Leading Conversion Technology for Power Resilience

e-one 10 - 48/230

User Manual V1.2

BEYOND THE INVERTER

THE NEW GENERATION OF POWER CONVERTERS

- EASY TO INSTALL
- COMPACT DESIGN
- HIGH EFFICIENCY
- WIDE OPERATING TEMPERATURE RANGE
- SHORT DEPTH ALLOWS 300 MM RACK INTEGRATION

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Leading Conversion Technology for Power Resilience

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Release Note:

Version	Release date (DD/MM/YYYY)	Modified page number	Modifications
1.0	27/06/2018	-	First release of the Manual
1.1	07/12/2018	-	Amendment and correction
1.2	21/11/2019	-	New layout

1. CE+T at a glance

CE+T Power designs, manufactures and markets a range of products for industrial operators with mission critical applications, who are not satisfied with existing AC backup systems performances, and related maintenance costs.

Our product is an innovative AC backup solution that unlike most used UPS's

- Maximizes the operator's applications uptime;
- Operates with lowest OPEX;
- Provides best protection to disturbances;
- Optimizes footprint.

Our systems are:

- Modular
- Truly redundant
- Highly efficient
- Maintenance free
- Battery friendly

CE+T power puts 60+ years expertise in power conversion together with worldwide presence to provide customized solutions and extended service 24/7 - 365

2. Abbreviations

REG	Regular
DSP	Digital Signal Processor
AC	Alternating current
DC	Direct current
ESD	Electro Static Discharge
MET	Main Earth Terminal
USB	Universal Serial Bus
PE	Protective Earth (also called Main Protective Conductor)
N	Neutral
PCB	Printed Circuit Board

3. Warranty and Safety Conditions*

WARNING:

The electronics in the power supply system are designed for an indoor, clean environment.

When installed in dusty and/or corrosive environment, outdoor or indoor, it is important to:

- Install an appropriate filter on the enclosure door, or on the room's air control system.
- Keep the enclosure door closed during operation.
- Replace the filters on a regular basis.

Important Safety Instructions and Save these Instructions.

- The inverter system/rack can reach hazardous leakage currents. Earthing must be carried out prior energizing the system. Earthing shall be made according to local regulations.
- Prior to any work conducted to a system/unit make sure that AC input voltage and DC input voltage is disconnected.
- CAUTION – Risk of electric shock. Capacitors store hazardous energy. Do not remove cover until 5 minutes after disconnecting all sources of supply.
- CAUTION – Disconnection of the DC source is required to de-energize this unit before servicing.
- Maximum operating ambient temperature is 40º C (104º F).
- AC and DC circuits shall be terminated with no voltage / power applied.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.
- Warning labels must not be removed.
- Never wear metallic objects such as rings, watches, bracelets during installation, service and maintenance of the product.
- Insulated tools must be used at all times when working with live systems.
- When handling the system/units pay attention to sharp edges.
- ESD Strap must be worn when handling PCBs and open units.
- The inverter system/rack is not supplied with internal disconnect devises on input nor output.
- REG systems can be seen as independent power sources.
- In case of output short circuit, the inverter must disconnect in maximum 15 seconds. However, an external protection must be provided in order that the short circuit protection operates within 15 seconds.
- The equipment must be installed and commissioned by skilled technicians according to instructions in this manual.
- Local regulations must be adhered.

* These instructions are valid for most CE+T Products/Systems. Some points might however not be valid for the product described in this manual.

- The manufacturer declines all responsibilities if equipment is not installed, used or operated according to the instructions herein by skilled technicians according to local safety regulations.
- Warranty does not apply if the product is not installed, used and handled according to the instructions in the manuals.
- CE+T cannot be held responsible for disposal of the Inverter system and therefore the customer must segregate and dispose the materials which are potentially harmful to the environment, in accordance with the local regulations in force in the country of installation.
- If the equipment is dismantled, to dispose of the products it consists of, you must stick to the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.
- System is designed for installation in an IP20 environment. When installed in a dusty or humid environment, appropriate measures (air filtering) must be taken.

