

Let's talk!

Inverter INVP-Series for Industry, Telecom und Rail Applications

Technical Description – English



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1 Preface

Thank you for purchasing a product from Power Innovation GmbH.

This manual contains detailed information about the Power Innovation GmbH device you purchased. It describes the features, basic functions, various applications and offers solutions in case of failure. Instructions on installation, storage and shipping are also included.

Please note that this manual contains the description of an entire series of Power Innovation products. Please check your order and/or device label in order to refer to the corresponding information given in this manual.

This manual addresses mostly to chief operators and system supervisors, to electrical consultants and electricians. Our devices may only be installed by qualified personnel, according to the following instructions as well as to national and international regulations where applicable.

Our products' technology meets all requirements of telecommunications, electric power supply, industry and railway technology. Our product line ranges from small power converters up to large systems.

State of the art circuit design delivers high efficiency. This allows long-term operation at low temperature stress. The devices need no servicing.

2 Acceptance test

Power Innovation products are manufactured, controlled and shipped according to strict quality standards. If a product is defective in material or workmanship, the warranty will be granted (refer to our “Terms of Warranty”).

2.1 Checking for damages

- Check the product for damage due to shipment. In case of damage keep all packing material for further examination.
- If you discover shipping damage after inspection, you must submit a claim for covered shipping damage.
- Inform the forwarder of shipping damage by sending a fax immediately.
- Send a copy of the damage claim to Power Innovation GmbH immediately.

The manufacturer will not be liable for any injury, loss or damage, arising directly or consequentially out of the improper use of this product. It is mandatory to read this manual. Please observe all written instructions, especially the safety advices.



In case of claims, please refer to your specific product information, such as product name, serial number, power rating, input and output voltages, as shown on the device label.

3 Installation



Note:

The electrical planning and installation of the device may only be undertaken by qualified personnel. It must comply with all local legislation and regulations.

The installation instructions must be followed carefully. If neglected, safety and health of the personnel involved are threatened and injuries or fatality may be caused. Please refer to your country's regulations.



Warning Explosion:

Do not operate the inverters in explosive areas. Operation of the inverters in such an environment constitutes a safety hazard.

Furthermore, the inverters must not be operated in hermetically sealed cabinets.

3.1 Operational environment

All the requirements concerning environment described in this chapter must be fulfilled. When planning location and installation of the device, the following points must be considered:

- For correct function and optimal life span, avoid temperature and humidity peaks (non-condensing environment).
- Ensure proper ventilation.
- With forced cooling devices, ensure that cooling air is able to flow unhindered through front side and rear side of the inverter. (Provide a minimum clearance of 150 mm on the front side and on the rear side.)

Upon disregard of the above hints, Power Innovation GmbH can guarantee neither the safety of personnel involved nor a correct function of the power supply.

3.2 Safety requirements

Explanation of the safety symbols used in this manual:



Warning



Caution



**Warning Ex-
plosion**

The electrical planning and installation of the device may only be undertaken by qualified personnel. It must comply with all local legislation and regulations. The installation instructions must be followed carefully. If neglected, safety and health of the personnel involved are threatened and injuries or fatality may be caused. Furthermore, the device or connected load may be damaged. All wiring must be done in a voltage-free state in order to avoid any damage to life and equipment. Make sure that wiring diameters meet the specified system current from/to the device, if applicable. Please refer to your country's regulations.



Warning:

Do not open the device! Some components inside carry high voltages. Disregard threatens the safety and health of personnel involved and may cause injuries or even fatality. There are no maintenance points inside the inverter.

3.3 External fusing

For maintenance and especially for safety reasons, external fusing for DC supply and AC output must be provided. It is strongly recommended to use 2-pole circuit breakers for both DC and AC fusing.

3.4 Electrical connections

When connecting the inverter, ensure the correct cable sizes and diameters. Please find additional information printed in section 3.8 *Control elements and connections*.

3.5 Mechanical support

It is recommended using additional mounting rails to support the sub-rack inside the frame / cabinet. Please contact your cabinet manufacturer for a suitable rail.

3.6 Grounding

Ensure a correct ground connection. The ground contact (PE) must be connected to the DC input of the device, using the largest possible diameter. Furthermore, for all wall mounted devices, connect PE to the ground bolt.

The inverters manufactured by Power Innovation GmbH have a galvanic isolation between DC input and AC output. The generated AC output voltage (230V_{AC}/50Hz or 115V_{AC}/60Hz) is electrically isolated from the DC input and the protective earth (PE) / mechanical housing. The only connection is a capacitive connection via the EMC Y-capacitors to the mechanical

housing. These capacitors are necessary to fulfill the EMC requirements. The leakage current is $< 3.5 \text{ mA}$. Thus, the inverter fulfills international norms and is marked with the CE label.

If the inverter is used in an application, where no neutral wire (N) is connected to the unit, voltage between the single phases and PE can be measured to approx. 115V_{AC} (58V_{AC}). This voltage comes from the capacitive EMC voltage divider. It is uncritical because of the low capacitance of the Y-capacitors. See figure 1 for reference.

In the island mode, one phase can be connected to earth (PE). This pole is defined as neutral wire (N). The other pole corresponds to the phase (L1).

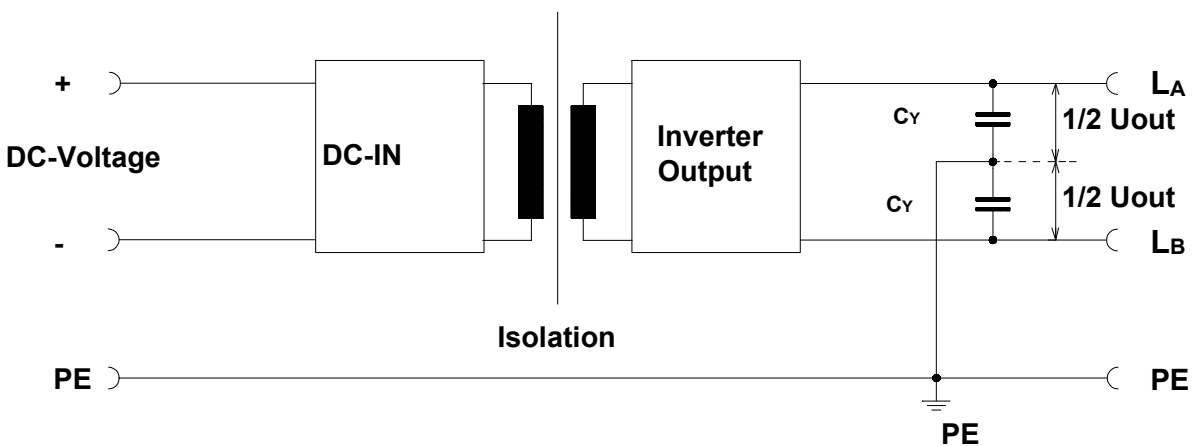


Figure 1

3.7 Product description



Please note:

The following chapters describe technical features and data that may depend on power version, voltage version or options ordered. If not otherwise mentioned, any information given in these chapters refer to all the series' products. Please check your order confirmation/delivery note and/or device label in order to refer to the corresponding information given.



