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PowerScale 10-50 kVA
User Manual

Power and productivity
for a better world™

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GENERAL CONTENTS OF THE USER MANUAL PowerScale

10.10 BATTERY AUTONOMIES

10.11 INSTALLATION PLANNING

10.12 WIRING AND BLOCK DIAGRAMS FOR ALL UPS FRAMES

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 certified service partners.

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

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

When operating in parallel configuration, each POWERSCALE can take the leadership role avoiding single points of failure in the parallel chain ensuring the highest level of power availability.

The most demanding IT infrastructures start 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. POWERSCALE 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 POWERSCALE that can support to give answers to tender and end-user requirements. The POWERSCALE was designed to respond to the most stringent safety, EMC and other important UPS standards.

POWERSCALE is a stand-alone UPS which can be paralleled for power protection increase and/or for redundancy purpose. It offers 7 different power ranges: 10-15-20-25-30-40-50kVA in three different cabinet sizes.
Up to 20 UPS can be paralleled together to achieving any redundant power capacity with common or separate battery configuration.

CONTENTS SECTION-1

1.1 SAFETY INSTRUCTIONS

1.1.1 DESCRIPTION OF SYMBOLS USED IN THIS MANUAL

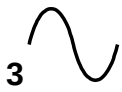
WARNING! **THERE IS DANGER OF AN ELECTRICAL IMPACT**

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 direct current or voltage may be applied or supplied.



Three-phase alternating current

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.

THE MANUFACTURER 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, 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 (Safety) and EN 62040-2 (EMC) is enclosed in Annexe (1)

Safety	IEC/EN 62040-1, IEC/EN 60950-1	
Electromagnetic Compatibility	IEC/EN 62040-2, IEC/EN61000-3-2, IEC/EN61000-6-2,	
EMC Classification for	10kVA	15-50kVA
Emission Class	C2	C3
Immunity Class	C3	
Performance	IEC/EN62040-3	
Product certification	CE	
Degree of protection	IP 20	

1.1.6 INQUIRIES

Address inquiries about the UPS and battery cabinet to the local office or agent certified by the manufacturer. Please note the type code and the serial number of the equipment and contact your nearest agent certified by the manufacturer.

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

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 POWERSCALE 10-20KVA CABINET A

PowerScale Cabinet A				
				
Power range	kVA	10	15	20
Dimensions (WxHxD)	mm	345x720x710		
Weight without battery	kg	60	62	64
Weight with battery with 48 block of 7Ah	kg	180	182	184
with standard packaging	kg	+ 4		
Colour		Graphite grey (RAL 7024)		

1.2.2 MECHANICAL CHARACTERISTICS POWERSCALE 10-25KVA CABINET B

PowerScale Cabinet B					
					
Max. Power connection	kVA	10	15	20	25
Dimensions (WxHxD)	mm	345x1045x710			
Weight without battery	kg	88	90	92	94
Weight with battery with 96 block of 7Ah	kg	328	330	332	334
with standard packaging	kg	+ 5			
Colour		Graffito grey (RAL 7024)			

1.2.3 MECHANICAL CHARACTERISTICS POWERSCALE 25-50KVA CABINET C

PowerScale Cabinet C					
					
Max. Power connection	kVA	25	30	40	50
Dimensions (WxHxD)	mm	440x1400x910			
Weight without battery	kg	(9Ah/28Ah) 151/135	(9Ah/28Ah) 160/145	9Ah/28Ah 165/150	9Ah/28Ah 170/155
Weight with battery					
144 blocks of 7/9Ah	kg	540	550	555	560
48 blocks of 28Ah	kg	605	615	620	625
with standard packaging	kg	+ 5			
Colour		Graffito grey (RAL 7024)			

1.2.4 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 disturbances, 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.

1.2.4.1 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% 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

1.2.4.2 Feature : Flexible Battery Management (FBM)

The Flexible Battery Management (FBM) has been designed in all 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 preserve 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
- Wide range of number of battery blocks (16-50(*) 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.

