



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS C 8960 : 2012

(JEMA)

Glossary of terms for photovoltaic power generation

ICS 01.040.27;27.160

Reference number : JIS C 8960 : 2012 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 1997-07-20

Date of Revision: 2012-03-21

Date of Public Notice in Official Gazette: 2012-03-21

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Electricity Technology

JIS C 8960:2012, First English edition published in 2013-10

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED FY COPYRIGHT

Contents

	Page
Introduction.....	1
1 Scope	1
2 Classification of terms	1
3 Terms and definitions	2
Alphabetical index.....	38

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Electrical Manufacturers' Association (JEMA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently, **JIS C 8960:2004** is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, applications for a patent after opening to the public or utility model rights. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, applications for a patent after opening to the public or utility model rights.

Glossary of terms for photovoltaic power generation

Introduction

This Japanese Industrial Standard was established in 1997 and has gone through 2 revisions to this day. The last revision was made in 2004, and the revision at this time is to correspond to the terms added in related **JISs** afterwards.

To incorporate terms from associated **IEC** Standards, **IEC/TS 61836** is also referred to.

1 Scope

This Standard specifies terms on elements, equipment and systems used for photovoltaic power generation (PV).

2 Classification of terms

Terms are classified as follows.

a) Element

1) Basic

1.1) General

1.2) Climatic conditions

2) Element

2.1) General

2.2) Material

2.3) Structure

2.4) Classification

2.5) Production

3) Characteristics and evaluation

3.1) Characteristics of cell and module

3.2) Solar radiation

3.3) Evaluating method

3.4) Evaluation equipment

b) Equipment

1) Power conditioner

1.1) Structure

1.2) Classification of inverters

1.3) Characteristics and performances

2) Storage battery

2.1) General

2.2) Characteristics and tests

3) Evaluating equipment

4) Other equipment

c) System

1) Classification of systems

2) Arrays

3) Utility interaction

4) Characteristics and performances

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions apply.

In addition, English equivalents are shown for information. Furthermore, in the column of definition, terms or sentences shown in parentheses are alternative expressions or supplementary explanations. Symbols are shown in the column of definition by starting a new line. Units are also shown in parentheses in the column of definition. In the column of English equivalent, abbreviations of English equivalents are shown in parentheses. Terms also in **IEC/TS 61836** are shown in bold face.

a) Element

1) Basic

1.1) General

No.	Term (Japanese character)	Definition	English equivalent
101	アクセプタ	additives in small amounts for supplying holes as majority carriers such as boron in the case of silicon photovoltaic cells	acceptor
102	禁制帯幅	width of zonal range of energy level in which electron cannot stay in energy band of semiconductor	energy gap , band gap
103	空乏層	very thin area having electric field generated in the interface between p-type layer and n-type layer of photovoltaic cell	depletion layer
104	シート抵抗	electrical resistance from one side to opposite side of a square thin film Sheet resistance of surface layer of photovoltaic cell is one of the important factors for determination of the series resistance. Unit: $\Omega/\square$	sheet resistance

No.	Term (Japanese character)	Definition	English equivalent
105	障壁エネルギー	energy which an electron releases when passing through a depletion layer This is greatness of electrostatic potential of the barrier. Unit: eV	barrier energy
106	接合	portions in contact with semiconductor materials In general, semiconductors with mutually different physical properties are made contact.	junction
107	太陽エネルギー	radiant energy radiated from the sun The source of solar energy is nuclear fusion reaction of hydrogen, and the radiation spectrum is close to that of black body at about 6 000 K.	solar energy
108	太陽光発電 (たいようこうはつでん), (たいようひかりはつでん)	power generation system which directly converts the solar energy to electric energy It is general to use photovoltaic cells which utilize photovoltaic effect.	photovoltaic power generation
109	太陽電池	semiconductor device which receives irradiation of light such as sunlight and directly converts its energy into electric energy A type of photoelectric conversion element which utilizes photovoltaic effect. In some cases, it is used as the generic expression of photovoltaic cell, photovoltaic module, photovoltaic panel and photovoltaic array.	cell, photovoltaic cell
110	ドーパント	additives in small amounts added that determine p-type semiconductor or n-type semiconductor	dopant
111	ドナー	additives in small amounts for supplying electrons as majority carriers such as phosphorus in the case of silicon photovoltaic cells	donor
112	半導体材料	substance having conductivity between a metal and an insulating media of which the conductivity changes by adding impurities and by imparting small energy (for example, heat)	semiconductor material
113	pin 接合	junction of such a construction that nondoping layer (i-type layer) is provided between p-type layer and n-type layer to reduce recombination of minority carriers This is widely used in amorphous silicon photovoltaic cells.	PIN junction
114	pn 接合	junction in a continuous body of semiconductor, at which the material on one side has p-type structure and the material on the other side has n-type structure	PN junction, cell junction
115	光起電力効果	one of the photoelectric effects that electromotive force appears due to irradiation of light This mainly found in the junction of semiconductor.	photovoltaic effect

