

# INV-P

## RACKMOUNTING DC-AC SINEWAVE INVERTER



POSITIVE PROBLEM SOLVING **+ =**

The INV-P range provides a true stabilised sinewave output. Up to five units can be operated in parallel and installed into a 19" enclosure.

The load current is automatically shared by each inverter. This ability to increase the output power ensures that the system can be expanded as needs dictate. Units in this range are robust and extremely light, weighing between 7kg and 11kg. A variety of DC Inputs are available. The AC output is provided via both a standard IEC socket and Phoenix-style connectors on most models. The user can easily adjust the protection limits and a variety of other parameters through the front panel.

- + Up to 5 Parallel Inverter Modules**
- + Hot-swappable for True N+1 Redundancy**
- + Mean Time Between Failures of >30 Years at 50°C**
- + User Settable 50Hz/60Hz Output Frequency**
- + Optional LAN Interface for Remote Monitoring**

### CONTENTS

Selection Table	2
Options	2
General Specifications	2
Modularity (Master/Slave)	3
Operating Ranges	3
Input Ranges	4
Interfaces & Control	4
Safety & Protection	4-5
Isolation	6
Mechanical	6
Form Factor & Enclosures	6

## 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-P 500-24	500VA	24VDC	230VAC	50Hz
INV-P 500-48-60	500VA	48/60VDC	230VAC	50Hz
INV-P 500-110	500VA	110VDC	230VAC	50Hz
INV-P 500-220	500VA	220VDC	230VAC	50Hz
<b>1kVA MODELS</b>				
INV-P 1000-24	1kVA	24VDC	230VAC	50Hz
INV-P 1000-48-60	1kVA	48/60VDC	230VAC	50Hz
INV-P 1000-72	1kVA	72VDC	230VAC	50Hz
INV-P 1000-110	1kVA	110VDC	230VAC	50Hz
INV-P 1000-220	1kVA	220VDC	230VAC	50Hz
<b>2kVA MODELS</b>				
INV-P 2000-24	2kVA	24VDC	230VAC	50Hz
INV-P 2000-48-60	2kVA	48/60VDC	230VAC	50Hz
INV-P 2000-110	2kVA	110VDC	230VAC	50Hz
INV-P 2000-220	2kVA	220VDC	230VAC	50Hz
<b>4kVA MODELS</b>				
INV-P 4000-48-60	4kVA	48/60VDC	230VAC	50Hz
INV-P 4000-110	4kVA	110VDC	230VAC	50Hz
INV-P 4000-220	4kVA	220VDC	230VAC	50Hz
INV-P 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-P 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-P 2000 or INV-P 4000)

## GENERAL SPECIFICATIONS

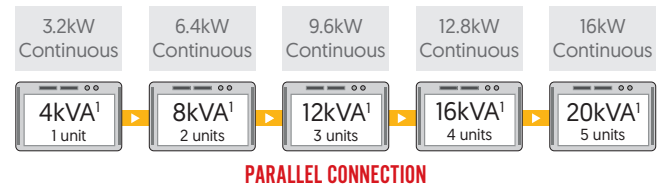
TECHNICAL DATA	
Accessories	Push button for setup, main switch
Warranty	2 years

## MODULARITY (MASTER/SLAVE)

### PARALLEL OUTPUTS

Up to 5 INV-P modules can be connected in parallel to make a single, synchronised output. The load is automatically shared between all parallel modules, and dynamically adapts as modules are added, removed, or swapped. Each module is also able to operate independently, so that systems can be reconfigured, expanded, or broken up as needs dictate.

The modular approach is useful for installations that might need to power many different sized power devices. Individual modules can be used for the day-to-day running of multiple small devices, then #grouped together for larger projects. If power use increases after commissioning, then the system can be easily expanded to match the new requirement. The example right shows parallel connection of 5× 4kVA models.



<sup>1</sup> This is the maximum continuous apparent power at max PF.

### N+1 REDUNDANCY

Units can be added or swapped without powering down the system. True N+1 redundancy can therefore be achieved by including redundant units that can be exchanged as required, with no interruption to the output. By using a system with additional redundant inverters in parallel, the remaining inverters will smoothly take over the load sharing in the event of failure or disconnection of any unit.

