The People's Republic of China

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GB 14621 (2010) (English): Limits and measurement methods for exhaust pollutants from motorcycles and mopeds under two-speed idle conditions

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National Standard
of the People's Republic of China

GB14621-200X
Replacement of GB14621-2002

Limits and measurement methods for exhaust pollutants from motorcycles and mopeds under two-speed idle conditions and simple transient driving mode conditions

(Draft for approval)

Issue Date: XX-XX-200X Implementation Date: XX-XX-2009

Issued by the Ministry of Environmental Protection
of the People's Republic of China
General Administration of Quality Supervision, Inspection and Quarantine of
the People's Republic of China

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Foreword

This Standard is drawn up to implement the “Environmental Protection Law of the People's Republic of China” and the “Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution”, to prevent and control environmental pollution from fuel evaporative pollutants from motorcycles and mopeds, and to improve the environmental air quality.

This Standard defines the limits and measurement methods of evaporative pollutant emissions from motorcycles and mopeds under idle speed conditions and high idle speed conditions. It also specifies the measurement methods for simple transient driving mode conditions of motorcycles and mopeds.

This Standard is a modification of the Limits and Measurement Methods for Exhaust Emissions from Motorcycles and Mopeds under Idle Speed (GB14621-2002). The modified main contents are as below:

- Added the exhaust limits and the measurement method under high idle speed conditions;
- Added the measurement requirements for simple transient driving mode conditions.

This Standard is the replacement for the following standards: GB14621-1993, GB14621-2002.

Appendix A to this Standard is an informative annex and Appendix B to this Standard is a normative annex.

This Standard was proposed and formulated by the Department of Science & Technology and Standards of the Ministry of Environmental Protection of the People's Republic of China.

The organisations responsible for the drafting of this Standard are:
Tianjin Motorcycle Technical Centre;
The Chinese Research Academy of Environmental Sciences.

This Standard was approved by the Ministry of Environmental Protection on xx xx xxxx (date).

This Standard shall enter into force on xx xx xxxx (date).

The Ministry of Environmental Protection is responsible for the interpretation of this Standard.

Limits and Measurement Methods for Exhaust Pollutants from Motorcycles and Mopeds under Two-speed Idle Conditions and Simple Transient Driving Mode Conditions

1 Scope

This standard specifies the limits and measurement methods for exhaust pollutants from motorcycles and mopeds under idle speed conditions and high idle speed conditions. It also specifies the measurement methods for simple transient driving mode conditions of motorcycles and mopeds.

This standard applies to the type-approval, inspection for exhaust pollutants from new and in-use motorcycles and mopeds with positive-ignition engines.

2 Normative References

The provisions of the following documents will become provisions of this Standard after being referenced. The effective versions of the undated references shall apply to this Standard.

GB 14622-2007 Limits and measurement methods for the emissions of pollutants from motorcycles on the running mode (China stage III)
GB 17930-2006 Gasoline for motor vehicles
GB 18047 Compressed natural gas as vehicle fuel
GB 18176-2007 Limits and measurement methods for the emissions of pollutants from mopeds on the running mode (China stage III)
GB 19159 Liquefied petroleum gas as vehicle fuel
GB/T 5359.4 Terms for motorcycles and mopeds – Part 4: Mass of vehicles with two and three wheels
GB/T 5359.5 Terms for motorcycles and mopeds – Part 5: Mass of vehicles with two wheels
GB/T 5359.6 Terms for motorcycles and mopeds – Part 6: Mass of vehicles with three wheels
GB/T 15089 Classification of power-driven vehicles and trailers
HJ/T 3-1993 Gasoline-fuelled motor vehicles – Exhaust emissions analyser – Technical specialisation
HJ/T 289-2006 Equipment specialisation and quality control requirements for gasoline vehicles in two-speed idle exhaust emission test
HJ/T 290-2006 Equipment specialisation and quality control requirements for gasoline vehicles exhaust emission test in short transient loaded mode

3 Terms and definitions

The terms and definitions listed below apply to this Standard.

3.1 Motorcycle

Any two-wheeled motorcycle (Category L3), three-wheeled motorcycle with a side car (Category L4) or motor tricycles (Category L5) as specified in GB/T 15089.

3.2 Mopeds

Any two-wheeled mopeds (Category L1) or three-wheeled moped (Category L2) as specified in GB/T 15089.

3.3 Exhaust pollutants

The carbon monoxide (CO), hydrocarbon (HC) and nitrogen oxide (NOx) emitted by the gas exhaust pipes.

