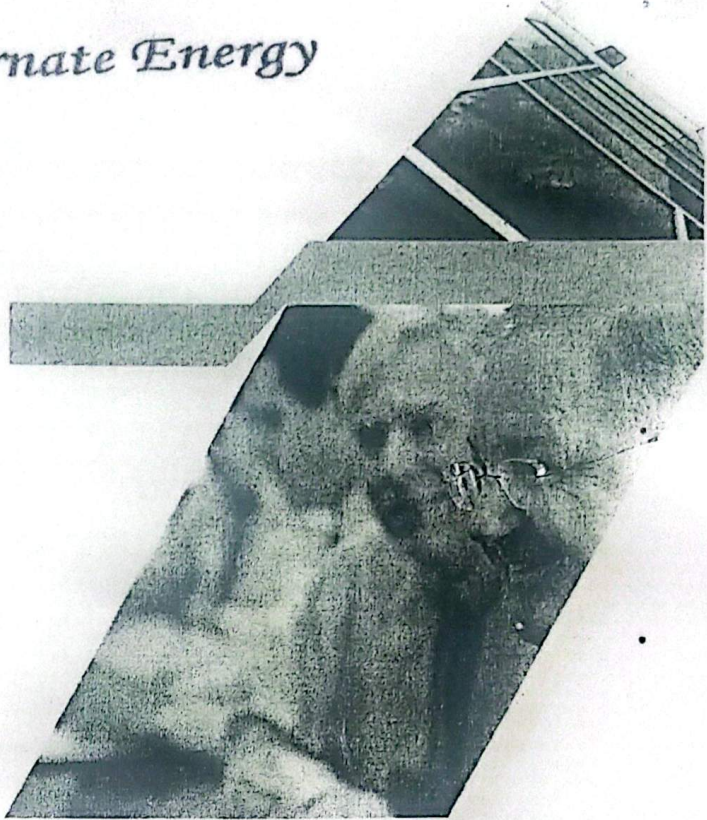


Next Gen Alternate Energy



DATE :: 18TH Apr 2024
REF # SL-02-744

Engineering Design Proposal - EDC
800.40 KW PV GRID CONNECTED
PROJECT AT SARHAD UNIVERSITY,
PESHAWAR CAMPUS

200.10 KW PV GRID CONNECTED
PROJECT AT SARHAD UNIVERSITY,
ISLAMABAD CAMPUS

200.10 KW PV GRID CONNECTED
PROJECT AT UNIVERSITY OF BOLTON,
ISLAMABAD CAMPUS.

This Document gives performance review of Grid Tied PV Plant having total capacity of 1.2MWp at SARHAD UNIVERSITY, PESHAWAR and ISLAMABAD CAMPUSES and UNIVERISTY OF BOLTON, ISLAMABAD.

Page 1

**1200.60 KW PV GRID CONNECTED PROJECT AT SARHAD
UNIVERSITY PESHAWAR AND ISLAMABAD CAMPUSES AND
UNIVERSITY OF BOLTON, ISLAMABAD.**

The Solar PV System design included in this document has been prepared considering your location's meteorological conditions and terrain. Our design team makes use of latest design techniques, standards and Solar Energy databases to give you accurate yield estimations so you can know how much you will save during your plant's design life i.e. 25 years.

Our product selection has been done considering a combination of Tier-1 Solar Modules and Balance of System which will enable a system configuration having minimum losses and optimum performance and that fully complies with the AEDB requirements.

Next Gen Alternate Energy Ltd. does not just supply & install Solar PV Systems, the company believes in educating its clients so that they themselves can know what's best for them and what they are investing in.

