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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Proton exchange membrane fuel cell backup power system -
Safety**

质子交换膜燃料电池备用电源系统 安全

(English Translation)

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1 Scope

This Standard specifies terms and definitions, safety requirements and protective measures, type tests, routine tests, and marking, labeling and packaging related to the proton exchange membrane fuel cell backup power system.

This Standard applies to the proton exchange membrane fuel cell backup power system (hereinafter referred to as PEMFC backup power system), including.

- PEMFC backup power system providing AC or DC power;
- PEMFC backup power system using hydrogen and air as reactant gases.

Safety requirements for the installation site are not specified in this Standard.

Figure 1 is a schematic diagram of the boundary of a typical PEMFC backup power system.

The PEMFC backup power system applicable to this Standard shall constitute a complete system. In order to achieve the set function, the system shall be composed of some or all of the following components.

- Fuel storage and supply system. a system that is used for storing fuel used by the PEMFC backup power system and providing fuel for the PEMFC backup power system;
- Air supply system. a system that is used for metering, conditioning, processing and pressurizing the air required by the PEMFC backup power system;
- Thermal management system. a system that provides cooling, heat dissipation, and/or heating functions to maintain thermal balance within the PEMFC backup power system;
- Water treatment systems. a system that treats and purifies the recovered or added water for use by the PEMFC backup power system;

- Electrical output conditioning system. a system that controls or converts the generated electrical energy to meet the electrical demand within the manufacturer's design range;
- Automatic control system. a system consisting of sensors, actuators, valves, switches, logic elements and control boards, etc., which is used for maintaining the parameters of the PEMFC backup power system, without manual intervention, within the range set by the manufacturer;
- Ventilation system. a system that realizes the air exchange inside and outside the cabinet of the PEMFC backup power system by means of forced or natural ventilation;
- Fuel cell module. a module consisting of one or more fuel cell stacks, electrical connection devices for delivering electrical energy to the stacks, and monitoring devices, which converts chemical energy into electrical energy and thermal energy.
- Auxiliary energy storage device. a rechargeable and dischargeable energy storage device inside the system, which is used for assisting or supplementing the fuel cell module to supply power to internal or external loads. (Optional)

This Standard applies to commercial, industrial and domestic PEMFC backup power systems in non-hazardous (unclassified) areas around the equipment.

This Standard only considers dangerous situations that may cause harm to persons, objects or the environment outside the PEMFC backup power system, and proposes safety requirements for such dangerous situations, excluding the safety measures that may be taken when the PEMFC backup power system itself may be damaged. The prerequisites in this part are not intended to limit innovation. When materials, designs or manufactures different from this part are used, they shall have the same or equivalent safety and performance with those specified in this part.

concentration is lower than critical ratio of the low flammability limit (LFL) or higher than the high flammability limit (UFL), it will not initiate combustion.

3.2 thermal stability

Stable temperature conditions, quasi-steady state. Read the temperature twice at an interval of 15 minutes; in any state where the temperature change does not exceed 3 °C or 1% of the absolute operating temperature, the temperature with the higher reading shall prevail.

3.3 accessible areas

Under normal operating conditions, an area that meets one of the following factors.

- a) It is accessible without the use of tools;
- b) It is accessible after the operator is specially provided with an access method;
- c) Whether or not the use of tools is required, the operator can be guided to access.

Note 1: Unless otherwise defined, the terms "access" and "accessibility" refer only to the operator's access to the area in the above definition.

Note 2: Only maintenance personnel can enter the inaccessible area. When entering the inaccessible area, the maintenance personnel may need to take appropriate personal protection according to the maintenance manual.

3.4 combustible materials

Burnable materials.

Note: Combustible materials shall also be considered combustible after being refractory treated, flame retardant treated or plastered.

3.5 design pressure

The maximum pressure value in all operating modes, including steady state and transient state.

3.6

Cabinets for storing fuel tanks and their auxiliary equipment.

3.13 hazardous area

Areas where flammable gases are present or expected to be present in quantities sufficient to require special precautions for the construction, installation and use of electrical equipment.

Depending on the frequency and duration of the presence of flammable gases, hazardous areas can be divided into.

Area 0.an area where flammable gases are continuously present or present for a long time.

Area 1.an area where flammable gases may occur during normal operation.

Area 2.an area where flammable gas is unlikely to occur, and if it occurs, it occurs occasionally and only for a short time during normal operation.

3.14 flue gas vent

A line that carries exhaust gas from a backup power system to the outside environment.

3.15 interlock

A control method that monitors whether the specified conditions are met or not and ensures that the relevant control equipment performs safe actions.

3.16 state

3.16.1 cold state

The state where the fuel cell power generation system has neither energy input nor energy

output at ambient temperature.

[GB/T 28816-2012, Definition 3.110.1]

3.16.2 operational state backup power system. Anti-vibration facilities can be installed to avoid the adverse effects caused by vibration and impact (including those generated by the machine itself and auxiliary equipment, as well as those generated by the physical environment). The above adverse effects do not include the effects caused by seismic impact; if the manufacturer believes that its products are suitable for use in seismic areas, it shall be stated separately.

4.2.6 Transportation and storage temperature requirements

The PEMFC backup power systems shall be designed to withstand, or with proper precautions taken, transportation and storage temperatures of -25 °C ~ 55 °C.

Manufacturers may also specify an alternative temperature range.

4.3 Selection of materials

The PEMFC backup power system shall meet the following requirements when selecting materials during the design and manufacturing stages.

- When the materials used are known to be dangerous under certain conditions, the manufacturer shall take various precautions and provide the user with the necessary information to minimize the risk to personal safety and health;
- The possible corrosion, wear, erosion, etc. of these materials shall be fully considered, and materials with fire-resistant properties (see all parts of GB/T 5169), hydrogen embrittlement resistance and environmental friendliness shall be chosen as far as possible;
- Metallic piping and metallic connectors shall comply with the provisions in GB/T 20972.1-2007;
- Non-metallic piping and related fittings shall comply with the regulations in GB/T 5563-2006, GB/T 15329.1, GB/T 20801 (all parts);
- Vulcanized rubber and thermoplastic rubber parts shall be subjected to hot air accelerated aging test and heat resistance test (aging time not less than 96 h) in accordance with the provisions of GB/T 3512-2001, to ensure that the performance (elasticity, tensile strength, etc.) after the test can still meet the safe use of the power generation system within the expected life.