(*) depending of the effective load in kW used by system.

1.2.4.3 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 twenty 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 PowerScale version of UPS.

1.2.5 QUALITY STANDARDS AND UPS CLASSIFICATION CODE

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

The unique PowerScale 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 for the design and manufacture correspond to the most stringent quality standards.

The manufacturer 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 UPS has the **Classification Code VFI-SS-111.**

1.2.6 SINGLE/PARALLEL CONFIGURATIONS

Single UPS Configuration:

Parallel UPS Configurations:

It is possible to parallel a PowerScale UPS (up to 20 units) in order to increase power capacity or for power redundancy purpose.

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).**

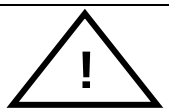
1.3.2 RECEIPT OF THE UPS AND VISUAL INSPECTION

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
- The manufacturer

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 !!

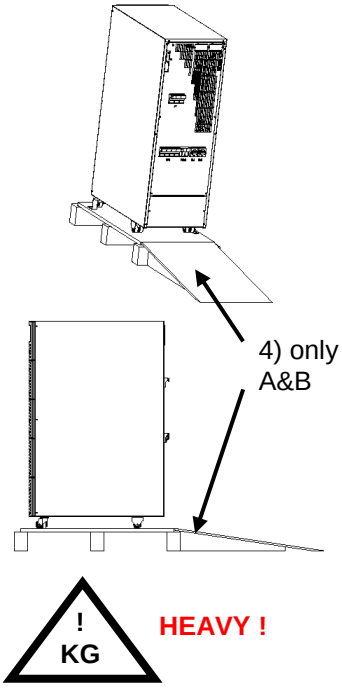
OTHER CLAIM FOR SHIPPING DAMAGE MUST BE FILED IMMEDIATELY TOO AND THE CARRIER MUST BE INFORMED WITHIN 7 DAYS OF RECEIPT OF THE EQUIPMENT. THE PACKING MATERIALS SHOULD BE STORED FOR FURTHER INVESTIGATION.

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:

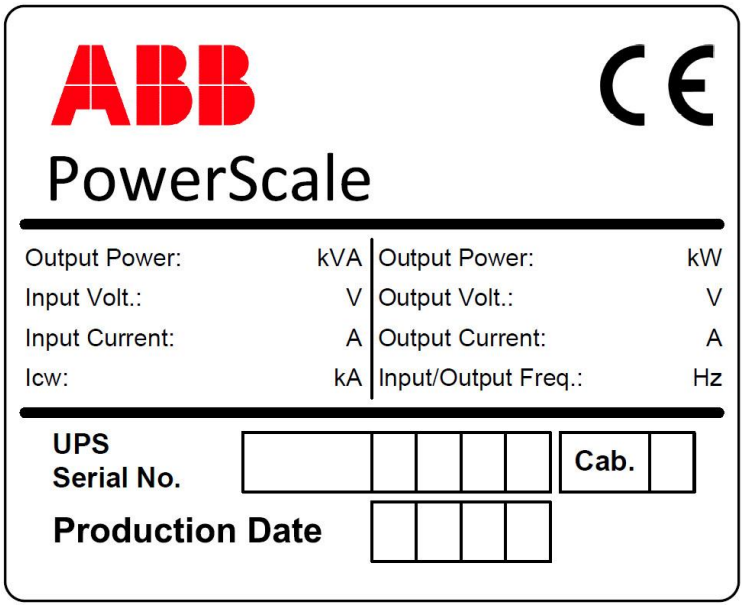
1) Examine the UPS for any sign of damage. Notify your carrier or supplier immediately if damage is apparent;
2) Cut the two bands;
3) Remove the plastic cover from the UPS;
4) Add the enclosed ramp at the rear side of the cabinet and roll the UPS down (only for cabinets A&B);
5) Remove the UPS from the pallet with a forklift (for cabinet C).



