

# CPA Family



## Contactless power analyzers



### Description

CPA is a family of power analysers and current transducers for ac 1-phase or dc installation monitoring, thanks to Hall effect sensing. Current is measured with no contact with the copper wire. The comprehensive set of measured variables allow this device to be used to monitor photovoltaic installations, industrial processes, battery charging systems.

### Benefits

- **Flexible solution.** The instrument allows users to monitor both ac and dc system with the same device.
- **Fast connection.** ac or dc current sensing with no need to cut and join the cable.
- **Reliability.** The instrument is equipped with a Modbus/RTU communication port by RS485 connection.
- **Complete monitoring.** Depending on the model, the instrument provides a comprehensive range of monitored variables (V, A, W, var, VA, kWh, PF, HZ, THD) or limited to current variables (A, Amin, Amax, Ah).
- **Wide range of device mounting types.** The instrument can be mounted in four different ways (either DIN rail or panel mounting, vertical or horizontal) to match different installation constraints.
- **Easy programming.** Plug'n play set-up by means of CARLO GAVAZZI UCS (Universal Configuration Software).
- **Integrated solution.** The instrument is compatible with VMU-C EM solution for energy monitoring.

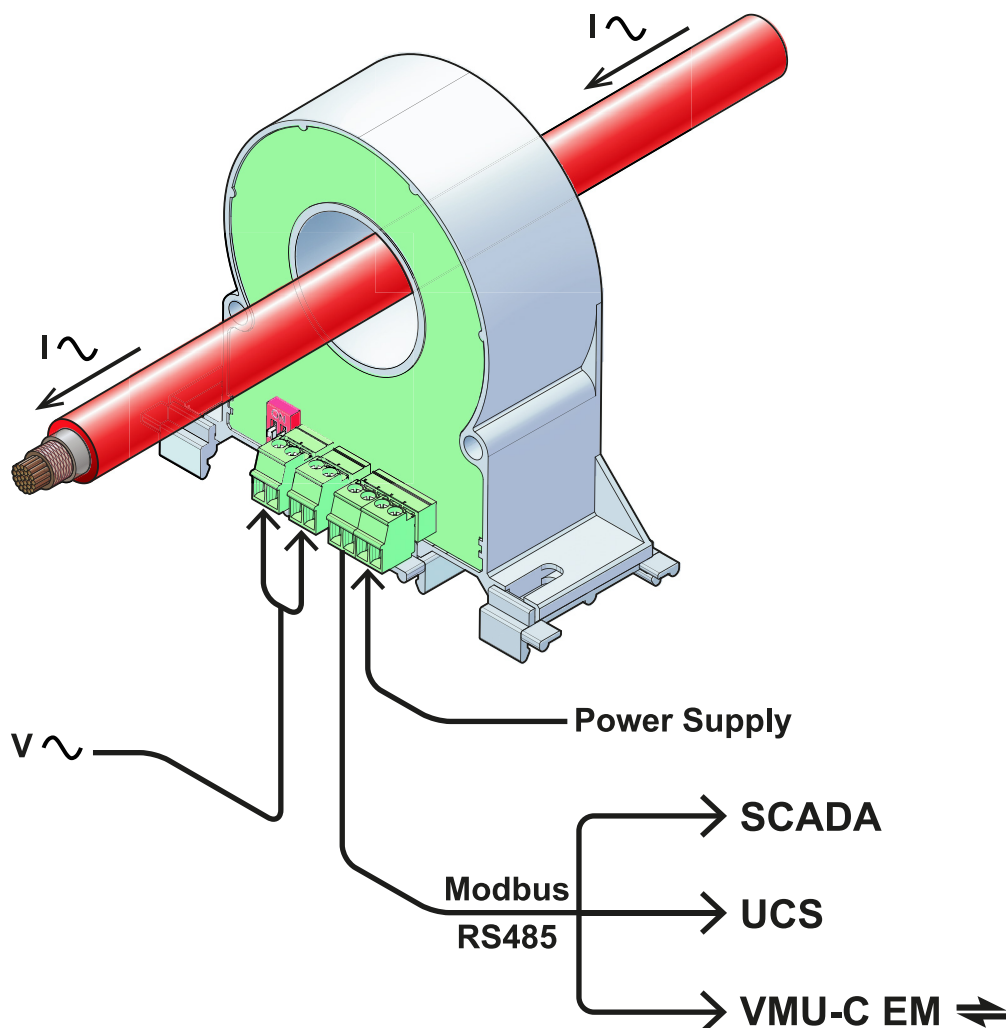
### Applications

CPA power analysers are the ideal solution for those applications which are beyond standard ac monitoring. Given their capability of working both at different frequency ranges, they match the needs of dc applications (battery charging, photovoltaic monitoring), of ac applications with high crest factor (UPS, variable frequency drives) and standard 1-phase ac installations.

### Main functions

- Compatible with VMU-C EM
- Configurable by means of UCS (Universal Configuration Software) solution
- Hall effect sensing

### CPA system architecture for ac system



### CPA operating principles for ac systems

CPA is a power analyser, measuring current with contactless Hall effect sensing and voltage with shunt based technology.