No.	Term (Japanese character)	Definition	English equivalent
116	光起電力材料	material that exhibits the photovoltaic effect	photovoltaic material
117	光起電力デバイス	device which utilizes the photovoltaic effect, for example, photovoltaic cell, module or array	photovoltaic device
118	光電流	current which is produced in a photoelectric conversion element due to irradiation of light	photovoltaic current , photo current
119	ヘテロ接合	junction between semiconductors of two types different in energy gap	heterojunction
120	ホモ接合	pn junction formed by the same semiconductor materials (having the same energy gap)	homojunction

1.2) Climatic conditions

No.	Term (Japanese character)	Definition	English equivalent
151	アルベド	intensity ratio of the incident ray to the reflected ray on a certain surface, expressed by the average value on all wavelength components In the photovoltaic power generation area, it means the reflectivity of ground surface for the sunlight.	albedo
152	エアマス	ratio of the length of path traversed by the direct reaching sunlight incident to the earth atmosphere and that when the sunlight is incident vertically to the atmosphere of standard conditions (standard atmosphere 1 013 hPa) It is frequently abbreviated as AM.	air mass (AM)
153	周囲温度	temperature of air measured with a thermometer under such a state that the air is in a ventilated vessel isolated from radiation of sunlight Unit: °C	ambient temperature
154	大気透過率	ratio of transmitted ray against the incident ray when the thickness of atmosphere in vertical direction is employed as the unit distance (air mass = 1) Unit: %	atmospheric transmissivity
155	太陽高度	angle made by the horizontal plane and the direction to the centre of the image of sun	solar elevation, solar altitude
156	太陽スペクトル	distribution of solar energy as the function of wavelength	solar spectrum
157	太陽定数 (たいようていすう), (たいようじょうすう)	amount of solar energy which is received by such a unit area per unit time, that the area is perpendicular to the sunlight at the upper end of earth atmosphere when the earth is at the average distance from the sun	solar constant

2) **Element**2.1) **General**

No.	Term (Japanese character)	Definition	English equivalent
201	太陽電池サブモジュール	minimum unit of photovoltaic cell group consisting of plural cells formed at the same time on a substrate which is not separable	submodule, photovoltaic submodule
202	太陽電池セル	minimum unit which constitutes photovoltaic cell assembly used for photovoltaic power generation	cell, photovoltaic cell
203	太陽電池モジュール	minimum power generation unit formed in such a way that photovoltaic cells or photovoltaic submodules are sealed in an enclosure for environmental protection to have a prescribed power	module, photovoltaic module

2.2) **Material**

No.	Term (Japanese character)	Definition	English equivalent
211	アモルファス	metastable state of a solid which has no long-range order in its atom arrangement	amorphous
212	ウェハ	slice of semiconductor material, that forms the basis of a crystalline photovoltaic cell	wafer
213	基板	basic material for manufacturing photovoltaic cells In the case of photovoltaic cells of crystalline system, this means the semiconductor wafer, and the photovoltaic cell are made by forming the junction and electrodes on the wafer. In the case of thin film photovoltaic cells, this means the support on which the thin film grows up and glass, stainless steel, etc. are used. In a photovoltaic module, this means the plate material to maintain the mechanical strength of the module.	substrate
214	太陽電池級シリコン	silicon used for raw materials of substrate of crystalline photovoltaic cells	solar grade silicon (SOG silicon)
215	多結晶	crystal made in such a manner that many single crystals are gathering in various crystal directions	multicrystal, polycrystal
216	単結晶	crystal that the arrangement of atoms constituting the whole crystal material is regular and it is possible to select single crystal axis	single crystal, monocrystal
217	リボン結晶	thin sheet of silicon crystal produced in a continuous process by withdrawal from a molten bath of silicon by using two ribbons parallel to each other	ribbon