Warning:

Do not open the device! Some components inside carry high voltages. Disregard threatens the safety and health of personnel involved and may cause injuries or even fatality. There are no maintenance points inside the inverter.

The INVP2000 and INVP4000 inverters are designed as follows:

Power rating and voltage versions:

Product	Power rating	DC input voltage	AC output rating
INVP2000	2000VA/1600W	24, 48/60, 110, 220V _{DC}	115V _{AC} , 60 (50) Hz
INVP4000	4000VA/3200W	48/60, 110, 125, 220V _{DC}	230V _{AC} , 50 (60) Hz

Table 1

The inverters have an integrated parallel mode module. Up to five inverters can be connected in parallel. The inverters are operated by the control bus according to the master-slave principle. By paralleling inverters, the user can achieve either a higher AC output power or an N+1 redundancy. The inverters are fan cooled. The speed of the internal fans depends on the internal inverter temperature and the AC output power.

The inverters offer the following protective functions:

- a) Overload- and short circuit protected output
- b) DC UVP (under voltage protection) and DC OVP (over voltage protection) with hysteresis parameters
- c) AC UVP/OVP at the inverter's output
- d) Protection against excess temperature
- e) Built-in AC fuse

Notes on the operation of an external bypass switch for manual load switching between inverter and mains voltage

The inverters from Power Innovation GmbH are self-commutated inverters designed for island operation, e.g. as energy source in UPS applications. For applications requiring inverter operation in parallel to the mains (e.g. load supply simultaneously provided by the mains and by an inverter) or assigned to feed energy into the mains, it is necessary to use so-called “line-commutated” inverters. Such inverters are not included in our product portfolio.

Inverters from Power Innovation GmbH are equipped with output stages not protected against reverse current. It must strictly be avoided that a reverse current supplied from the mains or from other inverters can flow back through the connected load into the inverter’s AC output. When installing the system, it must therefore be ensured that a manual bypass switch provided by the customer (where applicable) separates the load from the inverter AC voltage **first** and **then** establishes the connection to the mains voltage. An interruption-free switchover is **not** possible, so-called MAKE-BEFORE-BREAK relays inevitably lead to the destruction of the inverter output stage.

An exception is possible with Power Innovation INVB(L) inverters, if the DC supply of the inverter is interrupted **first** (i.e. **before** the load is bypassed manually from inverter supply to mains supply or vice versa). INVB(L) inverters are equipped with an internal bypass switch for automatic load switching from DC supply to mains supply (or vice versa). If the DC supply of the inverter is interrupted first, this internal bypass is forced to disconnect the inverter’s output stage and to switch over to the mains – even before switching over to the mains via an external, manually operated bypass switch. For this external switchover, a multistage, interlocked changeover switch needs to be provided by the customer. The release of that switch must already trigger a switching procedure disconnecting the inverter’s DC supply. Now it is possible to switch over the AC line from inverter operation (internally bypassed¹) to mains operation (manually bypassed²) without interruption. Thus, it is, for example, possible to replace an inverter without interrupting the load supply.

An interruption-free switch-over to mains operation (manually bypassed) is not possible with Power Innovation INVW(R) and INVP(L) inverters. INVW(R) and INVP(L) inverters are designed for stand-alone operation, INVP(L) inverters for parallel operation as well. They are not provided with an internal bypass switch.

¹ The internal bypass has switched to the mains.

² Load is supplied by the mains, externally bypassing the inverter.

