

Translated English of Chinese Standard: QC/T1130-2021
www.ChineseStandard.net → Buy True-PDF → Auto-delivery.
Sales@ChineseStandard.net

QC

AUTOMOBILE INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 43.020

CCS T 40

QC/T 1130-2021

**Measurement Methods of Fuel Consumption for
Methanol Vehicles**

甲醇汽车燃料消耗量试验方法

Issued on: March 05, 2021

Implemented on: July 01, 2021

Issued by: Ministry of Industry and Information Technology of PRC

Table of Contents

Foreword.....	3
1 Scope.....	4
2 Normative References	4
3 Terms and Definitions	4
4 Test Requirements	5
5 Test Conditions	5
6 Test Methods	7
7 Calculation Method of Fuel Consumption	8
8 Production Conformity, Certification Extension and Type Approval of Vehicle Family	11
Appendix A (Normative) Type Test Result Report	12

Measurement Methods of Fuel Consumption for Methanol Vehicles

1 Scope

This Document specifies the fuel consumption test methods for methanol vehicles and the inspection and determination methods for production consistency.

This Document is applicable to light-duty methanol vehicles and heavy-duty methanol vehicles with a maximum speed greater than or equal to 50km/h.

2 Normative References

The provisions in following documents become the provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 1884 Crude Petroleum and Liquid Petroleum Products - Laboratory Determination of Density - Hydrometer Method

GB/T 4472 Determination of Density and Relative Density for Chemical Products

GB/T 15089 Classification of Power-Driven Vehicles and Trailers

GB 18352.6-2016 Limits and Measurement Methods for Emissions from Light-Duty Vehicles (CHINA 6)

GB/T 19233 Measurement Methods of Fuel Consumption for Light-Duty Vehicles

GB/T 27840 Fuel Consumption Test Methods for Heavy-Duty Commercial Vehicle

GB 27999-2019 Fuel Consumption Evaluation Methods and Targets for Passenger Cars

GB 30510 Fuel Consumption Limits for Heavy-Duty Commercial Vehicles

GB/T 31130 Coriolis Mass Flow Meter

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB/T 15089, GB

18352.6-2016, GB/T 19233, GB/T 27840 and the following apply.

3.1 Methanol fuel vehicle

M and N category vehicles equipped with methanol single-fuel engines or diesel/methanol dual-fuel engines (referred to as methanol vehicles).

3.2 Light-duty methanol fuel vehicle

M₁, M₂ and N₁ category methanol vehicles with the maximum design total mass not exceeding 3 500kg (referred to as light-duty methanol vehicles).

3.3 Heavy-duty methanol fuel vehicle

M and N category methanol vehicles with maximum design total mass exceeding 3500kg (referred to as heavy-duty methanol vehicles).

4 Test Requirements

4.1 General requirements

The test requirements for light-duty methanol vehicles shall comply with the relevant provisions of GB/T 19233. The automobile manufacturer or its authorized agent can refer to the relevant provisions of GB/T 19233 to measure the vehicle's fuel consumption in the low-temperature environment, air-conditioning and refrigeration status, and high-altitude environment.

The test requirements for heavy-duty methanol vehicles shall comply with the relevant provisions of GB/T 27840.

4.2 Other requirements

Before the test, the manufacturer or its authorized agent shall provide the inspection agency with a control strategy during the engine start-up process, so that it can measure gasoline or diesel fuel consumption and methanol fuel consumption according to the engine control strategy, respectively.

5 Test Conditions

5.1 Test environment, test vehicles and running-in

The test conditions for light-duty methanol vehicles shall comply with the relevant provisions of GB/T 19233; the test conditions for heavy-duty methanol vehicles shall comply with the relevant provisions of GB/T 27840.

c) The methanol hydrogen-carbon ratio is 4, and the oxygen-carbon ratio is 1.

5.4.2 If a flow meter (mass flow meter or volume flow meter) is used to measure fuel consumption, the measuring equipment shall meet the following conditions:

- a) The installation of a fuel flow recording device shall not affect the normal operation of the engine;
- b) The fuel supply pipeline needs to be equipped with two valve systems or two sets of test equipment with only a single valve to ensure that methanol fuel, gasoline fuel or diesel fuel flow from the normal fuel supply pipeline to the corresponding measurement pipeline. The operation time for changing the fuel direction shall not exceed 0.2s;
- c) A mass flow meter that meets the requirements (or similar principles) of GB/T 31130 shall be used, with a measurement accuracy of $\pm 1\%$ or a volume flow meter with a measurement accuracy of no less than $\pm 0.5\%$;
- d) The flow meter shall not make, the change OF fuel pressure and temperature at the inlet OF the methanol fuel and gasoline or diesel fuel recording device on the vehicle, exceeding 10% and $\pm 5^\circ$, respectively.

6 Test Methods

6.1 Light-duty methanol vehicles shall be tested in accordance with the relevant provisions of GB/T 19233. Heavy-duty methanol vehicles shall be tested in accordance with the relevant provisions of GB/T 27840.

6.2 When using the carbon balance method to measure fuel consumption, first measure the CO_2 , CO, and HC emissions of gasoline and methanol in cycle of the working conditions, as well as the driving distance. And then calculate the gasoline and methanol fuels consumption according to the method described in 7.1; and convert methanol consumption into equivalent gasoline consumption according to the equivalent calorific value method, and count it into the total gasoline consumption. The calculation result is expressed in L/100km, rounded-off (rounded) to two digits after the decimal points. The inspection agency shall determine the switching time between gasoline and methanol fuel based on the changes in the currently used fuel type (PID\$51) in the measured and recorded OBD universal scanning tool mode \$01, and record it in the test report.