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 of the UPS. Check if it corresponds to the purchased material mentioned in the delivery note. For cabinets A&B the nameplate will be positioned on the rear side, for cabinet C at the front behind the cover.



TYPE	PRODUCT DESCRIPTION	DIMENSIONS
PS1	PowerScale 10-20 kVA	Cabinet A (345x720x710mm)
PS2	PowerScale 10-25 kVA	Cabinet B (345x1045x710mm)
PS3	PowerScale 25-50 kVA	Cabinet C (440x1400x910mm)

1.3.5 BATTERIES AND STORAGE

The standard batteries of the UPS are sealed, maintenance-free batteries, usually mounted in UPS cabinet (external battery cabinet as option) 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, the manufacturer 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 DEEP-DISCHARGE WILL DESTROY BATTERIES!

1.3.5.2 Storage of UPS

If you plan to store the UPS prior to use, keep the UPS with its original packaging in a storage room with an ambient temperature between (+20°C to +25°C) if the UPS contains batteries, with a temperature between (-25°C to +70°C) without batteries and humidity of less than 95% non-condensing for both cases.

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 installed inside a room where:

- Humidity and temperature don't exceed the limits: humidity =< 95 % non-condensing and temperature between 0°C and +40°C. However an ambient temperature of +20°C to +25°C is recommended to achieve a long life of the UPS and batteries
- Fire protection standards are respected
- Cabling can be performed easily
- On cabinet A and B front, rear and side access is necessary for service and maintenance. On cabinet C front and side access is necessary for service and maintenance. Side access required for battery service
- Requested air cooling flow should be granted. The cooling air entering the UPS must not exceed +40°C.
- 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
- The floor material should be non-flammable and strong enough to support the heavy physical 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.

1.4.2.2 Positioning

UPS : A minimum 200 mm 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 Fig. 1 and 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.

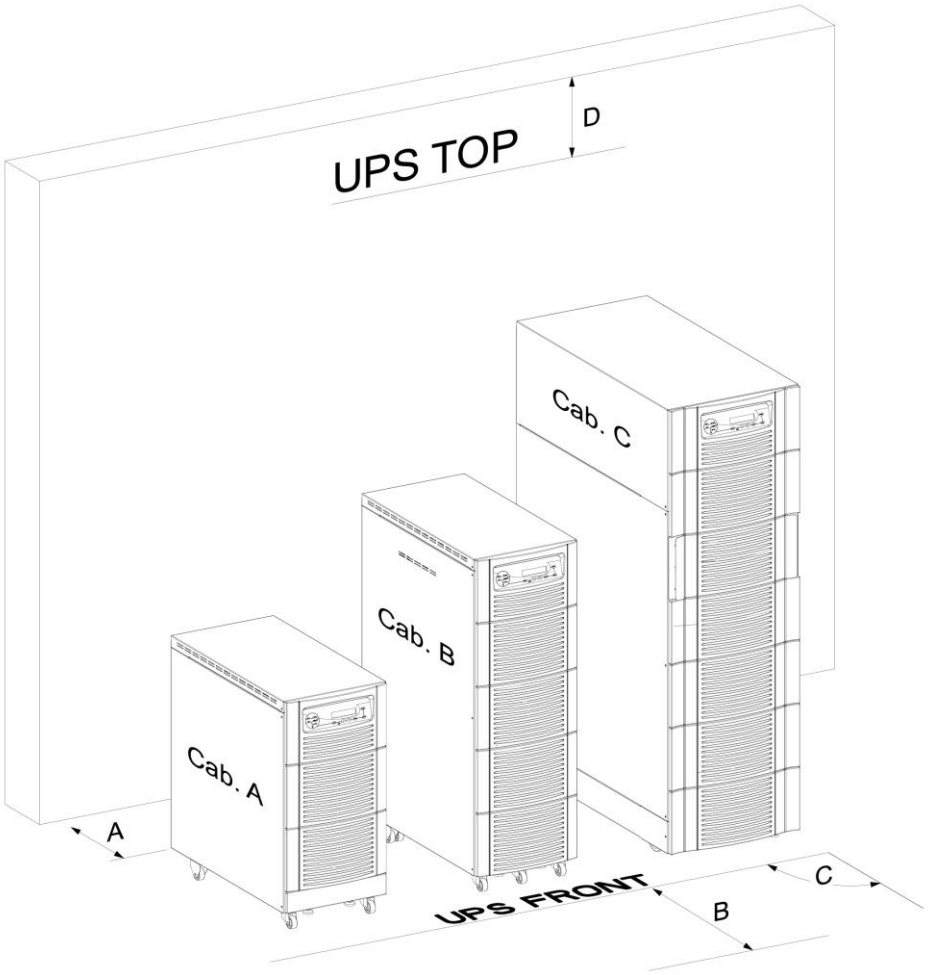
WARNING!