3.4 Mode conditions of idle speed and high idle speed

The mode condition of idle speed is when the engine is in normal running with no-load and in a minimum steady running state, and the transmission is in neutral, the throttle controller is at its minimum position, the choke valve is completely open, and the rotation speed of the engine conforms to the specifications of the technical documentation of the manufacturer.
The mode condition of high idle speed is when the above mentioned conditions are met (the position of the throttle controller is not included. In respect of vehicles equipped with automatic transmissions, the driving wheels must be in a free state).To adjust the throttle controller, control the rotation speed of the engine under the high idle rotating speeds which are specified in the technical documentation of the manufacturer, but note that the rotation speed under high idle speed must not be lower than 2000r/min. If this is not specified in the technical documents, then the rotation speed of the engine shall be controlled to be in the range of 2500r/min ± 250r/min.

3.5 Volume fraction of carbon monoxide (CO), hydrocarbon (HC) and carbon dioxide (CO_2)

The volume fraction of the carbon monoxide (CO) is the volume percentage of the CO contained in the exhaust gases, presented as a percentage. The volume fraction of hydrocarbon (HC) is the volume percentage of the HC contained in the exhausted gases, presented as 10^{-6}; the volume fraction of the carbon dioxide (CO_2) is the volume percentage of the CO_2 contained in the exhausted gases, presented as a percentage.

3.6 Gaseous fuel

The natural gas (NG) specified in GB18047 or the liquefied petroleum gas (LPG) specified in GB 19159.

3.7 Dual-fuel vehicles

Motorcycles that can use both gasoline and gaseous fuel, but not both at the same time.

3.8 Single-gaseous fuel vehicles

Motorcycles that only use one type of gaseous fuel or that can use one type of gaseous fuel (natural gas NG) or liquefied petroleum gas (LPG) and gasoline; however, gasoline is only used in emergency situations or only used at start-up of motorcycles.

3.9 Reference mass (RM)

The total mass of complete vehicle kerb mass of any motorcycle specified in GB/T 5359.5 or GB/T 5359.6 and the body mass of the vehicle driver.

3.10 Newly-produced vehicles

Any motorcycle or moped before it has been allocated number plates but has passed the final production line inspection of the manufacturer.

3.11 In-use vehicles

Any motorcycle or moped which has been registered and has been allocated number plates.

4 Limits of exhaust pollutants

4.1 Type approval and exhaust pollutant limits of newly-produced vehicles

The type approval and the exhaust pollutant limits of any newly-produced motorcycle and moped shall not exceed the limited values specified in Table 1.

Table 1 Type approval and the exhaust pollutant limit of any newly-produced motorcycle and moped (volume fraction)

Vehicle type and production dates	Idle speed conditions		High idle speed conditions	
	CO %	HC[a] 10^{-6}	CO %	HC[a] 10^{-6}
Type approval and new vehicles produced since xx xx 200x (date)	2	250	2	250
HC[a] the volume fraction value of the HC[a] shall be according to the n-hexane equivalent values.				

4.2 The limits of exhaust pollutants of in-use vehicles

The exhaust pollutant limits of any in-use motorcycle and moped shall not exceed the limited values specified in Table 2.

Table 2 The exhaust pollutant limit of in-use vehicles (volume fraction)

Vehicle type and production dates	Idle speed conditions		High idle speed conditions	
	CO %	HC[a] 10^{-6}	CO %	HC[a] 10^{-6}
Motorcycles and mopeds (two-stroke) produced before 1 July 2003	4.5	8000	/	/
Motorcycles and mopeds (four-stroke) produced before 1 July 2003	4.5	2200	/	/
Motorcycles and mopeds (two-stroke) produced	4.5	4500	/	/

since 1 July 2003				
Motorcycles and mopeds (four-stroke) produced since 1 July 2003	4.5	1200	/	/
Motorcycles and mopeds produced since 1 July 2010	3	400	3	400
Motorcycles and mopeds produced since 1 July 2011				
HC[a] the volume fraction value of the HC[a] shall be according to the n-hexane equivalent values.				

5 Measurement methods

5.1 Measurement instruments

The measurement instruments for exhaust pollutants shall conform to the regulations set out in HJ/T 289-2006. Exhaust monitors that conform to HJ/T 3-1993 shall also apply to the exhaust measurement tests under idle speed conditions which are specified in Table 2. The measurement results do not need to be amended at present.

5.2 Measurement procedures

5.2.1 The preparation and use of the instruments

The preparation (including pre-heating) and use of the instruments shall be carried out in accordance with the manual instructions of the instrument manufacturers.

