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National Standard of the People's Republic of China

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Replaces GB 15744-1995, GB/T 16486-1996

Limits and measurement methods of fuel consumption for mopeds

(IS07859:2000 (E) Mopeds- Fuel consumption measurements, NEQ)

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Table of Contents

Foreword

The Appendices to this Standard are recommended, whilst the rest is mandatory.

The consistency degree between this Standard and ISO7859:2000, "Mopeds – Fuel consumption measurements" (first edition English version), implemented by the International Standards Organisation (ISO) on 1 May 2000 is non-equivalent.

In comparison with the abovementioned Standard ISO7859:2000, the main revised contents of this Standard are:

- the referenced international standards set out in ISO 7859; in this Standard, the corresponding national Standards have been referenced instead;
- the operating cycles content in ISO 7859 has been withdrawn and the operating cycles in GB18176-2002 are now directly used;
- some number ordering of clauses and articles has been readjusted;
- fuel consumption limits have been added;
- some of the content of Appendix A has been condensed.

This Standard replaces the moped-related contents of GB/T15744-1995 "Motorcycles and mopeds – Limits of fuel consumption", and GB/T16486-1996 "Motorcycles and mopeds - Measurement methods of fuel consumption". Compared to GB/T15744-1995 and GB/T16486-1996, the main changes to this Standard are:

- The division of the fuel consumption limits is only carried out on the basis of two-wheels and three wheels, the division methods carried out on the type basis of stroke numbers, three-wheeled, three-wheeled with side-car, riding on and seating on mopeds have been withdrawn;
- The fuel consumption value is the weighted average value of the measured values from Type I test and Type II test; the contents of Type I test (measurement of the average fuel consumption under the condition of prescribed operating cycle) have been added, and the driving speed, number of tests and the value determination method for Type II test (measurement of the average fuel consumption at constant speed) have been altered.

Appendices A and B to this Standard are normative annexes.

This Standard is proposed by China National Development and Reform Commission.

This Standard is under the jurisdiction of the National Automobile Standardisation Technical Committee.

The organisations that participated in the drafting of this Standard:
Shanghai Motorcycle Research Institute;
Tianjin Motorcycle Technical Centre;
Zhejiang Qianjiang Motorcycle Co., Ltd.

The draughters of this Standard: Quan Yifeng, Guo Zexin, He Wenjie, Wang Qing, Guo Dongshao, Sun Weimin.

This Standard replaces the previously issued Standards:

- GB 4567-1984;
- GB/T 15744-1995;

– GB/T 16486-1996.

This Standard comes into effect six months after its issue date; the checking for conformity of the production thereof shall be carried out 18 months after the issue date.

Limits and measurement methods of fuel consumption for mopeds

1 Scope

This Standard specifies the limits and measurement methods of fuel consumption for mopeds.
This Standard applies to mopeds.

2 Normative References

The provisions of the following documents become provisions of this Standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this Standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this Standard.

GB/T 1884, Crude petroleum and liquid petroleum products – Laboratory determination of density – Hydrometer method (GB/T 1884-2000, ISO 3675:1998, EQV);

GB/T 5378-1994, General rules of running test for motorcycles and mopeds;

GB/T 5384-1996, Measurement method for the maximum speed of motorcycles and mopeds;

GB14622-2002, Limits and measurement methods for exhaust emissions from mopeds under running mode.

3 Terms and definitions

The following terms and definitions and the terms and definitions set out in GB/T 18176-2002 apply to this Standard.

3.1 Reference speed

The driving speed when carrying out fuel consumption measurement tests (Type II test) on mopeds.

4 Test types and test conditions

4.1 Test types

Mopeds shall be subject to tests of two types.

4.1.1 Type I test (measurement of the average fuel consumption under the condition of prescribed operating cycle)

Type I test is completed on a chassis dynamometer, the test uses operating cycles set out in C.2 of Appendix C, GB 18176-2002. Each test includes two continuous operating cycles.

4.1.2 Type II test (measurement of the average fuel consumption at constant speed)

The type II test is completed on a road or on a chassis dynamometer, to measure the fuel consumption of the test-vehicle when the test-vehicle is driving at a reference speed.

4.2 Environment conditions

The test environment should meet the following conditions:

- Relative humidity: less than 95%;

- Maximum wind velocity: below 3m/s;

- Maximum velocity of gusts: below 5m/s;

- Environment temperature: 278k ~ 303k.

4.3 Standard conditions

Standard conditions as follows:

- Atmospheric pressure: p_0=100kpa;

- Atmospheric temperature: T_0=293K;

- Relative air density: d_0=0.9197;

The relative air density during test should be determined by means of the formula (1) , when compared to the air density under the standard state, the differential value should not be greater than 7.5%.

$$d_T = d_0 \times \frac{P_T}{P_0} \times \frac{T_0}{T_T} \qquad (1)$$

Where:

d_T – the relative air density under test condition;

P_T – the atmospheric pressure when testing, unit is kPa (kPa);

T_T – the atmospheric temperature when testing, unit is Kelvin (K);

5 Test preparations

5.1 Test-vehicle

5.1.1 The manufacturer of the moped or its authorised agent should submit information concerning the product description in accordance with Appendix A.

