

Technical data sheet

# PowerWave 33 Serie 3

## 60 – 120 kW



## Document information

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## Revision history

Revision number	Chapter	Description	Date						
140714	9.1	Cable entry: bottom <del>bottom, bottom rear</del> Parallel capability: up to 10 frames <del>up to 6 frames</del>	14.07.2014						
	9.2	Corrected "Current (r.m.s), maximum (with charging batt. and input 400/230V)"							
		<table border="1"> <tr> <td><del>102</del></td> <td><del>135</del></td> <td><del>168</del></td> <td><del>202</del></td> </tr> <tr> <td>101</td> <td>134</td> <td>167</td> <td>201</td> </tr> </table>		<del>102</del>	<del>135</del>	<del>168</del>	<del>202</del>	101	134
<del>102</del>	<del>135</del>	<del>168</del>	<del>202</del>						
101	134	167	201						
	9.8	Added fuse type on the description of the Fuse E in tables 13 and 14. Type: gR or CB							
140730	9.1	Added "Acoustic noise (acc. to IEC 62040-3)" figures	30.07.2014						
	9.2	Added "rated short-time withstand current (I <sub>cw</sub> )" figure							
	9.3	Added "Eco-mode efficiency, linear load" figure							
	9.3	Added "AC / AC efficiency in normal mode, linear load" figures for each model.							
	9.7	Added "head dissipation without load" figures							
	9.8	Corrected the recommended wiring for batteries (Cable E) tables 13 and 14 like in section 4.4							
150206	N/A	New release for some user manual corrections	06.02.2016						
REV-A	N/A	Updated the entire layout of the document	04.02.2016						
	7	Updated the entire "Installation planning" chapter							
	9	Corrected the IA3 and IA4 references on the block diagram picture.							

# Contents

1 System description.....	4
2 General characteristics .....	5
3 Input characteristics.....	6
4 Output characteristics.....	7
5 Battery characteristics .....	9
6 User interface - communication.....	10
6.1 Display & mimic diagram.....	10
6.2 Customer inputs .....	11
6.3 Customer outputs (optional usb port & relay card) .....	11
7 Installation planning .....	12
8 Heat dissipation.....	13
9 Cable and fuse recommendations.....	14

# 1 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.

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 Centers 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 comes in the following rated power: 60-80-100-120 kW. It can be paralleled for power protection increase and/or for redundancy purpose, up to 10 units.

This Technical Datasheet (TDS) provides all technical specification required by IEC 62040-3, providing mechanical, electrical and environmental characteristics. It can be used for tendering and end-user requirements. PowerWave 33 S3 is designed to respond to the actual UPS standards which are:

- Safety, IEC / EN 62040-1
- EMC, IEC / EN 62040-2
- Performance, IEC / EN 62040-3

## 2 General characteristics

PowerWave 33 Series 3	60	80	100	120	KW
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Photograph  
(front view with open doors)



Power, rated:

Apparent	60	80	100	120	kVA
Active	60	80	100	120	kW

UPS type: on-line, transformerfree, decentralized parallel architecture

Parallel capability: up to 10 frames

Battery: not included

Performance classification: VFI-SS-111

### MECHANICAL

Dimensions (width×height×depth)	615x1954x480 or with feet 615x1978x480				mm
Weight (w/o batteries)	198	206	228	230	kg
Acoustic noise (acc. to IEC 62040-3) in normal mode (at ≤25°C) at 100% / 50% Load	64 / 59	64 / 60	64 / 61	64 / 59	dBA
in battery mode (at ≤25°C) at 100% / 50% Load	64 / 59	64 / 60	64 / 61	64 / 59	

### SAFETY

Access: operator

Degree of protection against hazards and water ingress: IP 20

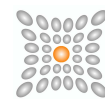
### ELECTROMAGNETIC COMPATIBILITY

Compliant to IEC 62040-2

Category Emission / Immunity C3 / C3

### ENVIRONMENTAL

Storage temperature range	-25 – +70	°C
Operative temperature range	0 – +40	°C
Relative humidity	≤ 95 (non-condensing)	%
Max. altitude without de-rating	1000	m



## ADDITIONAL AND USUAL INFORMATION

Connection	5 wires, 3 phase + N + PE
Cable entry	Bottom
Accessibility	Frontal only
Air outlet	Top
Color	Graphite Grey (RAL 7024)
Color code	PULVERLACKE NR.4222903402 Ver. 09RCCAT1 ORANGE PEEL

