
	TP SOUTHERN ODISHA DISTRIBUTION LIMITED		F02-(09.07.04)
			Revision: 03
			TS released Date: 13.05.2026
Name of the Document	Technical Specification of ON- Grid rooftop Solar System up to 100KW plant capacity		
Document No.	ENG-GEN-4065	Document Revision No.	00
Prepared By	Reviewed By	Approved By	Issued By
Debi Prasad Roy	Shailendra Kumar Jaiswal	Ashok Saraf	D.R. Dharmadhikari

CONTENT

1. SCOPE
2. APPLICABLE STANDARDS
3. CLIMATIC CONDITIONS OF THE INSTALLATION
4. GENERAL TECHNICAL REQUIREMENTS
5. GENERAL CONSTRUCTIONS
6. MARKING
7. TESTS
8. TYPE TEST CERTIFICATES
9. PRE-DISPATCH INSPECTION
10. INSPECTION AFTER RECEIPT AT STORES
11. GUARANTEE
12. PACKING
13. TENDER SAMPLE
14. QUALITY CONTROL
15. TESTING FACILITIES
16. MANUFACTURING FACILITIES
17. SPARES, ACCESSORIES AND TOOLS
18. TRAINING
19. DRAWINGS AND DOCUMENTS
20. GUARANTEED TECHNICAL PARTICULARS
21. SCHEDULE DEVIATIONS

	TP SOUTHERN ODISHA DISTRIBUTION LIMITED		F02-(09.07.04)
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1. SCOPE:


The specification covers the designing, Supplying, Installing and Commissioning of On Grid roof top solar system (power plant), assembly, stage inspection, final inspection and testing before dispatch, packing and delivery at destination stores by road transport, transit insurance of Solar PV Module, complete with all fittings, accessories, associated equipment's, spares, etc.

2. APPLICABLE STANDARDS:


Required for its satisfactory operation shall conform to IEC 61215:2005 and IS 14286:2010 (with latest amendments). The Solar PV Module shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the employer shall have the power to reject any work or material, which, in his judgment, is not in full accordance therewith.

The PV modules must conform to the latest edition of the following IEC / equivalent BIS Standards for PV module design qualification and type approval:

Sl. No.	Standard	Description
1.	IS 12834 : 2013	Solar Photovoltaic Energy Systems- Terms, Definitions and Symbols
2.	IEC: 61215/IS: 14286	Crystalline silicon terrestrial photovoltaic modules – Design qualification and type approval.
3.	IEC: 61730 – Part 1	Photovoltaic (PV) module safety qualification – Requirements for construction.
4.	IEC: 61730 – Part 2	Photovoltaic (PV) module safety qualification – requirements for testing.
5.	IS IEC: 61701	Salt Mist Corrosion Testing of the module

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6.	IEC: 62716	Test Sequence useful to determine the resistance of PV Modules to Ammonia.
7.	IEC: 61853-1:2011/ IS16170-1:2014	Photovoltaic (PV) module performance testing and energy rating–: Irradiance and temperature performance measurements, and Power Rating
8.	IEC62109 or IS: 16221	Safety of power converters for use in photovoltaic power systems –Part1: General requirements, and Safety of power converters for use in photovoltaic power systems
		Part2: Requirements for inverters. Safety compliance (Protection degree IP65 or better for outdoor mounting, IP54 or better for indoor mounting)
9	IEC 62116:2014/ IS16169, IEC 60068, IS:IEC: 61683	Utility-interconnected photovoltaic inverters - Test procedure of islanding prevention measures

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3. CLIMATIC CONDITIONS:


- i. Max. altitude above sea level 1000m
- ii. Max. Ambient Temperature 50 °C
- iii. Max. Daily average ambient temp 35 °C
- iv. Min Ambient Temp 0 °C
- v. Maximum temperature attainable by an object exposed to sun 60 °C
- vi. Maximum Humidity 100% & Minimum Humidity 10%
- vii. Average No. of thunderstorm days per annum 70
- viii. Average Annual Rainfall 150 cm
- ix. Average No. of rainy days per annum 120
- x. Thermal Resistivity of soil 150 Deg. Ccm/W
- xi. Wind Pressure 126 kg/sq. m up to an elevation of 10 meter.
- xii. Earthquakes of intensity in horizontal direction equivalent to seismic acceleration of 0.3g
- xiii. Earthquakes of intensity in vertical direction equivalent to seismic acceleration of 0.15g
- xiv. Wind velocity 180 km/hr.