Director: Akhunzada Sadiq Saeed (+92-346-9080511)

Next Gen Alternate Energy

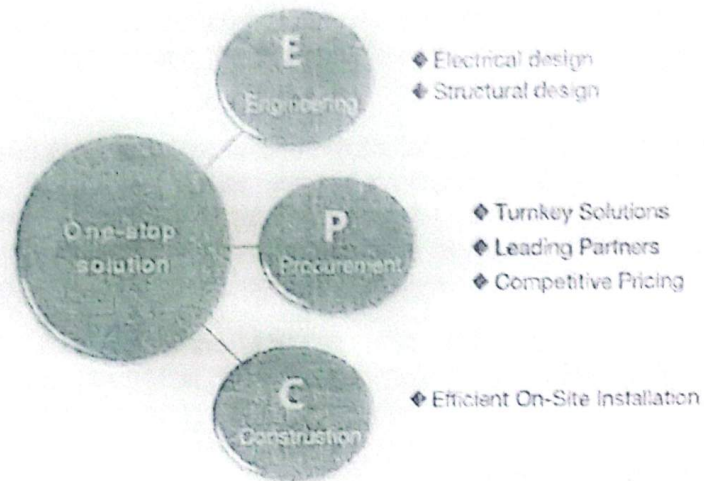
Email: akhunzada.sadiq@nextgenalternateenergy.com

CONTENTS

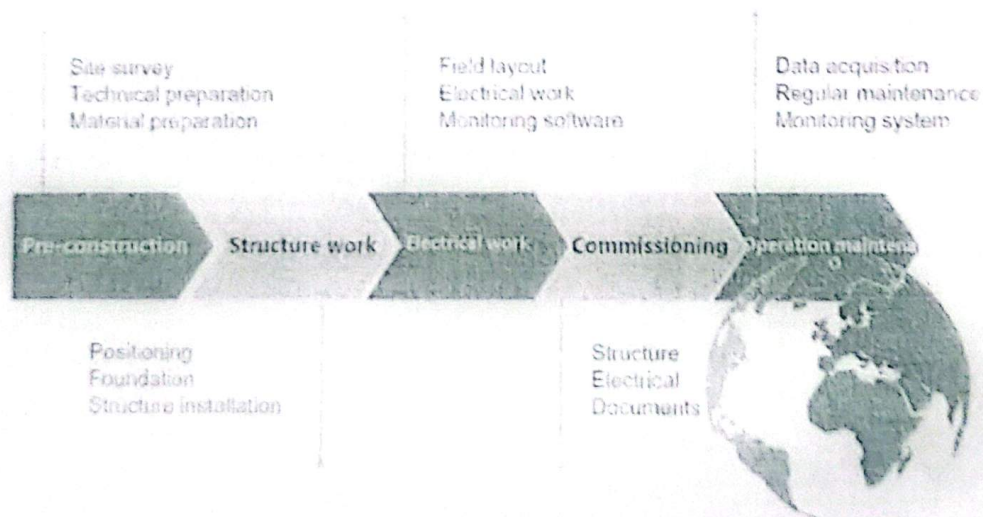
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Inverter 125KW	19

TURNKEY EPC

Turnkey solutions provider for PV solar projects across Pakistan.



PROJECT MANAGEMENT



PRELIMINARIES

The type of technology used here is Grid Tied PV system with mono-perc/ N-Type technology solar photovoltaic panels. This type of system works in synchronization with an external source. The external source in this case will be Grid.

The mounting structures to be used are design to withstand the effects of high wind pressures and physical load. The mounting structure to be used is Roof Mounted Customized structure.

The grounding and earthing of the system require the knowledge of current earthing setup at the site. This is to incorporate new and existing earthing system together. The PV system is protected by surge arrestors installed in inverters. Other than these, the inverters are fully protected against surges and faults. The modules, inverters, combiners, AC LV panels are all appropriately grounded.

This document elaborates the 1200.60 KWp Grid-tied PV Plant design, meteorological data, technical justifications, Yield Calculations, and technical documents of inverters.

SYSTEM SUMMARY AND DESIGN CONSIDERATIONS:

Hookup Voltage	:	380V (Single Injection)
System Type	:	On Grid System
Generator Synchronization	:	Considered
Proposed System Size	:	1200.60 KWp
Roof Mount/Ground Mount	:	Roof Mounted
Tilt & Azimuth Orientation	:	10 Degree True South
PV Modules to Inverter Distance	:	150 Meters Max
Inverter to Termination Distance	:	10 Meters