## OPTIONS

- Battery cabinets
- Parallel Kit
- SNMP Cards
- USB port & Relay card with potential-free contacts (Customer outputs)
- Back-feed protection
- Single input feed KIT
- Sea freight packaging (wooden box)

## 3 Input characteristics

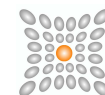
PowerWave 33 Series 3	60	80	100	120	KW
Rated voltage (steady-state, r.m.s)	380 / 220 400 / 230 415 / 240				VAC
Tolerance, referred to 400/230V	-10 / +15 at <100% load -20 / +15 at <80% load, -30 / +15 at <60% load				%
Frequency, rated	50				Hz
Tolerance, referred to 50Hz	-30 / +40				%
Current (r.m.s), rated (with battery charged and input 400/230V)	92	122	152	183	A
Current (r.m.s), maximum (with charging batt. and input 400/230V)	101	134	167	201	A
Total harmonic distortion (THDi)	≤ 4% at 100% load				%
In-rush current (A or % of nominal)	< 100% of the rated current				A or %
Power factor	0.99 @ 100% load				
Rated short-time withstand current (I <sub>cw</sub> )	10 for 1.5 seconds				kA, s
<b>AC power distribution system: TN-S, TN-C, TN-C-S, TT</b>					
note: in static bypass mode or eco-mode TN-C and TN-C-S can cause PE current to rise above 5% of phase currents.					
Phases required	3				
Neutral required	yes				

## ADDITIONAL AND USUAL INFORMATION

Connection:	5 wires, 3 phase + N + PE
Cable entry:	Bottom
Accessibility:	Frontal
Walk In/Soft Start:	Yes

## 4 Output characteristics

PowerWave 33 Series 3	60	80	100	120	KW
Power, rated:	60	80	100	120	kW
<b>AC power distribution system: TN-S, TN-C, TN-C-S, TT</b>					
available phases	3				-
neutral available	yes				-
Rated voltage (steady state, r.m.s.)	380 / 220 400 / 230 415 / 240				VAC
Variation in normal mode / battery mode	± 1.5 / ± 1.5				%
<b>Total harmonic distortion (THDu), 100% load, normal mode:</b>					
Linear	< 2.0				%
Non-linear (acc. to IEC 62040-3)	< 4.0 %				
<b>Total harmonic distortion (THDu), 100% load, battery mode:</b>					
Linear	< 2.0				%
Non-linear (acc. to IEC 62040-3)	< 4.0 %				
Voltage unbalance and phase displacement, 100% load unbalance	0				°
<b>Voltage transient and recovery time, 100% step load:</b>					
Linear	± 4				%
Non-linear (acc. to IEC 62040-3)	± 4				%
Transfer normal mode --> battery mode	0				%
Frequency (steady-state), rated:	50 / 60 (selectable)				Hz
Variation in normal mode (frq. Synchronized with mains)	± 2 / ± 4				%
Variation in battery mode (free-running)	± 0.1				
Max synch phase error (referred to a 360° cycle)	<2				°



<b>Max slew-rate</b>	1				Hz/s
<b>Nominal current (In), r.m.s. rated:</b>	87	116	145	174	A
<b>Overload on inverter</b>	0.5 @ 150% load; 5 @ 125% load; 20 @ 110% load				min
<b>Fault clearing capability normal mode and battery mode (100ms)</b>	2.0 x In	2.0 x In	2.0 x In	2.0 x In	A
<b>Crest factor (Load supported)</b>	3: 1				-
<b>Load power factor, rated</b>	1				-
<b>Displacement (permissible lead-lag range)</b>	(all range) 0				%, s
<b>AC / AC efficiency in normal mode, linear load:</b>					
<b>100% load</b>	95.5 <sup>1)</sup>	95.5 <sup>1)</sup>	95.7 <sup>1)</sup>	95.7 <sup>1)</sup>	%
<b>75% load</b>	95.8 <sup>1)</sup>	95.8 <sup>1)</sup>	96.0 <sup>1)</sup>	96.0 <sup>1)</sup>	
<b>50% load</b>	96.0 <sup>1)</sup>	96.0 <sup>1)</sup>	96.0 <sup>1)</sup>	96.0 <sup>1)</sup>	
<b>25% load</b>	95.0 <sup>1)</sup>	95.0 <sup>1)</sup>	95.0 <sup>1)</sup>	95.0 <sup>1)</sup>	
<b>Eco-mode efficiency, linear load</b>	≥ 99.0				%
<b>Bypass - automatic: static switch</b>					
<b>Transfer time: inverter → bypass / bypass → inverter / in eco-mode</b>	<1 / <5 / <6				ms
<b>Rated current</b>	87	116	145	174	A
<b>Fault clearing capability (bypass mode) for 20 ms</b>	10 x In <sup>2)</sup>				A
<b>Overload on bypass mode</b>	continuously @ 110% load 0.5 @ 150% load 5 @ 125% load				min
<b>Bypass - maintenance</b>	yes, standard				
<b>Bypass protection fuse or circuit breaker rating</b>	Not included				