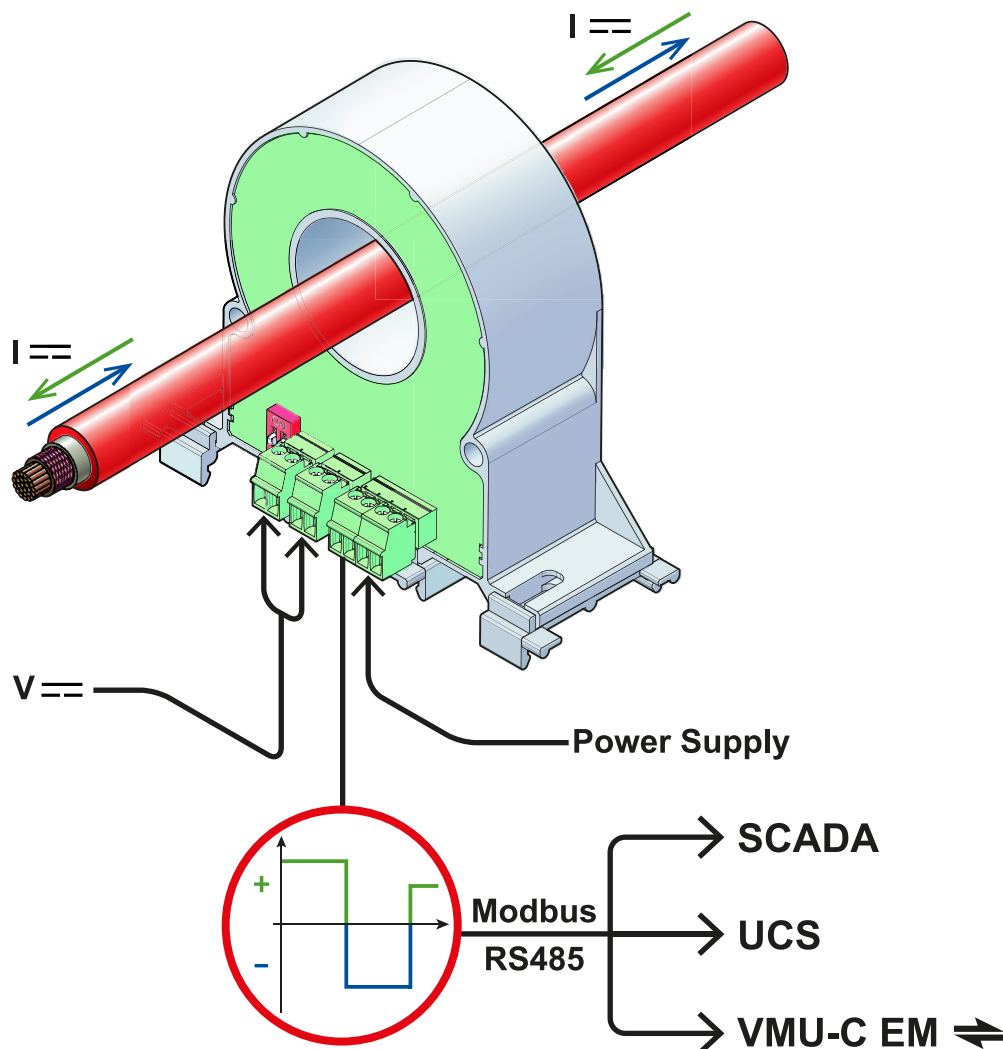
Power, power factor, energy, frequency and harmonic distortion (up to the 40th harmonic) are also measured by CPA with true RMS up to 400 Hz.

The measured variables are available to the monitoring system connected through RS485, via Modbus/RTU communication.

UCS (universal configuration software) installed onto a PC connected to CPA via RS485, allows to configure CPA (i.e. RS485 parameters) with ease and display measured variables in real time; configuration parameters are saved in both CPA's memory and UCS' database.

UCS allows to create, edit and exchange configurations of both single CPA meters and complete networks of CPA units.

### CPA system architecture for dc system



### CPA operating principles for dc systems

CPA is a power analyser, measuring dc current in both directions with contactless Hall effect sensing and dc voltage with shunt based technology.

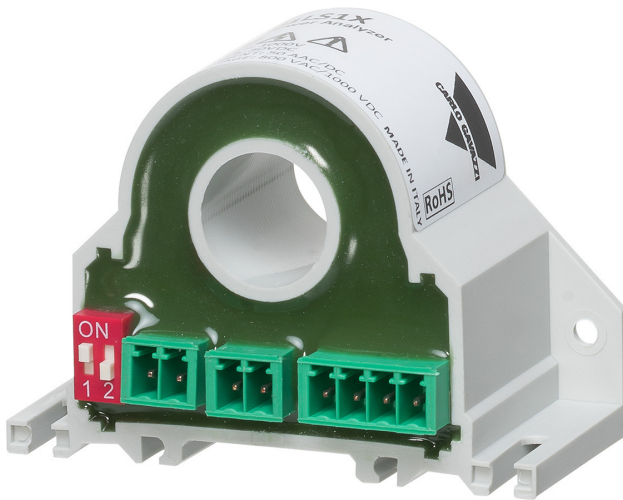
Power and energy are also measured by CPA.

The measured variables are available to the monitoring system connected through RS485, via Modbus/RTU communication.

UCS (universal configuration software) installed onto a PC connected to CPA via RS485, allows to configure CPA (i.e. RS485 parameters) with ease and display measured variables in real time; configuration parameters are saved in both CPA's memory and UCS' database.

UCS allows to create, edit and exchange configurations of both single CPA meters and complete networks of CPA units.

