

TSI BRAVO - 125 VDC

User Manual V7.0

BEYOND THE INVERTER

THE NEW GENERATION OF POWER CONVERTERS

- » **DUAL INPUT INVERTER**
The Commercial Power as default source
- » **AC BACKUP IN A DC ENVIRONMENT**
Leverage your existing DC infrastructure
- » **ONE STOP SHOP**
wide output power range
- » **HARSHEST AC INPUT CONDITIONS**
Without compromising the quality of the AC output

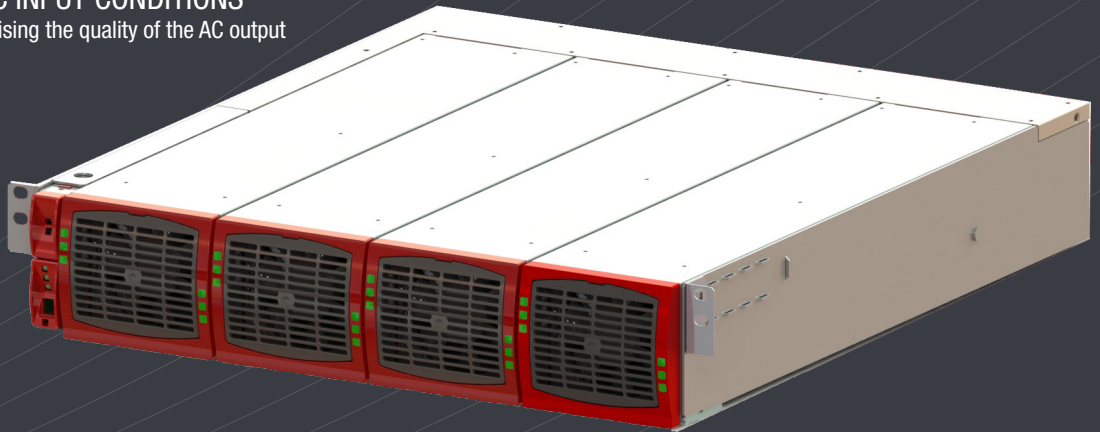


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Leading AC Backup Technology

Release Note:

Version	Release date (DD/MM/YYYY)	Modified page number	Modifications
7.0	12/08/2014	-	Release of the Manual.



Leading AC Backup Technology

CE+T at a glance

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



2. Abbreviations

TSI	Twin Sine Innovation
EPC	Enhanced Power Conversion
REG	Regular
DSP	Digital Signal Processor
AC	Alternating current
DC	Direct current
ESD	Electro Static Discharge
MET	Main Earth Terminal
MBP	Manual By-pass
TCP/IP	Transmission Control Protocol/Internet Protocol
USB	Universal Serial Bus
PE	Protective Earth (also called Main Protective Conductor)
N	Neutral
PCB	Printed Circuit Board
TRS	True Redundant Structure

3. Safety Instructions

Important Safety Instruction. Save these Instruction.

3.1 Disclaimer

- The manufacturer declines all responsibilities if equipment is not installed, used or operated according to instructions herein by skilled technician according to local regulations.
- Warranty does not apply if the product is not installed, used and handled according to the instructions in the manuals.

3.2 Technical care

- This electric equipment can only be repaired or maintained by “qualified employee” with adequate training. Even the personnel who are in charge of simple repair or maintenance are required to have the knowledge or experience in relation to electrical maintenance.
- Please follow the procedures contained in this Manual, and note all the “DANGER”, “WARNING” AND “NOTICE” marks contained in this manual. Warning labels must not be removed.
- Qualified employees should have the knowledge to know how to recognize and avoid any dangers that might be present when working on or near exposed electrical parts.
- Qualified employees should know how to lock out and tag out machines, so the machines will not accidentally be turned on and hurt the employees that are working on them.
- Qualified employees also should know safety related work practices, including those by OSHA and NFPA, as well as knowing what personal protective equipment should be worn.
- All operators are to be trained to perform the emergency shut-down procedure.
- Never wear metallic objects such as rings, watches, bracelets during installation, service or 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.

3.3 Installation

- This product is intended to be installed only in restricted access areas as defined by UL60950 and in accordance with the National Electric Code, ANSI/NFPA 70, or equivalent agencies.
- Inverter System contains output over current protection in the form of circuit breakers. In addition to these circuit breakers, the user must observe the recommended UL listed upstream and downstream circuit breaker requirements as defined in this manual.
- Please use extreme caution when accessing circuits that may be at hazardous voltages or energy levels.
- The modular inverter rack is a dual input power supply. The complete system shall be wired in a way that both input and output leads can be made powerless.
- When AC Mains is not connected, the output AC circuit is considered as a separately-derived source. Use terminal (X2) for bonding this circuit to the enclosure. A bonding jumper neutral kit is factory installed, if the AC main is connected this bonding jumper has to be removed (see 7.5.3, page 20). Ground the enclosure to the electrode terminal(see 7.5.2, page 20) in accordance with local code requirements.
- AC and DC circuits shall be terminated with no voltage / power applied.

Safety Instructions

- The safety standard IEC/EN62040-1-1 requires that, in case of output short circuit, the inverter must disconnect in maximum 5 seconds. Parameter can be adjusted on T2S; however, if the parameter is set at a value >5 seconds, an external protection must be provided in order that the short circuit protection operates within 5 seconds. Default setting is 60s.

3.3.1 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 rebuild. This is especially important in dual or three phase configurations.
- Empty inverter positions must not be left open. Replace with module or cover.

3.3.2 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.

3.3.3 Other

- Isolation test (Hi-Pot) must not be performed without instructions from the manufacturer.

3.4 Maintenance

- The modular 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 any work conducted to a system/unit make sure that AC input voltage and DC input voltage are disconnected.
- Inverter modules and shelves comprise capacitors for filtering and energy storage. Prior to accessing to the system/modules after power down, wait atleast 5 minutes to allow capacitors to discharge.
- Some components and terminals carry high voltage during operation. Contact may result in fatal injury.

