29,8	191	49,8	24,8	252	15,3	7,0	313	28,1	28,1	374	26,3	26,3	435	40,1	40,1	496	28,1	27,9	557	45,8	44,0
9	0,0	0,0	70	0,0	0,0	131	26,0	26,1	192	52,4	28,4	253	11,5	3,5	314	27,9	27,9	375	25,7	25,7	436	39,8	39,8	497	32,8	31,9	558	45,9	44,1
10	0,0	0,0	71	0,0	0,0	132	22,0	22,1	193	54,4	31,8	254	7,2	0,0	315	26,0	26,0	376	25,5	25,5	437	38,9	38,9	498	36,3	35,4	559	46,0	44,2
11	0,0	0,0	72	0,0	0,0	133	18,5	18,6	194	55,6	34,6	255	2,5	0,0	316	22,7	22,7	377	25,6	25,6	438	37,5	37,4	499	37,1	36,2	560	46,1	44,3
12	0,0	0,0	73	0,0	0,0	134	16,6	16,8	195	56,1	36,3	256	0,0	0,0	317	19,0	19,0	378	26,0	25,9	439	35,8	35,8	500	35,1	34,2	561	46,2	44,4
13	0,0	0,0	74	1,7	1,7	135	17,6	17,7	196	56,2	37,8	257	0,0	0,0	318	16,0	16,0	379	26,4	26,3	440	34,2	34,1	501	31,1	30,2	562	46,3	44,5
14	0,0	0,0	75	5,8	5,8	136	21,0	21,1	197	56,2	39,6	258	0,0	0,0	319	14,6	14,6	380	27,0	26,9	441	32,5	32,5	502	28,0	27,1	563	46,4	44,6
15	0,0	0,0	76	11,8	11,8	137	25,2	25,4	198	56,2	41,3	259	0,0	0,0	320	15,2	15,2	381	27,7	27,6	442	30,9	30,9	503	27,5	26,6	564	46,7	44,9
16	0,0	0,0	77	18,3	17,3	138	29,1	29,2	199	56,7	43,3	260	0,0	0,0	321	16,9	16,9	382	28,5	28,4	443	29,4	29,4	504	29,5	28,6	565	47,2	45,5
17	0,0	0,0	78	24,5	22,0	139	31,4	31,6	200	57,2	45,1	261	0,0	0,0	322	19,3	19,3	383	29,4	29,3	444	28,0	27,9	505	34,0	32,6	566	48,0	46,3
18	0,0	0,0	79	29,4	26,2	140	31,9	32,1	201	57,7	47,5	262	0,0	0,0	323	22,0	22,0	384	30,2	30,1	445	26,5	26,5	506	37,0	35,5	567	48,9	47,1
19	0,0	0,0	80	32,5	29,4	141	31,4	31,6	202	58,2	49,0	263	0,0	0,0	324	24,6	24,6	385	30,5	30,4	446	25,0	25,0	507	38,0	36,6	568	49,8	48,0
20	0,0	0,0	81	34,2	31,1	142	30,6	30,7	203	58,7	50,0	264	0,0	0,0	325	26,8	26,8	386	30,3	30,2	447	23,5	23,4	508	36,1	34,6	569	50,5	48,7