5.1.2 Before the test, the test-vehicle should be run-in in accordance with the requirements set out in the manufacturer's technical documentation, in normal operating mode.

5.1.3 Check the air-tightness of the air intake system and fuel supply system so as to ensure the mixed air is not affected by unexpected air intake.

5.1.4 The adjustment of the test-vehicle should be carried out in accordance with the requirements set out in the technical documentation. The pressure of the tyres should conform to the requirements set out in the technical documentation.

5.1.5 The test-vehicle should be examined before the test is carried out; the test-vehicle should be consistent with the description in the manufacturer's technical documentation; the test-vehicle can be driven normally and can be started normally under either cold state or hot state.

5.1.6 Before testing, in order to achieve the normal mode specified in the manufacturer's technical documentation, the test-vehicle should undergo out pre-warm up driving. If no requirements are specified, the test-vehicle should undergo pre-warm up running for four operating cycles in accordance with the operating cycle requirements set out in C.2 of Appendix C to GB 18176-2002; if the test is carried out on a road, in order for the engine and driving system to achieve normal heat conditions, the test-vehicle should be driven for at least 15 minutes under normal driving conditions.

5.1.7 When testing, the load mass of the vehicle and the mass of the passenger should meet the requirements set out in GB/T 5378-1994. The total mass of the passenger, the equipment and instrument is considered as 75kg. The mass of the fuel consumption measuring device should be obtained, and each of the abovementioned masses should be recorded in the test record.

5.1.8 The load distribution between the front-wheel axle and back-wheel axle should conform to the requirements specified in the manufacturer's technical documentation. When installing the measuring instrument on the test vehicle, the effect on the original load distribution should be reduced to a minimum.

5.1.9 When installing fuel consumption measuring device and speed sensor on the sides of the moped, additional air resistance should be reduced as far as possible.

5.2 Fuels and lubrication oil

The fuels specified in GB 18176-2002 should be used when testing. The density of the test fuel should be determined in accordance with the method set out in GB/T 1884; the ratio of the carbon-hydrogen should use a fixed value, gasoline is 1.85.

The distribution of the lubrication engine oil should conform to the required grades and quantities specified in the manufacturer's technical documentation.

6 Type I Test (measurement of the average fuel consumption under the condition of prescribed operating cycle)

6.1 The operating cycle on the chassis dynamometer

The setting of the operating cycles of the moped should conform to the requirements set out in section C.2 of Appendix C to GB 18176-2002.

6.2 Test equipment

6.2.1 Chassis dynamometer

The main characteristics of the chassis dynamometer should conform to the requirements set out in section C.4.1 of Appendix C to GB 18176-2002.

When measuring fuel consumption, the measurement system used for fuel consumption, travel distance and time should be kept simultaneously.

6.2.2 Measurement methods and measurement equipment of fuel consumption

The measurement of fuel consumption should be carried out in accordance with one of the following methods, the selection of the measurement method depending on the characteristic of each method and test type (Type I test or Type II test):

a) flow measurement method;

b) volume measurement method;

c) weight measurement method;

d) carbon balance measurement method (applies only to mopeds with a four-stroke engine installed).

For the interpretation of the measurement methods, see section B.1 of Appendix B. Other measurement methods may be used if the test results can be proved to be the same.

6.2.2.1 In section B.2 of Appendix B, the installation requirements and operating instructions for the fuel consumption measuring device are specified. The fuel should be supplied to the engine once it has passed through a device for measuring fuel rate, which is consistent with

section B.2 of Appendix B, with an accuracy of ± 2%. This device should ensure the performance of the engine is not affected. When using the volume measurement system, the fuel temperature which is inside the device or the fuel temperature at the device outlet should be measured.

The switch-over from a normal fuel supply system to a measurement system should be achieved via a valve system; the switch-over time should not be greater than 0.2s.

6.2.2.2 When using the carbon balance method to take measurements, the test equipment should be the same as the equipment required as set out in GB 18176-2002.

6.3 Measurement procedures

6.3.1 The readjustment of the chassis dynamometer should conform to sections C.5.1 and C.5.2 of Appendix C to GB 18176-2002.

6.3.2 Measurement work should be carried out in accordance with the procedures set out in section C.6 of Appendix C to GB 18176-2002. The operating procedures of the measuring device for fuel consumption should conform to Appendix B. When using the carbon balance method to carry out exhaust gas sampling, analysis and volume measurement, the procedure should conform to the requirements set out in section C.7 of Appendix C to GB 18176-2002.

6.4 Measurement of fuel consumption

The fuel consumption value from every two continuous operating cycles is regarded as one measured value.

