Block PVV

The PVV block calculates the output voltage and the temperature of a crystalline photovoltaic generator, depending on PV generator current, global radiation on the generator plane, ambient temperature, and wind speed.



Name	PVV
Function	se0001
Inputs	3 . . . [5]
Outputs	2
Parameters	1 . . . 30
Strings	0 . . . [1]
Group	S

Inputs

1 Current I / A
2 Global radiation on the generator plane G / W m^{-2}
3 Temperature T / °C
4 Wind speed close to the generator v_w / m s^{-1}
5 Time t / s

Outputs

1 Voltage V / V
2 Cell temperature T_c / °C

Parameters

1 Mode
- 0 The cell temperature is given by input 3.
- 1 The cell temperature depends on the thermal parameters of the PV modules and the inputs of the block; initial value of the cell temperature is given by parameter number 28.
- 2 The difference between cell temperature and ambient temperature is a linear function of the global radiation (input 2) on the basis of NOCT.

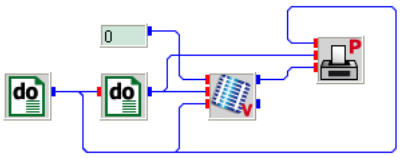
2 Number of cells in series per module N_s. If only PARAMS(1) is given, PARAMS(2) ... PARAMS(30) are read from the PV module database (data/pv/pv_modules.fb.bin), for the module STRINGS(1).
3 Number of cells in parallel N_p
4 Number of modules in series M_s
5 Number of modules in parallel M_p
6 Area of a single cell A_c / m^2
7 Area of a single module A_m / m^2
8 Band gap E_g / eV (c-Si $\approx$ 1.12 eV, a-Si $\approx$ 1.75 eV)
9 Coefficient of short-circuit current density c_{ph} / V^{-1}
10 Temperature coefficient of short-circuit current c_t / $V^{-1}\,K^{-1}$
11 Coefficient of saturation current density (Shockley diode) c_s / $A\,m^{-2}\,K^{-3}$
12 Coefficient of saturation current density (Recombination diode) c_r / $A\,m^{-2}\,K^{-5/2}$
13 Series resistance parameter r_s / $\Omega\,m^2$
14 Parallel resistance parameter r_p / $\Omega\,m^2$
15 Diode ideality factor α
16 Diode ideality factor β
17 Bishop parameter a
18 Bishop parameter m
19 Bishop parameter V_{br} / V
20 Module tolerance plus / %
21 Module tolerance minus / % (< 0)
22 Characteristic module length ℓ_m / m
23 Module mass m_m / kg
24 Absorption coefficient a
25 Emission factor ϵ
26 Specific heat of a module c_m / $J\,kg^{-1}K^{-1}$
27 Nominal operating cell temperature NOCT / °C
28 Initial value of cell temperature / °C
29 Error tolerance of voltage (or current) of a single cell in the numerical iteration to solve the two-diode-model equation
30 Maximum number of iterations to solve the two-diode-model equation

Strings

1 Product ID, e. g., pv003305 (legacy Photon database) or Ablytek 6MN6A270 (CEC database)

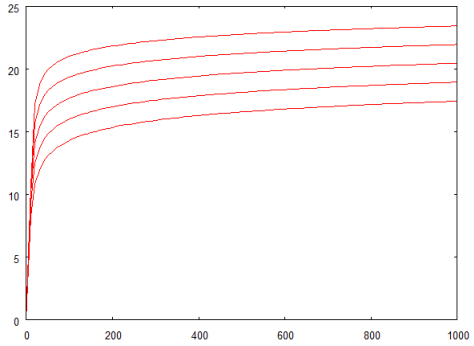
Description For a detailed description of the models used in the PVV block please refer to the description of block PVI.

pvv.vseit



Two nested DO blocks are used to vary temperature (outer block) and radiation (inner block) from 0 to 80 °C in steps of 20 °C and 0 to 1000 W/m^2 in steps of 10 W/m^2, respectively. The current input of the PVV block is set to zero by a CONST block in order to simulate open-circuit voltage.

The PLOTP block displays radiation dependence of the module's open-circuit voltage with the module temperature as curve parameter.



See also Blocks PVI, PVDET1, PVDET2, PVFIT1, PVFIT2.