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**General safety code for small
polymer electrolyte fuel cell power
systems**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of a Japanese Industrial Standard submitted by The Japan Electrical Manufacturers' Association (JEMA) with a draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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General safety code for small polymer electrolyte fuel cell power systems

1 Scope

This Japanese Industrial Standard specifies the matters required for the general safety code, performance maintenance control, etc. for the stationary and portable small polymer electrolyte fuel cell power systems (hereafter referred to as “fuel cell systems”) such as its structure, material, function, installation criteria, marking and sign, and operation manual.

This Standard is applied to the fuel cell system satisfying the following items.

- a) **Kind of fuel cell** Polymer electrolyte fuel cell
- b) **Output** Rated transmission output of less than 10 kW
- c) **Output mode** Grid-connected operation, grid-independent operation or independent operation of dc output or ac output of 220 V or less
- d) **Raw fuel** Gaseous fuel (city gas, liquefied petroleum gas, etc.), liquid fuel (kerosene etc.) or hydrogen
- e) **Operating pressure** Maximum allowable working pressure of the portion through which fuel gas passes of less than 0.1 MPa
- f) **System configuration** Stationary and portable dedicated power generation system or cogeneration system stored in a package (except a micro fuel cell)

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

- JIS B 8409 *Pressure type solenoid pumps for oil burners*
- JIS C 8800 *Glossary of terms for fuel cell power system*
- JIS C 8823 *Testing methods for small polymer electrolyte fuel cell power systems*
- JIS C 8980 *Power conditioner for small photovoltaic power generating system*
- JIS C 9219 *Electric storage tank water heaters*
- JIS S 2092 *General constructions of gas burning appliances for domestic use*
- JIS S 2093 *Test methods of gas burning appliances for domestic use*
- JIS S 2109 *Gas burning water heaters for domestic use*
- JIS S 3021 *Oil burning water boilers*
- JIS S 3024 *Oil burning water heaters for domestic use*
- JIS S 3027 *Oil burning bath boilers with water heaters for domestic use*
- JIS S 3030 *General rules for construction of oil burning appliances*
- JIS S 3200-1 *Equipment for water supply service—Test methods of hydrostatic pressure*

JIS S 3200-2 *Equipment for water supply service—Test method of low temperature resistant*

JIS S 3200-3 *Equipment for water supply service—Test method of water hammer*

JIS S 3200-4 *Equipment for water supply service—Test method of prevention from back current*

JIS S 3200-5 *Equipment for water supply service—Test methods of destruction by vacuum pressure*

JIS S 3200-6 *Equipment for water supply service—Test methods of durability*

JIS S 3200-7 *Equipment for water supply service—Test methods of effect to water quality*

3 Terms and definitions

For the purposes of this Standard, the terms and definitions given in **JIS C 8800** and the following apply.

3.1 package

container in which main devices constituting a polymer electrolyte fuel cell power generation unit (hereafter referred to as “power generation unit”) such as a fuel cell stack, a fuel reformer, a power conditioner, a control unit, auxiliary equipment are stored

3.2 burner

device which mixes air and fuel to burn

It refers to a pilot burner and a main burner in the case of burners with a pilot burner, and refers to the main burner in the case of burners without a pilot burner.

