GREEN CUBES
THE POWER TO PERFORM

Bravo TSI48/120

Hot-Swappable Modular Inverter
48Vdc & 120Vac to 120Vac @ 2.5kVA

Overview

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 x208VAC + 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 30kVA 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 configure 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.

System Components

Description	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
Relay Rack Mid-Mount Kit	385.6400.5719
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	385.6401.5719
Management Module Blank	105.5701.01
BRAVO to ACX Translator	001 5301 0000

Features

- Extra AC input for increased efficiency
- Compact design
- Up to 30 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

Industries & 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.

Safety Certification

cUL1778 Recognized

Specifications

General

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

AC Input

Nominal Range	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 Range 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_n 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_n during 15s and 1.5 x In after 15s

In Transfer Performance

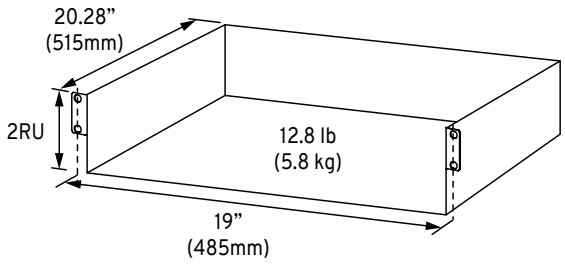
Max. Voltage Interruption	0s
Total Transient Voltage Duration (max)	0s

Signalling & Supervision

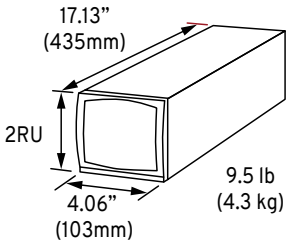
Display	Synoptic LED
Alarms Output & Supervision	Dry contacts on shelf / Standard USB port and MODBUS on T2S, optional : Candis Display / Candis TCP-IP
Remote on/off	on rear terminal of the shelf via T2S

Outlines

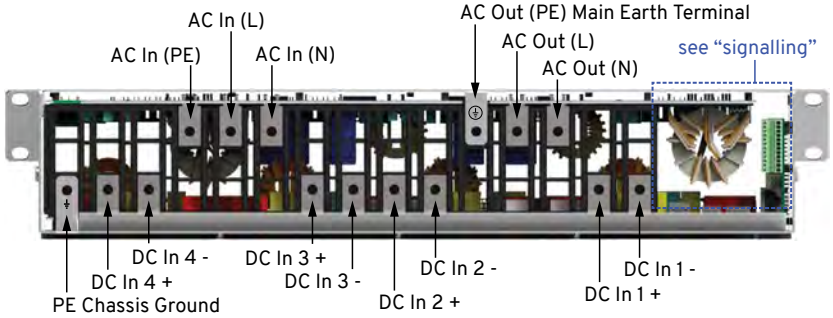
Rack-Mount Shelf



Inverter Module



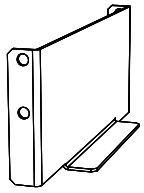
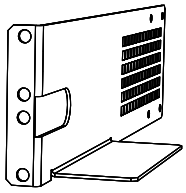
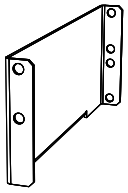
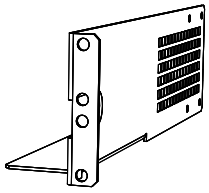
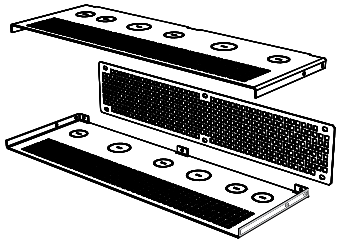
Shelf Rear View



Relay Rack Mid-Mounting

The BRAVO TSI shelf is provided with front face mounting brackets. To facilitate mid-mounting in an open relay rack Green Cubes offers a mid-mount kit comprising the parts shown below.

