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PEOPLE'S REPUBLIC OF CHINA**

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**Fuel cell power systems for industrial electric trucks - Part 2:
Performance test methods**

电驱动工业车辆用燃料电池发电系统 第2部分：性能试验方法
(English Translation)

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1 Scope

This document specifies the performance test methods for the fuel cell power systems for industrial electric trucks.

This document applies to industrial electric trucks using gaseous hydrogen or direct methanol as the fuel for the fuel cell power systems, such as: material handling equipment and forklifts, etc.

This document applies to DC fuel cell power systems with a rated output voltage not exceeding

150 V for indoor and outdoor use.

This document applies to the fuel cell power systems defined in 3.7 and Figure 1.

This document does not apply to fuel cell power systems equipped with reformers, hybrid vehicles equipped with internal combustion engines and fuel cell power systems used in potentially explosive atmospheres.

For the fuel cell power systems involved in this document, the fuel source container is permanently attached to the industrial trucks or the fuel cell power systems. Removable fuel source containers are not allowed.

3 Terms and Definitions

The following terms and definitions are applicable to this document.

3.1 Noise Level

Noise level refers to the measured sound pressure level of the fuel cell power system in all operating modes at a certain specific distance.

NOTE: the unit of expression is (dB); see 14.2 for the measurement method.

3.2 Background Noise Level

Background noise level refers to the sound pressure level of ambient noise at the measurement point.

NOTE: the fuel cell power system under the cold state in 14.2 adopts and describes this measurement method.

3.3 Battery

Battery refers to an electrochemical energy storage device, which is used to provide energy input to support auxiliary load and / or provide electric energy output.

NOTE: backup battery used to control software memory and for similar applications is not included.

3.4 Cold State

Cold state means that the fuel cell power system is in a state without energy input or energy output at ambient temperature.

[source: GB/T 28816-2020, 3.110.1]

3.5 Discharge Water

Discharge water refers to water discharged from the fuel cell power system, including wastewater and condensate water.

NOTE: discharge water does not constitute part of the heat recovery system.

[source: GB/T 28816-2020, 2.2, modified]

3.6 Fuel Cell System Electrical Efficiency

Fuel cell system electrical efficiency refers to the ratio of the average electrical output power of the fuel cell power system to the average power of the supplied fuel within a certain given period of time.

---standard temperature: $T_s = 273.15 \text{ K}$ ($0 \text{ }^{\circ}\text{C}$);

---standard pressure: $p_s = 101.325 \text{ kPa}$ (absolute).

6 Basis of Heat Value

Unless it is otherwise specified, the heat value of the fuel shall adopt low heat value (LHV) or similar.

NOTE: Appendix A provides the low heat value (LHV) and high heat value (HHV) of hydrogen and methanol.

If the low heat value (LHV) is adopted to calculate the energy efficiency, then, the symbol "LHV" is not required, for example:

$\eta_{\text{ael}}, \eta_{\text{ath}}$ or $\eta_{\text{atotal}} = xx\%$

If the high heat value (HHV) is adopted to calculate the energy efficiency, then, indicate the symbol "HHV" after the value, for example:

$\eta_{\text{ael}}, \eta_{\text{ath}}$ or $\eta_{\text{atotal}} = xx\% \text{ (HHV)}$

7.1 General Rules

For each test, high-precision instruments shall be selected; the test plan shall be meticulously made; attention shall be paid to details to minimize the uncertainties. The relevant parties of the test shall formulate a detailed test plan based on this document and compile a written test plan.

7.2 Data Collection Scheme

In order to satisfy the uncertainty of the target, an appropriate duration and frequency of readings need to be determined, and data recording equipment shall be available prior to the performance test.

8 Test Devices

Figure 2 and Figure 3 respectively illustrate the test devices required for the test of the fuel cell power systems using hydrogen and methanol fuel. The fuel cell power systems are connected to the electronic load.

---pressure: between 91 kPa (absolute) ~ 106 kPa (absolute).

For each test, the environmental conditions of the laboratory during the test shall be measured.

Sine air quality may affect the performance of the fuel cell power system, the air components (carbon dioxide, carbon monoxide and sulfur dioxide, etc.) of the laboratory shall be reported together with the test results.