

# INV-B

## RACKMOUNTING INVERTER WITH BYPASS



POSITIVE PROBLEM SOLVING **+ =**

**The INV-B range provides a true stabilised sine wave output. This series of inverters are built with integrated static bypass switches, ensuring continual supply of an AC load.**

Connected systems are protected from loss of supply caused by power failures and disturbances. Should the primary power supply fail the INV-B will automatically switch over to the secondary source. This makes these inverters ideal for use as part of a UPS (Uninterrupted Power Supply) system. The wide operating temperature range and choice of inputs help to ensure that the INV-B is the first choice for the majority of locations.

- + Primary/Secondary Supply Settable to AC or DC**
- + Rapid Switching Time of <10ms**
- + User Settable 50Hz/60Hz Output Frequency**
- + Optional LAN Interface for Remote Monitoring**
- + Ruggedised Versions Available on Request**

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## SELECTION TABLE

| Part Number         | Maximum Power <sup>1</sup> | Input Voltage | Output Voltage <sup>2</sup> | Output Frequency <sup>2</sup> |
|---------------------|----------------------------|---------------|-----------------------------|-------------------------------|
| <b>500VA MODELS</b> |                            |               |                             |                               |
| INV-B 500-24        | 500VA                      | 24VDC         | 230VAC                      | 50Hz                          |
| INV-B 500-48-60     | 500VA                      | 48/60VDC      | 230VAC                      | 50Hz                          |
| INV-B 500-110       | 500VA                      | 110VDC        | 230VAC                      | 50Hz                          |
| INV-B 500-220       | 500VA                      | 220VDC        | 230VAC                      | 50Hz                          |
| <b>1kVA MODELS</b>  |                            |               |                             |                               |
| INV-B 1000-24       | 1kVA                       | 24VDC         | 230VAC                      | 50Hz                          |
| INV-B 1000-48-60    | 1kVA                       | 48/60VDC      | 230VAC                      | 50Hz                          |
| INV-B 1000-110      | 1kVA                       | 110VDC        | 230VAC                      | 50Hz                          |
| INV-B 1000-220      | 1kVA                       | 220VDC        | 230VAC                      | 50Hz                          |
| <b>2kVA MODELS</b>  |                            |               |                             |                               |
| INV-B 2000-24       | 2kVA                       | 24VDC         | 230VAC                      | 50Hz                          |
| INV-B 2000-48-60    | 2kVA                       | 48/60VDC      | 230VAC                      | 50Hz                          |
| INV-B 2000-110      | 2kVA                       | 110VDC        | 230VAC                      | 50Hz                          |
| INV-B 2000-220      | 2kVA                       | 220VDC        | 230VAC                      | 50Hz                          |
| <b>4kVA MODELS</b>  |                            |               |                             |                               |
| INV-B 4000-48-60    | 4kVA                       | 48/60VDC      | 230VAC                      | 50Hz                          |
| INV-B 4000-110      | 4kVA                       | 110VDC        | 230VAC                      | 50Hz                          |
| INV-B 4000-220      | 4kVA                       | 220VDC        | 230VAC                      | 50Hz                          |
| INV-B 4000-540      | 4kVA                       | 540VDC        | 230VAC                      | 50Hz                          |

<sup>1</sup> This is the maximum continuous apparent power at max PF. <sup>2</sup> Different output voltage and frequencies are possible. Please contact ETPS to discuss your requirements.