# CPA050



## Main features

- True RMS ac (from 1 to 400 HZ) and dc monitoring
- Current sensing by Hall effect; range: 50 Aac/Adc
- Voltage range: 800 Vac/1000 Vdc
- RS485 Modbus output; variables: A, V, W, var, VA, kW, HZ, PF, THD
- 15 mm hole diameter
- Din rail or panel, vertical or horizontal mounting

## Main functions

- Compatible with VMU-C EM
- Configurable by means of UCS (Universal Configuration Software) solution
- Hall effect sensing

## Description

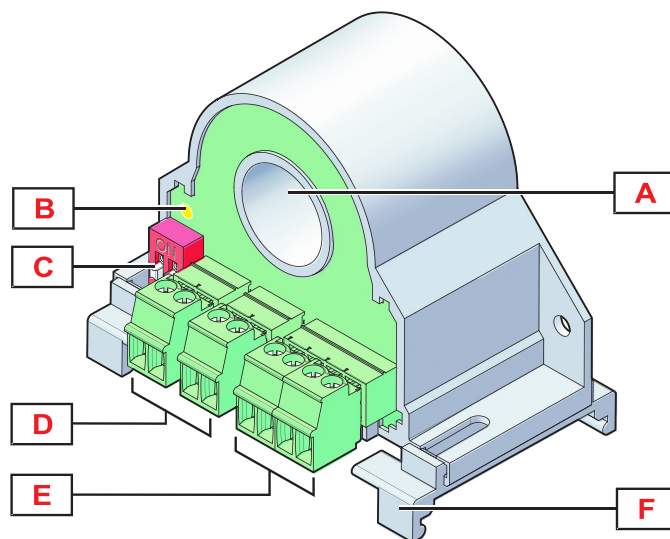
CPA050 is a power analyser for dc or ac 1-phase applications.

With a maximum current of 50 Aac/Adc and maximum voltage range of 800 Vac/1000 Vdc, it is the ideal solution for monitoring small photovoltaic installations, industrial processes, battery charging systems.

## Applications

CPA power analysers are the ideal solution for those applications which are beyond standard ac monitoring. Given their capability of working both at different frequency ranges, they match the needs of dc applications (battery charging, photovoltaic monitoring), of ac applications with high crest factor (UPS, variable frequency drives) and standard 1-phase ac installations.

## Structure

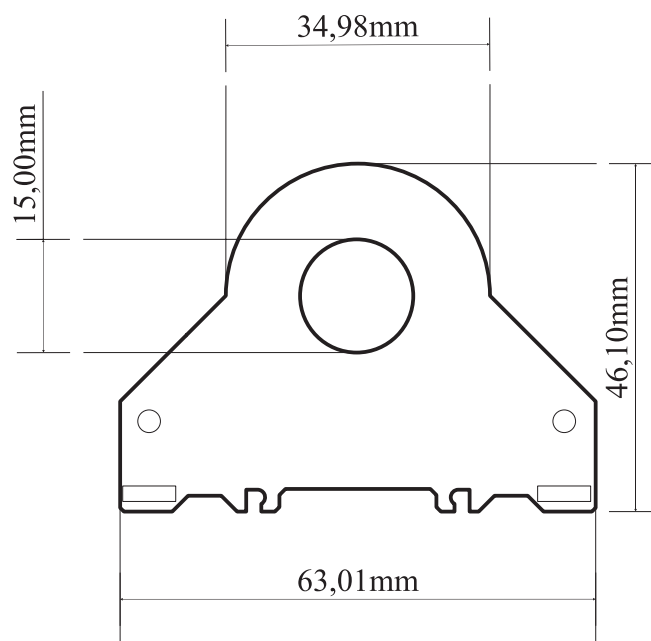


| Element | Component   |
|---------|---|
| A       | Hall sensor hole for current sensing  |
| B       | <b>LED.</b><br>Hidden: power off<br>Steady: power on<br>Blinking: data communication on |
| C       | DIP switch for RS485 parameters set-up  |
| D       | Screw terminals for voltage input connection  |
| E       | Screw terminals for serial communication and power supply                               |
| F       | Hooks for DIN rail mounting   |

## Features

### General

|                             |  |
|-----------------------------|--|
| <b>Material</b>             | PBT (Filling epoxy resin)  |
| <b>Assembly</b>             | Screw grooves for vertical or horizontal panel mounting.<br>Clips included for vertical or horizontal DIN rail mounting. |
| <b>Protection degree</b>    | IP20   |
| <b>Weight</b>               | 80 g   |
| <b>Terminals</b>            | Detachable screw terminals.  |
| <b>Overvoltage category</b> | Up to 600 V Cat. III<br>Up to 1000 V Cat. II   |
| <b>Rejection (CMRR)</b>     | 100 dB, 48 to 62 Hz  |



### Power Supply

|                     |          |
|---------------------|----------|
| <b>Power supply</b> | 9-30 Vdc |
| <b>Consumption</b>  | <1.3 W   |

### Environmental

|                            |                                       |
|----------------------------|---------------------------------------|
| <b>Working temperature</b> | -15° C to 65° C (5° F to 149° F)      |
| <b>Storage temperature</b> | -40° C to 85° C (-40° F to 185° F)    |
| <b>Relative humidity</b>   | < 90% non-condensing @ 40° C (104° F) |



## Compatibility and conformity

|   |             |
|---|-------------|
| Electromagnetic compatibility (EMC) - immunity  | EN61000-6-2 |
| Electromagnetic compatibility (EMC) - emissions | EN61000-6-4 |
| Safety  | EN61010-1   |
| Approvals                                       |             |

## Inputs

| Current input      |                                     |
|--------------------|-------------------------------------|
| System type        | 1-phase ac/dc                       |
| Rated current (In) | 50 A ac/dc                          |
| Crest factor       | 1.8                                 |
| Coupling type      | Built-in Hall effect current sensor |
| Cable max diameter | 14 mm                               |
| Transformer ratio  | 1.0 default (customizable)          |

| Voltage input      |                                  |
|--------------------|----------------------------------|
| System type        | 1-phase ac/dc                    |
| Rated Voltage (Un) | 800 Vac<br>1000 Vdc              |
| Rated frequency    | 1-400 Hz or dc                   |
| Impedance          | $\geq 1 \text{ M}\Omega \pm 1\%$ |
| Transformer ratio  | 1.0 default (customizable)       |