TECHNICAL & COMMERCIAL PROPOSAL

SARHAD UNIVERSITY PESHAWAR 800-KW				
S.No.	Equipment	Description	UoM	Qty
1	Solar Panels	Solar Panel - 580 Wp Total = 1380 Modules x 580W = KWp (Tier 1 Manufactured, as per Bloomberg list) Brands: Longi, JA Solar, Risen, Trina, jinko or equivalent.	Watts	800,400
2	Inverter	GrowWatt 125KW	Nos	6
3	Remote Monitoring Device	Smart Data Logger	Nos	1
4	DC Cables (Imported)	DC Cables: IEC-50618 TUV Certified1. 1C x 6mmsq, 1000DC; Cu/XLPE, Red & Black	Meters	26000
5	Connectors	MC4 connector / QC4 connector	Nos	500
6	Mounting Structure (Roof Mount)	Orientation: Portrait Tilt Angle: 10-Degrees	Watts	800,400
7	AC Combiner Box-01	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted/Gound Mount, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker, AC SPD Type II etc. Complete in all respect. 4No. MCCB, TP, 250A 1No. ACB, TP, 1200A Type 1 & 2 AC SPD Ground Fault Protection Device (Built in Within Inverter) & with ACB	Qty	1
8	DC Combiner Box	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker etc. Complete in all respect. 2X13No. DC Circuit Breaker 20A 1000V MCB/Fuse Make: Suntime / Chint /ZI Beny	Qty	7

9	AC Cable 4C x 240sqmm (Per Phase 2 cable)	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	300
10	AC Cable 4C x 120sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	100
11	Earthing Cable 1C x 120sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	20
12	Earthing Cable 1C x 50sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	100
13	Earthing Cable 1C x 16sqmm bare conductor	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu Bare conductor	Meters	400
14	Earthing Cable 1C x 2.5sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	400
15	Main Earthing (3 Pits including for arrestor)	Local - One Earthing pit (Resistance < 5 ohms)	Job	1
16	Miscellaneous Items, including inverter stand EPOXY, UPVC, Nut Bolt, cable trays, cable ties, Termination Kits etc.	Local	Job	1
17	Electrical & Mechanical Installation & Commissioning & Transportation	Local	Job	1
18	Lightning Arrestor	Local	Job	1
19	Communication Cable	Local	Meters	50
20	Net-Metering	Grid-Interconnection Study	Job	1
TOTAL PROJECT PRICE PKR (EXCLUSIVE OF TAX)			80,040,000/-	
PRICE PER WATT PKR/Wp (EXCLUSIVE OF TAX)			100.00/-	

Warranties

Product	Warranty
Solar Modules	12 Years Product and 25 Years Performance
Inverter	5 Years
Mounting Structure	2 Years

SARHAD UNIVERSITY ISLAMABAD 200-KW				
S.No.	Equipment	Description	UoM	Qty
1	Solar Panels	Solar Panel - 580 Wp Total = 345 Modules x 580W = KWp (Tier 1 Manufactured, as per Bloomberg list) Brands: Longi, JA Solar, Risen, Trina, jinko or equivalent.	Watts	200,100
2	Inverter	GrowWatt 100KW	Nos	2
3	Remote Monitoring Device	Smart Data Logger	Nos	1
4	DC Cables (Imported)	DC Cables: IEC-50618 TUV Certified1. 1C x 6mmsq,1000DC; Cu/XLPE, Red & Black	Meters	6500
5	Connectors	MC4 connector / QC4 connector	Nos	150
6	Mounting Structure (Roof Mount)	Orientation: Portrait Tilt Angle: 10-Degrees	Watts	200,100
7	AC Combiner Box-01	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted/Ground Mount, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker, AC SPD Type II etc. Complete in all respect. 4No. MCCB, TP, 250A 1No. ACB, TP, 1200A Type 1 & 2 AC SPD Ground Fault Protection Device (Built in Within Inverter) & with ACB	Qty	1
8	DC Combiner Box	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker etc. Complete in all respect. 2X13No. DC Circuit Breaker 20A 1000V MCB/Fuse Make: Suntime / Chint /ZJ Beny	Qty	4