Kit Components

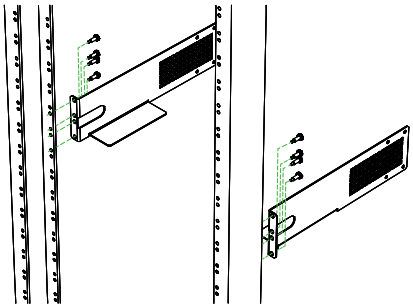
Item 1 Left-front Support Bracket	Item 2 Left-rear Support Bracket	Item 3 Right-front Support Bracket	Item 4 Right-rear Support Bracket	Items 5-7 Conduit box panels Top, Bottom & Rear
				

Hardware kit included:
10 x screws for mounting the support brackets to the rack.
2 x nuts / bolts and 2 x screws for fixing the power shelf to the front brackets.

Quick Installation Guide

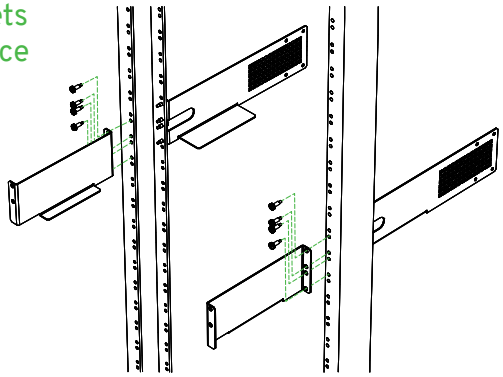
1

Fix brackets to rear face



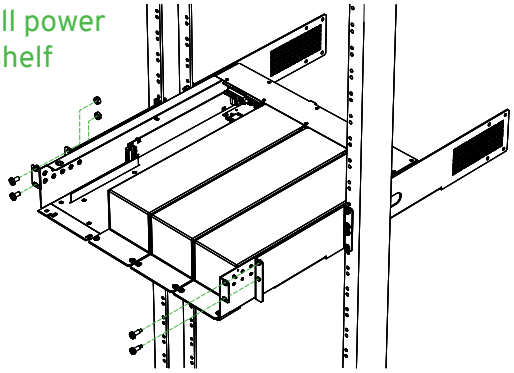
2

Fix brackets to front face



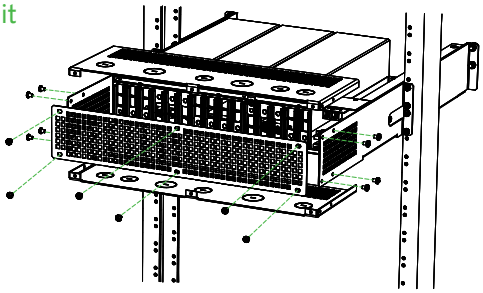
3

Install power shelf



4

Fit conduit covers



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.

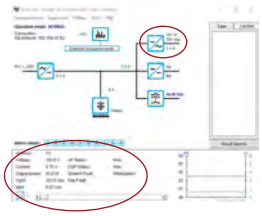
Bravo to ACX Advanced Translator (order code 001-5301-0000

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.

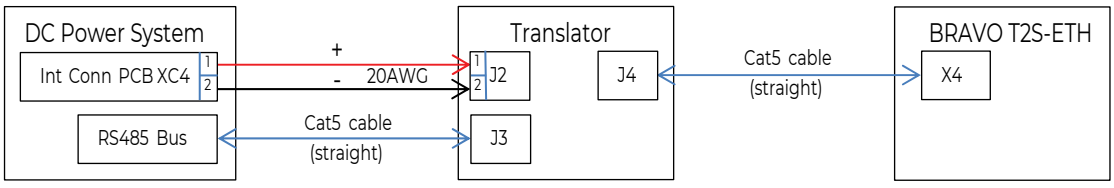
The translator mounts to standard 35mm DIN rail profiles.