2.3) Structure

No.	Term (Japanese character)	Definition	English equivalent
231	拡散層	p-type layer or n-type layer produced by diffusion of impurity to form a PN junction	diffusion layer
232	カバーガラス	glass used for protection of photovoltaic cell surface	cover glass
233	グリッドライン	metal wire that is arranged on the surface of photovoltaic cell to supply current to a bus bar It is also called a finger.	grid line
234	テクスチャ構造	uneven structure formed on front surface and back surface of photovoltaic cell to increase light absorption by decreasing surface reflection loss and utilizing light confinement effect This also simply means the front surface and back surface of photovoltaic cell having uneven structure.	textured surface, textured structure
235	透明電極	electrode provided on the light incident side surface of photovoltaic cell, which has such characteristics that conductivity is high and light transmissivity is large	transparent conducting electrode, transparent electrode
236	透明導電性酸化層	transparent conducting oxide layer used as an electrode in thin-film photovoltaic cell It is deposited on transparent glass.	transparent conducting oxide layer
237	バスバー	line on the cell for collecting grid line (also called a finger) current and transmitting it to an interconnector The interconnector is connected to a bus bar by soldering etc. It is also called bus lines.	bus bar, bus lines
238	反射防止膜	coating formed on the surface of photovoltaic cell to reduce the reflective loss of light	anti-reflective coating (AR coating), antireflection coating, antireflective film (AR film)
239	BSF 効果	such an effect that optically produced carriers are effectively collected near back surface of photovoltaic cell due to built-in electric field formed by heavily doped region in the vicinity of electrode on the back surface of photovoltaic cell substrate	back surface field effect
240	光閉込め効果	such an effect that the short circuit current increases due to increase of light absorption by trapping light in the photovoltaic cell using textured surfaces, etc.	light confinement effect, light trapping effect

2.4) Classification

No.	Term (Japanese character)	Definition	English equivalent
251	MIS 形太陽電池	photovoltaic cell of such construction that a very thin insulating material is inserted between the substrate semiconductor and the electrode metal in a Schottky barrier photovoltaic cell	metal-insulator-semiconductor cell
252	化合物太陽電池	photovoltaic cell which employs compound semiconductor consisting of several elements This is classified into III-V family photovoltaic cell, II-VI family photovoltaic cell, I-III-VI ₂ family photovoltaic cell, etc. according to the composing elements. There are GaAs photovoltaic cell, InP photovoltaic cell, CdS photovoltaic cell, CdTe photovoltaic cell, CIS photovoltaic cell, etc. as the principal products.	compound semiconductor cell
253	結晶系太陽電池	generic name of photovoltaic cell that uses a single crystal or a multicrystal	crystalline photovoltaic cell
254	建材一体形太陽電池 モジュール	photovoltaic module integrated as members for building such as roof materials, wall materials	building integrated cell module, building integrated photovoltaic module
255	CIS 系太陽電池	photovoltaic cell that uses thin coating of Cu-In-Se compound as main material	CIS photovoltaic cell
256	色素増感太陽電池	cell that converts sunlight into electric energy using dyes The phenomenon that electrons are excited from dyes by irradiating dyes with sunlight is utilized.	dye-sensitized photovoltaic cell
257	湿式太陽電池	photovoltaic cell in which electrolyte is used at the junction with semiconductor Rectifying characteristic like Schottky junction can be obtained at the interface of semiconductor/electrolyte by selecting materials, and electric power generation is possible by irradiating this interface with light.	photoelectro-chemical cell, liquid junction cell
258	集光形太陽電池	photovoltaic cell which generates electric power by irradiation of the sunlight concentrated by a lens or the like	concentrator photovoltaic cell
259	集積形太陽電池	photovoltaic cell that plural cells are connected in series on single substrate There is amorphous silicon photovoltaic cell as the representative photovoltaic cell employing this construction.	integrated type PV cell
260	ショットキーバリア 形太陽電池	photovoltaic cell using Schottky junction formed at the metal-semiconductor interface	schottky barrier photovoltaic cell
261	シリコン太陽電池	photovoltaic cell which employs silicon as the semiconductor material There are single crystal silicon photovoltaic cell, multicrystal silicon photovoltaic cell and amorphous silicon photovoltaic cell as the principal products.	silicon photovoltaic cell

No.	Term (Japanese character)	Definition	English equivalent
262	多接合太陽電池	photovoltaic cell of such construction that plural photovoltaic cells are stacked and the incident ray transmits these cells in the order while being absorbed in the cells In the case of two layers, it is sometimes called "tandem photovoltaic cell".	stacked photovoltaic cell, tandem photovoltaic cell, multi-junction cell
263	薄膜太陽電池	photovoltaic cell which employs thin film semiconductor There are amorphous silicon photovoltaic cell, CdS photovoltaic cell, CdTe photovoltaic cell, CIS photovoltaic cell, etc. as the principal products.	thin film photovoltaic cell
264	pn 接合形太陽電池	photovoltaic cell which utilizes PN junction of semiconductor	PN junction photovoltaic cell
265	フレキシブル太陽電池	photovoltaic cell which is flexible and capable of being folded back without breakdown	flexible photovoltaic cell
266	ヘテロ接合形太陽電池	photovoltaic cell which utilizes heterojunction of two different types of semiconductor	heterojunction photovoltaic cell
267	有機太陽電池	photovoltaic cell that performs optical power generation by reacting organic substances photochemically on the molecular level like plant photosynthesis	organic photovoltaic cell