21	0,0	0,0	82	34,4	32,9	143	29,5	29,7	204	59,3	49,5	265	0,0	0,0	326	27,9	27,9	387	29,5	29,5	448	21,9	21,8	509	31,5	30,0	570	51,0	49,2
22	1,0	1,0	83	34,5	34,7	144	28,0	28,1	205	59,8	48,8	266	0,0	0,0	327	28,1	28,0	388	28,7	28,6	449	20,4	20,3	510	24,5	23,1	571	51,1	49,4
23	2,6	2,6	84	34,6	34,8	145	24,9	25,0	206	60,0	47,6	267	0,5	0,5	328	27,7	27,7	389	27,9	27,9	450	19,4	19,3	511	17,5	16,7	572	51,0	49,3
24	4,8	4,8	85	34,7	34,8	146	20,2	20,3	207	60,0	46,5	268	2,9	2,9	329	27,2	27,1	390	27,5	27,5	451	18,8	18,7	512	10,5	10,7	573	50,4	48,7
25	7,2	7,2	86	34,8	34,9	147	14,8	15,0	208	59,9	46,1	269	8,2	8,2	330	26,8	26,8	391	27,3	27,2	452	18,4	18,3	513	4,5	4,7	574	49,0	47,3
26	9,6	9,6	87	35,2	35,4	148	9,5	9,7	209	59,9	46,1	270	13,2	13,2	331	26,6	26,6	392	27,0	26,9	453	18,0	17,8	514	1,0	1,2	575	46,7	45,0
27	12,0	12,0	88	36,0	36,2	149	4,8	5,0	210	59,9	46,6	271	17,8	17,8	332	26,8	26,8	393	26,5	26,4	454	17,5	17,4	515	0,0	0,0	576	44,0	42,3
28	14,3	14,3	89	37,0	37,1	150	1,4	1,6	211	59,9	46,9	272	21,4	21,4	333	27,0	27,0	394	25,8	25,7	455	16,9	16,8	516	0,0	0,0	577	41,1	39,5
29	16,6	16,6	90	37,9	38,0	151	0,0	0,0	212	59,9	47,2	273	24,1	24,1	334	27,2	27,2	395	25,0	24,9	456	16,4	16,3	517	0,0	0,0	578	38,3	36,6
30	18,9	18,9	91	38,6	38,7	152	0,0	0,0	213	59,8	47,8	274	26,4	26,4	335	27,4	27,4	396	21,5	21,4	457	16,6	16,5	518	0,0	0,0	579	35,4	33,7
31	21,2	21,2	92	38,8	38,9	153	0,0	0,0	214	59,6	48,4	275	28,4	28,4	336	27,6	27,5	397	16,0	15,9	458	17,7	17,6	519	2,9	3,0	580	31,8	30,1
32	23,5	23,5	93	38,8	38,9	154	0,0	0,0	215	59,1	48,9	276	29,9	29,9	337	27,7	27,7	398	10,0	9,9	459	19,4	19,2	520	8,0	8,2	581	27,3	26,0
33	25,6	25,6	94	38,7	38,8	155	0,0	0,0	216	57,1	49,2	277	30,5	30,5	338	27,9	27,9	399	5,0	4,9	460	20,9	20,8	521	16,0	14,3	582	22,4	21,8