Top View of translator board



PowCom showing BRAVO data

BLOCK DIAGRAM



Configuration Guide

PLEASE COMPLETE THE BELOW TABLE AND SUBMIT TO GREEN CUBES FOR VERIFICATION AND CONF. NO. ALLOCATION
(This form is fully interactive and may be completed electronically OR it can be printed and complete by hand)

STEP 1 - CUSTOMER DETAILS

Company: _____	Contact Name: _____
Address: _____	Email Address: _____
_____	Telephone: _____
Zip Code: _____ Country: _____	Quantity for quotation: _____

STEP 2 - PHASE CONFIGURATION - Choose one only

1- Phase - 120VAC L-N	1-Phase ☐ go to step 3a
2-Phase - 240VAC L1-L2-N	2-Phase ☐ go to step 3b
3-Phase - 230VAC L1-L2-L3-N OR 208VAC L1-L2, L2-L3, L3-L1	3-Phase ☐ go to step 3c

STEP 3a - OUTPUT CAPACITY - 1-phase

2.5kVA ☐	included parts: 1 x shelf, 1 x inverter Module, 3 x inverter blanks, 1 x management module.
5kVA ☐	included parts: 1 x shelf, 2 x inverter Module, 2 x inverter blanks, 1 x management module.
7.5kVA ☐	included parts: 1 x shelf, 3 x inverter Module, 1 x inverter blanks, 1 x management module.
10kVA ☐	included parts: 1 x shelf, 4 x inverter Module, 1 x management module.
12.5kVA ☐	included parts: 2 x shelf, 5 x inverter Module, 3 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
15kVA ☐	included parts: 2 x shelf, 6 x inverter Module, 2 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
17.5kVA ☐	included parts: 2 x shelf, 7 x inverter Module, 1 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
20kVA ☐	included parts: 2 x shelf, 8 x inverter Module, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
22.5kVA ☐	included parts: 3 x shelf, 9 x inverter Module, 3 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
25kVA ☐	included parts: 3 x shelf, 10 x inverter Module, 2 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
27.5kVA ☐	included parts: 3 x shelf, 11 x inverter Module, 1 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
30kVA ☐	included parts: 3 x shelf, 12 x inverter Module, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.

STEP 3b - OUTPUT CAPACITY - 2-phase

5kVA ☐	included parts: 2 x shelves, 2 x inverter Modules, 6 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
10kVA ☐	included parts: 2 x shelves, 4 x inverter Modules, 4 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
15kVA ☐	included parts: 2 x shelves, 6 x inverter Modules, 2 x inverter blanks, 1 x management module, 1 x management module blank & 1 x two-shelf cable.
20kVA ☐	included parts: 2 x shelves, 8 x inverter Modules, 1 x management module, 1 x management module blank & 1 x two-shelf cable.

STEP 3c - OUTPUT CAPACITY - 3-phase

7.5kVA ☐	included parts: 3 x shelves, 3 x inverter Modules, 9 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
15kVA ☐	included parts: 3 x shelves, 6 x inverter Modules, 6 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
22.5kVA ☐	included parts: 3 x shelves, 9 x inverter Modules, 3 x inverter blanks, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.
30kVA ☐	included parts: 3 x shelves, 12 x inverter Modules, 1 x management module, 2 x management module blanks & 1 x three-shelf cable.

STEP 4 - SHELF OPTIONS [one will be included for each shelf when selected]

Shelf Protection Covers	YES ☐	NO ☐	[Not available with mid-mount relay rack kit]
Mid-Mount Relay Rack Kit	YES ☐	NO ☐	[Incorporates rear cover kit with conduit knockouts]
19" to 23" Rack-Mount Adapter Kit	YES ☐	NO ☐	

STEP 5 - INTEGRATION WITH ASPIRO OR GUARDIAN DC POWER SYSTEM

Bravo to ACX Translator	YES ☐	NO ☐

STEP 6 - SUBMIT COMPLETED FORM TO UNIPOWER FOR CHECKING AND ALLOCATION OF CONFIGURATION PART NUMBER

Configuration Part Number: TSI-48/120-_____ (leave blank for completion by Green Cubes)

ABOUT GREEN CUBES TECHNOLOGY

Green Cubes Technology harnesses over 30 years of industry experience to ensure we design, develop and deliver solutions for the most challenging energy needs. We offer battery technology innovation, application design and performance management to drive productivity, scalability and sustainability.

Green Cubes provides complete power systems to the stationary power industry. With the addition of the Guardian and Aspiro Product lines offered under the UNIPOWER brand, these industry proven DC plant systems serve critical applications all around the world. Green Cubes offers complete power solutions including energy storage, power conversion, and seamless integration.

For more information, email **contact@greencubes.com** or visit **greencubes.com**

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