## OPTIONS

| CODE | DESCRIPTION  |
|------|--|
| /1   | Unit built with 115VAC, 60Hz output (not available for INV-B 4000 units)         |
| /2   | Unit built with connectors mounted on rear of unit (not possible with option /L) |
| /3   | Unit built with 230VAC, 60Hz output  |
| /L   | LAN interface for remote setting and measurement (INV-B 2000 or INV-B 4000)      |

## GENERAL SPECIFICATIONS

|             | INV-B 500                                   | INV-B 1000 | INV-B 2000 | INV-B 4000                       |
|-------------|---|------------|------------|----------------------------------|
| Accessories | Push button for setup, DC switch, AC switch |            |            | Push button for setup, DC switch |
| Warranty    | 2 years                                     |            |            |                                  |

## OPERATING RANGES AND FEATURES

|                                   | INV-B 500  | INV-B 1000 | INV-B 2000 | INV-B 4000 |
|-----------------------------------|--|------------|------------|------------|
| Maximum Continuous True Power     | 400W   | 800W       | 1600W      | 3200W      |
| Permissible Power Factor          | -0.8 to +0.8   |            |            |            |
| Maximum Continuous Apparent Power | 500VA  | 1000VA     | 2000VA     | 4000VA     |
| Voltage                           | 230VAC, failure tolerance $\pm 5\%$ [Option /1 for 115VAC, 60Hz] |            |            |            |
| Frequency                         | 50Hz [Option /1 for 115VAC, 60Hz], sinewave processor controlled |            |            |            |
| Efficiency                        | >88% at nominal load   |            |            |            |
| Load Range                        | 0 - 100%   |            |            |            |
| Crestfactor                       | >2.5   |            |            |            |
| Harmonic Distortion               | <2%  |            |            |            |

### TRUE SINE WAVE OUTPUT

The INV-B inverter is controlled by a microprocessor to produce a true sine wave output with low harmonic distortion of <2% to <5% depending on the model. This is within the UK grid tolerance of <5%, and significantly better than square, modified sine or quasi-sine wave inverters which produce very high levels of distortion. A pure sine output ensures that even sensitive electrical devices, such as computerised loads, can run smoothly from the inverter.

The AC output is provided via standard IEC, Phoenix or Wago sockets depending on the model. Each inverter supplies 230V<sub>AC</sub> output as standard, with 115V<sub>AC</sub> options available for models up to 1kVA. Output frequency is adjustable between 50/60Hz via the front panel of the unit.

### UNINTERRUPTED POWER SUPPLY (UPS) FUNCTIONALITY

The INV-B product family provides inverter capability with an AC input and integrated bypass, for continuity of supply during power failures. The inverter can be connected to external DC energy storage to run the load during grid outages. Alternatively, a secondary AC source can run the load when the DC supply is low or unavailable. Switching time is <10ms [typically <4ms].

## OPERATING MODES

### ON-LINE (DC INPUT PREFERRED)

When set to on-line, the INV-B will preferentially work in inverter mode. The DC input is treated as the primary supply, and the AC input will only be used when the DC supply is out of tolerance. See Safety and Protection for further details.

This mode is useful for installations with DC power generation, such as industrial DC grids, off-grid solar/wind power, or other battery storage systems with regular recharging. The AC supply can then take over running the load when the DC input is in need of recharging or maintenance.

### OFF-LINE (AC INPUT PREFERRED)

When set to off-line, the INV-B will preferentially work in bypass mode. The AC input is treated as the primary supply, and the DC input will only be used when the AC supply fails. See Safety and Protection for further details.

This mode is useful for systems with backup DC storage. A typical example is a UPS system where the AC load is run from batteries during grid outages or generator maintenance.

## INPUT RANGE

### TECHNICAL DATA

|          |                                |
|----------|--------------------------------|
| 24VDC    | 19 - 31VDC                     |
| 48/60VDC | 38 - 72VDC                     |
| 72VDC    | 60 - 90VDC                     |
| 110VDC   | 88 - 132VDC                    |
| 220VDC   | 178 - 264VDC                   |
| 540VDC   | 350 - 750VDC (4kVA units only) |

A large selection of nominal DC input voltages are available. Each unit has a wide input range for compatibility with the highly variable voltages of many DC power storage systems, such as batteries or capacitors. The inverter can continue to run without interruption even during large fluctuations of the input voltage. Voltage limit parameters can be adjusted as required within the range for most models, see Safety and Protection for further details.