6.5 The determination of measurement results

6.5.1 Measure the fuel consumption continuously three times as specified in 6.4, and take the arithmetic average value of the three measured values as the final measurement result. Between every second measurement, allow no longer than 60s idling speed. During the idling speed period, do not take any fuel consumption measurements.

6.5.2 If the maximum differential value between the measured values does not exceed 5% of the arithmetic average value, then this measurement result is valid; otherwise, re-take the measurement until the value A which is determined by means of the formula set out in 6.5.3 does not exceed 5%.

6.5.3 A value is determined by means of formula (2):

$$A = K \times \frac{s}{\sqrt{n}} \times \frac{100}{\overline{FC}} \qquad (2)$$

Where: K can be found in Table 1

Table 1 K value table

n	4	5	6	7	8	9	10
k	3.2	2.8	2.6	2.5	2.4	2.3	2.3
$\frac{k}{\sqrt{n}}$	1.6	1.25	1.06	0.94	0.85	0.77	0.73

n - number of tests;

s - standard deviation, which can be determined by means of formula (3):

$$s = \sqrt{\frac{\sum_{i=1}^{n}\left(\overline{FC} - FC_i\right)}{n-1}} \qquad (3)$$

Where:

FC_i - fuel consumption at the *i*-th time measurement, unit is litre per 100 kilometre (L/100km);

$\overline{FC}$ - arithmetic average value of the n *FC* values, unit is litre per 100km (L/100km).

6.5.4 If after 10 tests, value A is still greater than 5%, another vehicle of the same model should be used when taking measurements.

6.5.5 The result of the calculation of fuel consumption should be rounded to two decimal places.

7 Type II test (measurement of the average fuel consumption at constant speed)

7.1 Test conditions

7.1.1 Type II tests should be carried out on road or on the chassis dynamometer.

7.1.2 See 6.2.2.1 for the installation requirements and operating instructions for the fuel consumption measuring device.

7.2 Measurement methods on road

7.2.1 The driver and driving posture

7.2.1.1 The driver should wear protective clothing and helmet. The height of the driver should be 1.75m ± 0.05m, and the body weight of the driver should be 75kg ± 5kg.

7.2.1.2 Driving posture

When driving, the driver should be sitting on the designated seat, with both hands controlling the steering wheel, both feet on the foot-support, and both arms stretched out normally. During the measurement process, the driver should keep the same driving posture.

7.2.2 Test-road

7.2.2.1 The test-road should be an enclosed ring road with a length of more than 2000m and a minimum turning radius of more than 200m, or a straight road with a length of over 500m, on which the vehicle can drive in both directions.

7.2.2.2 The surface of the road should be covered with asphalt, tar, concrete or other equivalent materials.

7.2.2.3 The test-road should be as level as possible, the longitudinal slope of the road should not exceed 1%, the difference in height between any two points on the road should not exceed 1m, and the horizontal slope of the road should not exceed 3%.

7.2.2.4 The test-road should be level, dry and tidy.

7.2.2.5 Test distance: 500m.

7.3 Measurement methods on chassis dynamometer

When a test is carried on the chassis dynamometer, the setting should conform to the stipulations of 6.3.1.

7.4 Test methods

7.4.1 The test should be carried out in first gear, using 90% of the maximum speed of the moped and 30km/h as the reference speeds. The maximum speed of the moped should be measured in accordance with GB/T 5384. The best value obtained from the tests carried out in these two reference speeds is regarded as the measured result of the Type II test.

7.4.2 Measurement of fuel consumption

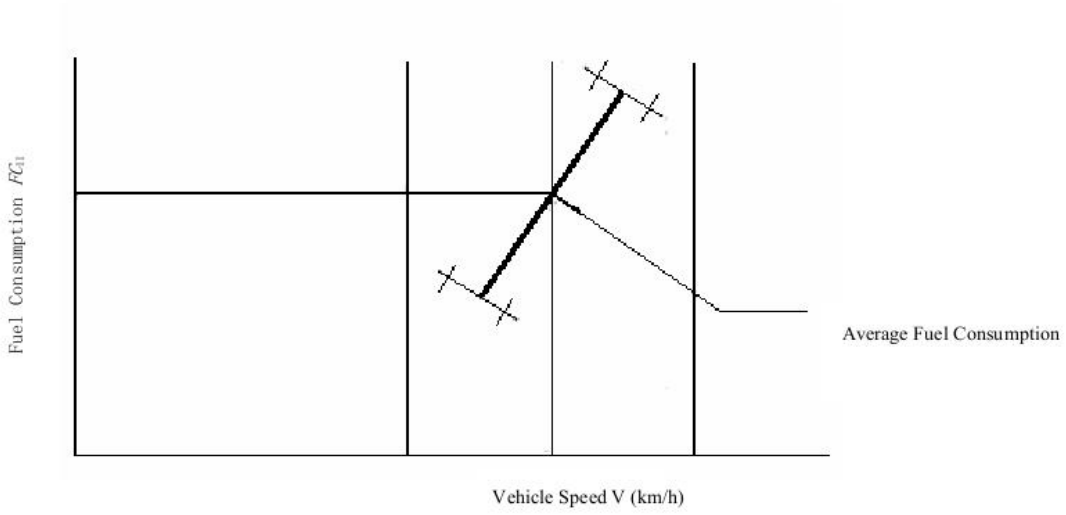
7.4.2.1 Measure the fuel consumption under a steady reference speed and carry out 4 tests, in which the average speed of the second test is lower than the reference speed, and the average speed of other two tests is higher than the reference speed. During the test process, the permitted difference of the driving speed of the test vehicle should be controlled within the range of ± 2km/h.

