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SNV040EC Combiner Box Card

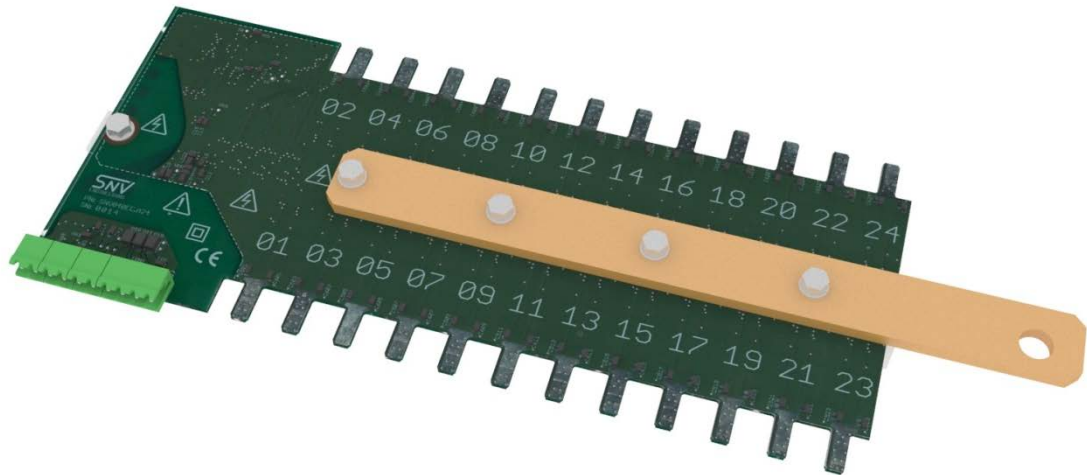


Figure 1: SNV040EC card

Features

- 08, 16, 24, 28 or 32 channels.
- board shape to collaborate with DIN rail fuse holders.
- on board positive current collector bar ready to connect to disconnection switch .
- independent DC current measurements per channel at positive side.
- 0 - 10A current measurement range (other ranges are available on demand). 16A/channel ampacity for entire operating temprature range.
- 0 – 1000V voltage measurement.
- very low sensing resistance on measurement channels: 3mΩ.
- system voltage up to 1000Vdc.
- 347Hz sampling per channel.
- 3 dry contact inputs.
- temperature measurement on board with high accuracy.
- on board long time averaging and integrations.
- communication using MODBUS over RS485.
- board low power consumption < 1W.
- Operating temperatures : -30°C to +75°C.
- 32bit ARM CORTEX-M3 microcontroller @ 96MHz.
- CE: EMC: EN61326-1 and Safety: EN61010-1.

Description / Typical Applications

SNV040EC is a “combiner box” card with dc current, voltage measurement and with three digital inputs. 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 specific board shape to fit in DIN rail fuse holders, avoiding extra cabling and material costs. Current collector bar is pre-mounted and designed to be directly connected to the disconnecter switch for a more clear installation and cost efficient. Negative pole collector bar can be also provided.

Current measurement is performed on the positive side. Very low thermal drift and thermal stability is achieved due to continually active correction from microcontroller. Measurements are 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 347Hz sampling for each channel. The averaging period is indicated-marked by a master controller 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.

Three contact inputs are also implemented in order to monitor other component like the condition of an SPD, disconnecter switch status, etc. Board temperature is also measured and provided.

Characteristics

Electrical Characteristics

| | note | min | nom | max | Unit |
|--------------------------------|-----------------------|-------|-----|------|------|
| Power supply | Absolute | 18 | 24 | 30 | V dc |
| Consumption: | Note 1, 2 Abs. Max | 40 | 30 | 25 | mA |
| Measurement channel resistance | each | | | 3 | mOhm |
| Channel maximum current | | -16 | | 16 | A |
| Channel max working voltage | Note 3 | | | 1000 | V dc |
| Current measurement range | Note 4, 5 | 0.075 | - | 10 | A |
| Voltage measurement range | | 0 | - | 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: Equipment pollution degree 2.

Note 4: Current values lower than 75mA are pulled down to zero.

Note 5: The provided measurement range is for the entire operating temperature range.

