

4



Direct Current Distribution Box (DCDB)

Combines outputs from multiple solar strings and safeguards the system by isolating faulty strings and protecting against surges and faults before power reaches the inverter.

Important Parameters

- Input from SPV strings.
- Fuse protection for each string with DC isolator switch.
- DC MCB/MCCB/Isolator for over-current and short circuit protection.
- Surge Protection Devices (SPD Type II) on DC side.
- Terminals suitable for copper cables with proper crimping lugs.
- Enclosure: IP65 or higher, UV resistant, suitable for outdoor use.

Manufacturers

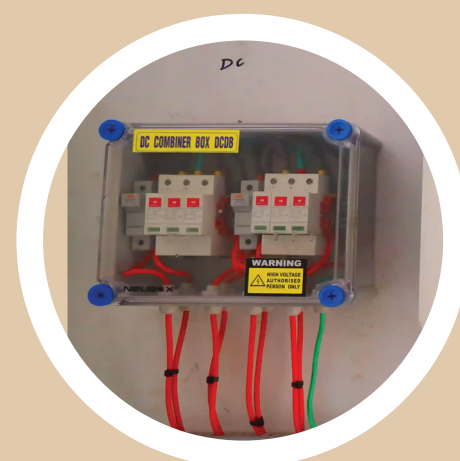
- Havells
- MERSEN
- Kenbrook
- amici Smart
- OBO Bettermann India

Quantity

- DCDB- 1

Standards

- All switches, circuit breakers, and connectors must comply with IEC 60947 standards (Parts I, II, and III), EN 50521.
- IEC 60364-5-53/ IS 15086-5 (SPD)
- IEC 61643- 11:2011



5



Alternative Current Distribution Box (ACDB)

Receives AC power from the inverter and distributes it to the grid or load, providing protection against over-voltage, over-current, leakage currents, and short circuits.

Important Parameters

- Rated for 230V (1 ϕ), 50 Hz.
- Protection: MCB/MCCB (over-current or short circuit), RCCB/ELCB (leakage), SPD SPD on AC side.
- Enclosure: IP65 or higher, powder coated / polycarbonate, suitable for outdoor use.
- Proper busbar arrangement and labelling for ease of maintenance.

Standards

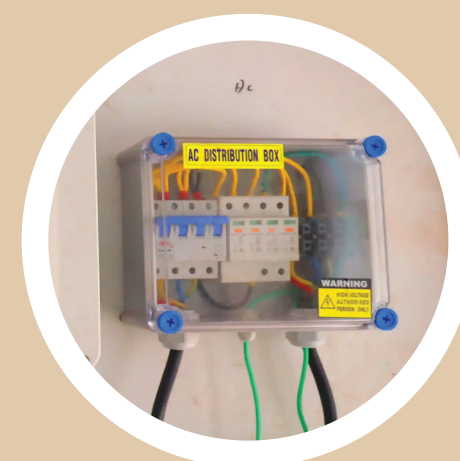
- All switches, circuit breakers, and connectors must comply with IEC 60947 standards (Parts I, II, and III), EN 50521.
- IEC 60364-5-53/ IS 15086-5 (SPD)
- IEC 61643- 11:2011

Manufacturers

- Havells
- MERSEN
- Kenbrook
- amici Smart
- OBO Bettermann India

Quantity

- ACDB- 1 (Single Phase)



6



Solar Inverter

Converts DC power from PV modules into AC power, enabling supply to household appliances or export to the electricity grid.

Type

- String Inverter

Important Parameters

- Should be a grid-tied inverter.
- Displays the following:
 - » Unique Serial Number
 - » Model Number
 - » Manufacturer's Name
 - » Manufacturing Year
 - » Inverter Wattage
- Smart inverter with smart phone monitoring.
- Rating IP65+ for outdoors, IP54+ for shaded installations.
- Operates reliably from -20 to 60°C.
- Safety features: Active islanding detection.



- Environmental Testing of PV System- IEC 60068-2 /IEC 62093 (as applicable)
- Test procedure of islanding prevention measures

Manufacturers

- Luminous Power Technologies
- Su-Kam Power Systems
- Servotech Power Systems
- WAAREE Energies Ltd
- Tata Power Solar
- Jakson Solar

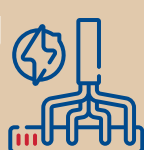
Inverter Capacity & Quantity

- Single Phase 3kW inverter -1

Standards

- Safety of power converters for use in photovoltaic power systems - IEC 62109 or IS: 16221
- Procedure for Measuring Efficiency- IS/IEC 61683 latest (as applicable)

7



Wiring

Interconnects RTPV modules, inverter with other components. Ensures safe and efficient transmission of DC & AC power with reliable performance under different environmental conditions.