## OPERATING RANGES AND FEATURES

	INV-P 500	INV-P 1000	INV-P 2000	INV-P 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-P inverter is controlled by a microprocessor to produce a true sine wave output with low harmonic distortion of <3%. This is well 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 Phoenix-style connectors, with additional standard IEC sockets for models up to 2kVA. Each inverter supplies 230V<sub>AC</sub> output as standard, with 115V<sub>AC</sub> options available for models up to 2kVA. Output frequency of 50/60Hz is adjustable on the unit.

## 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-P 500	INV-P 1000	INV-P 2000	INV-P 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, 220VDC)	3 × high current terminal blocks 16mm		Phoenix Power Combicon	3 × high current terminal blocks 16mm
AC Output (Parallel-Mains)	2 × Phoenix Power Combicon plugs			1 × Phoenix Power Combicon
AC Output (Parallel-Signal)	2 × RJ45 S-UTP, 1 × appliance outlet			2 × Phoenix Power Subcon
Alarm	Phoenix Power Combicon plugs			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			

The modules 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).

## 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, up to the input voltage.

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

### OVERTEMPERATURE

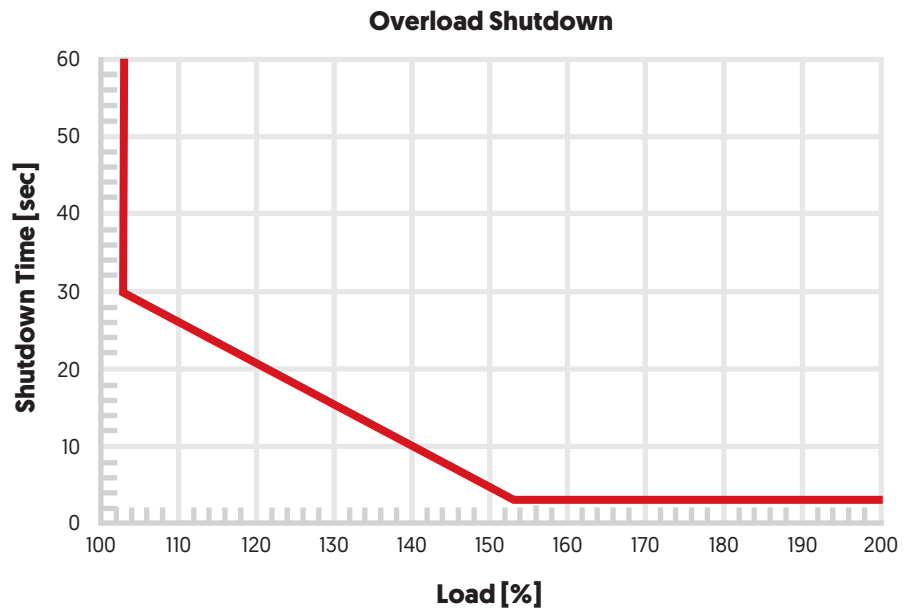
Each inverter uses temperature and load-controlled fans to cool the module. This allows operation at full power across a wide temperature range of -5°C to +45°C/+50°C, depending on the model. Above the temperature range maximum, the output of 2kVA and 4kVA models is automatically derated for protection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

## HIGHLIGHTED FEATURES

### OUTPUT OVERLOAD/SHORT-CIRCUIT

Each INV-P 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-P will shut down to prevent damage to the inverter. The system will automatically restart after a short period if the overload is corrected.



