



SPC5 REVERSE POWER CONTROLLER

Use of solar power is increasing rapidly but the major issue for solar inverters used in combination with grid power is that the excess power generated by the inverter is fed back to the grid & as there is no net metering (Bi-directional energy meter) the user is charged for this excess power. This issue is resolved by the **SPC5** Reverse Power Controller.

The multifunction meter **SPC5** is to be connected at the grid side where it continuously measures the grid power, reads the inverter power through Rs485 and calculates the load power. Accordingly, **SPC5** instructs the inverter to deliver only the required amount of power thus preventing the extra charges arriving out of the reverse power exported back to the grid. Along with controlling the reverse power, **SPC5** gives the complete information about Solar, Grid and Load parameters.

Reverse Power Control

Prevents the inverter power from being exported to the grid by controlling the Inverter power.

Compatibility

Compatibility with PVSA inverters.

Multiple Inverters control

Can control up to 20 Inverters at a time, where each must be of PVSA make.

Dual Modbus Card

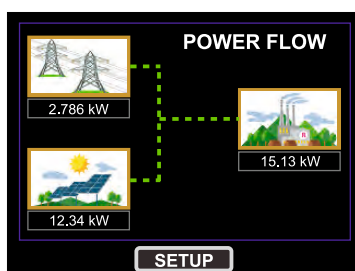
The addon card has dual RS485 ports : one for monitoring and controlling of inverters by SPC5 (device as master).and the other for monitoring and configuring SPC5 (device as slave).

Touch screen graphics LCD

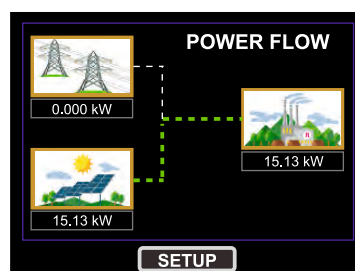
Touch sensible color graphics LCD display with resolution of 320x240.

Power Flow Representation

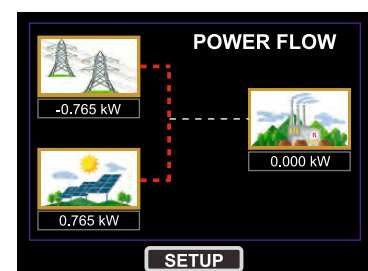
Pictorial representation of power flow between Solar Inverters, Grid and the Load as shown:



Load consuming both Solar and Grid power.



Load consuming only Solar power.



Total Solar power being exported to grid.

Quick Access GUI

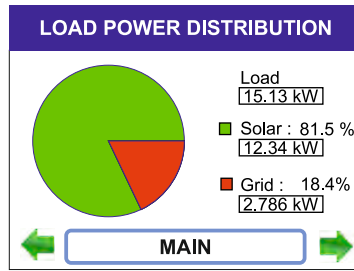
Individual Grid, Load and Solar icons on main screen for direct access to the desired parameters.

GridParameters

Grid icon for energy, power, voltage, current, frequency and auxiliary parameters like phasor diagram, on hour, THD, etc.

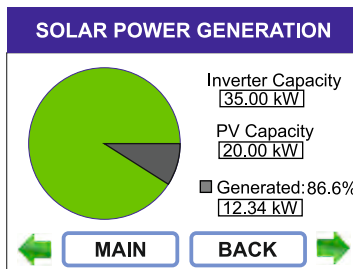
Load Power Distribution:

Load icon for graphical view of power distribution at the load as shown:

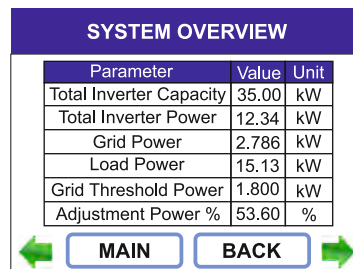


Solar Parameters

Solar icon for directly accessing all the information the user needs to know about the PV (Photovoltaic) plant, in tabular as well as graphical form as shown:

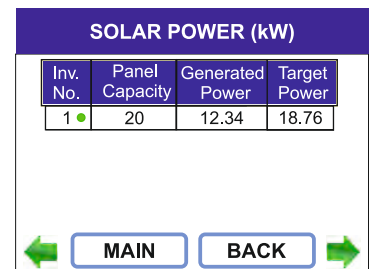


Solar power generation compared to the total PV(Panel) capacity.