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 certified by the manufacturer.



PowerScale Cabinets		*Cab. A*	*Cab. B*	*Cab. C*
A	Back clearance for ventilation (forced air outlet) / access for wiring in case the unit cannot be pulled forward	200 / 500 mm	200 / 500 mm	200 mm / front wiring
B	Front clearance for pulling the unit forward (to get rear access for wiring or side access for battery replacement)	800 mm	800 mm	1000 mm
C	Maximum door opening angle (there is no door)	-	-	-
D	Top Clearance, not needed	0 mm	0 mm	0 mm
	Side clearance R for vent. (natural air-exchange) / access for battery replacement in case the unit cannot be pulled forward	50 / 800 mm	50 / 800 mm	0 / 800 mm
	Side clearance L for ventilation (natural air-exchange)	50 mm	50 mm	0 mm

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 certified 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 CERTIFIED 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*

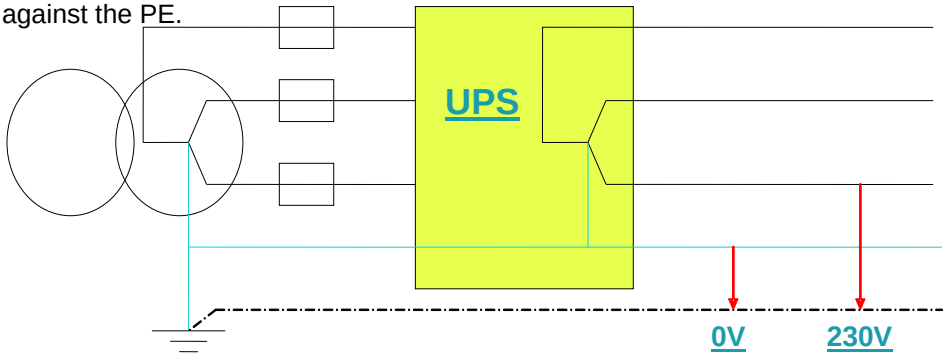
Load (Out) : **Three-phase** (3L1, 3L2, 3L3), Neutral (3N) and protective earth (PE)
connection for the *load output*

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, when open, the system - UPS and all downstream equipment - are floating against the PE.



1.5.1 PREPARATION FOR THE INPUT CABLING

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

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).

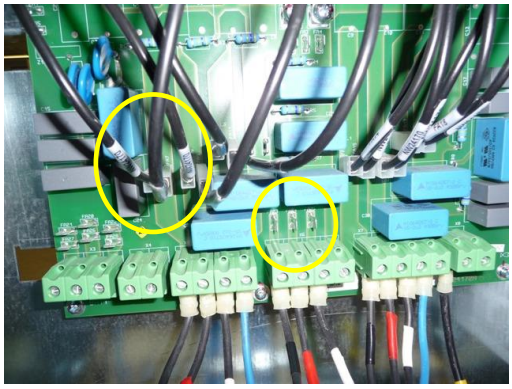
1.5.1.2 Single Input Feed

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:

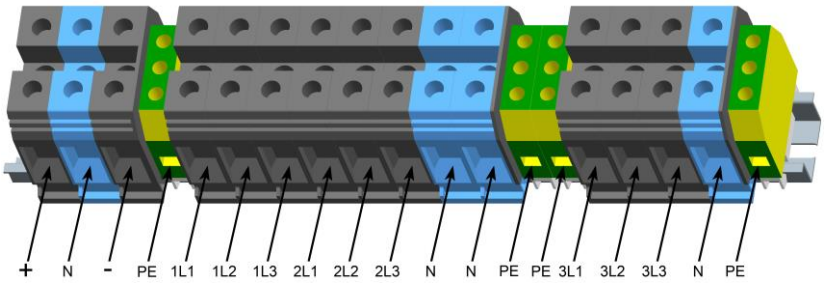
MAINS INPUT CABLE	UPS TERMINAL
Phase L1	1L1
Phase L2	1L2
Phase L3	1L3
NEUTRAL	1N
EARTH	PE

Cabinets A&B



Cabinet C

For single input feed it is possible to use both terminals (mains or bypass)



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

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).

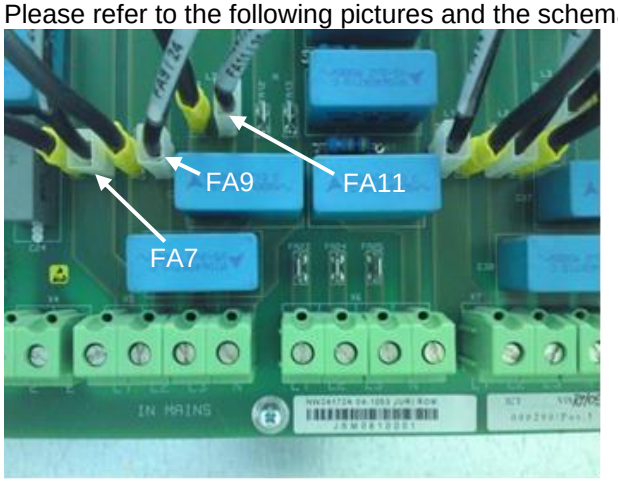
Procedure to convert from Single to Dual Input Feed for Cabinet C
Simply unscrew and remove the Terminal Bridges between 1L1-2L1, 1L2-2L2, 1L3-2L3, as shown in the picture below.

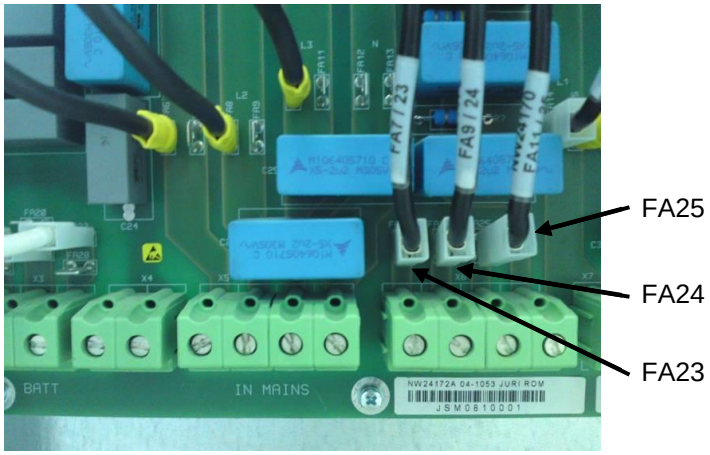
UPS TERMINAL Rectifier		UPS TERMINAL Bypass
1L1	●	
1L2	●	
1L3	●	
1N	●	● 2N
PE	●	
		● 2L1
		● 2L2
		● 2L3

