**Wiring**

**Attention: Make sure of the right polarity! Follow the security advice!**

Wiring and installation must follow the corresponding regulations! Check the voltage / power rating and polarity of each equipment (battery, solar modules, DC and AC loads) which is to be connected to the inverter, **before** you start with the actual connection! Their voltage / power rating have to correspond to one another! If you have any doubts – ask your local dealer. Please follow this exact order during installation:

1. Check whether the connected battery is already earthed. In that case the minus connector must be earthed since the solar-station is internally connected to earth. If that is not the case, connect the earth of the unit to the earthing point of your house. If you have no suitable earth connection available, the earthing must be done according to the corresponding regulations (e.g. earthing spear). Under no circumstances can the unit be operated without earthing because faulty units of Protection Class I may represent serious hazard to human health and life (life danger). Earthing of the neutral connection is not allowed and will destroy your unit!
2. Switch your unit off before connecting it (AUS position). The connecting symbols can be found on the unit itself.
3. Connect the battery with the appropriate cables while making sure of the right polarity. Always install a fuse directly at the battery plus terminal, according to the corresponding regulations.
4. Connect the solar modules to the screw terminals with the right polarity.
5. Connect the DC loads (if any) to the screw terminals with the right polarity.
6. Switch the unit on (EIN position). The green LED should light. If not, please check fuses and the presence of voltage from the battery.
7. Now AC loads can be connected to the output socket.
8. If you do not wish to operate AC loads at the moment, please switch the unit off again.

**Technical data:**

| Type | PC400 | | PC1000 | |
|---|---|---|---|---|
| Battery connections | | | | |
| Nominal voltage $U_{nom}$ | 12V | 24V | 12 V | 24 V |
| Input voltage range $U_{in}$ | 10,5...15V | 21...30V | 10....15 V | 20....30 V |
| Max. input current / Fuse | 60A / 2x30A | 30A / 2x15A | 120A / 4x30 A | 80A / 4x20 A |
| Typical standby consumption with inverter ON | 0,2A | 0,2A | 0,4A | 0,4A |
| Typical standby consumption with inverter OFF | 4mA | 4mA | 4mA | 4mA |
| Recommended battery $Ah_{min}$ | 80Ah | 80Ah | 120 Ah | 120 Ah |
| 230V Output | | | | |
| Output voltage | 225V +/-5% | 225V +/-5% | 225V +/- 5% | 225V +/- 5% |
| Output frequency | 50Hz +/-1% | 50Hz +/-1% | 50Hz +/-1% | 50Hz +/-1% |
| Output current continuous / peak | 1,8 / 5,4A | 1,8 / 5,4A | 4,5 / 12 A | 4,5 / 12 A |
| Max. continuous power at cos φ > 0,8 | 400VA | 400VA | 1000VA | 10000VA |
| Max. peak power at cos φ > 0,8 | 1200VA | 1200VA | 2500VA | 2500VA |
| Typ. Efficiency (at nom. load power 1000W, $U_{in} = U_{nom}$) | 88% | 90% | 94 % | 96 % |
| Deep Discharge Protection - AC Load | | | | |
| Advance warning indication | < 12,0V | < 24,0V | <11,0 V | <24,0 V |
| Switch-off threshold of DDP | 10,4V | 20,8V | 9,8V | 19,6 V |
| Reset threshold | 12,3V | 24,6V | 12,0 V | 24,0 V |
| Solar charge controller | | | | |
| Typ. standby consumption | 4mA | 4mA | 4mA | 4mA |
| Solar module input | | | | |
| Nominal current | 20A | 20A | 20A | 20A |
| Float charge limit at Tu = 25°C | 13,7V | 27,4V | 13,7V | 27,4V |
| Charge limit when Gas-control deactivated at Tu = 25°C | 14,1V | 28,2V | 14,1V | 28,2V |
| Charge limit when Gas-control active at Tu = 25°C | 14,5V | 29,0V | 14,5V | 29,0V |
| Temperature compensation with / without Gas-control | -3mV / -4mV | -3mV / -4mV | -3mV / -4mV | -3mV / -4mV |
| Deep Discharge Protection - DC Load | | | | |
| Nominal current | 20A | 20A | 20A | 20A |
| DDP Load disconnection | 11,0V | 22,0V | 11,0V | 22,0V |
| Reset threshold | 12,6V | 25,2V | 12,6V | 25,2V |
| Other data | | | | |
| Operating temperature | 0...+ 40°C | 0...+ 40°C | 0....+ 40 °C | 0....+ 40 °C |
| Dimensions (mm) | 205x250x105 | 205x250x105 | 283x350x115 | 283x350x115 |
| Weight | 3,0kg | 3,0kg | 5,5 kg | 5,5 kg |
| MC Directive | EN55011:03.91; EN50082-1:01.92 | | | |
| Low Voltage Directive | EN60335-1:09.94+A11:05.95 | | | |