34	27,1	27,1	95	38,5	38,5	156	0,0	0,0	217	53,2	49,6	278	30,5	30,5	339	28,1	28,1	400	2,2	2,1	461	22,3	22,2	522	24,0	19,3	583	17,7	17,7
35	28,0	28,0	96	38,0	38,1	157	0,0	0,0	218	48,3	49,9	279	30,3	30,3	340	28,3	28,3	401	1,0	0,9	462	23,2	23,0	523	32,0	23,5	584	13,4	13,5
36	28,7	28,7	97	37,4	37,5	158	0,0	0,0	219	43,9	50,0	280	30,2	30,2	341	28,6	28,6	402	0,0	0,0	463	23,2	23,0	524	38,8	27,3	585	9,3	9,4
37	29,2	29,2	98	36,9	37,0	159	0,0	0,0	220	40,3	49,8	281	30,1	30,1	342	29,0	29,1	403	0,0	0,0	464	22,2	22,0	525	43,1	30,8	586	5,5	5,6
38	29,8	29,8	99	36,6	36,7	160	0,0	0,0	221	39,5	49,5	282	30,1	30,1	343	29,6	29,6	404	0,0	0,0	465	20,3	20,1	526	46,0	33,7	587	2,0	2,1
39	30,4	30,3	100	36,4	36,5	161	0,0	0,0	222	41,3	49,2	283	30,1	30,1	344	30,1	30,1	405	0,0	0,0	466	17,9	17,7	527	47,5	35,2	588	0,0	0,0
40	29,6	29,6	101	36,4	36,5	162	0,0	0,0	223	45,2	49,3	284	30,1	30,2	345	30,5	30,6	406	0,0	0,0	467	15,2	15,0	528	47,5	35,2	589	0,0	0,0
41	28,7	28,7	102	36,5	36,6	163	0,0	0,0	224	50,1	49,4	285	30,1	30,2	346	30,7	30,8	407	0,0	0,0	468	12,3	12,1	529	44,8	32,5	590	0,0	0,0
42	27,9	27,9	103	36,7	36,8	164	0,0	0,0	225	53,7	49,4	286	30,1	30,2	347	30,8	30,8	408	1,2	1,2	469	9,3	9,1	530	40,1	27,9	591	0,0	0,0
43	27,5	27,4	104	36,9	37,0	165	0,0	0,0	226	55,8	48,6	287	30,2	30,2	348	30,8	30,8	409	3,2	3,2	470	6,4	6,2	531	33,8	23,2	592	0,0	0,0
44	27,3	27,3	105	37,0	37,1	166	0,0	0,0	227	55,8	47,8	288	30,4	30,5	349	30,8	30,8	410	5,9	5,9	471	3,8	3,6	532	27,2	18,5	593	0,0	0,0
45	27,4	27,3	106	37,2	37,3	167	0,0	0,0	228	54,7	47,0	289	31,0	31,0	350	30,8	30,8	411	8,8	8,8	472	2,0	1,8	533	20,0	13,8	594	0,0	0,0
46	27,5	27,4	107	37,3	37,4	168	0,0	0,0	229	53,3	46,9	290	31,8	31,9	351	30,8	30,8	412	12,0	12,0	473	0,9	0,8	534	12,8	9,1	595	0,0	0,0