5.2.2 Fuel and vehicle preparation

5.2.2.1 The fuels used for the type approval tests shall conform to the requirements set out in the Appendix F to the GB 14622-2007, the fuels used for the inspection tests of any new produced vehicle and in-use vehicle shall conform to the regulations set out in the technical documents of the manufacturer. If the mixed lubrication method is applied to any engine, then the engine oil quantity and grade which are added to the fuel shall conform to the regulations specified in the technical documents of the manufacturers.

5.2.2.2 Vehicles must be in the normal state specified by the manufacturers; the exhaust system must not have any leaks.

5.2.2.3 Vehicles shall be pre-heated in accordance with the regulations set out in the technical documents of the vehicle manufacturers. In the case that no regulations are set out in the technical documents, four circulations shall be conducted on the chassis dynamometer in accordance with the mode conditions specified in GB 14622-2007 for motorcycles and GB 18176-2007 for mopeds, or driving on a normal road for 15 minutes to carry out pre-heating. The measurements of exhaust emissions at idle speed and high idle speed shall be carried out within 10 minutes of the vehicle being pre-heated.

5.2.2.4 Add a length of 600 mm with an inner diameter of 40mm special sealed connecting tube to the rear part of the exhaust muffler, the exhaust back pressure shall be ensured not to exceed

1.25kPa, and will not affect the normal operating of the engine.

5.2.2.5 In the case of multiple exhaust pipes, a Y-shape shall be used to connect the tube to collect the emissions into an identical tube for measurement, or measuring the emissions individually, and take the mean value of the measurement results of all exhaust pipes as the measurement result.

5.2.3 Measurement of the exhaust pollutants under high idle speed condition

5.2.3.1 Engines accelerating from idle speed to 70% of its maximum net power rotation speed; after operating for 10 seconds, it is then reduced to high idle speed.

5.2.3.2 Maintain the high idle speed, insert a sample probe into the connecting tube and ensure the inserting depth is not less than 400 mm. After maintaining for approximately 15 seconds, read the mean value with a mean value functional instrument within 30 seconds, or manually read the maximum value and minimum value within 30 seconds. The average value shall be the measurement result of the pollutants under high idle speed condition.

5.2.4 Measurement of the exhaust pollutants at idle speed

When the condition of the engine from high idle speed reduced to idle speed and after maintaining for 15 seconds, read the mean value with a mean value functional instrument within 30 seconds, or manually read the maximum value and minimum value within 30 seconds. The average value shall be the measurement result of the pollutants under idle speed condition.

5.2.5 Recording of measurement result

The rotation speed of the engine at test, as well as the measurement of the volume fraction values of the carbon monoxide (CO), carbon dioxide (CO2) and hydrocarbon containing in the exhaust gases shall be recorded.

5.2.6 Amendment of the measurement results

The amended concentration of the carbon monoxide ($C_{CO\ modification}$) shall be amended with the measurement values of the carbon monoxide (C_{CO}) concentration and carbon dioxide (C_{CO2}) concentration in accordance with the following formula, the amended value shall be used as the measurement result.

5.2.6.1 The amended concentration of the carbon monoxide (CO) for two-stroke engines shall be:

$$C_{co\ modification} = C_{co} \times \frac{10}{C_{co} \times C_{co_2}}\ \%$$

5.2.6.2 The amended concentration of the carbon monoxide (CO) for four-stroke engines shall be:

$$C_{co\ modification} = C_{co} \times \frac{15}{C_{co} \times C_{co_2}}\ \%$$

5.2.6.3 For the total measured concentration value (Cco + Cco2) of any two-stroke engine which is not less than 10%, or the total measured concentration value (Cco + Cco2) of any four-stroke engine which is not less than 15%, then the concentration value of the measured carbon monoxide (CO) shall not need to be modified in the above formulas 5.2.6.1 and 5.2.6.2.

5.2.7 Number rounding off

One decimal place shall be kept for the rounding-off of the exhaust value for carbon monoxide (CO); the tens digit place shall be kept for the rounding-off of the exhaust value for hydrocarbon (HC).

5.2.8 Data recording

Enter the entire measurement data into Appendix A.

6 Single-gas fuel vehicles and dual-fuel vehicles

With regards to vehicles using single-gas fuel, detection of emissions shall only be conducted with the relevant gas fuel; in respect of vehicles using dual-fuels, it is required to conduct emission detection with both fuels respectively.

7 Determination of the measurement results

If there is any one inspection item value of the exhaust pollutants of any vehicle which has exceeded the corresponding limit specified in Chapter 4, then the exhaust emissions of this vehicle shall be regarded as unqualified.

