

## DESCRIPTION

Bravo TSI 48/120 is a compact modular inverter that converts a 48VDC power source into 120VAC and provides a pure sine wave. By using several modules, we can offer solutions for two-phase (2 x 120Vac + N) or three-phase (3 x 208VAC + N) infrastructures.

The extra AC input ensures a high overall efficiency (up to 95%) which results in a reduction of energy loss and heat dissipation.

This module has a modularity from 2.5kVA to up to 80kVA in order to be able to evolve with your needs. The hot swap feature makes maintenance easier and reduces the risk of errors.

The low ripple voltage avoids any disturbances on DC loads and batteries.

BRAVO TSI 48/120 systems can be configured for operation in split phase and three phase applications using a combination of shelves.

Integration with Aspiro and Guardian DC Power Systems is achieved using a translator board that enables the ACX Advanced controller to monitor key parameters.

## FEATURES

- ◆ Extra AC input for increased efficiency
- ◆ Compact design
- ◆ Up to 80 kVA
- ◆ Multiple phase options:
  - 1-phase L-N
  - 2-phase L1-L2-N
  - 3-phase L1-L2-L3-N
- ◆ No disturbances on DC loads & batteries

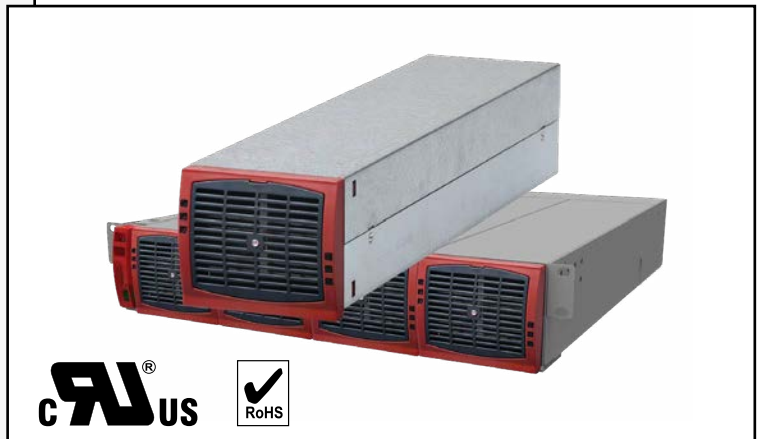
## TWO-YEAR WARRANTY

## SAFETY CERTIFICATION

cUL1778 Recognized

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## ORDERING GUIDE

DESCRIPTION	UNIPOWER PART NUMBER
Inverter Module (4 per shelf max.)	105.5724.48
Management Module (T2S ETH)	105.5701.2448
Power Shelf: 19" x 2RU	105.5719.00
Rear Protection Cover for Shelf	105.5720.02
19" to 23" / 600mm fixing kit	385.6300.2302
BUS Cable Kit: 2-shelf	105.5720.03
BUS Cable Kit: 3-Shelf	105.5720.04
Inverter Module Blank	105.5715.01
Management Module Blank	105.5701.01
BRAVO to ACX Translator	001-5301-0000

## APPLICATIONS

All business critical applications and all types of AC loads.

The design is modular and scalable with hot-swappable inverter modules which ensures low Mean Time to Repair (MTTR), reduction in service costs and meets the changing needs for future expansion.

## SPECIFICATIONS

### GENERAL

Part Number   UNIPOWER Order Code	T321330201   105.5724.48	
EMC (Immunity)	IEC 1000-4	
EMC (Emission) (class)	FCC part 15	
Safety	cUL 1778 Recognized	
Cooling	Forced	
Isolation	Double	
MTBF	240 000 hrs (MIL-217-F)	
Efficiency (Typical)	Enhanced Power Conversion On-Line	95% 91%
Dielectric Strength DC/AC	4300 Vdc	
True Redundant Systems – compliant	3 disconnection levels on AC out and DC in power ports 4 disconnection levels on AC in port	
RoHS	Compliant	
Vibration - GR63	Office Vibration Transport Vibration	0 to 100Hz - 0.1g 5 to 100Hz - 0.5g, 100 to 500Hz - 1.5 g Drop test
Operating Ambiance   Ingress Protection	Free from dust and corrosive materials   NEMA 1	
Altitude Above Sea Derating	<1500m >1500m	None 0.8% / 100m
Operating Temperature Range	-20 to 50°C	
Storage Temperature Range	-40 to 70°C	
Relative Humidity, max.	95%, non-condensing	
Case Material	Coated Steel-ALU ZINC	

### AC OUTPUT POWER

Nominal Output Power	2500VA   2000W	
Overload Capacity	150% (15 seconds) 110% permanent within operating temperature range	
Admissible Load Power Factor	Full power rating from 0 inductive to 0 capacitive	
Internal Temperature Management and Switch Off	2% / °C, derating beyond 50°C with cut-off at 65°C	

### DC INPUT

Nominal Voltage	48Vdc	
Voltage Range	40 to 60Vdc	
Nominal Current	56A (at 40Vdc and 2000W output)	
Maximum input current (for 15 second)	84A	
Voltage Ripple	<2mV Psophometric	
Input Voltage Boundaries	User selectable with T2S interface	

