ИБП Newave Powerwave (60-500 кВт) - руководство по эксплуатации. Юниджет

Постоянная ссылка на страницу: https://www.uni-jet.com/catalog/ibp/on-line-ibp/abb-powerwave-33/

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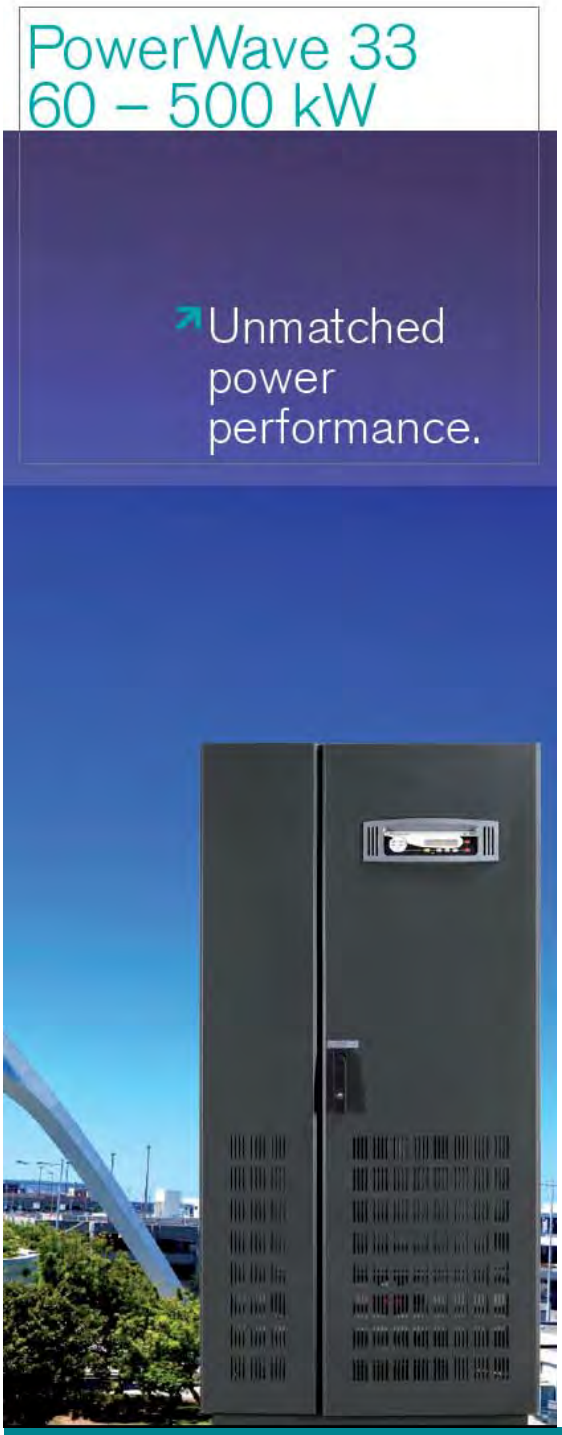

PowerWave 33
USER MANUAL

PowerWave 33 highlights at a glance

- Best in class efficiency
  Cost savings during the entire life-cycle(TCO)
- Low input harmonic distortion
  Cost saving during installation
- Input Power Factor near unity
  Cost savings during installation and the entire life-cycle(TCO)
- Full rated output power from 0.9 lag to 0.9 lead
  Suitable power for the last IT equipment generation without de-rating
- Compact size
  Floor space cost savings

High end power protection
Power range: 60-500kW

Specifications are subject to change without notice

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SWISS QUALITY

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GENERAL CONTENTS OF THE USER MANUAL PowerWave 33

APPENDIX C - CONVERTING FROM SINGLE TO DUAL INPUT FEED OR VICE-VERSA ON PW33 400-500 kW

0.1 FOREWORD

The UPS System operates with mains, battery or bypass power. It contains components that carry high currents and voltages. The properly installed UPS System is grounded to earth and IP 20 rated against electrical shock and foreign objects. Installation and service have to be done by the manufacturer's qualified technicians or their authorized service partners.

OPERATIONS INSIDE THE UPS MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT AUTHORIZED BY THE MANUFACTURER.

This user manual contains guidelines to check delivery, installing and commissioning of the UPS and is intended for people who plan the installation, install, commission and use or service the UPS. The reader is expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols

CAREFULLY READ THE USER MANUAL BEFORE OPERATING OR WORKING ON THE UPS.

0.2 POWERWAVE 33 SYSTEM DESCRIPTION

In environments that demand zero downtime, continuous power protection availability is essential. In order to respond to today's dynamic IT and process-related environments that experience daily change through new server technologies, migration and centralization, resilient and easily adaptable power protection concepts are required.
POWERWAVE 33 is the foundation for continuous power protection availability of network-critical infrastructures in enterprise data centers where business continuity has paramount importance and in process control environment where manufacturing continuity is essential.

POWERWAVE 33 is an advanced double conversion UPS, VFI (Voltage and Frequency Independent) topology that responds fully to both highest availability and environmentally friendly requirements compliant with IEC 62040-3 (VFI-SS-111) standards.

The POWERWAVE 33 UPS features innovations that combine to deliver the industry's best key values like: enhanced power performance, parallel capability and connectivity's interaction

Newave's Decentralized Parallel Architecture is based on stacking independent UPSs for power capacity increase or for redundancy purpose for power availability increase. When operating in parallel configuration, each POWERWAVE 33 can take the leadership role avoiding single points of failure in the parallel chain ensuring the highest level of power availability.

The most demanding Data Centres starts with low power before achieving its full capacity. It is in this case essential to be able to recover the missing power requirement without risk for the applied load. POWERWAVE 33 allows for system upgrades to meet the highest level of availability interruption free and without a temporary transfer the load to row mains (by-pass).

This Technical Specification provides detailed technical information on the mechanical, electrical and environmental performance of the POWERWAVE 33 that can support to give answers to tender and end-user requirements. The POWERWAVE 33 was designed to respond to the most stringent safety, EMC and other important UPS standards.

POWERWAVE 33 is a stand-alone UPS which can be paralleled for power protection increase and/or for redundancy purpose. It offers 8 different power ranges: 60-80-100-120-160-200-250-300-400-500kW .
Up to 10 UPS can be paralleled together to achieving the maximum power capacity of 5000kW using common or separate battery configuration.

Key Features of POWERWAVE 33:

• Best in class efficiency, up to 96%	*Energy-Operational cost savings (TCO)*
• Compact size, Small Footprint	*Space-saving of expensive floor space*
• Blade-server-friendly power Full power	*No de-rating with leading PF loads*
• Very low input current distortion THDi THDi = < 3.5% @ 100% load	*Gen-set power and installation cost saving*
• Input Power Factor near unity	*Cost savings during installation and the entire lifecycle (TCO)*

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CONTENTS SECTION-1

1.1 SAFETY INSTRUCTIONS

1.1.1 DESCRIPITON OF SYMBOLS USED IN THIS MANUAL

WARNING! **THERE IS DANGER OF AN ELECTRICAL IMPACT**

NOTE! **READ THE INFORMATION, IN ORDER TO AVOID EQUIPMENT DAMAGES**

1.1.2 SYMBOLS, CONTROLS, AND INDICATORS

PROTECTIVE GROUNDING TERMINAL
A terminal which must be connected to earth ground prior to making any other connection to the equipment.

A terminal to which or from which a line part or voltage may be applied or supplied.

This symbol indicates the word “phase”.

ON The principal power switch is in the “ON” position.

OFF The principal power switch is in the “OFF” position.

C CAUTION: REFER TO MANUAL
St Refer to the Operator’s Manual for more information.

DANGER: RISK OF ELECTRIC SHOCK
There is a risk of electric shock present, and you should observe associated warnings. The UPS contains high voltages.

Caution
Risk of explosion of battery if replaced by an incorrect type. Dispose of used batteries according to the instruction.

1.1.3 OPERATOR PRECAUTIONS

The only user operations permitted are:

- Use of the LCD control panel (LCD Display) and of the Maintenance Bypass
- Start up and shut down of the UPS of the user field (excluding the commissioning start up)
- Operation of additional connectivity modules:
- SNMP adapters and their software
- Modem/GSM or Modem/Ethernet adapters and their software
- Multidrop Kit for paralleling connectivity information between multi-UPS configurations

The user must follow the precautions and only perform the described operations. Also in these measures the operator of the USP System must adhere to the instructions in this manual. Any deviations from the instructions could be dangerous to the user or cause accidental load loss.

NEWAVE SA DOES NOT TAKE ANY RESPONSIBILITY FOR DAMAGES CAUSED THROUGH WRONG MANIPULATIONS OF THE UPS SYSTEM.

 WARNING!	**IT IS PROHIBITED TO REMOVE ANY SCREWS FROM THE UPS SYSTEM OR FROM THE BATTERY CABINET. THERE IS A DANGER OF ELECTRICAL SHOCK.**
 WARNING!	**HIGH FAULT CURRENTS (LEAKAGE CURRENTS): BEFORE CONNECTING THE MAINS YOU MUST ENSURE THAT THERE IS A PROPER EARTH CONNECTION!**
 WARNING!	**THE USER MUST DISPLAY A WARNING SHIELD ON ALL PRIMARY UPS CIRCUIT BREAKERS. THE SERVICE PERSONNEL HAS TO BE INFORMED ABOUT DANGEROUS VOLTAGES. THE WARNING PANELS MUST CONTAIN THE FOLLOWING TEXT: " BEFORE STARTING WITH THE MAINTENANCE WORK ON THE CIRCUIT BREAKERS MAKE SURE THE UPS IS ISOLATED.**

1.1.4 ENVIRONMENTAL CONSIDERATIONS

The UPS must be installed according to the recommendations in this manual. To operate the UPS at peak efficiency, your installation site should meet the environmental parameters outlined in this manual. Excessive amount of dust in the operating environment of UPS may cause damage or lead to malfunction. The UPS should be always protected from the outside weather and sunshine. If you intend to operate the system at an altitude higher than 1000 meters, contact your local sales or service office for important information about high altitude operation. The operating environment must meet the weight, airflow, size and clearance requirements specified in the technical datasheet.

Under no circumstances the UPS should be installed in an airtight room, in the presence of flammable gases, or in an environment exceeding the specification.

The basic environmental requirements of the UPS system are:

- Ambient Temperature Range: 0 to +40˚C (32 – 104˚F)
- Recommended Operating Range: +20 to +25˚C (68 – 77˚F)
- Maximum Relative Humidity: 95% (non-condensing)

The UPS cabinet uses forced air cooling to regulate internal component temperature. Air inlets are in the bottom sides and front of the cabinet, and outlets in the rear of the cabinet. You must allow clearance in back of the cabinet for proper air circulation. Refer to *Section 1, 1.4.2.2 Positioning* for clearance requirements.

1.1.5 DECLARATION OF SAFETY CONFORMITY AND CE MARKING

The product has the CE marking in compliance with the following European directives:

- Low Voltage Directive: 2006/95/EC
- EMC Directive: 2004/108/EC

Declaration of conformity with UPS harmonized standards and directives EN 62040-1-1 (Safety) and EN 62040-2 (EMC) is enclosed in Annexe (1)

Safety Standard:	IEC/EN 62040-1, IEC/EN 60950-1
Electromagnetic Compatibility Standard (EMC)	IEC/EN 62040-2 / IEC/EN 61000-3 / IEC/EN 61000-6 EMC Classes C3; C2 with optional filter (60-300 kW only)
Performance Standard:	IEC/EN 62040-3

1.1.6 INQUIRIES

Address inquiries about the UPS and battery cabinet to the local office or agent authorized by the manufacturer. Please note the type code and the serial number of the equipment and contact your nearest agent authorized by the manufacturer (www.newavenergy.com under Resellers).

The Code and the serial no. are shown on the nameplate see *Section 1, 1.3.4 Nameplate*

1.2 SYSTEM DESCRIPTION

The product described in this manual is a transformerless Uninterruptible Power System (UPS). It is a true online, continuous duty, double conversion, solid state, three-phase system, providing conditioned and uninterruptible AC power to protect the customer's load from all nine power failures.

1.2.1 MECHANICAL CHARACTERISTICS POWERWAVE 33 60-100KW

POWERWAVE 33 without battery enclosure

Power range	kW	60	80	100
Dimensions (WxHxD)	mm	550x1820x750		
Dimensions with elevation kit (WxHxD)	mm	550x1975x750		
Weight	kg	205	225	230
Colour		Graphite grey (RAL 7024)		

POWERWAVE 33 with Battery Enclosure A

Max. Power connection	kW	60	80	100
Dimensions (WxHxD)	mm	970x1820x750		
Weight without battery	kg	250	260	285
Weight with battery with 80 block of 28Ah	kg	1140	1150	1175
Colour		Graffito grey (RAL 7024)		

POWERWAVE 33 with Battery Enclosure B				
				
Max. Power connection	kW	60	80	100
Dimensions (WxHxD)	mm	1180x1820x750		
Weight without battery	kg	260	270	295
Weight with battery with 120 block of 28Ah	kg	1590	1600	1625
Colour		Graphite grey (RAL 7024)		

1.2.2 MECHANICAL CHARACTERISTICS POWERWAVE 33 120-200KW

POWERWAVE 33				
				
Max. Power connection	kW	120	160	200
Dimensions (WxHxD)	mm	850x1820x750		
Dimensions with elevation kit (WxHxD)	mm	850x1975x750		
Weight	kg	280	290	310
Colour		Graphite grey (RAL 7024)		

1.2.3 MECHANICAL CHARACTERISTICS POWERWAVE 33 250-300KW

POWERWAVE 33			
			
Max. Power connection	kW	250	300
Dimensions (WxHxD)	mm	1100x1920x750	
Dimensions with elevation kit (WxHxD)	mm	1100x1975x750	
Weight	kg	390	410
Colour		Graphite grey (RAL 7024)	

1.2.4 MECHANICAL CHARACTERISTICS POWERWAVE 33 400-500KW

POWERWAVE 33			
			
Max. Power connection	kW	400	500
Dimensions (WxHxD)	mm	1650x1994x850	
Dimensions with elevation kit (WxHxD)	mm	1650x2094x850	
Weight	kg	950	1000
Colour		Graphite grey (RAL 7024)	

POWERWAVE 33 with Top Cable Entry Enclosure (TCE)			
			
Max. Power connection	kW	400	500
Dimensions (WxHxD)	mm	2150x1994x850	
Dimensions with elevation kit (WxHxD)	mm	2150x2094x850	
Weight with TCE Basic	kg	950+115	1000+115
Weight with TCE single input feed with cables	kg	950+245	1000+245
Weight with TCE dual input feed with cables	kg	950+285	1000+285
Colour		Graphite grey (RAL 7024)	

1.2.5 GENERAL SYSTEM DESCRIPTION

The UPS's are used to protect sensitive equipment and prevent loss of valuable electronic information, minimise equipment downtime, and minimise the adverse effect on production equipment due to unexpected power problems.

The UPS system continually monitors incoming electrical power and removes the surges, spikes, sags, and other irregularities that are inherent in commercial utility power. Working with a building's electrical system, the UPS system supplies clean, consistent power that sensitive electronic equipment requires for reliable operation. During brownouts, blackouts, and other power interruptions, batteries provide emergency power to safeguard operation.

The UPS system is housed in single freestanding cabinets. The cabinets line up and match in style and colour, and have safety shields behind the doors for hazardous voltage protection.

1.2.5.1 Feature: Advanced-Booster Technology

Traditional input THD filters are no longer needed with this UPS product. The build-in advanced booster technology of UPS modules provides perfect sinusoidal input power quality at 0.99 input power factor with harmonic content less than 3.5% THD(i). This leads to more reliable total system operation and savings in generator and transformer sizing as losses in the windings are minimised.

Due to the active front booster, regulating each individual phase, the UPS is comparable to a clean resistor load (unity) from the mains perspective. Thus, the high input power factor provides minimised cabling and fusing costs due to no reactive power consumption. The low harmonic currents are due to high input power factor and provide the benefits:

- No additional losses in wires and cables
- No extra heating of transformers and generators with shortened service life
- No over sizing of generators
- No false circuit breaker tripping and malfunction
- No erratic operation of computers, telecommunication, monitors, electronic test equipment etc.
- No Resonance with power factor correction capacitors

1.2.5.2 Feature: Flexible Battery Management (FBM)

The Flexible Battery Management (FBM) has been designed in all NEWAVE UPS products with the goal to avoid the deterioration of battery age. The FBM – Key Features protect the battery from environmental negative impacts (high temperature and false manipulations) and avoid deterioration of battery life by advanced management of battery charging and preventive failure diagnostics. The implemented features result in benefits not only for the end user, but also to the environment. The battery user will be required to replace his batteries less often. This translates into financial and environmental benefits. Last but not least a well protected and managed battery is a healthy battery and hence it enhance the overall availability of the UPS system.

The major benefits are:

- AC-Ripple free battery charging due to DC-DC charger separated from the rectifier and inverter
- Flexible number of battery blocks (44-50 blocks of 12V)
- UPS'S wide input voltage window tolerance extends the battery life due to less discharge cycles
- Battery discharge protection caused by load jumps
- Proactive battery protection from false manipulations and inadequate charging voltages
- Proactive battery failure detection thanks to Advanced Battery Diagnosis (ABD) - Algorithm
- User selectable battery tests
- Optional temperature compensated charging to enhance battery life

Hence, the function of FBM system is to prolong the battery life considerably compared to traditional systems. In a traditional online UPS the inverter also causes ripple-current to be fed to batteries causing corrosion.

1.2.5.3 Feature: DPA Technology - Decentralized Parallel Architecture

The UPS product features DPA paralleling technology that provides N+X redundancy without introducing a single-point-of-failure. The products utilizing the DPA technology are completely autonomous be means of individual Power Units, Bypasses, CPU's, Control Panels and separate battery configuration for each single module.

The DPA technology makes it more reliable than traditional paralleling techniques. A parallel UPS system means the linking together of two or more UPS units in parallel so that in the unlikely event one fails the other can automatically take up the load. Traditionally a parallel redundancy configuration is achieved by having a random or fixed master-slave relationship among the UPS units. This master logic gives out individual commands to all the slaves units. Unfortunately this can lead to a single-point-of-failure for the whole system because if the master logic or communication to slaves fails, and causes the whole UPS system to be in trouble.

The DPA technology was developed as a Multi-Master logic concept with separated independent regulation and logic buses to allow parallel capacity system and to maintain the highest system availability. An industry leading paralleling technology in its own right, the DPA technology enables you to set up a parallel redundant system giving you 100% conditioned power at all times. Its unique decentralized design eliminates the system level single point of failure inherent in traditional parallel UPS, and exponentially increases the reliability of the overall system.

DPA technology allows up to ten UPS modules to cover the same load in parallel and redundant configuration. No vulnerable master logic is needed in this design. It provides automatic load sharing and module level redundancy with nothing other than the power connecting to the PowerWave 33 version of UPS.

1.2.6 QUALITY STANDARDS AND UPS CLASSIFICATION CODE

The PowerWave 33 will provide your critical equipment with a steady and reliable power supply for many years.

The unique PowerWave 33 belongs to the newest generation of midrange 3phase UPS-Systems. High reliability, low operating cost and excellent electrical performance are only some of the highlights of this innovative UPS solution.

The criteria and methods implemented at NEWAVE SA for the design and manufacture correspond to the most stringent quality standards.

NEWAVE is certified successfully in every areas according to the model of the International Standard ISO 9001/EN 29001 and ISO 14001. The Certification of UPS with the operating performance according to the Norm IEC 62 040-3 and VDE 0558 Part 530 is accomplished.

With it the NEWAVE UPS has the **Classification Code VFI-SS-111.**

1.2.7 SINGLE/PARALLEL CONFIGURATIONS

Single UPS Configuration:

A single-UPS configuration means, that there are no cabinets operating in a chain.

Parallel UPS Configurations:

It is possible to parallel a PowerWave 33 UPS (up to 10 units) in order to increase power capacity or for power redundancy purpose.

1.2.8 WARRANTY

The UPS supplied is warranted against defects in design, materials for a period of twelve (12) months from its original date of commissioning or fifteen (15) months from the date of original delivery, whatever comes first, unless agreed differently between Newave and the partner or customer. Refer to 1.2.7 Extended warranty.

Transportation cost of warranted material is not included in the warranty and has to be paid by the end-user.

Do not return anything without written authorization from NEWAVE or your closest service centre. NEWAVE or the closest service centre will give you further instructions how to proceed.

Any product must be returned to NEWAVE headquarter in Quartino with transportation charges prepaid and must be accompanied by a description of the failure. Products without description will not be handled.

The warranty is invalidated, if the UPS has not been installed and/or commissioned by duly trained personnel of authorised subsidiaries or distributors.

The warranty does not apply in any case of damage or loss caused by misuse, negligence, unauthorized repair or modification, incorrect installation and commissioning, inappropriate environmental conditions, accident, act of God or inappropriate application.

If the UPS fails to conform to the above within the warranty period then NEWAVE SA or an authorized service centre will, at its sole option, repair or replace the UPS or parts of it. All repaired or replaced parts will remain the property of NEWAVE or of the authorized service centre.

NEWAVE is not liable for any costs resulting from a failure, if the installation, commissioning, repair, alternation, or ambient conditions of the equipment do not fulfil the requirements specified in the documentation delivered with the unit and other relevant documentation, such as loss of profits or revenue, loss of equipment, loss of data or software, cost of substitutes, claims by third parties or otherwise.

Under no circumstances shall NEWAVE, its suppliers or subcontractors be liable for special, indirect, incidental or consequential damages, losses or penalties. The technical data, information and specifications are valid at the time of printing. The UPS manufacturer reserves the right to modifications without prior notice.

As general policy, NEWAVE does not recommend the use of any of its products in life support applications where failure or malfunction of the NEWAVE product can be reasonably expected to cause failure of the life support device or to significantly affect us safety or effectiveness. NEWAVE does not recommend the use of any of its products in direct patient care. NEWAVE will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to NEWAVE that the risks of injury or damage have been minimized, the customer assumes all such risks and the liability of NEWAVE is adequately protected under the circumstances.

The UPS may contain batteries that must be re-charged for a minimum of 24 hours every 6 months to prevent deep discharging. Batteries that have been, for whatever reason, deep discharged are not covered by the warranty.

1.2.9 EXTENDED WARRANTY

The local office or distributor may grant a Extended Warranty period different to the above twelve (12) months and refer to local terms of liability as defined in the supply agreement or maintenance contract.

For more details please contact the nearest local office or agent authorized by the manufacturer. (www.newavenergy.com Resellers).

1.3 DELIVERY - TRANSPORT - STORAGE

1.3.1 INTRODUCTION

This chapter contains all the necessary information for the correct unpacking, positioning, cabling and installation of the UPS

The UPS and accessories are delivered on a specifically designed pallet that is easy to move with a forklift or a pallet jack. Keep the UPS always in upright position and do not drop the equipment. Do not either stack the pallets because of high-energy batteries involved and the heavy weight

NOTE!

IF THE UPS IS NOT IMMEDIATELY INSTALLED THE FOLLOWING GUIDELINES MUST BE FOLLOWED:

TRANSPORT:

UPS CABINETS AND/OR BATTERY CABINET CAN FALL OVER. USE THE SHIPPING BRACKETS ON THE REAR AND FRONT TO SECURE THE CABINETS. DO NOT TILT THEM MORE THAN 10° FROM VERTICAL, OTHERWISE CABINETS MAY TIP OVER.

POTENTIAL DANGERS:

- **TILTING THE CABINET MIGHT DAMAGE THE SYSTEM AND THEREFORE SHOULD NO LONGER BE CONNECTED TO THE MAINS.**
- **WEIGHT OF THE UPS SYSTEM COULD CAUSE SERIOUS INJURIES TO PERSONS OR ANYTHING IN THE SURROUNDING AREA.**

STORAGE:

- **THE UPS SHOULD BE STORED IN THE ORIGINAL PACKING AND SHIPPING CARTON**
- **THE RECOMMENDED STORING TEMPERATURE FOR THE UPS SYSTEM AND BATTERIES IS BETWEEN +20 °C AND +25°C.**
- **THE UPS SYSTEM AND THE BATTERIE SETS MUST BE PROTECTED FROM HUMIDITY < 95% (NON-CONDENSING)**

1.3.2 RECEIPT OF THE UPS AND VISUAL INSPECTION

Upon receiving the UPS, carefully examine the packing container and the UPS for any sign of physical damage. The outside 'Tip&Tel' ("FRAGILE" and "ARROW") indicator should be intact if the equipment has been transported in the upright position. In case of rupture or suspect inform immediately:

- The carrier and
- NEWAVE SA.

Ensure that the received UPS corresponds to the material indicated in the delivery note.

The packing container of the **UPS** protects it from mechanical and environmental damage. To increase its protection the UPS is wrapped with a plastic sheet.

NOTE!

VISIBLE TRANSPORT DAMAGES MUST BE CLAIMED TO THE CARRIER IMMEDIATELY AFTER RECEIPT !!

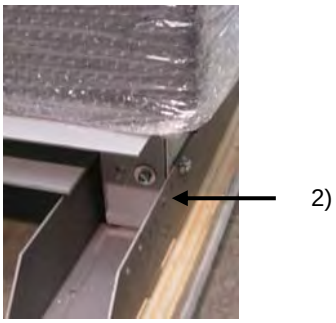
OTHER CLAIM FOR SHIPPING DAMAGE MUST BE FILED IMMEDIATELY TOO AND THE CARRIER MUST BE INFORMED WITHIN 7 DAYS OF RECEIPT OF THE EQUIPMENT. THE PACKING MATERIALS SHOULD BE STORED FOR FURTHER INVESTIGATION.

1.3.3 UNPACKING

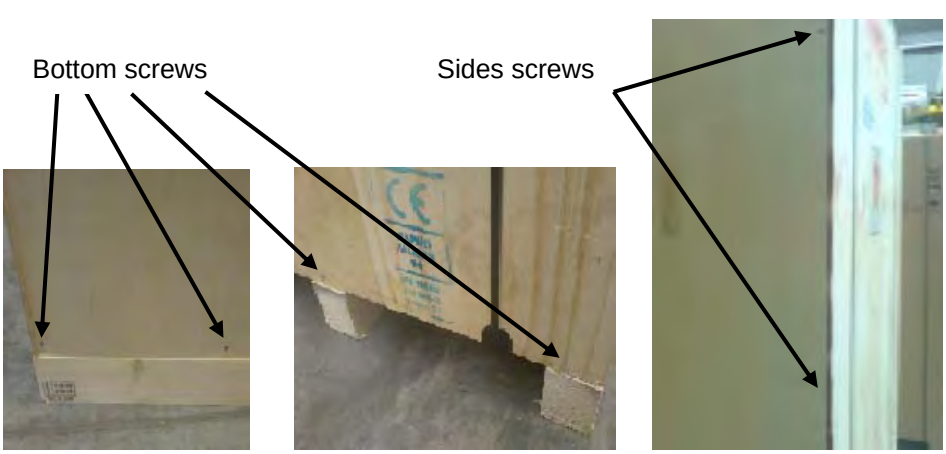
Unpack the equipment by removing the packing and shipping materials. Make a visual inspection and check that 'Tip&Tel' indicator ("FRAGILE" and "ARROW") on the packing container is intact.

Perform the following steps to unpack the UPS equipment from the pallet and make sure that the floor surface is solid and suitable for the wheeling and heavy weight:

1) Remove the plastic cover from the UPS;
2) Remove pallet from the UPS;
3) Retain the packaging materials for future shipment of the UPS;
4) Examine the UPS for any sign of damage. Notify your carrier or supplier immediately if damage is apparent.



By unpacking the equipment from the wooden case remove all screws.



1.3.4 NAMEPLATE AND IDENTIFICATION

The technical specifications of the Equipment are provided on the nameplate, which is situated at the front (internal door) of the UPS. Check if it corresponds to the purchased material mentioned in the delivery note.

Newave UPS System
PowerWave 33
CE
Made in Switzerland

Output Power:	**kVA**	**Output Power:**	**kW**
Input Voltage:	**V**	**Output Voltage:**	**V**
Input Current:	**A**	**Output Current:**	**A**
Input Freq.:	**Hz**	**Output Freq.:**	**Hz**

UPS Serial No. | S | Enc. | **Production Date**

TYPE	PRODUCT DESCRIPTION	DIMENSIONS
P1W	PowerWave 60-100 kW	Cabinet (550x1820x750mm)
P1W	PowerWave 60-100 kW	Cabinet + Enc. A (970x1820x750mm)
P1W	PowerWave 60-100 kW	Cabinet + Enc. B (1180x1820x750mm)
P2W	PowerWave 120-200 kW	Cabinet (850x1820x750mm)
P3W	PowerWave 250-300 kW	Cabinet (1100x1920x750mm)
P4W	PowerWave 400-500 kW	Cabinet (1650x1994x850mm)

1.3.5 BATTERIES AND STORAGE

The standard batteries of the UPS are sealed, maintenance-free batteries, mounted usually in an external battery cabinet and will typically be connected when the UPS is commissioned.

The battery life depends very much on the ambient temperature. A temperature range between +20°C and +25°C will achieve the optimum battery life.

If the UPS is delivered without batteries, NEWAVE is not responsible for any damage or malfunctioning caused to the UPS by incorrect wiring.

1.3.5.1 Storage of battery

The battery life depends very much on the ambient temperature. It is therefore important to follow the storage instructions/recommendation of the battery manufacturer. For long-term storage make sure that the battery is fully recharged every 6 months. Before and after storing, charge the battery.

Always store the batteries in a dry, clean, cool environment in their original packaging. If the packing container is removed protect the batteries from dust and humidity.

WARNING!

SEALED BATTERIES MUST NEVER BE STORED IN A DISCHARGED OR PARTIALLY DISCHARGED STATE.

EXTREME TEMPERATURE, UNDER- AND OVERCHARGE AND OVERDISCHARGE WILL DESTROY BATTERIES!

1.3.5.2 Storage of UPS

If you plan to store the UPS prior to use, keep the UPS unpacked in a dry, clean and cool storage room with an ambient temperature between (-25°C to +70°C) and humidity of less than 95% non-condensing.

If the packing container is removed protect the UPS from dust.

NOTE!

THE UPS SYSTEM, THE BATTERY CABINET AND THE BATTERIES ARE HEAVY AND MAY TIP DURING TRANSPORTATION CAUSING SERIOUS INJURY IF UNPACKING INSTRUCTIONS ARE NOT CLOSELY FOLLOWED.

1.4 SITE PLANNING AND POSITIONING

1.4.1 PLANNING BEFORE THE INSTALLATION

The equipment must be installed and transported in a upright position. The equipment requires space to bottom/front and back to enable cooling airflow. It is required to arrange ventilation of the UPS room.

All parts of the UPS for service and user access are accessible from the front and rear, making it a service-friendly and maintenance-friendly UPS. Reserve enough space from the front (min. 900 mm)

The UPS should be located where:

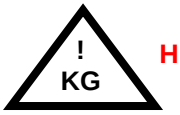
- Humidity (< 95 % non-condensing) and temperature (+20°C and +25°C) are within prescribed limits
- Fire protection standards are respected
- Cabling can be performed easily
- Available front accessibility for service or periodic maintenance
- Requested air cooling flow should be granted
- The air conditioning system should have sufficient amount of air cooling needed to keep the max. room temperature rise at desired level
- Dust or corrosive/explosive gases must be absent
- The place is vibration free
- Only front access is necessary for service and maintenance
- If the UPS will be installed in bayed enclosures, partition walls have to be installed as well

An ambient temperature of +20 °C to +25°C is recommended to achieve a long life of the UPS and batteries. The cooling air entering the UPS must not exceed +40 °C. Avoid high ambient temperature, moisture and humidity. The floor material should be non-flammable and strong enough to support the heavy load.

1.4.2 POSITIONING OF UPS AND BATTERY CABINET

1.4.2.1 Final Transport

Check before transporting the surface loading and use a adequate forklift to move the equipment to the final position.



HEAVY !

1.4.2.2 Positioning

UPS designed for location in a restricted access location only.

UPS 60-300kW: A minimum 20 cm rear space from the UPS to an obstruction is recommended for proper cooling as the air enters at bottom/front and exits at unit rear (see Figure 1).

UPS 400-500kW: Leave noting on top of the UPS. A clearance of minimum 40 cm between top of UPS and the roof of the room is required UPS for proper cooling as the air enters at bottom/front and exits through the top. The UPS can be placed directly against the wall (see Figure 2).

External Battery: It's recommended to install external battery cabinet(s) next to the UPS unit. The external battery is recommended to be placed on left hand side of the UPS unit.

Check before the installation that the battery voltage values in the type plate of the UPS and external battery cabinets are the same.

WARNING!

THE UPS CONTAINS HIGH DC VOLTAGES. A QUALIFIED PERSON MUST DO THE CONNECTIONS BETWEEN THE UPS AND THE EXTERNAL BATTERY CABINET(S). THE BATTERY CABINET IS CONNECTED ELECTRICALLY IN PARALLEL WITH THE INTERNAL BATTERIES OF THE UPS.

WARNING!

IF AVAILABLE, THE INTERNAL BATTERY HAS TO BE DISCONNECTED FIRST BECAUSE THE EXTERNAL BATTERY TERMINALS ARE HAZARDOUS DUE TO THE PARALLEL BATTERY STRING.

Battery Racks : External battery racks shall be sized to take the voltage drop in the cable into account. To obtain support and help contact the local office or agent authorized by the manufacturer.