## Measurements

|                     |   |
|---------------------|---|
| Variables           | Available via RS485 Modbus: A, A max, Amin, A peak, V, V max, V min, V peak, W, W min, W max, var, var min, var max, VA, VA min, VA max, Hz, PF, PF min, PF max, +/- kWh, THD A, THD A min, THD A max |
| Method              | Selectable (TRMS or average value)  |
| Sampling rate       | 11000 samples/s   |
| Measurement refresh | Programmable via UCS:<br>Default: every 50 cycles (ac) or 1 second (dc)   |
| Harmonic analysis   | Up to the 40 <sup>th</sup> harmonic   |

## Accuracy

|                       |   |
|-----------------------|---|
| Current               | < 0.5% F.S.   |
| Phase-neutral voltage | < 0.5% F.S.   |
| Phase-phase voltage   | < 0.5% F.S.   |
| Frequency             | +/- 0.1 Hz  |
| Active power          | < 0.5% F.S.   |
| Reactive power        | < 1.5% F.S.   |
| Apparent power        | From 0.1 In to In: +/- 1% rdg<br>From 0.05 In to 0.1 In: +/- 2% rdg |
| THD A                 | +/- 1%  |

## RS485

|                    |   |
|--------------------|---|
| Communication type | Multidrop, bidirectional (static and dynamic variables)   |
| Protocol           | Modbus RTU  |
| Address            | 1-247   |
| Data               | Dynamic: phase variables (only reading)<br>Static: all configuration parameters (reading and writing) |
| Data format        | 1 start bit, 8 data bits, Parity (None/ Odd/ Even), 1 stop bit  |
| Baud-rate          | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps   |
| Response delay     | ≤1000 ms  |

## Insulation

| Type                      | Voltage input | Current input (bare wire) | Power supply | RS485 |
|---------------------------|---------------|---------------------------|--------------|-------|
| Voltage input             | -             | 3 kV                      | 4 kV         | 4 kV  |
| Current input (bare wire) | 3 kV          | -                         | 3 kV         | 3 kV  |
| Power supply              | 4 kV          | 3 kV                      | -            | 0 V   |
| RS485                     | 4 kV          | 3 kV                      | 0 V          | -     |



## Connection Diagrams

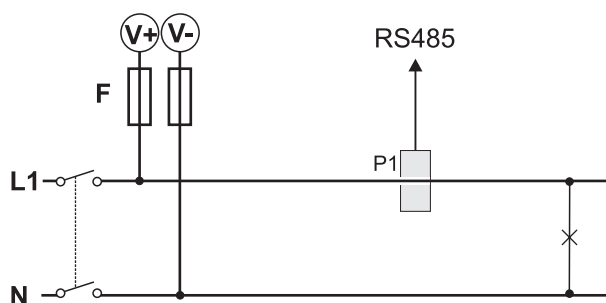


Fig. 1 ac input connection

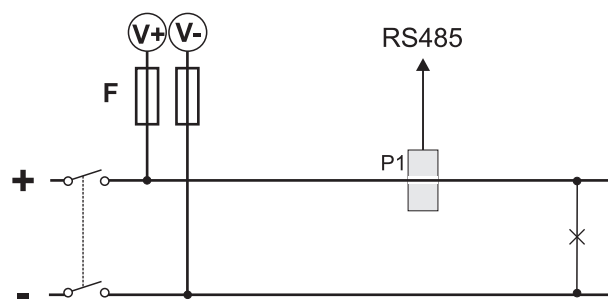


Fig. 2 dc input connection

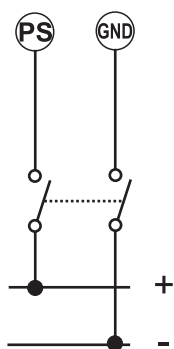


Fig. 3 Power supply

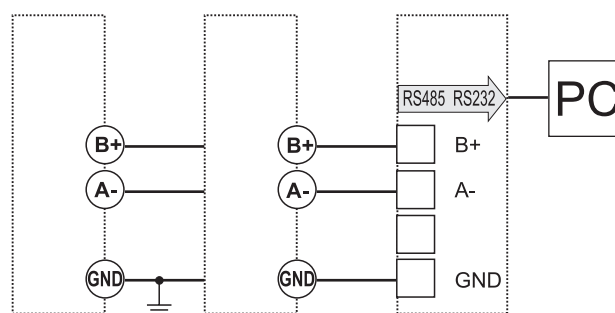


Fig. 4 RS485


### Note for RS485:

The serial output must be terminated on the last network device by means of a terminating unit according to Modbus standard; check grounding arrangements specification on the official Modbus documentation for proper grounding connections.

Please check **Multipoint System** requirements at section 3.4 of the **Modbus over serial line specification and implementation guide** available at: <http://www.modbus.org/specs.php>

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## References

 Order code



CPA 050 1 L S1 X

 CARLO GAVAZZI compatible components

| Purpose             | Component name/code | Notes |
|---------------------|---------------------|-------|
| Embedded Web Server | VMU-C EM            | -     |



## Main features

- True RMS ac (from 1 to 400 Hz) and dc monitoring
- Current sensing by Hall effect; range: 300 Aac/400 Adc
- Voltage range: 800 Vac/1000 Vdc
- RS485 Modbus output; variables: A, V, W, var, VA, kW, HZ, PF, THD
- 33 mm hole diameter
- Din rail or panel, vertical or horizontal mounting

## Main functions

- Compatible with VMU-C EM
- Configurable by means of UCS (Universal Configuration Software) solution
- Hall effect sensing