3.5 Replacement and Dismantling

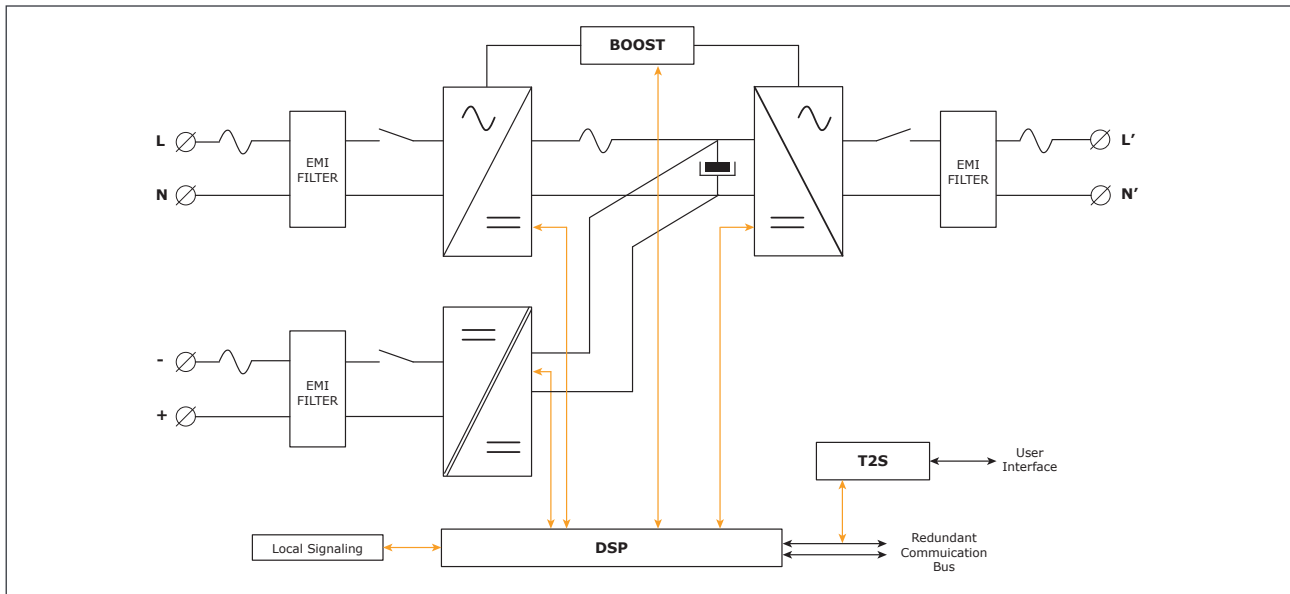
- ESD Strap must be worn when handling PCB's and open units.
- CE+T cannot be held responsible for disposal of the Inverter system and therefore the customer must segregate and dispose the materials which are potentially harmful to the environment, in accordance with the local regulations in force in 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.

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

4. TSI TECHNOLOGY ¹

Inverter modules carrying the TSI logo and the EPC mark are triple port converters (AC in, DC in, AC out). Sinusoidal output is converted from Mains or/and DC.

The block diagram here below gives an explicit description of the topology and operation.



The module is built around the following sub-converters

- AC to DC at input
- DC to DC at input
- DC to AC at output

The energy can flow either from the AC source or the DC source under the control of the local DSP controller. Thanks to internal energy buffering, the output sine wave is constant and disturbance free regardless of the active source.

The BOOST functionality multiplies the nominal current for a period of 20ms(max) in the event of down stream current surge. The upstream breakers do not have to be oversized to prevent tripping. After the boost has been activated or if the AC input is not present the overload capacity is 150% for 15 seconds regardless of the source currently used.

The TSI works according to True Redundant Structure (TRS) that features decentralized and independent logic, redundant communication bus and three internal levels of disconnection to isolate a module after internal failure.

The functionality is included in every inverter module. Running them in parallel provides a modular system with, no single point of failure, always conditioned output, high system efficiency and 0ms source transfer time.

4.1 On-line Mode

DC is the primary source of supply whilst Mains (AC) works as the secondary source of supply. Switching time between DC input and AC input is 0ms (source transfer). The power delivered by the DC source (usually a battery, but it could be any other type of DC generator) is converted to provide regulated and transient free power to the load. In case of short circuit at the load side, the boost is automatically and timely energized to trip downstream protective devices.

¹ | Information and data given in this chapter intend to for an overview on the technology. Detailed features and parameters for each individual module type of the range may differ and should be referred in the dedicated data sheet.

4.2 Safe mode

Safe mode uses DC as primary source of supply while Mains (AC) is in standby.

Mains (AC) is normally disconnected through internal inlet relay and is only connected when down stream clearance is required (boost) or if DC is unavailable.

The transfer between DC and AC results in typical transfer time of 10ms.

Typically the safe mode is used in extremely harshed environments such as railways. Under such conditions it provides extra isolation against disturbances carried by the Mains.

4.3 EPC-mode

Mains input (AC) is the primary source whilst DC works as backup.

The TSI is designed to operate on Mains on permanent basis and to deliver output voltage conditioned with low THD.

There is no physical difference on the output sine wave whether the source is AC (or) DC. If the Mains is out of tolerance or goes down, the converter seamlessly switches to DC and the converter operates in “Back-up mode” (Switching time back and forth is 0ms).

As soon as the Mains returns in to valid range, the EPC mode is automatically resumed.

The EPC mode offers higher efficiency (up to 96% depending on the model) without compromising the purity of the output sine wave.

Remarks: REG modules:

Inverter modules carrying the TSI logo together with REG mark are modules working only with DC input . Sinusoidal output is converted from DC and the module operates as a traditional inverter. EPC mode and the boost are not available with REG modules.

4.4 Mix Mode & Walk-in-mode

Under some circumstances DC and AC source can be combined. The sequence is defined by a user selectable set of parameters, start, control and exit are fully automatic .

A specific example of Mix-mode is the Walk-in mode where the transfer from DC source to AC source is ramped up within a fix and adjustable period of time.

5. Inverter Components

5.1 Inverter module

Bravo: 125VDC / 120VAC/240VAC, 60Hz.



- The TSI Bravo is a 2500VA/2000W converter based on the TSI technology (see section 4).
- The TSI inverter modules are hot swappable and hot pluggable. They are featured with self setting capabilities for easy plug-and-play operation.
- LED's on module front plate display the status of converter and output power.
- Inverter modules can be combined to build any single or multi-phase structures.
- The inverter modules are equipped with soft start.
- The fan is equipped with alarm and run time meter. It is field replaceable.
- 17.13" (D) x 4.02" (W) x 3.46" (H). [435mm (D) x 102mm (W) x 88mm (H)].
- 11 Lbs [5 kg].

5.2 Sub-rack

- The BRAVO shelf shall be integrated in min 600mm deep cabinets, 19 Inch / ETSI mounting.
- The BRAVO shelf houses max four (4) inverter modules and one (1) T2S interface. Max 10kVA per shelf.
- Additional shelves can be stacked and interconnected to build more powerful structures.
- The BRAVO shelf is designed with individual DC input, common AC input and common AC output.
- Optional rear cover can be provided for enhanced safety in cabinet.
- 18.9" (D) x 19" (W) x 2U (H). [480mm (D) x 19" (W) x 2U (H)].
- 13 Lbs [6 Kg] empty.