## INTERFACES AND CONTROL

|                                | INV-B 500                                     | INV-B 1000 | INV-B 2000             | INV-B 4000                            |
|--------------------------------|---|------------|------------------------|---------------------------------------|
| Connector Position             | Front of unit (option /2 for rear of unit)    |            |                        |                                       |
| DC Input (at 24, 48/60, 72VDC) | 3 × high current terminal blocks 16mm         |            |                        |                                       |
| DC Input (at 110, 220, 540VDC) | 3 × high current terminal blocks 16mm         |            | Phoenix Power Combicon | 3 × high current terminal blocks 16mm |
| AC Output                      | Appliance outlet Schurter                     |            |                        | 1 × Phoenix Power Combicon            |
| AC Input (Bypass)              | Appliance inlet Schurter                      |            |                        | 2 × Phoenix Power Subcon              |
| Bypass Switch Time             | <10ms   |            |                        | <5ms                                  |
| Alarm                          | Phoenix Mini Combicon                         |            |                        | Binder round connector                |
| Optical Signals                | LCD dot matrix display                        |            |                        | LEDs for load display, PG/ON          |
| Signal Output                  | Voltage free alarm contact for loss of output |            |                        | Potential free contact                |

The inverter can be set up entirely from the front panel, including changing the output frequency between 50Hz and 60Hz. For certain models, more settings are available via the built-in LCD display such as overvoltage and undervoltage thresholds. 2kVA and 4kVA models can include an optional LAN interface to allow monitoring through a web browser, or through an NMS (Network Management System) via SNMP (Simple Network Management Protocol).

## MECHANICAL

|                           | INV-B 500                       | INV-B 1000 | INV-B 2000 | INV-B 4000                      |
|---------------------------|---------------------------------|------------|------------|---------------------------------|
| Operating Temperature     | -5°C to +45°C (non condensing)  |            |            | -5°C to +55°C (non condensing)  |
| Over-Temperature Derating | +45°C to +70°C (2%/°C derating) |            |            | +55°C to +70°C (2%/°C derating) |
| Ventilation               | Internal fan                    |            |            |                                 |

The wide operating temperature and excellent efficiency also help to ensure that the INV-B is ideal in numerous applications. Further ruggedisation is optionally available, increasing resilience against shock, vibration, and condensing humidity. This is useful for units installed in motor vehicles, boats, or any other system that might experience movement, vibration, or an uncontrolled environment.

## FORM FACTOR AND ENCLOSURES

|                | INV-B 500                      | INV-B 1000    | INV-B 2000                   | INV-B 4000   |
|----------------|--------------------------------|---------------|------------------------------|--------------|
| Casing         | 19" rack with mounting flanges |               |                              |              |
| Size           | 19" x 3U x 240mm [W x H x D]   |               | 19" x 3U x 360mm [W x H x D] |              |
| Weight         | Approx. 7kg                    | Approx. 7.5kg | Approx. 11kg                 | Approx. 15kg |
| Classification | IP 20                          |               |                              |              |

Units in this inverter range are robust and extremely light, weighing between 7kg and 15kg. All units are compatible with standard 19" rack mounting enclosures for easy installation. Each INV-B is 3U high with a depth of 240mm/360mm depending on the model. Connectors are built on the front of the inverter as standard. If required, input and output connectors can be installed on the rear panel at no additional cost.



1KVA MODEL WITH REAR CONNECTORS (FRONT)



1KVA MODEL WITH REAR CONNECTORS (REAR)

## SAFETY AND PROTECTION

### TECHNICAL DATA

|                   |   |
|-------------------|---|
| Electrical Safety | EN 60950, VDE 0805 [overload & short circuit protected] |
| EMC [Emission]    | EN 50081-1, Curve EN 55022B                             |
| EMC [Immunity]    | EN 50082-2  |

## HIGHLIGHTED FEATURES

### ⊖ ⊕ REVERSE DC CONNECTION

The DC input is protected against reverse connection<sup>3</sup>. This prevents damage in the event of reversed polarity of the DC source limit during initial connection.