Environmentally, some of the regions, where the work will take place include coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. The atmosphere is generally laden with mild acid and dust in suspension during the dry months and is subjected to fog in cold months. The design of equipment and accessories shall be suitable to withstand seismic forces as mentioned above.


4. GENERAL TECHNICAL REQUIREMENTS:

The general Technical Parameters are given here under:


Section I – Designing, Supplying, Installing and Commissioning of On Grid rooftop solar system (power plant)	
Parameters	
Load Power (KWac)	1-100KWAC

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Solar Capacity (kWp)	to be submitted by bidder		
No. of Panels (No's)	to be submitted by bidder		
Inverter	<ul style="list-style-type: none">• Inverter (MPPT base) Independent or integrated shall be acceptable with BIS certification. It shall comply proper space and ensure thermal capability• A central inverter with MPPT shall be used with the power plant for maximum efficiency• There should be provision to export excess PV power to the grid in case the load consumption is less than the actual generation. This is a futuristic feature and provision should be there to enable or disable this export feature• Inverter shall provide display of PV array DC voltage & current, Inverter Voltage & Current, Grid voltage & Current and required parameters when a fault occurs. Remote monitoring of inverter parameters should be possible• Operating temperature range shall be 0 to 55 deg C• Maximum Power Point Tracker (MPPT) shall be integrated into the power conditioner unit to maximize energy drawn from the Solar PV array• MPPT units should qualify for IEC standards• Online microprocessor-based Data Acquisition Systems and Remote• Monitoring facility for 365 Days with data Recovery from a remote location should equip.		
	Overload Capacity		150% for 10 Second
	<ul style="list-style-type: none">• Short Circuit Protection		<ul style="list-style-type: none">• Circuit Breakera• Electronics protection again sustained fault.
	<ul style="list-style-type: none">• Convert DC power into AC power and ensure anti-islanding by shutting itself down (and hence the PV generation) in case of grid failure.• Rating- inverter rating shall be with DC side and AC side as per Solar capacity (KWp) and load power (KWac).• Synchronize the output AC power with the phase, frequency, and voltage of the available grid in order to feed the PV power into the grid.• Ensure protection of the PV system from DC- side (i.e., PV-side) for reverse polarity, overcurrent, overvoltage, and surge		

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	<ul style="list-style-type: none"> • Ensure protection of the PV system from AC-side (i.e., grid-side) for grid-fault (e.g., over/ under-voltage, over/ under frequency, high rate of change of frequency, etc.), ground fault, residual current or fault conditions, etc. • Grid frequency synchronization range $\pm 3\%$ • Total Harmonic distortion $< 3\%$ with resistive load. • Power factor 0.9 inductive, 0.9 capacitive • automatic cooler fan forced air cooling with temperature controlled automatic cooler fan in build. • Controller MPPT base up to 98% efficiency and minimum inverter efficiencies per recent government notification (effective Jan 2026): 95% for 3-5 kW, 96% for 5-10 kW • 100 % load balancing shall ensure by inverter controller to bear unbalancing load (consumer and grid load). • The inverter should have the facility to automatically switch off in case of overload or overheat and should restart when normal conditions are restored
Output Voltage (inverter)	415 V, 3 phase 4 wire system
PV Module Type and Size	<ul style="list-style-type: none"> • Mono Crystalline, bi-facial or more efficient. • 550 Wp or more per modules, • IP 65 for PV Solar Module • MC4 Connector • The module frame shall be made of corrosion-resistant materials, having anodized aluminium and should have a minimum thickness of 1.5 mm and width 40 mm for sustainability.
MMS (module mounting structure)	<ul style="list-style-type: none"> • Fixed Tilt 10/15/20 degree - 180 KMPH(SS304 frame), (SS 304 fasteners) GA drawings to be provided along with Bid • The upper edge of the module must be covered with a windshield so as to avoid bulk air ingress below the module. Slight clearance must be provided on both edges (upper & lower) to allow air for cooling. • PV modules shall be secured to support structure using screw fasteners and/or metal clamps. Screw fasteners shall use existing mounting holes provided by module manufacturers. No additional holes shall be drilled on module frames. Module fasteners/clamps shall be adequately treated to resist corrosion • Adequate spacing shall be provided between any two modules secured on PV array for improved wind resistance. • The structure shall be designed to withstand operating environmental conditions for a period of a minimum of 25 years