3.8 Control elements and connections

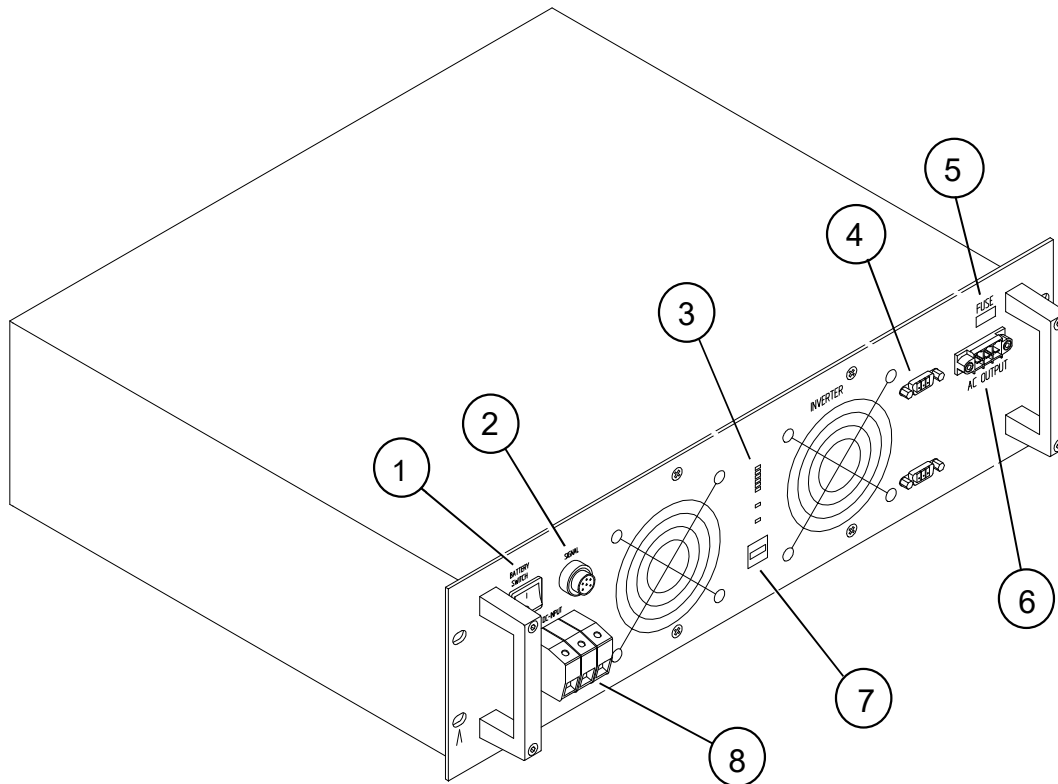


Figure 2

No.	Description	Type / Function
1	BATTERY SWITCH	Inverter ON (1) / OFF (0)
2	Potential-free alarm contact	Binder round connector DIN 45322, 0.5/0.75mm ² , contact load: 100 V/0.2 A, 40 V/0.5 A
3	LED display	6x Load-LED, 1x Online- and 1x Power-LED (red/green/orange)
4	Parallel signal	2x Phoenix Power-Subcon, 3-pole, 0.75mm ²
5	AC fuse	30A, magnetic
6	AC output	Phoenix Power CombiCon, 3-pole, 2.5mm ²
7	Control push button	For switching between standby mode and normal operation as well as for changing factory settings in the setup menu.
8	DC input	Phoenix HDFK 16 screw clamps, 16mm ²

Table 2

3.9 Block diagram

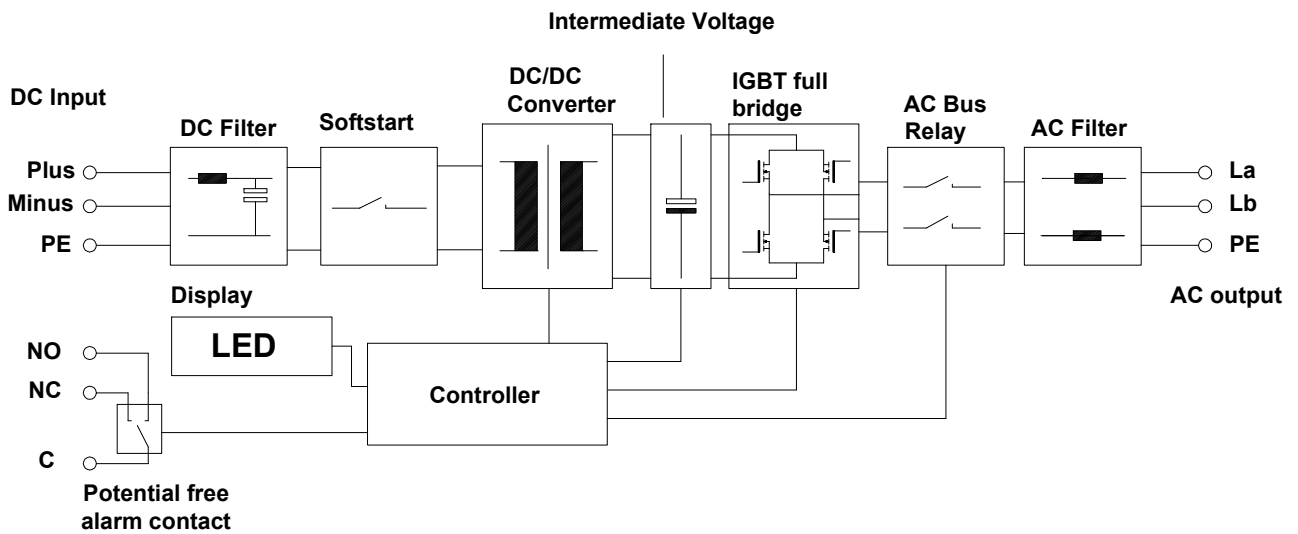


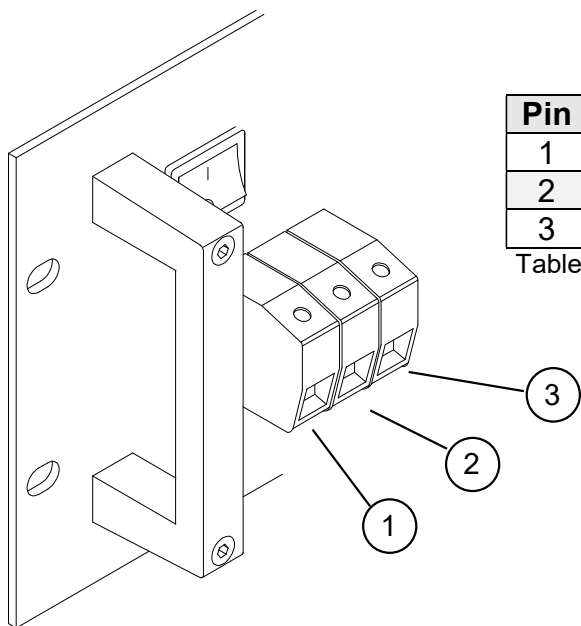
Figure 3

3.10 Pin assignment

3.10.1 DC input

2000 VA inverter for $DC_{IN} = 24, 48/60, 110$ and $220 V_{DC}$

4000 VA inverter for $DC_{IN} = 48/60, 110, 125$ and $220 V_{DC}$



Pin	Function	Abbreviation
1	Input voltage reference	0V U_{IN}
2	Ground wire	PE
3	Input voltage positive	+ U_{IN}

Table 3

Figure 4

3.10.2 Alarm contact

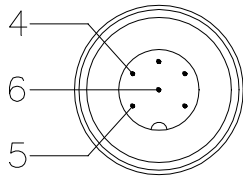


Figure 5

Alarm relay

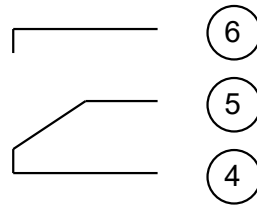


Figure 6, illustration: currentless relay

Pin	Function	Contact
1	Not connected	n.c.
2	Not connected	n.c.
3	Not connected	n.c.
4	Inverter: Alarm	Normally Closed (NC)
5	C	Common (C)
6	Inverter: OK (Power Good)	Normally Open (NO)

Table 4 (The contact designations refer to the idle position of the currentless relay.)

During fault-free operation of the inverter, the alarm relay is energized (Power Good = output voltage is within admissible operating parameters).