47	27,6	27,5	108	37,4	37,5	169	0,0	0,0	230	52,3	46,6	291	32,7	32,8	352	30,8	30,8	413	15,4	15,4	474	0,0	0,0	535	7,0	4,5	596	0,0	0,0
48	27,6	27,6	109	37,3	37,4	170	0,0	0,0	231	52,0	46,6	292	33,6	33,7	353	30,8	30,8	414	18,9	18,9	475	0,0	0,0	536	2,2	2,3	597	0,0	0,0
49	27,6	27,6	110	36,8	36,9	171	0,0	0,0	232	52,1	46,6	293	34,4	34,5	354	30,9	30,9	415	22,1	22,1	476	0,0	0,0	537	0,0	0,0	598	0,0	0,0
50	27,7	27,6	111	35,8	36,0	172	0,0	0,0	233	51,8	46,9	294	35,0	35,1	355	30,9	30,9	416	24,8	24,7	477	0,0	0,0	538	0,0	0,0	599	0,0	0,0
51	27,8	27,8	112	34,7	34,8	173	0,0	0,0	234	50,8	46,4	295	35,4	35,5	356	30,9	30,9	417	26,8	26,8	478	0,0	0,0	539	0,0	0,0	600	0,0	0,0
52	28,1	28,1	113	31,8	31,9	174	0,0	0,0	235	49,2	45,6	296	35,5	35,6	357	30,8	30,8	418	28,7	28,7	479	0,0	0,0	540	0,0	0,0			
53	28,6	28,5	114	28,9	29,0	175	0,0	0,0	236	47,5	44,4	297	35,3	35,4	358	30,4	30,4	419	30,6	30,6	480	0,0	0,0	541	0,0	0,0			
54	29,0	28,9	115	26,7	26,9	176	0,0	0,0	237	45,7	43,5	298	34,9	35,0	359	29,6	29,6	420	32,4	32,4	481	0,0	0,0	542	2,7	2,8			
55	29,2	29,2	116	24,6	24,7	177	0,0	0,0	238	43,9	43,2	299	33,9	34,0	360	28,4	28,4	421	34,0	34,0	482	0,0	0,0	543	8,0	8,1			
56	29,5	29,4	117	25,2	25,4	178	0,0	0,0	239	42,0	43,3	300	32,4	32,4	361	27,1	27,1	422	35,4	35,4	483	0,0	0,0	544	16,0	14,3			
57	29,7	29,7	118	26,2	26,4	179	0,0	0,0	240	40,2	43,7	301	30,6	30,6	362	26,0	26,0	423	36,5	36,5	484	0,0	0,0	545	24,0	19,2			
58	30,1	30,0	119	27,6	27,7	180	0,0	0,0	241	38,3	43,9	302	28,9	29,0	363	25,4	25,4	424	37,5	37,5	485	0,0	0,0	546	32,0	23,5			
59	30,5	30,5	120	29,2	29,4	181	0,0	0,0	242	36,4	43,8	303	27,8	27,8	364	25,5	25,5	425	38,6	38,6	486	1,4	1,4	547	37,2	27,2			
