MODENA

User Manual Book

Solar Power Plant

SolarPad Series
SL – OGD/HBR

TABLE OF CONTENT

This guide book explains everything you need to know about your new product. Please contact our Customer Care should you need further assistance trhough www.modena.com

PART 1: PRODUCT INTRODUCTION

On Grid Solar Power Plant Guidance

On Grid Solar Power Plant (SPP) Planning is made by design and size based on public tender documents and explanatory reports. On Grid SPP is a power plant whose power generation components (solar modules), inverters (off grid), and monitor/display devices, are placed and assembled in one area that is integrated or very close together, then the electricity is supplied to the target point (house) through distribution networks and house connections. To overcome the voltage drop due to the distance between the generator and the house, the On Grid SPP system uses the AC (alternating current) system output, Medium Voltage Network (MVN) and Low Voltage Network (LVN).

Components Introduction

- Solar Module MODENA SL 450 W

- Solar MicroInverter

- After reading this manual book, make sure to keep it where the user can find it anytime.

PART 2: INSTALLATION

The scope of, installation, activities includes the installation and construction of solar modules, electronic rooms, quard rooms/offices, cable networks and home Installations. The following sections describe the detailed planning of each PV mini-grid component and sub-system and installation instructions.

General Explanation

On grid SPP system which has been described above consists of the main components which include:

1. Solar Module
2. Solar Inverter
3. Accessories

Judging from the form of activity, the installation of On Grid SPP System includes mechanical, electrical and civil works.

Electrical work includes:

- Solar module installation and wiring work.
- Inverter junction / jumper cable installation system, SCR, inverter, and distribution panel
- Network pole installation and customer home installation.

Mechanical work includes:

- Installation of the upper frame on the Rooftop
- Cable and Inverter Installation
- Installation of Distribution Panels and connectors to KWH meter.

Solar Module

The solar module is installed as the roof of the house. The solar modules are assembled and mounted on the roof battens of the house so that the arrangement of the modules is rectangular.

The module support must be strong to withstand loads and forces that can cause deformation of the module surface. All module supports are made of hot dip galvanized iron to provide protection against rust. To facilitate transportation, the batten and rib module supports are made in the form of a knock down.

Inverter

The inverter used is a Hybrid inverter (DC/AC). The inverter work automatically and there is no need to ON/OFF manually. The inverte will supply AC power to the distribution panel, then it will be distributed to the network.

Disconnector

It is a switch that functions to connect and disconnect the inverter voltage.

Panel Disconnector

It is a switch that functions to connect and disconnect the battery voltage and inverter input.

Load Disconnector

ls a 50A MCCB which functions to connect and disconnect low voltage.

Wiring System

For the safety of installation personnel and operators, before carrying out the work the following points should be observed:

- Electrical work is carried out by at least two people and only carried out by officers who have been tested to work at high voltages (DC or AC voltage) and have mastered the overall system design.
- Please remember that when the sun shines the open voltage of the solar module can reach 1000 VDC, so it is very dangerous.
- DC voltage is always formed without realizing it (DC voltage does not give a shock effect) it often happens that our bodies contact with the battery poles while working, this can be fatal.
- Inverter short circuit current exceeds 1000 A.
- When using mechanical tools, such as screwdrivers, pliers and wrenches should be used with care, if possible, use properly insulated equipment.
- Use footwear that has good insulation, if possible, use shoes specifically designed for electrical work.
- Check that all switches, fuses, and MCBs are in the "OFF" position.
- The ends of the cable must be equipped with the appropriate cable shoes.
- Think carefully about the steps to be taken, then do it gradually, carefully and avoid rushing conditions.

The cable that will be installed in the On Grid SPP system must be adjusted to the voltage capacity and the amount of current to be flowed. This needs to be done to avoid energy losses and maintain electrical safety.

Solar Module Circuit

- Make sure all switches and fuses on the generator Box MCB module are "OFF".
- The solar modules are arranged in series of 20 modules to form an array of solar modules.
- Connect the positive, Pole of the module to the blocking diode terminal, arrester and MCB 10 A on the MCB box then connect it to the inverter and the negative pole directly to the inverter.
- The cable used is a 4 mm2 NYAF cable.

