Application Note: AS/NZS 5033:2021

DCU/Optimizer calculations under the new AS/NZS Standard

To whom it may concern,

The release of AS/NZS 5033:2021 has prompted many questions on how string voltages are to be calculated under the new standard. This document discusses the different classifications of an optimized system according to AS/NZS 5033 and how to calculate string voltage for each.

AS/NZS 5033:2021 refers to DC Conditioning Units (DCUs). These are DC to DC power conversion equipment connected to individual PV modules or groups of PV modules to modify the voltage and or current of the PV output. The Tigo TS4-A-O optimizer is considered a DCU.

4.2.1.3 PV array maximum voltage calculation

The calculation used for *PV array maximum voltage* differs between systems using DCUs and those that do not. Systems containing no DCUs calculate PV array voltage by the *PV module maximum voltage*[1] times the number of series connected PV modules in any string.

$$\text{PV Array maximum voltage} = \text{PV module maximum voltage} \times M$$

The *PV module maximum voltage* is the VOC of the PV module plus the module's temperature coefficient adjusted for the environmental temperature different from Standard Test conditions. M is the number of modules in the string.

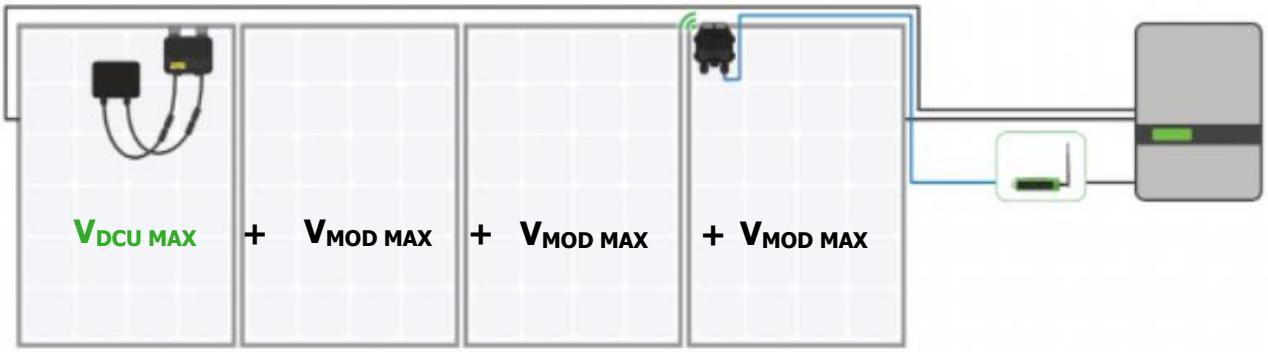
$$\text{PV module maximum voltage} = V_{OC\ MOD} + Y_V\ (T_{MIN} - T_{STC})$$

For systems using DCUs (optimizers), we refer to sections *4.2.1.3.2 Systems containing partial DCUs*, and *4.2.1.3.3 Systems containing DCUs on all modules*. This is the focus of the document.

4.2.1.3.2 Systems containing partial DCUs

If TS4-A-Os are being used in a Selective Deployment or Partial Deployment design this is a system containing partial DCUs. Systems containing partial DCUs calculate PV array maximum voltage as follows:

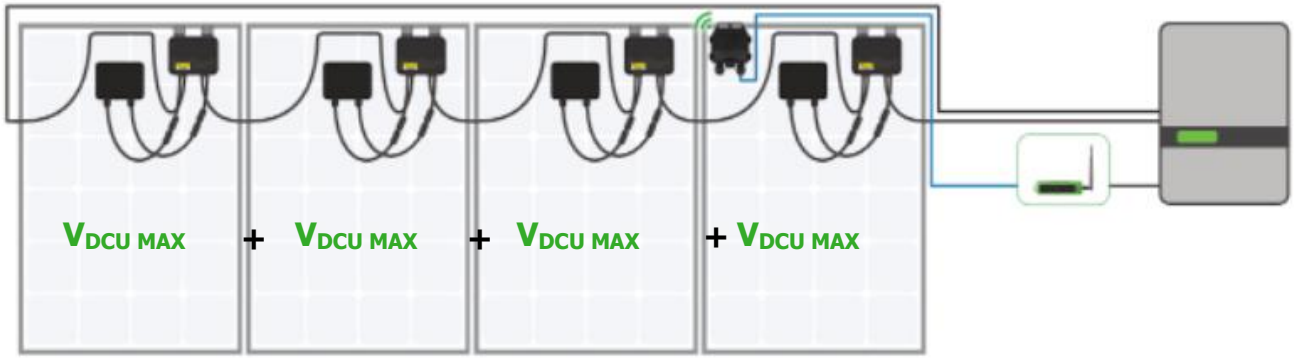
$$V_{DCU\ STRING\ MAX} = (V_{DCU\ MAX} \times \#\ \text{of DCUs in series}) + (\text{Remaining } V_{MOD\ MAX} \times M)$$



4.2.1.3.3 Systems containing DCUs on all modules

When TS4-A-Os are installed on every module in the string/array, the system contains DCUs on all modules. Systems containing DCUs on all modules calculate PV array maximum voltage as follows:

$$V_{DCU\ STRING\ MAX} = (V_{DCU\ MAX} \times \#\ of\ DCUs\ in\ series)$$



How to Determine DCU max Voltage using Tigo TS4-A-O

Each of the calculations above depend on the maximum voltage of the DCU. The maximum voltage output of a TS4-A-O is dependent on the PV module it is connected to. To calculate the $V_{DCU\ MAX}$ refer to the connected PV module's nameplate V_{OC}. This VOC value must be temperature adjusted.

Due to the method in which the TS4-A-O operates the Maximum String Voltage using Tigo will always be simplified to:

$$PV\ Array\ maximum\ voltage = PV\ module\ maximum\ voltage \times M$$

$$Or,\ PV\ Array\ maximum\ voltage = (V_{OC\ MOD} + Y_V\ (T_{MIN} - T_{STC})) \times M$$

4.3.10.3 DC Conditioning units

The AS/NZS 5033:2021 additionally requires the PV inputs of the DCUs have an I_{SCPV} rating as defined in IEC 62109-1 of at least 1.25 x K_I x $I_{SC\ MOD}$, except where protected by an overcurrent protection device/fuse.

Should I_{SCPV} be greater than the input current rating of the TS4-A-O:

$$I_{SCPV} > \text{Tigo } I_{SC\ MAX}$$

String fusing will be required in order to comply with this Clause.

Single strings on an MPPT have a recommended fuse rating of 20A. For multiple strings, 30A fuses are recommended.

More information on the different methods of deployment with TS4 systems can be found on here: [TS4 Systems - Methods of Deployment – Tigo Help Center (tigoenergy.com)]

Sincerely,

Jeffrey Routledge

Jeffrey A Routledge

APAC Director Tigo
Energy, Inc.

Phone: 408.402.0802

Email: sales@tigoenergy.com