<sup>3</sup> Excluding 4000VA/48V models

### OVP LIM UVP LIM AC OVERVOLTAGE/UNDERVOLTAGE

The voltage at the AC input is monitored, and the inverter will switch to the DC input supply if this is out of tolerance. If the DC supply is unavailable, the inverter will shut down. The overvoltage and undervoltage thresholds can be adjusted independently as required. When the AC supply is within tolerance again, the inverter will revert to the preferred input.

### °C OVERTEMPERATURE

Each inverter uses temperature and load-controlled fans to cool the module. This allows operation at full power across a wide temperature range of -5°C to +45°C/+50°C, depending on the model. Above the temperature range maximum, the output of 2kVA and 4kVA models is automatically derated for protection and continuous operation up to +70°C.

### Hz AC FREQUENCY MONITORING

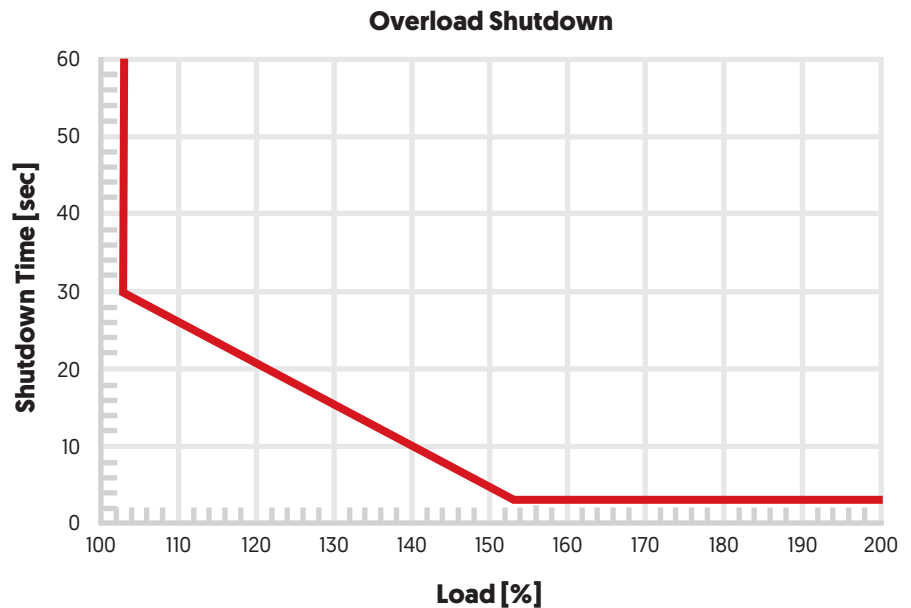
The frequency at the AC input is monitored, and the inverter will switch to the DC input supply if this exceeds the tolerance of ±3Hz. If the DC supply is unavailable, the inverter will shut down. When the AC supply is within tolerance again, the inverter will revert to the preferred input.

## HIGHLIGHTED FEATURES

### OUTPUT OVERLOAD/SHORT-CIRCUIT

The INV-B inverter can provide an output in excess of its nominal ratings for short periods. This is ideal for applications with surges in power demand, such as a motor's start-up current.

If the overload capacity is exceeded (e.g. due to a short-circuit) then the INV-B will shut down to prevent damage to the inverter. The system will automatically restart after a short period if the overload is corrected.