### AC INPUT

Nominal Voltage	120Vac (120/240V or 120/208V with combination of shelves)	
Voltage Range	100-138Vac (without derating) (can be disabled)	
Brownout	80-100Vac, use DC source contribution if needed (can be disabled) 2000VA/1600W @ 150Vac	
Conformity Range Before Transfer to DC	Adjustable	
Power Factor	>99%	
Frequency range (selectable)   synchronization range	50 - 60Hz   range 47- 53Hz / 57- 63Hz	

## AC OUTPUT

Nominal Voltage Operation within lower voltage networks leads to de-rating of power performances	120Vac
Frequency   Accuracy	50-60Hz   0.03%
Total Harmonic Distortion (Resistive Load)	<1.5%
Load Impact Recovery Time	0.4ms
Turn-on Delay	20s to 40s depending on the number of modules installed
Nominal Current. Protected against reverse current	21A
Crest Factor Nominal Power With Short Circuit Management and Protection	3:1
Short Circuit Clear-up Capacity	10 x I <sub>n</sub> for 20msec Available while Mains is available at AC input port With magnitude control and management
Short Circuit Current after Clear-up Capacity	2.1 x I <sub>n</sub> during 15s and 1.5 x I <sub>n</sub> after 15s

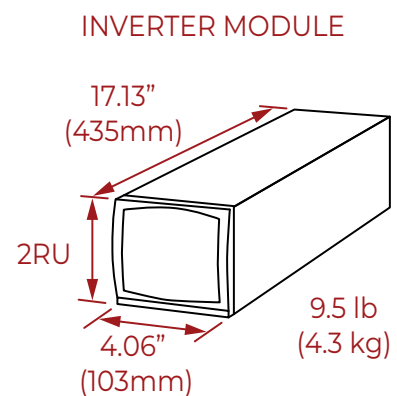
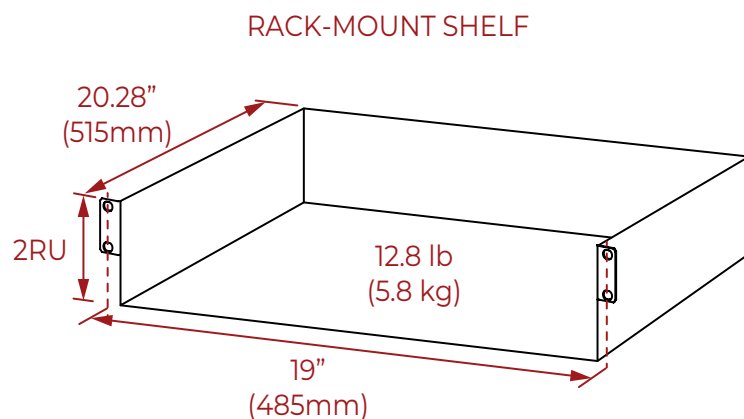
## IN TRANSFER PERFORMANCE

Max. Voltage Interruption	0s
Total Transient Voltage Duration (max)	0s

## SIGNALING &amp; SUPERVISION

Display	Synoptic LED
Alarms Output & Supervision	Dry contacts on shelf / Standard USB port and MODBUS on T2S, optional : Candis Display / Candis TCP-IP
Remote on/off	on rear terminal of the shelf via T2S

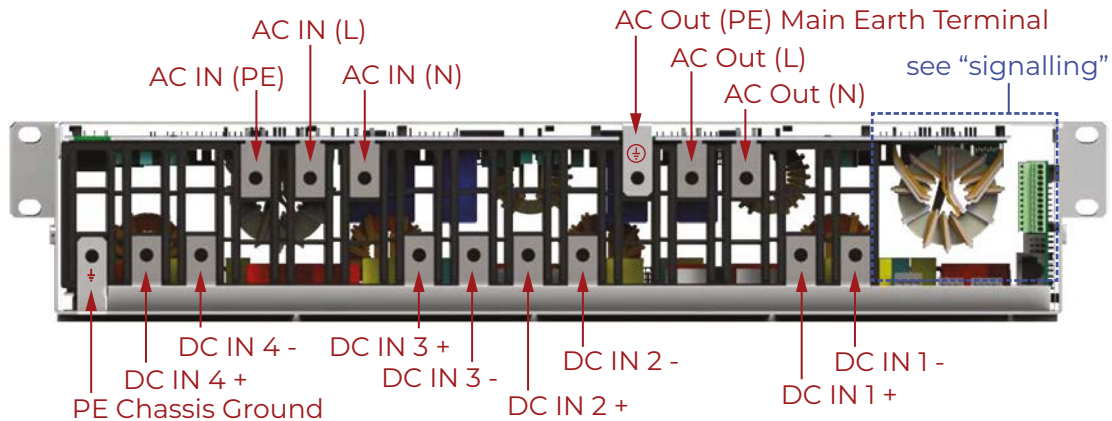
## OUTLINE DRAWINGS



## INSTALLATION INFORMATION

### Terminations

All terminations are clearly marked as shown below.