3.1 Handling

- The cabinet shall not be lifted using lifting eyes.
- Remove weight from the cabinet by unplugging the inverters. Mark inverters clearly with shelf and position for correct. This is especially important in three phase configurations.
- Empty inverter positions must not be left open. Replace with module or cover.

3.2 Surge and transients

The mains (AC) supply of the modular inverter system shall be fitted with suitable Lightning surge suppression and Transient voltage surge suppression for the application at hand. Manufacturer's recommendations of installation shall be adhered. It is advisory to select device with alarm relay for function failure.

Indoor sites are considered to have a working lightning surge suppression device in service.

- Indoor sites: Min Class II.
- Outdoor sites: Min Class I + Class II or combined Class I+II.

3.3 Other

- Isolation test must not be performed without instructions from the manufacturer.

To download the latest documentation and software, please visit our website at www.cet-power.com

4. Description

e-one 10 - 48/230 is a compact inverter providing a pure sine wave 230 V AC supply from 48 V DC input. Additionally AC input is featured for bypass operation.

e-one 10 - 48/230 comes with a IEC Socket at front and protected with a fuse.

e-one 10 - 48/230 - front view

4.1 Typical load

- Resistive
- Inductive and resistive
- Capacitive and resistive
- Non linear load with a maximum crest factor of 2.5 : 1

4.2 Module Specifications:

General	
Part number	T551730201
Cooling / Audible noise	Forced cooling with FAN speed control / < 65 dBA at 1 meter
MTBF	200 000 hrs
Peak Efficiency DC/AC	91%
Dielectric strength DC/AC	4300 Vdc
RoHS	Compliant
Vibration	GR63 office vibration 0 to 100 hz-0.1 g / transport vibration 5-100 Hz 0.5 g 100 to 500 hz-1.5 g / Drop test
Altitude above sea without de-rating	< 1500 m / derating > 1500 m – 0.8 % per 100 m
Ambient / storage temperature / relative humidity	-20 to 65° C / -40 to 70° C / 95 %, non-condensing Derating from 50° C to 65° C
Material (casing)	Coated steel
AC Output Power	
Nominal Output power (VA) / (W)	1000 VA / 800 W
Short time overload capacity	150 % (15 seconds) within T° range
Admissible load power factor	0 lagging to 0 leading

DC Input Specifications	
Nominal voltage (DC)	48 V
Voltage range (DC)	40 - 60 V
Nominal current at 800 W / 48 VDC	19 A
Maximum input current (for 15 seconds) / voltage ripple	28 A / 2 mV psopho @ 48 V - 80% LOAD
AC Input Specifications	
Nominal voltage (AC)	230 V
Nominal frequency	Separate part number for 50 Hz and 60 Hz
Voltage range	207 - 253 Vac
Frequency range	50 Hz (range 47 – 53 Hz) / 60 Hz (range 57 – 63 Hz)
AC Output Specifications*	
Nominal voltage (AC)	230 V
Frequency / frequency accuracy	Separate part number for 50 Hz / ± 0.1% and 60 Hz / ± 0.1%
Total harmonic distortion (resistive load)	< 3 %
Turn on delay	20 s
Nominal current. Protected against reverse current	4.35 A at 230 VAC
Crest factor at nominal power	2.5 : 1
With short circuit management and protection	> 9A (2xIn) for 15 s and then no output power from module
Transfer time from DC mode to By-pass mode and vice-versa	< 10 ms
Signaling & Supervision	
Display	Front LED
Alarms output / supervision	Dry contact on the front
Remote ON / OFF	On the front
Standard Compliances	
Standards	IEC60950
	ETS 300 386 – 2 : 2mV
	EN 55022 Class A Radiated and Conducted
	ETS 300 132 – 2 : Product Standard
	IEC 61000-3-2 harmonic current class A
	EN61000-4-2 ESD criteria A - 15 kV Air and 8 kV contact
	EN61000-4-3 RF Field – Enclosure Port criteria A : 10 V/m
	EN61000-4-4 Burst - All ports criteria A : 2kV
	EN61000-4-5 Surge criteria B all ports
	EN61000-4-6 class A criteria A 10V

* This specification is valid for DC mode only. In By-pass mode, the output will be same as AC input.