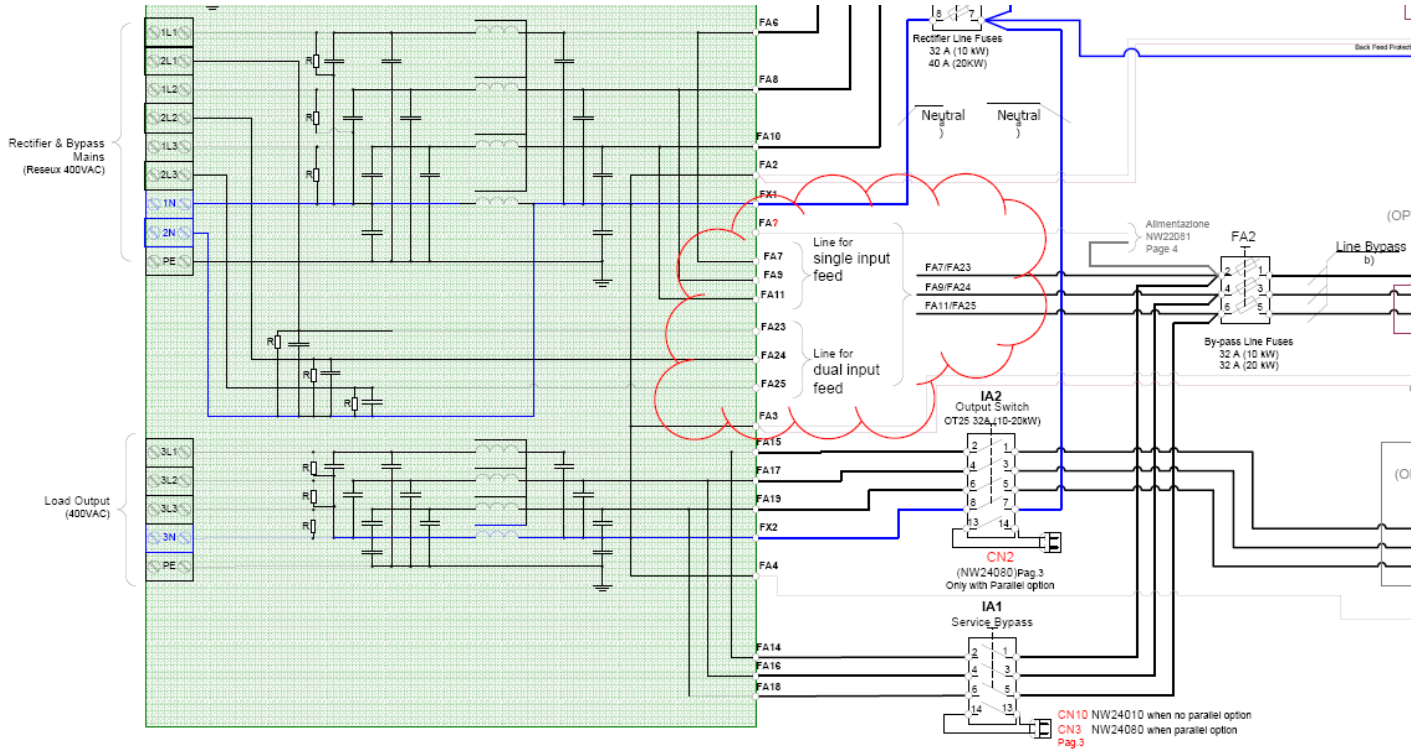
Procedure to convert from Single to Dual Input Feed for Cabinet A & B
On the distribution PCB, NW24170 (for 10kVA unit) or NW24172 (for 15-20kVA unit) unplug and reconnect the three wires as follows:

L1: unplug from FA7 and reconnect to FA23,
L2: unplug from FA9 and reconnect to FA24,
L3: unplug from FA11 and reconnect to FA25.

Please refer to the following pictures and the schematic below:







Dual Input Feed connections for Cabinet A,B,C

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*

1.5.1.4 Preparation for the Output Cabling

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.

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 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, chapter 2.1.3* (Front view of the PowerScale)

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.
- ☐ 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)
- ☐ Start-up and operational checks performed by certified service personnel.
- ☐ All network connections are completed.

