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Measuring method of output power for crystalline solar cells

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS C 8913**:1989 is replaced with **JIS C 8913**:1998.

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Measuring method of output power for crystalline solar cells

Introduction In the application of a Standard, normative references to the Standard shall be simultaneously referred to. It is often necessary to compare with similar Standards, if any.

This Japanese Industrial Standard has been prepared based on **IEC 60904-1**, *Photovoltaic devices—Part 1: Measurements of photovoltaic current-voltage characteristics* published in 1987, without any modification in technical contents.

1 Scope This Japanese Industrial Standard specifies the method for measuring output characteristics of terrestrial flat plate non-concentrating crystalline solar cells intended for power generation (hereafter referred to as "solar cells") by means of the solar simulators for crystalline solar cells and modules specified in **JIS C 8912** (hereafter referred to as "solar simulators") using secondary reference crystalline solar cells specified in **JIS C 8911** (hereafter referred to as "secondary reference solar cells").

Remarks: The normative references to this Standard are given below.

JIS C 1102-1 *Direct acting indicating analogue electrical measuring instruments and their accessories Part 1 : Definitions and general requirements common to all parts*

JIS C 1102-2 *Direct acting indicating analogue electrical measuring instruments and their accessories Part 2 : Special requirements for ammeters and voltmeters*

JIS C 8911 *Secondary reference crystalline solar cells*

JIS C 8912 *Solar simulators for crystalline solar cells and modules*

JIS C 8916 *Temperature coefficient measuring methods of output voltage and output current for crystalline solar cells and modules*

JIS Z 8103 *Glossary of terms used in instrumentation*

JIS Z 8113 *Glossary of lighting terms*

JIS Z 8120 *Glossary of optical terms*

2 Definitions For the purpose of this Standard, in addition to the definitions specified in **JIS C 1102-1, JIS C 1102-2, JIS C 8912, JIS C 8916, JIS Z 8103, JIS Z 8113** and **JIS Z 8120**, the following principal definitions apply:

(1) **solar simulator** A light source which simulates the irradiance and spectral distribution of the reference solar radiation (see **JIS C 8912**).

(2) **solar cell** A semiconductor device which generates electricity by photovoltaic effect when exposed to such radiant energy as sunlight.

(3) **secondary reference solar cell** One of reference solar cells which is calibrated by the solar simulator of **JIS C 8912** using the primary reference solar cell.

(4) **solar cell area** The overall area of a solar cell (including the area of non-generating part).

(5) **solar cell temperature** The temperature of the junction of a solar cell.

Remarks: This may be the temperature of rear surface or of a metal block or the like in close contact with a solar cell to have good thermal conductivity if the metal block or the like is carrying out the temperature control of the solar cell.

(6) **reference solar radiation** The natural sunlight the irradiance and spectral distribution of which are specified for the purpose of expressing output characteristics of solar cells under common conditions.

(7) **irradiance (E_r)** The radiant flux incident to the surface of solar cell divided by the area of the surface.

(8) **spectral irradiance** The irradiance at a specific wavelength zone or that as a function of wavelength.

(9) **spectral response mismatch error** The measurement error due to the discrepancy in relative spectral response between the reference solar cell and the solar cell to be measured (called as "specimen cell") and the discrepancy in spectral irradiance distribution between the reference solar radiation and the measurement light source when the output characteristics of the specimen cell are measured by using the reference solar cell.

(10) **current-voltage characteristic curve or $I-V$ characteristic curve** The characteristic curve which shows correlation between output current and output voltage of a solar cell.

(11) **four-terminal method** Such a measuring method that the measuring terminals are provided for each of the current measurement and the voltage measurement.

(12) **open-circuit voltage (V_{oc})** The voltage which appears across both terminals when the output terminals of a solar cell is opened.

(13) **short-circuit current (I_{sc})** The current which flows through both terminals when the output terminal of a solar cell is short-circuited.

(14) **maximum output (P_m)** The output of a solar cell at which the current $\times$ the voltage is the maximum on the $I-V$ characteristic curve from short-circuit current to open-circuit voltage.

(15) **maximum power voltage (V_{pm})** The voltage at which the output of a solar cell is the maximum.

(16) **maximum power current (I_{pm})** The current at which the output of a solar cell is the maximum.

(17) **voltage at specified current (V_i)** The voltage which appears across both terminals of a solar cell when the current of the solar cell is adjusted to a specified value.

(18) **current at specified voltage (I_v)** The current which flows through a solar cell when the voltage between both terminals of the solar cell is adjusted to a specified value.

(19) **solar cell conversion efficiency (η)** The maximum output (P_m) divided by the incident radiant flux into the cell area (A) of a solar cell. This is expressed in percentage (%).