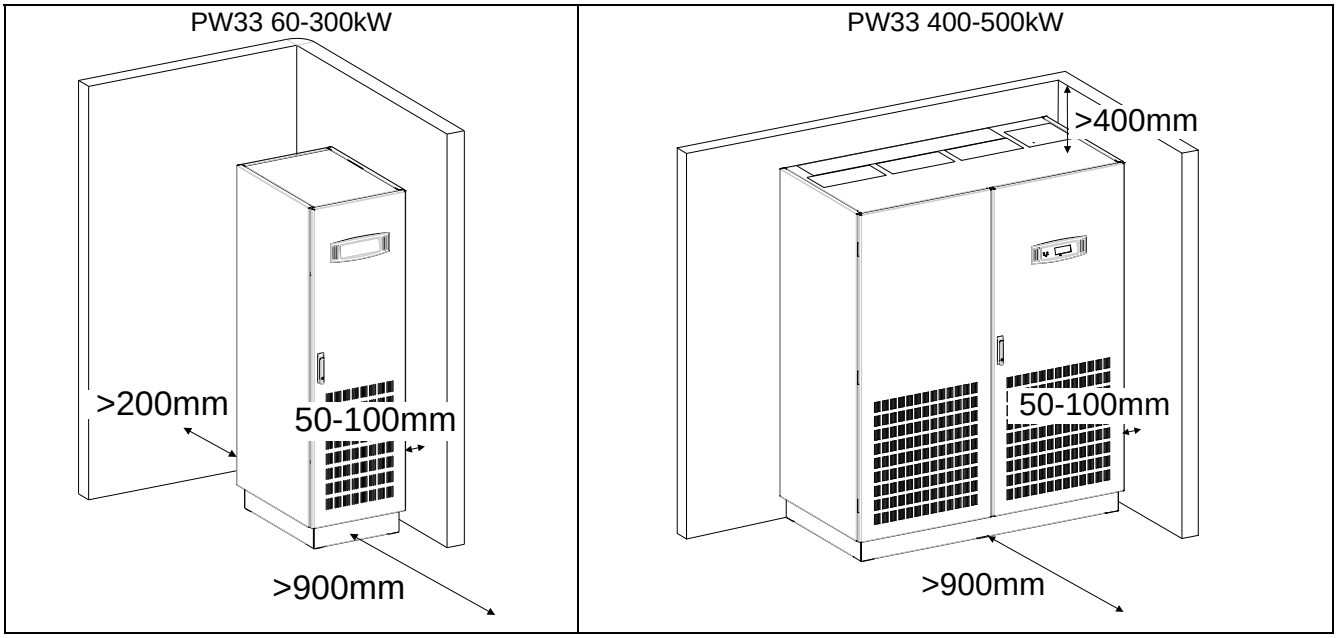


Figure 1-2 : UPS Positioning and space recommendation

UPS Frame type	**60-100 kW**	**60-80-100 kVA (with battery enclosure A&B)**	**120-200 kW**	**250-300 kW**	**400-500 kW**
Dimensions (WxHxD) mm	550x1820x750	A: 970x1820x750 B: 1180x1820x750	850x1820x750	1100x1920x750	1650x1994x850
Fan position	back				on top
Accessibility	Totally front accessibility for service and maintenance (no need for side, top or rear access)				
Positioning	Min. 200 mm rear space (required for fan)				Rear side directly at the wall
Input and Output Power Cabling	From the bottom on the front				

1.5 ELECTRICAL INSTALLATION

The customer has to supply the wiring to connect the UPS to the local power source see Section 2, chapter 1.1. The electrical installation procedure is described in the following text. The installation inspection and initial start up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent authorised by the manufacturer.

WARNING!

THE INSTRUCTION IN THIS USER MANUAL HAVE ALWAYS TO BE FOLLOWED IN ORDER TO AVOID INJURIES FROM ELECTRICAL IMPACTS.

WARNING!

ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY AUTHORISED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL.

DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE.

BY OPENING OR REMOVING THE UPS-COVERS YOU RUN RISK OF EXPOSURE TO DANGEROUS VOLTAGES

PHYSICAL INJURY OR DEATH MAY FOLLOW, OR DAMAGE MAY OCCUR TO THE UPS, OR THE LOAD EQUIPMENT IF THESE INSTRUCTIONS ARE IGNORED.

To ensure correct operation of the UPS and its ancillary equipment it is necessary to provide the mains cables with appropriate fuse protection. See *Section 2, chapter 2.1.3*

The UPS unit has the following power connections:

Rectifier (In) : **Three-phase** (1L1, 1L2, 1L3), Neutral (1N) and protective earth (PE) connection for the *rectifier input*

Bypass (In) : **Three-phase** (2L1, 2L2, 2L3), Neutral (2N) and protective earth (PE) connection for the *bypass if used as Dual Feed input*

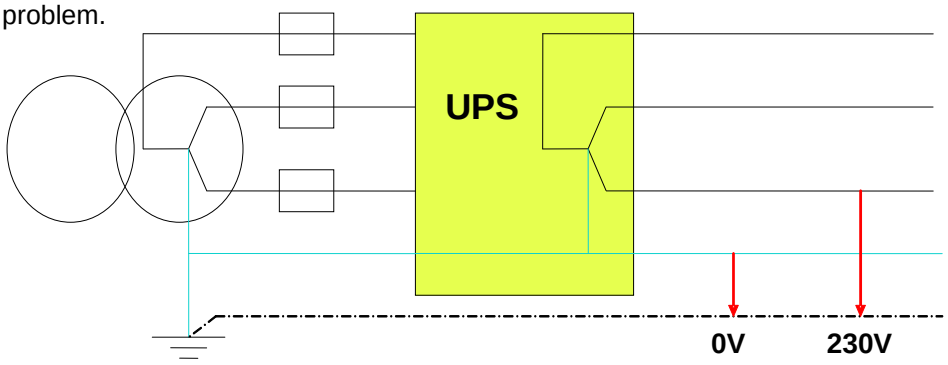
Load (Out) : **Three-phase** (3L1, 3L2, 3L3), Neutral (3N) and protective earth (PE) connection for the *load output*

External Battery : **Plus (+), Common (N), Minus (-)** and protective earth (PE) connection for the *external batteries*

NOTE!

INPUT NEUTRAL IS REQUIRED TO OPERATE THE RECTIFIER.

In TN-S Systems, no 4-pole input switches or circuit breakers should be used. If you have to use for other reason a 4-pole switch, you have to be aware that the neutral against the ground is floating. For the UPS itself this is not a problem.



1.5.1 PREPARATION FOR THE INPUT CABLING

If using the Top Cable Entry (TCE) Enclosure read and follow the instructions on APPENDIX A.

NOTE! Before proceeding read the chapter ELECTRICAL INSTALLATION (Section 1) and insure before starting connecting the cable to the UPS that:

- Mains voltage (INPUT VOLTS) and frequency (FREQUENCY) correspond to the values indicated on the Nameplate of the UPS.
- Earth connection is performed in accordance with the prescribed IEC Standards or with local regulations;
- UPS is connected to the mains through a Low Voltage (LV)-Distribution Board with a separate mains line (protected with a circuit breaker or fuse) for the UPS.

Provide input fuses and cables according to *Section 2, chapter 2.1.3* or in accordance with the prescribed IEC Standards or with the local regulations.

The input of the UPS must be fitted with circuit breakers or other kind of protection. The circuit breakers will be connected between the mains supply and the UPS and will provide additional protection to the UPS in the event of overloads and short circuits.

1.5.1.1 Mains Supply and Earth connection

For PW33 400-500kW additionally read and follow the instructions on APPENDIX B which describes the procedure for mounting the cable-fixing bars while connecting the I/O cables.

To ensure protection of personnel during the installation of UPS make sure that the connections are performed under the following conditions:

- No mains voltage is present
- All Loads are shut down and disconnected
- The UPS System is shut down and voltage-free
- The UPS System is fitted in its correct position
- Maintenance Bypass IA1 is open and in position OFF
- Parallel Isolators *IA2* is in position OFF
- Remove Terminal cover of the UPS

1. Connect first the Earthing wire coming from the Low Voltage-Distribution Board to the terminal "PE".
2. Connect the input power cable coming from the Low Voltage-Distribution Board to the terminals of the UPS showed in *Section 2, chapter 2.1.2.1*
3. Keep the phase rotation in clock-wise sense.

NOTE! **INPUT NEUTRAL IS REQUIRED TO OPERATE THE RECTIFIER.**

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

NOTE: The **UPS** is provided with facilities for both single feed (one common input cable for rectifier and bypass) and dual feed (separate input cable for rectifier and bypass).

1.5.1.2 Single Input Feed

To achieve correct Input Cabling see Drawing *Section 2, chapter 2.1.3*

For single input feed connect the mains input cable to UPS Terminal Block according to the following table:

MAINS INPUT CABLE	UPS TERMINAL
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

For minimum recommended Input Cable Sections and Fuse Ratings *Section 2, chapter 2.1.3*

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

1.5.1.3 Dual Input Feed

For PW33 400-500 kW additionally read and follow the instructions on APPENDIX C which describes the procedure for converting the UPS from single to dual input feed and vice versa.

To achieve correct input cabling see Terminal Block in *Section 2, chapter 2.1.3*

NOTE: The UPS is supplied (as standard version) with facilities for a single cable feed (for rectifier and bypass).

If dual feed is required unscrew the terminal bridges between

UPS TERMINAL Rectifier		UPS TERMINAL Bypass	
1L1	●	●	2L1
1L2	●	●	2L2
1L3	●	●	2L3
1N	●	●	2N

For dual input feed connect the mains input cables to UPS Terminal according to following tables:

MAINS INPUT CABLE	UPS TERMINAL Rectifier
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

BYPASS INPUT CABLE	UPS TERMINAL Bypass
Phase L1	2L1
Phase L2	2L2
Phase L3	2L3
NEUTRAL	2N
EARTH	PE

For minimum recommended Input Cable Sections and Fuse Ratings *Section 2, chapter 2.1.3*

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

1.5.1.4 Preparation for the Output Cabling

For PW33 400-500 kW additionally read and follow the instructions on APPENDIX B which describes the procedure for mounting the cable-fixing bars while connecting the I/O cables.

Before you start connecting the loads, ensure that the UPS rated powers (OUTPUT POWER) on the nameplates (on the front side of the UPS) is equal to or larger than the total load requirements.

The output of the UPS must be fitted with circuit breakers or other kind of protection. These circuit breakers will be connected between the loads and the UPS and will provide additional protection to the UPS in the event of overloads and short circuits.

These circuit breakers will enable the protection of each load separately.

The size of the circuit breakers depends on the load rating of the load sockets.

The circuit breakers must comply with the prescribed IEC Standards. It is recommended to provide a separate output distribution board for the load.

The following values should be indicated on the output distribution board:

Maximum total load rating;

Maximum load rating of the load sockets.

If a common distribution board is used (sockets for Mains and UPS voltage), ensure that on each socket there is an indication of the applied voltage (“Mains” or “UPS”).

Output power cable ratings should be in accordance with the recommended cable sections and fuses ratings or in accordance with the prescribed IEC Standards or with the local regulations.

Under the connection terminal of the UPS there is a cable-fixing rail to ensure that the cables have been fastened properly.

Ensure that the earth connection is performed in accordance with the prescribed IEC Standards or with the local regulations.

1.5.1.5 Connection of the Load

To ensure protection of the personnel during the installation of the UPS make sure that the connections are performed under the following conditions:

No mains voltage is present;

All loads are shut down and disconnected;

UPS is shut down and voltage-free.

Before connecting the output power cables make sure that:

UPS is placed in its final and correct position;

Maintenance bypass IA1, if available, is in position OFF.

Parallel Isolator IA2 is in position OFF.

Remove the terminal cover of the UPS.

Connect the output power cable coming from the LV-Distribution Board to the terminals of the UPS as shown in drawing in *Section-2, Paragraph 2.1.3* (Front view of the PowerWave 33)

1.5.2 INSTALLATION CHECKLIST

- ☐ All packing materials and restraints have been removed from each cabinet.
- ☐ Each cabinet in the UPS system is placed in the installed location.
- ☐ All conduits and cables are properly routed to the UPS and auxiliary cabinets.
- ☐ All power cables are properly sized and terminated.
- ☐ A ground conductor is properly installed.
- ☐ Battery cabinet installation instructions have been completed.
- ☐ Air conditioning equipment is installed and operating properly.
- ☐ The area around the installed UPS system is clean and dust-free. (It is recommended that the UPS be installed on a level floor suitable for computer or electronic equipment.
- ☐ Adequate workspace exists around the UPS and other cabinets.
- ☐ Adequate lighting is provided around all UPS equipment.
- ☐ Any optional accessories are mounted in their installed location and properly wired.
- ☐ Summary alarms and/or building alarms are wired appropriately. (OPTIONAL)
- ☐ Startup and operational checks performed by authorized service personnel.
- ☐ All network connections are completed.

CONTENTS SECTION-2

2.1 BLOCK DIAGRAM

2.1.1 WIRING AND BLOCK DIAGRAMS

The customer has to supply the wiring to connect the UPS to the local power source. The installation inspection and initial start up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent authorized by the manufacturer.

2.1.2 RECOMMENDED CABLE SECTIONS & FUSE RATINGS

2.1.2.1 Terminal Connection Overview

UPS Range Terminals (T) Connection Bar (B)	**Battery** (+ / N / -) +PE	**Input Bypass** 3+N (N,2L1,2L2,2L3)	**Input Rectifier** 3+N+PE (N,1L1,1L2,1L3)	**Output load** 3+N+PE (N,3L1,3L2,3L3)	**Max. cable section admissible (mm²)**	**Toghtening Torque (Nm)**
60kW (Fig.1)	4 x M8	4 x 35 mm^2	4 x 35 mm^2 + PE M8	4 x 35 mm^2 + PE M8	35	3.5
80kW (Fig.1)	4 x M8	4 x 50 mm^2	4 x 50 mm^2 + PE M8	4 x 50 mm^2 + PE M8	50	5
100kW (Fig.1)	4 x M8	4 x 70 mm^2	4 x 70 mm^2 + PE M8	4 x 70 mm^2 + PE M8	95	8
120kW ((Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	185	Max. 50
160kW (Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	185	Max. 50
200kW (Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
250kW (Fig.3)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
300kW (Fig.3)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
400kW (Fig.4)	3 x 4xM12	3 x 4 x M12	3 x 5 x M12	3 x 5 x M12	240	Max. 84
500kW (Fig.4)	3 x 4xM12	3 x 4 x M12	3 x 5 x M12	3 x 5 x M12	240	Max. 84

Fig. 1: 60-80-100 kW

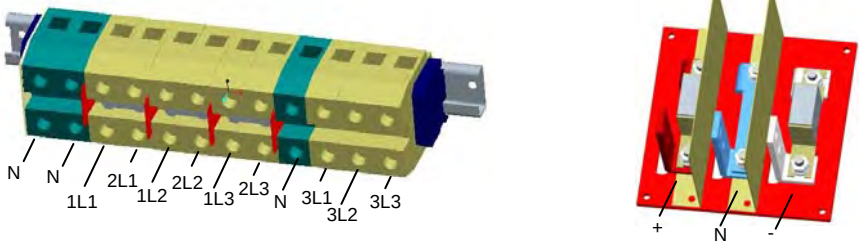
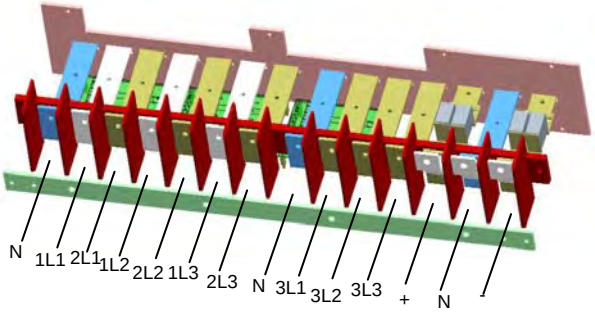


Fig. 2: 120-160-200 kW

Dual input feed connections



Single input feed connections

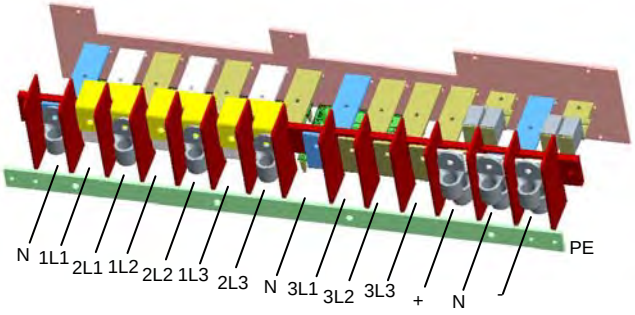
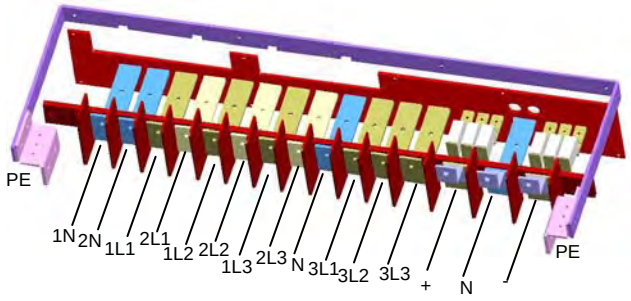


Fig. 3: 250-300 kW

Dual input feed connections



Single input feed connections

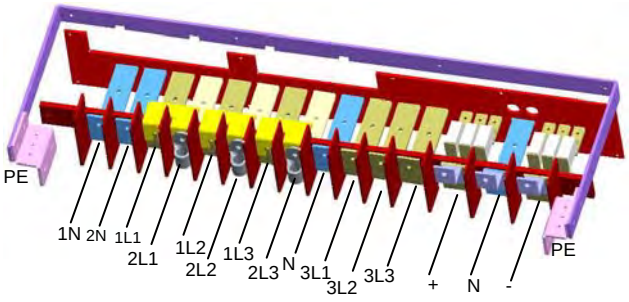
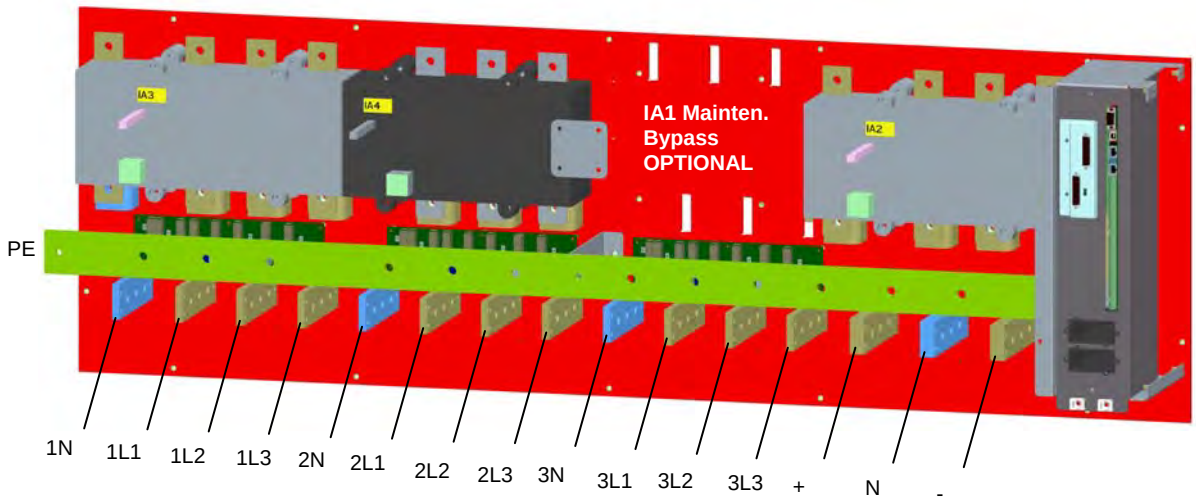


Fig. 4: 400-500 kW



2.1.3 CONNECTION DIAGRAM POWERWAVE 33 60-300kW

Cable Sections and Fuse Ratings recommended. Alternatively, local standards to be respected

Block Diagram

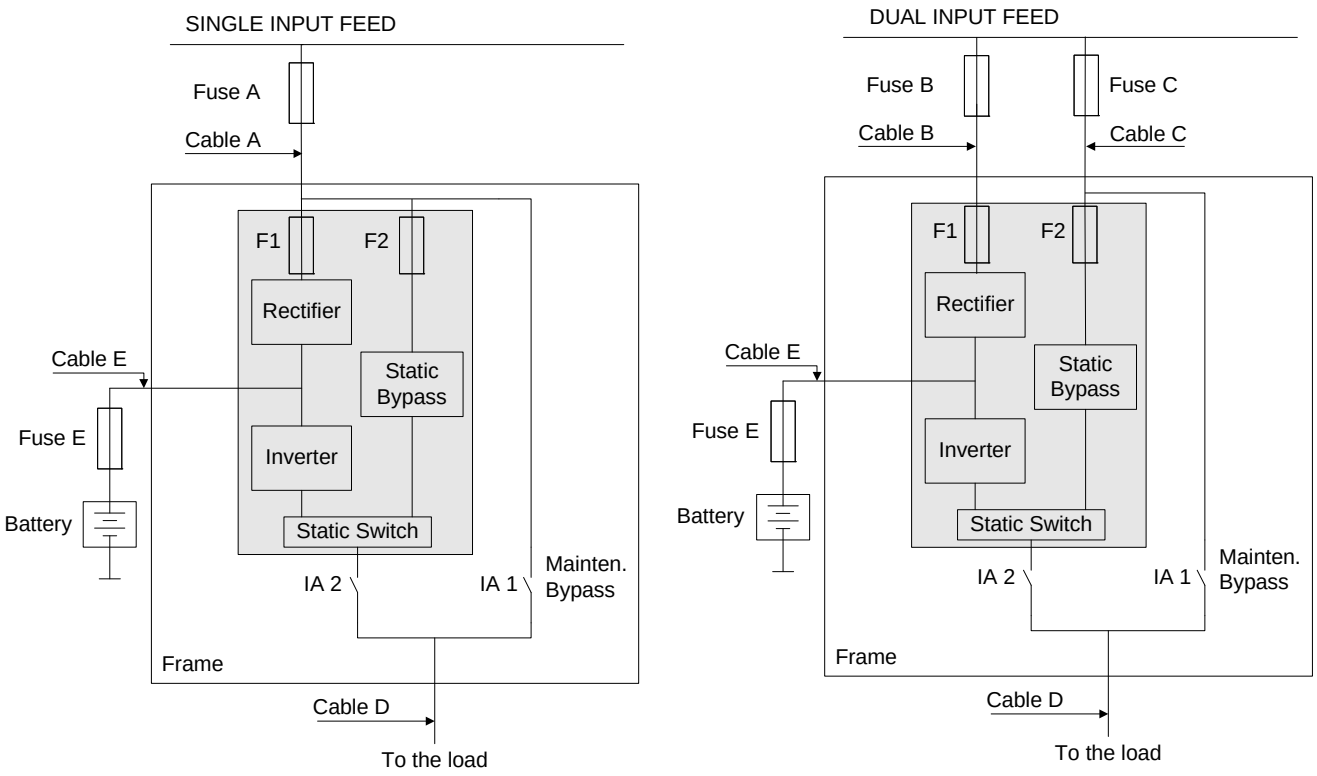


Figure 5: Block Diagram PowerWave 33 from 60-300 KW

STANDARD VERSION (SINGLE INPUT FEED)

Power (kW)	Fuse A (Agl/CB)	Cable A (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
60	3x100	5x35	5x35	3x125A	3x35+ PE
80	3x125	5x50	5x50	3x160A	3x50 + PE
100	3x160	5x50	5x50	3x250A	3x95 + PE
120	3x200	5x70	5x70	3x250A	3x120 + PE
160	3x250	5x120 or 5x(2x50)	5x120 or 5x(2x50)	3x350A	3x(2x70) + PE
200	3x350	5x185 or 5x(2x70)	5x185 or 5x(2x70)	3x450A	3x(2x95) + PE
250	3x400	5x240 or 5x(2x95)	5x240 or 5x(2x95)	3x630A	3x(2x150) + PE
300	3x500	5x(2x120)	5x(2x120)	3x630A	3x(2x150) + PE

VERSION ON REQUEST (DUAL INPUT FEED)

Power (kW)	Fuse B (Agl/CB)	Cable B (IEC 60950-1)	Fuse C (Agl/CB)	Cable C (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
60	3x100	5x35	3x100	5x35	5x35	3x125A	3x35+ PE
80	3x125	5x50	3x125	5x50	5x50	3x160A	3x50+ PE
100	3x160	5x50	3x160	5x50	5x50	3x250A	3x95+ PE
120	3x200	5x70	3x200	5x70	5x70	3x250A	3x120+ PE
160	3x250	5x120 or 5x(2x50)	3x250	5x120 or 5x(2x50)	5x120	3x350A	3x(2x70) + PE
200	3x350	5x185 or 5x(2x70)	3x315	5x185 or 5x(2x70)	5x185	3x450A	3x(2x95) + PE
250	3x400	5x240 or 5x(2x95)	3x400	5x240 or 5x(2x95)	5x240 or 5x(2x95)	3x630A	3x(2x150) + PE
300	3x500	5x(2x120)	3x500	5x(2x120)	5x(2x120)	3x630A	3x(2x150) + PE

2.1.4 CONNECTION DIAGRAM POWERWAVE 33 400-500kW

Cable Sections and Fuse Ratings recommended. Alternatively, local standards to be respected

Block Diagram

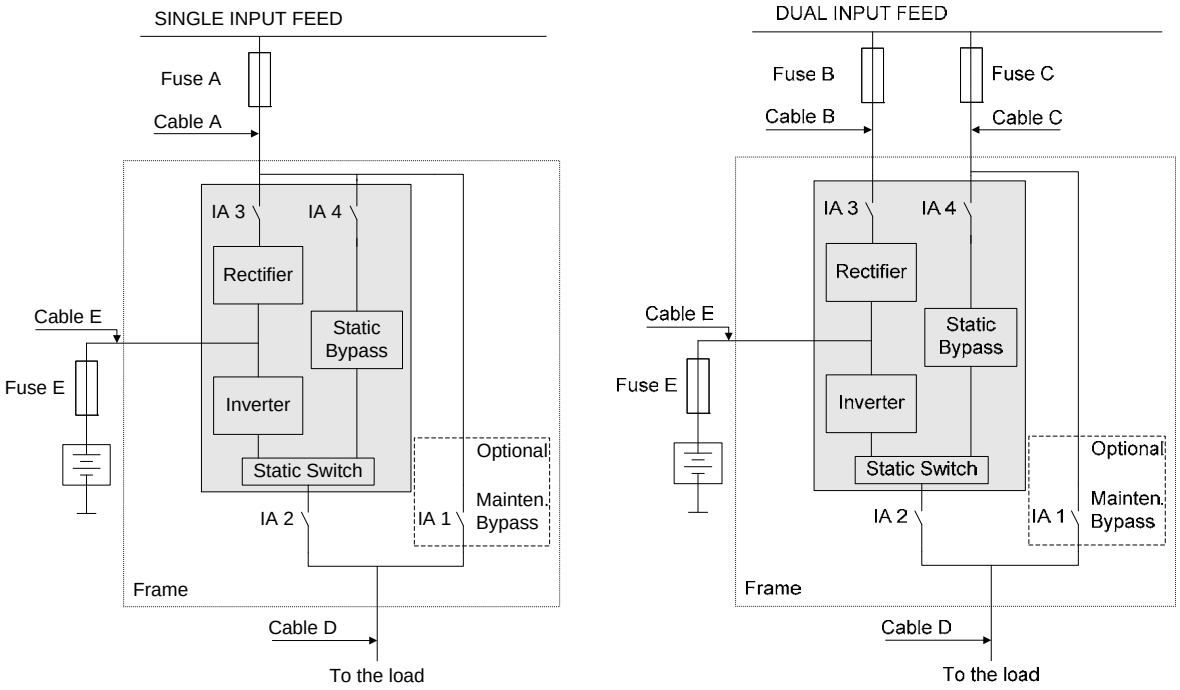


Figure 6: Block Diagram PowerWave 33 from 400-500kW

STANDARD VERSION (SINGLE INPUT FEED)

Power (kW)	Fuse A (Agl/CB)	Cable A (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
400	3x630	5x(3x95) or 5x(2x185)	5x(3x95) or 5x(2x185)	3x1000A	3x(3x185) + PE
500	3x800	5x(3x150)	5x(3x150)	3x1250A	3x(3x240) + PE

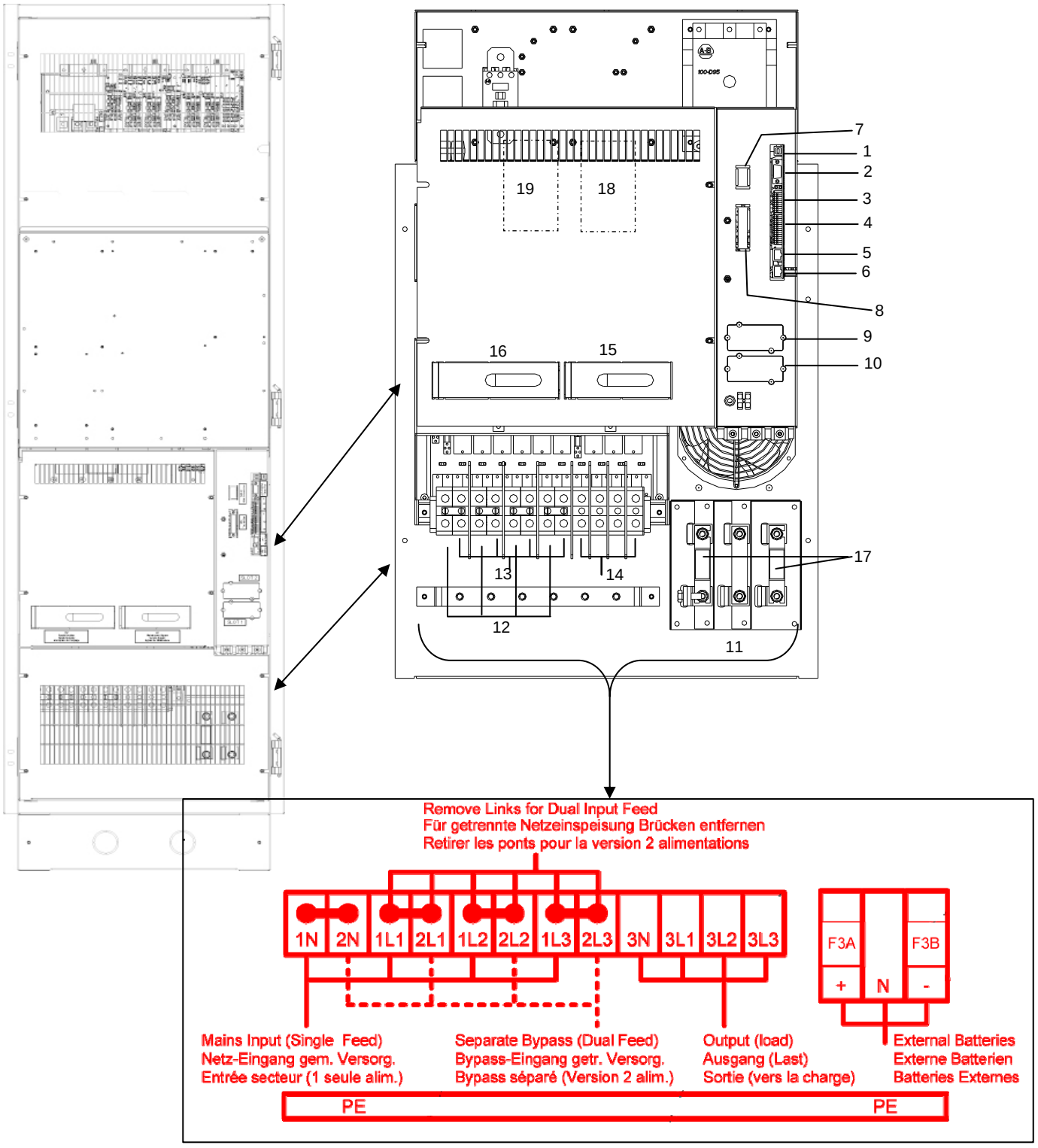
VERSION ON REQUEST (DUAL INPUT FEED)

Power (kW)	Fuse B (Agl/CB)	Cable B (IEC 60950-1)	Fuse C (Agl/CB)	Cable C (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
400	3x630	5x(3x95) or 5x(2x185)	3x630	5x(3x95) or 5x(2x185)	5x(3x95) or 5x(2x185)	3x1000A	3x(3x185) + PE
500	3x800	5x(3x150)	3x800	5x(3x150)	5x(3x150)	3x1250A	3x(3x240) + PE