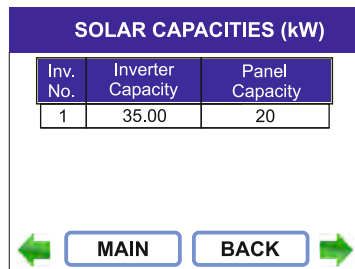
Parameter	Value	Unit
Total Inverter Capacity	35.00	kW
Total Inverter Power	12.34	kW
Grid Power	2.786	kW
Load Power	15.13	kW
Grid Threshold Power	1.800	kW
Adjustment Power %	53.60	%

The total Capacity, Power consumption, threshold and adjustment power for all the inverters combined.



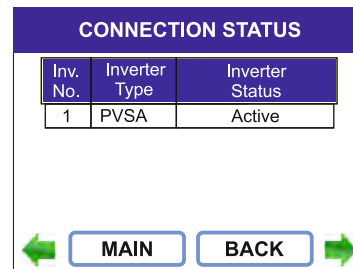
Inv. No.	Panel Capacity	Generated Power	Target Power
1	20	12.34	18.76

The connectivity, panel capacity, generated power and target power (Adjustment Power as % of Inverter Capacity) for individual inverter.



Inv. No.	Inverter Capacity	Panel Capacity
1	35.00	20

Comparison of Inverter and Panel Capacity for individual inverter.



Inv. No.	Inverter Type	Inverter Status
1	PVSA	Active

Inverter Type (Make) and corresponding connection status for individual inverter.

Potential Free Relay

A dedicated internal relay which can be configured for tripping based on reverse power flow or inverter communication breakage.

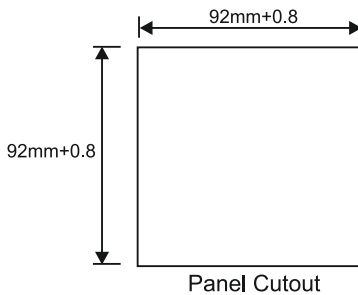
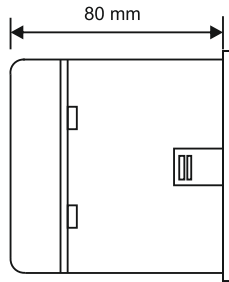
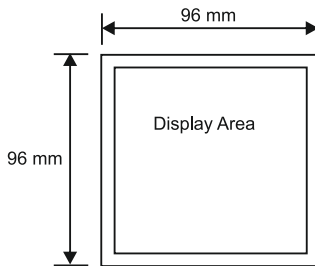
Grid Threshold setting

Onsite programmable grid threshold power which is the minimum power taken from the grid. This helps in smoothening the power characteristics.

Parameter Screen recall

In case of power failure, SPC5 memorizes the last displayed screen.

Dimensions Details:



Technical Specifications:

Inverters

Maximum inverters	20
Compatible with	PVSA

Grid Accuracy

Energy Measurement	Class 0.2S as per IEC 62053 - 22
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Auxiliary Supply:

Range	100-550V AC/DC
Frequency	45 to 65 Hz range
Power Burden	< 8VA Approx.

Grid Input Voltage:

Nominal input voltage (AC RMS) (onsite programmable).	100VLL to 600 VLL (57.5VLN to 346.42 VLN)
System PT primary values	100VLL to 1200kVLL programmable on site.

Grid Input Current:

Nominal input current	1A / 5A onsite programmable
System CT primary values	From 1A to 9999A

Grid Operating Measuring Ranges:

Current (Energy Measurement)	1...120% of nominal value
Voltage	20... 120% of nominal value

Interfaces

Relay	250VAC, 5 A AC 30VDC, 5 A DC
Dual Modbus	RS-485 (Physically Isolated) for Inverter Control RS-485 (Physically Isolated) for device monitor and configuration

Correction time: 1 min. approx.

Overall time taken to prevent the reverse power flow considering the inverter response time.

