**Explanations about MPPT**

Number of MPP Trackers

Number of String per MPPT

Max Current per MPPT

Max Short Current per MPPT

## Number of MPPT

As the number of MPPT increases, energy yield possibility from the solar system increases.

* Different string designs
  + Number of modules in string
  + Usage of different modules in string
    - Fill factor of available space for module placement
  + East-west placement on roof
    - Start-up voltage and direction angle of light
  + Different ventilation of modules (Operating temp and power generation capability)
    - “Modules produce less energy the hotter they are, 10°C ->> %4 decrease in Pout”
  + Degradation of panels forces other modules to operate as if they are also degraded. Multi-mppt design decreases the degradation effect.

## Number of Strings per MPPT

Number of strings per MPPT is limited to 2 for current solar modules due to reverse current capabilities. The higher than 2 strings per MPPT results in placement of DC string fuses according to standards. [1]

Domestic, residential arrays will always have a single DC string per MPPT, large commercials strings, however, have similar operating conditions irradiation, soiling etc. so they could be managed by single MPPT.

Case: 3 strings connected in parallel. One string is faulty, other two is healthy. Modules can produce 1.25 times of short-circuit current.

In this case, 2.5\*Isc is forced to pass through faulty string

Isc = 8.87A, Module Series Fuse Rating/Max Reverse Current = 15A

2\*8.87A\*1.25 = 22.18A > 15A Implies that requires fuses. [2]

Sun Point: Research on reverse current, bypass diode etc. [4]

## Max Short Current per MPPT

This is a safety limitation. Max short current of MPPT determines the parallel string number and solar module short circuit current. NEC section 690.8(A) (1) specifies the max SC current of modules multiplied with 1.25. Hence if max SC current per MPPT of inverter is 22.5A. Then 2 parallel strings with SC current 9A could be connected at max.

## Max Current per MPPT

This is not a safety and warranty-relevant specification. If mppt current of solar module less than max current per mppt of inverter, input dc current is clipped with adjustments of string voltage. However, the guide from JinkoSolar [3] says that power clipping occurs, genereally, before the current clipping Therefore, if the mppt current of solar module is not much higher than inverter max mppt current, power loss due to current clipping is not much.

[1] MULTIPLE MPPT VS SINGLE MPPT INVERTERS, Segen Solar, <https://portal.segensolar.co.za/reseller/images/Presentations/2018/Huawei%20Brochure/V8_23-10-2018.pdf>

[2] When To Fuse, When not to Fuse?, <https://www.greentechrenewables.com/article/when-fuse-when-not-fuse>

[3] Inverter matching with high current solar module <https://jinkosolar.com.au/wp-content/uploads/2021/05/Jinko-Technical-note-for-high-current-module_rev1.1.pdf>

[4] Hong Yang, He Wang, Minqiang Wang, "Investigation of the Relationship between Reverse Current of Crystalline Silicon Solar Cells and Conduction of Bypass Diode", International Journal of Photoenergy, vol. 2012, Article ID 357218, 5 pages, 2012. https://doi.org/10.1155/2012/357218