2.2 FRONT VIEW

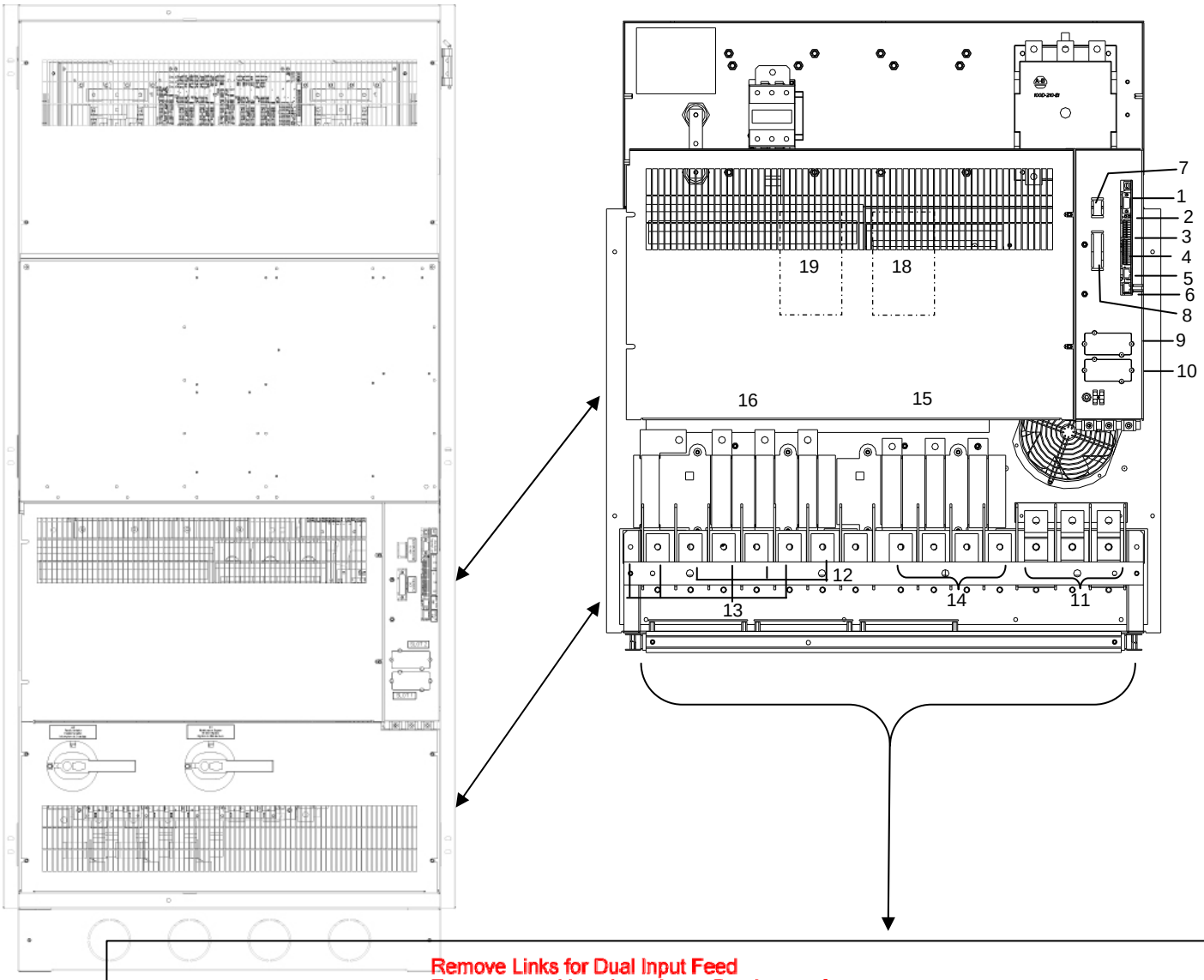
2.2.1 FRONT VIEW OF POWERWAVE 33

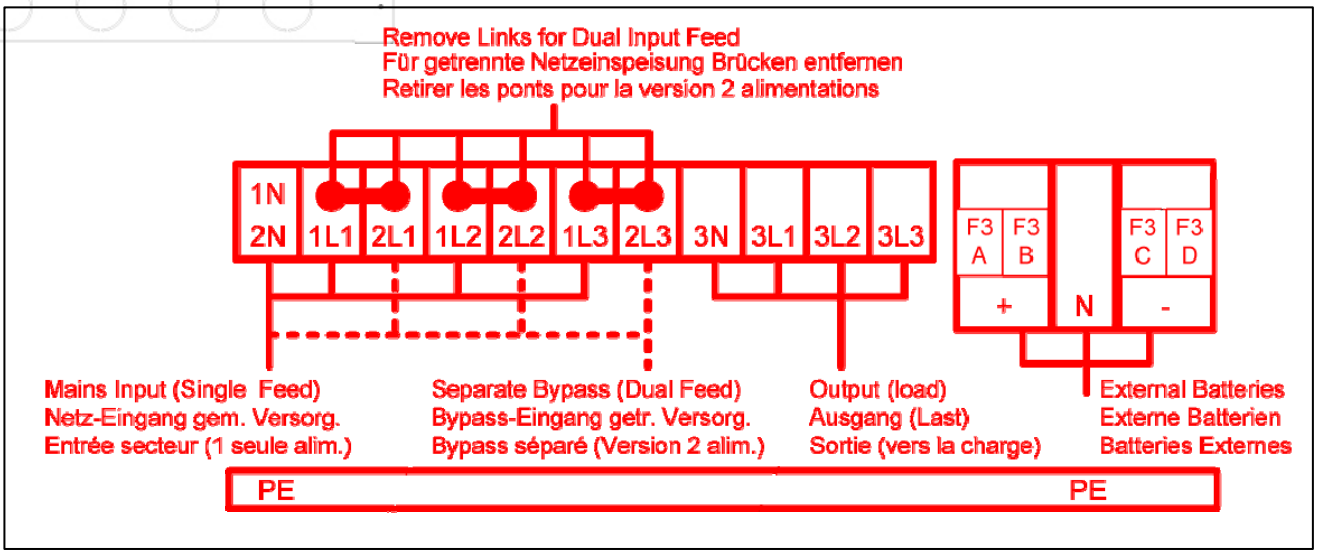
2.2.1.1 Front View PW33 60-100kW and Connection Terminals



1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
3	X1	Customer Inputs
4	X2	Customer interface on Phoenix Terminals: X2= Potential free contacts (detail see Section 3 / 1.2)
5	JR2/RS485 on RJ 45 port	Remote panel connection (see Section 3)
6	JR1/RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets (see Section 3)
7	SW1-9	Multi-Cabinet Configuration Switch (see section 4)
8	JD8	Parallel BUS connector
	ONLY For paralleling cabinets use optional adapter:	
	JD5	**Parallel BUS - Input Connector**
	JD6	**Parallel BUS - Output Connector**
9	SNMP	Slot for optional SNMP card ONLY
10	Modem	Slot for optional Modem/Ethernet card ONLY
11	Battery terminal + / N / -	
12	Input Rectifier terminal	for Single feed (see section 2 / 2.1.2)
13	Input Bypass terminal	for Dual Input feed (see section 2 / 2.1.2)
14	Output Load terminal	
15	IA1	Maintenance Bypass
16	IA2	Parallel Isolator
17	F3	Battery Fuse A/B
18	F2	Bypass Line Fuse
19	F1	Rectifier Fuse

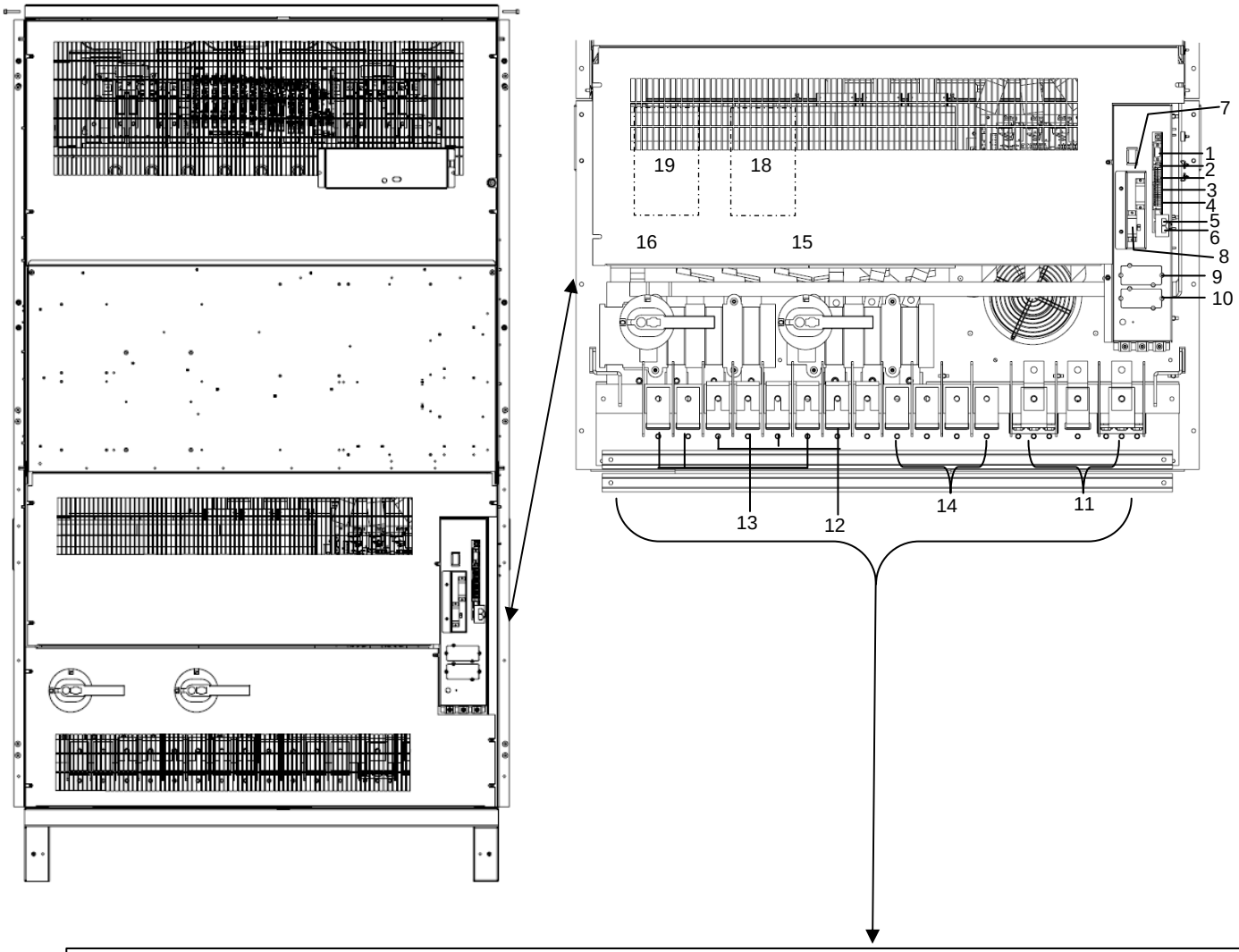
2.2.1.2 Front View PW33 120-200kW and Connection Terminals

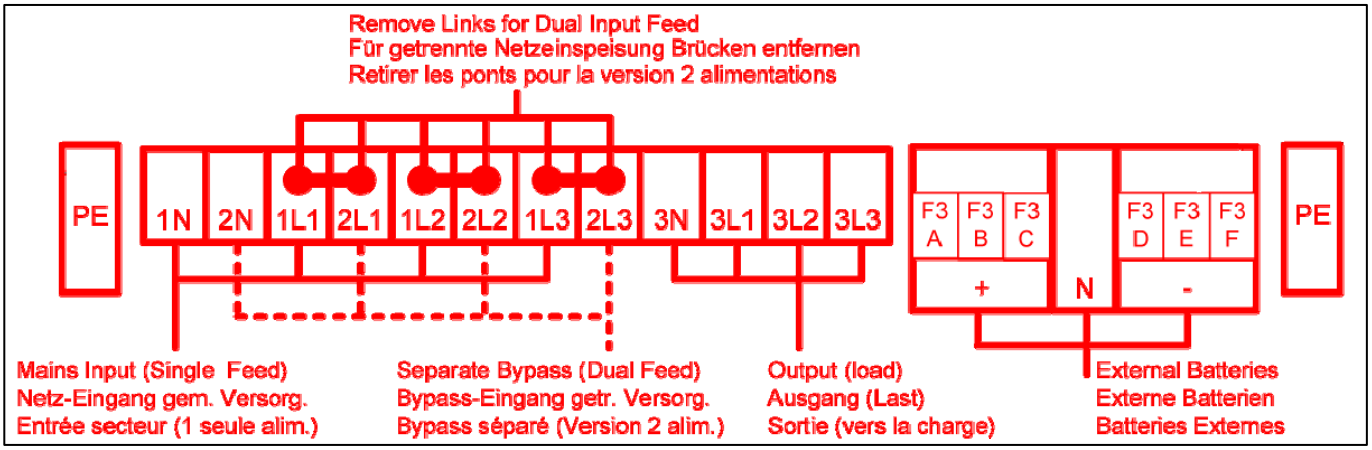




1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
3	X1	Customer Inputs
4	X2	Customer interface on Phoenix Terminals: X2= Potential free contacts (detail see Section 3 / 1.2)
5	JR2/RS485 on RJ 45 port	Remote panel connection (see Section 3)
6	JR1/RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets (see Section 3)
7	SW1-9	Multi-Cabinet Configuration Switch (see section 4)
8	JD8	Parallel BUS connector
	ONLY For paralleling cabinets use optional adapter:	
	JD5	**Parallel BUS - Input Connector**
	JD6	**Parallel BUS - Output Connector**
9	SNMP	Slot for optional SNMP card ONLY
10	Modem	Slot for optional Modem/Ethernet card ONLY
11	Battery terminal + / N / -	
12	Input Bypass terminal	for Dual Input feed (see section 2 / 2.1.2)
13	Input Rectifier terminal	for Single feed (see section 2 / 2.1.2)
14	Output Load terminal	
15	IA1	Maintenance Bypass
16	IA2	Parallel Isolator
18	F2	Bypass Line Fuse
19	F1	Rectifier Fuse

2.2.1.3 Front View PW33 250-300kW and Connection Terminals





1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
3	X1	Customer Inputs
4	X2	Customer interface on Phoenix Terminals: X2= Potential free contacts (detail see Section 3 / 1.2)
5	JR2/RS485 on RJ 45 port	Remote panel connection (see Section 3)
6	JR1/RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets (see Section 3)
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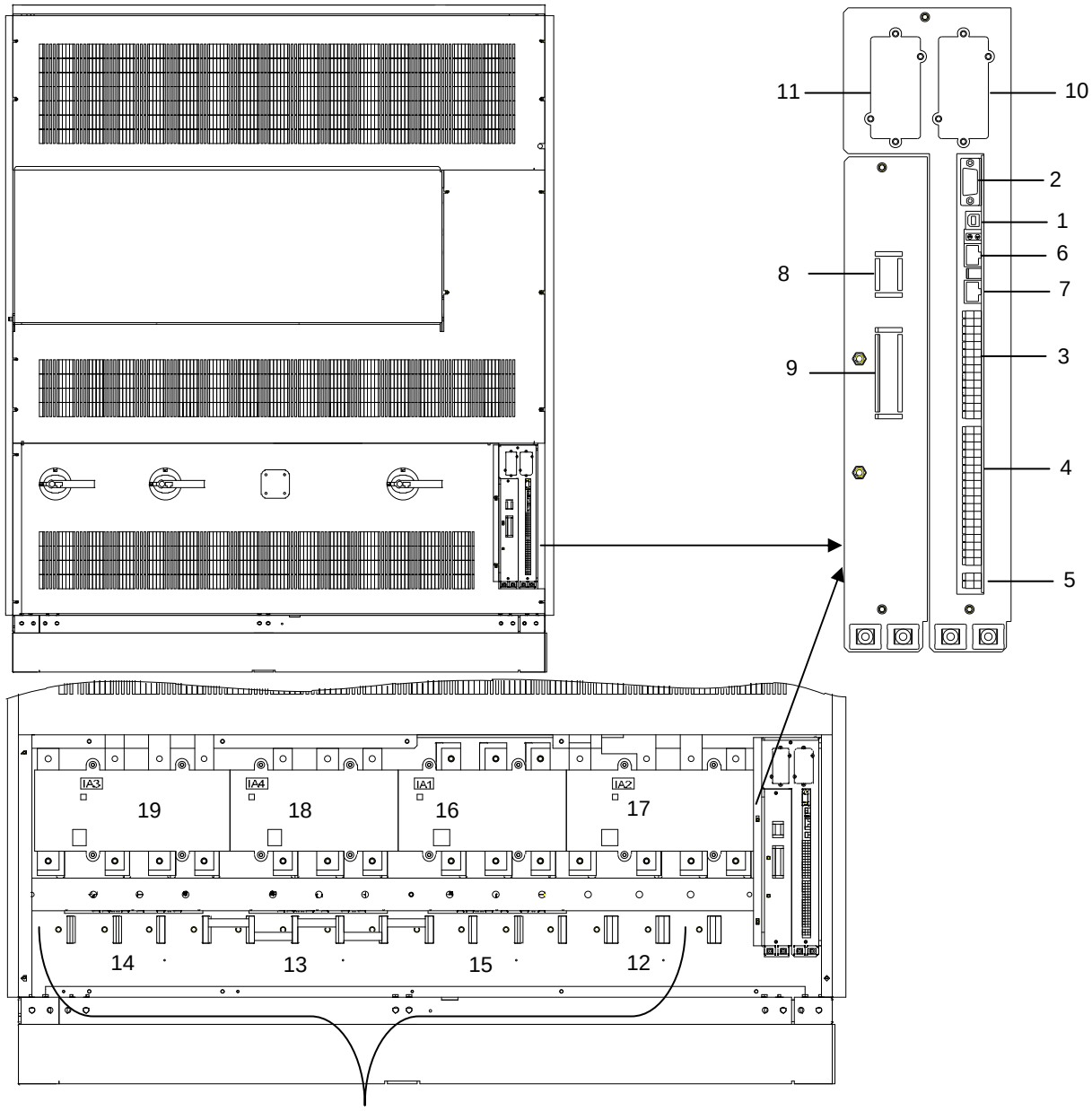
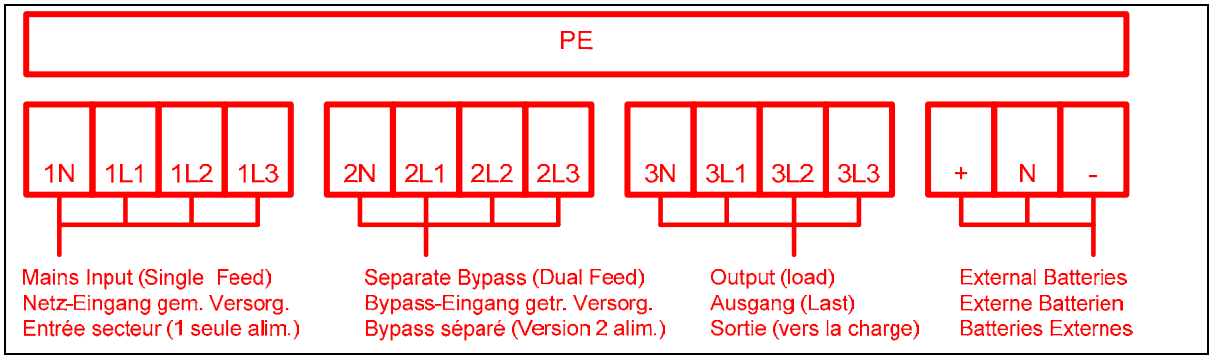
11	Battery terminal + / N / -	
12	Input Bypass terminal	for Dual Input feed (see section 2 / 2.1.2)
13	Input Rectifier terminal	for Single feed (see section 2 / 2.1.2)
14	Output Load terminal	
15	IA1	Maintenance Bypass
16	IA2	Parallel Isolator
18	F2	Bypass Line Fuse
19	F1	Rectifier Fuse

2.2.1.4 Front View PW33 400-500kW and Connection Terminals





1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 3.2.1)
3	X3	Customer Inputs
4	X2	Customer interface on Terminals: X2= Potential free contacts (detail see Section 3 / 3.2.2.2)
5	X1	Interlock Castell Function (detail see Section 3 / 3.2.2.3)
6	JR3/RS485 on RJ 45 port	Remote panel connection (see Section 3)
7	JR2/RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets (see Section 3)
8	SW1-9	Multi-Cabinet Configuration Switch (see section 4)
9	JD8	Parallel BUS connector
	ONLY For paralleling cabinets use optional adapter:	
	JD5	**Parallel BUS - Input Connector**
	JD6	**Parallel BUS - Output Connector**
10	SNMP	Slot for optional SNMP card ONLY
11	Modem	Slot for optional Modem/Ethernet card ONLY
12	Battery terminal + / N / -	
13	Input Bypass terminal	for Dual Input feed (see section 2 / 2.1.2)
14	Input Rectifier terminal	for Single feed (see section 2 / 2.1.2)
15	Output Load terminal	
16	IA1	Maintenance Bypass (optional)
17	IA2	Output switch
18	IA4	Bypass switch
19	IA3	Rectifier switch

2.3 BATTERY CONNECTIONS

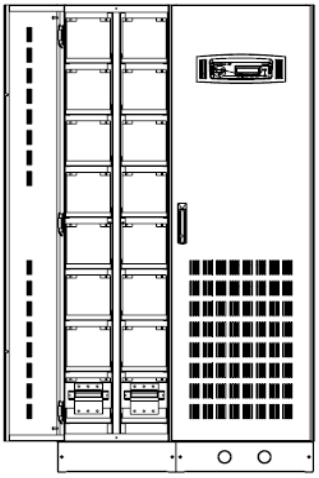
2.3.1 BATTERY ENCLOSURES A & B AND EXTERNAL BATTERY

2.3.1.1 Battery Enclosures A & B only for 60-100kW

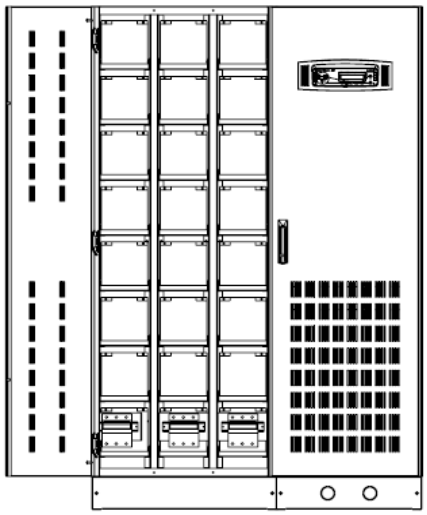
In **PowerWave 33** there is a possibility to have additional battery enclosure. In the drawing below different Battery enclosures are shown.

NOTE: Within the battery enclosures A & B only 28Ah or 24 Ah battery are allowed (40-50 blocks)

Battery Enclosure A (max. 80 blocks)



Battery Enclosure B (max.120 blocks)



NOTE: Set-up the correct number of battery blocks on Control Panel (Menu: Service-Set-Up).

The integrated battery enclosures are part of the UPS, therefore cannot be defined as a separate battery cabinet	**UPS &** **BAT- ENC A** Only for 60, 80 and 100kW	**UPS &** **BAT- ENC B** Only for 60, 80 and 100kW
BAT- ENC A & B		
Configuration accommodates:	**80 Batt. Blocks for 28Ah mounted on 16 shelves (5 blocks/shelf)**	**120 Batt. Blocks for 28Ah mounted on 24 shelves (5 blocks/shelf)**

The integrated battery enclosures are part of the UPS, therefore cannot be defined as a separate battery cabinet	**UPS &** **BAT- ENC A** Only for 60, 80 and 100kW	**UPS &** **BAT- ENC B** Only for 60, 80 and 100kW
Strings : Terminals :	**2** **3 x M8**	**3** **3 x M8**
Fuse Type (Very Fast acting)	**2 x 3 x 100A**	**3 x 3 x 100A**
Dimensions of UPS and battery Side (WxHxD)	**970x1820x750**	**1180x1820x750**
Weight w/o trays and w/o batteries (kg)	**20**	**30**
Battery configuration with BAT-ENC A & B	Batt. Config. (2x40)x28Ah	Batt. Config. (3x40)x28Ah

2.3.1.2 Examples of Battery Autonomy at full load with standard battery cabinets and standard battery configuration

28Ah battery										
UPS Range		***60kW***	***80kW***	***100kW***	***120kW***	***160kW***	***200kW***	***250kW***	***300kW***	***400kW***	***500kW***
BAT-ENC	**Battery configuration**	**Autonomy time in minutes @ 80% Load (kW)**									
	Batt. Enclosure A (2x40)x28Ah	13	9	7	**not available**						
	Batt. Enclosure B (3x40)x28Ah	22	15	12							

NOTE: For UPS-Systems PowerWave 33 it is allowed to use 40-50 (only even numbers) of 12V-battery blocks in the range from 60 to 160kW and 250-500kW, the 200kW power only 50 blocks are allowed.

2.3.1.3 Connection of External Battery for PowerWave 33

It is normally recommended for redundant systems to provide each UPS with its own separate battery. In this way the redundancy is extended also to the batteries. In the Figure 7 the drawing shows how to connect the batteries in the external battery cabinet and the PowerWave 33 frame.

! NOTE!	**ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY AUTHORISED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL. DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE. BY OPENING OR REMOVING THE UPS-COVERS YOU RUN RISK OF EXPOSURE TO DANGEROUS VOLTAGES.**

! To ensure protection of the personnel during the installation of the UPS make sure that the connections are performed under the following conditions:

- No mains voltage is present in the UPS
- All the loads are disconnected
- The UPS and the external battery are voltage-free

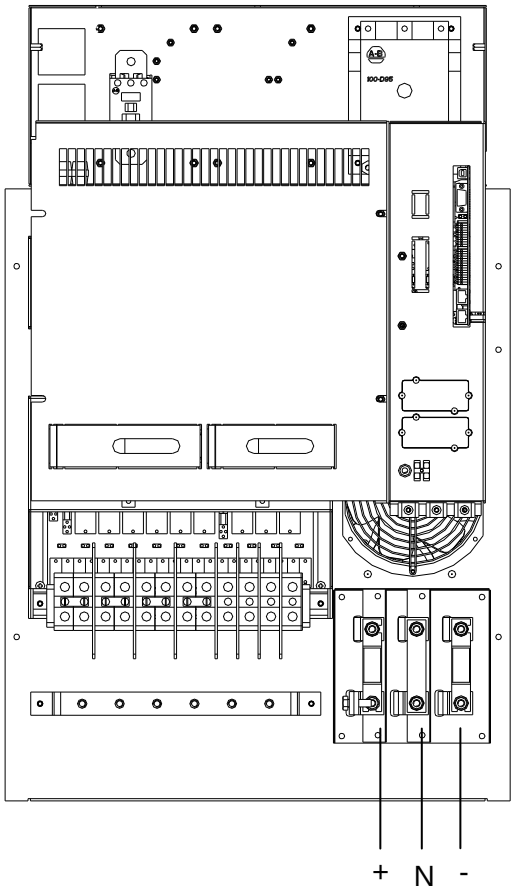
To verify the complete shut down of the **PowerWave 33** perform following steps:

1) Make sure that the fuses feeding the UPS in the input Distribution Board are all open and no power is fed to the UPS.
2) Make sure the "MAINTENANCE BYPASS"(IA1) is open (position "OFF")
3) Make sure the battery fuses in the external battery cabinet or racks and on the UPS are open.
4) Connect Earth **(PE)** between the UPS and external battery cabinet.
5) Connect the corresponding **+ , N, -** terminals between UPS and external battery cabinet according to drawing

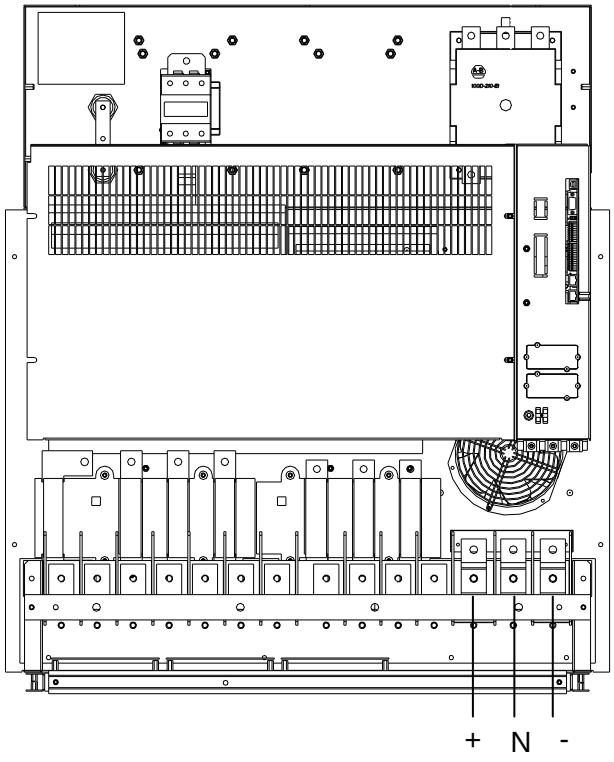
2.3.1.4 Terminals for External Battery connection

External Battery for separate Batteries per UPS

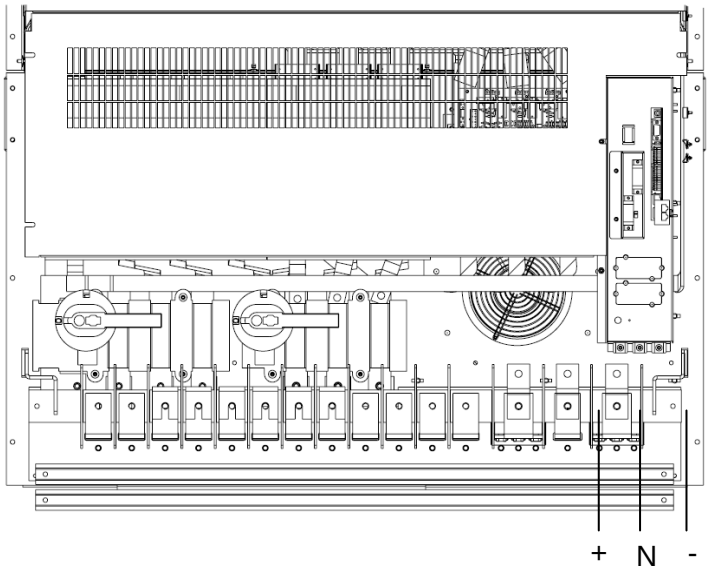
60-100kW



120-200kW



250-300kW



400-500kW

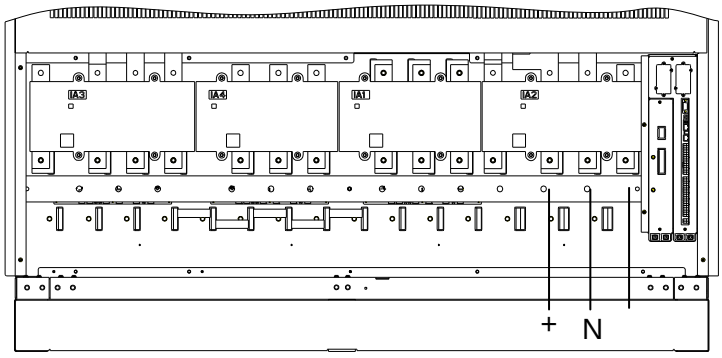


Fig. 7 Connection of external separate batteries

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CONTENTS SECTION-3

3.1 INTERFACING POWERWAVE 33 60-300 KW

Each UPS is provided with communication port and a communication card, which provides system information

- Input Interfaces — X1 (Phoenix terminals)
- Output Interfaces : — X2 DRY PORTs ,volt-free contacts (Phoenix terminals)
- USB port /RS232: — Interface (UPS system to computer)
- JD1 / RS232 Sub D9 / female : — Interface (UPS system to computer)
- JR2 / RS485 on RJ 45 port: — Remote panel connection
- JR1 / RS485 on RJ 45 port: — Interface for Multidrop connection between several UPS cabinets
- SLOT 1 / SNMP Slot
- SLOT 2 / Modem Slot

3.1.1 SMART PORT JD1 (SERIAL RS 232 / SUB D9 / FEMALE) AND USB PORT

The **SMART PORT JD1** and **USB port** located on the UPS itself is an intelligent RS 232 serial port that allows the UPS to be connected to a computer. The connector is a standard D-Type, 9-pin, female, and the USB is a standard USB port.

When installed the optional SMART PORT, the software WAVEMON allows the computer to monitor the mains voltage and the UPS status continuously.

In the event of any changes the computer terminal will display a message.

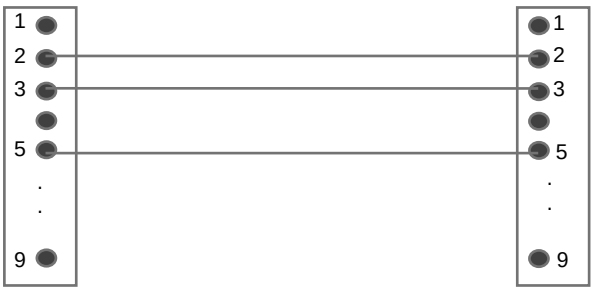
(For details see our Monitoring Package: ***WAVEMON***).

The Fig. 1.1 shows how to connect a PC to the UPS with different Sub-D connectors.

a)Interface Cable (UPS End)
(9-Pin, D-Type female)

Interface cable (Computer End)
(9-Pin, D-Type male)

Connects UPS
to SMART PORT



Connects to
Computer

Figure 1.1 Connector Cable - PC Serial Port with 9-Pin Connection

3.1.2 CUSTOMER INTERFACES

All the Input and Output interfaces are connected to Phoenix terminals (cable 0.5 mm2)

3.1.2.1 CUSTOMER INPUTS DRY PORTS: Terminal block X1

- Connection of Remote Shut down facilities, Generator Operation, Customers specials ***(see Section 9, chapter 1.2 OPTIONS)***

3.1.2.2 CUSTOMER OUTPUTS DRY PORTS: Terminal blocks X2

- Provision of signals for the automatic and orderly shutdown of servers, AS400 or Automation building systems

All voltage free contacts are rated 60 VAC max. and 500 mA max.:

Block	Terminal	Contact	Signal	On Display	Function
X1	X1 / 10	GND	GND		**12 Vdc source**
	X1 / 9	IN	+12Vdc		(Max 200mA load)
	X1 / 8	GND	GND		**Remote Shut down**
	X1 / 7	IN	+12Vdc		(Do not remove the factory mounted bridge until an external remote shut down is connected)
	X1 / 6	GND	GND		**Temperature Battery**
	X1 / 5	IN	+3.3Vdc		(If connected, the battery charger current is batt. temperature dependent)
	X1 / 4	GND	GND		**Customer IN 1**
	X1 / 3	IN	+12Vdc		(Function on request, to be defined)
	X1 / 2	GND	GND		**Customer IN 1 (default as Generator Operation)**
	X1 / 1	IN	+12Vdc		(NC = Generator ON)
X2	X2 / 15	C	ALARM	COMMON_ALARM	Common
	X2 / 14	NC			NO Alarm Condition
	X2 / 13	NO			**Common Alarm** (System)
	X2 / 12	C	Message	LOAD_ON_MAINS	Common
	X2 / 11	NC			(Load on Inverter)
	X2 / 10	NO			**Load on bypass** (Mains)
	X2 / 9	C	ALARM	BATT_LOW	Common
	X2 / 8	NC			Battery OK
	X2 / 7	NO			**Battery Low**
	X2 / 6	C	Message	LOAD_ON_INV	Common
	X2 / 5	NC			(Load on Mains bypass)
	X2 / 4	NO			**Load on Inverter**
	X2 / 3	C	ALARM	MAINS_OK	Common
	X2 / 2	NC			**Mains Failure**
	X2 /1	NO			Mains Present

Figure 1.2 Customer Interface PowerWave 33 60-300 kW X1, X2 Phoenix Terminals

On the Interface board are located two LED's:

- Green LED showing the status of the Interface:
  - Fast Blinking: 2 times/sec = Interface is Master (1st Cabinet of a parallel System)
  - Slow Blinking: 1 times/sec = Interface is Slave (2nd,.. 10th cabinet of a //- System)

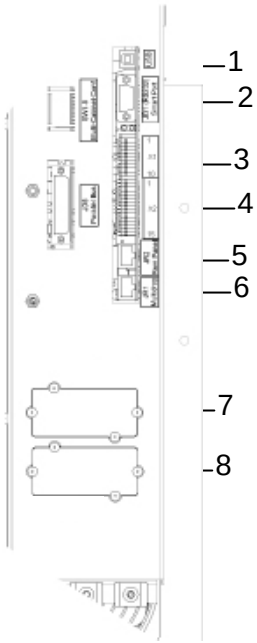
  Red LED Board Alarm (indicates a possible replacement of the board)

On the Master board the following ports are active:

- The Input ports (X1)
- The Output port (X2)

3.1.3 JR1 / RS485 INTERFACE FOR MULTIDROP

The **Computer Interface JR1** located on the distribution part is an intelligent RS485 serial port that allows to get from several UPS cabinets which are connected in parallel the complete system information by using the Multidrop connection kit. (For details see user manual Multidrop kit). The connector JR1 is a standard RJ45 port.