6. Accessories

6.1 T2S-2C Interface

The T2S is an interface giving access to the TSI modules that are connected together in any TSI systems.

The T2S doesn't perform any control or management of the TSI system. It can be removed, replaced or moved to another live system without affecting neither the original TSI system operation nor the target system.

6.1.1 Parameters setting

The T2S interface is featured with a USB connector at the front. Connected to a laptop, it enables TSI system settings, module assignment to phases and other various adjustments to allow TSI best fit with actual site conditions.

6.1.2 System diagnostic and troubleshooting

The T2S is featured with built in user interface to allow on-line diagnostic through laptop.

Installers and maintenance technicians should always carry proper laptop to access/reconfigure the system on site.

6.1.3 On-the-fly monitoring

The T2S monitors max 32 inverter modules.

The T2S is featured with

- 3 outgoing alarms contacts.
- 2 digital inputs.
- MOD bus.
- CAN bus (optional).
- Alarm monitoring.
- Record the latest 200 events. FIFO.

6.2 Surge Arresters

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.

Surge arrestor(optional) is installed in the cabinet.

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.



7. TSI Bravo Shelves Installation

7.1 Unpacking the system

Modules are packed separately. They are normally marked to be replaced in the right slot (important for multi phase systems).

Module packing material shall be taken apart and stored in case of return under warranty. Unproper packing may void the warranty.

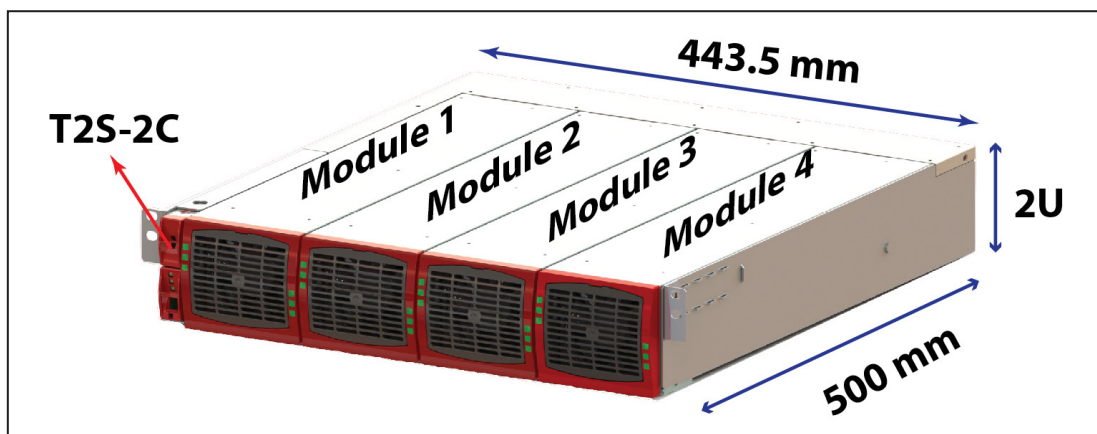
The packing material of the TSI system is recyclable.

Transport the cabinet in the box on the pallet.

7.2 Mechanical Installation

- Sub-rack is preferable mechanically fixated without modules.
- T2S-2C can be left in the sub-rack.
- Min two (2) fixing screws per side of the sub rack.
- Fixing holes for Inch and ETSI mounting frames.

7.2.1 System Dimensions



7.2.2 Fixing

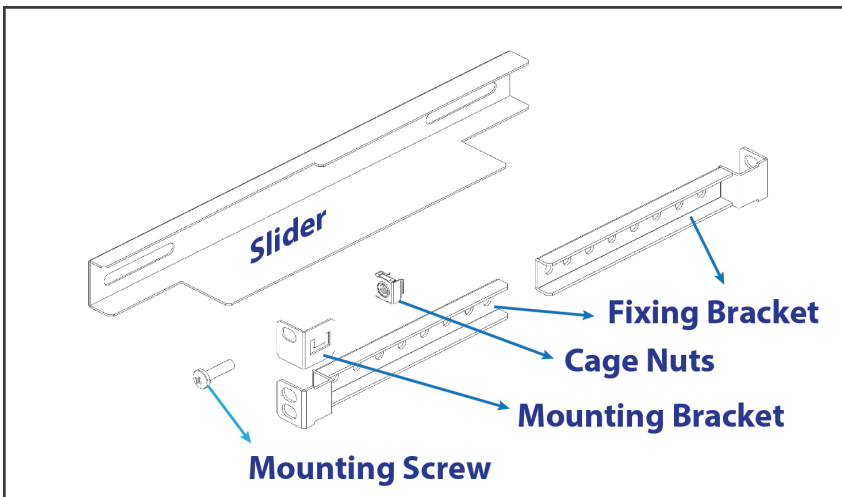
A full range of accessory is ready made to allow easy integration of the TSI in almost any kind of standard cabinets. Among other we provide fixing set for:

- 19" – 600mm depth cabinets (most standard solution, which is supplied by default - shown here).
- 19" – 800mm depth cabinets.
- ETSI – 600mm depth cabinets.

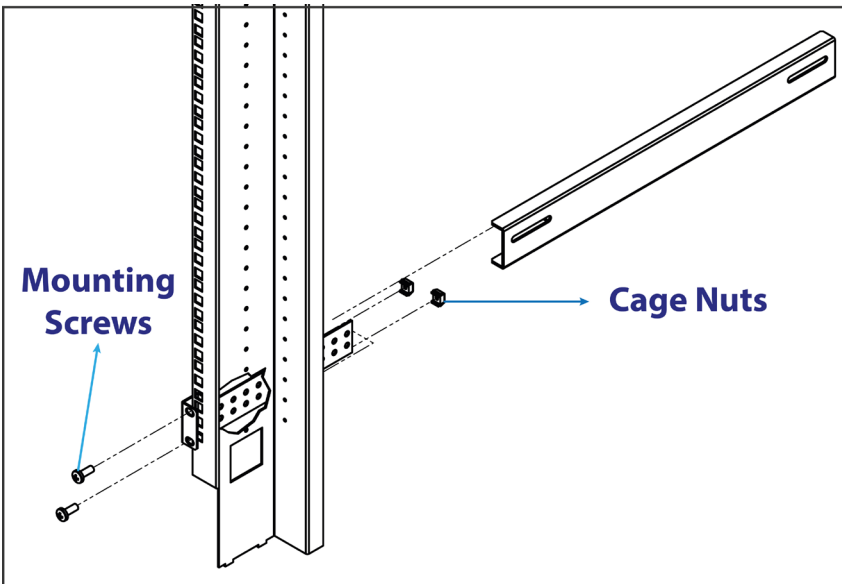
TSI Bravo Shelves Installation

7.2.3 Mounting Kit

Make sure that you have received the proper accessories for TSI BRAVO which consist of 1 pair of 19" kit as shown following Figure. The mounting guide rail is adjustable to fit different kind of cabinet depths.