8 Implementation requirement

8.1 From the implementation date of this Standard, the exhaust limits specified in Table 1 shall be applied to the type approval of motorcycles and mopeds and the exhaust monitoring of new vehicles; the manufacturers of the motorcycles and mopeds shall treat the two-speed idle speed measurement results of the type approval tests as the consistency guarantee of the enterprise production and the reference basis of its self-inspection.

From the implementation date of this Standard, the exhaust limits and measurement methods specified in Table 2 shall be applied to the exhaust monitoring of any in-use motorcycles and mopeds.

8.2 On the basis of the local actual situation, the local administrative departments may select the two-speed idle speed method or the simple transient driving method as the exhaust detection method for in-use vehicles in areas which are heavily polluted and have a large number of motorcycles and mopeds. With regard to any type of the same model in-use vehicles, when conducting routine environmental protection detection, only one type of the exhaust pollutant detection methods can be selected.

8.3 Areas using a simple transient driving method shall be specified an emission limit for each local exhaust pollutant, and the said limits shall be approved by the government departments at provincial levels, and be filed by the administrative department for environmental protection of the State Council prior to implementation.

9 Implementation of this Standard

The implementation date of this Standard shall be xx xx 200x (date).

Appendix A

Recording Table for Pollutants in Two-speed Idle Mode

(Informative Annex)

A.1 Vehicle information

Vehicle model: _____

Manufacturer: _____

Vehicle Identification Number (VIN): _____

Engine Identification Number (EIN): _____

Number of strokes per minute: _____

Idle speed (r/min): _____

Maximum net power rotation speed (r/min): _____

High idle rotation speed_____

Fuel specification: _____

Lubricant specification: _____

Fuel supply method: Carburettor /electric injection _____

Fuel injection system: open type/ closed type _____

Pollution control unit: _____

A.2 Test instruments

Model number of the exhaust gas analyser: _____

Model number of the tachometer: _____

A.3 Test environment

Atmospheric pressure: _____

Temperature: _____

Relative humidity: _____

Test location: _____

Test date: _____

Test technician: _____

Contents	High idle speed				Idle speed			
	Rotation speed r/min	CO %	CO_2 %	HC 10^{-6}	Rotation speed r/min	CO %	CO_2 %	HC 10^{-6}
Measurement result								
Result	/		/	/	/		/	/

amendment								
Result rounding-off	/				/			

Appendix B

(Normative Annex)

Measurement methods for simple transient driving mode

B.1 Scope

This Appendix specifies the test procedures for the simple transient driving mode conditions which are mentioned in 8.1 of this Standard.

B.2 Test running cycle

In accordance with the specifications set out in CA.2 of the GB14622-2007, an urban district running cycle must be conducted on the test motorcycle chassis dynamometer; and in accordance with the specifications set out in C.2.1 of the GB18176-2007, a running cycle must be conducted to the test moped chassis dynamometer.

B.3 Vehicles and fuels

B.3.1 Test vehicles

B.3.1.1 The mechanical condition of the test vehicles must be sufficient, there must be no mechanical failures which may affect safety or lead to test deviations.

B.3.1.2 There must be no leakage in the exhaust system, to avoid a decrease in the quantity of the exhaust gas collection.

B.3.1.3 There must be no liquid leakage from the engine, gear-box and cooling system of the test vehicles.

B.3.1.4 The tyre pressure shall be within the normal range, the tyres shall be dry and clean.

B.3.1.5 The driving wheels of the vehicles must be on the roller, the vehicles must be laterally stable and well-spaced.

B.3.1.6 Before conducting the test, the test vehicles shall be pre-heated in accordance with the rules specified in the technical documents of the vehicle manufacturer. The exhaust measurement must be started within 10 minutes after the test vehicle has been pre-heated.

B.3.2 Test fuels

Commercially available fuels which conform to the specifications set out in the technical documents of the vehicle manufacturers shall be used.

B.4 Test equipment

B.4.1 Chassis dynamometer

A chassis dynamometer is mainly composed of a power-absorbing unit, a roller, an inertia simulation unit, a driving motor and a rotation speed sensor. It is used to simulate the road resistance of vehicles. As a minimum, a chassis dynamometer must be able to simulate the acceleration and inertia of a vehicle under normal road conditions. It must also simulate the mode conditions of a vehicle while the vehicle's road driving speed is steady or is accelerating – by controlling the power-absorbing unit. The mode of speed deceleration is simulated by general flywheels, or by a chassis dynamometer which is able to simulate the entire inertia of a vehicle driving on the road.