3.10.3 AC output

2000 VA inverter for $AC_{OUT} = 115 V_{AC}$

4000 VA inverter for $AC_{OUT} = 230 V_{AC}$

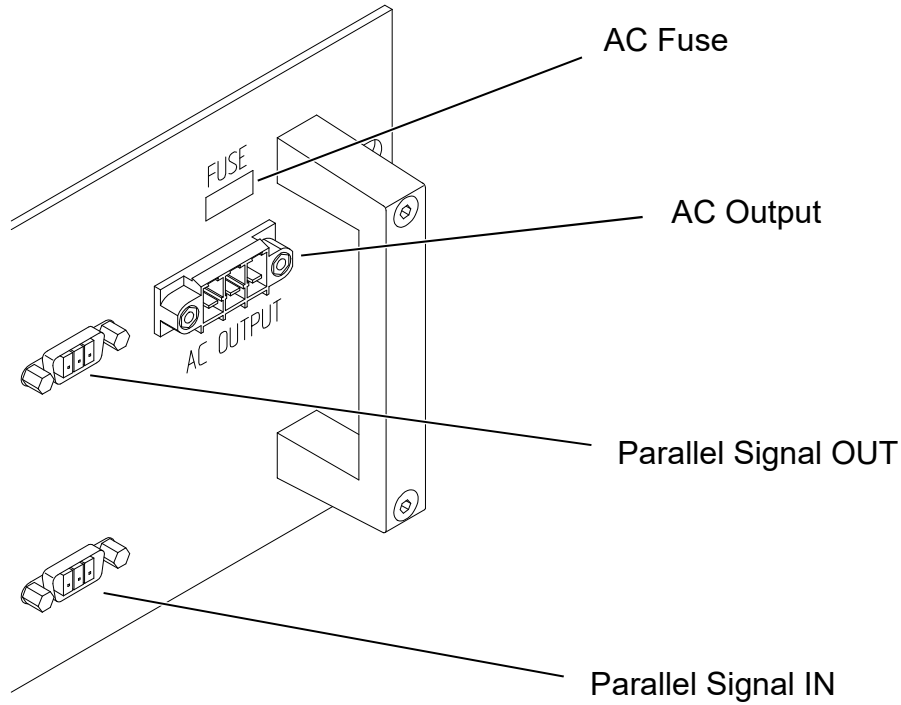
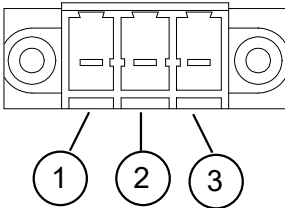


Figure 7

AC output



Pin	Function	Abbreviation
1	AC output	LA
2	Ground wire	PE
3	AC output	LB

Table 5

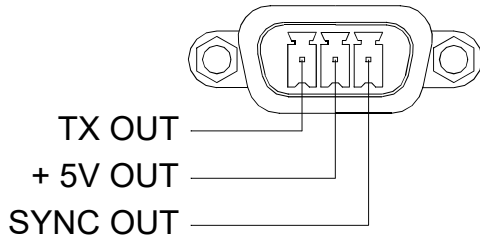
Figure 8



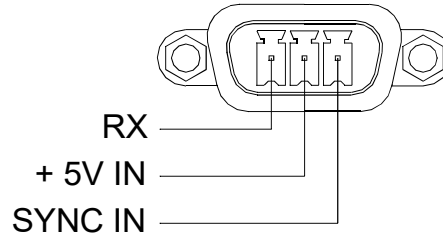
Caution:

For parallel operation, the outputs must be connected with correct phase assignment. LA and LB must not be interchanged! In case of non-compliance, the devices may be damaged.

Parallel signal OUT



Parallel signal IN

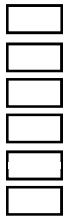


Figures 9 and 10

Note: The inverters can operate either as stand-alone or parallel operating units. The inverters' output is floating. For an L/N/PE configuration of the output, one of the pins (L_A or L_B) must be connected to the protective earth contact PE. Refer to section 3.6 *Grounding*.

3.11 LED operating display

LOAD



Load display

LED 6 (red)	150% overload
LED 5 (red)	125% overload
LED 4 (green)	100% load
LED 3 (green)	75% load
LED 2 (green)	50% load
LED 1 (green)	25% load

ONLINE



Online display

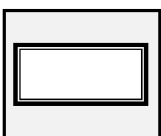
Online LED (green)	Signalizes normal operation (output voltage present)
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POWER



Power display

Power-LED orange	Standby mode
Power-LED green flashing	Selftest
Power-LED green	Normal operation
Power-LED red	Internal failure
Power-LED red flashing	Setup failure
Power-LED off	Inverter is off / no DC supply



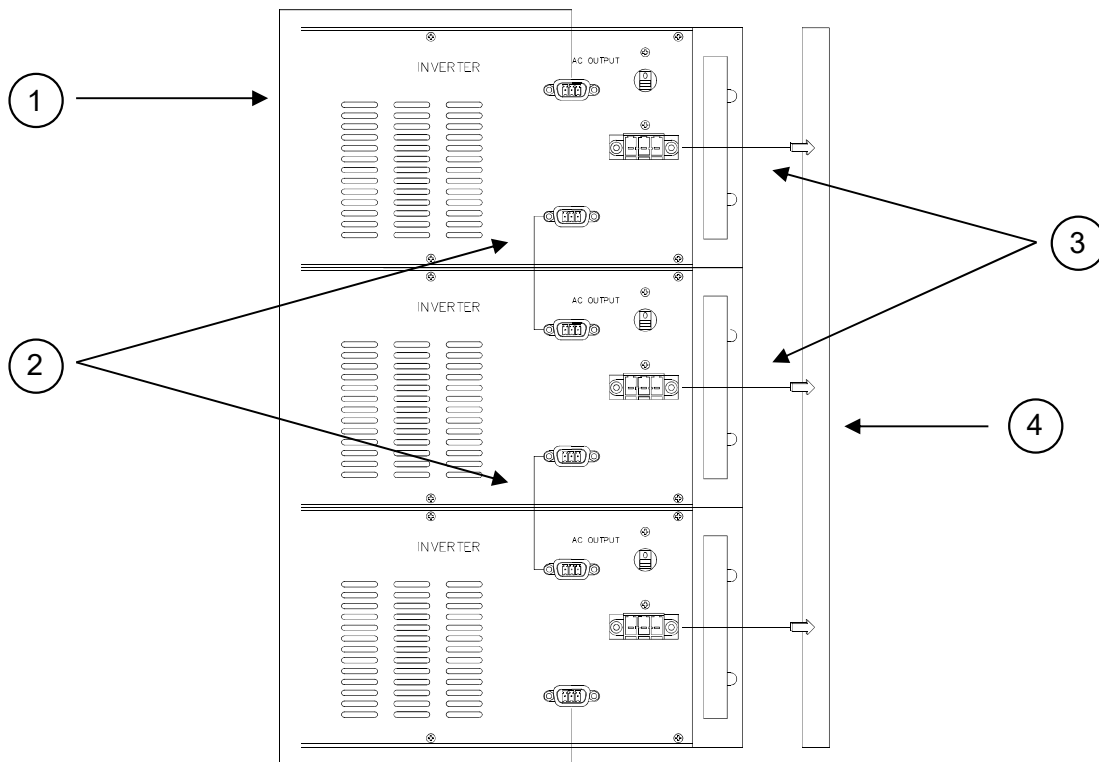
Push button

For switching between standby mode and normal operation and for setup setting (please refer to chapter 5 *Setup mode*).