9	AC Cable 4C x 240sqmm (Per Phase 2 cable)	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	220
10	AC Cable 4C x 120sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	50
11	Earthing Cable 1C x 120sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	50
12	Earthing Cable 1C x 50sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	30
13	Earthing Cable 1C x 16sqmm bare conductor	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu Bare conductor	Meters	300
14	Earthing Cable 1C x 2.5sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	300
15	Main Earthing (1 or 2 Pits including for arrestor)	Local - One Earthing pit (Resistance < 5 ohms)	Job	1
16	Miscellaneous Items, including inverter stand EPOXY, UPVC, Nut Bolt, cable trays, cable ties, Termination Kits etc.	Local	Job	1
17	Electrical & Mechanical Installation & Commissioning & Transportation	Local	Job	1
18	Lightning Arrestor	Local	Job	1
19	Communication Cable	Local	Meters	50
20	Net-Metering	Grid-Interconnection Study	Job	1
TOTAL PROJECT PRICE PKR (EXCLUSIVE OF TAX)			20,010,000/-	
PRICE PER WATT PKR/Wp (EXCLUSIVE OF TAX)			100.00/-	

Warranties

Product	Warranty
Solar Modules	12 Years Product and 25 Years Performance
Inverter	5 Years
Mounting Structure	2 Years

UNIVERSITY OF BOLTON ISLAMABAD 200-KW				
S.No.	Equipment	Description	UoM	Qty
1	Solar Panels	Solar Panel - 580 Wp Total = 345 Modules x 580W = KWp (Tier 1 Manufactured, as per Bloomberg list) Brands: Longi, JA Solar, Risen, Trina, jinko or equivalent.	Watts	200,100
2	Inverter	GrowWatt 100KW	Nos	2
3	Remote Monitoring Device	Smart Data Logger	Nos	1
4	DC Cables (Imported)	DC Cables: IEC-50618 TUV Certified 1. 1C x 6mmsq, 1000DC; Cu/XLPE, Red & Black	Meters	6500
5	Connectors	MC4 connector / QC4 connector	Nos	150
6	Mounting Structure (Roof Mount)	Orientation: Portrait Tilt Angle: 10-Degrees	Watts	200,100
7	AC Combiner Box-01	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted/Ground Mount, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker, AC SPD Type II etc. Complete in all respect. 4No. MCCB, TP, 250A 1No. ACB, TP, 1200A Type 1 & 2 AC SPD Ground Fault Protection Device (Built in Within Inverter) & with ACB	Qty	1
8	DC Combiner Box	DB Local Fabricated in 16 Gauge, Color Code: RAL7035, Wall Mounted, MS Powder Coated, Glands, Lugs, Indication Lights, Control Breaker etc. Complete in all respect. 2X13No. DC Circuit Breaker 20A 1000V MCB/Fuse Make: Suntime / Chint / ZI Beny	Qty	4

9	AC Cable 4C x 240sqmm (Per Phase 2 cable)	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	220
10	AC Cable 4C x 120sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC/PVC	Meters	50
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12	Earthing Cable 1C x 50sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	30
13	Earthing Cable 1C x 16sqmm bare conductor	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu Bare conductor	Meters	300
14	Earthing Cable 1C x 2.5sqmm	Pakistan Cable/Fast Cable/Newage Cable/Equivalent Cu/PVC	Meters	300
15	Main Earthing (1 or 2 Pits including for arrestor)	Local - One Earthing pit (Resistance < 5 ohms)	Job	1
16	Miscellaneous Items, including inverter stand EPOXY, UPVC, Nut Bolt, cable trays, cable ties, Termination Kits etc.	Local	Job	1
17	Electrical & Mechanical Installation & Commissioning & Transportation	Local	Job	1
18	Lightning Arrestor	Local	Job	1
19	Communication Cable	Local	Meters	50
20	Net-Metering	Grid-Interconnection Study	Job	1
TOTAL PROJECT PRICE PKR (EXCLUSIVE OF TAX)				20,010,000/-
PRICE PER WATT PKR/Wp (EXCLUSIVE OF TAX)				100.00/-

Warranties

Product	Warranty
Solar Modules	12 Years Product and 25 Years Performance
Inverter	5 Years
Mounting Structure	2 Years