The chassis dynamometer must also be suitable for motorcycles or mopeds with a complete vehicle kerb mass not more than 400 kg.

B.4.1.1 Power-absorbing unit

B.4.1.1.1 Power-absorption of chassis dynamometer

The total absorbed power of a chassis dynamometer (Pa) includes the indicated horsepower (IHP) and the parasitic power (PLHP) in two parts. Unless otherwise specified, the power value displayed by the chassis dynamometer shall be the Pa value:

$$Pa = IHP + PLHP$$

IHP – Indicated horsepower, the absorbed power of the power-absorb unit, kW;

PLHP – Parasitic power, the power absorbed by the friction of the rotating parts, kW;

B.4.1.1.2 See Section 4.12 of HJ/T 290-2006 for the technical requirements of the coast-down test for parasitic power.

B.4.1.1.3 See Section 4.13 of HJ/T 290-2006 for the technical requirements of the load coast-down test for the chassis dynamometer.

B.4.1.1.4 See Section 4.14 of HJ/T 290-2006 for the technical requirements of the pressure sensor calibration for the chassis dynamometer.

B.4.1.1.5 See Section 4.16.2 and Section 4.16.3 of HJ/T 290-2006 for the technical requirements of the response time for the chassis dynamometer.

B.4.1.1.6 The power absorbed by the power-absorb unit shall use 0.01kW as the adjustable unit. Within the environmental temperature range of $0^{o}C$ to $40^{o}C$, after the chassis dynamometer is pre-heated, its power deviation shall not exceed ± 0.02kW or ± 2% of the power absorption, among these two, the larger value shall be selected.

B.4.1.2 Roller technical requirements

B.4.1.2.1 The chassis dynamometer shall be equipped with a single roller, with a diameter of not less than 400 mm.

B.4.1.2.2 The surface treatment of the roller must ensure the tyre will not skid; the surface of the roller shall be dry; be able to ensure the measuring distance and speed accuracy; and the tyre abrasion and noise must be kept to a minimum.

B.4.1.3 Inertia

B.4.1.3.1 Dynamometer inertia weight

The chassis dynamometer shall be equipped with a machine flywheel; the total dynamometer inertia weight shall be 120 kg ± 15 kg. The deviation between the dynamometer inertia weight and 120 kg must be quantified, and a modification of coast-down test time shall be conducted in accordance with the actual dynamometer inertia weight. The accuracy of the actual dynamometer inertia weight shall be ± 2.5 kg, and shall be clearly stated on the plate of the chassis dynamometer or the flywheel.

B.4.1.3.2 Inertia simulation

The chassis dynamometer must be able to simulate the inertia of any motorcycle or moped with a complete vehicle kerb mass not exceeding 400 kg when using the acceleration of 1.47 m/s^2 as the accelerated speed. The simulation difference of the electrical inertia must not exceed 2%, and must be able to provide a 1 kg mass increment.

B.4.1.4 Other requirements

B.4.1.4.1 The test vehicles on the chassis dynamometer must be horizontally positioned; and the chassis dynamometer must have a spacing gripping holder to hold the test vehicles.

B.4.1.4.2 The chassis dynamometer must be suitable for vehicles with a maximum safe driving speed of 90 km/h or greater.

B.4.1.4.3 In order to avoid the engines of the test vehicles becoming over-heated during the test process, a cooling blower shall be fitted. This cooling blower shall be located on the right front side of the test vehicle, at a distance of 30-40 cm away from the end of the front wheels, the lower part of the cooling blower shall be 15-20 cm off the ground, the area of the air outlet shall be at least $0.4m^2$, the ventilation quantity shall not be lower than $85m^3$/min and the wind speed shall not be lower than 4.5 m/s.

B.4.1.4.4 The chassis dynamometer shall be equipped with a system to measure the rotation of the roller. The rotation measurement is used to calculate the driving speed of a vehicle and the accuracy of the speed measurement must be ± 0.16 km/h.

B.4.1.4.5 The chassis dynamometer will be able to measure the equivalent driving speed of a vehicle, with a distance accuracy of ± 2%.

B.4.2 Exhaust gas sampling system and five gas analyser

B.4.2.1 The main components of the five gas analyser and sampling system shall conform to the specifications set out in Section 5.1 of HJ/T 290-2006.

B.4.2.2 The sampling system shall be designed so that the materials which it is made of, and its materials which come into contact with the sampled gases are not contaminated or do not change the properties of the analysing gases, and also do not lead to any corrosion caused by any sampled gases. The sampling system must conform to the specifications set out in Section 5.2 of HJ/T 290-2006.