5. Installation

e-one 10 - 48/230 is designed for installation in an IP20 environment. When installed in a dusty or humid environment, appropriate measures should be taken.

The module is foreseen to be recessed into an electrical cabinet of 19" and 1U height standard or wall mounted. Product weight is 7 lbs (3.2 kg).

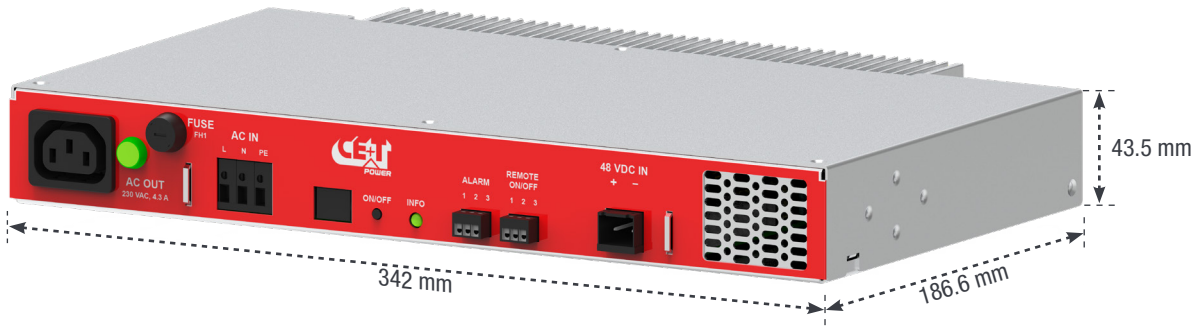
5.1 Accessories

The following accessories are present inside the e-one 10 - 48/230 packaging box.

S.No	Accessories	Quantity
1	6.3 A Fuse	1
2	Ferrite core	1
3	IEC Male plug	1
4	Connectors (DC, Alarm & Remote ON/OFF)	3
5	Rack clamps for 19" shelf	2
6	Wall clamps	2
7	M6 - cage nuts, screws, spring and flat washers	4 sets
8	M3 Screws	8

Note: The L clamp for 19" cabinet of **depth 80 mm** is available and it can be ordered separately. The part number of this clamp is T559000005.

5.2 e-one 10 - 48/230 dimensions

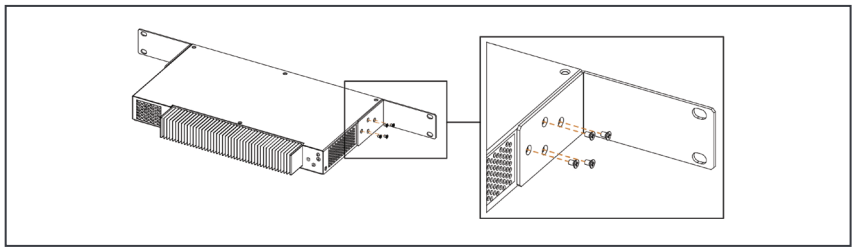


5.3 Mounting kits

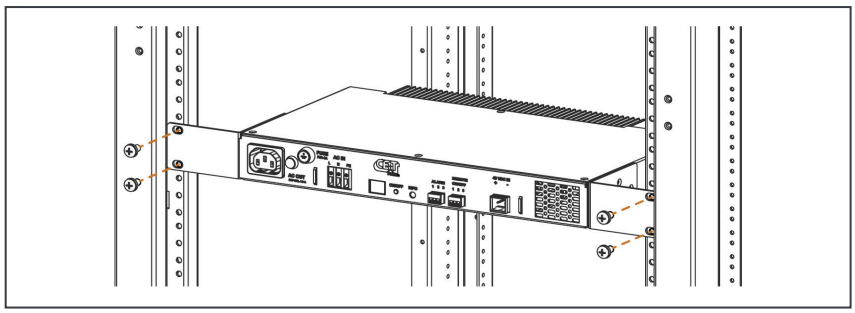
Make sure that you have received the right accessories for e-one which consist of L Clamp's and Screws.

