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Guidelines for safety requirements of fuel cell electric motorcycles and mopeds

燃料电池电动摩托车和燃料电池电动轻便摩托车安全要求指南

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Foreword

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Lizhi, Li Dongbing, Zhang Gang, Wang Luhua. Fuel cell electric motorcycles and fuel cells Safety Requirements Guidelines for Electric Mopeds

1.Scope This document provides guidance on safety requirements and test methods for fuel cell electric motorcycles and fuel cell electric mopeds. suggestion. This document applies to fuel cell electric motorcycles and fuel cell electric vehicles that use hydrogen fuel cells as a single or primary power source. Moped (unless otherwise specified, hereinafter referred to as "vehicle").

4 General Principles

Fuel cell electric motorcycles and fuel cell electric mopeds are classified as a type of electric motorcycle and electric moped. The safety requirements for fuel cell electric motorcycles and fuel cells should include all applicable provisions of GB 24155-2020, and should specifically address fuel cell electric motorcycles and fuel cells. The characteristics of electric mopeds have been supplemented and revised, including design and manufacturing principles, factors to be considered in electrical safety requirements, and operational safety. Factors to be considered, markings and warnings, and testing methods. In addition, fuel cell electric motorcycles and fuel cell electric mopeds... Compared to electric motorcycles and electric mopeds, the main differences in their power systems are the addition of a fuel cell system and a hydrogen supply system. For the parts involving safety, safety requirements should be proposed for these two parts and the related structures and functions.

5 Design and Manufacturing Principles

Safety risks should be fully considered during the design and manufacturing process of vehicles to avoid the following malfunctions or accidents during use.

a) The heat generated by the fuel cell and its electrical components could cause combustion, explosion, or burns.

b) Hazards of fire or electric shock caused by improper or mishandling;

c) Personal injury caused by breakage, loosening, deformation, or interference of movement of the vehicle or its components.

6 Factors to be considered for electrical safety

6.1 Protection against electric shock from live parts The electric shock protection scheme for the live parts of the vehicle is proposed with reference to the content described in

4.2.2 of GB 24155-2020, and it is advisable to include the fuel cell system. It is incorporated into the vehicle's energized components as a Class B voltage circuit.

6.2 Fuel Cell System The safety design of fuel cell systems includes the following

principles.

a) Avoid the risk of fire and mechanical deterioration due to improper use;

b) Avoid situations that may cause external damage, such as flames or molten metal, during operation;

c) The casing of the fuel cell system should be reliably grounded;

d) It is very important to configure overheat and short circuit protection devices.

7 Factors to Consider for Hydrogen Safety

7.1 Vehicle hydrogen emission concentration The test should be conducted according to the test method described in 11.1.During vehicle operation (including starting and stopping), the flatness within any consecutive 3 seconds should be measured. The average hydrogen emission integral should not exceed 4%, and the instantaneous hydrogen emission integral should not exceed 8%.

7.2 Vehicle-wide hydrogen leakage

7.2.1 Leakage inside the vehicle For hydrogen leakage in vehicles with a driver's cab, please refer to the description in section

4.1.2.1 of GB/T 24549-2020.

7.2.2 Leakage outside the vehicle For vehicles using gaseous hydrogen storage, it is advisable to refer to Appendix A of GB/T 24549-2020 for instructions on hydrogen storage in a confined space. When conducting hydrogen leakage tests, it is advisable that the integral of hydrogen gas measured at any given time does not exceed 1%. For vehicles using solid-state hydrogen storage, it is advisable to use a hydrogen concentration detector to monitor the hydrogen storage device outlet, vehicle body pipe joints, and fuel tank. The battery system's air intake connection should be inspected (avoiding the fuel cell system's exhaust period), and a leaked hydrogen concentration of less than 0.05 per mille is appropriate.

7.3 Pressure Relief System The safety of a vehicle's pressure relief system should refer to the description in section

4.2.2 of GB/T 24549-2020.

7.4 Functions of the Hydrogen Leakage Alarm Device The function of the hydrogen leak alarm device in the vehicle should refer to the description in section

4.2.5 of GB/T 24549-2020.

7.5 Hydrogen replenishment and discharge

7.5.1 Hydrogen replenishment using solid-state hydrogen storage devices The following principles apply when using solid-state hydrogen storage devices for hydrogen replenishment.

a) The vehicle is refueled by replacing the solid-state hydrogen storage device or by removing the solid-state hydrogen storage device;

b) The vehicle is designed to ensure that no hydrogen gas is released during the connection and disconnection of the solid-state hydrogen storage device from the vehicle. leakage.

7.5.2 Hydrogen replenishment using a gaseous hydrogen storage device During hydrogen refueling using a gaseous hydrogen storage device, the vehicle must not move using its own drive system, and the following principles must be followed.

a) The vehicle is refueled with hydrogen via a hydrogen refueling port;

b) It is very important that the hydrogenation port meets the relevant requirements of GB/T 26779;

c) The hydrogen filling port has a dust cover to prevent the ingress of dust, liquids, and contaminants. The fuel type for the hydrogen filling port is indicated next to the dust cover. Type, nominal working pressure, and expiration date of hydrogen storage cylinder.

7.5.3 Hydrogen emission For purposes such as vehicle maintenance or repair, vehicles should have the function of safely discharging residual hydrogen.

7.6 Structure and Location The design of vehicle structure and location includes the following principles.

a) In the design and installation of vehicles, avoid components such as hydrogen storage devices, hydrogen pipelines and valves, fuel cell systems, and power batteries from being damaged in the vehicle. In the event of a vehicle tipping over, it is crucial that it makes direct contact with the ground.

b) For vehicles using gaseous hydrogen storage, the installation location and height of the hydrogen refueling port should take into account safety protection and ease of hydrogen refueling operation.

7.7 Safety of Hydrogen Storage Units and Piping The safety design of hydrogen storage devices should include the following principles.

a) Hydrogen storage devices employing solid-state hydrogen storage are described in GB/T 44399;

b) Hydrogen storage devices employing gaseous hydrogen storage are described in GB/T 35544 or GB/T 42612;