3.3 pilot burner

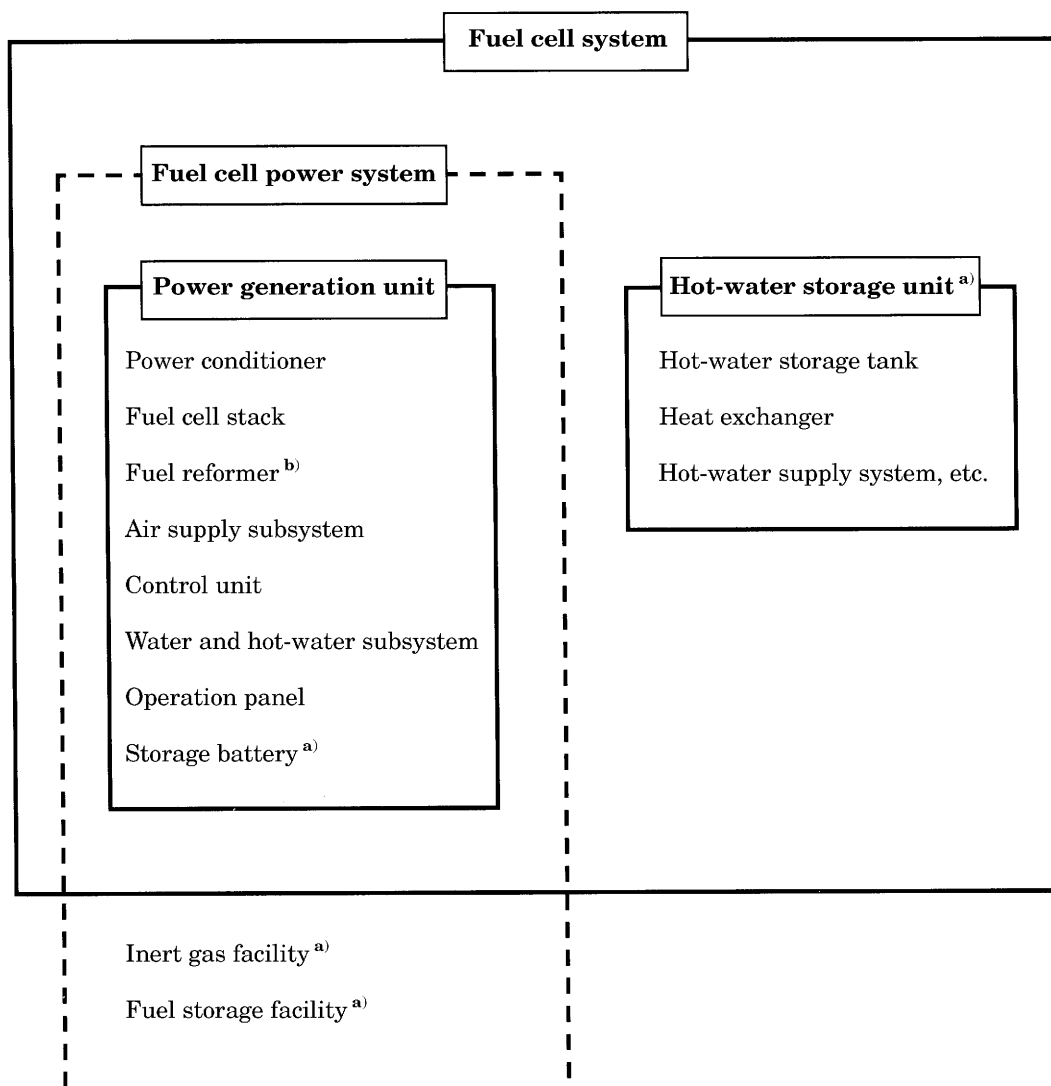
burner which is used for igniting a main burner and continues to burn along with the main burner at least while the main burner is burning

3.4 ignition burner

burner which burns only when it is ignited

4 Configuration and scope

The basic configuration of the fuel cell system in the scope of this Standard shall be as shown in figure 1.



NOTE : Installation location of device etc. is not limited to that in one package.

Notes ^{a)} Equipment or unit installed as necessary.

^{b)} It is not used when raw fuel is hydrogen.

Figure 1 Basic construction of fuel cell system

5 Material, structure and function on safety

5.1 General material

The general material shall be as follows.

- The material or the coating material which has sufficient corrosion resistance under the use conditions shall be used.
- The nonmetallic material of rubber or plastics shall be selected according to the use conditions so that it may not deteriorate in a short period of time.
- For the material used in the environment with high hygroscopic moisture, the corrosion-resistance material such as cast iron, stainless steel shall be used. When carbon steel is used, the coating having strong corrosion resistance shall be applied.