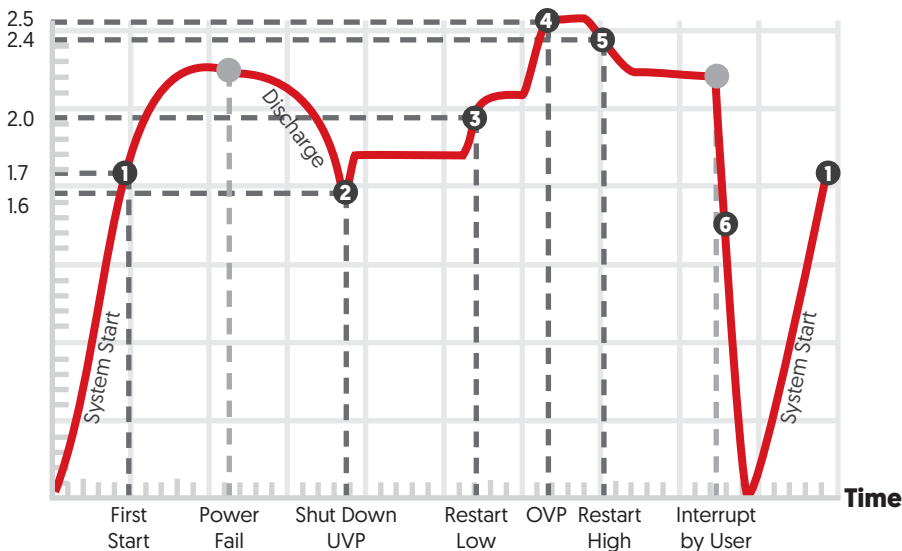
### DC OVERVOLTAGE/UNDERVOLTAGE

The inverter intelligently monitors the DC input voltage and shuts down if this breaches the expected limits. 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 due to low input voltage.
3. Restart Low: after a low voltage shutdown, the inverter will restart when the voltage recovers.
4. OVP: the overvoltage protection point causes automatic shutdown due to high input voltage.
5. Restart High: after a high voltage shutdown, the inverter will restart when the voltage recovers.
6. Reset: if the DC supply is disconnected, the inverter will restart after returning to the First Start voltage.

#### V/cell

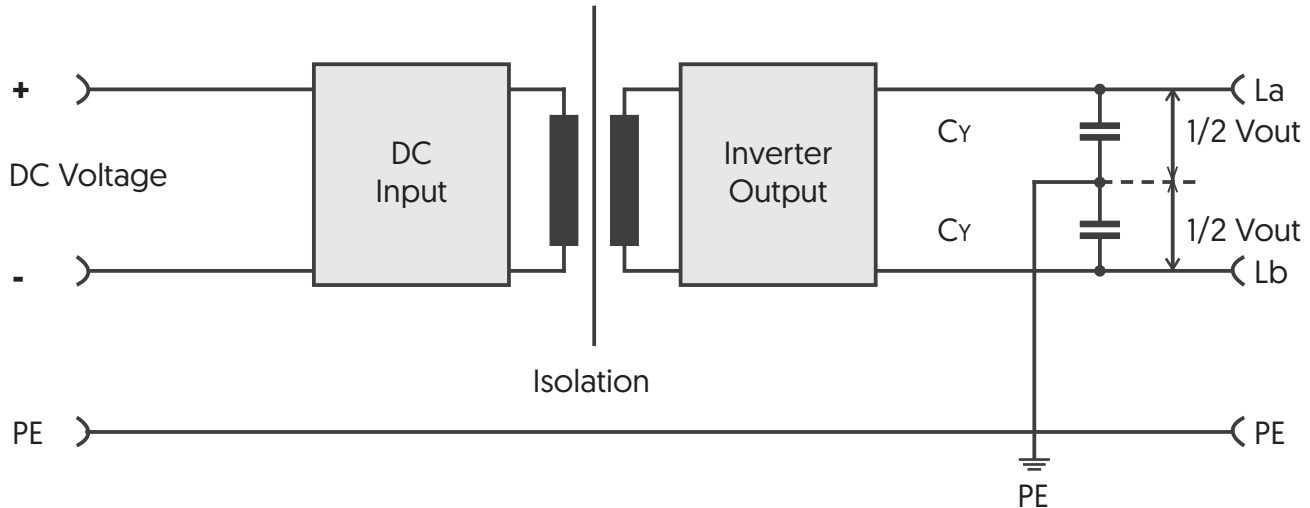


## ISOLATION

## TECHNICAL DATA

Galvanic Isolation	3.75kVDC
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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 of CE and UKCA. The leakage current is <3.5mA.



## MECHANICAL

	INV-P 500	INV-P 1000	INV-P 2000	INV-P 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-P 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-P 500	INV-P 1000	INV-P 2000	INV-P 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	
Classification	IP 20			

Units in this inverter range are robust and extremely light, weighing between 7kg and 11kg. All INV-P modules are compatible with standard 19" rack mounting enclosures for easy installation. This is useful for parallel systems, where multiple units can be installed in one rack. Each INV-P 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.

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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