4 Parallel operation

4.1 Parallel operation concept

The parallel connection of the inverters must be carried out via an external distribution rail
Up to five inverters can be paralleled.



Paralleling with external distribution rail

Figure 11

No.	Function
1	Feed-back cable of the communication and data bus
2	Short communication and data bus cable (Parallel signal)
3	Short power cable (Parallel AC Out)
4	External distribution rail

Table 6



Caution:

Make sure the bus connections (Power-Subcon cables) have been connected **before** the AC connections are made in order to assure synchronization of the outputs. The feedback cable is mandatory for the function of the system. Neglecting might result in permanent damage of the devices.

4.2 Initialization and expansion of the system

An inverter system based on INVP series inverters can be expanded to up to 5 parallel working units to achieve the requested power needs of the connected loads or to ensure an N+1 redundancy. An additional inverter can be integrated during active operation without interrupting the connected loads.



Warning:

An expansion of the system during active operation is only possible in a prewired cabinet.

The expansion of the cabinet wiring is only possible in a voltage-free state.



Warning:

If the expansion of the system is carried out during active operation, it must be observed, that the external distribution rail required for parallel connection is under high electrical voltage. Observe all relevant national and other safety regulations for working on live electrical systems.

When installing an additional inverter into a running system, the following steps need to be carried out in the sequence stated. (For installation of a stand-alone inverter, skip the steps referring only to parallel operation.)

- Make sure, that the external circuit breaker provided for DC fuse protection of the new inverter is switched off (0 – OFF).
- Make sure, that the BATTERY SWITCH of the new inverter is in position OFF (0 – OFF).
- Connect the DC supply to the inverter's DC input. (Please refer to chapter 3 *Installation*).
- By using the Power-Subcon cables provided, connect the Parallel Signal IN of the new inverter to the Parallel Signal OUT of the last inverter of the system and the Parallel Signal OUT of the new inverter to the feedback cable of the system.
- Connect the AC output of the new inverter to the external distribution rail.
Warning, the distribution carries high voltage!
- Switch on the external DC circuit breaker of the new inverter (1 – ON).

- Switch on the new inverter by using the BATTERY SWITCH. The inverter will log on automatically to the master-slave bus.

Note: Do not use the control push button in the middle of the inverter front panel; the inverter will start on its own. The control push button can switch off the whole system.

- The new inverter is running in the system now. The load sharing happens dynamically. An inverter operating in stand-alone mode is on standby and can be switched on by using the control push button.



Note:

If faults occur, refer to chapter 7.2 *Troubleshooting*.

4.3 Exchange of inverters during parallel operation

Analogous to the expansion of the system described above, an inverter can be exchanged for maintenance purposes or repair without interrupting the connected loads.



Warning:

If the exchange of an inverter is carried out during active operation, it must be observed, that the external distribution rail required for parallel connection is under high electrical voltage. Observe all relevant national and other safety regulations for working on live electrical systems.

When exchanging an inverter, the following steps need to be carried out in the sequence stated:

- Switch off the inverter to be exchanged by using the BATTERY SWITCH. (Do not use the control push button which would switch off the whole system!)
- Switch off the external circuit breaker protecting the DC input of the inverter to be exchanged (0 – OFF).
- First disconnect the inverter's data bus cables (Power-Subcon cables IN and OUT) and then the AC connection cables from the system. **Warning, the distribution carries high voltage!**
- Disconnect the inverter's DC supply cables.

- Install the new inverter into the system.
- By using the Power-Subcon cables provided, connect the Parallel Signal IN of the new inverter to the Parallel Signal OUT of the last inverter of the system and the Parallel Signal OUT of the new inverter to the Parallel Signal IN of the next inverter in the system.
- Connect the external DC fuse circuit (that previously has been switched voltage-free) with the DC input of the new inverter.
- Connect the AC output of the new inverter to the external distribution rail.
Warning, the distribution carries high voltage!
- Switch on the external DC circuit breaker of the new inverter (1 – ON).
- Switch on the new inverter by using the BATTERY SWITCH (1 – ON). The inverter will log on automatically to the master-slave bus.
Note: Do not use the control push button; the inverter will start on its own. Under certain conditions, the control push button can switch off the whole system.
- The new inverter is running in the system now. The load sharing happens dynamically.



Note:

If faults occur, refer to chapter 7.2 *Troubleshooting*.

5 Setup mode



Caution:

Setup mode changes the parameters of the inverter. The factory defaults comply with standard conditions and/or the parameters ordered by the customer. Alteration by qualified personnel only! Damage to the inverter or connected devices or financial losses due to down times are on sole responsibility of the customer.



Note:

To make changes in the setup mode, it is necessary to shut down the inverter or, respectively, the whole inverter system switched in parallel. The connected load is not being supplied during shut-down time.

In the setup mode, you can adjust or change the output frequency and the short-circuit behavior of the inverter. The procedure required for this is described below. In case of systems with several inverters connected in parallel, this sequence of actions must be carried out on all inverters.

Switching to setup mode:

- Switch the inverter (or, respectively, the whole system) to standby by pressing the control push button.
- Switch off the inverter by setting the BATTERY SWITCH to position 0 – OFF.
- Press and hold the control push button and activate the setup mode by setting the BATTERY SWITCH to position 1 – ON.

The inverter is in setup mode now.