Important Parameters

- Lay cables in conduits/trays with proper clamping, routing, and clear AC/DC segregation.
- Use crimped, lugged and labelled terminations for easy identification.
- Prefer fire-retardant, halogen-free cables for enhanced safety.

- Color Coding for AC wire:
 - » Red: Live (Phase)
 - » Black: Neutral
 - » Green: Earth (Protective Ground)

Standards

- PVC insulated cables up to 1100- IS 694 / IEC 60227
- Power cables with extruded insulation- IS 1554 (Part 1 & 2) / IEC 60502
- Fire performance of cables- IS/IEC 60332

Quantity

Based on estimations, an average 3 kW plant requires:

- DC Cable (1C, 4 Sqmm Cu. XLPO) Red - As per site requirement
- DC Cable (1C, 4 Sqmm Cu. XLPO) Black - As per site requirement
- AC Cable (2C, Cu. Flexible cable 4 Sqmm)- As per site requirement

Manufacturers

- Polycab
- KEI Industries
- Orient Cables
- Suraj Cables

AC Wire

- XLPE insulated, armoured copper/aluminium cables.
- Voltage rating: 1.1 kV (AC), AC wiring losses \leq 2%.

8

Earthing

Provides a low-resistance path to ground, to safely discharge leakage and fault currents protecting both equipment and personnel while ensuring reliable RTPV systems.

Components

- Down Conductors:
 - » 6 mm² copper cable
 - » 16 mm² aluminium
 - » GI strip bearing size 25*3 mm thick
- Earth Termination System
 - » 2 earth pits-
 - Solar Array structure
 - Inverter / AC equipment

Quantity

- Down Conductor-As per site requirement
- Earthing chemical fill- 10kg
- Earth Chamber- 350 mm dia FRP Earth pit chamber with cover- 2
- Earthing Rod with 1.5m long Copper bonded electrode 14 mm dia (minimum 250-micron)- 2

Important Parameters

- Earth resistance for each pit should be \leq 5 Ω and maintained regularly.
- **Earthing system to be clearly marked and protected from mechanical damage.**

Standards

- Electrical installations (Earthing) - IEC 62561/IEC 60634
- Code of Practice for earthing IS 3043-2018



Manufacturers

- True Power Earthing
- Kenbrook
- Gravin Earthing and Lightning
- Protection System Pvt Ltd
- OBO Bettermann India
- Avon Earthing
- Orient Star

9

Energy Meters

Bi-directional meter that calculates net monthly electricity usage/import, generally procured from the state department. If unavailable, the consumer/ vendor may procure the meter and submit it for testing, after which it can be installed at the consumer's residence.

Standards

- Technical guidelines issued by Central Electricity Authority (CEA)

Manufacturers

- Secure
- HPL Energy Meter

Quantity

- Bi-directional energy meter- 1

Notes

- For a 3-kW system, a single-phase bi-directional energy meter is to be used.
- Net-meter shall only be installed by the DISCOM after submission of interconnection agreement/ net-metering agreement by the user.



Residential Rooftop Solar PV System Installation

A Guide for Vendors

This guide is designed to help vendors install a quality residential rooftop solar photo voltaic (RTPV) systems that comply with the technical requirements of the **PM-Surya Ghar: Muft Bijli Yojana**. It provides the concerned individual/vendors with clear guidance on the necessary equipments required for a **3-kW Rooftop Solar PV** system.

3 kW

10 Balance of Material

Miscellaneous parts making the system safe, secure and in place.

- MC 4 Connectors: 4 Pcs
- Flexible Conduit/Cable Tray: As per site requirement
- UV protected Cable Ties (Nylon) - 1 Packet
- UV protected Cable Ties (SS) - 1 Packet
- PU foam bottle - 450ml
- Insulation Tape (1 phase)- Red-1, Black-1, Green-1
- Nutbolts (B+N+2PL+1 Serrated Washer) - 25 Pcs
- Lug (6 Sqmm Cu. Ring type) - 26 Pcs

Installing a correct RTPV system, shall ensure a safe and secure system for prolonged life and quality power.

Vasudha Foundation does not endorse or promote any of mentioned manufacturers.