## Description

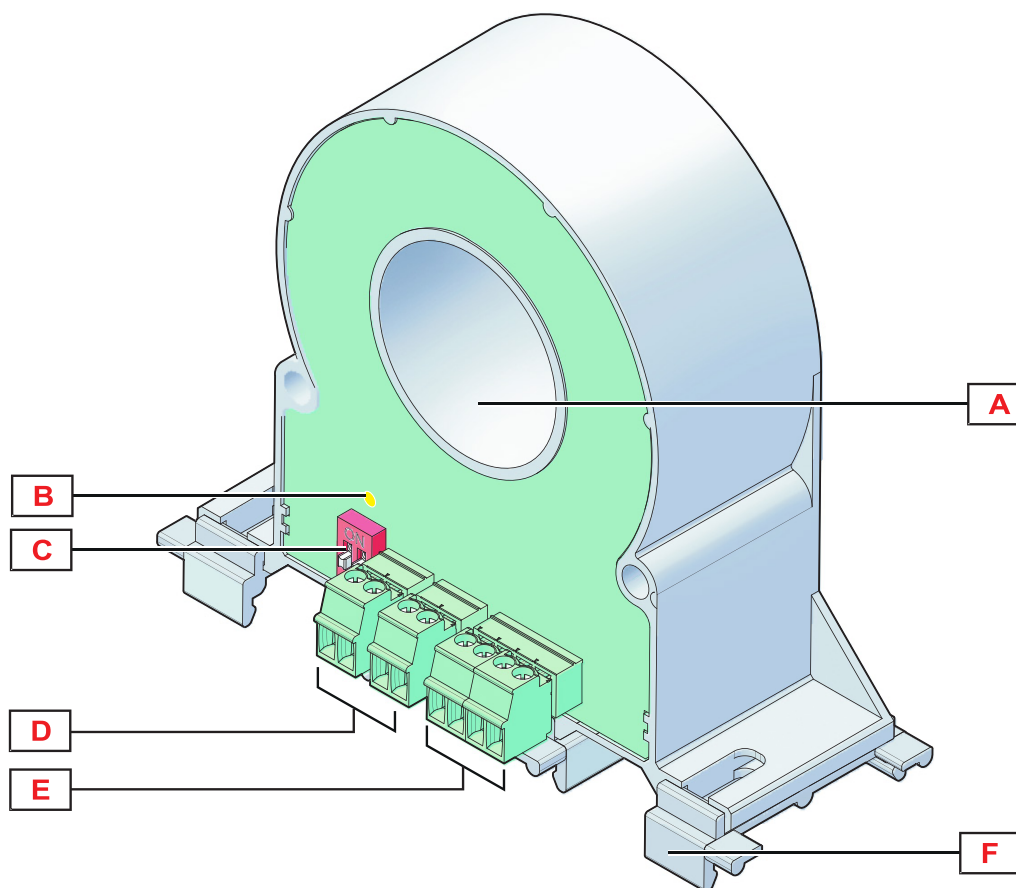
CPA300 is a power analyser for dc or ac 1-phase applications.

With a maximum current of 300 Aac/400 Adc and maximum installation voltage of 800 Vac/1000 Vdc, it is the ideal solution for monitoring medium/large PV installations, industrial processes, battery charging systems.

## Applications

CPA power analysers are the ideal solution for those applications which are beyond standard ac monitoring. Given their capability of working both at different frequency ranges, they match the needs of dc applications (battery charging, photovoltaic monitoring), of ac applications with high crest factor (UPS, variable frequency drives) and standard 1-phase ac installations.

## Structure

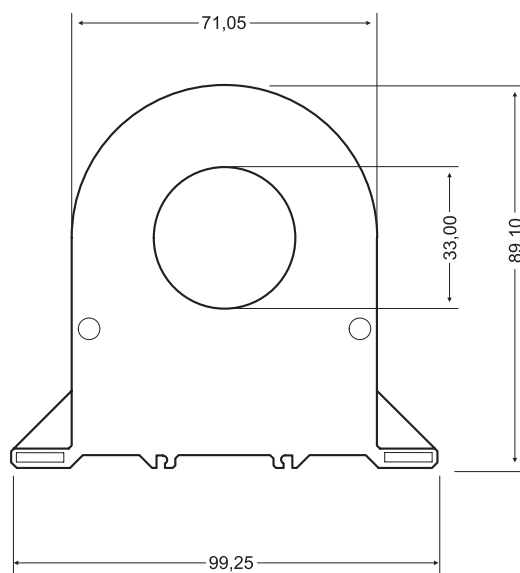


| Element | Component   |
|---------|---|
| A       | Hall sensor hole for current sensing  |
| B       | <b>LED.</b><br>Hidden: power off<br>Steady: power on<br>Blinking: data communication on |
| C       | DIP switch for RS485 parameters set-up  |
| D       | Screw terminals for voltage input connection  |
| E       | Screw terminals for serial communication and power supply                               |
| F       | Hooks for DIN rail mounting   |

## Features

### General

|                             |  |
|-----------------------------|--|
| <b>Material</b>             | PBT (Filling epoxy resin)  |
| <b>Assembly</b>             | Screw grooves for vertical or horizontal panel mounting.<br>Clips included for vertical or horizontal DIN rail mounting. |
| <b>Protection degree</b>    | IP20   |
| <b>Weight</b>               | 370 g  |
| <b>Terminals</b>            | Detachable screw terminals.  |
| <b>Overvoltage category</b> | Up to 600V Cat. III<br>Up to 1000V Cat. II   |
| <b>Rejection (CMRR)</b>     | 100 dB, 48 to 62 Hz  |



### Power Supply

|                     |          |
|---------------------|----------|
| <b>Power supply</b> | 9-30 Vdc |
| <b>Consumption</b>  | <1.3 W   |

### Environmental

|                                     |                                    |
|-------------------------------------|------------------------------------|
| <b>Working temperature</b>          | -15° C to 65° C (5° F to 149° F)   |
| <b>Assembly Storage temperature</b> | -40° C to 85° C (-40° F to 185° F) |