## 5 Battery characteristics

PowerWave 33 Series 3	60	80	100	120	KW
<b>Technology: VRLA, vented lead-acid, NiCd</b>					
Number of 12 V blocks (even and odd)	42 – 48 <sup>9)</sup>				-
Number of 1.2 V NiCd cells (even and odd)	420 – 480 <sup>9)</sup>				-
Battery charger max. current charger capability	37	49	61	61	A
Battery charger max. power charger capability	18	24	30	30	kW
Floating voltage (VRLA / NiCd)	2.25 / 1.40				VDC
End of discharge voltage (VRLA / NiCd)	1.65 / 1.05				
R.M.S. ripple current (% of the battery capacity )	2				%
<b>Temperature compensation: optional</b>					
<b>Battery test: automatic and periodic battery test (selectable)</b>					

1) Tolerances of  $\pm 0.2\%$  applies

2) With recommended fuses, see section 1.9.

3) IMPORTANT NOTES:

- Autonomies > 60 min are only allowed for loads < 90%. For loads 90 -100%, the max. allowed autonomy is 60min.
- For autonomies < 20 min, the UPS supports 42 - 50 12V blocks.

## 6 User interface - communication

### STANDARD ITEMS

<b>RS232 on Sub-D9 port</b>	For service (upgrades and event log download) and for SNMP box
<b>X1</b>	Customer INPUTS (see details in 1.6.2)
<b>RJ45 port</b>	Multidrop connection (for a parallel system)
<b>DISPLAY + MIMIC DIAGRAM</b>	2x20 characters LCD display + mimic diagram with 5x dual colour LEDs

### OPTIONAL ITEMS

<b>On x1 5/6</b>	Battery temperature sensor
<b>Slot 1</b>	SNMP Card (for monitoring and integration in network management)
<b>Slot 2</b>	USB port & Relay card. Relay card = customer OUTPUTS (see details in 1.6.3)

### 6.1 Display & mimic diagram

The 2 x 20 character LCD (Figure 1) 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 UPS or load transfer from UPS to BYPASS and vice-versa and finally it serves for the DIAGNOSIS (SERVICE MODE) for adjustments and testing.

The mimic diagram located under the logo (Figure 1) 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. The LED-indicator BATTERY is normally lit green, and when it supplies the load is blinking. 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.

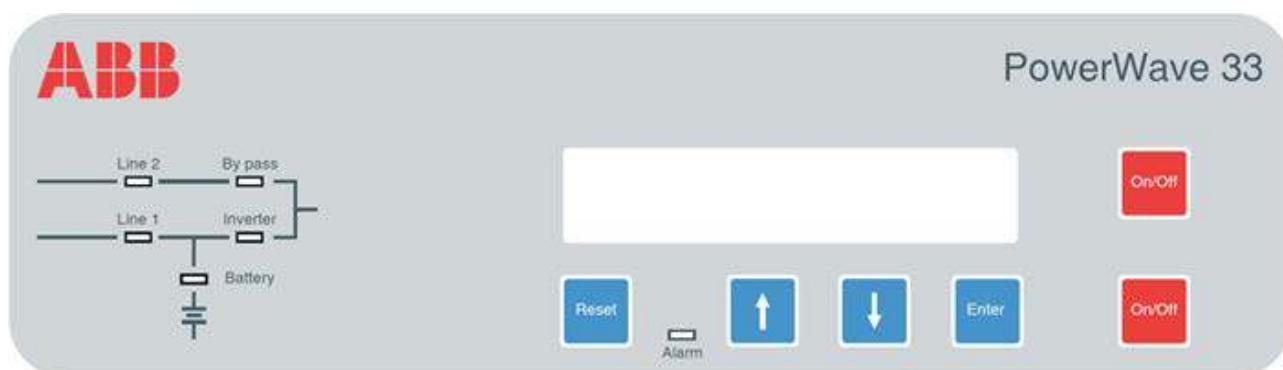


Figure 1: Display & Mimic diagram of PowerWave 33 S3.