1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
3	X1	Customer Inputs
4	X2	Customer interface on Phoenix Terminals: X2= Potential free contacts (detail see Section 3 / 1.2)
5	JR2 / RS485 on RJ 45 port	Remote panel connection
6	JR1 / RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets
7	SNMP	Slot for optional SNMP card ONLY
8	Modem	Slot for optional Modem/Ethernet card ONLY
9	JD8	Parallel BUS connector
	ONLY For paralleling cabinets use optional adapter:	
	JD5	**Parallel BUS - Input Connector**
	JD6	**Parallel BUS - Output Connector**

Example : Distribution Interfaces

3.2 INTERFACING POWERWAVE 33 400-500 KW

Each UPS is provided with communication port and a communication card, which provides system information

- Input Interfaces — X3 (Terminals)
- Output Interfaces : — X2 DRY PORTs ,volt-free contacts (Terminals)
- USB port /RS232: — Interface (UPS system to computer)
- JD1 / RS232 Sub D9 / female : — Interface (UPS system to computer)
- JR3 / RS485 on RJ 45 port: — Remote panel connection
- JR2 / RS485 on RJ 45 port: — Interface for Multidrop connection between several UPS cabinets
- SLOT 1 / SNMP Slot
- SLOT 2 / Modem Slot

3.2.1 SMART PORT JD1 (SERIAL RS 232 / SUB D9 / FEMALE) AND USB PORT

The **SMART PORT JD1** and **USB port** located on the UPS itself is an intelligent RS 232 serial port that allows the UPS to be connected to a computer. The connector is a standard D-Type, 9-pin, female, and the USB is a standard USB port.

When installed the optional SMART PORT, the software WAVEMON allows the computer to monitor the mains voltage and the UPS status continuously.

In the event of any changes the computer terminal will display a message.

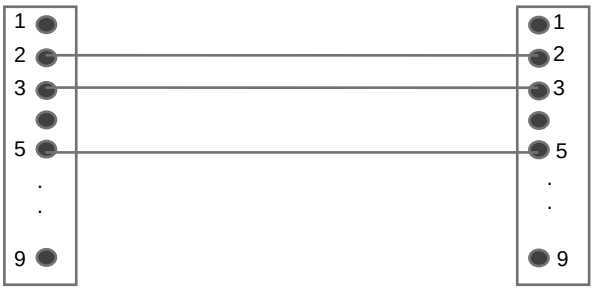
(For details see our Monitoring Package: ***WAVEMON***).

The Fig. 1.3 shows how to connect a PC to the UPS with different Sub-D connectors.

a)Interface Cable (UPS End)
(9-Pin, D-Type female)

Interface cable (Computer End)
(9-Pin, D-Type male)

Connects UPS
to SMART PORT



Connects to
Computer

Figure 1.3 Connector Cable - PC Serial Port with 9-Pin Connection

3.2.2 CUSTOMER INTERFACES

3.2.2.1 CUSTOMER INPUTS DRY PORTS: Terminal blocks X3 / 3-14

Connection of Remote Shut down facilities, Generator Operation, Customers specials *(see UM Section 9 / OPTIONS)*

3.2.2.2 OUTPUTS DRY PORTS: Terminal blocks X2 + X3 / 1-2

Provision of signals for the automatic and orderly shutdown of servers, AS400 or Automation building systems

3.2.2.3 INTERLOCK CASTELL FUNCTION: Terminal block X1

This function allows a secure transfer from inverter (normal operation) to external maintenance bypass and vice-versa. During normal operation the external bypass is locked in position OFF. Only when the UPS is/are transferred to static bypass mode, the lock on the external bypass is released and it possible to switch to position ON. The transfer from maintenance bypass back to normal operation happens exactly the other way around. The release signal is 230VAC when the maintenance bypass is free and 0V when locked.

Figure 1.4 Customer Interface PW33 400-500KW

Block	Terminal	Contact	Signal	On Display	Function
X3	X3 / 14	GND	GND	-	Temperature Battery (If connected, the battery charger voltage is batt. Temperature dependent)
	X3 / 13	IN	+3.3Vdc	-	
	X3 / 12	GND	GND		Customer IN 1 (function on request, to be defined)
	X3 / 11	IN	+12Vdc		
	X3 / 10	GND	GND	GENERATOR_ OPER_ON -	Generator Operation (NC = GEN ON) (or on request External Output Breaker)
	X3 / 9	IN	+12Vdc		
	X3 / 8	GND	GND	EXT_MAN_BYP	External Manual Bypass (External IA1)
	X3 / 7	IN	+12Vdc		
	X3 / 6	IN	+12Vdc	-	+ 12Vdc source (Max. 200mA Load)
	X3 / 5	GND	GND	-	
	X3 / 4	GND	GND	REMOTE_ SHUTDOWN-	RSD (Remote Shut down) Do not remove the factory mounted bridge (JP5) until an external remote shut down is connected
	X3 / 3	IN	+12Vdc		
	X3 / 2	C	-	REMOTE_ SHUTDOWN-	RSD (Remote Shut down) for external switch Max. 250Vac/8A ;30Vdc/8A ;110Vdc/0.3A ;220Vdc/0.12A
	X3 / 1	NO	-		
X2	X2 / 18	C NC NO	-	-	Common
	X2 / 17		-	-	Relais AUX (function on request, to be defined)
	X2 / 16		-	-	
	X2 / 15	C NC NO		COMMON_ALARM	Common
	X2 / 14		ALARM		No Alarm Condition
	X2 / 13				Common Alarm (System)
	X2 / 12	C NC NO		LOAD_ON_MAINS	Common
	X2 / 11		Message		No Load on Bypass
	X2 / 10				Load On Bypass (Mains)
	X2 / 9	C NC NO		BATT_LOW	Common
	X2 / 8		ALARM		Battery Ok
	X2 / 7				Battery Low
	X2 / 6	C NC NO		LOAD_ON_INV	Common
	X2 / 5		Message		No Load on Inverter
	X2 / 4				Load on Inverter
	X2 / 3	C NC NO		MAINS_OK	Common
	X2 / 2		ALARM		Mains Failure
	X2 / 1				Mains Present
X1	X1 / 2	230Vac 2AT	-	EXT_MAN_BYP	Interlock Castel Function (Ext Manual Bypass) 230Vac / 2AT
	X1 / 1	N	-		

All Terminals X1-X3 can hold Cable from 0.2mm2 – 1.5mm2
All Voltage free contacts are rated: Max 250Vac/8A; 30Vdc/8A; 220Vdc/0.12A

On the Interface board are located two LED's:

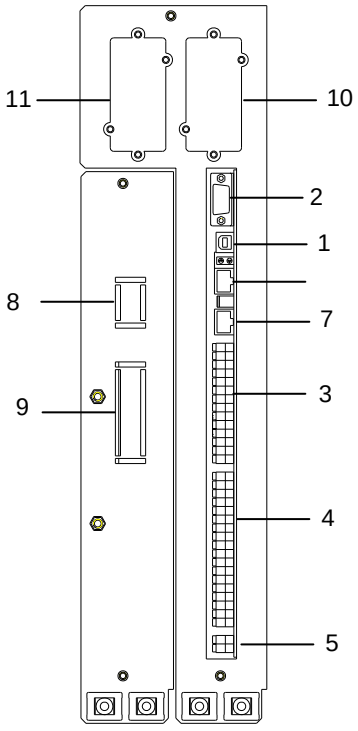
- Green LED showing the status of the Interface:
  - Fast Blinking: 2 times/sec = Interface is Master (1st Cabinet of a parallel System)
  - Slow Blinking: 1 times/sec = Interface is Slave (2nd,.. 10th cabinet of a //- System)
- Red LED Board Alarm (indicates a possible replacement of the board)

On the Master board the following ports are active:

- The Input ports (X1)
- The Output port (X2)

3.2.3 JR2 / RS485 INTERFACE FOR MULTIDROP

The **Computer Interface JR2** located on the distribution part is an intelligent RS485 serial port that allows to get from several UPS cabinets which are connected in parallel the complete system information by using the Multidrop connection kit. (For details see user manual Multidrop kit). The connector JR2 is a standard RJ45 port.



1	USB	PC Interface
2	JD1/RS232 Sub D9/female	Interface (UPS system to computer)
3	X3	Customer Inputs
4	X2	Customer interface on Terminals: X2= Potential free contacts
5	X1	Interlock Castell Function
6	JR3/RS485 on RJ 45 port	Remote panel connection
7	JR2/RS485 on RJ 45 port	Interface for Multidrop connection between several UPS cabinets
8	SW1-9	Multi-Cabinet Configuration Switch (see section 4)
9	JD8	Parallel BUS connector
	ONLY For paralleling cabinets use optional adapter:	
	JD5	**Parallel BUS - Input Connector**
	JD6	**Parallel BUS - Output Connector**
10	SNMP	Slot for optional SNMP card ONLY
11	Modem	Slot for optional Modem/Ethernet card ONLY

Example : Distribution Interfaces

CONTENTS SECTION-4

4.1 OPERATION

4.1.1 COMMISSIONING

The PowerWave 33 is a high quality electronic machine, that must be commissioned by a fully trained and authorized NEWAVE field service engineer before being put into use.

The commissioning of the UPS involves the connection of the UPS and battery, the checking of the electrical installation and operating environment of the UPS, the controlled start-up and testing of the UPS and customer training.

WARNING!

OPERATIONS INSIDE THE UPS MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM AN AGENT AUTHORIZED BY THE MANUFACTURER.

4.1.2 CONTROL PANEL

WARNING!

ONLY PERSONS WHICH HAVE BEEN TRAINED BY SERVICE TECHNICIANS OF THE MANUFACTURER OR HIS AUTHORIZED SERVICE PARTNERS ARE ALLOWED TO OPERATE ON THE CONTROL PANEL WITH CLOSED DOORS. ALL OTHER INTERVENTIONS ON THE UPS SYSTEM HAVE TO BE DONE ONLY BY SERVICE TECHNICIANS OF THE MANUFACTURER.

The user-friendly control panel is composed of three parts:

- POWER MANAGEMENT LCD DISPLAY (PMD);
- LED INDICATORS;
- KEYS.

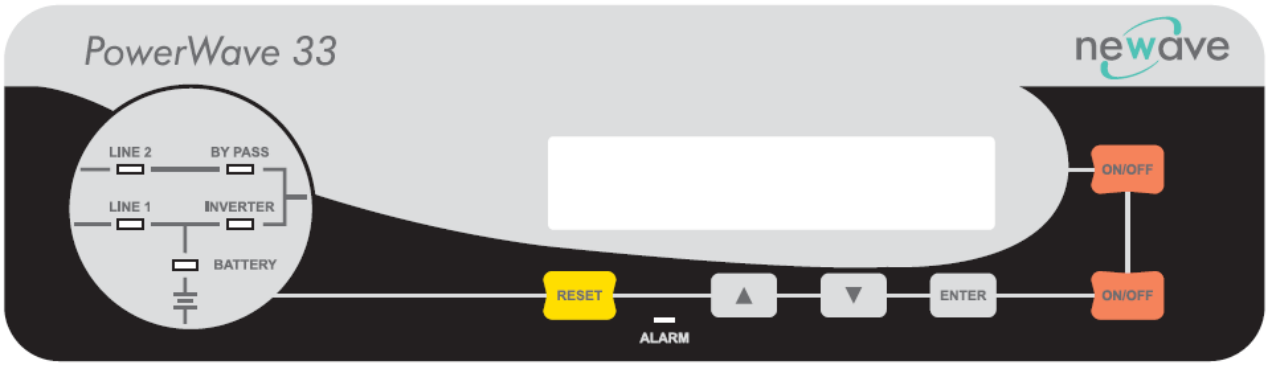


Figure 1.1 Control Panel

4.1.2.1 Power Management Display (PMD)

The 2 x 20 character LCD simplifies the communication with the UPS and provides the necessary monitoring information about the UPS. The menu driven LCD enables the access to the:

- EVENT REGISTER;
- Monitor the input and output U, I, f, P,
- Battery runtime;
- To perform commands like start-up and shut-down of UPS and
- Load transfer from INVERTER to BYPASS and vice-versa;
- DIAGNOSIS (SERVICE MODE);
- Adjustments and testing.

4.1.2.2 LED Indicators

The mimic diagram serves to indicate the general status of the UPS. The LED-indicators show the power flow status and in the event of mains failure or load transfer from inverter to bypass and vice-versa. The corresponding LED-indicators will change colours from green (normal) to red (warning).

The LED's LINE 1 (rectifier) and LINE 2 (bypass) indicate the availability of the mains power supply.

The LED's INVERTER and BYPASS if green indicate which of the two is supplying power to the critical load. When the battery is supplying the load due to mains failure the LED-indicator BATTERY is flashing.

The LED-indicator ALARM is a visual indication of any internal or external alarm condition. At the same time an audible alarm will be activated.

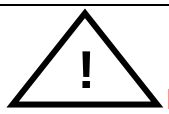
INDICATOR	INDICATOR STATUS	MEANING
ALARM	OFF	No alarm condition
	RED	Alarm condition
LINE 1	GREEN	Mains rectifier available
	RED	Mains rectifier not available
LINE 2	GREEN	Mains bypass available
	RED	Mains bypass not OK or not available
	OFF	UPS is turned off
BY-PASS	GREEN	Load on bypass (Bypass-or Eco-Mode)
	OFF	Bypass not operating (switched-off)
INV	GREEN	Load on inverter
	RED	Inverter fault or load not transferable to inverter
	OFF	Inverter not operating (switched-off)
BATTERY	GREEN	Battery OK
	RED	Battery fault or battery is discharged
	Flashing GREEN	Battery in discharge or battery fuse open

4.1.2.3 Keys

The keys allow the user to operate the UPS to perform settings and adjustments, to start-up and shutdown the UPS, to monitor on the LCD display the voltages, currents, frequencies and other values.

KEYS	FUNCTION
ON/OFF ON/OFF	Serve to switch-on (press both keys simultaneously), or shutdown the UPS (press both keys simultaneously)
UP (↑)	Move upwards through the menu
DOWN (↓)	Move downwards through the menu.
RESET	Cancel the audible alarm. If the alarm condition was only transient the LED-indicator ALARM would also extinguish otherwise it will remain on (red).
ENTER	Confirms a chosen menu item.

4.1.2.4 ON/OFF Start-up and Shutdown Buttons



NOTE!

IN THE CASE THAT THE PARALLEL UPS SYSTEM HAS TO BE TURNED OFF, THEN BOTH ON/OFF BUTTONS ON ALL UPS MODULES HAVE TO BE PUSHED. IN THIS CASE THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED.

4.1.2.5 Definition of a Single/ Multi-Cabinet Chain (DIP Switch SW1-9)

By means of the DIP Switch SW1-9, which is located on the bottom right front of the UPS, it is possible to determine the "position" of the UPSs when are in parallel configuration:

- **"First"** UPS in the parallel configuration chain
- **"Middle"** UPS in the parallel configuration chain (there may be more than one)
- **"Last"** UPS in the parallel configuration chain.

NOTE: If a UPS is a **Single UPS** then it is seen as the **"First"** and **"Last"** in an imaginary chain.
For more details concerning the positions of the DIP Switch SW1-9 please refer to **"CONTENS SECTION-6"** point **"6.1.2.4 DIP Switch 1-9"**.

4.1.3 DESCRIPTION OF THE LCD

4.1.3.1 Status Screens

	DESCRIPTION	LCD-DISPLAY
1	Load is protected by UPS power (load is supplied by inverter(Normal Operation)	**LOAD PROTECTED** **S**
2	Load is not protected by UPS power it is supplied by mains power (load on bypass)	**LOAD NOT PROTECTED** **S**
3	Load supply completely interrupted. UPS has been switched off by "ON/OFF" buttons	**LOAD OFF SUPPLY FAILURE** **S**
4	The UPS/module is not supplying load anymore. The output switch is open	**LOAD DISCONNECTED PARALLEL SWITCH OPEN** **S**

NOTE: On the right hand side of the LCD there is a 3-digit indicator defining the UPS "Position" in the Multi-UPS system.

S stands for **S**ingle UPS. The system consists only of one UPS.

P01 stands for **P**arallel UPS in a Multi- UPS system and 01 stands for the first UPS (**MASTER**) in the Multi- UPS system.

P02 stands for **P**arallel UPS in a Multi- UPS system and 02 stands for the second UPS (**SLAVE**) in the Multi- UPS system.

P03 stands for **P**arallel UPS in a Multi- UPS system and 03 stands for the third UPS (**SLAVE**) in the Multi- UPS system.

The definition of the UPS "Position" in a parallel system and frame is achieved in the Menu Service Set-Up.

DESCRIPTION	LCD-DISPLAY
Single UPS Systems	**SYSTEM CONFIGURATION SINGLE** **S**
Parallel System e.g. first UPS cabinet	**SYSTEM CONFIGURATION PARALLEL** **P01**
Parallel System e.g. second UPS cabinet / Slave	**LOAD OFF SUPPLY FAILURE** **P02**

The max no. of UPS units is 10.

4.1.3.2 Main Menu Screen

DESCRIPTION	LCD-DISPLAY
1 Logging Control. A log of the last 64 events is stored in the Power Management Display.	→ **EVENT LOG** MEASUREMENTS
2 In Menu Measurements: monitor voltages, power, frequencies, currents, autonomy etc.	→ **MEASUREMENTS** COMMANDS
3 The Command Menu enables to perform the commands “Load to inverter”, Load to bypass, battery test.	→ **COMMANDS** UPS DATA
4 The UPS Data are the UPS personalized information “serial number”	→ **SET-UP DATA** SET-UP USER
5 Various settings can be performed by the user: Date/Time, automatic battery test, etc.	→ **SET-UP USER** SET-UP SERVICE
6 Various adjustments can be performed by the service staff	→ **SET-UP SERVICE** **NO MORE MENU**

4.1.3.3 Event Log Screen

DESCRIPTION	LCD-DISPLAY
1 Logging Control; a log of the last 64 events is stored in the Power Management Display.	**01** 05-10-08 14-38-59 **LOCAL LOAD OFF**
2 Every stored event is identified with a sequential number and time stamp.	**02** 05-10-08 14-38-56 **LOCAL LOAD TO BYP**
3 By press ENTER the code of the event will be displayed. (Press ENTER to come back to the previous indication)	**02** 8104 **LOCAL LOAD TO INV**
4 All events and alarms are indicated with their date and time of appearance.	**03** 05-10-08 14-37-14 **LOCAL LOAD TO INV**

4.1.3.4 Measurements Screen

DESCRIPTION	LCD-DISPLAY
1 Battery Runtime	**BATT. RUN TIME (MIN)** 00h 00m
2 UPS-Output Frequency	**OUTPUT FREQUENCY (HZ)** 50.00
3 Bypass Frequency.	**BYPASS FREQUENCY (HZ)** 50.00
4 Battery Voltage	**BATTERY VOLTAGE (V)** + 0.0 - 0.0
5 Battery Charger Current	**BATT. CHARGE CUR. (A)** + 0.0 - 0.0
6 Discharge Current.	**DISCHARGE CURRENT (A)** 00.00
7 Rectifier Voltage of all three phases	**RECTIFIER VOLTAGE (V)** 230 230 230
8 Bypass Voltage of all three phases	**BYPASS VOLTAGE (V)** 230 230 230

9	Output Voltage of all three phases	**OUTPUT VOLTAGE (V)** 230 230 230
10	Output Current of all three phases	**OUTPUT CURRENT (A)** 00.00 00.00 00.00
11	Active Output Power of all three phases	**ACTIVE POWER (KW)** 00.00 00.00 00.00
12	Reactive Output Power of all three phases	**REACTIVE POWER (kVAr)** 00.00 00.00 00.00
13	Apparent Output Power of all three phases	**APPARENT POWER (KVA)** 00.00 00.00 00.00
14	Output Power of all three phases	**OUTPUT POWER (%)** 00.00 00.00 00.00
15	Battery capacity	**BATT. CAPACITY (%)** 00.00

4.1.3.5 Commands Screen

	DESCRIPTION	LCD-DISPLAY
1	Transfer Load to inverter	→ **LOAD TO INVERTER** LOAD TO BYPASS
2	Transfer Load to bypass.	→ **LOAD TO BYPASS** PERFORM BATT.TEST
3	Battery Test	→ **PERFORM BATT.TEST** **NO MORE COMMANDS**

4.1.3.6 UPS Data

	DESCRIPTION	LCD-DISPLAY
1	These general UPS Data are installed at the manufacturing plant	**UPS SERIAL NUMBER** **NW-nnnnn**
2	Manufacturing date	**DATE OF MANUFACTURE** **15-01-2008**
3	EPROM Version	**EPROM VERSION** **V-000**
4	Actual Date and Time	**DATE** **TIME** dd-mm-yyyy hh:mm:ss

4.1.3.7 Set-Up User

	DESCRIPTION	LCD-DISPLAY
1	Set-up Language	→ **SET LANGUAGE** SET DATE AND TIME
		ENGLISH **FRANCAIS** **DEUTCH** **DUTCH** **SPANISH** **POLISH** **PORTOGUESE**
2	Set-up Date and Time	→ **SET-UP DATE/TIME** SET-UP BATT. TEST
		DD-MM-YY **HH-MM-SS**

3 Set-up battery test	→ **SET BATTERY TEST** SET GENERATOR OP.
	DAY OF MONTH **(1-31)**
	HOUR OF DAY **(1-24)**
	REPETITIVE (Y/N) YES/NO
4 Set-up operation with Gen-Set	→ **SET GENERATOR OP.** NO MORE SETTINGS
	BATT.CHARGE LOCK YES/NO
	BYPASS LOCK YES/NO

4.1.3.8 Set-Up Service

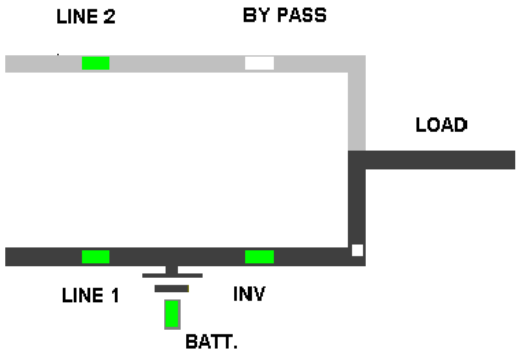
DESCRIPTION	LCD-DISPLAY
1 This Menu is reserved for authorized service engineers. It is not to be used by End-Users	→ **SET-UP SERVICE** PASSWORD
2 Type in password	→ **PASSWORD.**

Password is necessary to enter: Service Manual

4.1.4 OPERATING MODES

4.1.4.1 Mode "ON LINE" (INVERTER MODE)

The ON-LINE-Mode is the UPS-Operating Mode in which the load is supplied through the RECTIFIER and INVERTER.



LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

Using the control panel (see figure 1.1), the UPS can easily be transferred to the ON-LINE-Mode. The ON-LINE-Mode provides the highest degree of protection, especially in the event of a mains disturbance or failure.

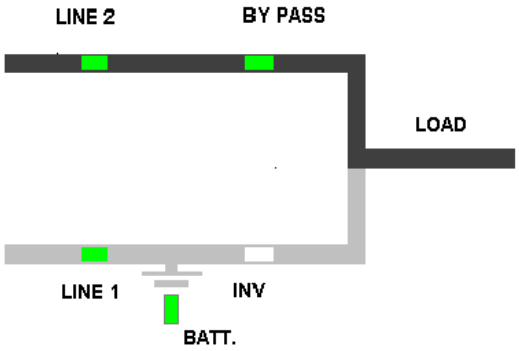
This operating mode is always recommended if the critical loads (computer systems) will not tolerate any interruption of the supply (not even the shortest).

In the unlikely event of an inverter fault or overload condition the UPS will transfer the load automatically and without interruption to the static bypass-mains supply (transfer time = 0).

4.1.4.2 Mode"OFF-LINE"(ECO- or BYPASS MODE)

In the "OFF-Line Mode", the load is supplied from the mains through the static bypass.

Using the control panel (see figure 1.1), the UPS may be easily transferred to "Bypass Mode".



LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

When the UPS is operating in "Bypass Mode", the efficiency of the system is higher. In the event of a mains failure the load will automatically be transferred from mains to inverter within 5 msec (this is valid for single and parallel systems). The battery charger remains active in the "Bypass-Mode".

The "Bypass-Mode", is recommended only if the loads can tolerate interruptions of 3-5 ms (transfer time from Bypass Mode to ON-LINE Mode).

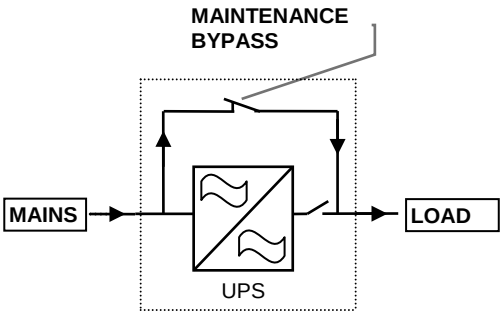
NOTE!

TO HAVE TO MOST ESSENTIAL SECURITY LEVEL, WE RECOMMEND TO RUN THE UPS ON NORMAL OPERATION MODE, MEANS UPS MODE.

4.1.4.3 "MAINTENANCE BYPASS" - Mode

The Maintenance Bypass Mode is performed by means of the IA1 BYPASS SWITCH on the front of the UPS:

POSITION OF SWITCH	EFFECT
ON	Bypass-Switch Closed (Load supplied directly from mains) LCD-indication: “MANUAL BYP IS CLOSED” LED Indicators will indicate as shown in table below.
OFF	Bypass-Switch Open – Normal operating condition (Load supplied by inverter) LCD-indication “MANUAL BYP IS OPEN” LED Indicators will indicate as shown in table below.



	Bypass Switch	
LED Indicator	**ON**	**OFF**
LINE 1	Green	Green
LINE 2	Green	Green
BYPASS	Green	OFF
INVERTER	RED	Green
BATTERY	Green	Green

Before transferring the load to Maintenance Bypass (IA1) always make sure all the UPS-modules are in the "Bypass-Mode” or “ECO-Mode”.

NOTE!

ON OPERATION MODE „MANUAL BYPASS“ THE LOAD IS NOT PROTECTED AGAINST ANY MAINS FAILURES OR MAINS DISTURBANCES.

4.1.4.4 Parallel Isolator (IA2)

Every UPS-unit is provided with an output parallel isolator (IA2) which, when opened isolates the corresponding unit from the PARALLEL BUS and from the LOAD. Once IA2 is open there is no power coming from its inverter.

In redundant parallel configurations it is used to isolate a unit from the parallel system without the need of transferring the load to bypass.

POSITION	EFFECT
ON	Normal Operation (Load supplied by UPS)
OFF	UPS-Module isolated from Parallel Bus for maintenance or module replacement (UPS-Module not supplying load)

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CONTENTS SECTION-5

5.1 OPERATION - PROCEDURES

5.1.1 START-UP PROCEDURE

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

Situation of UPS-System before switching it on:

1. Make sure the fuses for the supply of UPS-System in the Input Distribution Board on site are open.
2. Make sure all the input and output cabling has been performed correctly.
3. Verify that the Output Switch IA2 is open (Position OFF).
4. If present verfy that the Maintenance Switch IA1 is open (Position OFF).
5. Make sure that the internal battery enclosure fuses and/or the external battery cabinets fuses are open.
6. Bypass fuses F2 are inserted (60-300kW) OR IA4 is closed (Position ON) (400-500kW)

Start up procedure of PowerWave 33:

1. Insert fuses for the supply of UPS-System in the Input Distribution and check the input phase rotation.
   - The LED-indicators LINE 1 and battery on UPS-Module is lit – green
   - On LCD-Display “LOAD OFF, SUPPLY FAILURE” will appear.
2. UPS 1:
   Press both “ON/OFF” Main Buttons to switch on UPS.
   LCD panel must display: “LOAD DISCONNECTED PARALLEL SWITCH OPEN” and the LED-indicator will appear as shown below:

LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Flashing Green

3. Check Command: LOAD TO INVERTER
   LED indicator will appear as shown below:

LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Flashing Green

4. Scroll through the menu measurement and check their correctness
5. Check battery polarity and voltage.

6. If the battery polarity and voltage are correct insert battery enclosure and/or external battery fuses (breakers).

7. Testing of Parallel Functions
(The load fuses in output Distribution Board are still open i.e. the loads are disconnected!).
All UPS-Modules are on INVERTER MODE

8. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD) on all control panels to turn the modules OFF. On the LCD's message "LOAD OFF, SUPPLY FAILURE" will appear

9. Close Parallel Isolator IA2-1 (position ON) of UPS 1, on LCD: "PARALLEL SW CLOSED" will appear.

10. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD) to turn the UPS ON. On output Terminal Block there is now UPS power and on all LCD's: "LOAD PROTECTED" will appear.

11. Close Parallel Isolator IA2-1 (position ON) of UPS 2, on LCD: "PARALLEL SW CLOSED" will appear.

12. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD) to turn the UPS ON. On output Terminal Block there is now UPS power and on all LCD's: "LOAD PROTECTED" will appear. **(now the two units are operating in parallel)**

13. Perform step 11. and 12. until all the unit of the system are complete switched in parallel**.**

14. Load transfer to Maintenance Bypass (on 400-500kW optional)
On the control panel go to Menu COMMANDS and choose command "LOAD TO BYPASS", (for parallel operation is enough to give the order in one of the units) and transfer the load to mains.
Close Maintenance Bypass Switch IA1 (position ON)
On LCD: "MANUAL BYP IS CLOSED" will appear and the LED-indicator will indicate as shown below:

LED Indicator	**Colour**
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

15. Connect Load to the UPS Output
Insert fuses in output Distribution Board
Verify on control Panel that the load is on bypass

16. Open Maintenance Bypass Switch IA1
On LCD: "MANUAL BYP IS OPEN" will appear followed by "LOAD NOT PROTECTED"

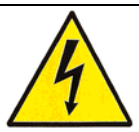
17. Check on LCD the Output Powers, Voltages Currents and Frequencies.

18. Load transfer to Inverter
On control panel go to Menu COMMANDS**,** choose command "LOAD TO INVERTER" and transfer the load to inverter.
On all LCD's: "LOAD PROTECTED" will appear

19. Check the output Voltages and Currents once again.

THE LOAD IS NOW PROTECTED BY THE POWERWAVE 33

5.1.2 SHUTDOWN PROCEDURE



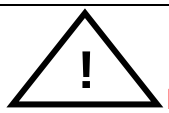
WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

The **POWERWAVE 33** may be shutdown completely, if the load does not need input power for an extended period of time.
It may be switched to Maintenance Bypass Mode for service or maintenance purposes, or transferred to the OFF-LINE Mode (ECO-Mode), if the load does not need the highest degree of protection.
The load may be disconnected by means of the two ON/OFF (LOAD-OFF) buttons for security reasons.

Complete Shutdown procedure of POWERWAVE 33:

Only in case there is no need to supply the load, the UPS System can be completely shutdown. The following procedures can only be executed after the load has completely been de-energized.



NOTE!

IN THE CASE THAT THE PARALLEL UPS SYSTEM HAS TO BE TURNED OFF, THEN BOTH ON/OFF BUTTONS ON ALL UPS MODULES HAVE TO BE PUSHED. IN THIS CASE THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED.

1. Verify that the loads are shutdown and that there is no need for power supply to the load.
2. If the loads are all disconnected, press simultaneously both ON/OFF-Buttons on UPS-Control Panel on all three Control Panels.
   On the LCD: “LOAD OFF, SUPPLY FAILURE” will appear and the LED-indicator will indicate as shown below:

LED Indicator	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

3. Open all Parallel Isolator Switches IA2.
4. Open battery fuses/breakers on external battery cabinets or racks.
5. Open the mains fuses/breaker in the building distribution panel.

NOTE!

MAKE SURE THE INTERNAL DC-CAPACITORS (ELCO) HAVE BEEN DISCHARGED WAITING AT LEAST 10 MINUTES.

THE POWERWAVE 33 IS NOW VOLTAGE FREE.

5.1.3 LOAD TRANSFER: FROM INVERTER OPERATION TO MAINTENANCE BYPASS

If it is necessary to perform service or maintenance on the UPS it is possible to transfer the UPS to MAINTENANCE BYPASS.

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

Situation of UPS-System before starting the Transfer Procedure to Maintenance Bypass:

The load is protected by PowerWave 33 running in normal operation. (The UPS is operating on inverter).

1. Using LCD panel, select the COMMANDS menu, choose command “LOAD TO BYPASS” and transfer the load to mains. (for parallel operation is enough to give the order in one of the units) On LCD panel “LOAD NOT PROTECTED” will appear.
2. Close Maintenance Bypass Switch IA1 (position ON). On a system with multiple UPS in parallel close IA1 on each UPS. On PowerWave 33 400-500kW the maintenance bypass switch is optional. On LCD: “MANUAL BYP IS CLOSED” will appear and the mimic panel will show:

LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

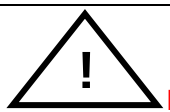
3. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD) on all control panels. On the LCD’s message “LOAD OFF, SUPPLY FAILURE” will appear and the mimic panel will show:

LED Indicator	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashing Green

4. Open the output switch IA2 on all UPSs
5. Open battery fuses/breakers on the external battery cabinets or racks.

NOTE!