- Slider - 2 Nos.
- Brackets - 4 Nos.
- Latches - 2 Nos.
- Bolts - 12 Nos.
- Removable nuts - 12 Nos.

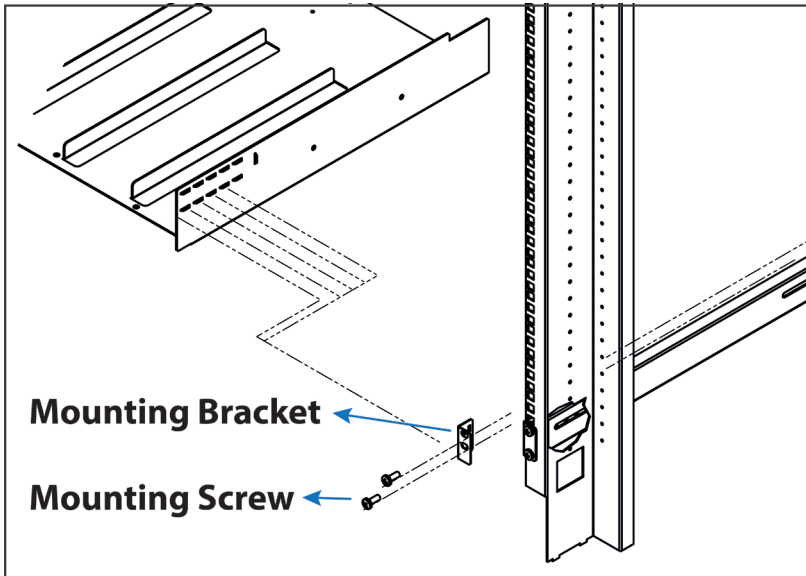


Assemble the sliders and adjust the length to suit the mounting depth

Fix cage nuts in the cabinet front and rear frame of the left and the right side

Fix the left and right slider of the cabinet with the supplied mounting screws.

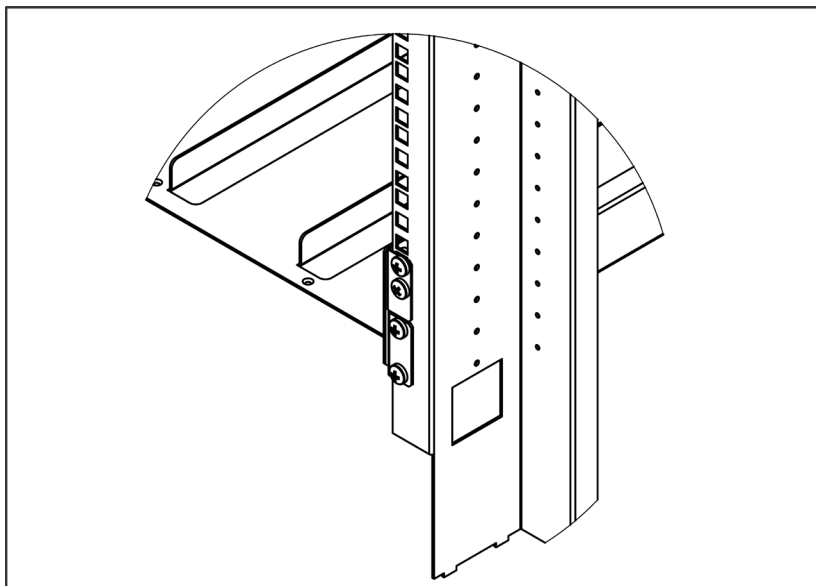
TSI Bravo Shelves Installation



Fix cage nuts in the mounting frame

Assemble the mounting bracket in a suitable position.

Slide the shelf in position and fix the shelf with the supplied mounting screws



Finished

7.3 Electrical installation (Bravo PACK or single shelf)

7.3.1 Pre requisites

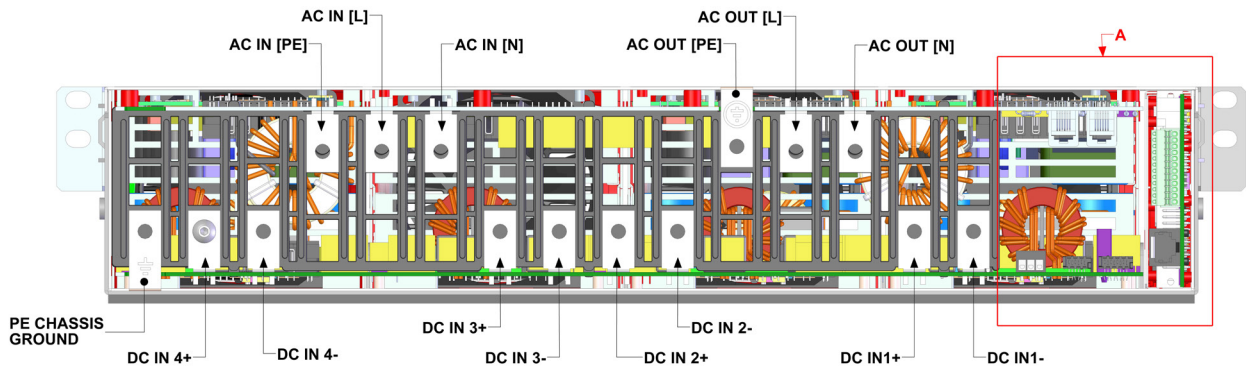
- The sub –rack have markings for all terminations
- All cables shall be rated at Min 90 deg C.
- Electrical terminations shall be tightened with 5Nm
- All connection screws are M5 x 12mm
- DC Input-Individual (per module), observe polarity.
- AC Input / AC output –Common (per shelf), respect phases.
- Wire all positions in the sub-rack for future expansion

TSI Bravo Shelves Installation

- Input AC / Output AC / Input DC / Signal cables shall be separated
- Cable crossings shall be done in 90 deg angles

7.3.2 Terminations

Rear Side of Bravo 125 VDC terminations are clearly marked in the following figure



7.3.3 Grounding

“PE CHASSIS GROUND”

PE Chassis ground shall be wired to MET or distributed earth bar connected to MET

Main protective conductor(PE) connection is made to the X2(AC IN) terminal block marked with symbol for identification.



PE must be terminated even if commercial Mains is not available and shall be connected to building or main panel ground. Recommended Cable cross section is the size equal(min) to Neutral cable cross section. Adhere to local regulations.