5.3.1 Rack mounting in 19" cabinet

Step A: Fix the brackets on both sides of the e-one module with M3 screws.

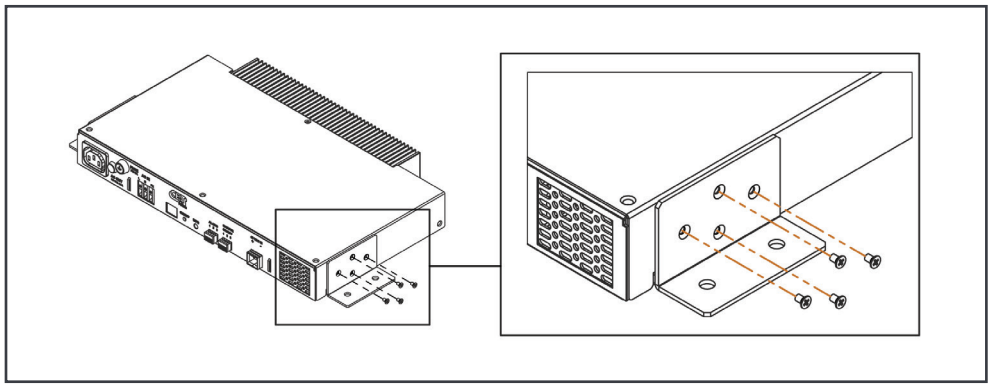


Step B: Place the e-one module inside the 19" cabinet horizontally and fix with M6 screws.

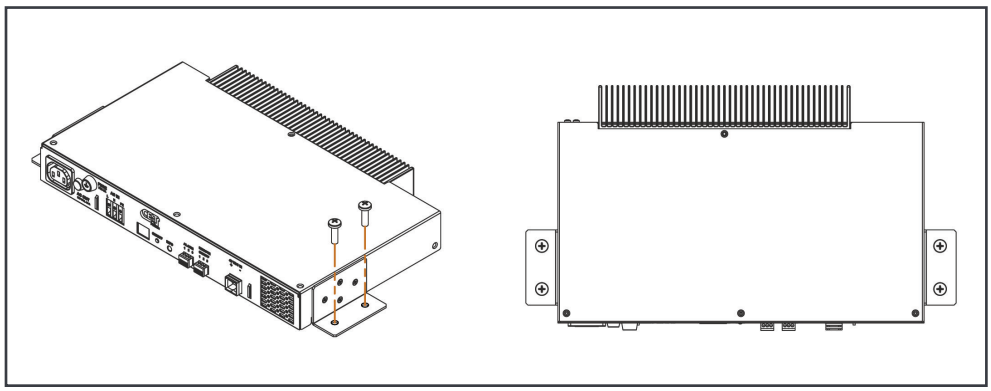


5.3.2 Wall mounting

Step A: Fix the brackets on both sides of the e-one module with M3 screws.



Step B: Place the e-one module on the wall and fix with the screws.



5.4 Wiring

The insulation cover of conductors must meet the local and international standards and the cross section must be related to the upstream protections.

Caution:

The e-one has internal fuses on DC input.