THE UPS SYSTEM IS STILL POWERED (DANGEROUS VOLTAGE).



NOTE!

THE LOAD IS NOW SUPPLIED BY MAINS AND IS THEREFORE NOT PROTECTED THROUGH THE UPS

5.1.4 LOAD TRANSFER: FROM MAINTENANCE BYPASS TO INVERTER OPERATIONS

This procedure describes the sequence of operations to be done in order to restart the UPS and restore ON-LINE mode (Load on Inverter).

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

Situation of UPS-System before starting the Transfer Procedure to ON-LINE mode:

The load is supplied directly by Input Mains power and the UPS is OFF.

1. Close battery fuses/breakers in the external battery cabinets or racks.
2. On the LCD's: "LOAD OFF, SUPPLY FAILURE" will appear and the mimic panel will show:

LED Indicator	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashing/Green

3. Close all Parallel Isolators IA2 and check message "PARALLEL SW CLOSED" on LCD of each UPS.
4. Press simultaneously the two ON/OFF buttons on the UPS-control panel (PMD).
   Unit will start-up and after about 60 seconds the mimic panel will show:

LED Indicator	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

5. Make sure that the bypass LED is green, then open the Maintenance Bypass Switch IA1 (for 400-500kW it is optional if present then open it) of each unit (position OFF).
6. Using LCD panel, select the COMMANDS menu and choose command "LOAD TO INVERTER" (for parallel operation is enough to give the order in one of the units). This will transfer the LOAD to Inverter on the complete system (all units). On LCD panel "LOAD PROTECTED" will appear.

THE LOAD IS NOW SUPPLIED BY INVERTER POWER AND IS PROTECTED

CONTENTS SECTION-6

6.1 MULTI-CABINET CONFIGURATION

6.1.1 CONCEPT OF MULTI-CABINET CONFIGURATION

The **POWERWAVE 33** UPS may be paralleled for power capacity or for redundancy up to 10 units. The standard version is not provided with this feature which is optional and field upgradable.

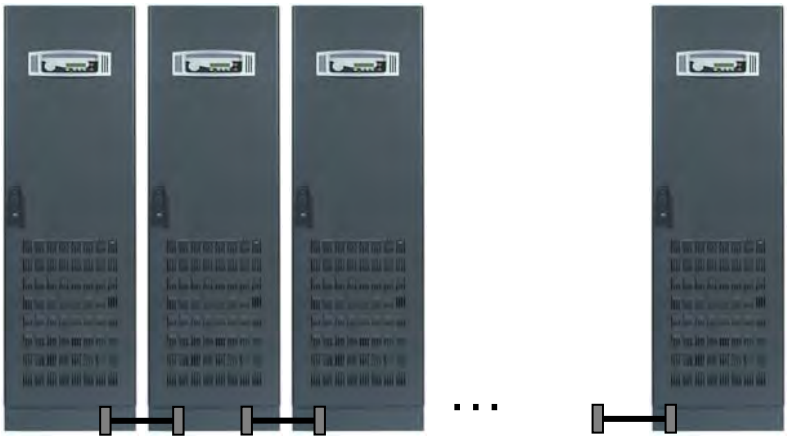


Fig. 1.1. **POWERWAVE 33** Multi-Cabinet Chain.

The Multi-Cabinet Chain is based on a decentralized bypass architecture i.e. every UPS is provided with its own static bypass. In a parallel system there is always one Master UPS and the other UPSs are slaves. If at any time the master is faulty the next UPS (former slave) will immediately take over the master function and the former master will switch off.

Every UPS unit in a parallel configuration is provided with a proper output parallel Isolator (IA2) which, when opened isolates the corresponding unit from the parallel system. Once the parallel isolator (IA2) of a unit is open that unit is isolated from the rest of the parallel system and therefore does not provide power to the output.

For example if you perform the command “LOAD TO BYPASS” on any unit, all the units will transfer the load simultaneously to mains and if you perform the command “LOAD TO INVERTER” on any unit all the UPS’s will simultaneously transfer the load to the inverters.

The **POWERWAVE 33** is paralleled for redundancy (highest availability) or for power parallel systems.

IMPORTANT: The BYPASS MODE (ECO-MODE) function of a parallel systems is the same as in single units of **POWERWAVE 33**. If in a parallel UPS system the load is transferred to the BYPASS (load on mains) and if the mains fails, the UPS’s will all be automatically transferred to inverter within 5msec.

6.1.2 INSTALLATION INSTRUCTIONS

6.1.2.1 Introduction

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

NOTE: IN ORDER TO ACHIEVE EQUAL LOAD SHARING BETWEEN THE UPS-CABINETS, THE INPUT CABLE LENGTHS FROM THE INPUT DISTRIBUTION BOARD TO THE UPS AND FROM THE OUTPUT CABLE TO THE OUTPUT DISTRIBUTION BOARD SHOULD BE THE SAME RESPECTIVELY.
WHEN CABLING THE UPS'S BEWARE TO CONNECT INPUT AND OUTPUT WIRES TO THE CORRESPONDING TERMINALS, RESPECTING THE SAME PHASE SEQUENCE ON ALL UPS CABINETS.
EXAMPLE: PHASE1 OF UPS1 = PHASE1 OF UPS2 = …… = PHASE1 OF UPS n

6.1.2.2 Paralleling of UPS-Cabinets

6.1.2.2.1 Connection of Parallel Communication Cables (BUS-lines)

For the correct performance of different parallel functions and operations the parallel units communicate continuously between each other. This is achieved by means of the so-called communication BUS-Lines.

After terminating the input and output cabling of each single UPS, it is necessary to connect the units together to form the parallel system. For this purpose a communication BUS line is connected sequentially between the units. Connect communication BUS lines according to Figure 1.2.

NOTE!

CONNECT THE BUS CABLES ONLY WITH SWITCHED OFF UPS AND OPENED PARALLEL ISOLATORS IA2. RESPECT THE FOLLOWING CONNECTION SEQUENCES.

1. Fit the Parallel Adapter over the Connector JD8 on all UPS-cabinets
2. Set DIP Switch SW2-2 on each Parallel Adapter depending on the UPS Cabinet in the parallel cabinet configuration (see section 6 chapter 1.2.2.2)
3. Connect PORT JD6 on Parallel Adapter of UPS-Cabinet 1and PORT JD5 of Parallel Adapter of UPS-Cabinet 2 with the corresponding BUS-Cable;
4. Connect PORT JD6 on Parallel Adapter of UPS-Cabinet 2 and PORT JD5 of UPS-Cabinet 3 with the corresponding BUS-Cable
5. Continue in the same manner for the remaining UPS-Cabinets.

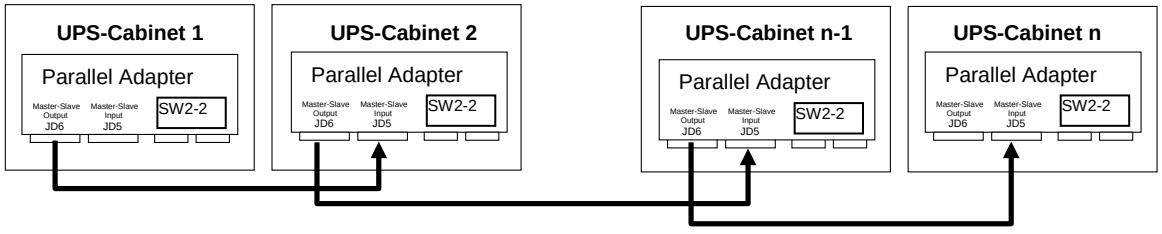
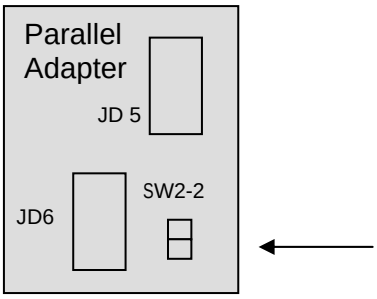


Figure 1.2.Connection of the Bus Lines when paralleling UPS-Cabinets by means of Parallel Adapters.

6.1.2.2.2 Parallel Adapter and DIP-Switch SW2-2

If the UPS-CABINETS are paralleled the Parallel Adapter will be placed on the Connector JD8 on the distribution panel and the communications cables between the cabinets will be connected through the connectors JD5 and JD6, as we are doing now.

NOTE: set the Switch SW2-2 correctly according to the corresponding cabinet configuration.



SW 2	SingleUnit	First Unit	Middle Unit	Last Unit
1	**ON**	**OFF**	**OFF**	**ON**
2	**ON**	**ON**	**OFF**	**OFF**

6.1.2.3 DIP-Switch SW1-9 Settings

Before starting up the parallel system it is necessary to set the DIP Switches SW2-2 and SW1-9 to their correct positions.

6.1.2.4 DIP Switch SW1-9

The DIP Switch SW1-9 is located on every Cabinet (POWERWAVE 33) With this switch it is possible to determine the **"position of an POWERWAVE 33 - Cabinet"** in a Multi-Cabinet Chain. Define each **POWERWAVE 33** - Cabinet in a Multi-Cabinet Chain as:

1. The **"First"**,
2. The **"Middle"** (there may be more than one) and
3. The **"Last"**

Cabinet in the Multi-Cabinet Chain by setting the DIP Switch SW1-9 on each cabinet according to the Table below:

SW1-9	**Single UPS**	First UPS	Middle UPS	Last UPS
1	**ON**	ON	OFF	ON
2	**ON**	**OFF**	OFF	ON
3	**ON**	ON	OFF	**OFF**
4	**ON**	ON	OFF	ON
5	**ON**	ON	OFF	ON
6	**ON**	ON	OFF	ON
7	**ON**	ON	OFF	ON
8	**ON**	ON	OFF	**ON**
9	**ON**	**ON**	OFF	ON

After having set the SW1-9 on all the **POWERWAVE 33** - Cabinets correctly the UPS's may be commissioned

6.1.2.5 ON/OFF – Main Buttons

The ON/OFF-Buttons serve to shutdown the UPS-system for service or maintenance or for emergency reasons.

! NOTE!	**WHEN BOTH ON/OFF BUTTONS ON ALL UPS MODULES IN A PARALLEL SYSTEM ARE PUSHED THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED.**

6.1.2.6 Parallel Isolator (IA2)

Every UPS-unit (Means each Module) is provided with a parallel isolator IA2. The parallel isolator is an important element of the UPS-unit, that allows the isolation of a Modul from the parallel system without the need to transfer the load to bypass.

! NOTE!	**IA2 OPEN:** **THE CORRESPONDING UPS-MODULE IS ISOLATED FROM THE OUTPUT. THERE IS NO COMMUNICATION BETWEEN THE ISOLATED UNIT AND THE REST OF THE PARALLEL SYSTEM. THE ISOLATED UPS-MODULE MAY BE REPLACED WITHOUT COMPROMISING THE REST OF THE SYSTEM.** **IA2 CLOSED:** **THE CORRESPONDING UPS IS BEING ADDED TO THE REST OF THE PARALLEL SYSTEM.** **IMPORTANT: BEFORE CLOSING THE IA2 OF A UPS-MODULE BE SURE THAT THE STATUS OF THAT UPS-MODULE IS THE SAME AS OF THE REST OF THE OPERATING UPS-MODULE WITH CLOSED IA2. EXAMPLE: IF ALL UPS'S WITH CLOSED IA2 ARE ON INVERTER, MAKE SURE THAT THE UNIT ON WHICH ISOLATOR IA2 IS BEING CLOSED IS ALSO ON INVERTER.**

6.1.2.7 Maintenance Bypass (IA1)

There are two types of Parallel System Configurations: redundant and capacity parallel systems (see SECTION 5).

6.1.2.7.1 Redundant Parallel Configuration

In a redundant parallel system a UPS-module may easily be isolated from the parallel system by opening the respective isolator (IA2). It is now possible to operate or shut down this unit without influencing the rest of the parallel system. The rest of the parallel system will continue to protect the load. The isolated UPS-Module may be replaced without the need of transferring the load to bypass by means of the Maintenance Bypass (IA1).

6.1.2.7.2 Capacity Parallel Configuration

In the event of a fault in one of the UPS-Modules in a capacity parallel system the load will automatically be transferred to static bypass (mains). In order to replace the faulty module the load must be transferred to mains by means of Maintenance Bypass (IA1).

6.1.2.8 ECO-MODE (BYPASS MODE) in Parallel Systems

The Eco-Mode function in a Parallel System is the same as in Single Systems. If in a **PowerWave 33** Parallel System the load is supplied by the mains(load on mains) and in the event of mains failure, **all UPS's will automatically transfer the load back to the inverters with 5msec.**

! ***In order to provide the load with maximum protection NEWAVE always recommends that the load be supplied by the inverter (ON-LINE-Mode).***

6.1.3 COMMISSIONING OF PARALLEL CONFIGURATION

WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

6.1.3.1 Start-up of a Parallel Configuration

Before starting up a parallel Configuration verify that:

1. All the input and output cabling has been performed correctly according to section 2 of this User Manual;
2. The parallel communication cables have been connected correctly according to Paragraph 6.1.2.2.1
3. All the DIP Switches for POWERWAVE 33 - Cabinets been set correctly according to Paragraphs 6.1.2.2.2 and 6.1.2.4
4. All the internal (if any) and /or external battery cabinets/racks have been connected correctly

The start-up of a parallel Configuration may be performed in analogy to the start-up procedures for a single PowerWave 33 - Cabinet described in Paragraph 1.1 of section 5.

6.1.3.2 Shutdown of Parallel Configuration

Before shutting-down of a Parallel Configuration make sure that the loads do need power protection and that they are disconnected.

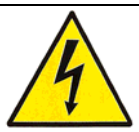
The UPS may be shut down completely if the loads do not need any power supply. Therefore the steps in this Paragraph are to be performed only after the load has been disconnected and does not need any power supply.

To perform a complete shutdown of a Parallel Configuration proceed in analogy to the shutdown procedures described in Paragraph 1.2 of section 5.

CONTENTS SECTION-7

7.1 MAINTENANCE

7.1.1 INTRODUCTION



WARNING!

THE OPERATIONS DESCRIBED IN THIS CHAPTER MUST BE PERFORMED BY A SERVICE ENGINEER FROM THE MANUFACTURER OR FROM A AGENT AUTHORIZED BY THE MANUFACTURER.

To ensure an optimum operation of the **PowerWave 33** and a continuous and efficient protection of the connected load it is recommended to check the batteries every 6 months, depending on the ambiance temperature.

7.1.2 USER RESPONSIBILITIES

There are no user serviceable parts contained within the UPS so the maintenance responsibilities of the user are minimal. To maximize the useful working life and reliability of the UPS and its batteries, the environment in which the UPS operates should be kept cool, dry, dust and vibration free. The batteries should be hold fully charged.

7.1.3 ROUTINE MAINTENANCE

The UPS is designed to receive regular preventative maintenance inspections. These preventative maintenance inspections are essential to ensure that both the useful working life and the reliability of the UPS are maximized. When the UPS is commissioned, the commissioning field service engineer will attach a service record book to the front of the UPS and this will be used to record the full service history of the UPS.
Preventative maintenance inspections involve working inside the UPS, which contains hazardous AC and DC voltages. Only NEWAVE trained or agreed service personnel and authorized field service engineers are fully aware of all of the hazardous areas within the UPS.
During a preventative maintenance inspection the field service engineer will carry out the following checks:

- Site/enivrement conditions
- Integrity of electrical installation
- Cooling airflow
- Rectifier operation and calibration
- Inverter operation and calibration
- Static switch operation
- Battery status
- Load characteristics
- Integrity of alarm and monitoring systems
- Operation of all installed options

7.1.4 BATTERY TEST

The battery test takes approx. 3 minutes and should be performed only if:

- there are no alarm conditions
- the battery is fully charged
- mains is present

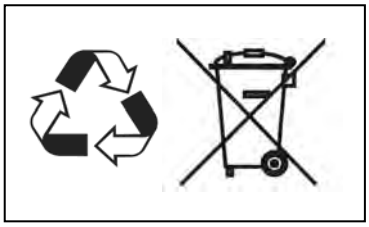
The battery testing can be carried out independently of the operation mode (OFF-LINE or ON-LINE) and whether or not the load is connected. The battery test procedure can be performed from the UPS front panel. See “Operation” *Section-4, Paragraph 4.1.1.10*

7.1.5 BATTERY MAINTENANCE

The battery maintenance shall be performed by a service engineer from the manufacturer or from an agent authorized by the manufactuere.

7.1.6 BATTERY DISPOSAL AND RECYCLING

Batteries contain dangerous substances that will harm the environment if thrown away. If you change the batteries yourself, call qualified organizations for battery disposal and recycling.



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CONTENTS SECTION-8

8.1 TROUBLESHOOTING

8.1.1 ALARMS

In the event of an alarm condition the red LED-Indicator “Alarm” and the audible alarm will turn on.
In this case proceed as follows:

1. Silence the audible alarm by pressing the button "Reset".
2. Identify the cause of the alarm condition by means of the EVENT LOG in the MAIN menu. (see *Section-4, Paragraph 4.1.1.6*)
3. In case of doubts please contact the nearest Service centre.
4. Fault identification and rectification information is given below.

8.1.2 MENU, COMMANDS, EVENT LOG AND MEASUREMENTS

In section 4 there is a detailed description of the Menu, Commands, Event Log and Measurements that can be operated and displayed on the LCD. The List of Alarms and Messages are shown below.

8.1.3 FAULT IDENTIFICATION AND RECTIFICATION

The major alarm conditions that will be encountered are:

Alarm Condition	Meaning	Suggested Solution
MAINS RECT. FAULT	Mains power supply is outside prescribed tolerance.	The input power to UPS is too low or missing. If site power appears to be OK, check the input circuit breakers etc. supplying the UPS.
MAINS BYP FAULT	Mains power supply is outside prescribed tolerance.	The input power to UPS is too low or missing. If site power appears to be OK, check the input circuit breakers etc. supplying the UPS.
OUTPUT SHORT	There is a short circuit at the output of UPS (on load side).	Check all output connections and repair as required.
OVERLOAD	Load exceeds the UPS rated power.	Identify which piece of equipment is causing the overload and remove it from the UPS. Do not connect laser printers, photocopiers, electric heaters, kettles etc. to the UPS.
TEMPERATURE HIGH	UPS temperature has exceeded the allowed value.	Check that the ambient temperature of the UPS is less than 40° C. If the ambient temperature is normal call the authorised service centre for assistance.
INV. PHASE FAULT	Inverter is faulty.	Call the authorised service centre for assistance.
SYNCHRON. FAULT	The inverter and mains are not synchronised.	The frequency of the input voltage to the UPS is outside operational limits and the UPS static bypass has been temporarily disabled.
BATTERY IN DISCHARGE	Battery is near end of autonomy.	Shutdown load connected to UPS before the UPS switches itself off to protect its batteries.
MANUAL BYP IS CLOSED	Maintenance Bypass closed. Load supplied by mains.	This alarm is only displayed if the UPS is on Maintenance Bypass.

In case of alarms not included in the list above, please contact the nearest authorised service centre for assistance.

CONTENTS SECTION-9

9.1 OPTIONS

9.1.1 INTRODUCTION

The **PowerWave 33** is provided with the following accessories:

- REMOTE SHUT DOWN FACILITIES
- GENERATOR ON FACILITIES
- 2 CUSTOMER IN FUNTIONS (ON REQUEST)
- TEMPERATURE SENSOR FOR TEMP. DEPENDING BATTERY CHARGING
- SOFTWARE FOR AUTOMATIC SHUTDOWN AND MONITORING
- SNMP INTERFACES FOR NETWORK MANAGEMENT AND REMOTE MONITORING

9.1.2 REMOTE SHUT DOWN POWERWAVE 33 60-300 KW

The REMOTE SHUT DOWN **must** use a normally closed contact, which opens to operate the remote shut down sequence. Usually the shut down procedure is disabled and it should be activated by a Hardware Code on “Setup Service” menu”. Please contact your distributor to enable this operation.

The remote shutdown on terminal port X1/7.. X1/8 is located on the **PowerWave 33 60-300KW** frame on communication card with terminal blocks X1. See *Section-3, Paragraph 3.1.2.2* for details.

In order to allow removal, maintenance or testing of any remote shut down facility without disturbing the normal operation of the UPS, it is recommended that a terminal block, with linking facilities, be installed between the UPS and the stop button.

1. Use a screened cable with 1 pair (section of wires 0.5 mm^2) and maximum length of 100 m.
2. Connect the cable as shown in Fig. 1.1

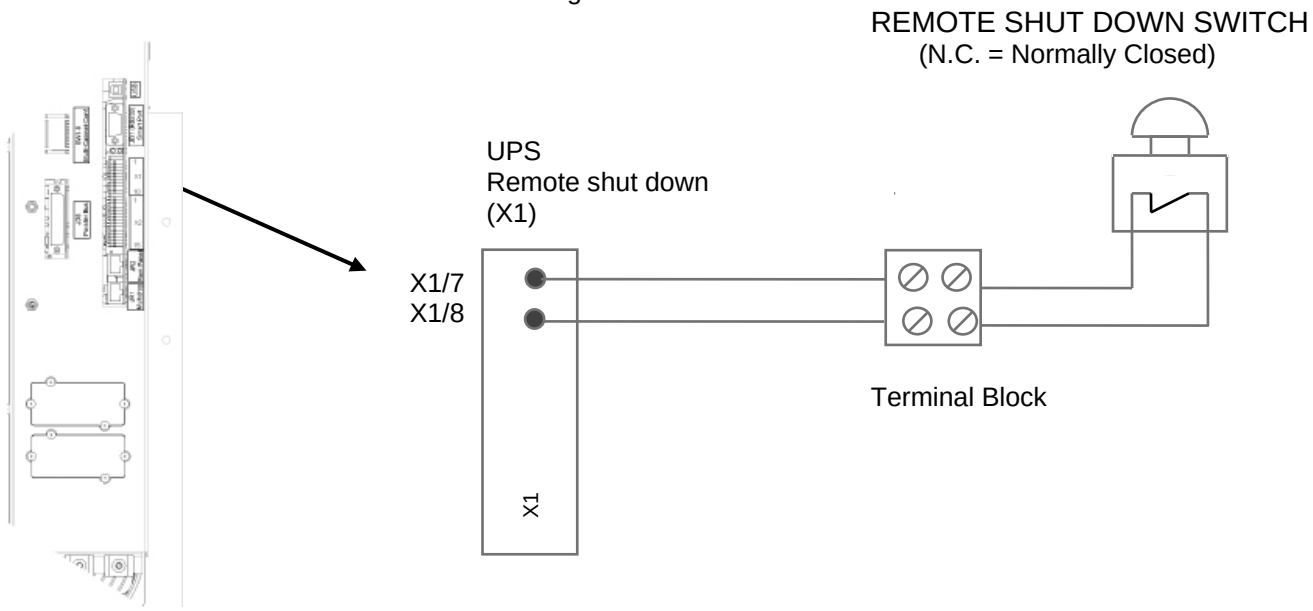

Fig 1.1 Drawing of the wiring for the REMOTE SHUT DOWN SWITCH PW33 60-300kW.

9.1.3 REMOTE SHUT DOWN POWERWAVE 33 400-500 KW

The REMOTE SHUT DOWN **must** use a normally closed contact, which opens to operate the remote shut down sequence. Usually the shut down procedure is disabled and it should be activated by a Hardware Code on “Setup Service” menu”. Please contact your distributor to enable this operation.

The remote shutdown on terminal port X3/3.. X3/4 is located on the **PowerWave 33 400-500kW** frame on communication card with terminal blocks X3. See *Section-3, Paragraph 3.2.2.1* for details.

In order to allow removal, maintenance or testing of any remote shut down facility without disturbing the normal operation of the UPS, it is recommended that a terminal block, with linking facilities, be installed between the UPS and the stop button.

1. Use a screened cable with 1 pair (section of wires can be choosen from 0.5 to 1.5mm^2) and maximum length of 100 m.
2. Connect the cable as shown in Fig. 1.2

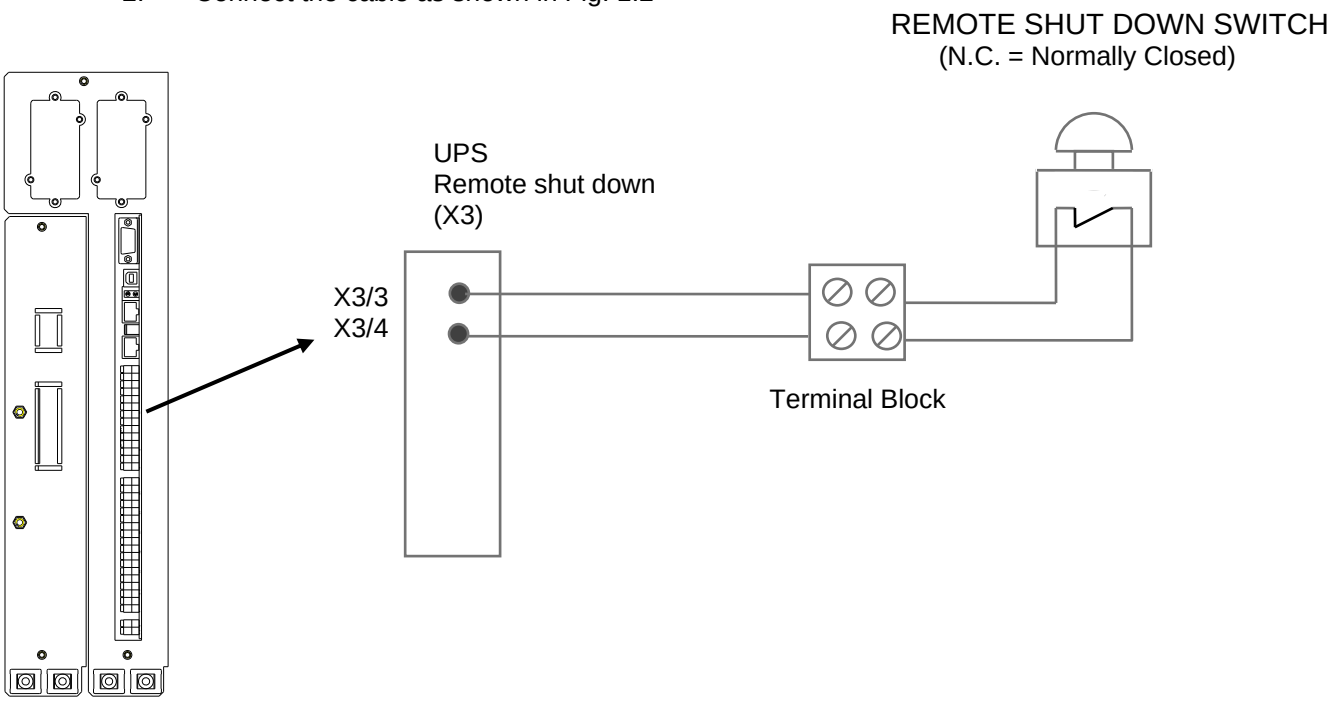

Fig 1.2 Drawing of the wiring for the REMOTE SHUT DOWN SWITCH PW33 400-500kW.

9.1.4 GENERATOR ON FACILITIES POWERWAVE 33 60-300 KW

The Generator ON facility must use a normally open contact that closes to indicate that a generator is running and supplying input power to UPS. It is located at the bottom of the **PowerWave 33 60-300kW** frame on communication card with terminal blocks X1. See *Section-3, Paragraph 3.1.2.2* for details

When used, this facility disables the UPS static bypass and prevents the UPS from transferring the load on to the generator power supply and/or block the battery charger during the time the UPS is supplied from the genset. Please refer to *Section-4, Paragraph 4.1.1.10*

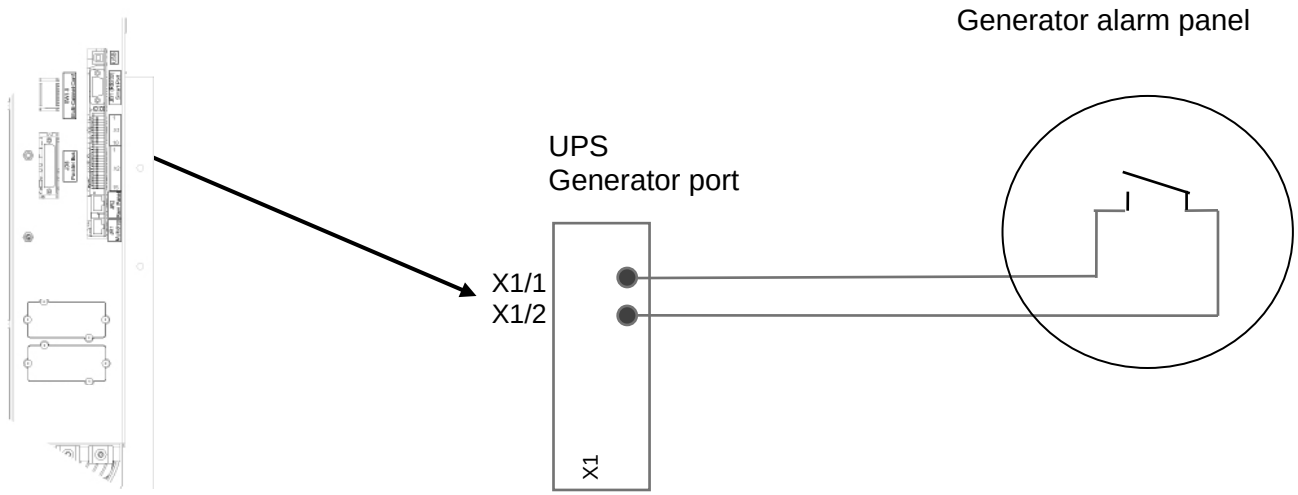

Figure 1.3: Generator ON Connection

9.1.5 GENERATOR ON FACILITIES POWERWAVE 33 400-500 KW

The Generator ON facility must use a normally open contact that closes to indicate that a generator is running and supplying input power to UPS. It is located at the bottom of the **PowerWave 33 400-500kW** frame on communication card with terminal blocks X1. See *Section-3, Paragraph 3.2.2.2* for details.

When used, this facility disables the UPS static bypass and prevents the UPS from transferring the load on to the generator power supply and/or block the battery charger during the time the UPS is supplied from the genset. Please refer to *Section-4, Paragraph 4.1.1.10*

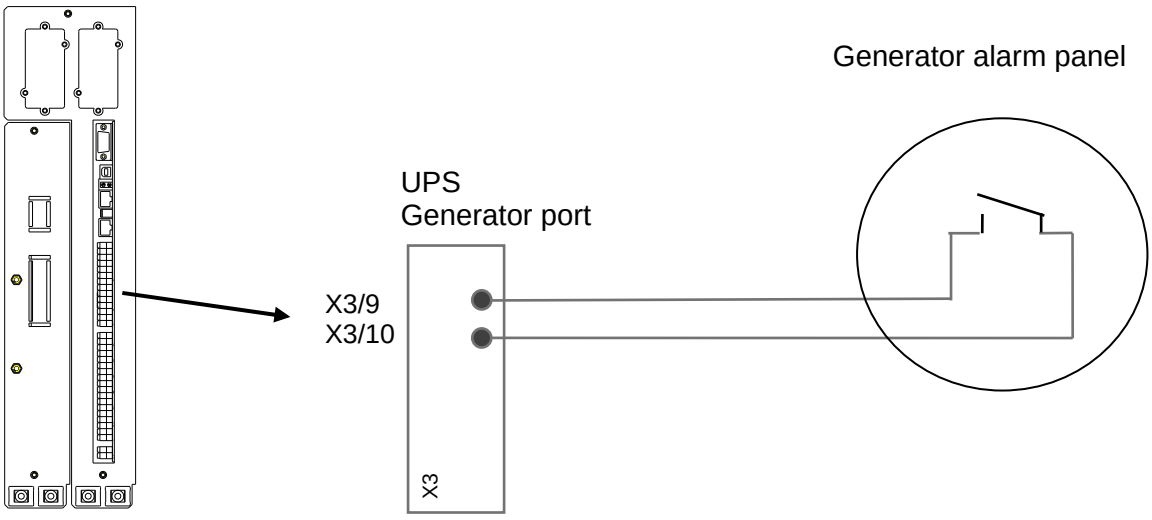

Figure 1.4: Generator ON Connection

9.1.6 WAVEMON SHUTDOWN AND MANAGEMENTSOFTWARE

9.1.6.1 Why is UPS Management important?

By combining a UPS with network management products, such as an SNMP protocol, System-administrators are guaranteed their data and their system will constantly be protected from corruption or data loss even in the event of an extended power failure or when batteries reach a critical low state. In the event of a power disturbance system administrators can also monitor their network from a central location, allowing an early detection of problems. In fact utility power is unreliable at times, ensuring that all network systems have constant power can be a difficult task. The situation becomes even more complex if systems are managed across a Local Area Network (LAN) or Wide Area Network (WAN) around the world.

When a power failure occurs action can be taken to protect the system and its valuable data. If no action is initiated by the operator, this event can seriously damage the system. The UPS software will react automatically in such a case and shutdown the operating system. NEWAVE has found it important to have a complete solution for its UPS and is able to offer a wide range of monitoring/remote controls for assuring the maximum protection degree to the NEWAVE customers.

9.1.6.2 WAVEMON Shutdown and Monitoring Software

WAVEMON Software is an external monitoring and shutdown software which was designed to operate with all NEWAVE UPS products, both with the DRY PORT (Relays) on Terminal block X2 and RS232 port JD11 on the communication card

The software packet consists of a CD ROM for most diffused operating systems (Windows, Unix, OS/2, DEC VMS, Novell, Apple), a standard connection and a user manual.

The dry port X2 with voltage-free contacts may also be used for automatic shutdown in connection with **WAVEMON Software**. It is necessary to provide a cable of 0.5 mm2 to connect Terminals X2 of the UPS and the serial port of the server.