Ground has to be connected in accordance with local code..

7.3.4 DC Input

	CB per inverter module	Cable, min	Connector	Torque
+125 VDC	20 A	2 x 12 AWG (4 mm ²)	M5	5Nm

7.3.5 AC Input

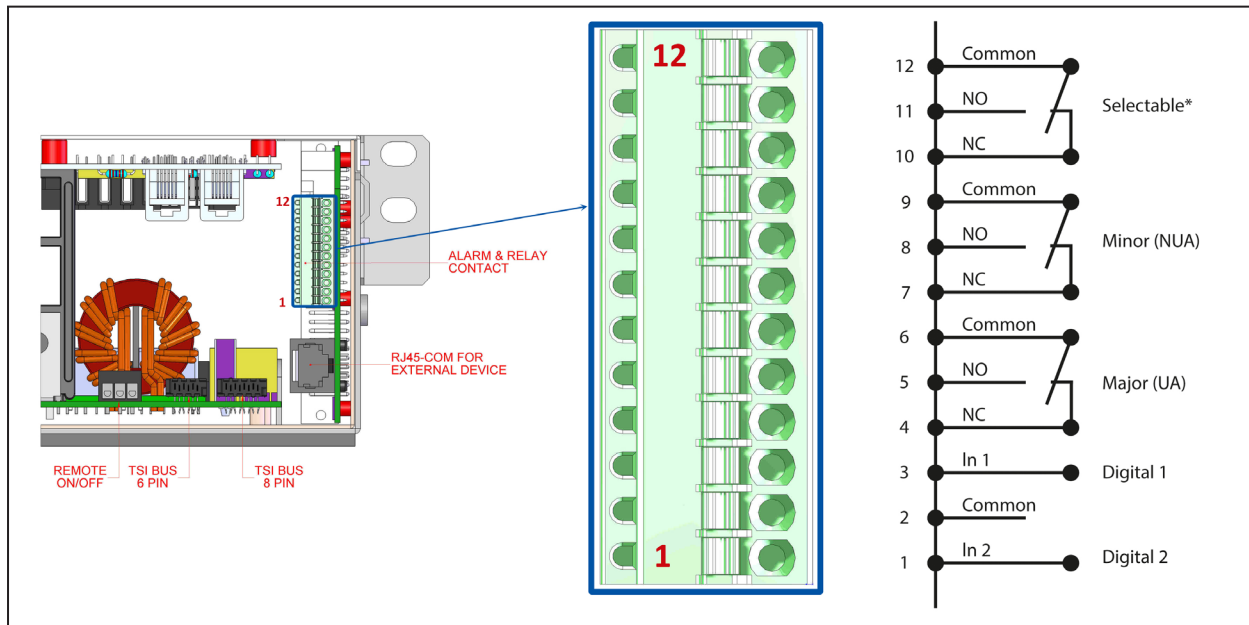
	CB per shelf	Cable, min	Connector	Torque
120 VAC	2p 100A	3 x 4 AWG (2 x 16 mm ²)	M5	5Nm

TSI Bravo Shelves Installation

7.3.6 AC output

	Cable, min	Connector	Torque
120 VAC	3 x 4 AWG (16 mm ²)	M5	5Nm

7.3.7 Signalling



Relay characteristics (Selectable, Major, Minor)

- Switching power 60W
- Rating 2A at 30VDC / 1A at 60VDC
- Max wire size 1mm²

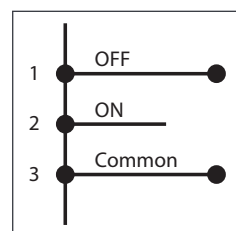
Digital input characteristics (Digital In 1 / 2)

- Signal voltage +5VDC (galvanic insulated)
- Max wire size 1mm²

7.3.7.1 Remote ON/OFF (X6)

Note: The system is by default equipped with a connection between pin 3 and 2. If remote ON/OFF is not used the strap shall remain. Should the remote ON/OFF be used the strap must be replaced with a changeover contact or emergency button.

- The remote ON/OFF switch the output AC OFF.
- Input AC and input DC is not affected by the remote ON/OFF.
- The remote ON/OFF requires changeover contacts, one input opens as the other close. If both transitions are not picked up the status is not changed.
- Digital input characteristics (Remote On/Off)
 - Signal voltage +5VDC (galvanically insulated)
 - Max wire size 17 AWG (1mm²)



TSI Bravo Shelves Installation

Functional table for remote ON/OFF function

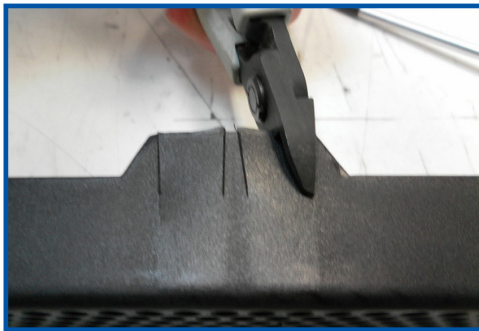
#	Pin 1-3	Pin 2-3	Status	Indication
1	Open	Open	Normal operation	All (Green)
2	Closed	Open	OFF	AC output (OFF) AC Input (Green) DC Input (Green)
3	Open	Closed	Normal operation	All (Green)
4	Closed	Closed	Normal operation	All (Green)

7.3.8 Rear cover

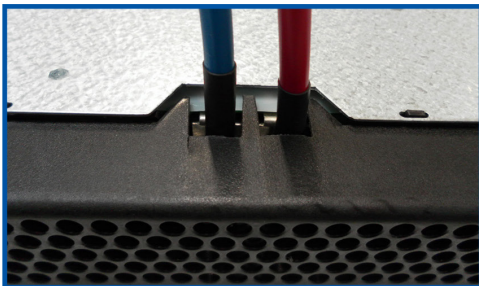
- The rear cover provides IP 20 to the rear terminations when required
- The rear cover is snapped in position in the rear of the sub-rack.
- Remove material using a pair of side cutters to allow cables enter and exit.
- The rear cover is ordered separately.