Subject to alteration

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Panelectron

# INSTRUCTION MANUAL

CE

**PC400 / PC1000 – 12/24V COMBI INVERTERS**
Sinewave inverter 400/1000VA with

- Built-in 20A solar charge controller with
- Deep Discharge Protection and 20A DC load output
- Gas regulation
- Temperature compensated charging

Dear Customer,
Thank you for buying our product. You have bought one of the most powerful, most compact and most reliable sinewave Inverter of its class. Please make sure to read this manual carefully before putting the unit into operation.

**WARNING!!! Important security advice!**

- While recharging and using sealed lead-acid (Gel) batteries, the gas-control **must be deactivated**. Switch-Off! (See Factory settings)
- Only solar modules can be used as power source.
- Please follow the correct order when connecting your unit! Disconnection should be done in a reversed order (see installation).
- The unit contains an internal fuse for the positive battery connection and another one for the AC output connection. In order to avoid high current if short-circuit occurs between the unit and the battery, the positive cable must be fused (e.g. built-in fuse in the battery cable).
- Equipment which, due to its function must not be switched off by means of load disconnection, (e.g. navigation lights) **must be connected directly** to the battery and fused.
- This unit produces 230V alternating current on the output side, which is dangerous for human life and health if touched!
- This unit must be kept away from children! Should a supervised operation in a household with children not be possible, all corresponding security measures related to the mains socket are to be taken!
- The operation of an alternating current load of protection class I (unit with protection plug containing PE connection) is dependent on the earthing of the PE connection at the sinewave inverter output or the earthing of the battery minus connector. Please note that according to the regulations the cover and the PE connector are internally connected to the minus connector of the battery. Under no circumstances should the output neutral-connector be earthed!
- Please note that even when the inverter is switched off, there could be dangerous voltage on the output stored in the capacitors!
- Operation under extreme conditions must be avoided, such as: in temperatures above 40ºC, inflammable gas, solvents, vapour, dust, humidity over 80% non cond., etc.)
- The unit must be kept and operated in closed, dry area.
- As soon as you assume that safe operation of the unit is no longer possible, unplug it immediately and make sure that it cannot be switched back by somebody else. Operation has become unsafe when the unit does not show any signs of working or has been visibly damaged under transportation of after storing the unit in unfavourable conditions. Under adverse circumstances (e.g. lack of charge regulation, extremely high temperature) lead acid batteries can produce hydrogen – danger of explosion! Batteries must be stored and installed in well-ventilated areas only!
- Due to the power consumption of the unit, it is only allowed to use lead acid batteries with a minimum Ah capacity, as required in the technical specifications.
- Batteries are able to deliver high currents, which can, despite the corresponding protecting measures taken, damage equipment and cause injuries to persons. In adverse conditions short-circuit could result in heat development and consequent fire. Please observe technical specification on voltages and polarity!

**Servicing and repair**
can be conducted by authorised personnel only. Only fuses with the same rating and characteristics can be used as replacement. It is forbidden to mend the burned fuse or short-circuit the fuse-holder. Before service or fuse replacement, all equipment must be disconnected from the inverter and the inverter itself from the batteries. It is necessary to wait for an additional 3 minutes in order to avoid dangerous voltage shock from the internal capacitors.

**Operation description / appropriate usage**
The PC400 / PC1000 combi inverters join an integrated solar load regulator and a 230 V AC sinewave inverter in one unit. The unit provides the DC loads with a nominal voltage of 12V and a max. power of 240W as well as AC loads (230V AC @ 50 Hz, cos φ > 0,8) up to a max. power of 400VA / 1000VA. The 12V lead acid battery which is used as power supply will be protected against hazardous deep discharge / overcharging. The unit is designed for usage in dry room and should be installed wall-mounted. When the necessary conditions for usage are not present, it is the responsibility of the user to provide them. Generally lead-acid batteries are used in photovoltaic systems for storing energy. They must be protected from deep discharging and overcharging. This solar charge controller complies with both requirements.