Note: R.H. < 90% non-condensing @ 40°C (104°F)

## Compatibility and conformity

|   |   |
|---|---|
| Electromagnetic compatibility (EMC) - immunity  | EN61000-6-2   |
| Electromagnetic compatibility (EMC) - emissions | EN61000-6-4   |
| Safety  | EN61010-1   |
| Approvals                                       |  |

## Inputs

| Current input      |                                     |
|--------------------|-------------------------------------|
| System type        | 1-phase ac/dc                       |
| Rated current (In) | 300 A ac/400 A dc                   |
| Crest factor       | 1.4                                 |
| Coupling type      | Built-in Hall effect current sensor |
| Cable max diameter | 32 mm                               |
| Transformer ratio  | 1.0 default (customizable)          |

| Voltage input      |                            |
|--------------------|----------------------------|
| System type        | 1-phase ac/dc              |
| Rated Voltage (Un) | 800 Vac<br>1000 Vdc        |
| Rated frequency    | 0.001-400 Hz or dc         |
| Impedance          | 1 M $\Omega$ $\pm$ 1%      |
| Transformer ratio  | 1.0 default (customizable) |

## Measurements

|                     |  |
|---------------------|--|
| Variables           | Available via RS485 Modbus: A, A max, A min, A peak, V, V max, V min, V peak, W, W min, W max, var, var min, var max, VA, VA min, VA max, Hz, PF, PF min, PF max, +/- kWh, THD A, THD A min, THD A max |
| Method              | Selectable (True RMS or dc measurements)   |
| Sampling rate       | 11000 samples/s  |
| Measurement refresh | Programmable:<br>Default: every 50 cycles (ac) or 1 second (dc)  |
| Harmonic analysis   | Up to the 40 <sup>th</sup> harmonic  |

## Accuracy

|                       |   |
|-----------------------|---|
| Current               | < 0.5% F.S.   |
| Phase-neutral voltage | < 0.5% F.S.   |
| Phase-phase voltage   | < 0.5% F.S.   |
| Frequency             | +/- 0.1 Hz  |
| Active power          | < 0.5% F.S.   |
| Reactive power        | < 1.5% F.S.   |
| Apparent power        | From 0.1 In to In: +/- 1% rdg<br>From 0.05 In to 0.1 In: +/- 2% rdg |
| THD A                 | +/- 1%  |

## RS485

|                    |  |
|--------------------|--|
| Communication type | Multidrop, bidirectional (static and dynamic variables)  |
| Protocol           | Modbus RTU   |
| Address            | 1-247  |
| Data               | Dynamic: System and phase variables (only reading)<br>Static: all configuration parameters (reading and writing) |
| Data format        | 1 start bit, 8 data bits, Parity (None/ Odd/ Even), 1 stop bit   |
| Baud-rate          | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps  |
| Response delay     | ≤1000 ms   |

## Insulation

| Type                      | Voltage input | Current input (bare wire) | Power supply | RS485 |
|---------------------------|---------------|---------------------------|--------------|-------|
| Voltage input             | -             | 3 kV                      | 4 kV         | 4 kV  |
| Current input (bare wire) | 3 kV          | -                         | 3 kV         | 3 kV  |
| Power supply              | 4 kV          | 3 kV                      | -            | 0 V   |
| RS485                     | 4 kV          | 3 kV                      | 0 V          | -     |

## Connection Diagrams

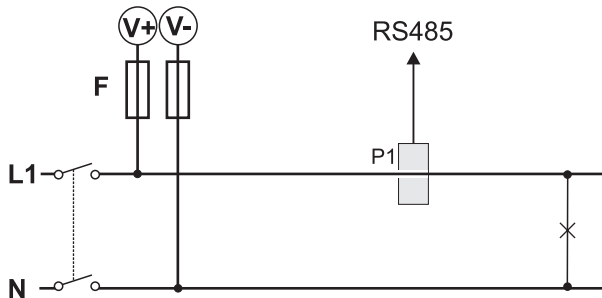


Fig. 5 ac input connection

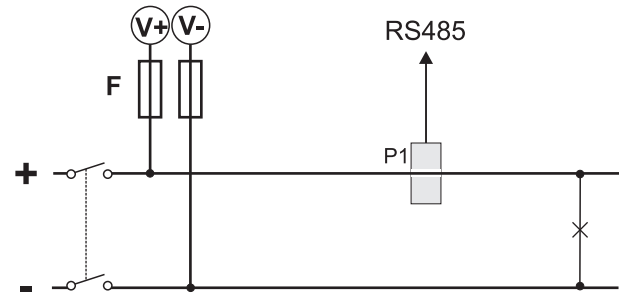


Fig. 6 dc input connection

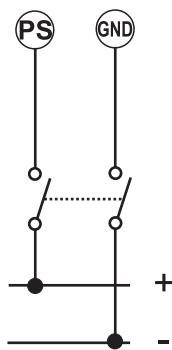


Fig. 7 Power supply

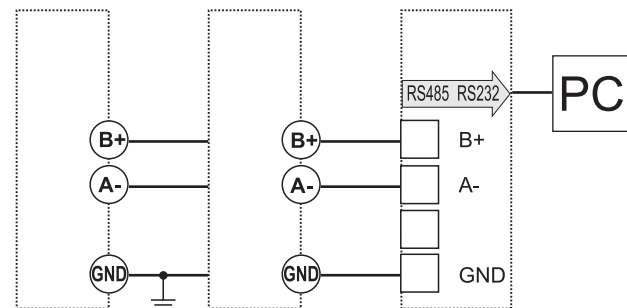


Fig. 8 RS485

### Note for RS485:

The serial output must be terminated on the last network device by means of a terminating unit according to Modbus standard; check grounding arrangements specification on the official Modbus documentation for proper grounding connections.