Connect Cables



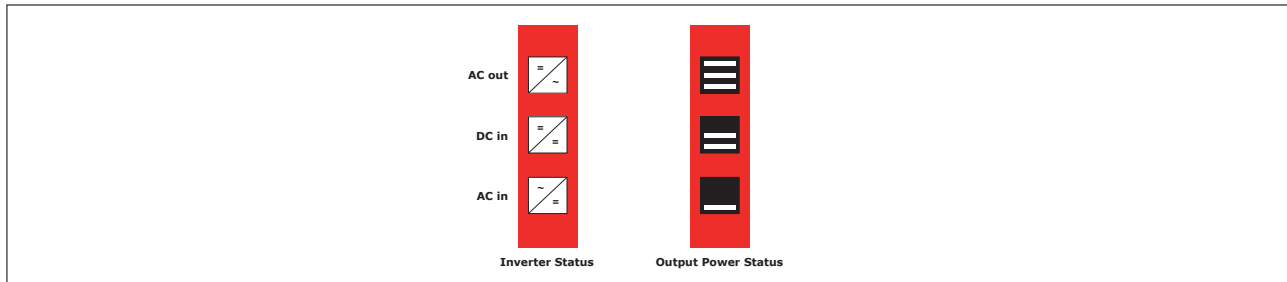
Cut holes to allow cable access



Clip rear cover in place

8. Human-Machine Interface

8.1 Inverter module



Inverter Status LED	Description	Remedial action
OFF	No input power or forced stop	Check environment
Permanent green	Operation	
Blinking green	Converter OK but working conditions are not fulfilled to operate properly	
Blinking green/orange alternatively	Recovery mode after boost (10 In short circuit condition)	
Permanent orange	Starting mode	
Blinking orange	Modules cannot start	Check T2S
Blinking red	Recoverable fault	
Permanent red	Non recoverable fault	Send module back for repair

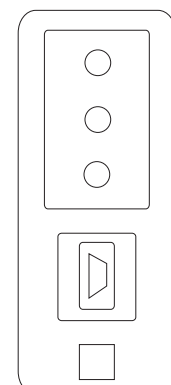
Output Power (redundancy not counted)						
<5%	5% to 40%	40 to 70%	80 to 95%	100%	100% = overload	Output Power (redundancy not counted)
×	×	×	≡	≡	≡	Status output power LED
×	×	≡	≡	≡	≡	
—	—	—	×	—	—	
1B	1P	2P	2P	3P	3B	Behaviour (B = blinking – P permanent)

8.2 T2S

- Alarm indication on T2S (Urgent / Non Urgent / Configurable)
 - Green: No alarm
 - Red: Alarm
 - Flashing Exchanging information with inverters (only Configurable alarm)
- Outgoing alarm relay delay
 - Urgent 60 seconds delay
 - Non urgent 30 second delay
- Parameter setting via Laptop or Copy/Paste.
- Factory default according to list of set values, see Table of set values

Major Alarm
Minor Alarm
User selectable Alarm

USB port



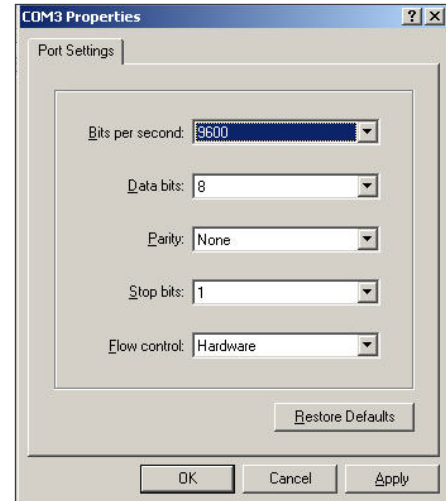
9. System set up

Bravo 125 VDC System is delivered with default set of parameters referred as factory settings.

Upon various site operating conditions or Site Manager requirements some parameters might have to be adjusted.

Refer to “TSI T2S 120VAC User Manual Vx_x” for detailed description of system status reading and changing as well as parameter adjustment.

- Parameter set up requires Hyper terminal installed on laptop
- USB cable type A to B (not included)
- T2S driver “CET_T2S.inf” installed on laptop.
- Available for download at <http://www.acbackuptsi.com>
 - Username: T322010000
 - Password: No password required (enter).



9.1 Communication setting

- Bits per second 115200
- Data bits 8
- Parity None
- Stop bits 1
- Flow control None

Remark: Refer to document XXXX for detailed system setting and operation.

9.2 Menu access

Root Menu

- 1 > System configuration
 - 0 > Return to previous menu
 - 1 > Send config file to T2S
 - 2 > Read config file from T2S
 - 3 > Restore default settings (no more available since version 2.5)
 - 4 > Restore factory settings (no more available since version 2.5)
- 2 > System information's selection
 - 0 > Return to previous menu
 - 1 > Module information's
 - 0 > Return to previous menu
 - 1 > Variables set 1
 - 2 > Variables set 2
 - 3 > Variables set 3
 - 4 > Variables set 4
 - + > Next page
 - > Previous page
 - 2 > Phase information
 - 0 > Return to previous menu
 - 1 > Variables set 1
 - 2 > Variables set 2
 - 3 > Variables set 3
 - 3 > Groups information
 - 0 > Return to previous menu
 - 1 > Display AC group information
 - 2 > Display DC group information
 - 4 > Alarms information
 - 0 > Return to previous menu
 - 1-1 > Page selection
 - 5 > History of the log display
 - 0 > Return to previous menu
 - 1-14 > Page number selection
 - 16 > Clear log
 - 17 > Save log to a file
 - 6 > Module errors information
 - 0 > Return to preceding menu
 - 1-32 > Detailed Modules errors
- 3 > System actions selection
 - 0 > Return to previous menu
 - 1 > System actions
 - 0 > Return to index
 - 1 > Turn ON system
 - 2 > Turn OFF system
 - 3 > Change Date and time setting
 - 2 > Inverter Module action
 - 0 > Return to previous menu
 - 1-4 > Page number selection
 - 5 > Identify selected Module
 - 6 > Turn ON selected Module
 - 7 > Turn OFF selected Module
 - 8 > Change address of sel. Module
 - 9 > Change phase of selected Module
 - 10 > Automatic address assignment
 - 11 > Change DC group of selected Module
 - 12 > Change AC group of sel. Module
 - 13 > Notify changed fan of sel. Module
 - + > Increment selector
 - > Decrement selector
 - 3 > T2s actions
 - 0 > Return to index
 - 1 > Force refresh of configuration texts and constants
 - 2 > Force refresh of events description texts
- 4 > Security Access
 - 0 > Return to index
 - 1 > Enable Password protectio

10. Inserting/removing/replacing modules

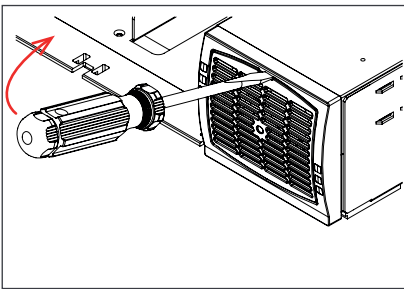
10.1 TSI Inverter

- The TSI inverter module is hot swappable.
- When a new module is inserted in a live system it automatically takes the working set of parameters.
- When a new module is inserted in a live system it is automatically assigned to the next available address.