2.5) Production

No.	Term (Japanese character)	Definition	English equivalent
281	キャスト法	producing method of multicrystalline silicon ingot by controlling the cooling rate of molten silicon that has been placed in square-section crucible Cubic silicon ingot is sliced into multicrystalline wafers that are square or rectangular.	directional solidification
282	チヨクラスキー法	producing method of single crystal silicon ingot by lifting a rotating seed crystal contacting to molten silicon bath Generally, cylindrical silicon ingot is sliced into wafers of round or pseudo-square.	Czochralski process
283	電磁キャスト法	producing method of multicrystal ingot by performing melt-solidification of silicon using electromagnetic induction dissolution method without using a crucible The produce of long ingot is possible by supplying material continuously.	electromagnetic casting

No.	Term (Japanese character)	Definition	English equivalent
284	浮遊帯域融解法	producing method of single crystal ingot by supplying multicrystalline silicon of raw material from upper part, and after fusing it by heating through means of absorbing electromagnetic waves of high frequency into melt formed between single crystals and multicrystals, by cooling the lower part of the melt This method is characterized by high purity since crucible is not used and it is difficult for the crystal to be contaminated by impurities such as oxygen.	float zone melting

3) Characteristics and evaluation

3.1) Characteristics of cell and module

No.	Term (Japanese character)	Definition	English equivalent
301	安定化後変換効率	conversion efficiency of photovoltaic cell and module (hereafter referred to as “photovoltaic cell/module”) after light irradiation for a given period under the given light irradiation condition It is especially used for amorphous silicon photovoltaic cell. Unit: %	stabilized conversion efficiency
302	暗電流	current which flows in photovoltaic cell without light irradiation	dark current
303	開放電圧	voltage across both terminals when the output terminals of photovoltaic cell/module are opened Quantifier: V_{OC} Unit: V	open circuit voltage
304	曲線因子	value obtained by dividing the maximum power by the product of open circuit voltage and short circuit current, which is expressed by the following formula $FF = \frac{P_{max}}{V_{OC} \times I_{SC}}$ where, FF : fill factor P_{max} : maximum power (W) V_{OC} : open circuit voltage (V) I_{SC} : short circuit current (A) This is one of parameters which shows characteristics of photovoltaic cell, and is influenced mainly by internal series resistances, parallel resistances and diode factor. Also called “FF”.	fill factor (FF)
305	最大出力	power at the point on current-voltage characteristics curve of photovoltaic cell/module where the product of current and voltage becomes the maximum Quantifier: P_{max} (or P_m) Unit: W	maximum power, peak power

No.	Term (Japanese character)	Definition	English equivalent
306	最大出力温度係数	change in maximum power when the temperature of photovoltaic cell/module changes by 1 °C This is used in relation with the photovoltaic system. Quantifier: $\alpha_{P_{\max}}$ Unit: $W \cdot ^\circ C^{-1}$ (or $\% \cdot ^\circ C^{-1}$)	maximum power temperature coefficient
307	最大出力動作電圧	voltage at the maximum power point of photovoltaic system Quantifier: $V_{P_{\max}}$ (or V_{P_m}) Unit: V	maximum power voltage
308	最大出力動作電流	current at the maximum power point of photovoltaic system Quantifier: $I_{P_{\max}}$ (or I_{P_m}) Unit: A	maximum power current
309	実効変換効率	value obtained by dividing the maximum power ($P_{\max}$) by the product of total area (A_t) of photovoltaic cell/module and irradiance (G) Quantifier: η_t Unit: % $\eta_t = \frac{P_{\max}}{A_t \times G}$ where, η_t : conversion efficiency A_t : total area of photovoltaic cell/module (m^2) $P_{\max}$: maximum power (W) G : irradiance ($W \cdot m^{-2}$)	conversion efficiency
310	収集効率	ratio of the number of electrons which flow out into external circuit from photovoltaic cell per unit time to the number of irradiated photons It is expressed by the following formula. Quantifier: P_c Unit: % $P_c = \frac{I_s}{P_h}$ where, P_c : collection efficiency I_s : short circuit current divided by electric charge of electron P_h : number of incident photons per unit time It is called the internal collection efficiency when corrected for surface reflection and the external collection efficiency when not corrected. As the function of wavelength, in some cases, the spectral characteristics of collection efficiency is obtained.	collection efficiency, quantum efficiency
311	出力電圧温度係数	change in open circuit voltage when temperature of photovoltaic cell/module changes by 1 °C Quantifier: β Unit: $V \cdot ^\circ C^{-1}$ (or $\% \cdot ^\circ C^{-1}$)	voltage-temperature coefficient