The differential value between the average speed of each test and the reference speed is less than 2km/h.

The fuel consumption of each test should be determined by means of formula (5) and formula (6).

7.4.2.2 The difference between the fuel consumption of the two tests in which the average speed is lower than the reference speed should be smaller than 5% of the average value obtained from these two tests; the same requirement applies to the two tests in which the average speed is higher than the reference speed. The fuel consumption measured under the reference speed should be determined by means of linear interpolation.

7.4.2.3 If none of the pairs of calculated values meets the requirements specified in 7.4.2.2, then 4 more tests should be carried out. If, after 10 sets of tests, the abovementioned requirements are still not met, then another moped of the same model should be selected and tests should be carried out in the above order.



Note: X shape marks (four intersections) correspond to the calculated values of each driving test. FC_{II} is the average fuel consumption obtained by means of the linear interpolation under the reference speed V.

Diagram 1 Calculation of average fuel consumption under a reference speed

8 The limits and the calculation methods of fuel consumption

8.1 The calculation of fuel consumption

Fuel consumption should be determined by means of formula (4):

$$FC = 0.6 \times FC_I + 0.4 \times FC_{II} \qquad (4)$$

Where:

FC_I - fuel consumption measured from Type I test, unit is litre per 100 kilometre (L/100km);

FC_{II} - fuel consumption measured from Type II test, which is obtained by means of linear interpolation under the reference speed, the unit is litre per 100kilometre (L/100km).

8.2 Calculation of fuel consumption for Type I test and Type II tests

8.2.1 If the fuel consumption value is obtained using the volume method, then the fuel consumption *FC* should be determined by means of formula (5):

$$FC_i = \frac{Q[1 + a(T_0 - T)]}{S} \times 100 \qquad (5)$$

Where:

FC_I - the fuel consumption at *i*-th time test, unit is litre per 100 kilometre (L/100km);

Q - measured fuel consumption, unit is litre (L);

a - coefficient of fuel volume expansion, gasoline is $0.001K^{-1}$;

T_0 - standard temperature (293k), unit is Kelvin (k);

T - fuel temperature, unit is Kelvin (k);

S - set travel distance per unit volume fuel in vehicle test, unit is kilometre (km).

8.2.2 If the fuel consumption value is obtained using the weight method, the fuel consumption *FC* should be determined by means of formula (6):

$$FC_i = \frac{m}{\mathrm{r} \times S} \times 100 \qquad (6)$$

Where:

FC_i - fuel consumption at *i*-th time test, unit is litre per 100 kilometre (L/100km);

m - measured value of fuel consumption, unit is kilogram (kg);

p - fuel density under standard state (293k), unit is kilogram per litre (kg/L);

S - distance travelled during vehicle test, unit is kilometre (km).

8.2.3 If the fuel consumption value is obtained using the carbon balance method, then the fuel consumption *FC* is determined by means of formula (7):

$$FC_i = \frac{0.1154}{\mathrm{r}} \times \left[(0.429 \times M_{co}) + (0.866 \times M_{HC}) + (0.273 \times M_{CO_2})\right] \qquad (7)$$

Where:

FC_I - fuel consumption at *i*-th time test, unit is litre per 100 kilometre (L/100km);

Mco - carbon monoxide emission, unit is gram per kilometre (g/km);

M_{HC} – hydrocarbon emission, unit is gram per kilometre (g/km);

M_{co2} - carbon-dioxide emission, unit is gram per kilometre (g/km);

p - the fuel density under standard state (293k), unit is kilogram per litre (kg/L);

8.2.3.1 The emission of gaseous pollutants should be determined by means of formula (8):

$$M_j = \frac{V_{mix} \times d_j \times 10^{-6}}{S} \qquad (8)$$

Where:

M_j - emission of pollutant *j*, unit is gram per kilometre (g/km);

V_{mix} - the volume of diluted exhaust gas which is corrected to standard state (273.2k and 101.33kPa), unit is litre per test (L/test);

d_j - the density of the pollutant *j* under standard mode (273.2k and 101.33kPa), unit is gram per litre (g/L);

C_j - the concentration of the pollutant *j* which is in the diluted exhaust gas; carry out corrections in accordance with the content of pollutant in the diluted air, unit is volume concentration 10^{-6}; if the volume is expressed by percentage, then the coefficient 10^{-6} should be replaced by 10^{-2}.