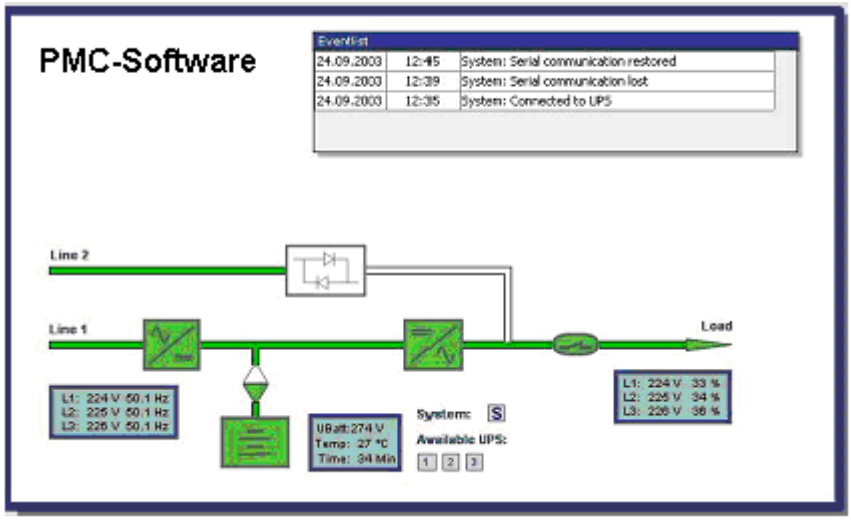

Figure 1.5 Monitoring image.

The main characteristics of **WAVEMON Software** are:

- Automatic unattended master/slave shutdown in heterogeneous networks
- On-screen autonomy time / battery time countdown
- On-screen server log off and shutdown procedure
- Extensive logging of all UPS activity and power quality data, with timestamp
- Scheduled UPS economy mode, service mode, other systems status
- Graphical user interface for Windows compatible platforms
- Automatic unattended local shutdown
- Special software modules to close and save open MS-Office documents.
- Compatible for all optional modules like UPSDIALER, SNMP adapters, Temperature sensors, etc.

The UPS-Management Software is a client-/server-application for networks and local workstations. Basically **WAVEMON-Software** consists of two parts: the server-module of the UPS-Management Software is **UPSServ**,

which communicates via RS-232 cable with the UPS. Working as a background process the UPSServ collects messages, received from the UPS. The UPSServ interprets received messages and makes them available to the client-module **UPSCli** and to any SNMP-based management station.

When UPSServ detects voltage variations or a power failure it can execute various so called system „event routines“, which for example may shutdown the server or send warning to connected users. These system event routines which are a part of the UPS-Management Software can be adjusted to your demands.

The UPS management software includes with every serial number the licence for using the UPS service on one server with one UPS and an unlimited numbers of connected WINDOWS workstations. When operating with two or more servers a licence for every additional server is required. It doesn't matter if the UPS service runs at that location or if the server is halted by a UPS service via remote command. The same regulations are applicable to the use of remote send/receive modules RCCMD and multiserver shutdown under NT, UNIX and other operating systems. The service programs are generally delivered as a single-licence. To use a single CD ROM to shutdown multiple servers you have to purchase additional CD license keys.

Parallel/redundant UPS systems are also manageable by the software.

The main principle is: let introduce a shutdown of a Server only when strictly necessary. A correct Parallel Handling has therefore to manage a parallel system as a whole and always considering redundancy. Following statements apply:

- Every alarm on any unit is immediately notified, but …
- … a reaction to a serious fault is introduced only when the minimum number of UPS –Modules necessary to supply the load exhibits an alarming situation.
- The real Battery autonomy time of the (whole) parallel system is computed continuously.
- Maintenance on a redundant unit may be executed without annoyance to the management system (supervisor).

In order to be managed, a NEWAVE UPS can be integrated into a network in two ways:

1. By means of the server which is being powered by the UPS and is integrated in the network. In most of the cases the server is used as sub-agent and you only need the PMC-Software without any SNMP Adapter. You need a standard serial connection between the RS232 JD11 port of the UPS and the RS232 port of the computer/server.
2. In some situations it is preferable to interface the network via an SNMP adapter. By this way up to 50 computers can be shut down in a RCCMD environment. RCCMD (Remote Console Command) is an additional software module, which can be triggered by the SNMP device to executes a command (typically a shutdown command) on a remote system.

9.1.7 SNMP CARD/ADAPTER FOR NETWORK MANAGEMENT /REMOTE MONITORING

The **S**imple **N**etwork **M**anagement **P**rotocol (SNMP) is a worldwide-standardized communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software also provides its data in this SNMP format with its internal software agent. The operating system you are using must support the SNMP protocol. We offer our software with SNMP functionality for Novell, OS/2, all Windows running on INTEL and ALPHA, DEC VMS, Apple.

Two types of SNMP interfaces with identical functionality are available: an external SNMP-Adapter (Box) and an internal SNMP-Card. Both can manage a parallel system (N modules) and return either global values - which are consistent for the whole parallel system - or specific values from the single modules.

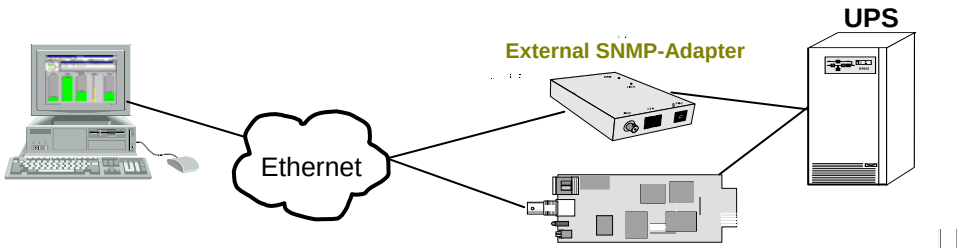

Figure 1.6 SNMP Adapter

The adapter may be configured via Telnet, HTTP (Web-Browser) or serial connection (Terminal). For normal operation at least one network connection (Ethernet) is required.

The SNMP adapter can be used, utilizing the RCCMD send function, for an automatic network wide shut down or just for informing connected users. The shut down procedure can be initiated on a low residual battery autonomy time (downtime) or by a countdown timer which is started at the beginning of the alarm. A shut down is therefore possible without extra input from the operator, and is fully software controlled.

The small (125x70 mm) External SNMP adapter comes with following interfaces:

1. RJ-45 connector for 10/100 Base-T(auto switchable)
2. Serial Port for configuration (COM2) or optional ModBus interface.
3. Error/Link LED for UPS status
4. Aux Port
5. DIP Switch
6. Serial Port to the UPS (COM1)
7. DC Supply (9 VDC or 9-36 VDC supply, depending on model);

Figure 1.6.1 External SNMP Adapter

The Internal SNMP-Card can be inserted into an appropriate extension slot of the **UPS.** This adapter communicates via the serial port of the UPS and makes a direct multiple server shut down possible without additional SNMP management software.

Figure 1.6.2 Internal SNMP Adapter

For detailed information please see Software Manual provided with the PMC-Software CD ROM.**RCCMD - Remote Console Command module** for a multi-server shutdown. This stand-alone software module is designed to receive and execute a command issued by a remote device. Thanks to RCCMD it is possible to execute a shutdown in an heterogeneous multiplatform network. The new release RCCMD2 is an application available for all Operating Systems, analogous to PMC-Software. Our SNMP Interfaces are compatible to RCCMD.

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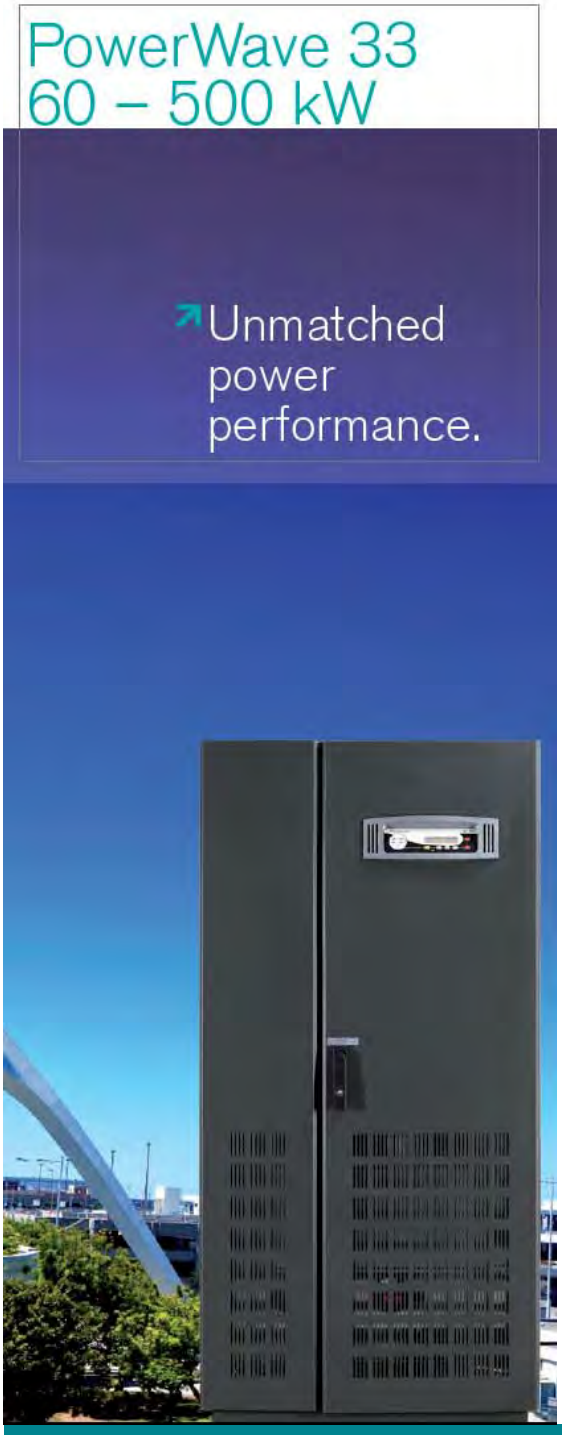


PowerWave 33
Technical Specifications

PowerWave 33 highlights at a glance

- Best in class efficiency
  Cost savings during the entire life-cycle(TCO)
- Low input harmonic distortion
  Cost saving during installation
- Input Power Factor near unity
  Cost savings during installation and the entire life-cycle(TCO)
- Full rated output power from 0.9 lag to 0.9 lead
  Suitable power for the last IT equipment generation without de-rating
- Compact size
  Floor space cost savings

High end power protection
Power range: 60-500kW

Specifications are subject to change without notice

Edition 12.06.2012

QUALITY SWISS

TABLE OF CONTENTS

10.1 POWERWAVE 33 SYSTEM DESCRIPTION

In environments that demand zero downtime, continuous power protection availability is essential. In order to respond to today's dynamic IT and process-related environments that experience daily change through new server technologies, migration and centralization, resilient and easily adaptable power protection concepts are required. POWERWAVE 33 is the foundation for continuous power protection availability of network-critical infrastructures in enterprise data centers where business continuity has paramount importance and in process control environment where manufacturing continuity is essential.

POWERWAVE 33 is an advanced double conversion UPS, VFI (Voltage and Frequency Independent) topology that responds fully to both highest availability and environmentally friendly requirements compliant with IEC 62040-3 (VFI-SS-111) standards.

The POWERWAVE 33 UPS features innovations that combine to deliver the industry's best key values like: enhanced power performance, parallel capability and connectivity's interaction

Newave's Decentralized Parallel Architecture is based on stacking independent UPSs for power capacity increase or for redundancy purpose for power availability increase. When operating in parallel configuration, each POWERWAVE 33 can take the leadership role avoiding single points of failure in the parallel chain ensuring the highest level of power availability.

The most demanding Data Centres starts with low power before achieving its full capacity. It is in this case essential to be able to recover the missing power requirement without risk for the applied load. POWERWAVE 33 allows for system upgrades to meet the highest level of availability interruption free and without a temporary transfer the load to row mains (by-pass).

This Technical Specification provides detailed technical information on the mechanical, electrical and environmental performance of the POWERWAVE 33 that can support to give answers to tender and end-user requirements. The POWERWAVE 33 was designed to respond to the most stringent safety, EMC and other important UPS standards.

POWERWAVE 33 is a stand-alone UPS which can be paralleled for power protection increase and/or for redundancy purpose. It offers 8 different power ranges: 60-80-100-120-160-200-250-300-400-500kW .
Up to 10 UPS can be paralleled together to achieving the maximum power capacity of 5000kW using common or separate battery configuration.

Key Features of POWERWAVE 33:

• Best in class efficiency, **up to 96%**	*Energy-Operational cost savings (TCO)*
• Compact size, Small Footprint	*Space-saving of expensive floor space*
• Blade-server-friendly power Full active power from 0.9 lead to 0.9 lag	*No de-rating with leading PF loads*
• Very low input current distortion THDi THDi = < 3.5% @ 100% load	*Gen-set power and installation cost saving*
• Input Power Factor near unity	*Cost savings during installation and the entire lifecycle (TCO)*

10.2 TECHNICAL CHARACTERISTICS

10.2.1 MECHANICAL CHARACTERISTICS POWERWAVE 33 60-100kW

POWERWAVE 33 without battery enclosure				
				
Power range	kW	60	80	100
Dimensions (WxHxD)	mm	550x1820x750	550x1820x750	550x1820x750
Dimensions with elevation kit (WxHxD)	mm	550x1975x750		
Weight	kg	205	225	230
Colour		Graphite grey (RAL 7024)		

POWERWAVE 33 with Battery Enclosure A				
				
Max. Power connection	kW	60	80	100
Dimensions (WxHxD)	mm	970x1820x750	970x1820x750	970x1820x750
Weight without battery	kg	250	260	285
Weight with battery with 80 block of 28Ah	kg	1140	1150	1175
Colour		Graffito grey (RAL 7024)		

POWERWAVE 33 with Battery Enclosure B				
				
Max. Power connection	kW	60	80	100
Dimensions (WxHxD)	mm	1180x1820x750	1180x1820x750	1180x1820x750
Weight without battery	kg	260	270	295
Weight with battery with 120 block of 28Ah	kg	1590	1600	1625
Colour		Graphite grey (RAL 7024)		

10.2.2 MECHANICAL CHARACTERISTICS POWERWAVE 33 120-200kW

POWERWAVE 33				
				
Max. Power connection	kW	120	160	200
Dimensions (WxHxD)	mm	850x1820x750	850x1820x750	850x1820x750
Dimensions with elevation kit (WxHxD)	mm	850x1975x750		
Weight	kg	280	290	310
Colour		Graphite grey (RAL 7024)		

10.2.3 MECHANICAL CHARACTERISTICS POWERWAVE 33 250-300kW

POWERWAVE 33			
			
Max. Power connection	kW	250	300
Dimensions (WxHxD)	mm	1100x1920x750	1100x1920x750
Dimensions with elevation kit (WxHxD)	mm	1100x1975x750	
Weight	kg	390	410
Colour		Graphite grey (RAL 7024)	

10.2.4 MECHANICAL CHARACTERISTICS POWERWAVE 33 400-500kW

POWERWAVE 33			
			
Max. Power connection	kW	400	500
Dimensions (WxHxD)	mm	1650x1994x850	1650x1994x850
Dimensions with elevation kit (WxHxD)	mm	1650x2094x850	
Weight	kg	950	1000
Colour		Graphite grey (RAL 7024)	

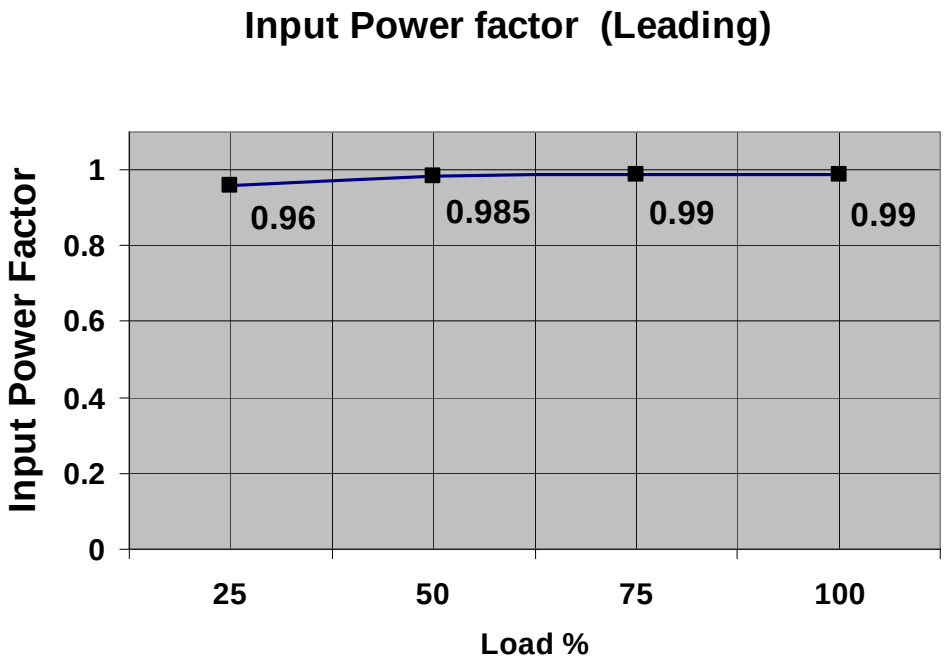
POWERWAVE 33 with Top Cable Entry Enclosure (TCE)


Max. Power connection	kW	400	500
Dimensions (WxHxD)	mm	2150x1994x850	
Dimensions with elevation kit (WxHxD)	mm	2150x2094x850	
Weight with TCE Basic	kg	950+115	1000+115
Weight with TCE single input feed with cables	kg	950+245	1000+245
Weight with TCE dual input feed with cables	kg	950+285	1000+285
Colour		Graphite grey (RAL 7024)	

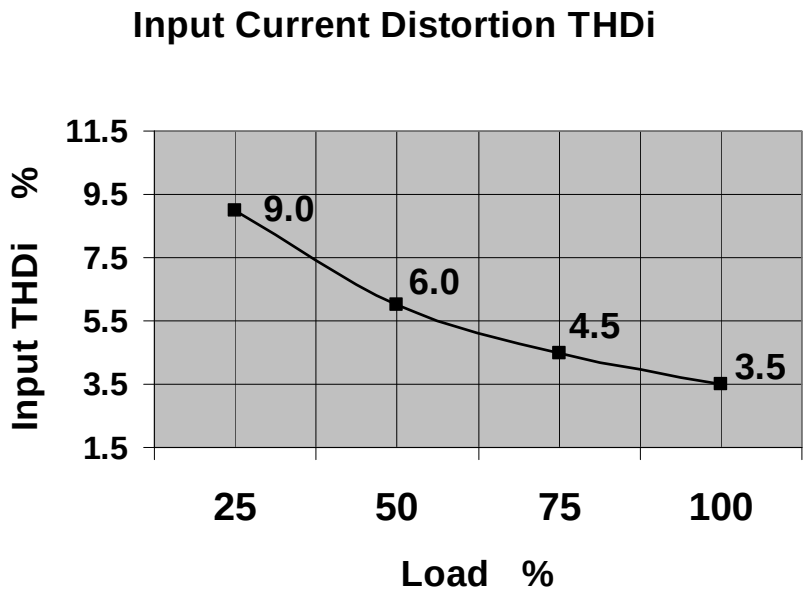
10.3 INPUT CHARACTERISTICS

UPS Model		PW 33 60	PW 33 80	PW 33 100	PW 33 120	PW 33 160	PW 33 200	PW 33 250	PW 33 300	PW 33 400	PW 33 500
Output Rated Power	kW	60	80	100	120	160	200	250	300	400	500
Nominal Input Voltage	V	3x380/220V+N, 3x400V/230V+N, 3x415/240V+N									
Input Voltage Tolerance (ref to 3x400/230V) for Loads in %:	V	(-23%/+15%) 3x308/177 V to 3x460/264 V for <100 % load (-30%/+15%) 3x280/161 V to 3x460/264 V for < 80 % load (-40%/+15%) 3x240/138 V to 3x460/264 V for < 60 % load									
Input Frequency	Hz	35 – 70									
Input Power Factor		PF=0.99 @ 100 % load									
Inrush Current	A	limited by soft start / max. In									
Input Distortion THDi		Sine-wave THDi = 3.5% @100% load									
Max. Input Power with rated output power and charged battery (output cosφ = 1.0)	kW	64	85	107	128	170	213	266	319	426	532
Max. Input Current with rated output power and charged battery (output cosφ = 1.0)	A	93	123	154	185	247	308	386	463	617	771
Max. Input Power with rated output power and discharged battery (output cosφ = 1.0)	kW	70	94	110	141	187	234	293	351	468	585
Max. Input Current with rated output power and discharged battery (output cosφ = 1.0)	A	102	136	160	204	271	339	424	509	679	848

10.3.1 GRAPH: INPUT PF VERSUS % LOAD



10.3.2 GRAPH: INPUT DISTORTION THDi VERSUS % LOAD



10.4 BATTERY CHARACTERISTICS

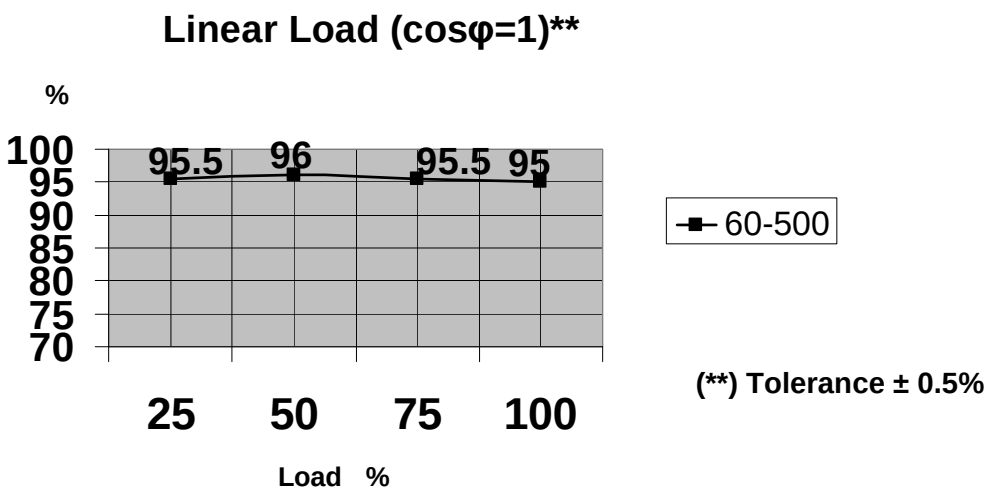
UPS Range		60 kW	80 kW	100 kW	120 kW	160 kW	200 kW	250 kW	300 kW	400 kW	500 kW
Min/Max Number of 12V Battery Blocks @ PF=1.0	No.	44 / 50			44 / 50		50	44 / 50		44 / 50	
Maximum Battery Charger Current	A	25A			50A			60A		100A	
Battery Charging Curve		Ripple free ; IU (DIN 41773)									
Temperature compensation ready		Standard (temp. sensor optional)									
Battery Test		Automatic and periodically (adjustable)									
Battery Type		Maintenance free VRLA or NiCd									

10.5 OUTPUT CHARACTERISTICS

UPS Range		60 kW	80 kW	100 kW	120 kW	160 kW	200(*) kW	250 kW	300 kW	400 kW	500 kW
Output Rated Power (@ min. 44 battery blocks)	kVA	60	80	100	120	160	200	250	300	400	500
Output Rated Power (@ min. 44 battery blocks)	KW	60	80	100	120	160	200	250	300	400	500
Output Current In PF 1.0 (400 V) (@ min. 44 battery blocks)	A	87	116	145	174	232	290	361	433	577	722
Output Rated Voltage	V	3x380/220V or 3x400/230V or 3x415/240V									
Output Voltage Stability	%	Static: < +/- 1% Dynamic (Step load 0%-100% or 100%-0%) < +/- 4%									
Output Voltage Distortion	%	With Linear Load < 2% With Non-linear Load (EN62040-3:2001) < 4%									
Output Frequency	Hz	50 Hz or 60 Hz									
Output Frequency Tolerance	%	Synchronized with mains < +/- 2 % (selectable for bypass operation) or < +/- 4 % Free running +/- 0.1 %									
Bypass operation		At Nominal Input voltage of 3x400 V +/- 15 % or 190 V to 264 V ph-N									
Permissible Unbalanced Load (All 3 phases regulated independently)	%	100%									
Phase Angle Tolerance (With 100 % Unbalanced load)	Deg.	+/- 0 deg.									
Overload Capability on Inverter	%	At PF 1.0 110% load 10 min. At PF 1.0 135% load 1 min. At PF 0.9 125% load 10 min. At PF 0.9 150% load 1 min.									
Output short capability (RMS)	A	Inverter: …..x In during 40 ms									
		2.7	2.0	2.3	1.8	1.9	2.1	1.8	2.0	2.0	2.0
		Bypass: 10 x In during 10 ms									
Crest - Factor		3 : 1									

(*) Only with 50 battery blocks

10.5.1 GRAPH: AC – AC EFFICIENCY with Linear load @ cosφ 1



(**) Tolerance ± 0.5%

10.5.2 GRAPH: Output Power in KW and KVA VERSUS cosφ
Vout=230Vac rms line to neutral, 50Hz, ≥ 44 battery blocks

	PW33	60		80		100	
	PF	kW	kVA	kW	kVA	kW	kVA
CAP	0.80	46	58	61	77	77	97
	0.85	50	59	66	78	83	98
	0.90	54	60	72	80	90	100
	0.95	57	60	76	80	95	100
	1.00	60	60	80	80	100	100
IND	0.95	57	60	76	80	95	100
	0.90	54	60	72	80	90	100
	0.85	51	60	68	80	85	100
	0.80	48	60	64	80	80	100
	0.75	45	60	60	80	75	100
	0.70	42	60	56	80	70	100
	0.65	39	60	52	80	65	100
	0.60	36	60	48	80	60	100

	PW33	120		160		200 (*)	
	PF	kW	kVA	kW	kVA	kW	kVA
CAP	0.80	92	116	122	154	154	194
	0.85	100	117	132	156	166	195
	0.90	108	120	144	160	180	200
	0.95	114	120	152	160	190	200
	1.00	120	120	160	160	200	200
IND	0.95	114	120	152	160	190	200
	0.90	108	120	144	160	180	200
	0.85	102	120	136	160	170	200
	0.80	96	120	128	160	160	200
	0.75	90	120	120	160	150	200
	0.70	84	120	112	160	140	200
	0.65	78	120	104	160	130	200
	0.60	72	120	96	160	120	200

Changes of this tables without notice – modifications reserved

(*) only using 50 battery blocks

	PW33	250		300		400		500	
	PF	kW	kVA	kW	kVA	kW	kVA	kW	kVA
CAP	0.80	193	241	231	291	310	388	388	485
	0.85	208	245	249	294	333	392	417	490
	0.90	225	250	270	300	360	400	450	500
	0.95	238	250	285	300	380	400	475	500
	1.00	250	250	300	300	400	400	500	500
IND	0.95	238	250	285	300	380	400	475	500
	0.90	225	250	270	300	360	400	450	500
	0.85	213	250	255	300	340	400	425	500
	0.80	200	250	240	300	320	400	400	500
	0.75	188	250	225	300	300	400	375	500
	0.70	175	250	210	300	280	400	350	500
	0.65	163	250	195	300	260	400	325	500
	0.60	150	250	180	300	240	400	300	500

10.6 ENVIRONMENTAL CHARACTERISTICS

UPS range		60 kW	80 kW	100 kW	120 kW	160 kW	200 kW	250 kW	300 kW	400 kW	500 kW
Audible Noise with 100% / 50% Load	dBA	< 65			< 69			< 71		N/A	
Operation temperature	°C	0 – 40									
Ambient Temperature for Batteries (recommended)	°C	20 – 25									
Storage Temperature	°C	-25 - +70									
Battery Storage Time at Ambient Temperature		Max. 6 months									
Max. altitude (above sea level)	m	1000m (3300ft) without de-rating									
De-rating factor for use at altitudes above 1000m sea level according (IEC 62040-3)		Meter above sea level (m / ft)	De-Rating Factor for Power								
		1500 / 4850	0.95								
		2000 / 6600	0.91								
		2500 / 8250	0.86								
		3000 / 9900	0.82								
Relative Air-humidity		Max. 95% (non-condensing)									
Accessibility		Totally front accessibility for service and maintenance (no need for side, top or rear access)									
Positioning		Min. 20 cm rear space (required for fan)									
Input and Output Power Cabling		From the bottom on the front									
Efficiency AC-AC up to (at cosφ 1.0) (depending on UPS	%	*Load* : *100 %* 95 %	*75 %* 95.5 %	*50 %* 96 %	*25 %* 95.5 %						
Eco-Mode efficiency at 100% load	%	99 %									

10.7 STANDARDS

UPS range	60 kW	80 kW	100 kW	120 kW	160 kW	200 kW	250 kW	300 kW	400 kW	500 kW
Safety	IEC/EN 62040-1-1, IEC/EN 60950-1/A11									
Electromagnetic Compatibility	IEC/EN 62040-2, IEC/EN61000-3-2, IEC/EN61000-6-2,									
EMC Classes C2 domestic or industrial In < 16A C3 industrial In >16A	C3									
	C2 optional with filter								not availab.	
Performance	IEC/EN62040-3:2001									
Product certification	CE									
Degree of protection	IP 20									

10.8 COMMUNICATION

Power Management Display (PMD)	LCD display	
RS232 on Sub-D9 port RS232 on USB port	For monitoring and integration in network management	
Customer Interfaces : Inputs DRY PORT	1 Remote Shut down [EMERGENCY OFF (Normally closed)] 1 GEN-ON (Normally open) 1 Programmable Customer's Inputs (Normally open) 1 Temp. Sensor for Battery Control	
Customer Interfaces : Outputs DRY PORT	6 voltage free contacts For remote signalling and automatic computer shutdown	
RS485 on RJ45 port	Remote monitoring system with graphical display	Option
RS485 on RJ45 port	For multidrop purpose	Option
Slot for SNMP	SNMP card For monitoring and integration in network management	Option

10.8.1 POWER MANAGEMENT DISPLAY (PMD)

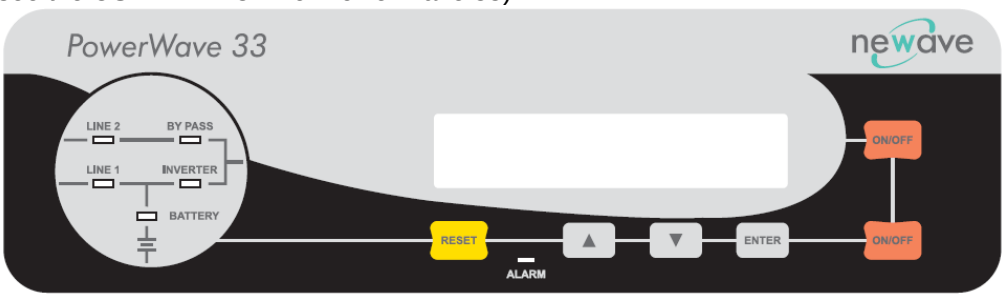
The user-friendly PMD consists of three parts the MIMIC DIAGRAM, CONTROL KEYS and LCD that provides the necessary monitoring information about the UPS.

10.8.2 MIMIC DIAGRAM

The mimic diagram serves to give the general status of the UPS. The LED-indicators show the power flow status and in the event of mains failure or load transfer from inverter to bypass and vice-versa the corresponding LED-indicators will change colour from green (normal) to red (warning). The LED's LINE 1 (rectifier) and LINE 2 (bypass) indicate the availability of the mains power supply. The LED's INVERTER and BYPASS if green indicate which of the two are supplying power to the critical load. When the LED-indicator BATTERY is lit it means that the battery due to mains failure is supplying the load. The LED-indicator ALARM is a visual indication of any internal or external alarm condition. At the same time the audible alarm will be activated.

10.8.3 DISPLAY

The 2 x 20 character LCD simplifies the communication with the UPS. The menu driven LCD enables the access to the EVENT REGISTER, or to monitor the input and output U, I, f, P, Autonomy Time and other Measurement's, to perform commands like start-up and shut-down of INVERTER or load transfer from INVERTER to BYPASS and vice-versa and finally it serves for the DIAGNOSIS (SERVICE MODE) for adjustments and testing (for more details see the USER MANUAL of PowerWave 33).