Inverter System Circuit

- Make sure all switches or cam switch, MCCB in the "OFF" position.
- Connect the output of the inverter to the MCCB on the distribution panel, connect the inverter output for the black line to the AC cam switch whose output is connected to the MCCB and the blue one directly to the MCCB. Make sure that the polarity of the cable is not reversed and tight or loose.

Grounding System Circuit

The grounding system must be carried out on all sub-system components. The entire installation must be equipped with arresters (high voltage protection) which may occur due to the induction of an electric field during a lightning strike.

With the completion of the wiring and installation of the On Grid SPP system, it is ready to undergo testing and commissioning.

PART 3: HOW TO USE

Operating Instructions

The electrical energy produced by On Grid SPP is limited by the capacity of the available solar modules, so there needs to be a limiter for electricity consumption or a kWh/VAh limiter. The advantages of this tool are:

1. It has a display of energy consumption, and the remaining available energy that can still be used (0-100%) and a short circuit warning.
2. It has a warning sign in the form of an LED bar that informs the user of how much energy balance is remaining.
3. The dimensions of the tool are compact and compact because it uses an electronic system.
4. The customer does not have the authority and cannot set the limit value for energy consumption, because this tool is set using a handheld and requires special knowledge.
5. The setting of the daily Wh usage limit and factory default reset time have been set, but can be changed by field technicians, without the need for a computer. Just use a handheld.
6. It has facilities that can cut off and reconnect electricity to problematic customers.
7. It has an electrical protection function, so it does not require replacement of components in the event of a short circuit.
8. It has a seal to prevent electricity theft.

Safety System

1. The diode in the solar module cable functions as a preventer from backflow from the inverter to the solar module through the cable.
2. MLB is a circuit breaker for DC system, which can disconnect or manually connect the connection between the solar module and the inverter whenever needed.
3. NH Fuse is a fuse that will break if there is a sudden surge in current that exceeds its capacity, so that the inverter is protected from damage.
4. Cam switch is a manual breaker / connection component between the battery and the inverter, which can be used if a problem occurs, or you want to perform maintenance or inspection on the battery or inverter.

5. The MCCB on the distribution panel can be used to disconnect or connect the inverter with the JTR. The MCCB needs to be lowered if a temporary disconnection to JTR is required for reasons of maintenance or repair.
6. The fuse in the customer's house is needed to prevent the lights or consumer electronic equipment from being damaged in the event of a power surge, because the fuse will break first.
7. The MCB in the consumer's house can be used to disconnect or connect the home installation cable to the JTR. This is necessary when it is necessary to repair or replace the switch or socket in the consumer's home.
8. Grounding is the connection of PE and/or Neutral cables into the ground through embedded iron rods. This groundinga is installed in the powerhouse (covering all components), JTR (starting and ending poles), and in every consumer's house. This grounding system serves to
9. Absorbs and distributes induced lightning strikes into the ground, so that the PV mini-grid system components.
10. On Grid and consumer electronic equipment is not damaged.

Safety Operation

1. Normal Start-up Procedure
   Normal start up needs to be done during the Centralized PV mini-grid system after undergoing a normal shutdown for repair and/or maintenance, either in whole or in part. The steps for normalizing the system are basically the same as those performed during commissioning.
2. Normal shut-down Procedure
   If maintenance and/or repair activities are related to electrical problems from the On Grid SPP system, then for the Safety of officers and equipment security, all connections between sub-systems, especially batteries and photovoltaics, must be removed.
   Normal shut-down steps are carried out as follows:

a) Position the MCCB main switch on the distribution panel in the “OFF” position.
b) Position the module MCB switch and AC cam switch on the “OFF” position.
c) Turn off the Inverter.
d) Lower the DC cam switch to the OFF position.

3. Emergency Procedure
   If a very dangerous situation occurs, such as the occurrence of a short circuit from each electrical section, the PLTS On Grid System must be immediately turned off by lowering the MCCB on the distribution panel, then do the same as in the normal shut-down procedure.

4. Normal Operation Procedure

When turning on the system, the first step that must be considered is to raise the DC Cam switch to the ON position then position the DC Breaker to ON then the inverter will turn on.

In the morning before the radiation has not provided enough energy to meet the electricity demand, the sun's intensity will slowly increase, until a time when the entire electrical load can be fully supplied by photovoltaics. If the intensity of the sun continues to increase, some of the excess electricity will be saved to power grid.