S - the travel distance during test period, unit is kilometre (km).

8.2.3.2 Volume determination

8.2.3.2.1 When using a dilution device, the constant flow of which is controlled by an orifice plate or venturi tube to measure the volume, continuously record the parameter which demonstrates the volume flow-rate, and calculate the total volume during the test.

8.2.3.2.2 When using a positive displacement pump to calculate volume, the volume of diluted exhaust gas inside of the positive displacement pump system should be determined by means of formula (9):

$$V = V_0 \times N \qquad (9)$$

Where:

V –volume of diluted exhaust gas (before the correction), unit is litre per test (L/test);

V_0 – gas volume discharged by the positive displacement pump under test conditions, unit is litre per revolution (L/r);

N – number of revolutions in each test, unit is revolution (r).

8.2.3.2.3 Correct the volume of diluted exhaust gas to standard mode; the correction for volume of diluted exhaust gas is determined by means of formula (10):

$$V_{mix} = V \times K_1 \times \frac{P_p}{T_p} \qquad (10)$$

Where:

k_1 – coefficient, $K_1 = \frac{273.2}{101.33} = 2.6961\left(K \times kPa^{-1}\right)$ (11)

P_p –absolute pressure at the inlet of the positive displacement pump, unit is kPa (kPa);

T_p –average temperature of the diluted exhaust gas which was admitted into the positive displacement pump during test, unit is Kelvin (K).

8.2.3.3 The corrected concentration of the pollutant which is inside the sampling bag should be determined by means of formula (12):

$$C_j = C_c - C_d\left(1 - \frac{1}{DF}\right) \qquad (12)$$

Where:

C_j - concentration of the pollutant *j* in the diluted exhaust gas after the content of the pollutant *j* in the diluted air is corrected; unit is volume concentration 10^{-6} or %;

C_e – measured concentration of the pollutant *j* in the diluted exhaust gas, unit is volume concentration 10^{-6} or %;

C_d – measured concentration of the pollutant *j* in the diluted air, unit is volume concentration 10^{-6} or %;

DF – dilution coefficient, determined by means of formula (13):

$$DF = \frac{14.5}{C_{CO_2} + 0.5C_{CO} + C_{HC}} \qquad (13)$$

Where:

C_{co2} –concentration of CO_2 in the diluted exhaust gas inside the sampling bag, unit is volume concentration %;

C_{co} - concentration of CO in the diluted exhaust gas inside the sampling bag, unit is volume concentration %;

C_{HC} - concentration of HC in the diluted exhaust gas inside of the sampling bag, unit is volume concentration %;

8.2.4 The situation of mixing fuels/ lubricants

For two-stroke mopeds which use mixed oil as lubrication, the consumption of the lubricant should be removed when carrying out the calculation.

8.3 See Tables 2 and 3 for fuel consumption limits for mopeds.

Table 2 Fuel consumption limits for two-wheeled mopeds

Engine Displacement	• 50
Fuel Consumption Limit L/100km	2.0

Table 3 Fuel consumption limits for three-wheeled mopeds

Engine Displacement ml	• 5
Fuel Consumption Limit L/100km	2.3

Appendix A

(Normative Annex)

Mopeds Product Description

A.1 Name of manufacturer (trademark) _____

A.2 Vehicle type _____

A.3 Vehicle mass

Complete vehicle kerb mass _____kg

Rated carrying-capacity _____kg

A.4 Transmission manual/ automatic _____

Gear ratio (manual transmission)

First gear _____

Second gear _____

Third gear _____

Fourth gear _____

Fifth gear _____

Sixth gear _____

A.5 Driving speed ratio

Primary _____

Final _____

A.6 Tyres:

Front tyre specification _____mm; Back tyre specification _____mm

Tyre pressure	Specified in technical documentation	Actual
Front tyre	_____kPa	_____kPa
Back tyre	_____kPa	_____kPa

A.7 Engine explanation

Manufacturer _____

Type _____

Cycle 2-stroke/4-stroke _____

Number of cylinders and arrangement form- _____

Cylinder bore _____mm

Stroke _____mm

Displacement _____ml

Compression ratio _____

Fuel _____

Cooling system type water/ air/ others (detailed explanation) _____

Air filter type _____

Lubrication system _____

(two-stroke engine: separate type/ mixed type)

A.8 Appended Pollution Control Device

(whether is included by other projects) _____yes/no

Fuel supply type _____

Carburettor /fuel injection system

Trademark _____

Type _____

A.9 Engine performance

Idling speed _____r/min

Engine maximum power and corresponding speed _____kW (r/min)

Appendix B

(Informative Annex)

Measuring Device for Moped Fuel Consumption

B.1 Measurement methods

B.1.1 Flow measurement method

The flow measurement method uses a device that allows continuous or discontinuous measurement of the definite mass or volume of fuel that passes through the device within a certain time range.

