



# SNV022EC.A

## Combiner Box Card

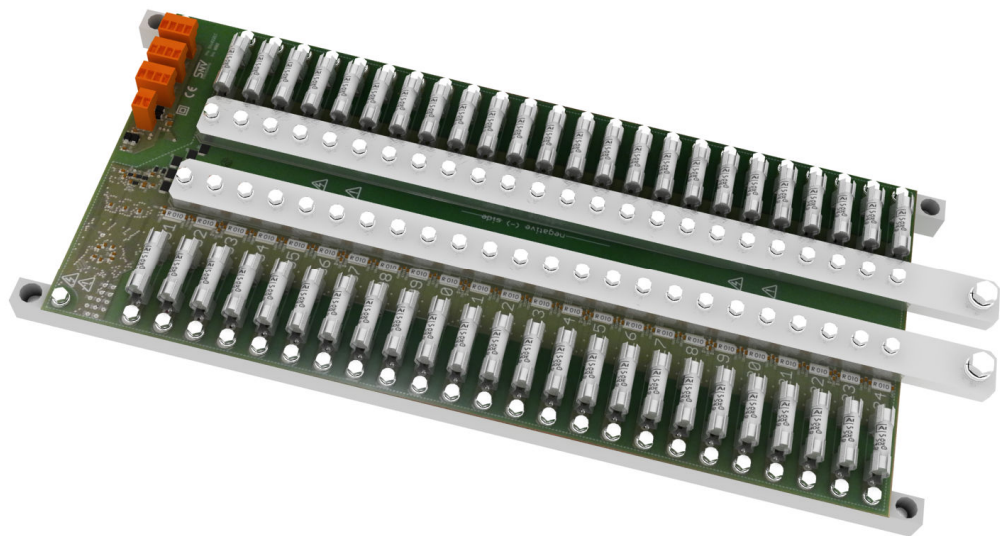


Figure 1: SNV022EC.A card

### Features

- 24 channels
- on board fuse holder clips for positive and negative side
- on board current collector bars ready to connect to disconnection switch
- 24 independent dc current measurement at positive side
- 0 - 13.5A current measurement range (other ranges are available on demand)
- 0 – 1000V voltage measurement
- Very Low Sensing resistance on measurement channels: 10mΩ
- Measurement channels voltage up to 1000Vdc
- 667Hz sampling per channel
- 1 contact input
- Board temperature measurement
- On board long time averaging and integrations
- Communication using MODBUS over RS485
- Board power consumption < 1.5W
- Operating temperatures : -20°C to +60°C
- 32bit ARM CORTEX-M3 microcontroller @ 96MHz
- CE: EMC: EN61326-1 and Safety: EN61010-1

## Description / Typical Applications

SNV022EC.A is a “combiner box” card with dc current, voltage measurement and with one digital input. It is designed to be used in photovoltaic parks with central inverters in order to connect in parallel strings and monitor string currents and voltage.

It has on board fuse holder clips for each string for both positive and negative side, avoiding extra cabling and material costs. Current collector bars are premounted and designed to be directly connected to the disconnecter switch for a more clear installation and cost efficient.

Current measurement is performed on the positive side. Low thermal drift, high quality shunt resistors are used. Voltage on them is amplified through precision amplifiers and then sampled and processed by a 32bit CORTEX-M3 microcontroller at 96MHz.

The microcontroller can deliver measurements through an isolated serial RS485 bus transceiver using Modbus protocol. It can also hold values, in order to perform simultaneous measurements through all the cards in a bus and then retrieve all the measurements. The microcontroller is also calculating the average of voltage, currents and current square values, with 667Hz sampling for each channel. The averaging period is indicated-marked by a master controller broadcast command. Averaged values of different cards are synchronized and then collected. Bandwidth consumption on the bus is limited, giving the ability for a prompt response of the rest requests.

A contact input is also implemented in order to monitor other component like the condition of an SPD. Board temperature is also measured and provided.

## Characteristics

### Electrical

	note	min	nom	max	Unit
Power supply	Absolute	18	24	30	V dc
Consumption:					
24V DC – 0A all 24 channels			21	30	mA
24V DC – 13.5A all 24 channels	Note 1, 2		45	54	
18V DC – 0A all 24 channels			29	39	
18V DC – 13.5A all 24 channels			68	79	
18V DC – 16A all 24 channels	Abs. Max			86	
Measurement channel resistance	each			12	mOhm
Channel maximum current		-16		16	A
Channel max working voltage	Note 3			1000	V dc
Current measurement range	Note 4	0.035	-	13.5	A
Voltage measurement range	Note 5	1	-	1000	V

Note 1: The value is for each installed board

Note 2: The maximum number of cards to be installed in series is 127.

Note 3: Maximum working voltage 1000VDC for pollution degree 1. For pollution degree 2 the maximum working voltage is 800VDC.