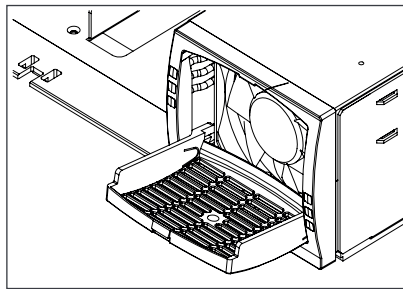
10.1.1 Removal

Notice: When one or several inverter modules is/are removed, live parts become accessible. Replace module with blinds without delay.

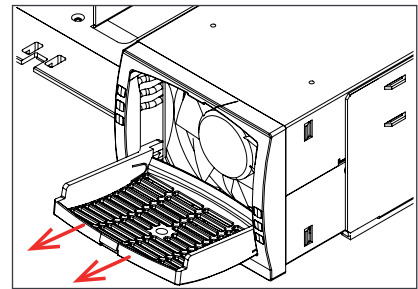
- Inverter module is not switched off when opening the handle. The handle only hooks the module to the shelf.
- Use a screw driver to release the latch of the handle.
- Open the handle and Pull the module out.
- Replace with new module or blind unit.



A) Use screwdriver to release the latch



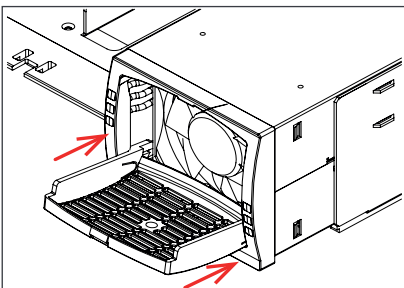
B) open the cover completely



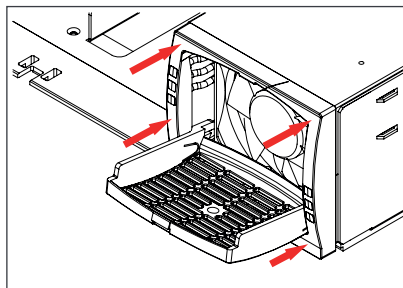
C) Use the cover as a handle to remove the module

10.1.2 Inserting

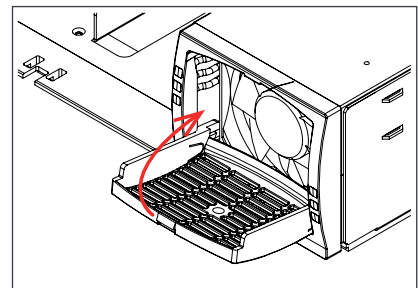
- Use a screw driver to release the latch of the handle.
- Open the handle and Push firmly until the unit is properly connected.
- Close the cover and latch in position.



A) Slide the module in



B) Push firmly till the connection is properly engaged



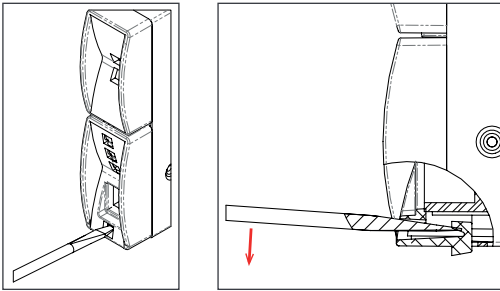
C) Close the cover and latch the module in place if too hard redo step B

Inserting/removing/replacing modules

10.2 T2S

10.2.1 Removal

- Use a small screw driver to release the latch keeping the T2S in position
- Pull the module out



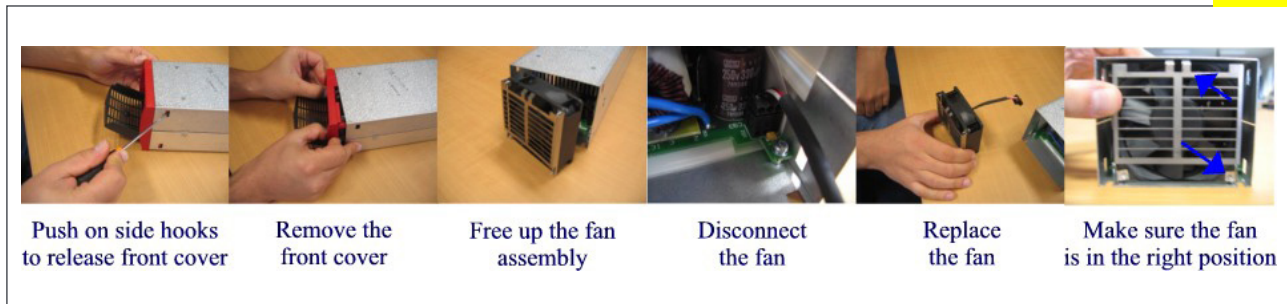
10.2.2 Inserting

- Push the module firmly in place until the latch snaps in position

10.3 Fan replacement

The FAN life is approx 45.000hours. The inverter modules have fan runtime meters and fan failure alarm. Fan failure can result from failing fan or driver circuit.

- Let the module rest at least 5 minutes prior to initiating work.
- The inverter front must be removed. Use a blunt tool to depress the latches on the module side fixing the front to the module.
- Remove the fan and unplug the supply cord.
- Replace with new fan and connect supply cord
- Replace front, make sure that the front latch properly.
- Plug in
- Check fan for operation
- Access T2S and reset the fan run time alarm from within the action menu



11.Final check

- Make sure that the sub-rack/cabinet is properly fixed to the cabinet/floor
- Make sure that the sub-rack/cabinet is connected to Ground.
- Make sure that all DC and AC input breakers are switched OFF.
- Make sure that all cables are according to recommendations and local regulations.
- Make sure that all cables are strained relieved.
- Make sure that all breakers are according to recommendation and local regulations.
- Make sure that DC polarity is according to marking.
- Re tighten all electrical terminations.
- Make sure that no inverter/controller positions are left open.
- Cover empty inverter positions with blanks.
- Make sure that the Remote ON/OFF is appropriately wired according to local regulations.
- Make sure that the point of AC supply meets local regulations.

12. Commissioning

The DC breaker is a protection device. Modules are plugged in a system and DC breaker is then engaged. 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 and have module failure when AC input recover from fault condition.

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 cover by warranty if procedures are not respected.