Power Management Display (PMD) of PowerWave 33

10.8.4 CUSTOMER INTERFACES (PW33 60-300 kW)

10.8.5 CUSTOMER INPUTS DRY PORTs: Terminal block X1

Connection of Remote Shut down facilities, Generator Operation, Customers specials *(see UM Section 9 / OPTIONS)*

10.8.6 CUSTOMER OUTPUTS DRY PORTs : Terminal blocks X2

Provision of signals for the automatic and orderly shutdown of servers, AS400 or Automation building systems
All voltage free contacts are rated 60 VAC max. and 500 mA max.:
All the interfaces are connected to Phoenix Spring terminals with wires : 0.5 mm^2

Block	Terminal	Contact	Signal	On Display	Function
X1	X1 / 10	GND	GND		**12 Vdc source**
	X1 / 9	IN	+12Vdc		(Max 200mA load)
	X1 / 8	GND	GND		**Remote Shut down**
	X1 / 7	IN	+12Vdc		(Do not remove the factory mounted bridge until an external remote shut down is connected)
	X1 / 6	GND	GND		**Temperature Battery**
	X1 / 5	IN	+3.3Vdc		(If connected, the battery charger current is batt. temperature dependent)
	X1 / 4	GND	GND		**Customer IN 1**
	X1 / 3	IN	+12Vdc		(Function on request, to be defined)
	X1 / 2	GND	GND		**Customer IN 1 (default as Generator Operation)**
	X1 / 1	IN	+12Vdc		(NC = Generator ON)
X2	X2 / 15	C	ALARM	COMMON_ALARM	Common
	X2 / 14	NC			NO Alarm Condition
	X2 / 13	NO			**Common Alarm** (System)
	X2 / 12	C	Message	LOAD_ON_MAINS	Common
	X2 / 11	NC			(Load on Inverter)
	X2 / 10	NO			**Load on bypass** (Mains)
	X2 / 9	C	ALARM	BATT_LOW	Common
	X2 / 8	NC			Battery OK
	X2 / 7	NO			**Battery Low**
	X2 / 6	C	Message	LOAD_ON_INV	Common
	X2 / 5	NC			(Load on Mains bypass)
	X2 / 4	NO			**Load on Inverter**
	X2 / 3	C	ALARM	MAINS_OK	Common
	X2 / 2	NC			**Mains Failure**
	X2 /1	NO			Mains Present

Customer Interface PowerWave 33 60-300 kW X1, X2 Phoenix Terminals

10.8.7 CUSTOMER INTERFACES (PW33 400-500 kW)

10.8.8 CUSTOMER INPUTS DRY PORTS: Terminal blocks X3 / 3-14

Connection of Remote Shut down facilities, Generator Operation, Customers specials *(see UM Section 9 / OPTIONS)*

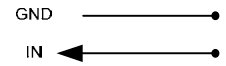
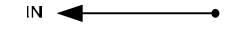
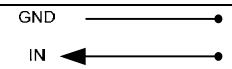
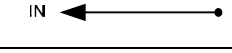
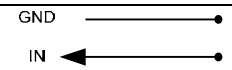
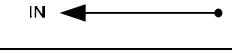
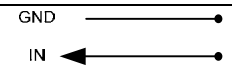
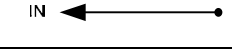
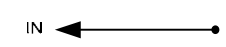
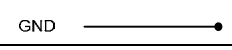
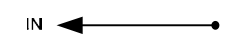
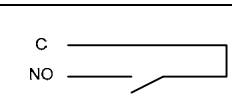
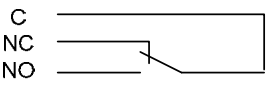
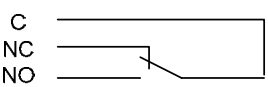
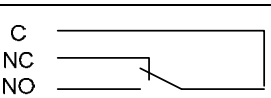
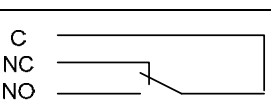
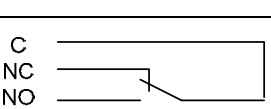
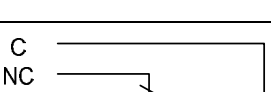
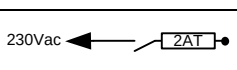
10.8.9 OUTPUTS DRY PORTS: Terminal blocks X2 + X3 / 1-2

Provision of signals for the automatic and orderly shutdown of servers, AS400 or Automation building systems

10.8.10 INTERLOCK CASTELL FUNCTION: Terminal block X1

This function allows a secure transfer from inverter (normal operation) to external maintenance bypass and vice-versa. During normal operation the external bypass is locked in position OFF. Only when the UPS is/are transferred to static bypass mode, the lock on the external bypass is released and it possible to switch to position ON. The transfer from maintenance bypass back to normal operation happens exactly the other way around. The release signal is 230VAC when the maintenance bypass is free and 0V when locked.

All Terminals X1-X3 can hold Cable from 0.2mm2 – 1.5mm2
All Voltage free contacts are rated: Max 250Vac/8A; 30Vdc/8A; 220Vdc/0.12A

Block	Terminal	Contact	Signal	On Display	Function
X3	X3 / 14		GND	-	Temperature Battery (If connected, the battery charger voltage is batt. Temperature dependent)
	X3 / 13		+3.3Vdc	-	
	X3 / 12		GND		Customer IN 1 (function on request, to be defined)
	X3 / 11		+12Vdc		
	X3 / 10		GND	- GENERATOR_ OPER_ON	Generator Operation (NC = GEN ON) (or on request External Output Breaker)
	X3 / 9		+12Vdc		
	X3 / 8		GND	EXT_MAN_BYP	External Manual Bypass (External IA1)
	X3 / 7		+12Vdc		
	X3 / 6		+12Vdc	-	+ 12Vdc source (Max. 200mA Load)
	X3 / 5		GND	-	
	X3 / 4		GND	REMOTE_ SHUTDOWN-	RSD (Remote Shut down) Do not remove the factory mounted bridge (JP5) until an external remote shut down is connected
	X3 / 3		+12Vdc		
	X3 / 2		-	REMOTE_ SHUTDOWN-	RSD (Remote Shut down) for external switch Max. 250Vac/8A ;30Vdc/8A ;110Vdc/0.3A ;220Vdc/0.12A
	X3 / 1		-		
X2	X2 / 18		-	-	Common
	X2 / 17		-	-	Relais AUX (function on request, to be defined)
	X2 / 16		-	-	
	X2 / 15			COMMON_ALARM	Common
	X2 / 14		ALARM		No Alarm Condition
	X2 / 13				Common Alarm (System)
	X2 / 12			LOAD_ON_MAINS	Common
	X2 / 11		Message		No Load on Bypass
	X2 / 10				Load On Bypass (Mains)
	X2 / 9			BATT_LOW	Common
	X2 / 8		ALARM		Battery Ok
	X2 / 7				Battery Low
	X2 / 6			LOAD_ON_INV	Common
	X2 / 5		Message		No Load on Inverter
	X2 / 4				Load on Inverter
	X2 / 3			MAINS_OK	Common
	X2 / 2		ALARM		Mains Failure
	X2 / 1				Mains Present
X1	X1 / 2		-	EXT_MAN_BYP	Interlock Castel Function (Ext Manual Bypass) 230Vac / 2AT
	X1 / 1		-		

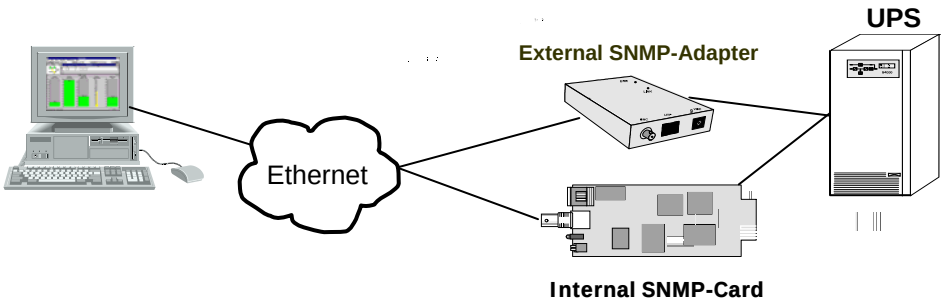
Customer Interface PW33 400-500KW

10.9 OPTIONS

- SNMP card and WaveMon Management Software , Modbus Protocol, USB
- External Battery Cabinets
- Parallel kit, Synchron kit
- In/output Transformer for special voltages
- Back-feed protection
- Temp. sensor for battery temp. control
- Top Cable Entry Enclosure (TCE)

10.9.1 SNMP card / WaveMon Management Software

The Simple Network Management Protocol (SNMP) is a worldwide-standardized communication-protocol. It is used to monitor any device in the network via simple control language. The UPS-Management Software WaveMon also provides its data in this SNMP format with its internal software agent. The operating system you are using must support the SNMP protocol. We offer our WaveMon software with SNMP functionality for Novell, OS/2, all Windows running on INTEL and ALPHA, DEC VMS, Apple.
Two types of SNMP interfaces with identical functionality are available: an external SNMP-Adapter (Box) and an internal SNMP-Card. Both can manage a parallel system (N modules) and return either global values - which are consistent for the whole parallel system - or specific values from the single modules.



10.9.2 Battery Enclosures

The integrated battery enclosures are part of the UPS, therefore cannot be defined as a separate battery cabinet		**UPS & BAT- ENC A** Only for 60, 80 and 100kW	**UPS & BAT- ENC B** Only for 60, 80 and 100kW
BAT- ENC A & B			
Configuration accommodates:	Max.	80 Batt. Blocks for 28Ah mounted on 16 shelves (5 blocks/shelf)	120 Batt. Blocks for 28Ah mounted on 24 shelves (5 blocks/shelf)
Strings : Terminals :		2 3 x M8	3 3 x M8
Fuse Type (Very Fast acting)	A	2 x 3 x 100A	3 x 3 x 100A
Dimensions of UPS and battery Side (WxHxD)	mm	970x1820x750	1180x1820x750
Weight w/o trays and w/o batteries	kg	20	30
Battery configuration with BAT-ENC A & B		Batt. Config. (2x40)x28Ah	Batt. Config. (3x40)x28Ah

10.9.3 Top Cable Entry Enclosure (TCE)

POWERWAVE 33 with Top Cable Entry Enclosure (TCE)			
			
Max. Power connection	kW	400	500
Dimensions (WxHxD)	mm	2150x1994x850	
Dimensions with elevation kit (WxHxD)	mm	2150x2094x850	
Weight with TCE Basic	kg	950+115	1000+115
Weight with TCE single input feed with cables	kg	950+245	1000+245
Weight with TCE dual input feed with cables	kg	950+285	1000+285
Colour		Graphite grey (RAL 7024)	

10.10 BATTERY AUTONOMIES

10.10.1 EXAMPLES OF BATTERY AUTONOMY AT FULL LOAD WITH STANDARD BATTERY CABINETS AND STANDARD BATTERY CONFIGURATION

28Ah battery										
UPS Range		***60kW***	***80kW***	***100kW***	***120kW***	***160kW***	***200kW***	***250kW***	***300kW***	***400kW***	***500kW***
BAT-ENC	**Battery configuration**	**Autonomy time in minutes @ 80% Load (kW)**									
	Batt. Enclosure A (2x40)x28Ah	13	9	7	**not available**						
	Batt. Enclosure B (3x40)x28Ah	22	15	12							

10.11 INSTALLATION PLANNING

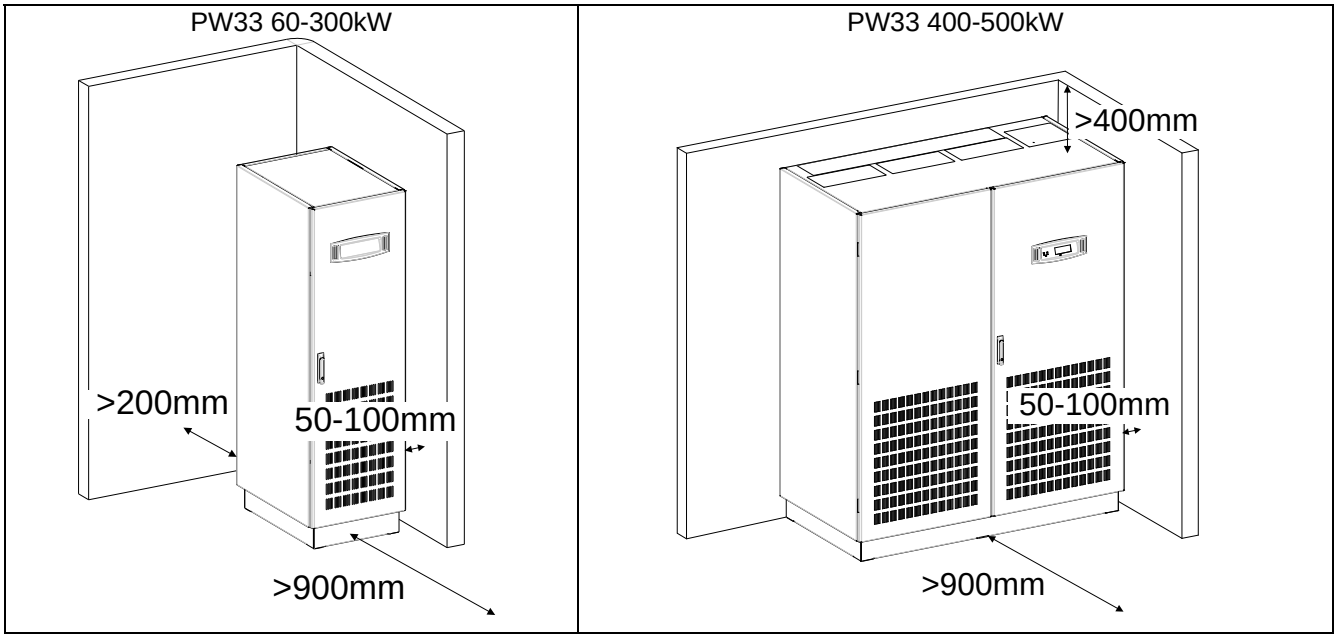


Figure 1-2 : UPS Positioning and space recommendation

UPS Frame type	**60-100 kW**	**60-80-100 kW (with battery enclosure A&B)**	**120-200 kW**	**250-300 kW**	**400-500 kW**
Dimensions (WxHxD) mm	550x1820x750	A: 970x1820x750 B: 1180x1820x750	850x1820x750	1100x1920x750	1650x1994x850
Fan position	back				on top
Accessibility	Totally front accessibility for service and maintenance (no need for side, top or rear access)				
Positioning	Min. 200 mm rear space (required for fan)				Rear side directly at the wall
Input and Output Power Cabling	From the bottom on the front				

10.11.1 MAXIMUM HEAT DISSIPATION PER UPS RANGE WITH NON-LINEAR LOAD

UPS Range		60 kW	80 kW	100 kW	120 kW	160 kW	200 kW	250 kW	300 kW	400 kW	500 kW
Air-flow		from front to back								from front to top	
Heat Dissipation with 100% Non-linear Load per range (EN 62040-1-1)	W	3830	5106	6383	7660	10213	12766	15957	19149	24000	30000
Heat Dissipation with 100% Non-linear Load per range (EN 62040-1-1)	BTU /h	13071	17428	21785	26142	34856	43570	54462	65355	81913	102389
Airflow (25° - 30°C) with 100% Non-linear Load per range (EN 62040-1-1)	m^3/h	1300	1500	1700	2500	2500	2500	3350	3350	6550	6550
Heat Dissipation without load	W	850	850	850	1500	1500	1500	2300	2300	4000	4000

10.12 WIRING AND BLOCK DIAGRAMS FOR ALL UPS FRAMES

The customer has to supply the wiring to connect the UPS to the local power source. The installation inspection and initial start up of the UPS and extra battery cabinet must be carried out by a qualified service personnel such as a licensed service engineer from the manufacturer or from an agent authorised by the manufacturer.
More details and procedure are mentioned in the user manual.

10.12.1 TERMINAL CONNECTIONS OVERVIEW

UPS Range Terminals (T) Connection Bar (B)	**Battery** (+ / N / -) +PE	**Input Bypass** 3+N (N,2L1,2L2,2L3)	**Input Rectifier** 3+N+PE (N,1L1,1L2,1L3)	**Output load** 3+N+PE (N,3L1,3L2,3L3)	**Max. cable section admissible (mm²)**	**Toghtening Torque (Nm)**
60kW (Fig.1)	4 x M8	4 x 35 mm^2	4 x 35 mm^2 + PE M8	4 x 35 mm^2 + PE M8	35	3.5
80kW (Fig.1)	4 x M8	4 x 50 mm^2	4 x 50 mm^2 + PE M8	4 x 50 mm^2 + PE M8	50	5
100kW (Fig.1)	4 x M8	4 x 70 mm^2	4 x 70 mm^2 + PE M8	4 x 70 mm^2 + PE M8	95	8
120kW ((Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	185	Max. 50
160kW (Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	185	Max. 50
200kW (Fig.2)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
250kW (Fig.3)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
300kW (Fig.3)	4 x M10	4 x M10	5 x M10	5 x M10	240	Max. 50
400kW (Fig.4)	3 x 4xM12	3 x 4 x M12	3 x 5 x M12	3 x 5 x M12	240	Max. 84
500kW (Fig.4)	3 x 4xM12	3 x 4 x M12	3 x 5 x M12	3 x 5 x M12	240	Max. 84

Fig. 1: 60-80-100 kW

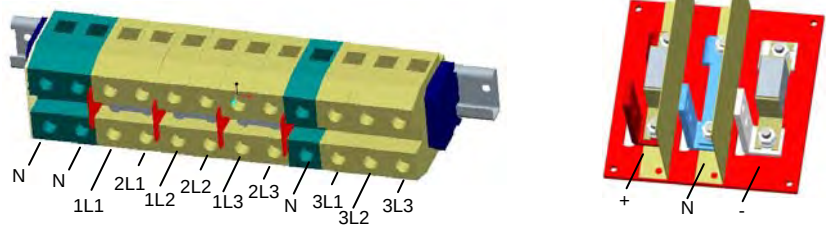
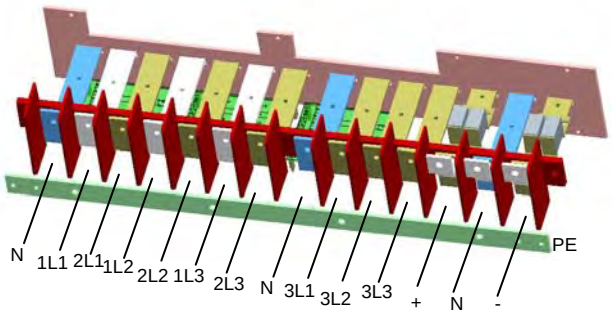


Fig. 2: 120-160-200 kW

Dual input feed connections



Single input feed connections

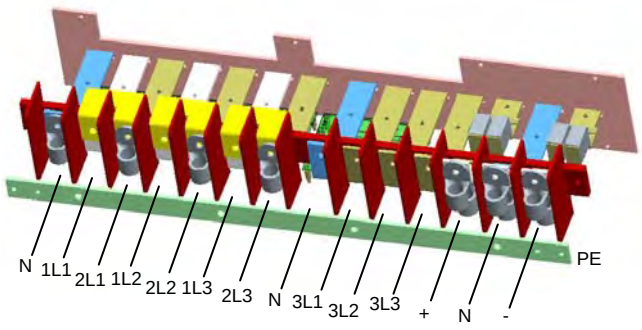
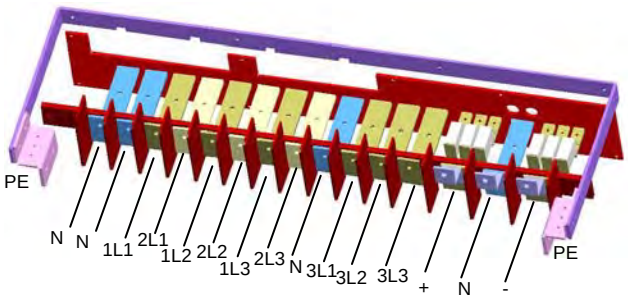


Fig. 3: 250-300 kW

Dual input feed connections



Single input feed connections

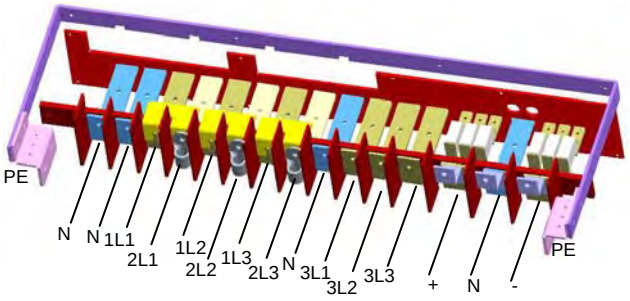
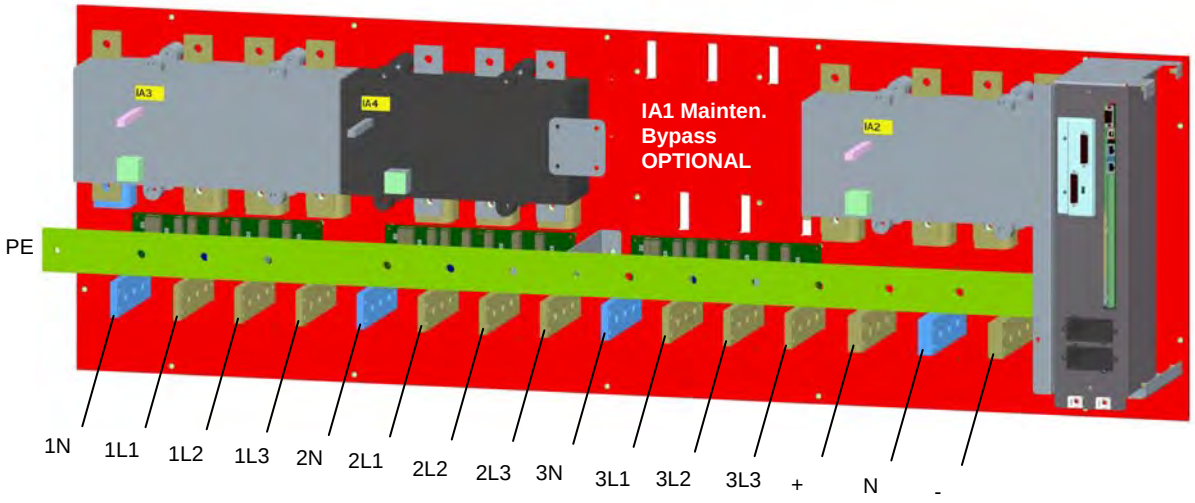


Fig. 4: 400-500 kW



10.12.2 INPUT FEED RATINGS POWERWAVE 33 60-300kW

Cable Sections and Fuse Ratings recommended. Alternatively, local standards to be respected

Block Diagram

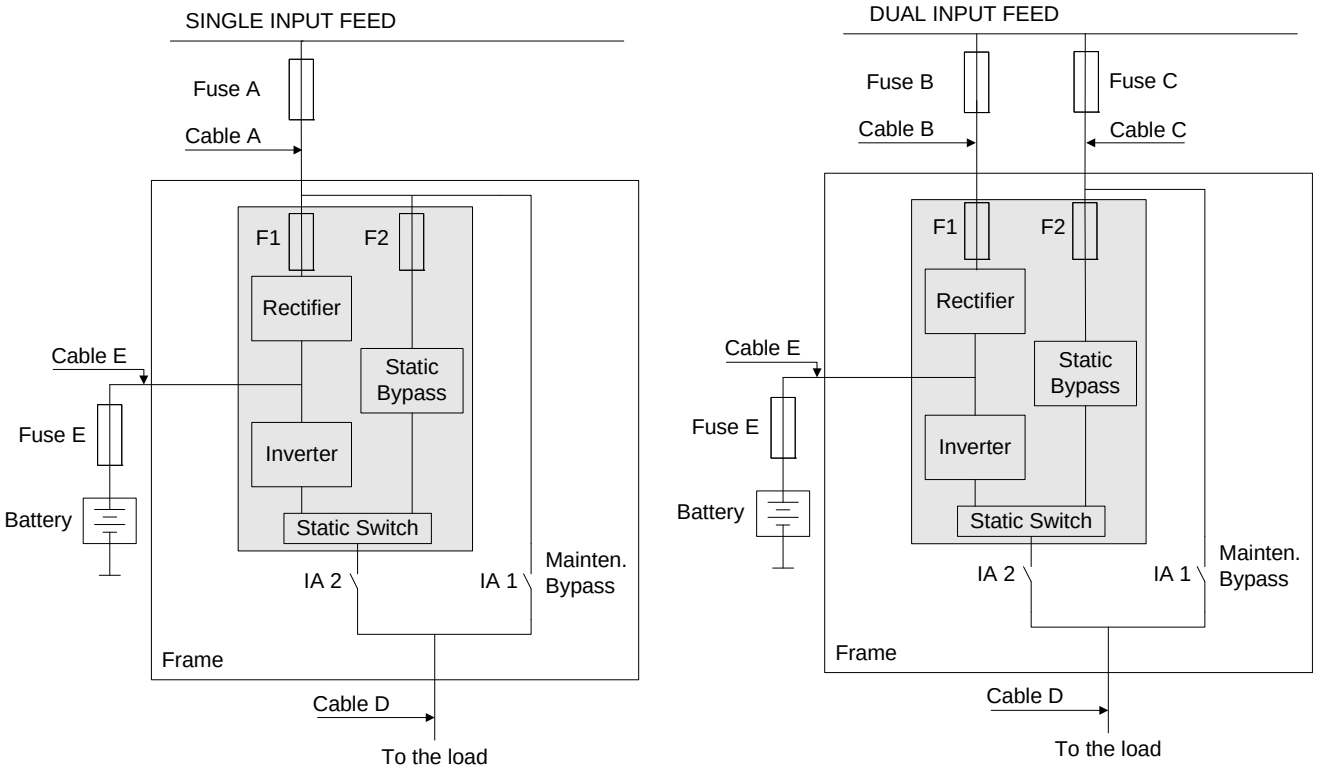


Figure 3.3: Block Diagram PowerWave 33 from 60-300kW

STANDARD VERSION (SINGLE INPUT FEED)

Power (kW)	Fuse A (Agl/CB)	Cable A (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
60	3x100	5x35	5x35	3x125A	3x35+ PE
80	3x125	5x50	5x50	3x160A	3x50 + PE
100	3x160	5x50	5x50	3x250A	3x95 + PE
120	3x200	5x70	5x70	3x250A	3x120 + PE
160	3x250	5x120 or 5x(2x50)	5x120 or 5x(2x50)	3x350A	3x(2x70) + PE
200	3x350	5x185 or 5x(2x70)	5x185 or 5x(2x70)	3x450A	3x(2x95) + PE
250	3x400	5x240 or 5x(2x95)	5x240 or 5x(2x95)	3x630A	3x(2x150) + PE
300	3x500	5x(2x120)	5x(2x120)	3x630A	3x(2x150) + PE

VERSION ON REQUEST (DUAL INPUT FEED)

Power (kW)	Fuse B (Agl/CB)	Cable B (IEC 60950-1)	Fuse C (Agl/CB)	Cable C (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
60	3x100	5x35	3x100	5x35	5x35	3x125A	3x35+ PE
80	3x125	5x50	3x125	5x50	5x50	3x160A	3x50+ PE
100	3x160	5x50	3x160	5x50	5x50	3x250A	3x95+ PE
120	3x200	5x70	3x200	5x70	5x70	3x250A	3x120+ PE
160	3x250	5x120 or 5x(2x50)	3x250	5x120 or 5x(2x50)	5x120	3x350A	3x(2x70) + PE
200	3x350	5x185 or 5x(2x70)	3x315	5x185 or 5x(2x70)	5x185	3x450A	3x(2x95) + PE
250	3x400	5x240 or 5x(2x95)	3x400	5x240 or 5x(2x95)	5x240 or 5x(2x95)	3x630A	3x(2x150) + PE
300	3x500	5x(2x120)	3x500	5x(2x120)	5x(2x120)	3x630A	3x(2x150) + PE

10.12.3 INPUT FEED RATINGS POWERWAVE 33 400-500kW

Cable Sections and Fuse Ratings recommended. Alternatively, local standards to be respected

Block Diagram

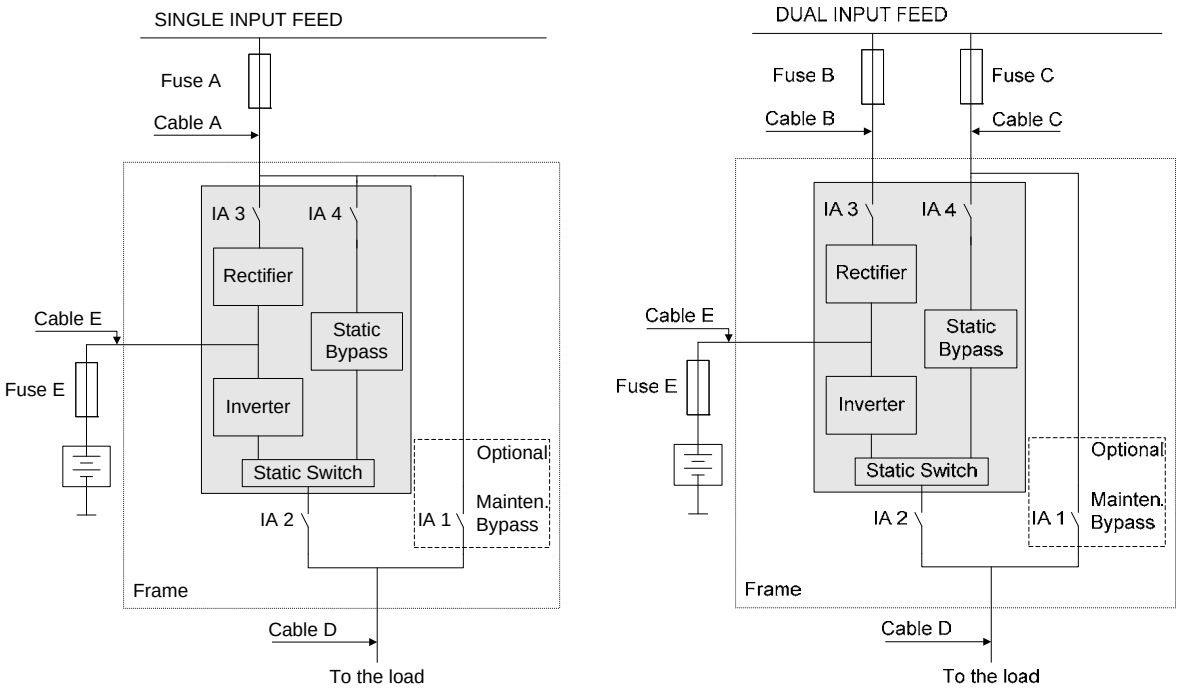


Figure 3.4: Block Diagram PowerWave 33 from 400-500kW

STANDARD VERSION (SINGLE INPUT FEED)

Power (kW)	Fuse A (Agl/CB)	Cable A (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
400	3x630	5x(3x95) or 5x(2x185)	5x(3x95) or 5x(2x185)	3x1000A	3x(3x185) + PE
500	3x800	5x(3x150)	5x(3x150)	3x1250A	3x(3x240) + PE

VERSION ON REQUEST (DUAL INPUT FEED)

Power (kW)	Fuse B (Agl/CB)	Cable B (IEC 60950-1)	Fuse C (Agl/CB)	Cable C (IEC 60950-1)	Cable D (IEC 60950-1)	Fuse E +/N/-	Cable E +/N/-
400	3x630	5x(3x95) or 5x(2x185)	3x630	5x(3x95) or 5x(2x185)	5x(3x95) or 5x(2x185)	3x1000A	3x(3x185) + PE
500	3x800	5x(3x150)	3x800	5x(3x150)	5x(3x150)	3x1250A	3x(3x240) + PE

CONTENTS APPENDIX-A

A. TOP CABLE ENTRY ENCLOSURE

A.1 INTRODUCTION

This appendix contains the necessary information for the correct positioning, cabling and installation of the Top Cable Entry (TCE) Enclosure. The product User Manual is also referenced in this document as the UPS should be correctly installed to ensure the appropriate assembly and functioning of the Top Cable Entry Enclosure.

The Enclosure is delivered on a specifically designed pallet that is easy to move with a forklift or a pallet jack. Accessories are delivered inside the Top Cable Entry Enclosure and cables are delivered in a separate package. Keep the container always in upright position and do not drop the Enclosure. Do not either stack the pallets.

A.2 SAFETY INSTRUCTIONS

WARNING!

THE INSTRUCTION IN THIS USER MANUAL HAVE ALWAYS TO BE FOLLOWED IN ORDER TO AVOID INJURIES FROM ELECTRICAL IMPACTS.

WARNING!

ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY AUTHORISED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL.

DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE.

PHYSICAL INJURY OR DEATH MAY FOLLOW, OR DAMAGE MAY OCCUR TO THE UPS, OR THE LOAD EQUIPMENT IF THESE INSTRUCTIONS ARE IGNORED.

A.3 PREPARING THE UPS

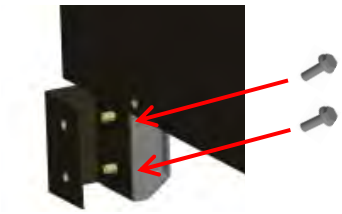
- Your UPS should be appropriately positioned and configured before the installation of the TCE Enclosure. Therefore, before reading the instructions in this document, the procedures written in the User Manual until *Section 1.5.1.1* should be followed.
- If any of your power cables arrive from the bottom, install the cable fixing bars to the UPS as indicated in *Appendix B.*
- If the UPS is supplied with facilities for a single cable feed but dual feed is required (or vice-versa), go to *Appendix C* for instructions.

A.4 POSITIONING

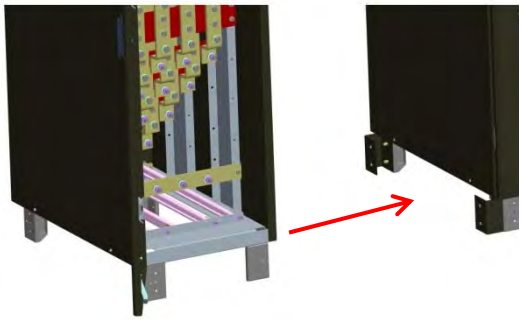
After the installation of the UPS, unpack the Top Cable Entry Enclosure and take the mechanical accessories that are delivered inside the cabinet and the screws that are delivered on top of the Enclosure.

Connecting the Top Cable Entry Enclosure to the UPS

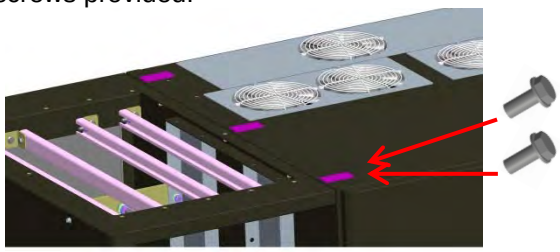
Using 8xM5 screws, connect the two “u” shaped profiles *to the base of the UPS*. By respecting the direction indicated in the drawing below (from the inside to the outside of the UPS base).



Bring the Top Cable Entry Enclosure near to the UPS and align their cabinets. Repeat the previous operation screwing on the “u” shaped profiles *to the Top Cable Entry Cabinet*.



Lastly, join the units from the top by placing the three small plates in their appropriate positions and by fixing them together with the 6xM5 screws provided.



A.5 ELECTRICAL INSTALLATION

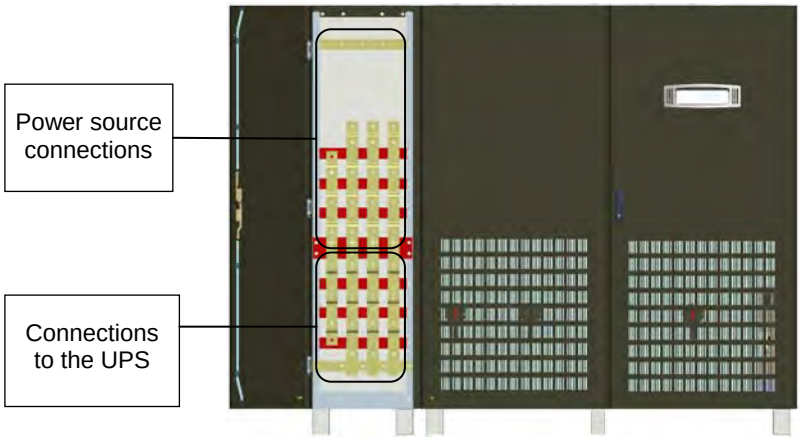
A.5.1 SINGLE INPUT FEED

To achieve correct cabling, follow the same steps as for the dual input feed (Section A.5.2 of this document), skipping the procedures for connecting 2N, 2L1, 2L2 and 2L3.