**Deep discharge protection – AC and DC load disconnection**
Lead acid batteries must be protected against deep discharging; otherwise the cells will be irreversibly damaged. All loads (both AC and DC) will be switched off automatically when battery discharge voltage is reached. A new automatic load re-connection is possible only after charging the battery to an appropriate level. This is to make sure that the battery leaves the discharged status as soon as possible.

**Protection against overcharge**
Exceeding the final charging voltage leads to the formation of gas in the battery. Gassing leads to the loss of electrolyte inside the battery and can also cause the formation of detonating gas through creating hydrogen. Due to the loss of electrolyte, the plates inside the battery are not covered completely which can lead to battery damage. In case you experience gas formation, eliminate the cause of the problem (please check table for faults) and check the electrolyte level. The amount of gas depends on the temperature. The inbuilt temperature-sensor with approx. 1.5m cable automatically regulates the final charging voltage according to the temperature in area of use/operation. The battery is not fully charged when the final charging voltage is reached. The charging current is then reduced just to the level that the final charging voltage is not exceeded. The charging process - „IU-charging" recharges the batteries evenly and quickly. The „IU-charging" is achieved by a very quick temporary short-circuiting procedure on the solar module - also known as the pulse-width modulation (PWM) shunt procedure. Short-circuiting solar panels is a normal, trouble-free procedure due to the high internal resistance of the solar cells. Nevertheless other power source (external charger, DC generator. etc.) must not be connected to the solar module input terminals! When charging the battery externally, always connect your external charger directly to the battery terminals!

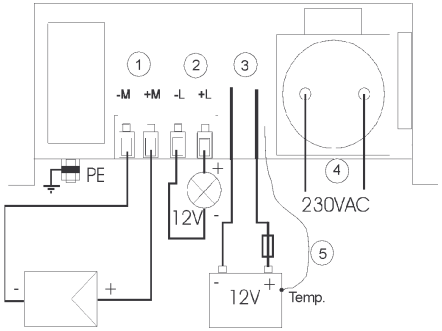
**Gas control**
An over-extended use of lead-batteries without a controlled gas-formation can lead to the development of damaging lead-sulphate layers. The Solar Charger Unit controls the gas-formation and therefore prevents the development of lead-sulphate. This process depends upon the temperature and is regulated by the in-built temperature-sensor. **Warning:** While recharging and using sealed lead-acid (Gel) batteries or while charging any batteries on boats, the gas-control **must be deactivated**. Switch-Off! (See Factory settings)

**Temperature compensation**
The in-built temperature compensator adjusts and regulates the final charging voltage and gas-formation of the batteries to the temperature in the area of use. For that reason the charge controller should be mounted in the same room as the batteries.

**Sinewave inverter**
The unit produces real sinewave at its output from which all alternating current loads (230V AC 50 Hz cos φ>0,8) within the corresponding power range can be operated. Nevertheless please note that some load devices require more power at start-up than their nominal power. Light bulbs can require 5 times more current at start-up than their nominal value. Drills and refrigerators take a much higher current at start-up than their rated power given in their manuals. There are also 230V appliances, which require a 16A fusing to get them started. Starting drills, refrigerators (with compressor), PC monitors or TVs (demagnetising coil) also requires 10 times more power than their nominal power consumption. Should disconnection due to overload repeatedly occur, please use a more powerful model with the corresponding power reserve for difficult start-ups.

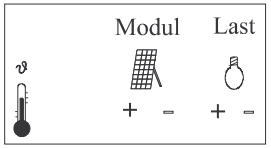
**Main switch**
The inverter can be started by the main switch, which is located on the top of the unit. If there is no load connected to the unit for a longer period, it is recommended to switch the unit off. This will save the batteries from discharging.