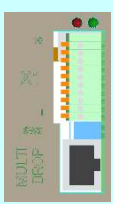
## 6.2 Customer inputs

The customer input interfaces are standard for each model and are located in the front bottom part of the unit.

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<sup>2</sup>

Table 1: details of the customer inputs.

Block	Terminal	Contact	Signal	Function
 X1	X1 / 10	GND	GND	<b>12 Vdc source</b> (Max 200mA load)
	X1 / 9	IN	+12Vdc	
	X1 / 8	GND	GND	<b>Remote Shut down</b> (Do not remove the factory mounted bridge until an external remote shut down is connected)
	X1 / 7	IN	+12Vdc	
	X1 / 6	GND	GND	<b>Temperature Battery</b> (If connected, the battery charger current is batt. temperature dependent)
	X1 / 5	IN	+3.3Vdc	
	X1 / 4	GND	GND	<b>Customer IN 1</b> (Function on request, to be defined)
	X1 / 3	IN	+12Vdc	
	X1 / 2	GND	GND	<b>GEN_OPERATION</b> (NC = Generator ON)
	X1 / 1	IN	+12Vdc	

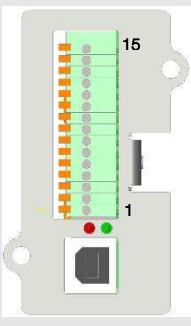
## 6.3 Customer outputs (optional usb port & relay card)

The customer output interfaces are on an optional relay card which goes into slot 2 of the UPS.

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<sup>2</sup>

Table 2: details of the customer outputs + USB on the relay card.

Block	Terminal	Contact	Signal	On Display	Function
 X2	X2 / 15	C	ALARM	COMMON_ALARM	Common
	X2 / 14	NC			NO Alarm Condition
	X2 / 13	NO			<b>Common Alarm</b> (System)
	X2 / 12	C	Message	LOAD_ON_MAINS	Common
	X2 / 11	NC			(Load on Inverter)
	X2 / 10	NO			<b>Load on bypass</b> (Mains)
	X2 / 9	C	ALARM	BATT_LOW	Common
	X2 / 8	NC			Battery OK
	X2 / 7	NO			<b>Battery Low</b>
	X2 / 6	C	Message	LOAD_ON_INV	Common
	X2 / 5	NC			(Load on Mains bypass)
	X2 / 4	NO			<b>Load on Inverter</b>
	X2 / 3	C	ALARM	MAINS_OK	Common
	X2 / 2	NC			<b>Mains Failure</b>
	X2 / 1	NO			Mains Present
+ USB					

## 7 Installation planning

Clearances needed to allow proper airflow on the UPS system and to allow door opening.