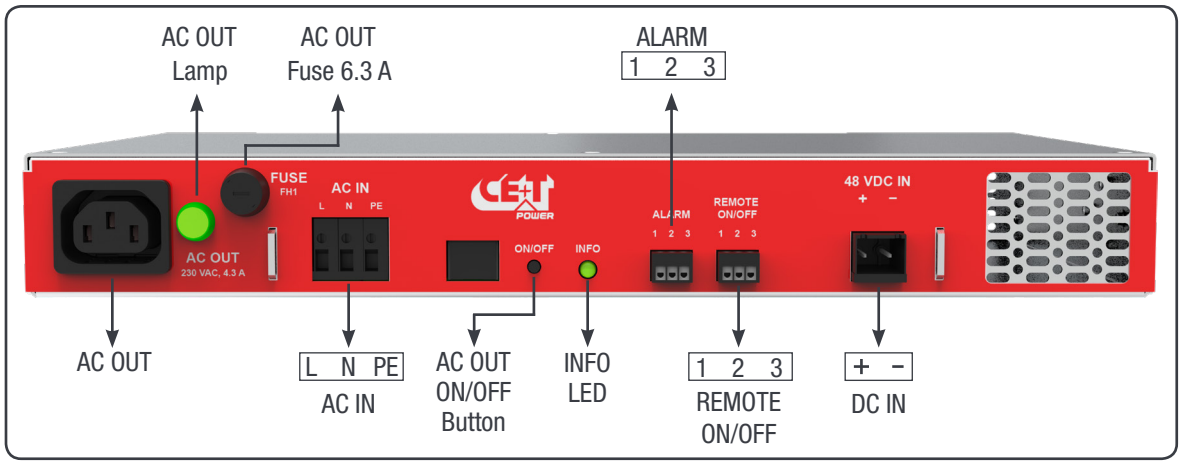
Those device do not protect the upstream cables connected to DC and AC inputs and upstream breakers or fuses shall be set up in accordance with DC and AC wires ratings, to meet the local national electrical code standard.

All breakers, cables and wires should be classified for min 90°C (194°F) operation. Matching respectively Line / Neutral feeder to Line / neutral input connections is required.

Before any intervention on the e-one input, operator has to make sure that power is switched off on DC leads and AC input mains.

Some safety labels are stuck on the unit. It should not be removed.

5.4.1 e-one 10 - 48/230 - Front view



In e-one 10 - 48/230:

- DC and AC conductors connected to screw terminals must be tied with torque between 1.2 and 1.5 Nm.
- Ground conductors connected to copper plates with bolts must be tied with torque between 5 and 7 Nm.

5.4.2 Disconnecting and protecting devices

5.4.2.1 DC input connection

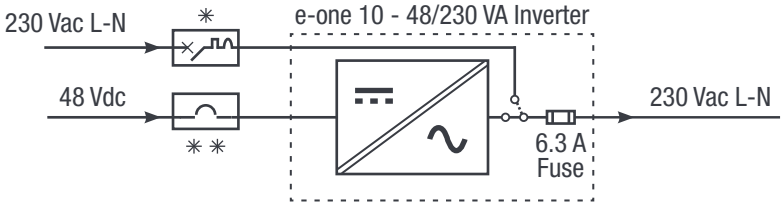
Integrator must provide branch circuit protection with breaking capacity related to short circuit capacity of upstream DC source.

- DC Breaker must be installed close enough to permit easy “Break Before Make”.
- Appropriate type can be chosen within the table here below.
- e-one is supplied with safety labels, which must be applied to the breaker in a visible way.

The insulation cover of connecting cables must meet the local and international standards and the cross section related to the upstream protections.

	**Model**	**DC input current at 40 VDC**	**DC breaker**	**Cable size**	**Max size**
	e-one 10 - 48/230	22 A*	25 A	4 mm²	1 x 6 mm² per pole

* Recommended upstream protection: minimum 30 A



✳ *AC input protection is mandatory and recommended minimum 10 Amps (Not Included).*

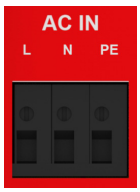
✳✳ *DC input protection is mandatory and recommended minimum 30 Amps (Not Included).*

The +DC 48V supply could be earthed or work in float mode.

Adapt the breaking capacity of your breaker in relation to your installation (length cable, battery capacity).

5.4.2.2 AC Input Connection

By default e-one by pass model is designed to operate in DC input. If DC input is not available the load is directly transferred to AC input mains.