The options and factory defaults for the output frequency and short-circuit behavior are listed in table 7:

Parameter	Options	Factory defaults
Output frequency	50 Hz / 60 Hz	INVP2000: 60 Hz INVP4000: 50 Hz
Short-circuit behavior	Switch-off (without restart) / Switch-off (with restart)	Switch-off (without restart)

Table 7

The selection of the parameter and the adjustment of the desired option is carried out by selecting and activating/deactivating the assigned LEDs using the control push button. The assignment of the LEDs to the parameters and options is shown in table 8:

LOAD LED	POWER LED activated	POWER LED deactivated
LOAD LED 6 (red)	-	-
LOAD LED 5 (red)	60Hz	50Hz
LOAD LED 4 (green)	Automatic restart after short-circuit	Switch-off after short-circuit
LOAD LED 3 (green)	Diagnose-mode, only for testing purposes	Standard display
LOAD LED 2 (green)	-	-
LOAD LED 1 (green)	High short-circuit current	Smaller short-circuit current

Table 8

Note: The other setup parameters must not be changed!

To change settings, proceed as follows:

- Select the desired Load LED by repeatedly pressing the control push button briefly.
- When the selected Load LED lights up, keep the push button pressed. In this way, you activate or deactivate the Power LED, thus setting the desired option. (The activated Power LED lights red.)
- When all settings are done, finish the setup mode by setting the BATTERY SWITCH to 0 (OFF). Thus, the changes are saved for operation of the inverter(s).

6 Battery diagram

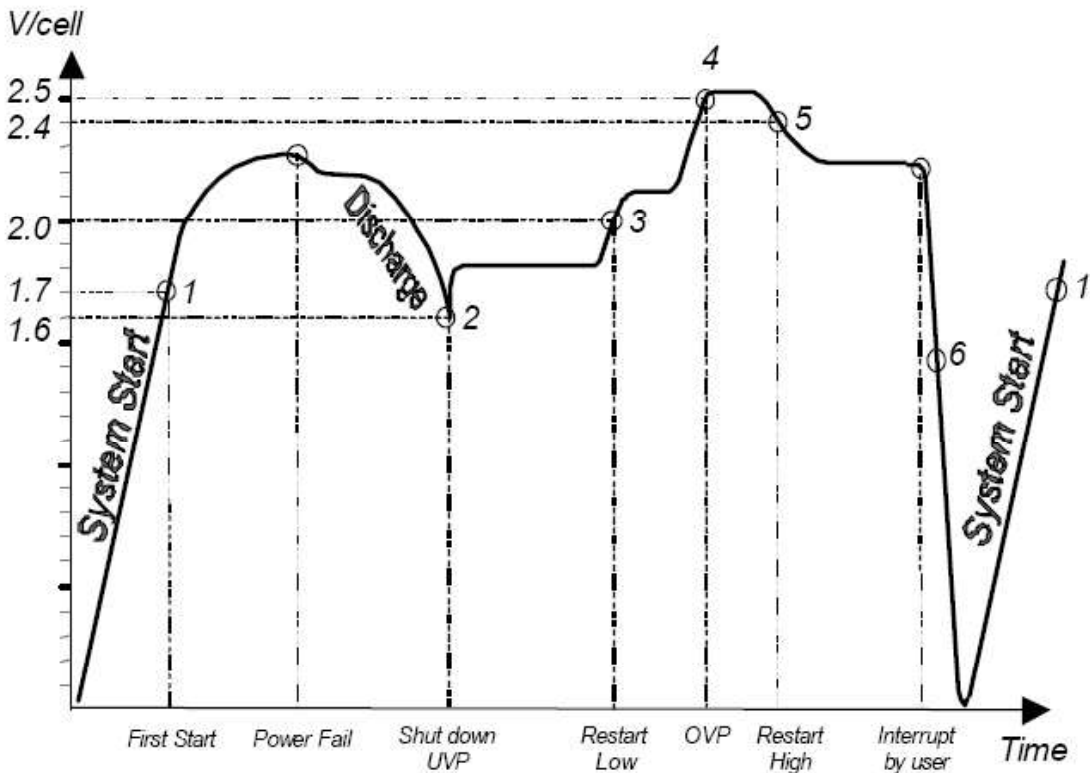


Figure 12

The voltage thresholds of the battery diagram are defined as follows:

First Start (1):

To start up the inverter, the “First Start” limit has to be reached and exceeded at the battery terminals.

UVP (2):

If the undervoltage limit is reached, the inverter shuts down in order to avoid a total discharge of the battery cells.

Restart Low (3):

After an inverter shutdown due to “UVP”, the DC voltage has to reach “Restart Low” level again for a restart.

OVP (4):

At overvoltage level, the inverter shuts down (over voltage protection).

Restart High (5):

If the inverter has shut down due to “OVP”, it will restart after a DC voltage decrease to the “Restart High” level.

Reset (6):

If the BATTERY SWITCH is turned off or the inverter is no longer connected to DC supply and terminal voltage decreases below “Reset” limit, the inverter will only restart after reaching “First Start” level again.

7 Overload behavior and troubleshooting

7.1 Overload behavior



Please note:

Permanent overload operation will considerably reduce the life span of the inverter.

Temporary overload peaks, e.g. through start-up currents of capacitive loads, are tolerated within a certain, load depending time frame, before the inverter automatically shuts down.

The inverter is set to the following thresholds:

- In case of an overload of $\geq 125\%$ the inverter shuts down after 12 seconds.
- In case of an overload of $\geq 150\%$ the inverter shuts down after 3 seconds.

Even though it is possible to overload the inverter, it is strictly recommended to extend the AC output power with an additional inverter in parallel if there is a permanent load excess. With the additional inverter, the necessary power reserve can constantly be provided.

7.2 Troubleshooting

Failure	Measures
<p>LEDs are off. Inverter does not operate.</p>	<p>Check if the BATTERY SWITCH is switched on (I – ON).</p> <p>Check if the DC supply is connected and the external DC circuit breaker is switched on.</p> <p>Check if the DC input voltage meets the specified operating parameters*.</p>
<p>Online LED (green) is on. No voltage at AC output.</p>	<p>Check if the AC fuse on the device’s front is switched on.</p>
<p>Online LED (green) and load LED 5 (red) are on (125% overload) – inverter switches off after approx. 12 seconds.</p>	<p>Reduce the connected load to $P < 1600W / 3200W^*$, switch off the device and turn it on again by using the BATTERY SWITCH, it will restart.</p>
<p>Online LED (green) and load LEDs 5 and 6 (red) are on (150% overload) – inverter switches off after approx. 3 seconds.</p>	<p>Reduce the connected load to $P < 1600W / 3200W^*$, switch off the device and turn it on again by using the BATTERY SWITCH, it will restart.</p>
<p>Power LED (red) and online LED (green) are on, inverter switches off because of excess temperature.</p>	<p>Check proper ventilation (Fans in operation? Blocked ventilation openings? Obstacles in front of the ventilation openings?).</p> <p>Let the inverter unit cool down. It will restart automatically, once the operating temperature is reached again.</p>
<p>Short-circuit at the output – inverter switches off after 3 seconds, only the power LED (red) is on.</p>	<p>Eliminate the short-circuit; switch off the device and turn it on again by using the BATTERY SWITCH, it will restart.</p>
<p>Inverter system shuts down during installation of an additional inverter.</p>	<p>Use the closed-loop-cable between last and first inverter to prevent an interruption of the communication bus.</p> <p>Never switch on the new inverter in the system with the control push button – always use the BATTERY SWITCH.</p>
<p>None of above reactions work.</p>	<p>Please contact the manufacturer at service@powerinnovation.com</p>