12.1 Check list

DATA	
Date	
Performed by	
Site	
System serial number	
Module serial numbers	
T1S/T2S serial number-Specify T1S/T2S	
ACTION	OK/ N.OK
Unplug all inverters except one inverter per phase (Just pull off the inverter from the shelf, to interrupt electrical contacts)	
Check the commercial AC before closing the AC input breaker.	
Switch ON the commercial AC	
Check if inverters are working (Green led)	
Check the DC power supply and switch ON the DC breakers	
Plug in all inverters one by one	
Check output voltage (on bulk output or on breaker)	
Check if inverters are working properly	
Check if system has no alarm (Disable the alarm if any)	
Read configuration file and review all parameters. Some parameters must be adapted according to the site (LVD, load on AC, AC threshold level)	
Switch OFF ACin and check if system is working on DC	
Switch ON ACin and check if system correctly transferred load on AC	
Switch OFF system and start on AC only	
Switch OFF system and start on DC only	
Check if display working properly (if this CANDIS option is present)	
Check if TCPIP working properly (if this option is present)	
Test on load (if available)	
ALARM	
Switch ON AC input and DC input and check that no alarm are present	
Pull out one inverter and check alarm according to redundancy	
Pull out two inverters and check alarm according to redundancy	
Switch OFF AC input (commercial power failure) and check the alarm according to the configuration	
Switch OFF DC input (DC power failure) and check that the alarm according to the configuration	
Check the different digital input according to the configuration (when used)	

13. Trouble Shooting and Defective Situations Fixing

13.1 Trouble Shooting

Inverter module does not power up:	<ul style="list-style-type: none">Check AC input present and in range (AC breakers)Check DC input present and in range (DC breakers)Check that the inverter is properly insertedRemove inverter to verify that slot is not damaged, check connectorsCheck that module(s) is (are) in OFF stateCheck for loose terminations
Inverter system does not start:	<ul style="list-style-type: none">Check that T2S is present and properly insertedCheck remote ON/OFF terminalCheck the configuration and settingCheck threshold level
Inverter only run on AC or DC:	<ul style="list-style-type: none">Check AC input present and in range (AC breakers)Check DC input present and in range (DC breakers)Check the configuration and settingCheck threshold level(s)
No output power:	<ul style="list-style-type: none">Check output breaker
All OK but I have alarm:	<ul style="list-style-type: none">Check configuration file and correct No of modulesDownload/clear log file
No output alarm:	<ul style="list-style-type: none">Mind the default time delay (UA: 60s, NUA: 30s)Check configuration file
No information on CanDis:	<ul style="list-style-type: none">Check that T2S is present and properly insertedCheck that the RJ45 cable is connected between T2S shelf and CanDis shelf
No value on TCP/IP:	<ul style="list-style-type: none">Check that the RJ45 cable is connected between T2S shelf and CanDis shelfWait approx 2 minutes to allow the system to collect serial data.

13.2 Defective modules

Unless input power is down all module LEDs should lit green(see section 8, page 19). No light, orange light , red or flashing light are abnormal conditions. Refer to section 9.2, page 30 to collect and record module information. If no fix can be found, replace module.

13.2.1 Replacing modules

Refer to section 10, page 22 to remove and re-insert modules.

13.2.2 Return defective T2S interface

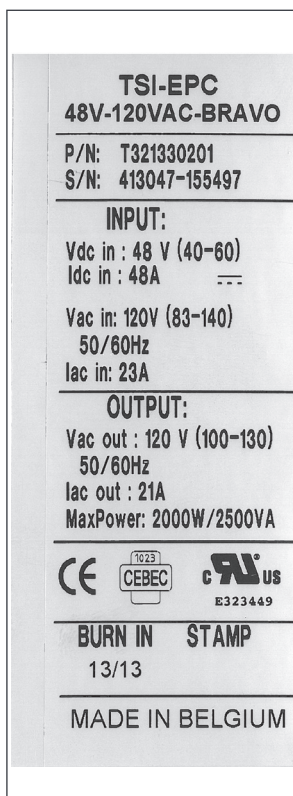
A T2s totally dark (indication area) or that cannot interface with your laptop are evidence of failure. Proceed as per section 13.2.4, page 28.

13.2.3 Return defective shelf

The shelf is passive. Failure is unlikely to happen. In turn defective situation are barely always visible. After depose proceed as per section 13.2.4, page 28.

13.2.4 Return 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!
- Information on failure occurrence as well as module status given through Menu 2-1 shall be attached to defective unit return package or recorded in RMA.





14. Service

For Service

- Check Service Level Agreement (SLA) of your vendor. Most of the time they provide assistance on call with integrated service. If such SLA is in place, you must call their assistance first.
- If your vendor doesn't provide such assistance (*) you may call CE+T directly. Toll free Number **1(855) 669 - 4627(**)**

Service is available from 8:00 A.M. to 10:00 P.M. EST, Monday through Friday, except closing periods for holidays or inclement weather.

Major Incidents and Emergency conditions can be invoked for immediate handling of same number or by dropping a mail on customer.support@cetamerica.com (***)

- (*) CE+T will redirect your call to your vendor if he has such SLA in place.
- (**) Valid in USA and Canada only.
- (***) Messages that are not Major Incident or Emergency will be served at the next scheduled working a day.

15.Maintenance Task

As maintenance will perform on live system, all task should perform only by trained people with sufficient acknowledge on TSI product.

Tasks :

- Identify the site, customer, responsible, cabinet number, product type.
- Download and save configuration file for back up.
- Check configuration file to be in accordance with operational site conditions.
- Read and save log file for back up.
- Check and analyze log file, and if alarm are present.
- Replace dust filter if present. Filter is mandatory in dusty environment.
- Check module temperature and log value. If internal temperature is higher then previous year, it should be interesting analyze if it is due an increasing load or dust effect. It is common to have a delta of 15°C by 30% of load between the ambient and the internal temperature. If temperature increase due internal dust built up clean the TSI with vacuum cleaner and/or soft compressed air.
- Clean cabinet (vacuum cleaner or dry cloth)
- Control the inverter mapping (AC Group, DC Group, Address)
- Check load level and record the rate value (print in word document the 4 screen modules information for the 32 modules, the 3 screen for the phases value and the 2 screens for the group AC and DC value)
- Change the configuration file for AC and DC mix mode to check that all TSI work on both power supply
- Check alarm operation (e.g., redundancy lost, mains failure, DC failure) on dry contact and through SNMP system or web interface.
- Switch OFF AC IN and check alarms.
- Check temperature terminal and temperature wiring. If possible use an infrared camera.
- Read and record value as wave form, power factor, Crest factor, THD I from power analyzer.
- Take cabinet picture
- Keep track of report and provide end user with a copy.
- Perform a MBP procedure. This task is not really recommended*, but could be demanded by site manager.

* It is not recommended because when you perform a By-pass procedure, generally there is no back up on AC input line, and the load shutdown if mains disappear.