Environmental

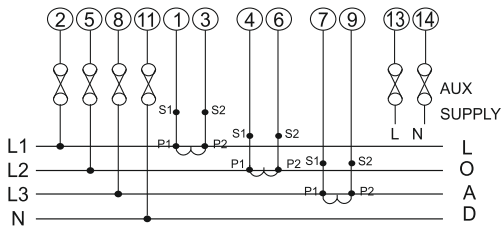
Operating temperature	-20 to +70°C
Storage temperature	-25 to +75°C
Shock	15g in 3 planes
Vibration	10... 55 Hz, 0.15mm amplitude
Enclosure	IP54 (front face only)

Applicable Standards

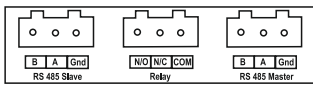
EMC	IEC 61326
Immunity	IEC 61000-4-3. 10V/m min – Level 3 industrial low level
Safety	IEC 61010-1-2001, Permanently connected use
Pollution degree:	2
Installation category:	III
High Voltage Test	2.2 kV AC, 50Hz for 1 minute between all electrical circuits

Display update rate: 1 sec approx.

Electrical Connection:



a) 3 Phase 4 Wire Unbalanced Load



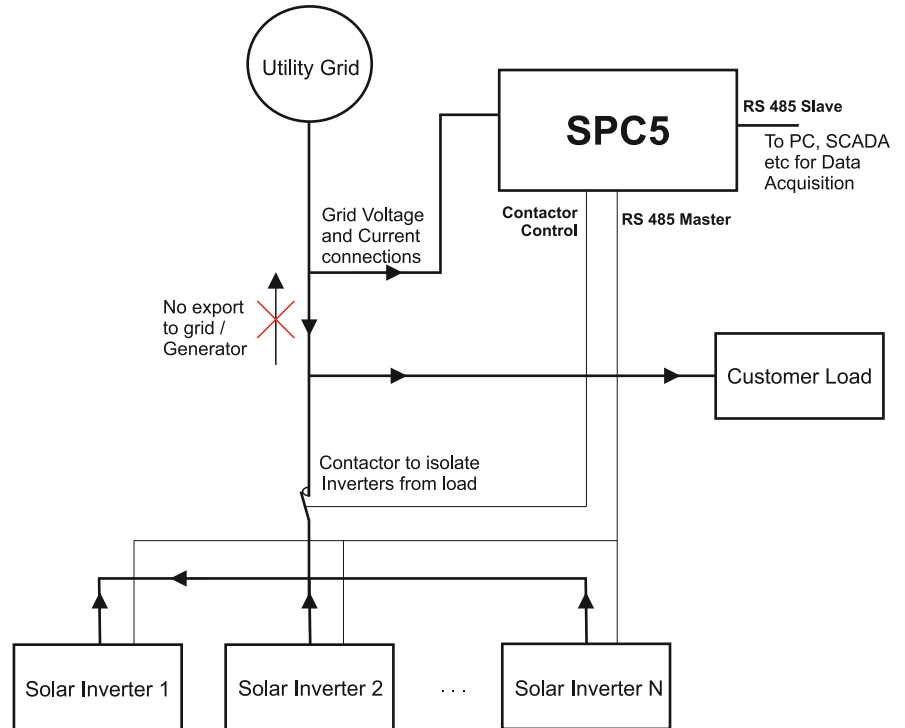
b) Connection for Dual Modbus Addon Card

It is recommended that the wires used for connections to the instrument should have lugs soldered at the end. That is, the connections should be made with Lugged wires for secure connections. The Maximum diameter of the lug should be 7.0 mm and maximum thickness 3.5 mm.

Permissible cross section of the connection wires: $\leq 4.0 \text{ mm}^2$ single wire or $2 \times 2.5 \text{ mm}^2$ fine wire.

Working Principle:

Working Principle for Reverse Power Control



SPC5 Reverse Power Controller measures the power from Load using its current and voltage connections and monitors the power from inverters connected serially via RS485 bus in regular intervals.

From the power measured from the grid and the power monitored from the inverters, SPC5 calculates the load power. It uses this information to get the value of maximum power that the inverters should feed to the load and sends the controlled values to the inverters.

In this way, SPC5 prevents the Reverse Power to flow back to the grid and also ensures that the power drawn from the grid is maintained at the threshold set by the user. This prevents the fluctuations from load to cause fluctuations in the inverters providing smooth power to the load.

Similarly, if the inverters start exporting reverse power to the grid or if the communication of any inverter breaks with SPC5, it would be detected by the instrument itself which will trip the relay available at the dual modbus card and isolate the inverters from the load.

Note : The maximum number of inverters that can be connected is 20.