Note 4: Current values lower than 35mA are pulled down to zero

Note 5: Voltage values lower than 1V are pulled down to zero

### Physical & Environmental Characteristics

	Details
Operating Temperature	-20 °C to +60 °C
Storage Temperature	-40 °C to +100 °C
Board Dimensions LxWxH	500x230x40 mm See "User and Installation manual " Annex A for detailed drawings
EMC – Emissions	Meets: EN 61326-1, EN 61000-6-3, EN 50081-1, EN 55011 (Class A ITE)
EMC – Immunity	Meets: EN 61326-1, EN 50082-1, EN61000-4-3 (Radiated EM fields immunity) EN61000-4-4 (Fast transient burst (EFT)) EN61000-4-5 (Surges) EN61000-4-6 (Conducted EM fields immunity)  Also successfully tested (Criterion A) at Conducted immunity at 10Vrms, and Radiated immunity at 10V/m (instead of 3Vrms and 3V/m required from the above standards) see accuracy report for immunity levels.
Safety	Meets EN 61010-1
Measurement Category	RATED CLASS I and RATED TRANSIENT OVERVOLTAGES 1,5KV
Usage	Indoor or outdoor use installed in a metallic and/or plastic box

### Measurement Characteristics

	Details
Maximum averaging time	15 days at 667Hz sampling
Measurement Accuracy	±1% of measurement current
ADC resolution (12bit)	3.3mA
Thermal Drift on board compensated (Note 6)	0.04‰ / °C
Calibration current	at 5.5 A

Note 6: Compensation, even for averaged values, is performed before value transmission, using actual board temperature, measured by the on board temperature sensor. Long time averaging with large temperature variations could produce thermal drifts on the transmitted values respectively.

### Communications and bus Characteristics

Hardware layer	RS485
Communication Protocol	Modbus RTU
Default baudrate	9600 bps
Max number of nodes	128
Max suggested cable length	1200 m
Protected from Overvoltage Line Faults up to	±60V
Clamp diodes (A and B to GND)	±30V
Bus Short-Circuit Protection	Yes

### Communication & Usage

For communication, MODBUS protocol over an RS485 serial line is implemented (RTU mode @9600bps). See further “MODBUS Application Protocol Specification v1.1b” and “MODBUS over Serial Line Specification and Implementation Guide v1.02”.

Data can be read through “16bit input registers”. Commands are send by writing “Holding registers”. Three commands are implemented: “hold”, “mark” and “change address”. Hold command transfer “instant current” values to “current holded values”. Command can be send with a broadcast write, acquiring a snapshot of all the currents from all the cards in the bus.

Mark command initiates averaging and at the same time terminates previous averaging and transfers the result to the relevant registers. It is suggested to broadcast periodically the “mark” command, with the desired period (as for example 10 mins), and during each period read and store the averaged data.

## Board Layout

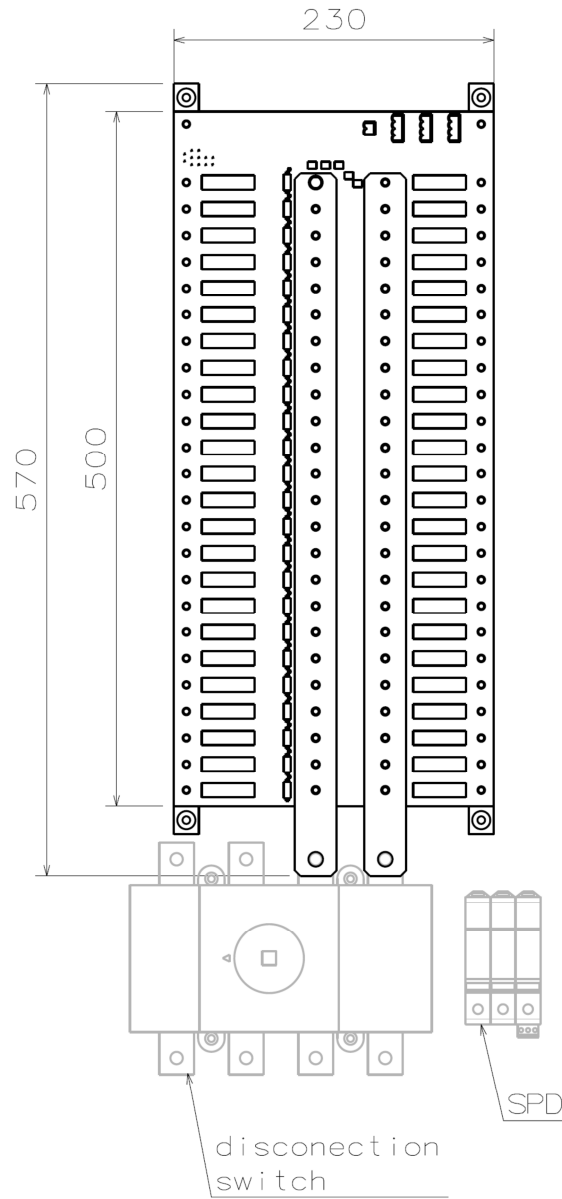


Figure 2: Card layout and dimensions

Document version: pre-release v0.1  
 Document version date of release: 01/10/2012  
 Document Identifier: SNV022EC.A\_datasheet\_v0.1