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MMS Foundation Material for PV panel	<ul style="list-style-type: none"> SS 304 material and the structure shall support SPV module suitable for 180 kmph wind speed. MMS is made of SS-304, the main frames and complete leg assemblies of the array structures shall be made of SS-304. Thickness of the SS shall be cater the load of PV panels as per the climatic condition given in serial no 3. In case the MMS is of Aluminium type, anodic coating of AC25 grade as per IS :1868 is to be done. The MMS should be designed and fabricated as per site condition. It should be properly earthed and should be designed to withstand Seismic criteria as per IS1893 All the nuts, bolts and other fasteners used should be of stainless steel (minimum grade SS 304). The nuts and bolts should be tightened using torque wrench. The installation of the mounting structure shall be done without disturbing the roof and its water proofing layer. All civil works including foundation required for erection and commissioning of solar plant shall be in the scope of vendor. The module mounting structure shall be installed using Chemical anchor only. In case of installation on roof sheet, proper adhesive to be used to anchor the MMS structure. For roof sheet installation, fixed type pathway to be construct as per site condition and as per instruction of engineer-in-charge. In case RCC foundation (for ground base Plant condition) successful bidder if required shall conduct soil investigation and accordingly submit design for Pile/ Open type RCC foundation suitable for 180 kmph wind speed supported with STAAD report for further approval of TPSODL.
ARRAY/ MAIN JUNCTION BOXES (JBs):	<ul style="list-style-type: none"> The Junction Boxes (JBs) made of double door, CRCA sheet (min 220 GSM) with full dust, water & vermin proof arrangement shall be provided. All wires/cables shall be terminated through Copper cable lugs. The JB's shall be such that input & output termination can be made through suitable cable glands. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads Conforming to IP65 standard and IEC 62208 Hinged door/ Screw based cover with EPDM rubber gasket to prevent water entry. Single/ double compression cable glands to be provided for safe cable entry. At least two Earthing point to be provided for each JB.