A continuous measuring device presents a display which is related to the flow-rate; a discontinuous measuring device presents a display which is set on the basis of measuring the minimum elementary volume.

B.1.2 Volume measurement method

The volume measurement method uses an already known volume measuring device to measure the volume of fuel consumption. This measuring device should be a “fixed” volume measuring device or a “variable” volume measuring device.

A “fixed” volume measuring device only allows a fixed reading of the fuel flow. This flow is already set. This flow depends on the volume of the measuring device itself or the indications on the measuring device.

“Variable” volume measuring device is an instrument with graduation marks. It allows to read non-fixed fuel flow.

B.1.3 Weight measurement method

The weight measurement method uses a weight measuring device to determine the mass of the fuel consumption. The device should be either a “fixed” weight measuring device or “variable” weight measuring device.

A “fixed” weight measuring device only allows the one fixed reading of fuel flow. This fuel flow is already set. This flow depends on the measuring device itself and its characteristics.

A “Variable” weight measuring device allows a non-fixed fuel flow to be read.

B.2 Installation of the measuring device

B.2.1 General points for attention

B.2.1.1 Whichever measurement method is selected, the installation of the measuring device shall not interfere with or alter the state of the fuel supply from the fuel supply system of the vehicle.

Here, the pressure drop and the dimension of the cross-section of the fuel supply pipeline, and the length of the pipeline should be taken into main consideration.

B.2.1.2 Consider meeting the conditions specified in B.2.1.1.

a) if the flow measurement method is selected, when the pressure drop of the passing system is smaller than 100Pa, then the installation of the flow-meter should be according to Diagram B.1 and Diagram B.2

b) the installations of the volume measurement method and weight measurement method should be according to Diagram B.3, Diagram B.4, Diagram B.5 and Diagram B.6.

B.2.1.3 Other installation methods may be used if it can be proven that the fuel supply system of the vehicle shall not be affected by the use thereof.

B.2.1.4 In order to reduce the pressure loss, suggest:

$$d_1 \le d_2 \qquad \text{(B.1)}$$

$$d_2 = d_3 \qquad \text{(B.2)}$$

Where:

d1 – diameter of the original fuel pipe, unit is millimetre (mm);

d2 and *d3* – diameters of the fuel pipes of the measurement devices, unit is millimetre (mm)

B.2.2 Flow measurement method

B.2.2.1 The flow-meter should be designed on the basis of the pressure drop of the passing device not being greater than 100Pa.

B.2.2.2 Diagram 1 is the schematic diagram for flow measurement system when the carburettor supplies fuel; Diagram 2 is the schematic diagram for the flow measurement system when fuel is supplied by fuel injection.

B.2.2.3 Accuracy

During the whole testing period, the accuracy for the overall testing process is within the range of ± 2%.

B.2.3 Volume measurement method

B.2.3.1 Diagram 3 is the schematic diagram for the volume measurement system when the carburettor supplies fuel; Diagram 4 is the schematic diagram for the volume measurement system when the fuel is supplied by fuel injection.

B.2.3.2 Test conditions (the chassis dynamometer indicated in Diagram 2 and Diagram 3 and the volume method used on a road)

B.2.3.2.1 The measuring tube should be installed on one side of the fuel tank according to the following method:

$$h_a \le h_u - h_1 + 300 \qquad \text{(B.3)}$$

The units of above mentioned numerical value should be mm.

B.2.3.2.2 The pressure inside the measuring tube should not be affected by the wind pressure acting on the air outlet of the measuring tube.

B.2.4 Weight measurement method

B.2.4.1 Diagram 5 is the schematic diagram for the weight measurement system when the carburettor supplies fuel; Diagram 6 is the schematic diagram for the weight measurement system when the fuel is supplied by fuel injection.

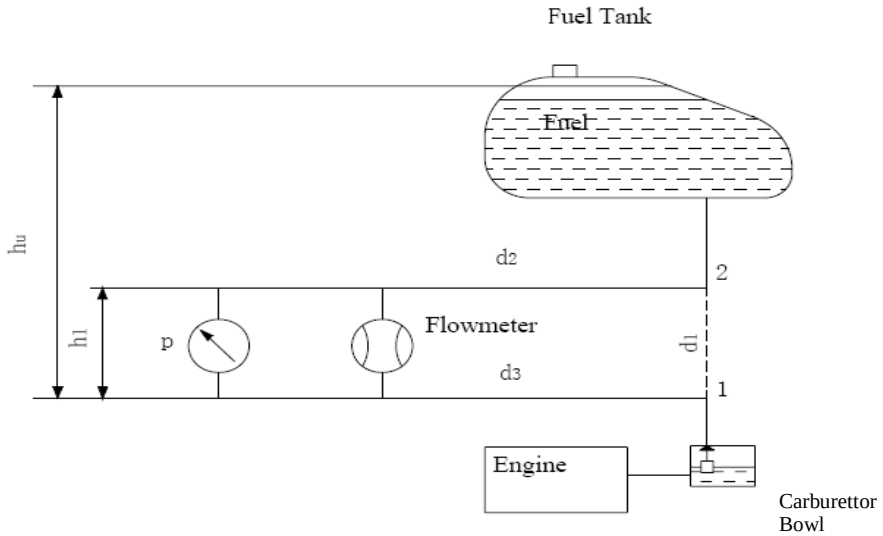
B.2.4.2 Requirements for graduation marks