Table 9

*: Please gather the correct values for the nominal power and the DC input voltage from the inverter type label.

8 Mechanical dimensions

All dimensions in mm.

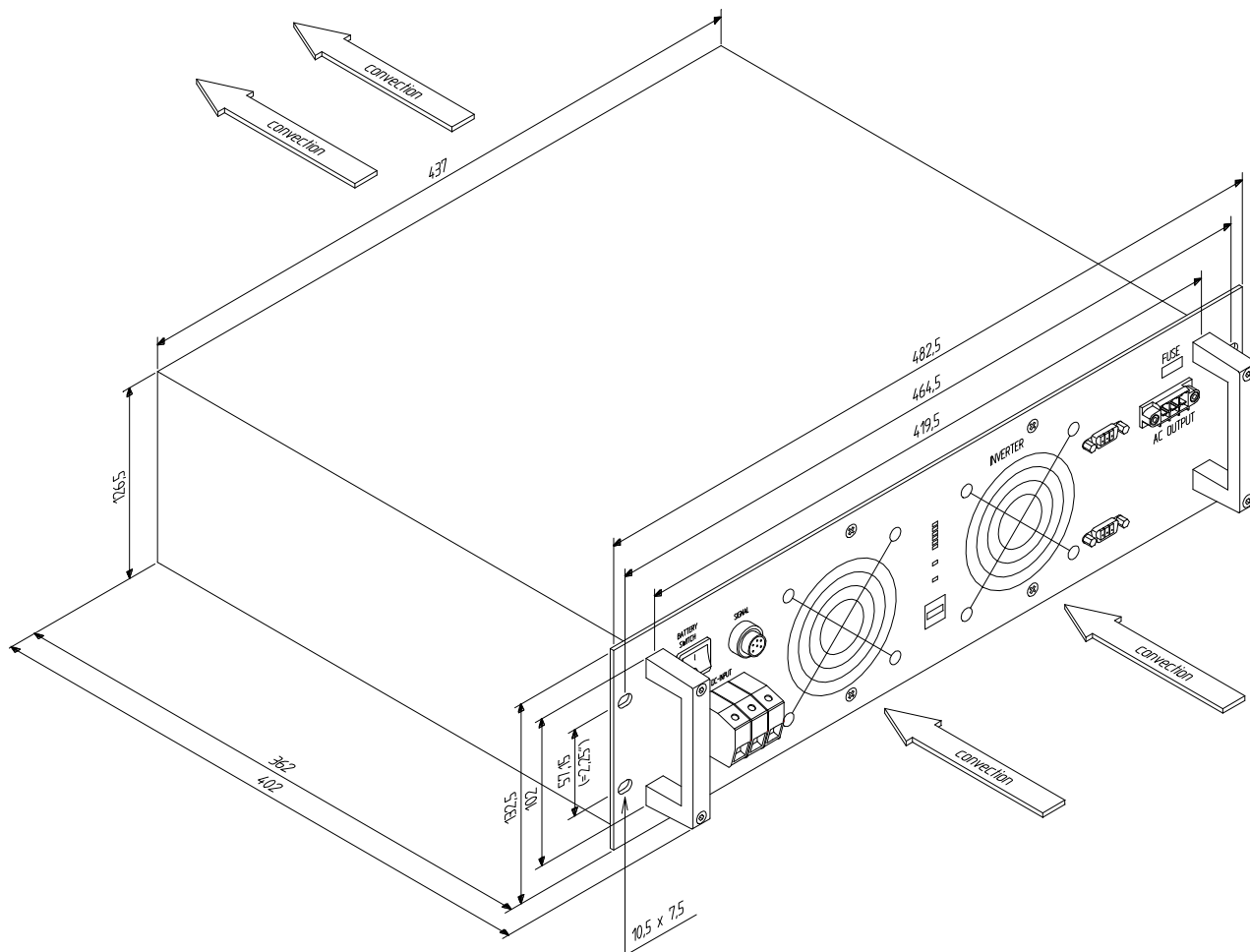


Figure 13

9 Appendix

Technical data, additional information and handling advices for this product series are listed in this appendix.

A. Conversion table AWG to millimetres

AWG	ø mm	mm ²
0	8,25	53,4
1	7,348	42,406
2	6,543	33,624
3	5,827	26,667
4	5,189	21,148
5	4,62	16,767
6	4,115	13,229
7	3,665	10,5510
8	3,268	8,3870
9	2,906	6,3200
10	2,588	5,2620
11	2,304	4,1680
12	2,052	3,3080
13	1,829	2,6270
14	1,628	2,0867
15	1,450	1,6513
16	1,290	1,3070
17	1,151	1,0387
18	1,024	0,8171
19	0,912	0,6504
20	0,813	0,5153
21	0,724	0,3959
22	0,643	0,3217
23	0,574	0,2624
24	0,511	0,2043
25	0,455	0,1590
26	0,404	0,1257
27	0,363	0,1018
28	0,320	0,0804

Table 10

AWG: American Wire Gauge

B. Declaration of conformity

We, **Power Innovation Stromversorgungstechnik GmbH,**

Address: Rehland 2
28832 Achim
Germany

hereby declare under our sole responsibility that the products listed below:

INVP2000 and INVP4000 Inverters

comply with the applicable standards of electrical safety and EMC listed in Appendix C. *Technical data*. A functional test ensuring all important functions was performed. All products have passed necessary safety tests like Protective Earth test, Isolation test and High Voltage test before delivery.

The products are labeled with a CE marking.