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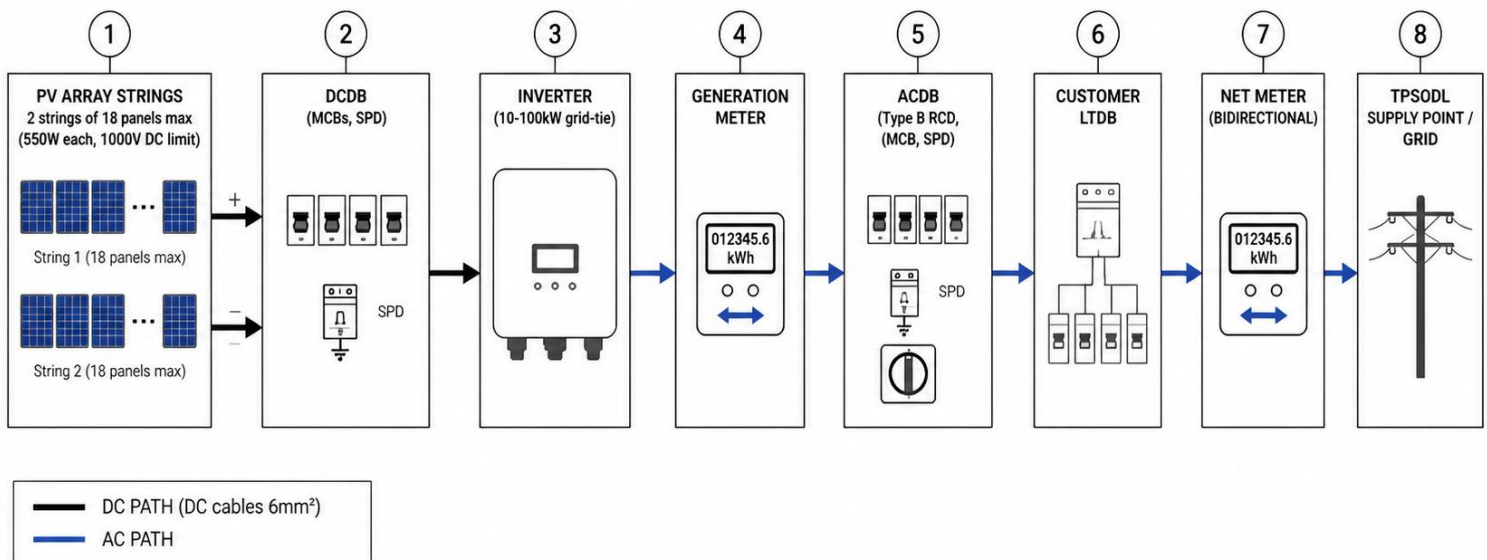
	<ul style="list-style-type: none"> 1000V solar DC DP MCB protection should be provided for each string for +ve cables. Each Junction Box shall have High-quality Suitable capacity SPDs (Type-II) for each string. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups. Suitable markings should be provided on the bus bar for easy identification and suitable cable glands with ferrules must be fitted at the cable termination points for identification. Array Junction Box should be IP 65(for outdoor)/ IP 54(for indoor) as per IEC 60529 and should be provided with fuses and Isolators of suitable ratings. ACDB should have a surge protection device of class 2 as per IEC 60947/60364-5-53, to protect inverters from surges in the AC line. AJBs/ MJBs may be kept below the modules. In case of need, this can be installed on the wall or rooftop. ACDB should be put at safe distance from DCDB/ AJBs/ MJBs to avoid Eddy current interference. However, in the case of an integrated product where ACDB and DCDB are already placed together shall be acceptable.
Monitoring System	<ul style="list-style-type: none"> Integrated remote monitoring and Control system
Other Parameters and protection	<ul style="list-style-type: none"> The system should be provided with all necessary protections like Earthing, Lightning & Surge and Grid Islanding in accordance with the latest codes & standards and best industry practices. ESE Type Lightning Arrestor for solar array area protection and type 2 Surge arrestor for all DCDB/ AJB and ACDB Chemical earthing 3 M, Qty can be designed to maintain the 5 Ohm of Earth resistance. Clearance of panel from roof or ground with minimum height 0.5m All cable lugs, bus bars excluding T&D line should be copper Inverter and MPPT must be designed to accommodate all the equipment with air circulation system GI strip of minimum size 25 mm x 3 mm shall be used for carrying out earthing connections. The GI strip should be connected to earth mat grid. Protection shall comply as per CEA's "Technical standard for connectivity of the distributed generation resources", Regulation 2013
Module Cleaning system	<ul style="list-style-type: none"> A sprinkler Based module cleaning system shall be provided. complete with proper pumping/motor arrangement, piping, valves, fittings, and control accessories. The system shall ensure uniform water distribution over the module surface and shall be designed for convenient operation and maintenance.