B.4.2.3 The sample tube shall conform to the specifications set out in Section 5.3 of HJ/T 290-2006.

B.4.2.4 The length of the sample probe shall be inserted into the gas exhaust extension tube at least 400 mm, and shall conform to the specifications set out in Section 5.4 of HJ/T 290-2006.

B.4.2.5 The five-gas analyser shall use the principles mentioned below to check the concentration of the exhaust pollutants: use the Non-Dispersive Infrared (NDIR) method to check the carbon monoxide (CO), hydrocarbon (HC) and carbon dioxide (CO_2); use the electrochemical method to check the nitric oxide (NO) and oxygen (O_2). Other principles shall be approved by the Ministry of Environmental Protection's designated units before being used. The five-gas analyser shall conform to the specifications set out in Section 5.5 and Section 5.6 of HJ/T 290-2006.

B.4.2.6 The analyser must be able to maintain the test accuracy. When considering the suitability of the calibrated gases and test gases, the following calibrated gases can be used, with an error margin of ± 1%.

I, Zero gases:

Concentration: O_2, 20.9%; N_2, balance. Impurity level: THC, CO, NO<1 x 10^{-6}; CO_2 < 200 x 10^{-6}.

II, Low-range standard gases:

200 x 10^{-6}	C_3H_3 (Propane)
0.50%	CO
6.0%	CO_2
300 x 10^{-6}	NO

99.99% pure balance gases N_2

III, High-range standard gases:

3200×10^{-6} C_3H_3 (Propane)

8.00% CO

12.0% CO_2

3000×10^{-6} NO

99.99% pure balance gases N_2

B.4.3 Effusion meter

B.4.3.1 The main components of an effusion meter must conform to the regulations set out in Section 6.1 of HJ/T 290-2006.

B.4.3.2 The specifications of the effusion meter and its technical requirements must conform to the regulations set out in Section 6.2 of HJ/T 290-2006.

B.4.3.3 Technical requirements of the effusion meter components

B.4.3.3.1 The diameter of the gas collecting tube must be within the range of 60 – 75 mm, the gas pump shall ensure the output gases go through the effusion meter is within the range of (30 - 70)L/s.

B.4.3.3.2 Other technical requirements of the effusion meter components must conform to the regulations set out in Section 6.3 of HJ/T 290-2006.

B.4.3.4 The technical characteristic requirements of the effusion meter must conform to the regulations set out in Section 6.4.1 and Section 6.4.2 of the HJ/T 290-2006.

B.4.4 Computer control system

B.4.4.1 The test procedure, data collecting and analysis system is automatic. According to the parameter database of the vehicle, the software is able to automatically set up the vehicle load.

B.4.4.2 The system is equipped with a clearly visible driver guide device (driver assistant). The guide device shall continuously display the required speed, time (in seconds) under test conditions, actual driving speed and time, engine rotation speed, brake application and any other necessary reminders and warnings. The guide device shall also be able to display the state of the test and equipment and other required information.

B.4.4.3 The system must be able to accurately record and display the test procedure data, and be able to automatically carry out calculations and modifications.

B.5 Test preparation

B.5.1 Test environmental requirements

Environmental temperature: $0^oC \sim 40^oC$;

Relative humidity: < 85%.

B.5.2 Before starting the test, record the information required by Appendix BA.

B.5.3 Add a length of 600 mm with an inner diameter of 40mm special sealed connecting tube to the rear part of the exhaust muffler, the exhaust back pressure must not exceed 1.25 kPa, and will not affect the normal operation of the engine. The materials used to make the exhaust tube extension must not affect the exhaust emissions, and are also not affected by the chemical composition of the exhaust emissions.

B.5.4 Preparation and set up of the test equipment

B.5.4.1 Pre-heat the analyser; it will reach a stable state after the power is connected for 30 minutes. If not adjusted within five minutes, the zero gas and the measuring distance reading of HC, CO, NO, CO_2 shall be kept within the range of the accuracy specification.

B.5.4.2 Before the machine is switched off the sampling system must be continuously cleaned for at least 15 minutes. At least 5 minutes cleaning is required if the back-flush cleaning method has been used.

B.5.4.3 The sample probe is inserted into the special sealed connecting tube for at least 400mm.

B.5.4.4 Samples from independently-operated multi-exhaust tubes shall be taken at the same time.

B.5.4.5 Within 2 minutes before each test, the analyser must complete its auto-zero purification, determination of ambient air and detection of HC residue.

B.5.4.5.1 Use zero gases to purify HC, CO, CO_2, NO and O_2.