Technical documentation for products listed above is kept at

Power Innovation Stromversorgungstechnik GmbH
Rehland 2
28832 Achim
Germany

C. Technical data

INVP2000 with 2000VA/1600W power rating
INVP4000 with 4000VA/3200W power rating

General

Electrical safety	EN 62368
Efficiency	>88% at nominal load
Galvanic isolation	3.75 kV _{DC}
EMC (emission)	EN 61000-6-4
EMC (immunity)	EN 61000-6-2
Operating temperature	-5 to +50°C, non-condensing +50 to +70°C: 2%/K derating

Input DC

Voltage	
INVP2000-24	24V _{DC} (19 – 31 V _{DC})
INVP2000/INVP4000-48/60	48/60V _{DC} (38 – 72 V _{DC})
INVP2000/INVP4000-110	110V _{DC} (88 – 132 V _{DC})
INVP4000-125	125V _{DC} (94 – 148 V _{DC})
INVP2000/INVP4000-220	220V _{DC} (178 – 264 V _{DC})

Output AC

Voltage	
INVP2000	115V _{AC}
INVP4000	230V _{AC}
Failure tolerance	±5%
Frequency	50Hz / 60Hz, sine wave processor-controlled
Power rating	
INVP2000	2000VA / 1600W
INVP4000	4000VA / 3200W
Power factor	0.8
Load range	0 – 100%
Crest factor	>2.5
Harmonic distortion	<2%

Signals

Visual	LEDs for load display and “Power Good”
Electrical	general alarm, potential-free alarm contact, 1-pole

Operation

BATTERY SWITCH
control push button for setup/standby mode

Warranty

24 months

Housing

Dimensions	19" rack housing
Weight	3 U, 84 HP, 360mm depth
Ingress protection class	approx. 11kg
Cooling	IP 20
	2 internal, regulated fans

Electrical connections

Input DC	front side
Parallel output AC	3 x Phoenix HDFK terminal blocks, 16mm ²
Parallel signal	Phoenix Power-Combicon
Alarm	2x Phoenix Power-Subcon
	Binder round connector DIN 45322, contact load: 100 V / 0.2 A, 40 V / 0.5 A

AC output fuse 30A, magnetic

We reserve the right to modify technical specifications without notice.

D. Fields of application

The galvanic isolation of the inverter's input and output is realized with a transformer. Due to the high-frequent clocking we have achieved small designs and low weights. The inverters of the INVP series have a very low output impedance. They are suitable for supplying non-linear loads (e.g. switching power supplies, capacitive and inductive loads). Temporary peak loads only cause a slight distortion of the output sine curve. The inverters are equipped with a robust IGBT full bridge at the AC output.

The inverter's construction is designed for resistance to shock or vibration which also facilitates mobile applications.

E. Applications

- Industrial DC supply networks
- Power plants
- Telecom applications
- Solar energy applications
- Off-shore-applications, DC networks on board of vessels, trains and other vehicles

F. Shipping and storage



The inverters are packed individually for shipping and storage purposes. Handle with care. In case of reshipment use the original packing. Make sure that the filling material of the packaging does not enter the convection area. The standard device box is not safe enough for transport. An additional transport box or pallets are necessary for shipping.



The recommended temperature for shipping and storage of the inverters is: -20°C to + 60°C non-condensing.



If the inverters are not installed on arrival, please store in original packaging.



Protect the inverters against moisture and weather influence.

G. Terms of warranty

Dear customer,

Thank you for choosing Power Innovation, the manufacturer of modern power supplies. In case your Power Innovation product needs guarantee service, please contact your distributor, or Power Innovation. In order to avoid any unnecessary inconvenience, we suggest reading the user and installation manual carefully before contacting us.

Your guarantee

Power Innovation guarantees the product to be free of defects in material and workmanship for a period of **two years** from the time of its original purchase. If, during this period of guarantee, the product proves to be defective due to improper material or workmanship, the manufacturer will repair or (at manufacturer's discretion) replace the product or its defective parts free of charge, corresponding to terms and conditions set out below. The manufacturer reserves the right (at its sole discretion) to replace spare parts of defective products or to replace low cost products with either new or recycled spare parts or products.

Conditions

1. This guarantee will be granted only when the original invoice or delivery note (indicating the date of purchase, appliance type, serial number and name of distributor) is presented together with the defective product.
Power Innovation reserves the right to refuse free-of-charge guarantee service if the above document cannot be presented or if the information contained in it is incomplete or illegible.
2. This guarantee will not reimburse nor cover the damage resulting from adaptations or adjustments which may be made to the product without the prior written consent of Power Innovation in order to conform to the national or local technical or safety standards in force in any country other than the ones for which the product was originally designed and manufactured.
3. This guarantee will not apply if the type or part/serial number on the product has been altered, deleted, removed or made illegible.
4. This guarantee covers none of the following:
 - 4.1. Periodic maintenance and repair or replacement of parts due to normal wear and tear;
 - 4.2. Any adaptation or changes to upgrade the appliance from its normal purpose as described in the user manual without the prior written consent of Power Innovation;
 - 4.3. Transport costs and all risks of transport relating directly or indirectly to the guarantee of the product;
 - 4.4. Damage resulting from:
 - 4.4.1. Misuse, including but not limited to failure to use the product for its normal purpose or in accordance with manufacturer's instructions on the proper use and maintenance and installation or use of the product in a manner inconsistent with the technical or safety standards in force in the country where it is used;
 - 4.4.2. Repair done by non-authorized service stations or distributors or the customer himself;
 - 4.4.3. Accidents, lightning, water, fire, improper ventilation or any cause beyond the control of Power Innovation;
 - 4.4.4. Defects in the system to which the product has been connected or into which it has been incorporated.
 - 4.4.5. IN NO EVENT SHALL POWER INNOVATION BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES OR COLLATERAL DAMAGES OF ANY KIND OR NATURE ALLEGED TO HAVE RESULTED FROM ANY BREACH OF WARRANTY. POWER INNOVATION DOES NOT WARRANT THE MERCHANTABILITY OF THE PRODUCT(S) OR THEIR/ITS FITNESS FOR ANY PARTICULAR PURPOSE. POWER INNOVATION MAKES NO WARRANTY, EXPRESSED OR IMPLIED OTHER THAN THOSE SPECIFICALLY SET FORTH HEREIN.
5. This guarantee does not affect the consumer's statutory rights under applicable national laws in force nor the consumer's rights against the distributor arising from their sales/purchase contract.