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Designing, supplying, Installing & Commissioning- Ground Mount System	<ul style="list-style-type: none"> Complete designing, supplying, installing & commissioning ON grid solar plant. Complete project painting with necessary markers and signages The agency shall deploy quality and safety personnel to ensure best quality and security during installation and commissioning. The agency shall ensure checks of critical material at source SS 304 PV structure should be installed Type B RCD or an equivalent device suitable for detection and protection against residual leakage currents, including smooth DC fault currents, as applicable to the inverter and system design. It may be inbuilt in Inverter.
Section – II Distribution and Metering – Applicable Only for Qualified Bidder(s)	
Generation Meters	Qualified bidder shall provide 3- phase static meters, the quantity and make and specs shall be decided in consultation with TPSODL & bidder which is suitable for the geography/ site.
Net solar Metering	<ul style="list-style-type: none"> TPSODL MMG will provide 3- phase net meters, the other process for installation of net solar metering to be done by the Bidder
Power cable, Service cables and MCB	<ul style="list-style-type: none"> Power cable: a suitable size & capacity, AC cable to be FRLSH grade, XLPE insulated, Armored/unarmored as per site. DC cables/wire shall be LSHF, FRLSH grade, UV resistant, single core, double - insulated cables. DC Cable should be laid in PVC conduit. Suitable size of MCB size & capacity for every part All Cables and MCB shall be BIS approved reputed manufacturer only.

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5. ON Grid roof top solar Connected PV system (TENTATIVE SLD)




NOTES:

1. DC path shown in thick black lines.
2. AC path shown in thin blue lines.
3. All equipment to be installed as per relevant IS / IEC standards and TPSODL guidelines.
4. Each string has individual SPD.

6. MARKING:

There should be a Name plate fixed inside the module which will give:

- a) Name of the manufacturer or Distinctive Logo.
- b) Name of the Scheme
- c) Name of DISCOM/Power Department (TPSODL)
- d) Model Number
- e) Unique Serial Number
- f) Year of Manufacture

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g) A distinctive serial number starting with NSM will be engraved on the frame of the modules or screen printed on the tender sheet of the module.

7. TESTS:

The scope of supply includes the provision of type test. The equipment offered should have been successfully type tested within five years from date of tender and the designs should

Have been in satisfactory operation for a period not less than three years as on the date of order. Compliance shall be demonstrated by submitting, (i) authenticated copies of the type test reports and (ii) performance certificates from the users, preferably from Central Govt./State Govt. or their undertakings.

8. TEST CERTIFICATES: -


The Bidder shall furnish the type test certificates for the tests as per the corresponding standards. In the event of any discrepancy in the test reports, i.e. any test report not acceptable, it shall be carried out without any cost implication to TPSODL.

9. PRE-DISPATCH INSPECTION:

The material shall be subject to inspection by a duly authorized representative of the TPSODL. Inspection may be made at any stage of manufacture at the discretion of the purchaser and the equipment, if found unsatisfactory as to workmanship or material, the same is liable to rejection. Bidder shall always grant free access to the places of manufacture to TPSODL's representatives when the work is in progress. Inspection by the TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing equipment in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPSODL.

Following documents shall be sent along with material.

1. Test reports
2. MDCC issued by TPSODL
3. TPSODL Invoice in duplicate
4. Packing list

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5. Drawings & catalogue
6. Guarantee / Warrantee card
7. Delivery Challan
8. Other Documents (as applicable).

10.INSPECTION AFTER RECEIPT AT STORE:

The material received at TPSODL site will be inspected for acceptance. The Engineer reserves the right to reject the material if on testing, the efficiency of panels is lower than the declared efficiency beyond tolerance limit as per IS /IEC or specified in technical particular from the guaranteed value including tolerance as per this specification and if any of the test results do not match with the values, given in the guaranteed technical particulars and as per technical specification.


11. GUARANTEE:

The PV module(s) will be warranted for a minimum period of 25 years from the date of supply. PV Modules used in Solar Home Lighting System must be warranted for their output peak watt capacity, which Should not be less than 90% at the end of Ten (10) years and 80% at the end of Twenty-five (25) years.

Warrantee	<ul style="list-style-type: none"> Overall: 5 years standard performance warranty Other equipment's: 1 year
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Comprehensive AMC should be for five years for entire product.

Bidder shall be liable to undertake to replace/rectify such defects at own costs, within mutually agreed time frame, and to the entire satisfaction of TPSODL, failing which TPSODL shall be at liberty to get it replaced/rectified at bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of expenses incurred), from the bidder or from the "Security cum Performance Deposit" as the case may be. Bidder shall further be responsible for free replacement

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for another period of THREE years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by TPSODL.