B.5.4.5.2 After the ambient air has been filtered by the sample probe, soft tube, filter and moisture separator, it is sent into the analyser through the sampling pump. The concentration of all five test gases shall be directly recorded, and not require any modification.

B.5.4.5.3 The analyser shall determine the pollution level of the ambient air and the HC residue. When the collected sample gases: (1) in the ambient air, have reached, HC $<7 \times 10^{-6}$, CO<0.02%, NO $<25 \times 10^{-6}$; (2) have a residue concentration of the HC in the sampling system higher than the sampling concentration of the ambient air but does not exceed 7×10^{-6}, then the instrument can be used.

B.5.4.6 Chassis dynamometer pre-heat

When the chassis dynamometer is switched on, it must be pre-heated. When the chassis dynamometer is switched off or the required temperature is not met, the chassis dynamometer shall automatically start to pre-heat and standby.

B.5.4.7 Coast-down test

After it is started and pre-heated, conduct a coast-down test according to the programs set by the chassis dynamometer, after the coast-down test is qualified, the exhaust test under simple transient driving mode can be conducted.

B.5.4.8 Load set of simple transient driving mode

Before conducting the exhaust test, according to the vehicle parameters, the system must be able to automatically set up the chassis dynamometer load. For motorcycles, it shall be conducted in accordance with the regulations specified in Section C.5.4 of GB14622-2007; for mopeds, it shall be conducted in accordance with the regulations specified in Section C.5.2 of GB18176-2007.

B.6 Test procedure

B.6.1 Starting the engine

B.6.1.1 Start the engine according to the instructions provided by the vehicle manufacturer.

B.6.1.2 The engine maintains its idle speed for 40 seconds; when 40 seconds has passed, start operating circulation, meanwhile start taking samples.

B.6.2 Idle speed

B.6.2.1 Hand/foot operated transmission

B.6.2.1.1 During idle speed operation, the clutch must be engaged and the transmission must be in neutral.

B.6.2.1.2 In order to allow acceleration to be performed as the test requires, after the idle speed and 5 seconds before acceleration, the clutch of the motorcycle is disengaged and the transmission is put into first gear.

B.6.2.1.3 The first idle speed period of each circulation includes the 6 seconds of the clutch engagement and neutral position of the transmission, and the 5 seconds of the clutch disengagement and the first gear position of the transmission.

B.6.2.1.4 The middle idle speed period of each circulation includes the 16 seconds of the clutch engagement and neutral position of the transmission, and the 5 seconds of the clutch disengagement and the first gear position of the transmission.

B.6.2.1.5 The last idle speed period of each circulation refers to the 7 seconds of the clutch engagement and neutral position of the transmission.

B.6.2.2 Semi-automatic transmission

To be carried out in accordance with the specification of the manufacturer. If it is not specified by the manufacturer, then it shall be carried out as manual transmission.

B.6.2.3 Automatic transmission

The gear selector is not used during the test, unless specified by the manufacturer. If the manufacturer specifies use of the gear selector, then the procedure shall be carried out using manual transmission.

B.6.3 Acceleration

B.6.3.1 During acceleration, the specified acceleration shall be ensured, and the changing rate of the acceleration shall be kept as stable as possible.

B.6.3.2 If the acceleration of the motorcycle does not use accelerated rotation for its specified range, then the accelerator must be fully depressed until the required vehicle speed is reached, then normal operations will be carried out as specified.

B.6.4 Deceleration

B.6.4.1 All speed deceleration shall be carried out when the accelerator is completely disengaged and the clutch is engaged. When the vehicle speed has decreased to 10 km/h, disengage the engine.

B.6.4.2 In the case that the period of speed deceleration is longer than the corresponding specified circulation rate, then the vehicle brake must be used in order to slow the vehicle to the specified circulation rate.

B.6.4.3 In the case that the period of speed deceleration is shorter than the corresponding specified circulation rate, then there must be a period of steady speed or idle speed to recover the specified circulation rate.

B.6.4.4 When the speed deceleration is complete (the motorcycle on the roller has stopped), engage the clutch and shift the transmission to neutral.

B.6.5 Steady speed

B.6.5.1 During the period of transition from acceleration to even speed, sudden increases or decreases in speed must be avoided.

B.6.5.2 During even speed, the accelerator position must be kept unchanged.

B.7 Limits to determine the exhaust pollutants

B.7.1 The dilution ratio of the exhaust emissions shall be calculated according to the formula below:

$$DR = \frac{[O_2]amb - [O_2]dil}{[O_2]amb - [O_2]raw}$$

In which: DR – Dilution Ratio

$[O_2]$amb – the oxygen concentration (volume fraction) in the surrounding ambient air, percentage

$[O^2]$dil – the reading of the oxygen concentration (volume fraction) of the oxygen sensor in the effusion meter, percentage.