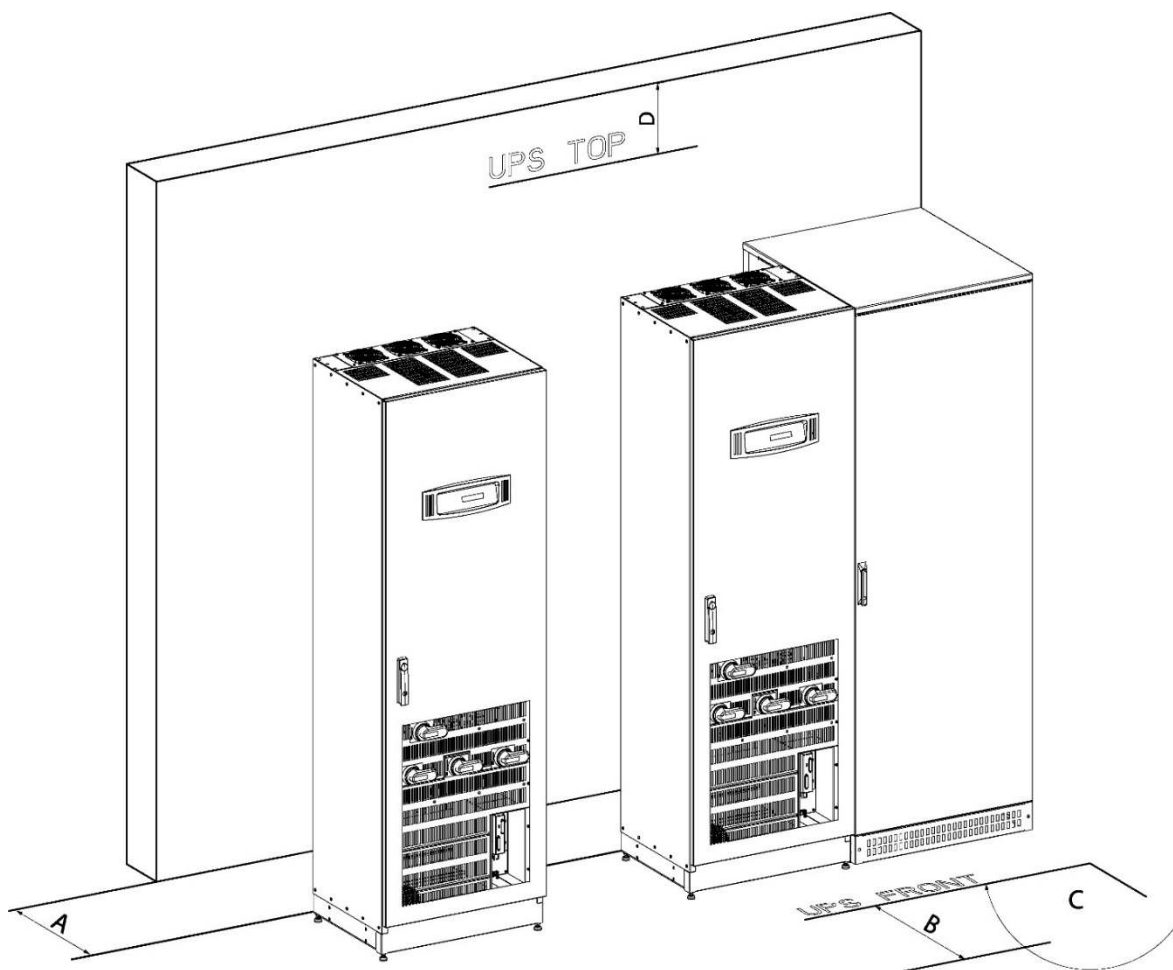


Figure 2: Top view and indication of the minimum clearances for UPS + other cabinets in row.

Table 3: minimum clearances for UPS + other cabinets in row.

<i>PowerWave 33 Series 3 Cabinets</i>		<i>60 / 80 / 100 / 120</i>	<b>UPS + battery cabinets in row.</b>
<b>A</b>	Back clearance for ventilation (forced air outlet)	0 mm	100mm <sup>4)</sup>
<b>B</b>	Front clearance needed to allow a correct door opening	1000 mm	
<b>C</b>	Maximum door opening angle	115°	
<b>D</b>	Top Clearance (Top clearance is only needed if there is no side clearance)	400 mm	

<sup>4)</sup> Battery cabinet requires 100mm clearance for natural ventilation. The UPS does not require any back clearance.

### Accessibility

Totally front accessible for start-up and maintenance

### Positioning

Strictly indoor in a temperature and humidity controlled environment. The UPS can be placed against the wall (back side)

### Power and signals wiring

Front bottom

## 8 Heat dissipation

PowerWave 33 Series 3	kW	60	80	100	120
<b>Air-flow</b>		from front to top			
<b>Heat Dissipation with 100% linear load</b>	<i>W</i>	2850	3800	4750	5700
	<i>BTU</i>	9730	12970	16220	19460
<b>Heat Dissipation with 100% non-lin. load (acc. to 62040-3)</b>	<i>W</i>	3158	4211	5264	6316
	<i>BTU</i>	10778	14371	17964	21557
<b>Airflow (25° - 30°C) with 100% non-lin. load</b>	<i>m<sup>3</sup>/h</i>	1600	1300	1500	1600
<b>Heat Dissipation without load</b>	<i>W</i>	410	530	640	640