Please check **Multipoint System** requirements at section 3.4 of the **Modbus over serial line specification and implementation guide** available at: <http://www.modbus.org/specs.php>



## References

▶ Order code



CPA 300 1 L S1 X

▶ CARLO GAVAZZI compatible components

| Purpose             | Component name/code | Notes |
|---------------------|---------------------|-------|
| Embedded Web Server | VMU-C EM            | -     |



## Description

CPA300V is a current transducer for dc or ac 1-phase applications. With a maximum current of 300 Aac/400 Adc and maximum installation voltage of 800 Vac/ 1500 Vdc, it is the ideal solution for monitoring medium/large PV installations, industrial processes, battery charging systems.

## Applications

CPA-300V is the ideal solution for those applications in which current only monitoring is required. Thanks to its high current range, its contactless Hall effect sensing and the maximum system voltage of 1500 Vdc, it fits perfectly the needs of medium to large size photovoltaic plant monitoring, where ease of installation and operation are mandatory requirements.

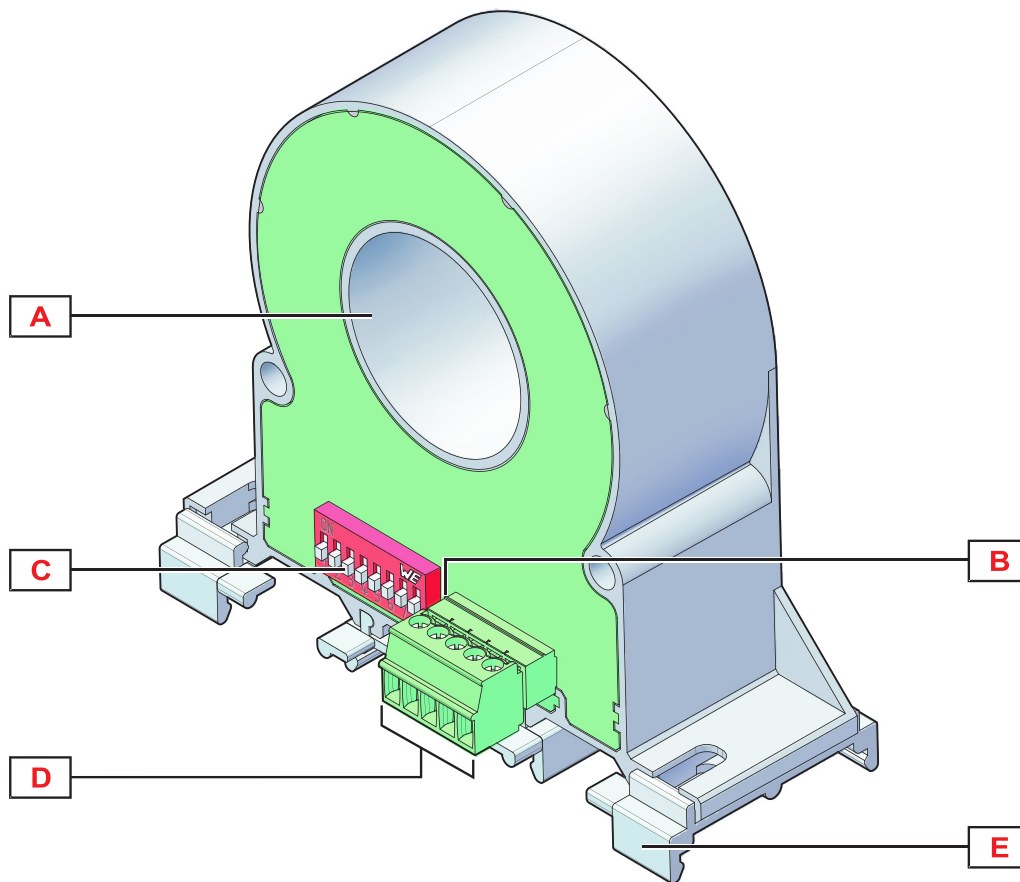
## Main features

- True RMS ac (from 1 to 400 HZ) and dc monitoring
- Current sensing by Hall effect; range: 300 Aac/400 Adc
- Maximum installation voltage: 800 Vac/1500 Vdc
- RS485 Modbus output; variables: Amax, Amin, Ah
- 33 mm hole diameter
- Din rail or panel, vertical or horizontal mounting

## Main functions

- Compatible with VMU-C EM
- Configurable by means of UCS (Universal Configuration Software) solution
- Hall effect sensing

## Structure

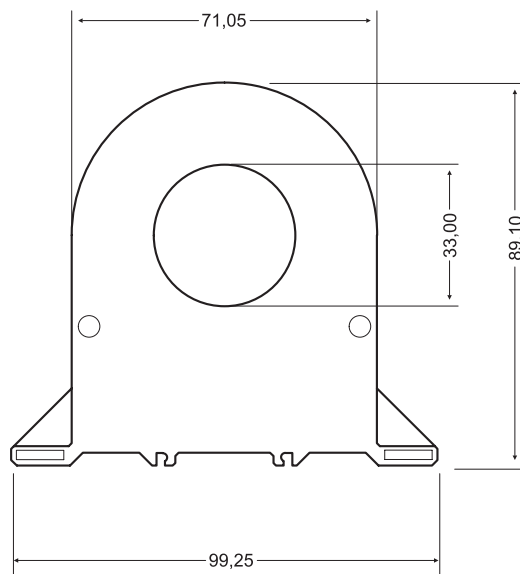


| Element | Component  |
|---------|--|
| A       | Hall sensor hole for current sensing   |
| B       | LED.<br>Hidden: power off<br>Steady: power on<br>Blinking: data communication on |
| C       | DIP switch for RS485 and measurement parameters set-up                           |
| D       | Screw terminals for serial communication, analogue output and power supply       |
| E       | Hooks for DIN rail mounting  |

