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

GB/T 23751.2-2017

**Micro fuel cell power systems -- Part 2: Performance test
methods**

微型燃料电池发电系统 第2部分：性能试验方法
(English Translation)

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Table of Contents

Foreword...	3
1 Scope...	5
2 Normative references...	6
3 Terms and definitions...	6
4 General principles...	7
5 Test...	9
6 Marking and labeling...	14
7 Test report...	14

1 Scope

This Part of GB/T 23751 provides performance test methods for the evaluation of micro fuel cell power systems for portable computers, mobile phones, personal digital assistants (handheld computers), home wireless appliances, television broadcast cameras, and autonomous robots, etc.

This Part introduces the performance test methods for the power characteristics, fuel consumption and mechanical durability of micro fuel cell power systems with an output not exceeding 60V DC and 240 W. The functional arrangement of a typical micro fuel cell power system that is evaluated according to this Part is shown in Figure 1.

This Part does not address the safety issues of micro fuel cell power systems.

This Part does not address the interchangeability of micro fuel cell power systems.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 28816-2012, Fuel cell - Terminology (IEC/T S62282-1:2010, IDT)

IEC 60068-2-6, Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)

IEC 60721-3-7, Classification of environmental conditions - Part 3-7: Classification of groups of environmental parameters and their severities - Portable and non- stationary use

ISO 4677-1, Atmospheres for conditioning and testing - Determination of relative humidity - Part 1: Aspirated psychrometer method

ISO 4677-2, Atmospheres for Conditioning and Testing - Determination of Relative Humidity - Part 2: Whirling Psychrometer Method

ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories

3 Terms and definitions

Terms and definitions determined by GB/T 28816-2012, and the following ones are applicable to this document.

3.1

conditioning

An operation where, before the performance test, the micro fuel cell power system in standby state is placed in the test environment for a period of time to adjust the system to the specified test conditions.

3.2

micro fuel cell power system

DC power supply powered by fuel cells, including a fuel container, which provides a DC output voltage not exceeding 60 V and an output power of 240 W, and is connected to a hand-held or portable electrical device, such as a portable computer, mobile phone, personal digital assistant (PDA), home wireless appliance, television broadcast camera

-- Time: $\pm 1\%$;

-- Mass: $\pm 1\%$;

-- Temperature: $\pm 2\text{ }^{\circ}\text{C}$;

-- Humidity: $\pm 5\%$;

-- Pressure: $\pm 5\%$;

-- Vibration frequency: $\pm 1\text{ Hz}$ ($5\text{ Hz} < \text{frequency} \leq 50\text{ Hz}$) or $\pm 2\%$ (frequency $> 50\text{ Hz}$);

-- Volume: $\pm 2\%$.

4.3.1 General

Measuring instruments shall be determined according to the required accuracy and the range of the measured value. Measuring instruments shall be calibrated periodically to maintain the level of accuracy specified in 4.2. With reference to ISO/IEC 17025, calibration information shall be described in the test report. Instruments for measuring voltage and

current shall be capable of continuously recording values throughout the measurement process.

4.3.2 Voltage

The accuracy specified in 4.2 above shall be guaranteed. The internal resistance of the voltage measuring instrument shall be greater than or equal to 1 Mohm.

4.3.3 Current

The accuracy specified in 4.2 above shall be guaranteed.

4.3.4 Time

The time measuring instrument shall have an accuracy of ± 1 s/h or higher, so as to ensure the measurement accuracy specified in 4.2.

4.3.5 Mass

The accuracy specified in 4.2 above shall be guaranteed. The measurement of mass shall be carried out in accordance with relevant national standards, industry norms or norms of relevant organizations.

4.3.6 Temperature

The accuracy specified in 4.2 above shall be guaranteed. Recommended instruments for direct measurement of ambient temperature are:

a) Thermocouple with sensor; or b) Resistance thermometer with sensor.

4.3.7 Humidity

The accuracy specified in 4.2 above shall be guaranteed. Refer to the requirements of ISO 4677-1 and ISO 4677-2 for the measurement of ambient humidity.

4.3.8 Pressure

The accuracy specified in 4.2 above shall be guaranteed. The measurement of pressure shall be carried out in accordance with relevant national standards, industry norms or norms of relevant organizations. If neither is available, the relevant organization shall create a stress measurement standard or specification for this performance test.

4.3.9 Vibration frequency

The accuracy specified in 4.2 above shall be guaranteed. Refer to the requirements of GB/T 2423.10 for the vibration frequency.

4.3.10 Volume

The accuracy specified in 4.2 above shall be guaranteed.

5.1 Test procedures

Each test shall be performed on 3 samples. The conditioning of samples shall be carried out at least 2 h before the start of the test, so as to adjust the sample to meet the test environmental conditions; the test shall be started immediately after conditioning.

Unless otherwise specified, the micro fuel cell power system shall be connected to the voltmeter and load specified by the manufacturer, so that it can operate at rated power or rated current; the measurement shall last for 1 h or according to the time specified by the manufacturer, so as to observe characteristics of the micro fuel cell power system in actual operation. Throughout the measurement process, data shall be recorded at the sampling frequency specified by the manufacturer. The reported test measurement value shall be the average of the average measurement values of 3 samples, wherein the average measurement value of each sample is the average value of the recorded data of the sample. These tests can be performed sequentially using one set of samples, or simultaneously using different sets of samples. Electrical parameter measurements shall be taken at the power interface.

5.2.4 Power generation test under low temperature and high temperature

conditions a) The purpose of this test is to confirm the performance of the micro fuel cell power system under low temperature and high temperature conditions.

b) The test temperature shall be the minimum and maximum operating temperature specified by the manufacturer. At the beginning of the test, the rechargeable battery or capacitor (optional) shall be fully charged, and the sample's internal reservoir or fuel container shall also be full. The sample shall be subjected to conditioning under the test temperature conditions in accordance with the provisions of 5.1, and then the output voltage shall be measured. The temperature of the test, the load connected and the duration of measurement shall be recorded in the test report.

5.2.5 Power generation test under low humidity and high humidity conditions

a) The purpose of this test is to confirm the performance of the micro fuel cell power system under low humidity and high humidity conditions.

b) The humidity for the test shall be specified by the manufacturer at a humidity level below 20% relative humidity and a humidity level above 80% relative humidity. At the beginning of the test, the rechargeable battery or capacitor (optional) shall be fully charged, and the sample's internal reservoir or fuel container shall also be full. The sample shall be subjected