UTTAR PRADESH NEW AND RENEWABLE ENERGY DEVELOPMENT AGENCY

Department of Additional Sources of Energy, Government of Uttar Pradesh
Vibhuti Khand, Gomti Nagar, Lucknow, Uttar Pradesh 226010

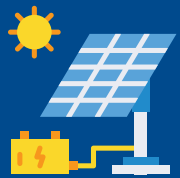
Helpline No.: 1800 1800 005, 9415609078

upneda.org.in | solarcitiesportal.upneda.org.in

Scan for Details



1



Solar Modules

Core component of a RTPV system, converting incident solar radiation into Direct Current (DC) electricity.

Types

- Crystalline Silicon Modules
 - » Mono-PERC
 - » TOPCON
- Thin Film Modules
 - » CdTe

*Mono-Facial/Bi-Facial

Important Parameters

- Ensure each module displays the following information:
 - » Unique Serial Number
 - » Model Number
 - » Manufacturer's Name
 - » Manufacturing Year
 - » Make in India' Logo
 - » Module Wattage
 - » ALMM Approval Status
- Domestic Content Requirement (DCR) certificate for PV modules

Standards

- Type approval:
 - » Crystalline Silicon-IEC 61215/ IS 14286
 - » Thin Film- IS 16077: 2013 /IEC 61646: 2008
- Salt Mist Corrosion Testing: IS/IEC 61701

- Photovoltaic (PV) module performance testing and energy rating- IEC 61853- 1/IS 16170-1
- Ammonia Resistance Testing- IEC 62716/ IS 16664
- Safety qualifications for PV modules used in grid-connected systems - IS/IEC 61730-1,2
- Potential induced degradation - IS 17210 (part 1) or IEC TS 62804-1

Manufacturers

- ReNew Photovoltaics
- Waaree Energies
- Indosol Solar
- Novasys Greenenergy
- Other ALMM listed manufacturers
- <https://mnre.gov.in/en/approved-list-of-models-and-manufacturers-alm/>

Module Capacity & Quantity

- 6 modules of minimum 500Wp



2



Mounting Structure

Supports RTPV modules at the required tilt angle and orientation to maximise sunlight exposure. It is designed for long term stability under different environmental conditions. Common materials include Hot Dip Galvanized Iron, Aluminium, or Hot Dip Galvanized Mild Steel (MS).

Components

- End Clamp
- Mid Clamp
- Rails
- Legs
- Purlin
- Rafter

Standards

- IS 2062/IS 4759/ AA6063 T6

Quantity of Materials

The below quantities are mentioned on an estimated basis and may vary depending upon site and design of the plant.

- End Clamp- 8
- Mid-Clamp- 8
- Purlin (21")- 3 Pcs
- Rafter (21")- 3 Pcs
- Base Plate- 4 Pcs
- Legs- 4 Pcs

Manufacturers

- Apollo Metalex
- Waaree
- Jakson
- NeuvoSol

Important Parameters

- Designed to withstand wind speeds up to 150 km/h (or as per site conditions and IS standards).
- Tilt angle optimised to site latitude with shadow-free layout.
- Structures to allow easy replacement, cleaning and maintenance of modules.
- Strong foundation with grouting/clamping suited to roof type (RCC, metal sheet, raised structure, etc.).



3



Lightening Protection System

Protects RTPV system by diverting direct lightning strikes and induced surges, safely to earthing pit, preventing damage to modules, inverters, and other critical components.

Components

- Air termination system/ Lightning Arrestor
 - » Franklin Rod
 - » Early Steamer Edition
- Down Conductors
 - » 6 mm² copper cable
 - » 16 mm² aluminium
 - » GI strip bearing size 25*3 mm thick
- Earth Termination System
 - » One earth pit- lightning arrestor earthing

- IEC 62561/IEC 60634 Series (for earthing chemical)

Quantity

- Lightning Arrestor-1
- Down Conductor-As per site requirement
- Earthing chemical fill- 10kg
- Earth Chamber- 350 mm dia FRP Earth pit chamber with cover-1
- Earthing Rod with 1.5m long Copper bonded electrode 14 mm dia (minimum 250-micron)- 1

Important Parameters

- Installed at the highest point of the rooftop plant, covering the solar array and equipment.
- Resistance of earth pits $\leq 5\Omega$ (as per standards).

Standards

- NFC 17-102:2011
- Protection against lightning- IEC 62305

Manufacturers

- True Power Earthing
- Kenbrook
- Gravin Earthing and Lightning
- Protection System Pvt Ltd
- OBO Bettermann India
- Avon Earthing
- Orient Star