SNV018EC.XX
Current Measurement Card

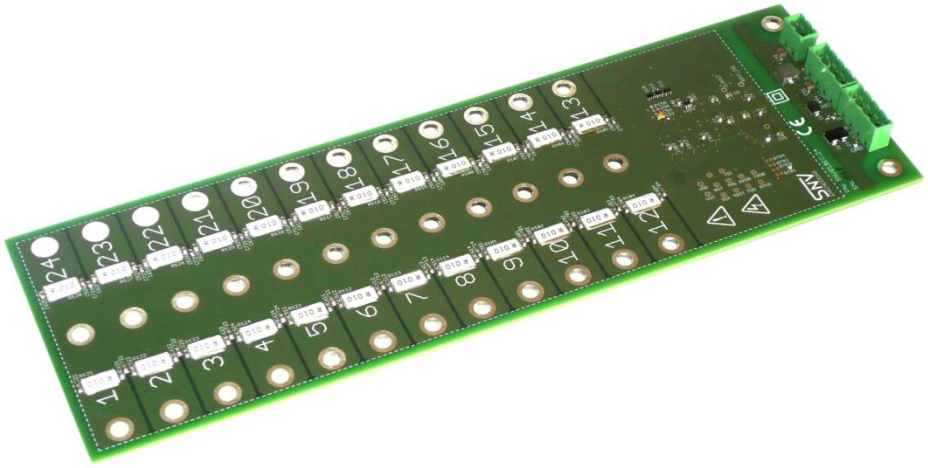


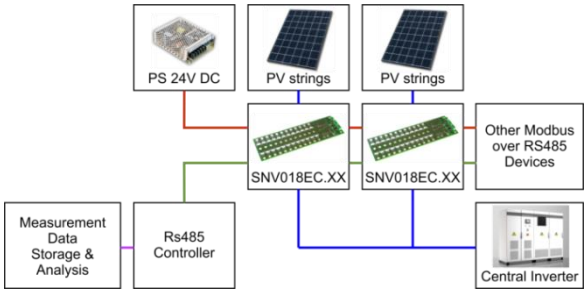
Figure 1: SNV018EC.24 card

Features

- 8, 12, 16, 24 isolated channels of dc current measurement (common low side)
- 0-13.5A measurement range (other ranges are available on demand)
- Very Low Sensing resistance on measurement channels: 10mΩ
- Measurement channels voltage up to 1000Vdc
- 1kHz 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

SNV018EC card is a DC current measurement & monitor card with an additional digital input. It is designed to be used in photovoltaic parks with central inverters in order to monitor string currents. It has four versions of 8, 12, 16 or 24 channels of DC current measurement. Low side terminal is common, hence, card is suitable for high side measurement (connecting positive cable to the card). Current measurement terminals are isolated from card power supply and bus terminals.



In order to perform the measurements, low thermal drift, 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 a serial RS485 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 the currents and of their square, with 1kHz 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* *24V DC – 13.5A all 24 channels* *18V DC – 0A all 24 channels* *18V DC – 13.5A all 24 channels* *18V DC – 16A all 24 channels*	 Note 1, 2 Abs. Max		 21 45 29 68	 30 54 39 79 86	mA
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

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: For software version > 2.1 values lower than 35mA 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	08 channels: 165x100x35 mm 12 channels: 201x100x35 mm 16 channels: 237x100x35 mm 24 channels: 309x100x35 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 B ITE: domestic environment)
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)
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 1kHz sampling
Measurement Accuracy	±1% of measurement current
ADC resolution (12bit)	3.3mA
Thermal Drift on board compensated (Note 5)	0.04‰ / °C
Calibration current	at 5.5 A

Note 5: 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

Board Layout

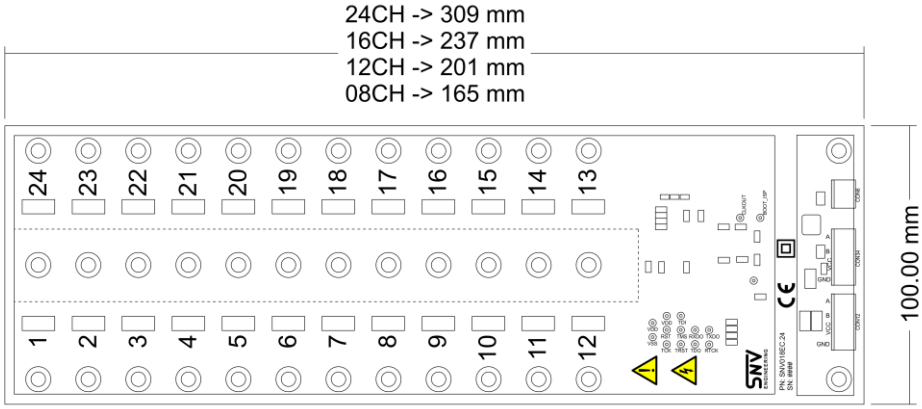


Figure 2: Card layout and dimensions

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.

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