SUMMARY				
S.No	INSTITUTE/CAMPUS	REQUIRED SYSTEM	TOTAL PRICE	PRICE PER WATT
1	SARHAD UNIVERSITY OF INFORMATION TECHNOLOGY, PESHAWAR	800.40 KW	PKR 80,040,000/-	PKR 100/-
2	SARHAD UNIVERSITY OF INFORMATION TECHNOLOGY, ISLAMABAD	200.10 KW	PKR 20,010,000/-	PKR 100/-
3	UNIVERSITY OF BOLOTON, ISLAMABAD	200.10 KW	PKR 20,010,000/-	PKR 100/-
GRAND TOTAL		1200.60 KW	PKR 120,060,000/-	PKR 100/-

TERMS & CONDITIONS

Validity	The validity of the quote is for 7 days.
Delivery and Installation	Delivery and Installation time would be between 1.5 to 2.5 months from the date of signing of the contract and receipt of advance payment.
Financials	Prices are hedged against dollar at 278 Rs/USD, any variation in the currency more than 1% price would reflect in the quote before issuance of PO. Payment terms are 30% advance with PO, 30% at the time of delivery and remaining 40% balance will be charged in 3 consecutive monthly instalments after completion of system and commissioning.
Technical	The equipment/services other than those mentioned in BOQ will be charged as per actual. Quantity of PV Module may change/vary due to availability of ratings, but potential would be same. Cable lengths other than that mentioned in BOQ, will be charged as per actual.
Net Metering	Next Gen' Scope: Next Gen will prepare the document for Net Metering. Customer's Scope: Meter Name change (If required) Sanction load change (If required) NOTE: All expenses not mentioned above maybe charged separately. It will be applicable as per the laws of NEPRA and local disco. This is an additional service for customer support. Timeline for net metering to be operational depends on the Local disco/NEPRA approvals, it does not fall under Nextgens' scope of work. Client shall not withhold NextGen's quoted amount due to Net Metering and its delays.
Relocation	Client will be charged for relocation of system from one site to another, as per actual. Or any relocation of solar equipment.
General	Next Gen shall not be deemed to be in default of any of its obligations under this Proposal for any delay or failure to fulfill its obligations hereunder, so long and to the extent to which any delay or failure in the fulfillment of such obligation is prevented, frustrated, hindered or delayed as a consequence of circumstances of Force Majeure (including but not limited to act of God, war, hostilities, riots, strikes, lock outs, acts of threat or terrorism or any unforeseeable circumstances beyond the control of Solis or related parties). In the event of any such excused delay, the time for performance of such obligations shall be extended for a period equal to the time lost by reason of the delay.

FINANCIAL ANALYSIS

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Data

Unit price Inclusive of GST (PKR)	60
Unit price Annual Increment (%)	2.00%
Cost of project (PKR)	120,060,000
First Year Energy Injected (kWh)	1,730,699

Year	Units Produced	Unit Price (PKR)	Revenue (PKR)	Initial Project Cost (PKR)	Net Cash Flow (PKR)	Payback
0	0		0	-120,060,000	-120,060,000	-120,060,000
1	1,730,699	50	86,534,950	-	86,534,950	-33,525,050
2	1,726,199	51	88,036,149	-	20,449,973	-13,075,077
3	1,721,427	52.02	89,548,633	-	20,741,246	7,666,169
4	1,716,655	53.06	91,086,401	-	21,035,990	28,702,159
5	1,711,883	54.122	92,649,861	-	21,334,227	50,036,386
6	1,707,111	55.204	94,239,424	-	21,635,980	71,672,366
7	1,702,339	56.308	95,855,510	-	21,941,268	93,613,634
8	1,697,567	57.434	97,498,544	-	22,250,114	115,863,748
9	1,692,795	58.583	99,168,957	-	22,562,538	138,426,286
10	1,688,023	59.755	100,867,187	-	22,878,558	161,304,844
11	1,683,251	60.95	102,593,679	-	23,198,194	184,503,038
12	1,678,479	62.169	104,348,883	-	23,521,464	208,024,502
13	1,673,707	63.412	106,133,258	-	23,848,385	231,872,887
14	1,668,935	64.68	107,947,269	-	24,178,975	256,051,862
15	1,664,163	65.974	109,791,387	-	24,513,249	280,565,111
16	1,659,391	67.293	111,666,090	-	24,851,222	305,416,333
17	1,654,619	68.639	113,571,866	-	25,192,909	330,609,242
18	1,649,847	70.012	115,509,205	-	25,538,323	356,147,565
19	1,645,075	71.412	117,478,610	-	25,887,477	382,035,042
20	1,640,303	72.841	119,480,587	-	26,240,381	408,275,423
21	1,635,531	74.297	121,515,652	-	26,597,046	434,872,469
22	1,630,759	75.783	123,584,327	-	26,957,482	461,829,951
23	1,625,987	77.299	125,687,142	-	27,321,696	489,151,647
24	1,621,215	78.845	127,824,637	-	27,689,696	516,841,343
25	1,616,443	80.422	129,997,357	-	28,061,488	544,902,831
Sum	41,842,403		2,672,615,564	-	664,962,831	