Accuracy: • 1%

Resolution capacity: 0.1g

B.2.4.3 Density measurement (mass/volume)

Measurement accuracy should be 1g/cm^3, and change to standard mode.



h_u – fuel upper limit, mm;

h_l – fuel lower limit, mm;

p – pressure loss after passing flow-meter, Pa;

I – carburettor fuel intake;

2 – fuel tank outlet;

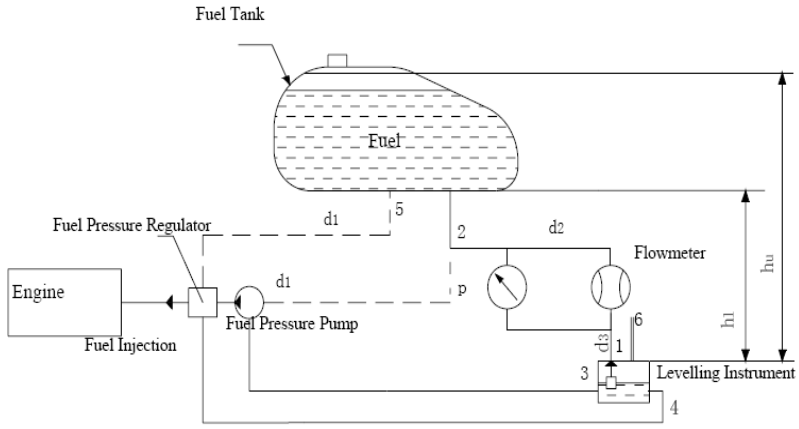
d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm

d_3 - diameter of measurement device fuel pipe. mm

Diagram 1 Flow measurement method

(Fuel Measurement System when carburettor supplies fuel)



h_u – fuel upper limit, mm;

h_l – fuel lower limit, mm;

p – pressure loss after passing flowmeter, Pa;

d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm

d_3 - diameter of measurement device fuel pipe, mm

1 – levelling instrument fuel inlet;

2 – fuel tank outlet;

3 – levelling instrument fuel outlet;

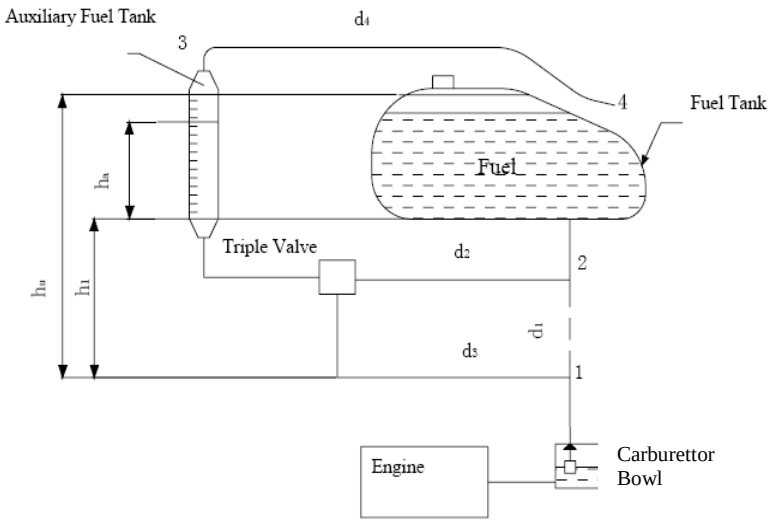
4 - levelling instrument fuel inlet;

5 – fuel tank inlet;

6 – levelling instrument air outlet pipe.

Diagram B.2 Flow measurement method

(Fuel Measurement System when fuel is supplied by fuel injection,)



h_u – fuel upper limit, mm;

d_4 – diameter of air outlet tube of measuring tube, mm;

h_l – fuel lower limit, mm;

h_a – maximum measuring height of the measuring tube, mm;

d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm

d_3 - diameter of measurement device fuel pipe, mm

1 – carburettor fuel intake;