- d) For the electrical insulator and thermal insulator, the material which sufficiently endures the temperature of the part in contact with or adjacent to it and has small moisture absorption shall be used.
- e) For the enclosure of the outdoor equipment, materials with excellent weather resistance such as a metal to which rust-proofing is applied or a synthetic resin shall be used. Furthermore, the enclosure material such as a synthetic resin shall be free from blisters, crazes, cracks or other abnormalities when it is cooled naturally after it is allowed to stand for 1 h in air at $80\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$.
- f) For the conductive material, copper, copper alloy, stainless steel, or iron or steel (except stainless steel) to which the plating conforming to the requirements when the test specified in “4 of appendix table 3 of attached table of the technical criteria in the Electrical Appliance and Material Safety Law” is performed is applied, or the material having electrical, thermal and mechanical stability which is equivalent to or superior to these shall be used. However, this does not apply to the cases where unplated iron or steel or elasticity is required, or where use of material not complying with the above is unavoidable due to structural reasons, but where no danger can be possibly caused from it.
- g) The material of components of the equipment shall not contain polychlorinated biphenyl.
- h) For the components of the equipment, asbestos or asbestos-containing materials shall not be used.

5.2 General structure

The structure shall be as follows.

- a) All components shall have the safe structure which is resistant to distortion, strain and other damages.
- b) Components such as a removable panel or a cover shall be structured such that they can not be attachable to a wrong position or can not be replaceable with another component.
- c) All the components which may be touched during the usual use shall have the structure without a sharp protrusion and angle in consideration of safety.
- d) All the components requiring periodical maintenance and inspection shall have a composition which enables an easy maintenance and inspection.
- e) The structure shall be such that a combustible gas does not remain inside the package.
- f) The structure shall be such that a leaked combustible gas does not flow into a power conditioning subsystem.
- g) The general structure of the equipment of the part passing a liquid fuel of the fuel cell subsystem which uses the liquid fuel as fuel, the fuel pump in the liquid part (limited to the pump specified in **JIS B 8409**, or the pump made of the equivalent material with the equivalent or less discharge pressure), the carburettor and the fuel piping (including the part of a desulfurizer) of the part passing a liquid shall be as specified in **JIS S 3030**.

- h) The structure of the equipment having live parts shall be such that the joint between the live parts or the live part and the non-live part does not generate looseness and endures use environmental conditions in the usual usage state.
- i) The structure of the equipment of which the part is attached or detached shall be such that the work of attachment or detachment can be performed securely and safely.
- j) For the plug socket attached to the equipment, the value of the maximum power or current which can be taken out safely shall be marked indelibly on itself or the location adjacent to it.
- k) The structure shall be such that foreign materials cannot go into the inside of a package.
- l) For the equipment with a remote control mechanism, the switching of a power supply circuit cannot be performed by the operation other than that of the equipment switch or controller except when there is no possibility of causing danger.
- m) For the equipment to be used by attaching to the building material, the structure shall be such that attachment shall be enabled easily and strongly.
- n) The clearance (including creepage distance) between the live parts having different polarity, between the live part and the non-live metal part with a possibility of short-circuiting, and between the live part and the surface of the non-metal part with a possibility that people might touch it shall conform to the requirements stipulated in “1 (2) ㄱ of attached table 8 of the technical criteria in the Electrical Appliance and Material Safety Law”.
- o) The thickness of an insulating material shall conform to the requirements stipulated in “1 (2) ㄴ of attached table 4 of the technical criteria in the Electrical Appliance and Material Safety Law”.
- p) For movable parts with a possibility that people touch it in the usual usage state, a suitable protective frame or protective net shall be attached so that there is no possibility that people might easily touch it. However, this does not apply to movable parts which are unavoidably exposed for functional reasons but are free from possibility of causing dangers such as an electric shock or injury in case of contact.
- q) For the equipment of the double rating with the mechanism which is capable of switching the rated input voltage or the rated frequency, the voltage and frequency which are switched shall be capable of being easily identified except the equipment with the mechanism capable of automatically switching.
- r) For the unvented type power generation unit installed indoors, the marked fuel consumption shall be 12 kW (based on HHV) or less and the function of automatic stop when incomplete combustion is detected shall be provided.
- s) The allowable temperature of each part when the temperature rise test is performed in accordance with **JIS C 8823** shall be as specified in table 1 and table 2.