**Connections**

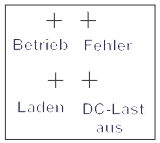



At the front panel the following connections can be found:

1) +/- Solar module terminals
2) +/- DC load terminals
3) +/- Battery cable
4) Earthed socket for 230VAC loads
5) Temperature sensor




**LED Indications**
On the top of the unit the following LED indicators can be found:




Inverter
- **"Betrieb"** (operating): the green LED shows that the inverter is switched on.
- **"Fehler"** (fault): red LED shows Warning or faulty operation of the inverter (see details in table)

Solar charge controller
- **"Laden"** (charging): green LED shows that the module input receives charging current
- **"DC Last aus"** (DC load off): red LED shows DC load disconnection

The solar charge controller has an internal 20A fuse. **Warning:** Should the terminals be reverse polarity connected to the load output, can even <20A fused units be completely damaged. Each system component must be individually fused.

**Factory settings**
The solar charge controller is factory-set the following way: Gas control activated, (see operating description) this function can be deactivated if requested. **Warning:** when charging Lead-gel batteries the gas control function must always be deactivated. Please deactivate this function the following way:

**Gas control de-activate**
1. Remove the cover screws and carefully remove cover. Make sure that the cable connecting the LEDs to the PCB will not break.
2. Disconnect the jumper JP1 situated to the right of the red LED. The gas-control is now de-activated.

**Temperature sensor**
Should be attached directly on the battery case (with a strip of tape, etc)

**Battery fully loaded**
Both LEDs of the charge controller indicate the charge level of the batteries, the actual charging status of the solar cells and possible system faults. In charging status (light falls upon the solar panels) the green LED lights.

**Protection against deep discharge - "DC Last aus" (red LED)**
When battery deep discharging occurs, all DC loads are automatically switched off and the red LED (DC Last aus) lights. When the battery is recharged, the LED stops illuminating and the DC loads are automatically re-connected. Now the battery is ready to supply power again.

**Fault table**

**The Solar System fails to function - possible reasons.**
Battery terminals are reverse connected: The fuse has blown, replace with a same type.
Module terminals are reverse connected: Avoid at all costs!!!
Load terminals are reverse connected: The equipment can be seriously damaged before the fuse blows. Batteries contain considerable amounts of electrical energy. A short-circuit can result in a large build-up of heat leading to FIRE!

**LED Indications – charge controller**

| „Laden" (Charging) green LED | "DC Last aus" (DC load off) red LED | During the day | During the night | Instructions and Remarks |
|---|---|---|---|---|
| 1 OFF | OFF | | No charging current | Deep discharge protection not activated |
| | | No charging current | | Module terminals reverse connected; load short-circuited. |
| | | Check slim-line fuse | Check slim-line fuse | Replace slim-line fuse |
| | | | Load does not work, although fuse is OK | Solar Charger Unit faulty |
| 2 ON | OFF | Charger current, battery being charged | | Green LED intensity reduces as full status is being reached |
| | | | Green LED lights bright | Solar Charger Unit faulty |
| 3 OFF | ON | | Battery deep -discharged | Load is disconnected |
| | | No charging current | | Check terminals and fuses |
| 4 ON | ON | Battery is deep discharged; charging current present | | Load reconnects automatically after reaching reset voltage |

**LED Indications – inverter**

| „Betrieb" (operating) green LED | „Fehler" (fault) red LED | Status |
|---|---|---|
| ON | OFF | Unit in operation. Everything is O.K. |
| ON | Flashing | The unit is temporarily overloaded. This operating status is limited in time. |
| OFF | Flashing | The unit has switched off due to impermissible overload. The unit will automatically switch back to ready status after a certain waiting time. |
| ON | ON | Advance warning to deep discharging.<br>The battery voltage has dropped below the deep discharge threshold but the discharge end voltage not yet reached. |
| OFF | Flashing | The battery voltage has dropped below the discharge end voltage and the loads were disconnected.<br>The unit will switch back only after the battery voltage reaches the switch-back threshold. |
| OFF | OFF | The unit is off. If the main switch is in ON position, either there is no voltage connected or the fuse is blown. |

**Installation**
Corresponding to its protection class, the unit must be mounted not far from the battery. Battery area must be ventilated according to the regulations. The unit must not be mounted directly above any heat source or on inflammable material. The free space must be > 100 mm above and below the unit.

In order to get the best performance out of the unit, please mount it on a vertical area with the output socket facing downwards or upwards. This position will allow the best ventilation for your inverter and it should be mounted this way whenever it is possible. Otherwise the unit might not be run at full load for too long, the internal overheating sensor switches the unit off temporarily.