60	30,7	30,6	121	31.0	31.2	182	0,0	0,0	243	34,6	43,0	304	27,2	27,2	365	26,3	26,3	426	39,7	39,6	487	4,5	4,5	548	40,4	30,5			

Table 5 Motorcycle Urban Driving Cycle (For motorcycles applicable to the emission standards effective prior to Jan. 1, 2017)

Step	Operating mode	Phase	Accelerate rate (m/s^2)	Vehicle speed (km/h)	Time (s)		Accumulated time	Manual gear shifting timing
					Operate	section		
1	Idling	1		0	11	11	11	6s PM+5s K
2	Accelerate	2	1.04	0-15	4	4	15	In accordance with EPA regulation of "The Exhaust Emissions Test Methods and Procedures for Motorcycles"
3	Constant speed	3		15	8	8	23	
4	Decelerate	4	-0.69	15-10	2	5	25	
5	Decelerate; declutch		-0.92	10-0	3		28	K
6	Idling	5		0	21	21	49	16s PM+5s K
7	Accelerate	6	0.74	0-32	12	12	61	In accordance with EPA regulation of "The Exhaust Emissions Test Methods and Procedures for Motorcycles"
8	Constant speed	7		32	24	24	85	
9	Decelerate	8	-0.75	32-10	8	11	93	
10	Decelerate; declutch		-0.92	10-0	3		96	K
11	Idling	9		0	21	21	117	16s PM+5s K
12	Accelerate	10	0.53	0-50	26	26	143	In accordance with EPA regulation of "The Exhaust Emissions Test Methods and Procedures for Motorcycles"
13	Constant speed	11		50	12	12	155	
14	Decelerate	12	-0.52	50-35	8	8	163	
15	Constant speed	13		35	13	13	176	
16	Decelerate	14	-0.68	35-10	9	12	185	
17	Decelerate; declutch		-0.92	10-0	3		188	K
18	Idling	15		0	7	7	195	7s PM
note：PM=neutral, clutch engaged K=declutch								

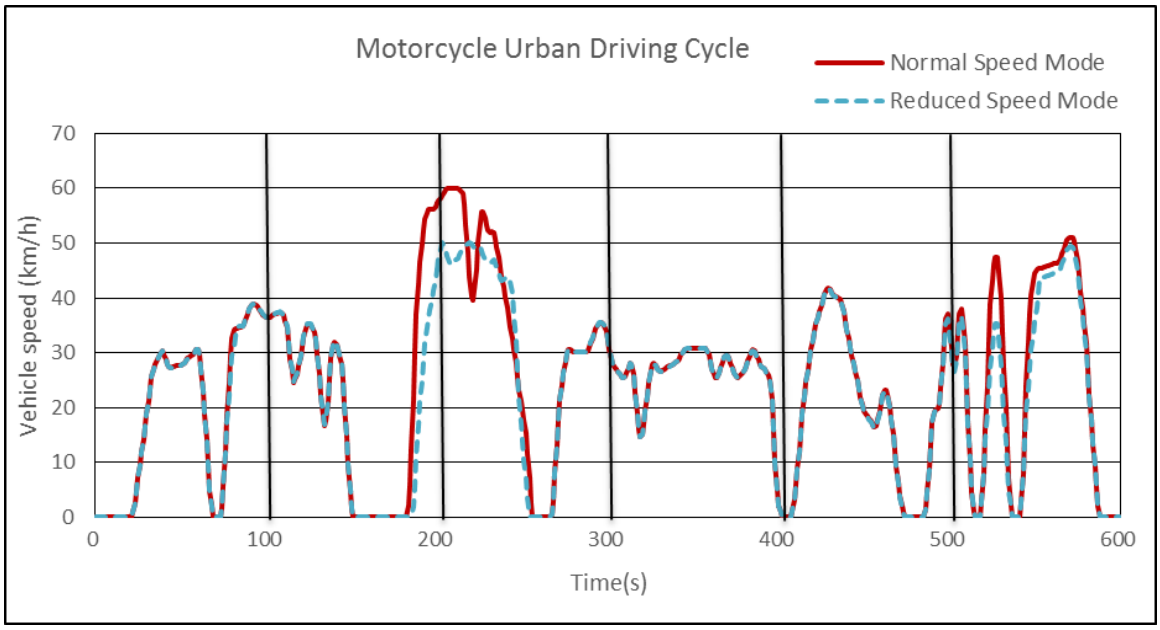

Figure 1 Motorcycle Urban Driving Cycle (For motorcycles applicable to the emission standards effective on and after Jan. 1, 2017)

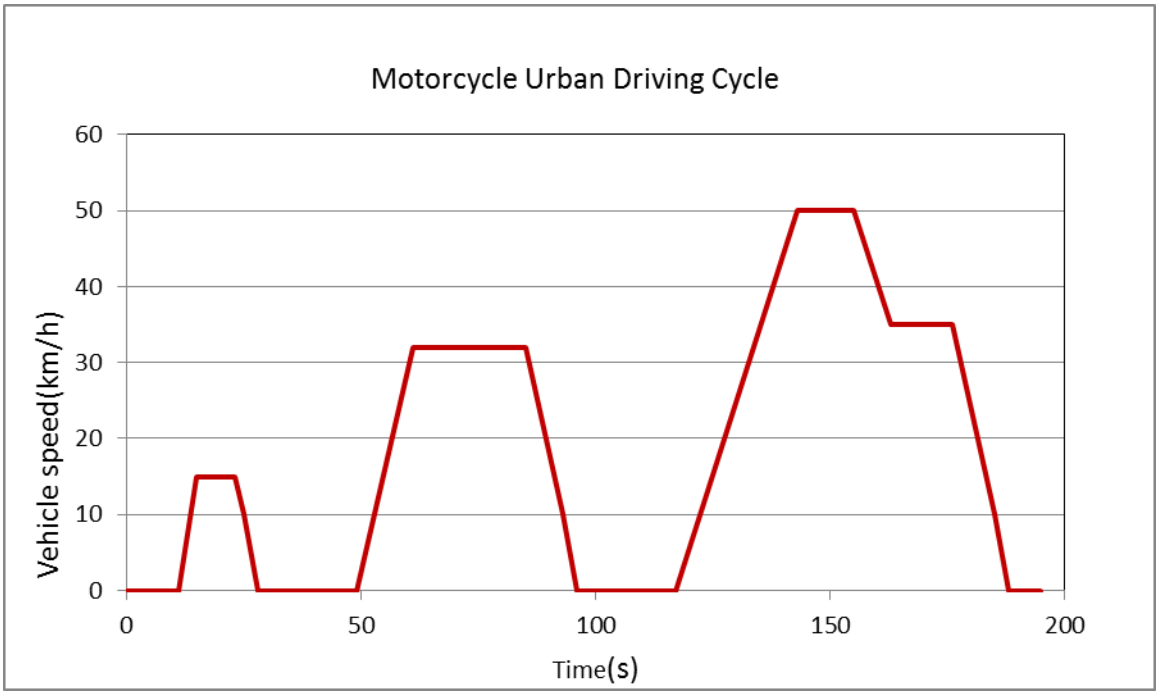

Figure 2 Motorcycle Urban Driving Cycle (For motorcycles applicable to the emission standards effective prior to Jan. 1, 2017)