Model	Iin @ 230 Vac	Cable size
e-one 10 - 48/230	4.35 A	1.5 mm²

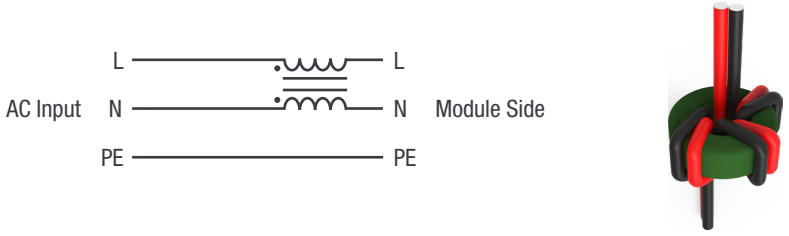
Icc value measured as 10 Arms per unit.

5.4.2.4 Ferrite core connection.

Wind 4 turn of AC input phase and neutral on supply through ferrite core as shown in below image.

Also the core should be near to the module.

Tube Ferrite: 22.3 x 10.3 x 10.3 AL = 20.5uH +/- 30% VNF EMC “TDG TS13 (T22 x 10 x 10)”



5.4.2.5 AC output distribution

The e-one unit has 1 x IEC Socket on output.

Caution:

Prior to any interventions on AC output make sure DC and AC inputs are disconnected.

Prior any handling of the e-one unit, wait at least five minutes for complete discharge of internal energized capacitors.

Output on socket

	Model	Iout @ 230 Vac	Cable size
	e-one 10 - 48/230	4.35 A	1.5 mm²

Output socket is protected by a fuse.

Output Short-Circuit

REG Mode

On output short-circuit, the e-one will push > 9 A (2 x In) ac current through the output terminals for 15 seconds with slow RED-Blinking indication and then stop the output permanently with a continuous RED indication and Major Alarm is generated. So, the module stops after 15 seconds of short-circuit.

Bypass Mode

Short circuit is protected by AC output Fuse.

5.4.2.6 Replacing Fuse

In-case of fuse failure, perform the following steps to replace fuse.

Fuse Details:

Manufacturer	Manufacturer Part Number	Current Rating	Voltage Rating AC	Fuse Size/Group
Schurter	0034.3125	6.3 A	250 Vac	5 mm x 20 mm

Fuse will be present at front left side of the system.

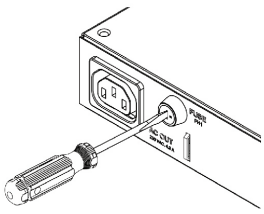
Step 1. By using the Flat Screw Driver gently turn the Fuse holder to 45° in anti clock wise direction. The Fuse Holder automatically ejects from the slot. (Fuse holder will not go beyond 45°).

Step 2. Remove the Fuse holder from the slot.

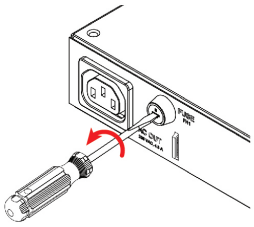
Step 3. Replace the appropriate new Fuse in the holder.

Step 4. Place the Fuse with holder in the slot.

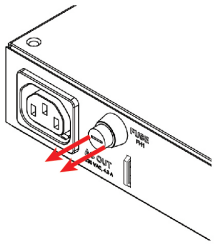
Step 5. By using the Flat Screw Driver gently push and turn the Fuse holder to 45° in clock wise direction. Make sure Fuse holder is locked.



1) Place the Screw Driver



2) Rotate 45° in anti-clock wise direction



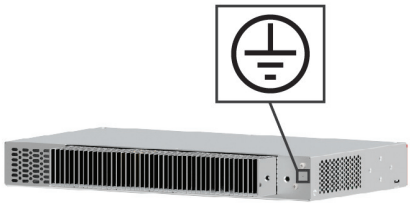
3) Remove the fuse

Warning: Risk of electric shock, do not replace the fuse in system running condition.

5.4.3 Grounding

Earth connection must be done to the PE point referenced with symbol ⏚.

Input ground must be connected to the appropriate terminal.