TECHNICAL DATASHEETS AND DOCUMENTS

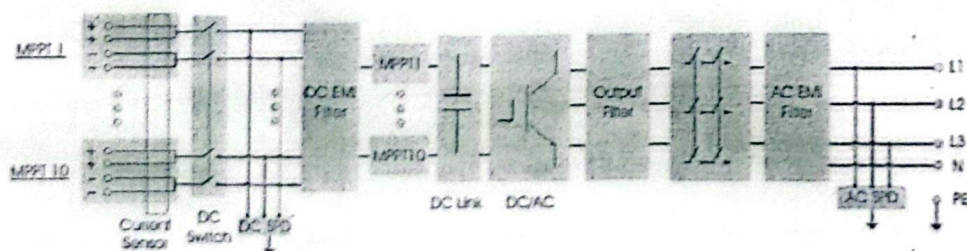
Inverter 125KW

MAX 100~125KTL3-X LV

- 10 MPPTs fusefree design
- Smart IV scan and diagnosis
- Intelligent string monitoring
- AC&DC type II SPD
- IP66 protection



Topology Diagram



Datasheet	MAX 100KTL3-X LV	MAX 110KTL3-X LV	MAX 120KTL3-X LV	MAX 125KTL3-X LV
Input safety (DC)				
Max. DC voltage		1100V		
Start voltage		100V		
Nominal voltage		600V		
MPP voltage range		180V-1000V		
No. of MPP tracker		10		
No. of PV string per MPP tracker		2		
Max. input current per MPP tracker		32A		
Max. short-circuit current per MPP tracker		43A		
Output safety (AC)				
AC nominal power	100000W	110000W	120000W	125000W
Max. AC apparent power	110000VA	121000VA	132000VA	137500VA
Nominal AC voltage (range*)		220/230V, 230V/400V (150-480V)		
AC grid frequency (range*)		50/60 Hz/45 - 55Hz/55-65 Hz		
Max. output current	155.6A@400V 167.1A@380V	174.6A@400V 183.6A@380V	190.5A@400V 200.5A@380V	198.5A@400V 208.9A@380V
Adjustable power factor		0 leading...0 lagging		
THDi		<3%		
AC grid connection type		3W+NPE		
Efficiency				
Max. efficiency		98.8%	98.8%	98.8%
European efficiency	96.4%	98.5%	98.5%	98.5%
MPP efficiency		99.9%		
Protection				
DC reverse polarity protection		Yes		
DC switch		Yes		
AC/DC surge protection		Type I / Type II		
Isolation resistance monitoring		Yes		
AC short circuit protection		Yes		
Ground fault monitoring		Yes		
String detection		Yes		
Anti-IFT function		Optional		
Anti-island detection (AFCI)		Optional		
General				
Dimensions (W/H/D)		976/400/345mm		
Weight		84kg		
Operating temperature range		-30°C ... +60°C		
Nighttime power consumption		< 1W		
Topology		Transformerless		
Cooling		Smart on cooling		
Protection degree		IP66		
Relative humidity		0-100%		
Altitude		4000m		
DC connection		MC4 (Max. 6mm ²)		
AC connection		C terminal (Max. 240mm ²)		
Display		LED/MPH/APP		
Interfaces: RS485 / USB / CAN/RS485/RS485		Yes/Yes/Optional/Optional/Optional		
Warranty: 5 years / 10 years		Yes / Optional		

* The AC voltage range and frequency range are only dependent on specific country grid standard.
All specifications are subject to change without notice.

Annexure - E











