

Application Note No. 007

Renac Inverter Compatible with High Power PV Module

Version History

- Version 01 (2021-04-07)
Initial Release

With the development of Cell and PV module technology, various technologies such as half-cut cells, shingling modules, bifacial modules, PERC, etc. are superimposed on each other. The output power and current of a single module have increased significantly. This brings higher requirements to inverters.

High-Power Modules Requiring Higher Current Adaptability of Inverters

The I_{mp} of PV modules was around 10-11A in the past, so the maximum input current of the inverter was generally around 11-12A. At present, the I_{mp} of 600W+ high-power modules has exceeded 15A which is necessary to select an inverter with a maximum 15A input current or higher to meet high power PV module.

The following table shows the parameters of several kinds of high-power modules which used in the market. We can see that the I_{mp} of the 600W bifacial module reaches 18.55A, which is out of the limit of most of the string inverters on the market. We must ensure the maximum input current of the inverter is greater than the I_{mp} of the PV module.

Module Model	580W	585W	590W	595W	600W
P_{max}/W	580	585	580	595	600
V_{oc}/V	40.9	41.1	41.3	41.5	41.7
I_{sc}/A	19.48	19.54	19.59	19.65	19.71
V_{mp}/V	33.8	34.0	34.2	34.4	34.6
I_{mp}/A	18.36	18.41	18.46	18.51	18.55

As the power of a single module increases, the number of input strings of the inverter can be appropriately reduced.

With the increase in the power of PV modules, the power of each string will also increase. Under the same capacity ratio, the number of Input Strings per MPPT will decrease.

Which Solution Renac can offer?

In April 2021, Renac released a new series of inverters R3 Pre-series 10~25 kW. Using the latest power electronics technology and thermal design technology to increase the maximum DC input voltage from the original 1000V to 1100V, allows the system to connect more panels, and also can save cable costs. At the same time, it has 150% DC oversize capability. The maximum input current of this series inverter is 30A per MPPT, which can meet the needs of high-power PV modules.

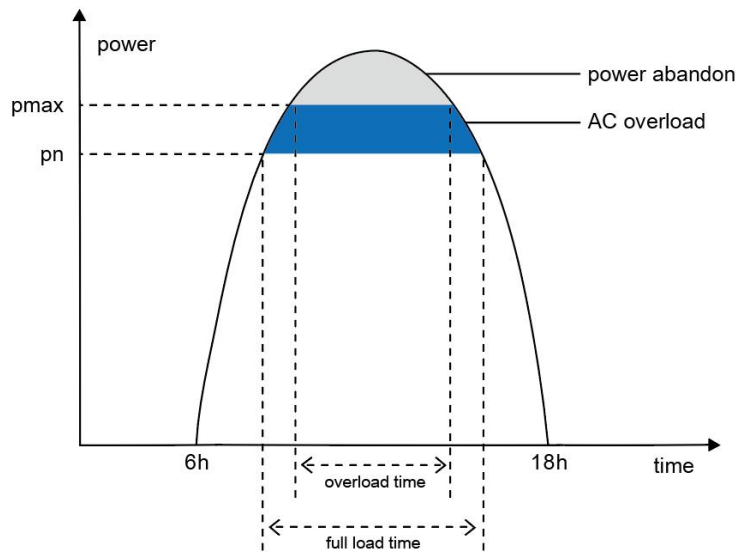


Taking 500W 180mm and 600W 210mm bifacial modules as examples to configure 10kW, 15kW, 17kW, 20kW, 25kW systems respectively. The key parameters of the inverters are as follows:

Model	R3-10K-G5	R3-15K-G5	R3-17K-G5	R3-20K-G5	R3-25K-G5
DC Input Data					
Max. Recommended PV Power	15000Wp	22500Wp	25500Wp	30000Wp	37500Wp
Max.DC Input Voltage	1100V				
MPPT voltage Range	150~1000V				
MPPT voltage Range (full load)	420-850	420-850	420-850	420-850	530-850
Start-up Voltage	165V	165V	165V	165V	165V
No. of MPP Trackers	2				
No. of Input Strings per Tracker	1/1	2/1	2/2	2/2	2/2
Max. DC Input Current	20A/20A	30A/20A	30A/30A	30A/30A	37.5/30A
DC Switch	Integrated				
AC Output Data					
Rated AC Power	10000W	15000W	17000W	20000W	25000W
Max. output power	11000VA	16500VA	18700VA	22000VA	27500VA
Max. AC Current	16A	24A	27.1A	31.9A	40A
Rated AC Voltage/Range	3/PE 380, 400;+/-20%; 3/N/PE 380, 400;+/-20%;				
Grid frequency/ range	50Hz/60Hz ; ±5Hz				

Note:

When we configure a solar system, we can consider DC oversize. DC oversize concept is widely adopted in solar system design. Currently, PV power plants worldwide are already oversized on average between 120% and 150%. One of the main reasons to oversize the DC generator is that the theoretical peak power of the modules is often not achieved in reality. In some areas where with insufficient irradiance, positive oversizing (increase PV capacity to extend system AC full-load hours) is a good option. A good oversized design could both help the system close to full activation and keep the system under healthy condition, which makes your investment worthwhile.



The recommended configuration is as follows:

Inverter Type	Input Solar Panel Solutions		Solar Panel's Specification				Inverter's Spec			System Configuration			
			Module Power(W)	Vmp(V)	Voc(V)	Imp(A)	Max. Input voltage(V)	No. of Input Strings per MPPT	Max. Input Current(A)	Input Strings Per MPPT	Recommend Module QTY per MPPT	Recommend Input Power	Override Ratio
R3-10K-G5	Solution1	MPPT1	500W	43.4	51.5	11.53	1100	1	20	1	10-15	10-15KW	100%-150%
		MPPT2		43.4	51.5	11.53					10-15		
	Solution2	MPPT1	600W Bifacial	34.6	41.7	18.55	1100	1	20	1	9-13	10.8-15.6KW	108%-156%
		MPPT2		34.6	41.7	18.55					9-13		
R3-15K-G5	Solution1	MPPT1	500W	43.4	51.5	11.53	1100	2	30	1-2	10-20	15-19KW	100%-130%
		MPPT2		43.4	51.5	11.53					15-18		
	Solution2	MPPT1	600W Bifacial	34.6	41.7	18.55	1100	2	30	1	13-20	15.6-19KW	100%-140%
		MPPT2		34.6	41.7	18.55					13-20		
R3-17K-G5	Solution1	MPPT1	500W	43.4	51.5	11.53	1100	2	30	1-2	12-24	17-24KW	100%-140%
		MPPT2		43.4	51.5	11.53					12-24		
	Solution2	MPPT1	600W Bifacial	34.6	41.7	18.55	1100	2	30	1	14-22	17.4-26.4KW	100%-155%
		MPPT2		34.6	41.7	18.55					14-22		
R3-20K-G5	Solution1	MPPT1	500W	43.4	51.5	11.53	1100	2	30	1-2	14-28	20-28KW	100%-140%
		MPPT2		43.4	51.5	11.53					14-28		
	Solution2	MPPT1	600W Bifacial	34.6	41.7	18.55	1100	2	30	1	17-24	20.4-28.8KW	100%-144%
		MPPT2		34.6	41.7	18.55					17-24		
R3-25K-G5	Solution1	MPPT1	500W	43.4	51.5	11.53	1100	2	30	1-2	17-38	25-38KW	100%-152%
		MPPT2		43.4	51.5	11.53					17-38		
	Solution2	MPPT1	600W Bifacial	34.6	41.7	18.55	1100	2	37.5	1-2	17-38	25-38KW	100%-152%
		MPPT2		34.6	41.7	18.55					17-24		

According to the calculation, the Renac inverters can perfectly match the 500W and 600W bifacial panels.

Summary

With the continuous improvement of module power, inverter manufacturers need to consider the compatibility of inverters and modules. In the near future, the 210mm wafer 600W+ PV modules with a higher current are likely to become the mainstream of the market. Renac is achieving progress with innovation and technology and will launch all new products to match high-power PV modules.