## Features

### General

|                          |  |
|--------------------------|--|
| <b>Material</b>          | PTB (Filling epoxy resin)  |
| <b>Assembly</b>          | Screw grooves for vertical or horizontal panel mounting. Clips included for vertical or horizontal DIN rail mounting |
| <b>Protection degree</b> | IP20   |
| <b>Weight</b>            | 370 g  |
| <b>Terminals</b>         | Detachable screw terminals. Section: 1.5mm <sup>2</sup> / Torque: 0.25 Nm max  |
| <b>Rejection (CMRR)</b>  | 100 dB, 48 to 62 Hz  |



### Power Supply

|                     |           |
|---------------------|-----------|
| <b>Power supply</b> | 12-30 Vdc |
| <b>Consumption</b>  | < 22mA    |

### Environmental

|                                     |                                    |
|-------------------------------------|------------------------------------|
| <b>Working temperature</b>          | -15° C to 65° C (5° F to 149° F)   |
| <b>Assembly Storage temperature</b> | -40° C to 85° C (-40° F to 185° F) |

Note: R.H. < 90% non-condensing @ 40°C (104°F)

## Compatibility and conformity

|   |   |
|---|---|
| Electromagnetic compatibility (EMC) - immunity  | EN61000-6-2   |
| Electromagnetic compatibility (EMC) - emissions | EN61000-6-4   |
| Safety  | EN61010-1   |
| Approvals                                       |  |

## Inputs

| Current input      |  |
|--------------------|--|
| System type        | 1-phase ac/dc  |
| Rated current (In) | Selectable by DIP switch: 300 A ac/400 Adc or 150 Vac/ Vdc |
| Crest factor       | 1.4  |
| Coupling type      | Built-in Hall effect current sensor                        |
| Cable max diameter | 32 mm  |
| Transformer ratio  | 1.0 default (customizable)                                 |

## Outputs

| Analogue output   |                                       |
|-------------------|---------------------------------------|
| Number of outputs | 1                                     |
| Type              | 0-10 V dc                             |
| Scaling factor    | Programmable via serial communication |
| Load              | $\geq 1 \text{ k}\Omega$              |
| Response delay    | Filter +200 ms                        |

## Measurements


|                     |   |
|---------------------|---|
| Variables           | Available via RS485 Modbus: A, A max, A min, Ah |
| Method              | Selectable (True RMS or dc measurements)        |
| Sampling rate       | 11000 samples/s                                 |
| Measurement refresh | 0.1 s   |

## Accuracy

|         |                        |
|---------|------------------------|
| Current | $< 0.5\% \text{ F.S.}$ |
|---------|------------------------|


**RS485**

|                           |  |
|---------------------------|--|
| <b>Communication type</b> | Multidrop, bidirectional (static and dynamic variables)  |
| <b>Protocol</b>           | Modbus RTU   |
| <b>Address</b>            | 1-247  |
| <b>Data</b>               | Dynamic: System and phase variables (only reading)<br>Static: all configuration parameters (reading and writing) |
| <b>Data format</b>        | 1 start bit, 8 data bits, Parity (None/ Odd/ Even), 1 stop bit   |
| <b>Baud-rate</b>          | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps  |
| <b>Response delay</b>     | 1-1000 ms  |


**Insulation**

| Type                             | Current input (bare wire) | Power supply | RS485 | Analogue output |
|----------------------------------|---------------------------|--------------|-------|-----------------|
| <b>Current input (bare wire)</b> | -                         | 3 kV         | 3 kV  | 3 kV            |
| <b>Power supply</b>              | 3 kV                      | -            | 0 V   | 0 V             |
| <b>RS485</b>                     | 3 kV                      | 0 V          | -     | 0 V             |
| <b>Analogue output</b>           | 3 kV                      | 0 V          | 0 V   | -               |

## Connection Diagrams

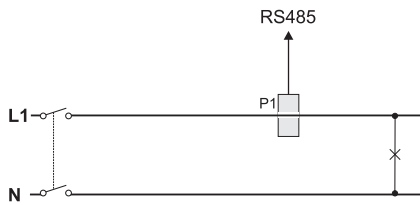


Fig. 9 ac input connection

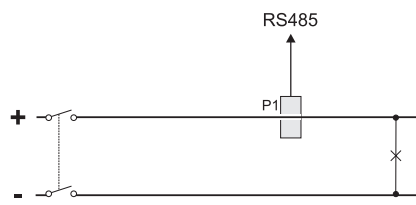


Fig. 10 dc input connection



Fig. 11 Analogue output

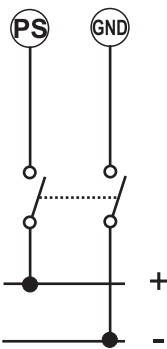


Fig. 12 Power supply

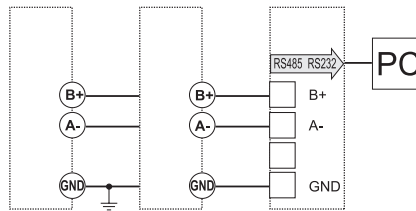


Fig. 13 RS485

### Note for RS485:

Please check **Multipoint System** requirements at section 3.4 of the **Modbus over serial line specification and implementation guide** available at: <http://www.modbus.org/specs.php>

## References

▶ Order code

 CPA 300 1 L S1 V

▶ CARLO GAVAZZI compatible components

| Purpose             | Component name/code | Notes |
|---------------------|---------------------|-------|
| Embedded Web Server | VMU-C EM            |       |



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