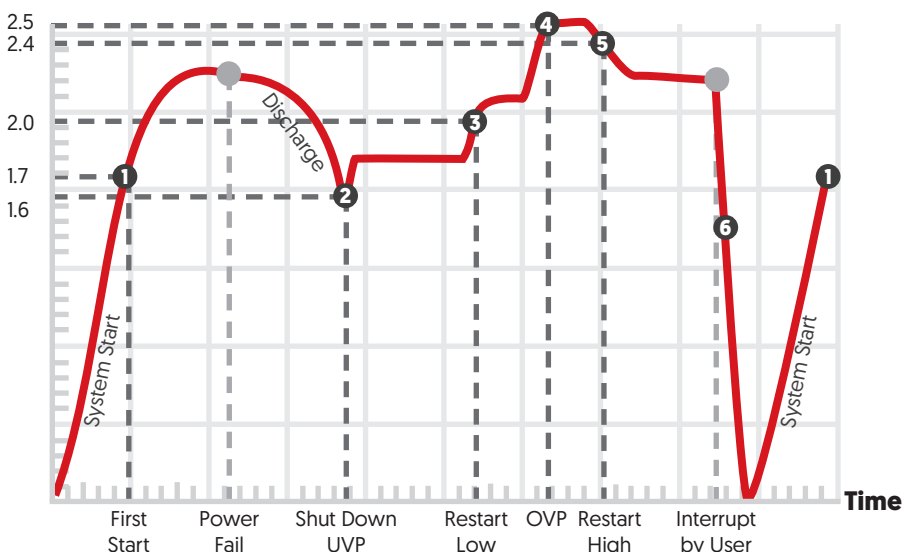
### DC OVERVOLTAGE/UNDERVOLTAGE

The inverter intelligently monitors the DC input voltage and switches to the AC supply if this fails. If neither the primary or secondary supplies are available, the inverter shuts down. The system will automatically reconnect when the input voltage returns to normal levels, with built-in hysteresis of the reconnection. This ensures a stable input is available prior to switching the output on.

For models with LCD display or LAN connectivity, all parameters below can be adjusted as required within the input range of the inverter. The system can be optimised for different DC supplies by adjusting the input voltage parameters, such as changing the UVP as to avoid over discharge of different battery chemistries.

1. First Start: the voltage required to start the inverter on initial connection.
2. UVP: the undervoltage protection point causes automatic shutdown of the DC input during low voltage.
3. Restart Low: after a low voltage shutdown, the DC input will restart when the voltage recovers.
4. OVP: the overvoltage protection point causes automatic shutdown of the DC input during high voltage.
5. Restart High: after a high voltage shutdown, the DC input will restart when the voltage recovers.
6. Reset: if the DC supply is disconnected, the DC input will restart after returning to the First Start voltage.