$[O_2]$raw – the reading of the oxygen concentration (volume fraction) of the oxygen sensor in the five-gas analyser, percentage.

B.7.2 The actual flow rate of the exhaust emissions shall be calculated according to the formula below:

$$Q_e = Q_{act} \times \frac{P}{T} \times \frac{273.2}{101.3} \times DR$$

In which: Q_e – the actual flow rate of the exhaust emissions, L/s;

Q_{act} -the actual flow rate of the volumetric dilution;

P – the reading of the pressure sensor of the diluted exhaust emissions, kPa;

T – the reading of the temperature sensor of the diluted exhaust emissions, K.

B.7.3 Measurement result of the exhaust emissions

B.7.3.1 The measurement result of the emitted CO

$$CO_M = \frac{\sum m_{co}}{S}$$

In which: CO_M – the amount of CO emitted per kilometre during the test, g/km;

S – the driving distance of the vehicle during test, km;

$\sum m_{CO}$ the total amount of CO emitted per second during the test, g;

In the formula, the $\sum m_{CO}$ shall be calculated according to the formula below:

$$m_{co} = 10^{-2} \times [CO] \times D_{co} \times Q_e$$

In which: m_{co} – the actual amount of CO emitted, g/s;

[CO] – the actual emitted CO concentration (volume fraction), %;

D_{co} – the CO density under standard conditions, g/L.

B.7.3.2 The measurement result of the emitted HC

$$HC_M = \frac{\sum m_{HC}}{S}$$

In which: HC_M – the amount of HC emitted per kilometre during the test, g/km;

S – the driving distance of the vehicle during the test, km;

$\sum m_{HC}$ – the total amount of HC emitted per second during the test, g;

In the formula, the$\sum m_{HC}$ shall be calculated according to the formula below:

$$m_{HC} = 10^{-6} \times [HC] \times D_{HC} \times Q_e$$

In which: m_{HC}– the actual amount of HC emitted, g/s;

[HC] – the actual concentration of HC emitted (volume fraction), 10-6;

D_{HC} – the HC density under standard conditions, g/L.

B.7.3.3 The measurement result of the emitted NOx

The nitrogen oxide (NOx) is presented by the equivalent of NO_2. The measured value of NO shall be automatically calculated and rounded-off by the system main processor.

$$NOx_M = \frac{46}{30} \times \frac{\sum m_{NO}}{S}$$

In which: NOx_M – the amount of NOx emitted per kilometre during the test, g/km;

S – the driving distance of the vehicle during the test, km;

$\sum m_{NO}$ – the total amount of NO emitted per second during the test, g;

In the formula, the $\sum m_{NO}$ shall be calculated according to the formula below:

$$m_{NO} = 10^{-6} \times [NO] \times D_{NO} \times Q_e$$

In which: m_{NO} – the actual amount of NO emitted, g/s;

[NO] – the actual concentration of NO emitted (volume fraction), 10^{-6};

D_{NO} – the NO density under standard conditions, g/L.

B.7.4 The test procedures and results data shall be recorded and kept in the system database.

Appendix BA

Report format of the test result

Test Result of the Exhaust Pollutants under Simple Transient Driving Mode Conditions

Name of test station: _____

Test date: _____

Test operator: _____

Test driver: _____

BA.1 Vehicle information

Vehicle model: _____

Vehicle manufacturer: _____

Reference mass: _____

Tyre pressure: _____

Transmission model: _____

Gear number: _____

Engine model: _____

Engine manufacturer: _____

Cylinder numbers: _____

Engine displacement: _____

Fuel supply method: _____

Catalytic converter model: _____

Total mileage: _____

Fuel specification: _____

Number of number plate: _____

Vehicle identification number: _____

Vehicle registration date: _____

Name and contact information of vehicle owner: _____

BA.2 Test equipment

Equipment authentication code:

Equipment name: _____

Model number: _____

Manufacturer: _____

Chassis dynamometer: _____

Exhaust emission analyser: _____

BA.3 Test environment state:

Temperature: _____

Atmospheric pressure: _____

Relative humidity: _____

BA.4 Test result and determination:

Exhaust pollutants	HC	CO	NOx
Test results (g/km)			
Limits (g/km)			
Determination result	Qualified/unqualified	Qualified/unqualified	Qualified/unqualified
Determination	Passed/Failed		