Caution:
Current leakages can reach hazardous values.
For your personal, SAFETY earth connections must be done before energizing the system.

5.4.4 Remote Monitoring and Control

5.4.4.1 Alarm Connector

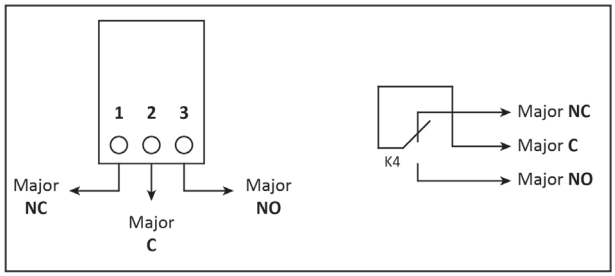
There is one free potential changeover contact provided. Maximum wire size is 0.5 mm². It can be used for Alarm indication purposes. It has one Major Alarm relay.

N.B. : relays are energized while idle (i.e. relays de-energized when event occur).

MAJOR relay provide an open or close free potential contact

Relay characteristics:

- Maximum switching capacity: 1 A @ 60 VDC
- Maximum switching power: 30 W



5.4.4.2 Remote ON/OFF

e-one 10 - 48/230 system can be remotely activated or stopped (stand-by mode).

Changeover contacts must be used.

To turn off the Inverter remotely, both conditions “Pin 1-3, Closed” and “Pin 2-3, Open” must be met.

The voltage present on terminal 1 and 3 is +5 V (galvanically insulated). Care should be taken to avoid connecting any external voltage on terminal 1 to 3. Maximum wire size is 1 mm²

Functional table for remote ON/OFF function

States	Pin 1-3	Pin 2-3	System status
1	Open	Open	System working normally
2	Closed	Open	Output switched OFF LED OFF
3	Open	Closed	System working normally
4	Closed	Closed	System working normally

The 3 wires must be used for the redundancy on the remote ON/OFF. Use NO/NC relay contact.

Warning: If remote ON/OFF is not used, pin 2 and 3 MUST be bridged together!

6. Getting started

6.1 Starting procedure

1. Check the DC and AC power supply (within range).
2. Turn on the DC breaker to the module. (Wait at least 30 seconds until INFO LED turns solid green)
3. Check AC output voltage at IEC socket
4. Apply the AC input power to the module (For Bypass)

6.2 LED and Lamp status

e-one 10 - 48/230 module indicate its functional status through module front **INFO** LED and **AC OUT** Lamp.

6.2.1 LED Indications - Alarm status

There is one LED at front for input and output status

S. NO	INFO LED	Description	Alarm
1	OFF	No inverter output	✓
2	Permanent GREEN	Inverter working fine	-
3	Fast - Blinking GREEN	DC source is out of range	✓
4	Blinking ORANGE	Output Power / VA Derating / Temperature Derating	-
5	Slow - Blinking RED	Inverter output short-circuited	-
6	Fast - Blinking RED	Module over-temperature and output OFF	✓
7	Permanent RED	Inverter output OFF due to permanent short-circuit	✓
8	Blinking RED - ORANGE	Inverter output voltage is out of range	-
9	Blinking RED - GREEN	Inverter output OFF (Load transfer to BYPASS) Due to Load power too High	✓
10	Slow - Blinking GREEN	AC Input - Unavailable / Out-of-range	-
11	Permanent ORANGE	Inverter overloaded output unavailable (Load transfer to BYPASS)	✓

6.2.2 Lamp Status

S. NO	AC OUT Lamp	Description
1	ON	Voltage present at output terminal
2	OFF	Voltage is not present at output terminal

7. Finishing

- Make sure that the inverter is properly fixed to the cabinet.
- Make sure that the inverter is connected to Ground.
- Make sure that all DC & AC input and AC output breakers are switched OFF.
- Make sure that all breakers and cables are according to recommendations and local regulations.
- Make sure that all cables are strain relieved.
- Make sure that DC IN polarity is according to marking.
- Make sure that AC IN phase and neutral connections are according to marking
- Re tighten all electrical terminations.
- Switch ON DC breaker.