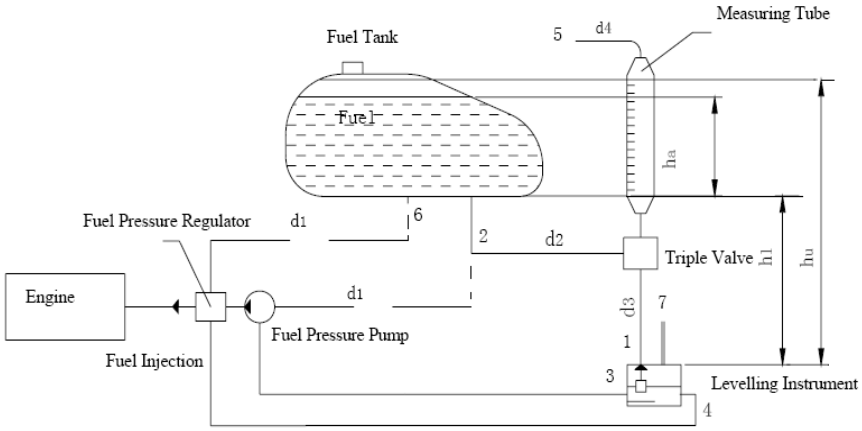
2 – fuel tank outlet;

3 – air outlet of measuring tube;

4 – air outlet end of measuring tube;

Diagram B.3 Volume measurement method

(Fuel Measurement System when carburettor supplies fuel)



h_u – fuel upper limit, mm;

h_l – fuel lower limit, mm;

h_a – maximum measuring value of the measuring tube, mm;

d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm

d_3 - diameter of measurement device fuel pipe, mm

d4 – diameter of air outlet tube of measuring tube, mm;

1 – levelling instrument fuel inlet;

2 – fuel tank outlet;

3 – fuel outlet of levelling instrument;

4 – fuel inlet of levelling instrument;

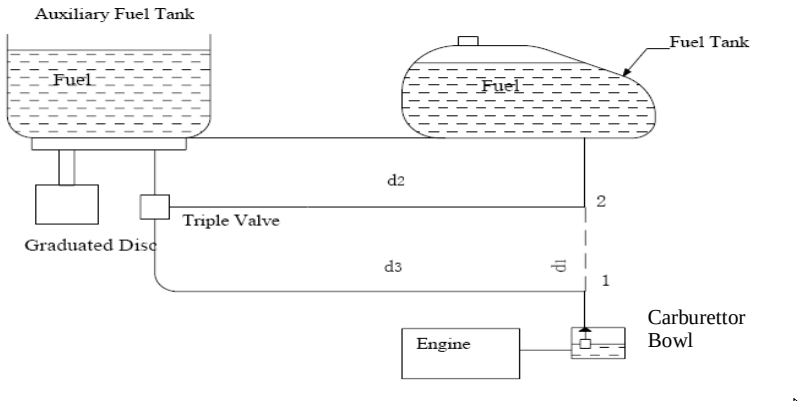
5 - air outlet end of measuring tube;

6 – fuel tank inlet;

7 – air outlet tube of levelling instrument;

Diagram B.4 Volume measurement method

(Fuel Measurement System when fuel is supplied by fuel injection,)



d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm

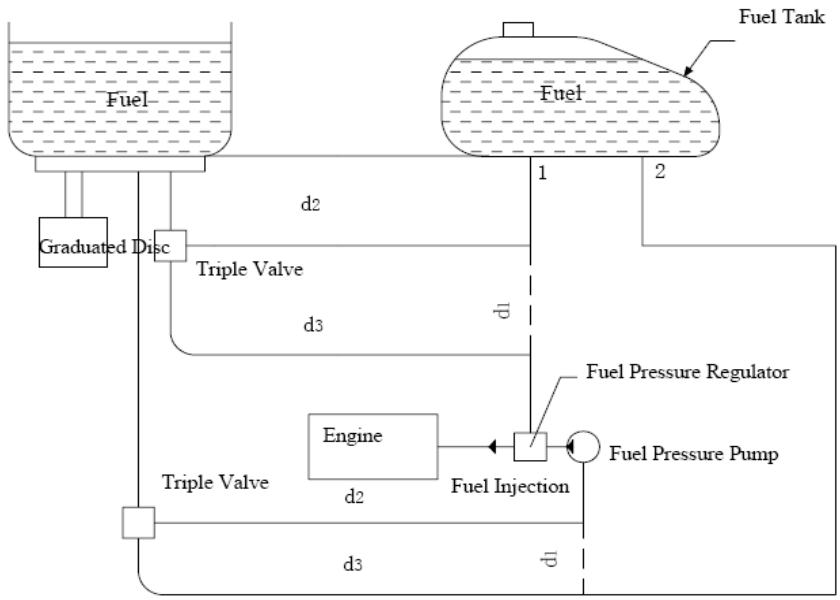
d_3 - diameter of measurement device fuel pipe, mm

1 – carburettor fuel intake;

2 – fuel tank outlet.

Diagram B.5 Weight measurement

(Fuel Measurement System when carburettor supplies fuel)



d_1 – diameter of original fuel pipe, mm;

d_2 – diameter of measurement device fuel pipe, mm;

d_3 - diameter of measurement device fuel pipe, mm;

1 – fuel tank inlet;

2 – fuel tank outlet.

Diagram B.6 Weight measurement method

(Fuel Measurement System when the fuel is supplied by fuel injection)