## 9 Cable and fuse recommendations

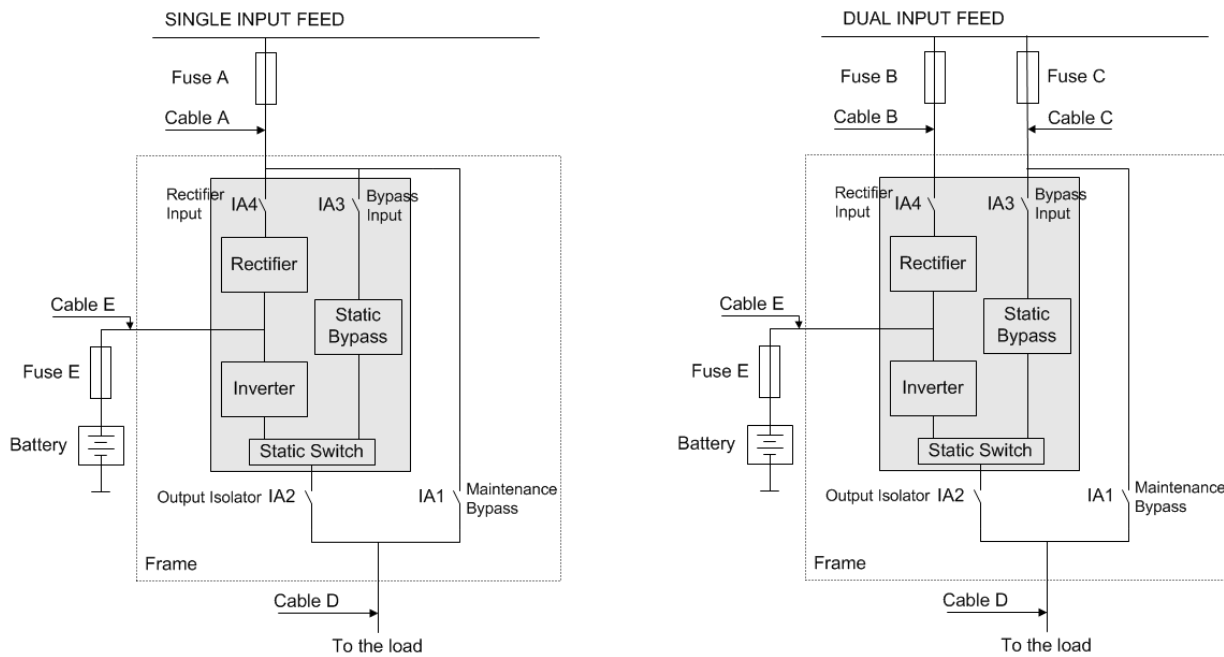


Figure 3: block diagram PowerWave 33 S3 60-120kW

Cable Sections and fuse ratings recommended according to (IEC 60950-1).  
Alternatively, local standards to be respected!

Table 4: SINGLE INPUT FEED (CABLE LINKS TO ACHIEVE SINGLE INPUT ARE OPTIONAL)

Rated output power	Fuse A Type:gL or CB (qty. x A)	Cable A (qty. x mm <sup>2</sup> )	Cable D (qty. x mm <sup>2</sup> )	Fuse E Type:gR or CB (qty. x A)	Cable E (qty. x mm <sup>2</sup> )
60 kW	3x100	5x(1x35)	5x(1x35)	2x160	2x(1x50)
80 kW	3x125	5x(1x50)	5x(1x50)	2x200	2x(1x95) @ 42-45 batt. blocks 2x(1x70) @ 46-50 batt. blocks
100 kW	3x160	5x(1x70)	5x(1x70)	2x250	2x(1x120) or 2x(2x50) @ 42-45 batt. blocks 2x(1x95) @ 46-50 batt. blocks
120 kW	3x200	5x(1x95)	5x(1x95)	2x300	2x(1x150) or 2x(2x50) @ 42-45 batt. blocks 2x(1x120) or 2x(2x50) @ 46-50 batt. blocks

Table 5: DUAL INPUT FEED (STANDARD VERSION)

Rated output power	Fuse B Type:gL or CB (qty. x A)	Cable B (qty. x mm <sup>2</sup> )	Fuse C Type:gL or CB (qty. x A)	Cable C (qty. x mm <sup>2</sup> )	Cable D (qty. x mm <sup>2</sup> )	Fuse E Type:gR or CB	Cable E (qty. x mm <sup>2</sup> )
60 kW	3x100	5x35	3x100	5x35	5x35	2x160	2x(1x50)
80 kW	3x125	5x50	3x125	5x50	5x50	2x200	2x(1x95) @ 42-45 batt. blocks 2x(1x70) @ 46-50 batt. blocks
100 kW	3x160	5x70	3x160	5x70	5x70	2x250	2x(1x120) or 2x(2x50) @ 42-45 batt. blocks 2x(1x95) @ 46-50 batt. blocks
120 kW	3x200	5x95	3x200	5x95	5x95	2x300	2x(1x150) or 2x(2x50) @ 42-45 batt. blocks 2x(1x120) or 2x(2x50) @ 46-50 batt. blocks

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