If solar radiation continues to increase and enters the running load so that it gradually reaches the fully covered level, then part of the photovoltaic generator will be transferred to power grid. In the afternoon when the sun's rays start to weaken, power grid will start to be active again releasing some of its electricity to the load. Demand for electricity will continue to increase steadily towards sunset, while charging from photovoltaic will stop completely. In this situation, all electricity demand will be supplied by the Inverter until a time when the electricity reserves from the Solar Panel are nearing exhaustion. With low electricity demand at midnight and early morning, it is hoped that this demand can be fully supplied from the inverter using a solar panel power source. After morning, the same process will be repeated. In the rainy season, the electricity process will decrease causing the charging load to not be maximal. So, it is expected that the burden will be transferred to power grid.

PART 4: MAINTENANCE

On Grid SPP systems are carefully designed to work well in uncertain natural conditions and minimal need for maintenance. However, proper, and programmed inspection and maintenance will greatly determine the operational reliability of this On-grid PLTS system and increase the economic and social value of the community. Because the manual presented in this section should be fully implemented properly.

1. General Instructions
   Based on the inspection and maintenance time interval, the system can be classified into 3 (three) parts, namely: 3 monthly. 6 monthly and annual intervals.
2. Notebook
   This notebook contains various fields that must be available at the location and stored properly in an easily accessible and safe place as a written guideline regarding On Grid SPP. This notebook is in the form of a written report regarding damage, measurement results and replacement of spare parts.
3. Maintenance of Photovoltaic Generator (solar module)
   Solar modules require essentially no maintenance during their technical life. However, the following should be noted from time to time:
   a. The possibility of shadows from trees or plants growing around the location of the solar module, if this happens, cut as much as possible because it will affect the energy output of the solar module.
   b. Leaves or other objects that may be left on the surface of the module should be cleaned immediately.
   c. The solar module is installed at a slope of 10°-15° to function so that the module is always washed naturally by rainwater.
   d. Cracks in the module glass may occur due to the impact of hard objects such as stones, in this case it is recommended to immediately report it to the competent authorities for further action.
   e. Check and correct the cable connections on the terminals that may be loose or loose, or the connection has lost contact due to rust interference.
   f. Check the module support, bolts and nuts are loose or loose and clean every part so as not to cause rust.

4. Inverter Maintenance

Before doing any work on the inverter, all DC connections from photovoltaic (through the MCB on the MCB module box), cam switch DC battery must first be disconnected and wait a while (minimum 5 minutes) to allow the capacitor to discharge static charge.

Inverter routine maintenance is carried out at 3 monthly intervals as follows:

a. For the Inverter, it is done by taking the data that appears on the display.
b. Open the inverter cover and check, tighten the cable connector and the bolt nut on the bus bar terminal is loose or not.
c. Check and repair if there are traces of sparks on each terminal and safety fuse.
d. Check for moisture and dust entering the inverter and carefully clean the dust and dirt inside the inverter.

PART 5: SPECIFICATION

Model	SL 450 WP
Cell Type	Monocrystalline PERC 166*183 mm
Number of Cells	144 (6 x 24)
Maximum Power (Pmax)	450 W
Open Circuit Voltage (Voc)	50.2 V
Short Circuit Current (Isc)	11.28 A
Voltage at Maximum Power (Vmp)	41.8 V
Current at Maximum Power (Imp)	10.77 A
Module Efficiency	20.37 %
Operating Temperature	-40°C to +85°C
Maximum System Voltage	1500 VDC
Junction Box	IP 68, 3 diodes
Front Cover Material	3.2 mm tempered glass with AR coating
Frame Material	Anodize Aluminum Alloy
Connector	MC4 or MC4 compatible
Module Dimension	2108 x 1048 x 40 mm
Weight	24 kg

*) Electrical characteristics at STC: Irradiance 1000W/m2, Cell temperature 25°C, AM1.5.

**) Specifications of this appliance may change without notice to improve the quality of the product. Pictures in this manual are schematic and may not match your product exactly. Values stated on the machine labels or in the documentation accompanying it are obtained in laboratory in accordance with the relevant standards. Depending on operational and environmental conditions of the appliance, values may vary.

Ciao! MODENA

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