A.5.2 DUAL INPUT FEED

A.5.2.1 Wiring

The bars inside the Top Cable Entry Cabinet are used to link the power source to the UPS. The top terminals are connected to the power source while the bottom terminals are connected to the UPS through the cables supplied by the manufacturer.



To ensure protection of the personnel, the first operations refer to the connection between the Top Cable Entry Enclosure and the UPS. The connections to the mains are realized in a second step.

A.5.2.2 Connecting to the UPS

Fig. 1 - ***Terminals in the Top Cable Entry Enclosure***

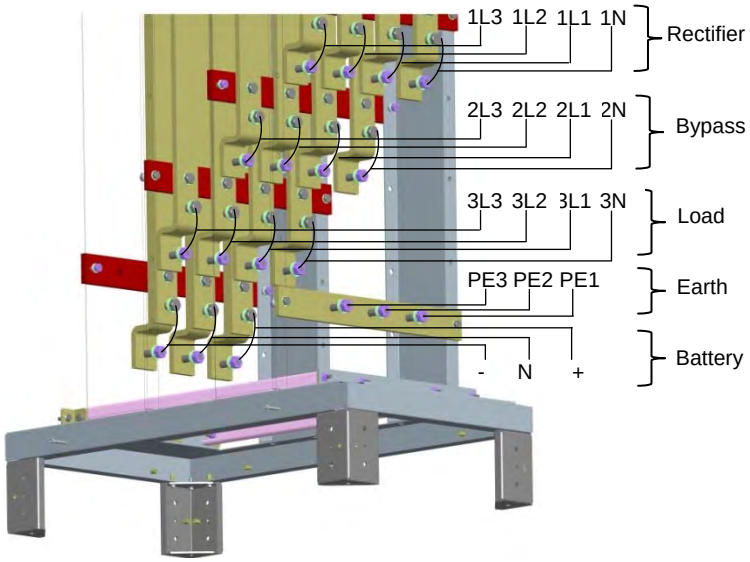
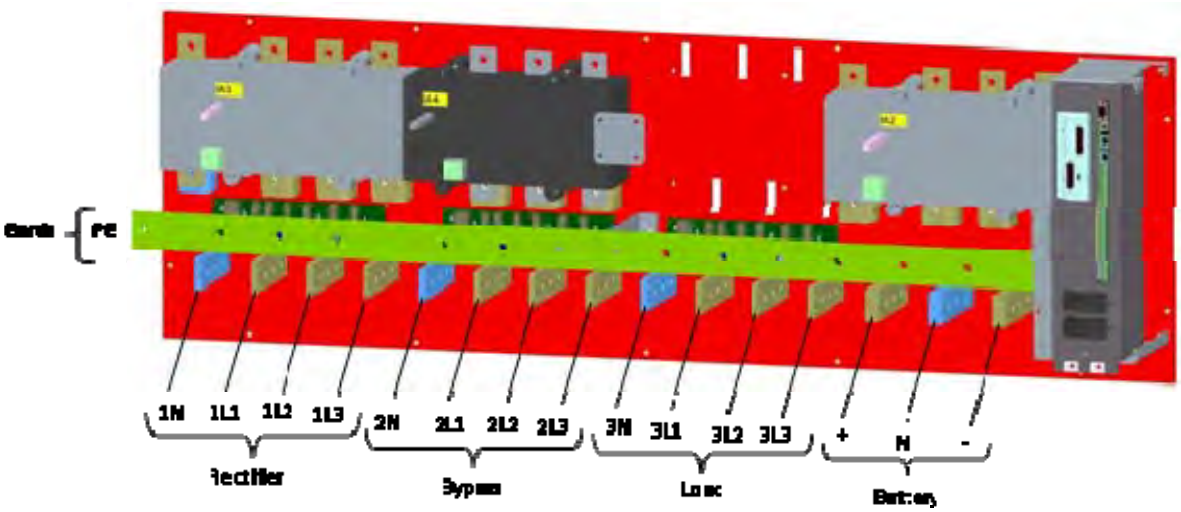


Fig. 2 - ***Terminals in the UPS***



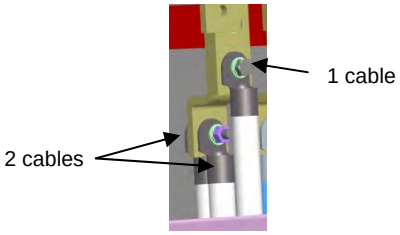
The wiring between the terminals in the UPS and the terminals in the Top Cable Entry Enclosure is done using the cables delivered by the factory. To ensure that all cables can be settled under the UPS, it is recommended to do the wiring always in groups of three cables and to connect them in the following order:

1) Battery cables
2) Load cables (3Lx + N)
3) Bypass cables (2Lx + N)
4) Rectifier cables (1Lx + N)
5) Earth cables (PE)

A.5.2.3 Battery Cables

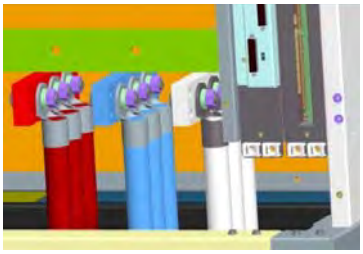
Connect two of the *negative* terminals of the external batteries to the end of the corresponding bar on the Top Cable Entry Enclosure as indicated in Fig. 3. Then, connect the third negative terminal of the battery to the front part of the same bar. (Use a maximum torque of 84 Nm.)

Fig. 3 - Connection between cables and TCE bars

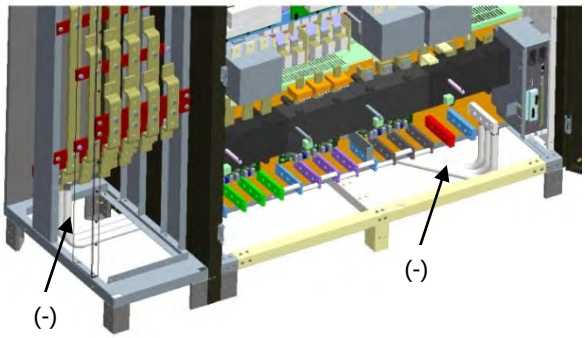
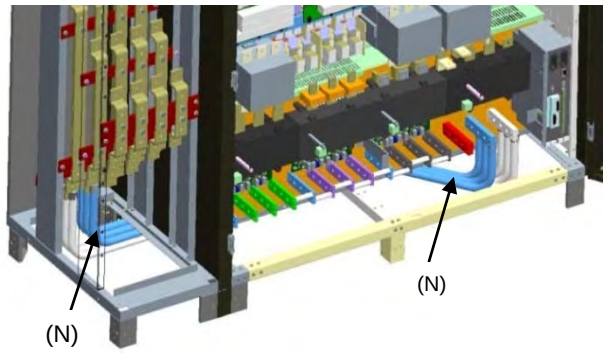


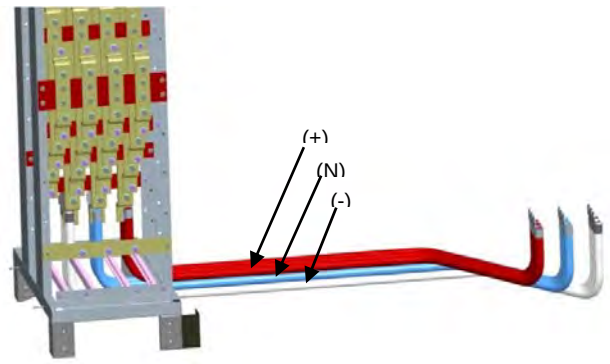
Pass the cables under the UPS and connect the other end of the cables to their appropriate terminals in the UPS as in Fig. 4.

Fig. 4 - Connection between cables and UPS bars

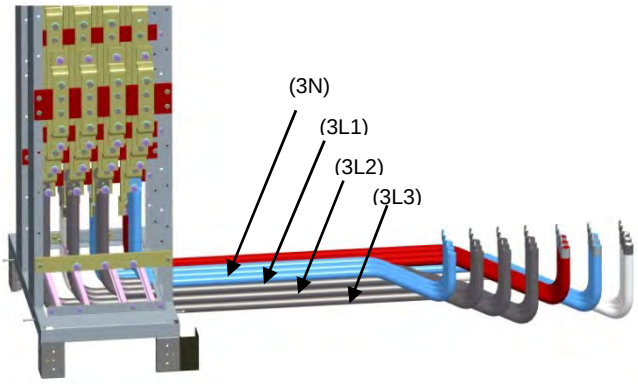


For appropriate cabling, follow the procedure below from step #1 to #9:

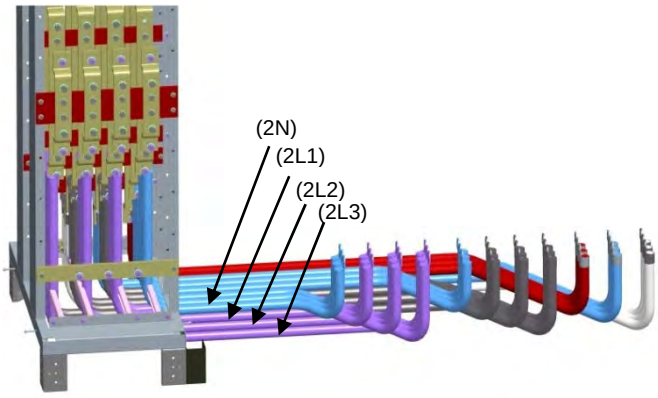
#	Picture	Description
1	Temporarily remove the left door of the UPS.	
2		Place the *negative battery cables* on the ground in the back part of the UPS.
3		In a similar way, connect the *battery neutral cables* to the Top Cable Entry Enclosure and to the UPS. Place these cables on top of the ones previously installed (battery negative cables).

4		Connect the *battery positive cables* to the Top Cable Entry Enclosure and to the UPS. Place these cables on top of the ones previously installed (battery neutral cables) as in the image.

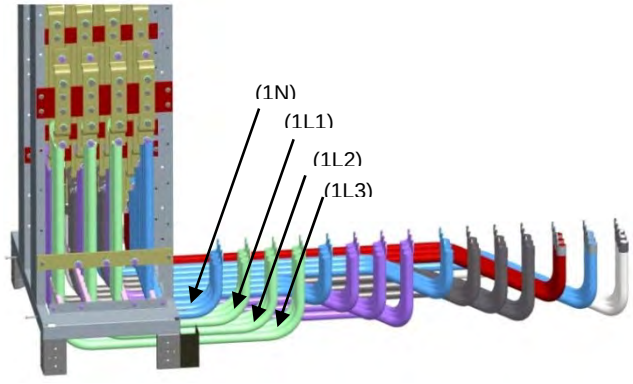
Load Cables

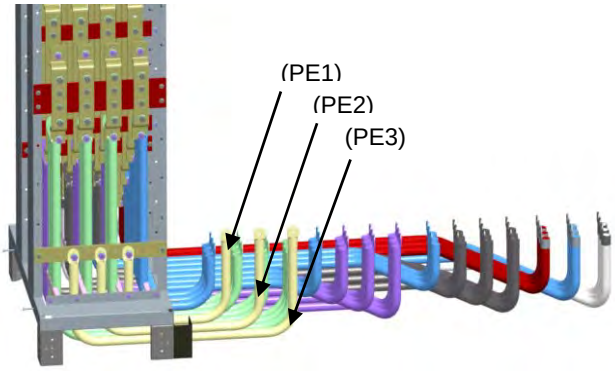
5		Do the connections of the three *3L3 cables*. Place them on the ground *in front of* the cables previously connected. Then, do the same procedure for the other *load cables* in the following order: 3L2 -> 3L1 -> 3N Place these cables on top of the other load cables as indicated in the image. Note that the wiring should be always done in groups of three cables.

Bypass Cables

6		Follow the same steps for the *bypass cables*. Connect three *2L3* cables. Position them on the ground in front of the load cables. Connect the other bypass cables in the following order: 2L2 -> 2L1 -> 2N Place these cables on top of the other bypass cables as indicated in the image.

Rectifier Cables

7		Follow the same steps for the *rectifier cables.* Connect three *1L3* cables. Position them on the ground in front of the bypass cables. Connect the other rectifier cables in the following order: *1L2 -> 1L1 -> 1N* Place these cables on top of the other rectifier cables as indicated in the image.

8		Connect the Earth cables.
9	Mount the UPS door back to its position.	

A.5.2.4 Connecting to the power supply

WARNING!

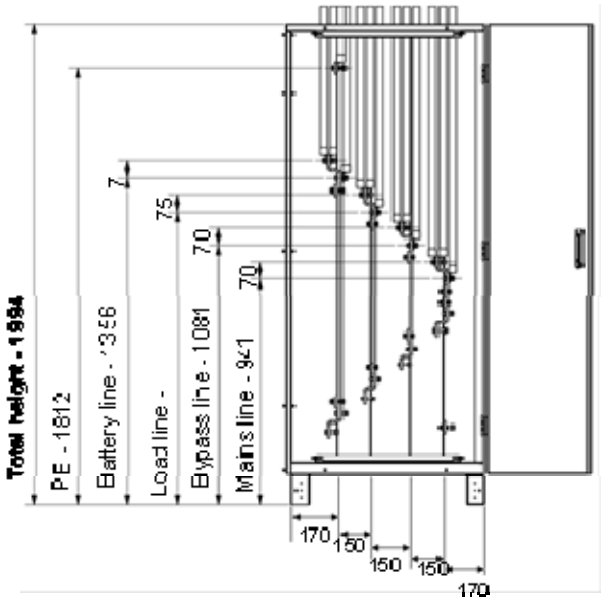
HIGH FAULT CURRENTS (LEAKAGE CURRENTS):
BEFORE CONNECTING THE MAINS YOU MUST ENSURE THAT THERE IS A PROPER EARTH CONNECTION!

The customer has to supply the wiring to connect the Top Cable Entry Enclosure to the local power source. For minimum recommended Input Cable Sections and Fuse Ratings see *Section 2, chapter 2.1.3 of the User Manual*.

Before connecting to the power supply, read carefully *the instructions for Output Cabling* in *Chapter 1.5.1.4* and *Chapter 1.5.1.5* of the User Manual.

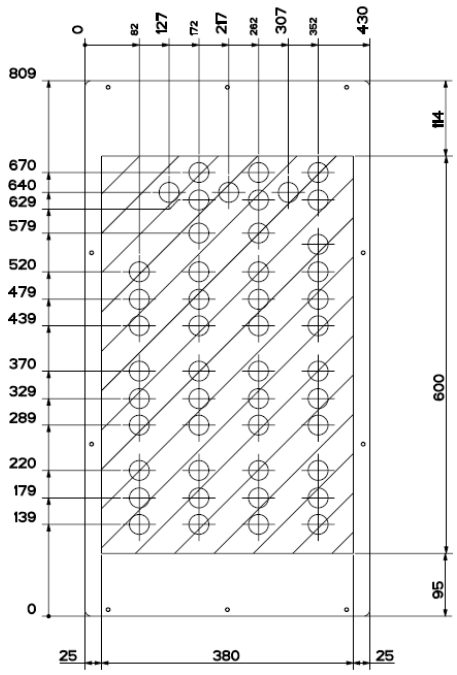
For planning the length of the cables, see the distances from the terminals to the floor in Fig. 5.

Fig. 5 - Distances from terminals to the ground (side view)



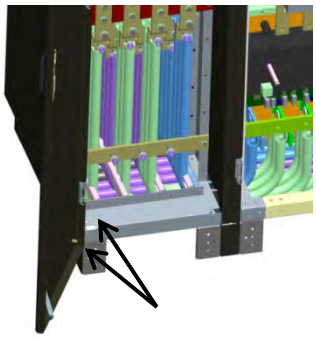
Remove the aluminum plate from the top of the enclosure and perforate it according to the chosen cables. Fig. 6 shows the top aluminum plate and indicates the position of each connection point inside the enclosure. Note that this figure is a reference to understand the position of the connections and does not specify the exact position of the holes. The dashed region indicates the zone that can be perforated.

Fig. 6 – Reference of Connection Points



Before connecting all the cables, use the small Earth cable provided and connect the door of the Cabinet to the basis of the enclosure as indicated in Fig. 7.

Fig. 7 – Earth Connection



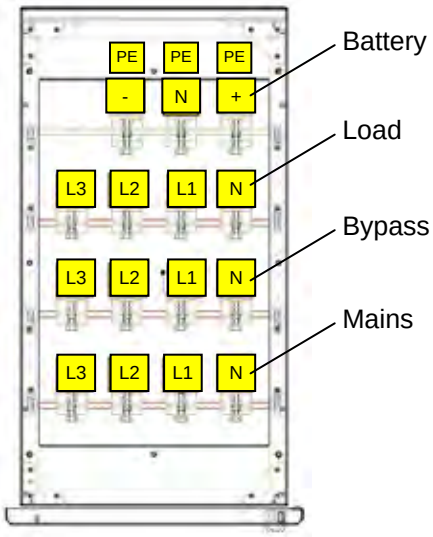
To do the appropriate wiring, connect the cables in the order indicated and according to the tables that follow:

1) Protective Earth (PE-Line)
2) Battery Line
3) Load Line
4) Bypass Line
5) Mains Line

MAINS INPUT CABLE	UPS TERMINAL Rectifier
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

BYPASS INPUT CABLE	UPS TERMINAL Bypass
Phase L1	2L1
Phase L2	2L2
Phase L3	2L3
NEUTRAL	2N
EARTH	PE

Top View



Go to *Section 1, Chapter 1.5.2* in the User Manual for Installation Checklist.

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CONTENTS APPENDIX-B

B. CABLE FIXING BARS ON PW33 400-500kW

B.1 INTRODUCTION

This appendix contains the necessary information for the correct procedure for connecting the I/O cables in combination with cable-fixing bars on PW33 400-500kW.

B.2 SAFETY INSTRUCTIONS

WARNING!

THE INSTRUCTION IN THIS USER MANUAL HAVE ALWAYS TO BE FOLLOWED IN ORDER TO AVOID INJURIES FROM ELECTRICAL IMPACTS.

WARNING!

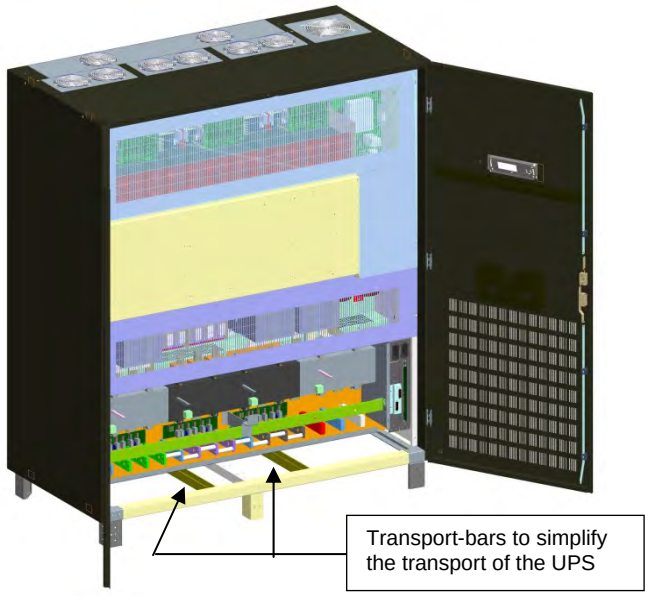
ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY AUTHORISED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL.

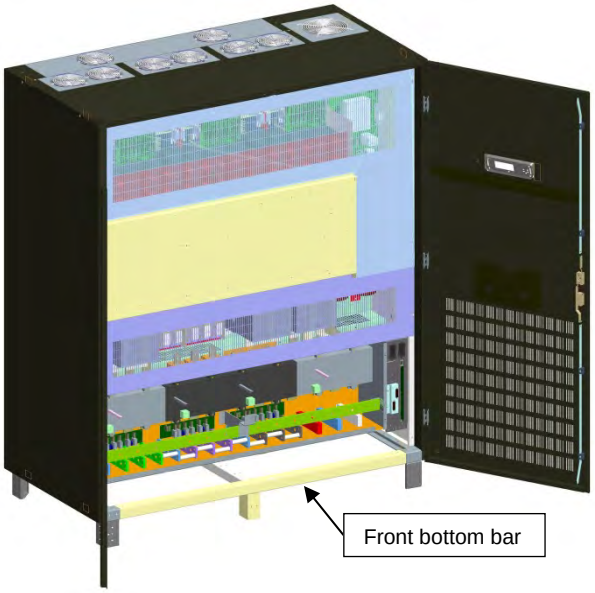
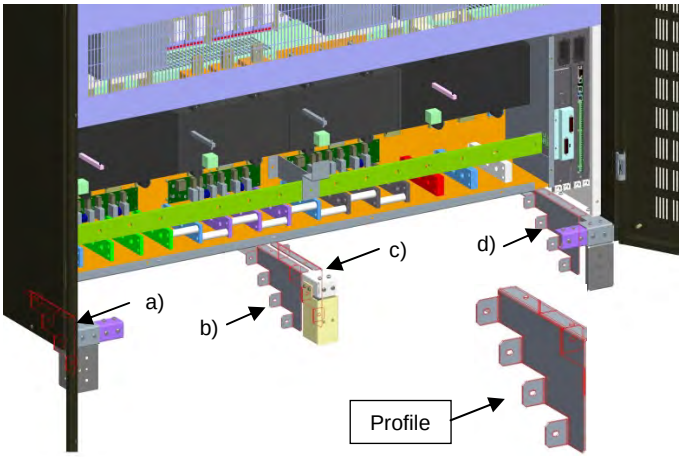
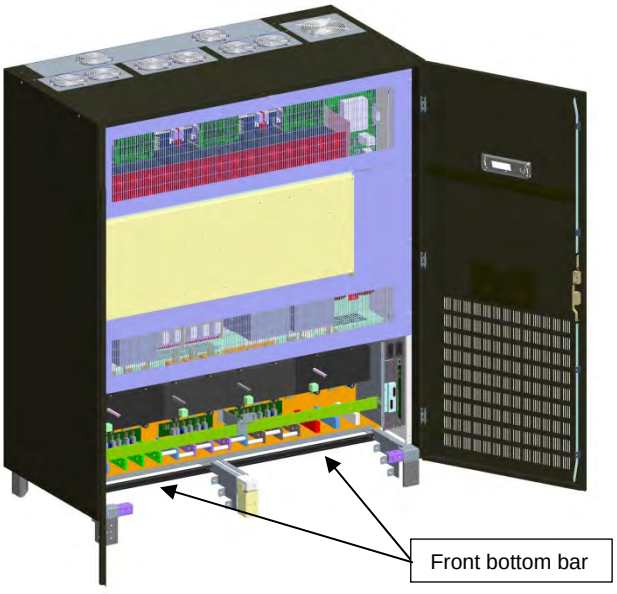
DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE.

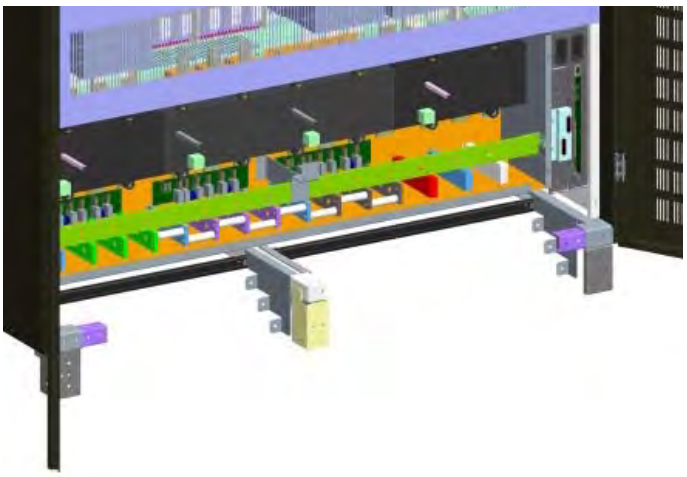
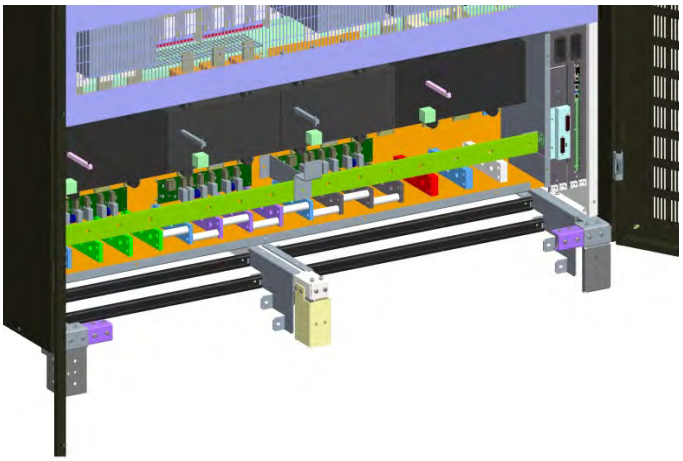
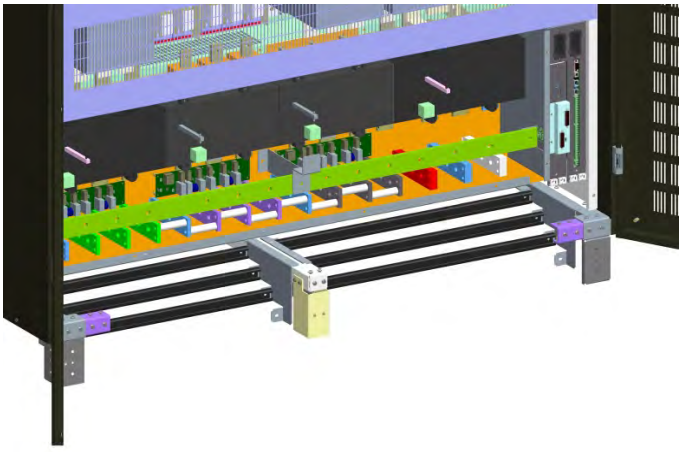
PHYSICAL INJURY OR DEATH MAY FOLLOW, OR DAMAGE MAY OCCUR TO THE UPS, OR THE LOAD EQUIPMENT IF THESE INSTRUCTIONS ARE IGNORED.

B.3 PROCEDURE

In order to mount the cable fixing-bars correctly, follow the procedure below from step #1 to #7:

#	Picture	Description
1		After having placed the UPS in its final position, remove the two transport-bars shown by the arrows.

2		Temporarily remove the front bottom bar and keep it aside.
3		Fix the four profiles a), b), c), d) as indicated in the picture. Each profile has to be fixed with two M5 screws, tightening torque 6.0 Nm.
4		Fix the first two cable-fixing bars on the back spot. Each bar has to be fixed with two M5 screws + nuts, tightening torque 6.0 Nm.

5		Connect the first group of cables to the terminals and fix them to the first cable-fixing bar. (In the picture cables are not shown for simplicity).
5		Fix the second two cable-fixing bars on the second spot. Each bar has to be fixed with two M5 screws + nuts, tightening torque 6.0 Nm. Connect the second group of cables to the terminals and fix them to the second cable-fixing bar. (In the picture cables are not shown for simplicity).
6		Fix the third two cable-fixing bars on the third spot. Each bar has to be fixed with two M5 screws + nuts, tightening torque 6.0 Nm. Connect the third group of cables to the terminals and fix them to the third cable-fixing bar. (In the picture cables are not shown for simplicity).

7		Fix the fourth two cable-fixing bars on the last spot. Each bar has to be fixed with two M5 screws + nuts, tightening torque 6.0 Nm. Fix the front bottom bar which was removed on point #2.

Go to *Section 1, Chapter 1.5.2* in the User Manual for Installation Checklist.

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CONTENTS APPENDIX-C

C. CONVERTING FROM SINGLE TO DUAL INPUT FEED AND VICE-VERSA ON PW33 400-500kW

C.1 INTRODUCTION

This appendix contains the necessary information for converting the input from single to dual on PW33 400-500kW and vice-versa. **Please note that back access is needed.**

C.2 SAFETY INSTRUCTIONS

WARNING!

THE INSTRUCTION IN THIS USER MANUAL HAVE ALWAYS TO BE FOLLOWED IN ORDER TO AVOID INJURIES FROM ELECTRICAL IMPACTS.

WARNING!

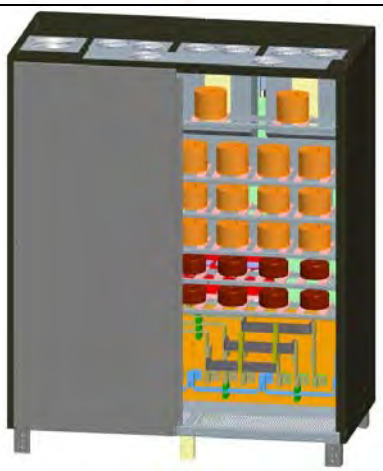
ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY AUTHORISED ELECTRICIANS OR BY QUALIFIED INTERNAL PERSONNEL.

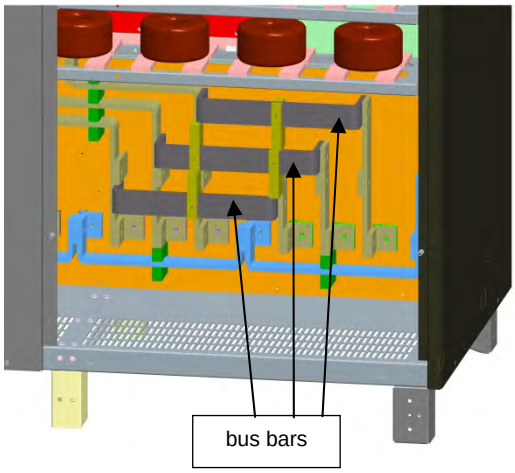
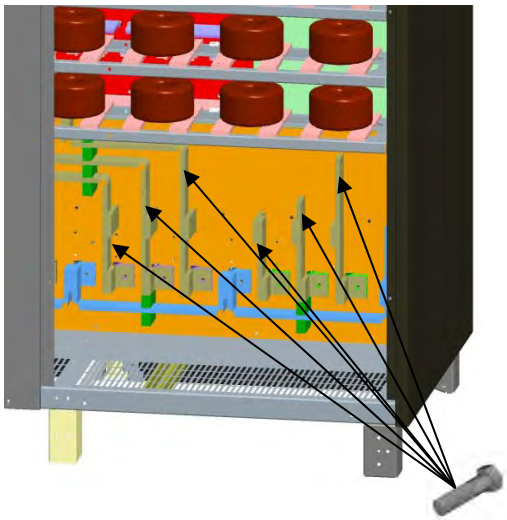
DO NOT OPERATE IN CASE OF PRESENCE OF WATER OR MOISTURE.

PHYSICAL INJURY OR DEATH MAY FOLLOW, OR DAMAGE MAY OCCUR TO THE UPS, OR THE LOAD EQUIPMENT IF THESE INSTRUCTIONS ARE IGNORED.

C.3 PROCEDURE FOR CONVERTING THE INPUT FEED FROM SINGLE TO DUAL

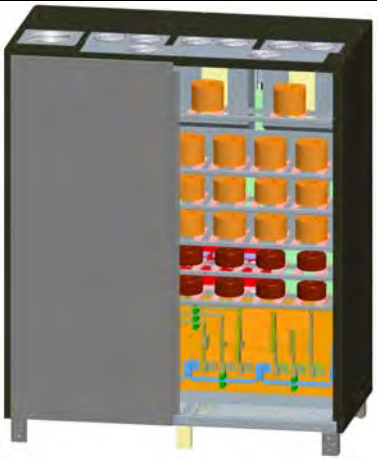
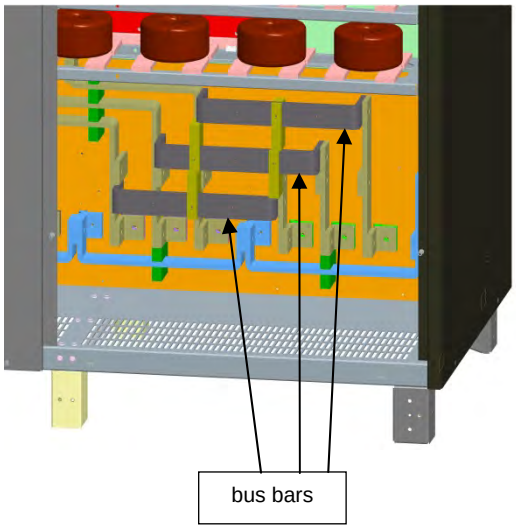
In order to convert the input feed from single to dual, follow the procedure below from step #1 to #5:

#	Picture	Description
1		**NOTE!** **The weight of the back wall is approximately 20kg.** Temporarily remove the right back wall of the unit by removing the 10x M5 screws.
2		The left back wall can remain in its place.

3		Remove the three busbars (all together) indicated in the picture, by removing the 6x M10 screws+nuts.
4		**IMPORTANT** Put the screws+nuts back in place in order to cover the holes. Each screw must be fixed a tightening torque of 50.1 Nm.
5		Fix the right back wall using the 10x M5 screws, with a tightening torque of 6.0 Nm.

C.4 PROCEDURE FOR CONVERTING THE INPUT FEED FROM DUAL TO SINGLE

In order to convert the input feed from dual to single, follow the procedure below from step #1 to #4:

#	Picture	Description
1		**NOTE!** **The weight of the back wall is approximately 20kg.** Temporarily remove the right back wall of the unit by removing the 10x M5 screws.
		The left back wall can remain in its place.
3		Fix the three busbars as indicated in the picture. Each busbar must be fixed with two M10 screws + nuts, with a tightening torque of 50.1 Nm.

4		Fix the right back wall using the 10x M5 screws, tightening torque 6.0 Nm.

Go to *Section 1, Chapter 1.5.2* in the User Manual for Installation Checklist.

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