6.3 When a flow meter (mass flow meter or volume flow meter) is used to measure fuel consumption, the data can be recorded through an automatic acquisition system or manually. If an automatic acquisition system is used, it shall be able to be continuous in real time with a sampling frequency of no less than 1 Hz to record fuel consumption, driving distance, and fuel pressure and temperature at the inlet of the fuel recording

$C_{\text{equ.}}$ – consumption of equivalent gasoline fuel¹⁾, in L/100km;

C_G – gasoline fuel consumption, in L/100km;

C_M – methanol fuel consumption, in L/100km;

d_i – the distance travelled by using gasoline during the test cycle, in km;

d – driving mileage of test, in km;

ρ_i – density of benchmark gasoline fuel at 288K (15°C), in kg/L;

ρ_M – density of methanol fuel at 288K (15°C), in kg/L;

q_i – low heating value of benchmark gasoline, taking the fixed value of 43.070MJ/kg;

q_M – low heating value of methanol, taking the fixed value of 19.569MJ/kg.

7.1.4 The correction of the calculated value of fuel consumption when the benchmark fuel is not used shall be implemented with reference to the relevant provisions of GB/T 19233.

7.2 Measurement method of flow meter (mass flow meter or volume flow meter)

7.2.1 Using mass flow meters to determine fuel consumption

When using a mass flow meter, the fuel consumption is calculated according to the following Formula:

$$F_{1,\text{equ.}} = \frac{m_i + m_M \cdot \frac{q_M}{q_i}}{d \cdot \rho_i} \times 100 \quad \dots\dots\dots (4)$$

$F_{1,\text{equ.}}$ – consumption of the equivalent fuel¹⁾, in L/100km;

m_i – the measured value of gasoline and diesel consumption (mass) during the test, in kg;

m_M – the measured value of methanol consumption (mass) during the test, in kg;

d – driving mileage of the test, in km;

ρ_i – density of benchmark gasoline and diesel fuel at the standard temperature of 20°C (293K), in kg/L;

q_i – low heating value of benchmark gasoline and diesel, taking the fixed value of

¹⁾ When calculating the equivalent gasoline or diesel consumption in GB 27999-2019, it shall be multiplied by 0.75.

43.070MJ/kg for the gasoline, and the fixed value of 42.652MJ/kg for the diesel;

q_M – low heating value of methanol, taking the fixed value of 19.569MJ/kg.

7.2.2 Use volume flow meters to determine fuel consumption

When a volume flow meter is used, the fuel consumption is calculated according to the following Formula:

$$F_{2, \text{equ.}} = \frac{V_i \times [1 + \partial_i \times (T_0 - T_i)] + V_M \times [1 + \partial_M \times (T_0 - T_M)] \times \frac{q_M \cdot \rho_M}{q_i \cdot \rho_i}}{d} \times 100 \quad (5)$$

$F_{2, \text{equ.}}$ – consumption of the equivalent fuel ¹⁾, in L/100km;

V_i – the measured value of the consumption (volume) of benchmark gasoline and benchmark diesel, in L;

V_M – the measured value of the consumption (volume) of methanol, in L;

∂_i – volume expansion coefficient of the benchmark gasoline and diesel fuel, $1.0 \times 10^{-3}/^{\circ}\text{C}$;

∂_M – volume expansion coefficient of methanol fuel, $1.2 \times 10^{-3}/^{\circ}\text{C}$;

T_0 – benchmark temperature, 20°C ;

ρ_i – density of benchmark gasoline and diesel fuel at the standard temperature of 20°C (293K), in kg/L;

ρ_M – density of methanol fuel at the standard temperature of 20°C (293K), in kg/L;

q_i – low heating value of benchmark gasoline and diesel, taking the fixed value of 43.070MJ/kg for the gasoline, and the fixed value of 42.652MJ/kg for the diesel;

q_M – low heating value of methanol, taking the fixed value of 19.569MJ/kg.

T_i – average temperature of gasoline and diesel fuel, in $^{\circ}\text{C}$ (When recording manually, it shall be the arithmetic mean of the fuel temperature taken on the volume measuring device at the beginning and end of each test. When recording with an automatic acquisition system, it shall be the arithmetic mean of the recorded results);

T_M – average temperature of methanol, in $^{\circ}\text{C}$ (When recording manually, it shall be the arithmetic mean of the fuel temperature taken on the volume measuring device at the beginning and end of each test. When recording with an automatic acquisition system, it shall be the arithmetic mean of the recorded results);

d – driving mileage of the test, in km.

This is an excerpt of the PDF (Some pages are marked off intentionally)

Full-copy PDF can be purchased from 1 of 2 websites:

1. <https://www.ChineseStandard.us>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Select your country (currency), for example: USA (USD); Germany (Euro).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Tax invoice can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with download links).

2. <https://www.ChineseStandard.net>

- SEARCH the standard ID, such as GB 4943.1-2022.
- Add to cart. Only accept USD (other currencies - <https://www.ChineseStandard.us>).
- Full-copy of PDF (text-editable, true-PDF) can be downloaded in 9 seconds.
- Receiving emails in 9 seconds (with PDFs attached, invoice and download links).

Translated by: Field Test Asia Pte. Ltd. (Incorporated & taxed in Singapore. Tax ID: 201302277C)

About Us (Goodwill, Policies, Fair Trading...): <https://www.chinesestandard.net/AboutUs.aspx>

Contact: Wayne Zheng, Sales@ChineseStandard.net

Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

----- The End -----