### Grounding

#### “PE CHASSIS GROUND”

PE Chassis ground shall be wired to MET or distributed earth bar connected to MET, according to local regulations.

### DC Input

MCB per inverter module	Cable, min	Connector	Torque
63 A	2 x 16 mm <sup>2</sup>	M5	5 Nm

Note: Module operates on derated power from 260 Vdc to 200 Vdc.

### AC Input

WARNING!!! - Recommendation of IEC 60364 4. 43

#### 431.3 Disconnection and reconnection of the neutral conductor in multi-phase systems

Where disconnection of the neutral conductor is required, disconnection and reconnection shall be such that the neutral conductor shall not be disconnected before the line conductors and shall be reconnected at the same time as or before the line conductors.

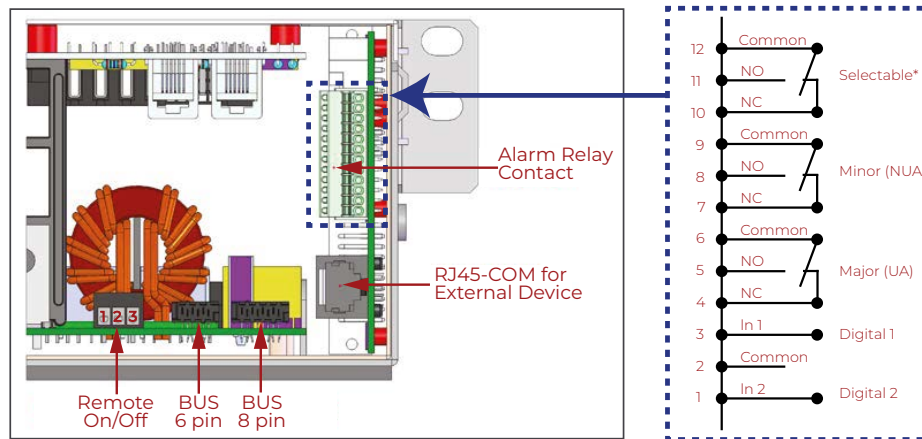
Cable, min	Connector	Torque
3 x 10 mm <sup>2</sup>	M5	5 Nm

Note: Icc value measured as 76.2 Arms per shelf with four modules.

### AC Output

MCB per shelf	Cable, min	Connector	Torque
2P 63 A	3 x 10 mm <sup>2</sup>	M5	5 Nm

## Signalling



### Relay characteristics (Selectable, Major, Minor)

- Switching power 60W
- Rating 2A at 30Vdc / 1A at 60Vdc
- Max wire size 1mm<sup>2</sup>

### Digital input characteristics (Digital In 1 / 2)

- Signal voltage +5Vdc (galvanic insulated)
- Max wire size 1mm<sup>2</sup>

### Remote ON/OFF

Notice: The shelf is by default equipped with a connection between pin 3 and 2. If remote ON/OFF is not used the strap shall remain in all connected shelves. Should the remote ON/OFF be used, all straps must be removed and in one (1) shelf 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 can be connected to any shelf.
- 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.

### Relay characteristics (Remote ON/OFF)

- Signal voltage +5VDC (galvanic insulated)
- Max wire size 1mm<sup>2</sup>

### 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)

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

Internal bus (Bus 6 pin / Bus 8 pin)

- The internal bus comprise of a 6 pole ribbon cable and an 8 pole ribbon cable.
- The internal bus connectors are sensitive and special caution should be taken during installation to keep them out of harms way.
- The internal bus is connected from the first shelf to the last shelf.

MONITORING UNIT - T2S ETH

T2S ETH is a monitoring solution for the full TSI inverter range and is able to monitor up to 32 inverters through a friendly web base interface. T2S also supports Modbus Serial communication (RTU) and SNMP v1 Communication.

This monitoring device provides a graphical user interface, embeds a SNMPv2c/SNMP v3 agent and Modbus TCP support with Catena, if one needs a touch screen display Catena can be connected to T2S ETH and is Compatible. It also allows user to change the configuration of the system.



T2S ETH provides 3 LEDs:

- Red for major alarm signaling
- Orange for minor alarm signaling
- Green for power and network connection status

The RJ45 is a standard Ethernet connector that can be connected on any IPv4 network.

T2S ETH firmware can be upgrade using the Micro SD card.

BRAVO to ACX Advanced Translator - 001-5301-0000

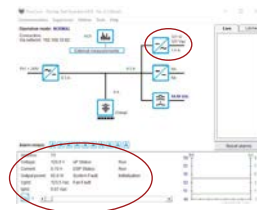
The BRAVO to ACX Advanced Translator provides communications between a UNIPOWER ACX controlled DC power system and a BRAVO inverter system. Relevant inverter data appears in the ACX controller under “SLI module data” and in the PowCom software under the inverter icons.

The ACX controller should have firmware v2.25 minimum (available for download from the website); configuration of BRAVO systems should not be required provided the default T2S-ETH and Modbus settings are used.

The translator mounts to standard 35mm DIN rail profiles.



Top View of translator board



PowCom showing BRAVO data

BLOCK DIAGRAM