12. PACKING AND TRANSPORT:

Supplier shall ensure that all material covered by this specification shall be prepared for rail/road transport (local equipment) and be packed in such a manner as to protect it from damage in transit. The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

13. TENDER SAMPLE

Not Required.

14. QUALITY CONTROL:

The bidder shall submit QAP indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. The Purchaser's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.


15. TESTING FACILITIES:

Supplier/ Manufacturer shall have adequate in house testing facilities for carrying out all routine tests & acceptance tests as per relevant Indian standards.

16. MANUFACTURING FACILITIES:

The successful bidder shall submit the bar chart for various manufacturing activities clearly elaborating each stage, with quantity. This bar chart should be in line with the Quality assurance plan submitted with the offer.

17. SPARES, ACCESSORIES AND TOOLS

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Not required.

18. TRAINING

The Bidder shall trained his facility(operation, checklist to TPSODL representative during


19. DRAWINGS AND DOCUMENTS:

- a) The contractor shall furnish, within fifteen days after issuing of Letter of Award, Six copies each of the following drawings/documents incorporating the Solar PV module rating and efficiency for approval:
 - Detailed overall general arrangement drawing showing front and side elevations and plan of the Module and all accessories with details of dimensions, net weights and shipping weights, etc.
 - Name plate drawing and connection diagrams.
 - Interconnection diagrams.
 - Technical leaflets of major components and fittings.
 - As built drawings of schematics, wiring diagram etc.
 - Completed technical data sheets.
- b) All drawings, documents, technical data sheets and test certificates, results calculations shall be furnished.
- c) Any approval given to the detailed drawings by the Employer's shall not relieve the contractor of the responsibility for correctness of the drawing and in the manufacture of the equipment. The approval given by the employer shall be general with overall responsibility with contractor.


Training- Bidder need to give adequate assistance after commissioning to the operation and maintenance team.

20. GUARANTEED TECHNICAL PARTICULARS

GTP with drawing and design of parameter shall submit

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S.N.	Description	Units/No	Requirement
1	Name of manufacturer/ Bidder		
2	Product Name		
3	Applicable standards		
4	Solar panel		Make : TATA , ADANI , Waaree , Vikram
	Name of Product		
	Company		
	Panel capacity	Panel	540W
	Overall panel size		to be submitted by bidder
	Manufacturer of solar cell		Reputed
	PV Model Material		Mono crystalline, bi-facial or higher efficient
	Array Size		to be submitted by bidder
5.	Make		Havells, Schnider, Studder, Delta, k-star, fronious, power one, radius, growatt, sungrow, polycab or as per ALMM list MNRE or BIS
	Output voltage		415 V, 3 phase 4 wire system
	Surge capability		to be submitted by bidder
6	Meter And Accessories cables		To submitted by bidder

 TP SOUTHERN ODISHA DISTRIBUTION LIMITED <small>(A Joint Venture of Tata Power and Government of Odisha)</small>	TP SOUTHERN ODISHA DISTRIBUTION LIMITED		F02-(09.07.04)
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			TS released Date: 13.05.2026
Name of the Document	Technical Specification of ON- Grid rooftop Solar System up to 100KW plant capacity		
Document No.	ENG-GEN-4065	Document Revision No.	00
Prepared By	Reviewed By	Approved By	Issued By
Debi Prasad Roy	Shailendra Kumar Jaiswal	Ashok Saraf	D.R. Dharmadhikari

	Meter Make		L&T, Secure, Genus, HPL
	Cables (AC/DC)		Havells/Polycab/LAPP
7	ACDB		As per specification define by MNRE
8	Array junction box/DCDB		L&T/CITEL/Havells/
9	Earthing and lightening arrestor		As per standard
Additional parameter to be provided during bid			

21. SCHEDULE “B” DEVIATIONS:

(TO BE ENCLOSED WITH TECHNICAL BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

We confirm that there are no deviations apart from those detailed above. Seal		

of the Company:

Signature

Designation