### V/cell



## ISOLATION

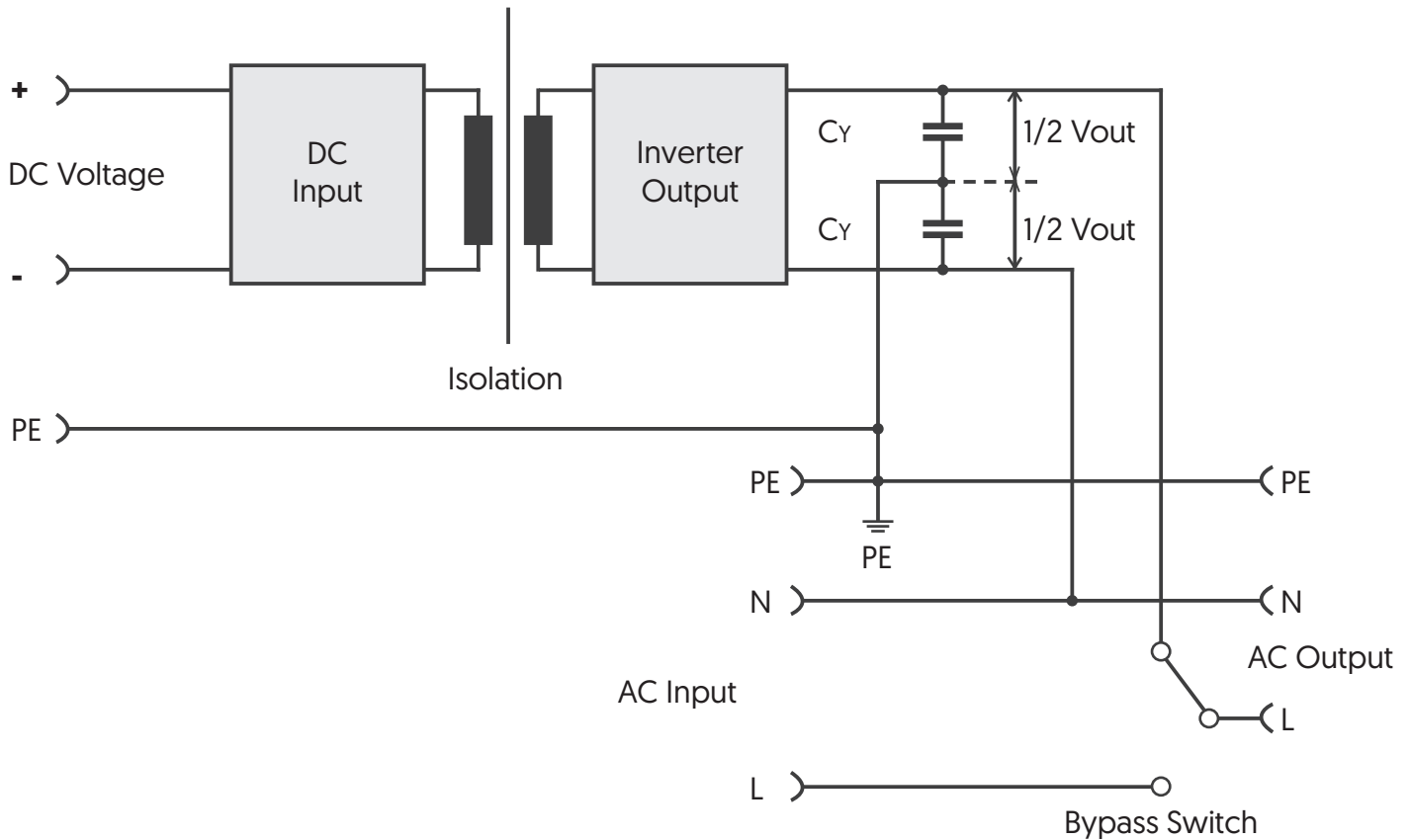
## TECHNICAL DATA

Galvanic Isolation

3.75kVDC

The AC output is galvanically isolated from the DC input at 3.75kV<sub>DC</sub>. The case of the inverter is electrically isolated, with a standard Y-capacitor connection between AC and ground. This is required to meet EMC requirements according to CE and UKCA. The leakage current is <3.5mA.

The PE and neutral wires of the AC input are fed straight through to the inverter's output. This provides a consistent output potential when switching between AC and DC input modes.



## RELATED PRODUCT FAMILIES



INV-LAVA-4000

For higher power applications, the INV-LAVA-4000 product family can include an optional bypass with hot-swappable units for N+1 redundancy. This is ideal for critical applications such as telecommunications or power station control systems. The installation can also be expanded with additional units, providing an output up to 48kVA.

If bypass functionality is not needed, INV-P inverters can be connected in parallel to combine outputs up to 20kVA. The inverters can be added, removed or exchanged without shutting down the system, allowing for true N+1 redundancy.

Every effort is made to ensure that the information provided within this technical summary is accurate. However, ETPS Ltd must reserve the right to make changes to the published specifications without prior notice. Where certain operating parameters are critical for your application we advise that they be confirmed at the time of order. ETPS Ltd specialises in modifying its proven platforms to suit your needs. Please contact our office if your requirement is non-standard. Please note that your actual unit may differ from those shown.



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ETPS engineer electronic power supply and testing systems. Our problem solving skills provide the spark of innovation to some of the world's leading technology brands.



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