8. Disassembly & Disposal

8.1 Disassembly

Switch off the upstream and downstream protective elements to stop the function of Inverter system.

- Disconnect the wires from the terminals.
- Ensure that all the cables (including PE, communication, etc) are removed.
- Check that all the cables are moved away from the system.
- Unscrew the system from the mounting position.
- Dismantle the system completely and segregate the materials.
    - Enclosure & accessories.
    - Cables.
    - Wound components.
    - PCBA etc.

8.2 Disposal

CE+T cannot be held responsible for disposal of the Inverter system and therefore the customer must segregate and dispose the materials which are potentially harmful to the environment, in accordance with the local regulations in force in the country of installation.

If the equipment is dismantled, to dispose of the products it consists of, you must stick to the local regulations in force in the country of destination and in any case avoid causing any kind of pollution.

9. Commissioning

The DC breaker is a protection device. When modules are plugged in a system please make sure the corresponding DC breaker is engaged in the ON position. Failure to observe this rules will result not to have all module operating when running on DC.

Installation and commissioning must be done and conducted by trained people fully authorized to act on installation.

It is prohibited to perform any isolation test without instruction from manufacturer.

Equipments are not covered by warranty if procedures are not respected.

9.1 Check list

DATA	
Date	
Performed by	
Site	
Inverter serial number	
ACTION	**OK/ N.OK**
Check the DC power supply and switch ON the DC breakers	
Check if inverters are working properly (INFO LED Green)	
Check if inverter is working in By pass mode	
Check output voltage	
Check if system has no alarm	
Switch OFF system	
Test on load (if available)	

10. Trouble shooting

Inverter does not power up:	Check the DC terminals are properly connected and also ensure the polarity.
	Check DC input is in range and DC breaker is switched ON (DC breakers)
	Check for loose terminations
Inverter does not start:	Check front ON/OFF button and Remote ON/OFF terminal
Inverter only run on AC or DC:	Check the Voltage range for DC or AC and AC Frequency range
No output power:	Check the front AC Output Fuse

11. Maintenance

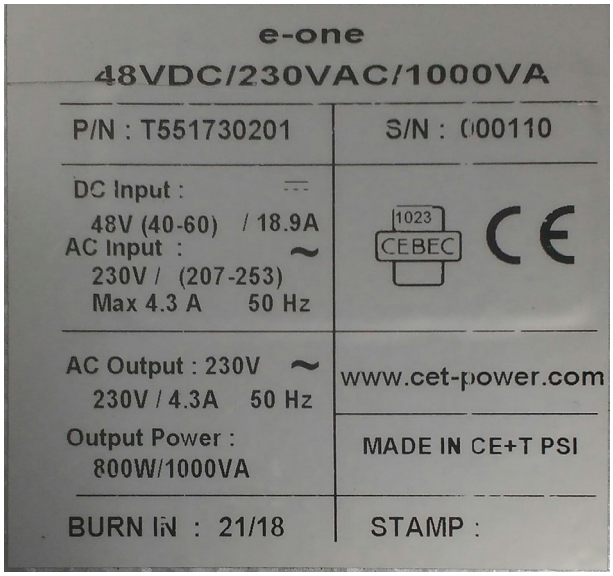
Maintenance shall only be performed by properly trained people.

11.1 Manual check

- Measure input voltage (DC input, AC output) with multi-meter
- Replace dust filter (if present)
- Take a snap shot of the inverter

12. Defective modules

- A repair request should follow the regular logistics chain:
  End-user => Distributor => CE+T Power.
- Before returning a defective product, a RMA number must be requested through the http://my.cet-power.com extranet. Repair registering guidelines may be requested by email at repair@cet-power.com.
- The RMA number should be mentioned on all shipping documents related to the repair.
- Be aware that products shipped back to CE+T Power without being registered first will not be treated with high priority! (Label shown here is only for representation)



13. Appendix

13.1 Electrical Layout