Physical & Environmental Characteristics

| | Details |
|--|--|
| Operating Temperature | -30 °C to +75 °C |
| Storage Temperature | -40 °C to +100 °C |
| Relative Humidity | up to 95% non condensing |
| Operating Altitude | bellow 2000m |
| Board Dimensions (see also annex A) | 08 Channels: LxWxH = 140 x 122 x 28 mm 16 Channels: LxWxH = 238 x 122 x 28 mm 24 Channels: LxWxH = 284 x 122 x 28 mm 28 Channels: LxWxH = 320 x 122 x 28 mm 32 Channels: LxWxH = 356 x 122 x 28 mm |
| 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) |
| Safety | Meets IEC61010-1(ed.3),IEC61010-2-030(ed.1) |
| Measurement Category | CAT 0 |
| Transient Overvoltage | rated for 1,5kV |
| Pollution degree | 2 |
| Usage | Indoor or outdoor use installed in a metallic and/or plastic box |

Measurement Specifications

| | Details |
|---------------------------------------|--------------------------------|
| Maximum averaging time | 25 days at 347Hz sampling |
| Current measurement range | 0.075 to 10 A |
| Current measurement accuracy | 0.5% reading + 0.5%range (10A) |
| ADC resolution (12bit) | 2.5mA |
| Thermal Drift on board compensated | 0.4% / °C |
| Calibration current | at 5.5 A |
| Voltage measurement range | 0 to 1000 V |
| Voltage measurement accuracy | less than 1% |
| Calibration voltage | 700 V |

Communications and bus Specifications

| | |
|--|------------|
| Hardware layer | RS485 |
| Communication Protocol | Modbus RTU |
| Default baud rate | 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 |

Ordering information

SNV040EC.X## ordering configuration:

| | |
|--------------|---|
| SNV040EC.A08 | 08 current measurement channels |
| SNV040EC.A16 | 16 current measurement channels |
| SNV040EC.A24 | 24 current measurement channels |
| SNV040EC.A28 | 28 current measurement channels |
| SNV040EC.A32 | 32 current measurement channels |
| SNV040EC.X## | Custom versions (could be different measurement range, etc) |

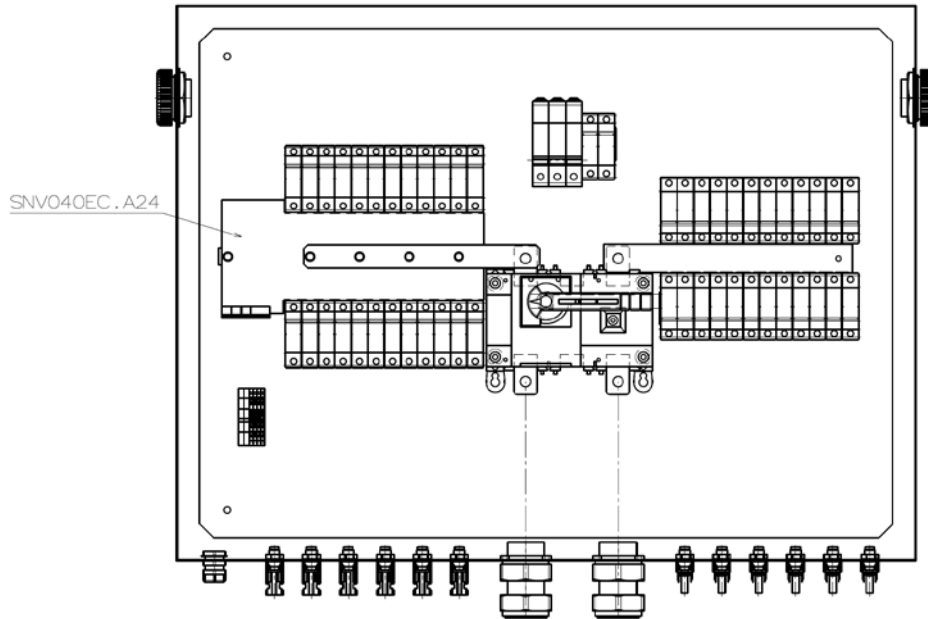
Communication & Usage

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.

Indicative CB Layout



See SNV040EC – User and Installation Manual Annex A (Drawings) for more details.

Figure 2: Card layout and dimensions

| | Board Dimensions [mm] | Overall Dimensions (with collector, mounting bars and terminals) [mm] |
|--------------|-----------------------|---|
| SNV040EC.A08 | 140 x 122 x 28 | 202 x 136 x 36 |
| SNV040EC.A16 | 238 x 122 x 28 | 300 x 136 x 36 |
| SNV040EC.A24 | 284 x 122 x 28 | 346 x 136 x 36 |
| SNV040EC.A28 | 320 x 122 x 28 | 382 x 136 x 36 |
| SNV040EC.A32 | 356 x 122 x 28 | 418 x 136 x 36 |

Technical Assistance

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