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Conversion methods for energy consumption of electric vehicles

电动汽车能耗折算方法

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Conversion methods for energy consumption of electric vehicles

1 Scope

This Standard provides the methods for converting electric vehicles' electric energy consumption equivalent into fuel consumption.

This Standard applies to pure electric vehicles and plug-in hybrid electric vehicles.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 18386 Electric vehicles - Energy consumption and range - Test procedures

GB/T 19233 Measurement methods of fuel consumption for light-duty vehicles

GB/T 19596 Terminology of electric vehicles

GB/T 19753 Test Methods for Energy Consumption of Light-duty Hybrid Electric Vehicles

GB/T 19754 Test methods for energy consumption of heavy-duty hybrid electric vehicles

3 Terms and definitions

The terms and definitions as defined in GB/T 19596 and the following apply to this document.

3.1 Fuel energy factor

The fuel volume which generates the same heat value (1 kW • h=3600 kJ) as the unit electric quantity, calculated by GB/T 2589, GB 17930, GB 19147, in

consumption shall be converted into equivalent gasoline/diesel consumption. For a pure electric vehicle, its electric energy consumption shall be converted into equivalent gasoline/diesel consumption. See Appendix A for the parameters used in the above calculations.

5 Heat value conversion method

5.1 Simple conversion method

According to formula (1), the equivalent fuel consumption (FC) of electric energy is calculated:

$$FC = E \times F_E \quad \cdots\cdots (1)$$

Where:

FC - Equivalent fuel consumption, in liters per 100 kilometers (L/100 km). The calculation result is rounded off to two decimal places;

E - The electric energy consumption of vehicle, in kilowatt-hours per 100 kilometers (kW • h/100 km). It is measured according to GB/T 18386, GB/T 19233, GB/T 19753, GB/T 19754. Its value is rounded off to two decimal places;

F_E - The energy factor of fuel, in liters per kilowatt-hour [L/(kW • h)]. The value is rounded off to four decimal places.

5.2 Fuel life cycle conversion method

5.2.1 Calculation of equivalent fuel consumption (FC_e)

According to formula (2), the equivalent fuel consumption (FC_e) is calculated:

$$FC_e = E \times F_E \times F_e \times r_p \times t_p \quad \cdots\cdots (2)$$

Where:

FC_e - Equivalent fuel consumption, in liters per 100 kilometers (L/100 km). The calculation result is rounded off to two decimal places;

E - The electric energy consumption of vehicle, in kilowatt-hours per 100 kilometers (kW • h/100 km). It is measured according to GB/T 18386, GB/T 19233, GB/T 19753, GB/T 19754. Its value is rounded off to two decimal places;

F_E - The energy factor of fuel, in liters per kilowatt-hour [L/(kW • h)]. The value

The calculation result is rounded off to two decimal places;

E - The electric energy consumption of vehicle, in kilowatt-hours per 100 kilometers (kW • h/100 km). It is measured according to GB/T 18386, GB/T 19233, GB/T 19753, GB/T 19754. Its value is rounded off to two decimal places;

F_{CO_2} - CO_2 conversion factor, in liters per kilowatt-hour [L/(kW • h)]. According to formula (5), it is calculated. The value is rounded off to two decimal places.

6.2 Calculation of CO_2 conversion factor (F_{CO_2})

According to formula (5), the CO_2 conversion factor (F_{CO_2}) is calculated:

$$F_{CO_2} = \frac{T_E \times T_C \times \varphi}{T_F \times t_M \times i_{ch} \times (1 - i_{tr})} \quad \cdots\cdots (5)$$

Where:

F_{CO_2} - CO_2 conversion factor, in liters per kilowatt-hour [L/(kW • h)]. The value is rounded off to two decimal places;

T_E - Standard coal consumption of thermal power supply, in kilograms per kilowatt-hour [kg/(kW • h)]. The value is rounded off to three decimal places;

T_C - CO_2 emission factor of fuel coal. The value is rounded off to two decimal places;

φ - Thermal power ratio, %. The value is rounded off to one decimal place;

T_F - CO_2 emission factor of fuel. The value is rounded off to two decimal places;

t_M - Reduced factor of fuel coal and standard coal. The value is rounded off to two decimal places;

i_{ch} - Charge efficiency, %. The value is rounded off to an integer bit;

i_{tr} - Line loss rate, %. The value is rounded off to two decimal places.

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