CONTENTS SECTION-2

2.1 BLOCK DIAGRAM

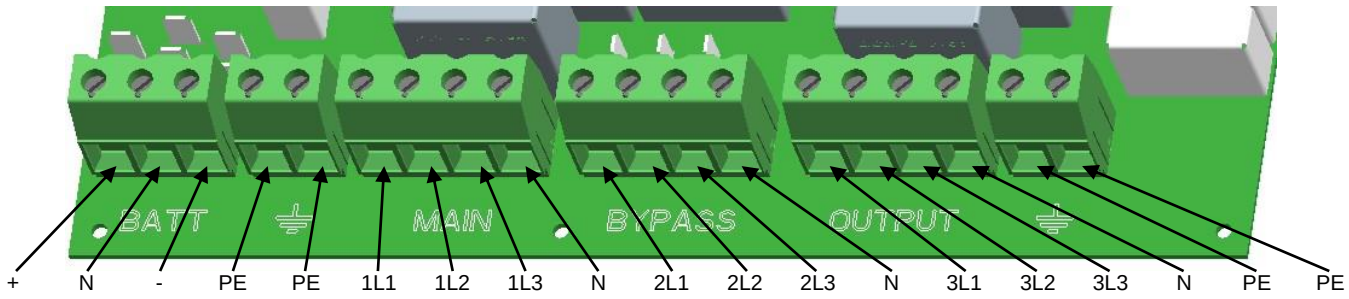
2.1.1 WIRING AND BLOCK DIAGRAMS

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 certified by the manufacturer.

2.1.2 RECOMMENDED CABLE SECTIONS & FUSE RATINGS

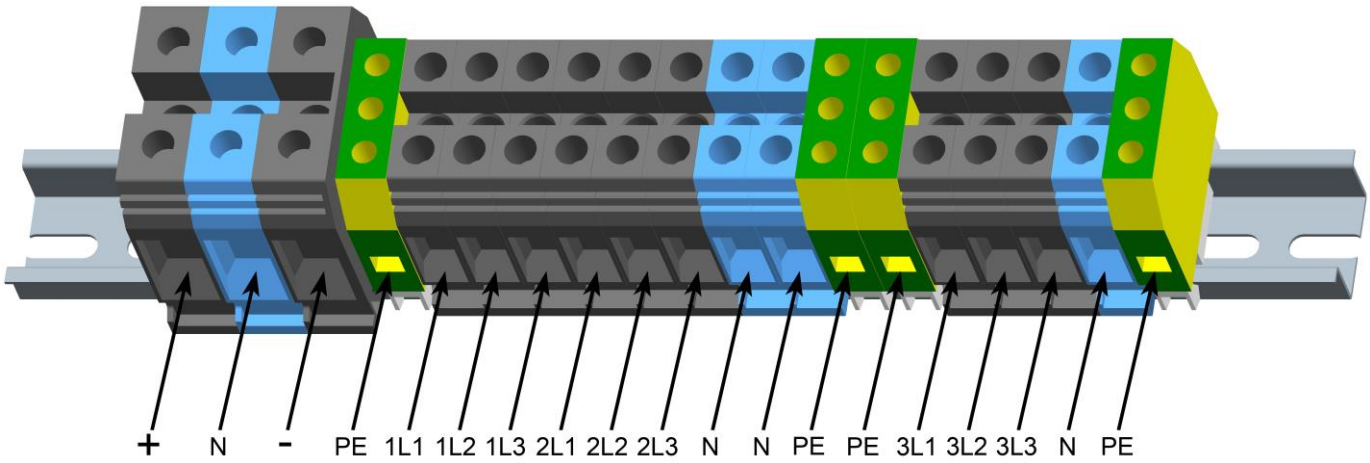
2.1.2.1 Cabinet A (10-15-20 kVA) & Cabinet B (10-15-20-25 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm^2]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm^2]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm^2]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm^2]	**Tightening Torque** [Nm]
4 x 16	**5 x 16**	**5 x 16**	**5 x 16**	**1.5**



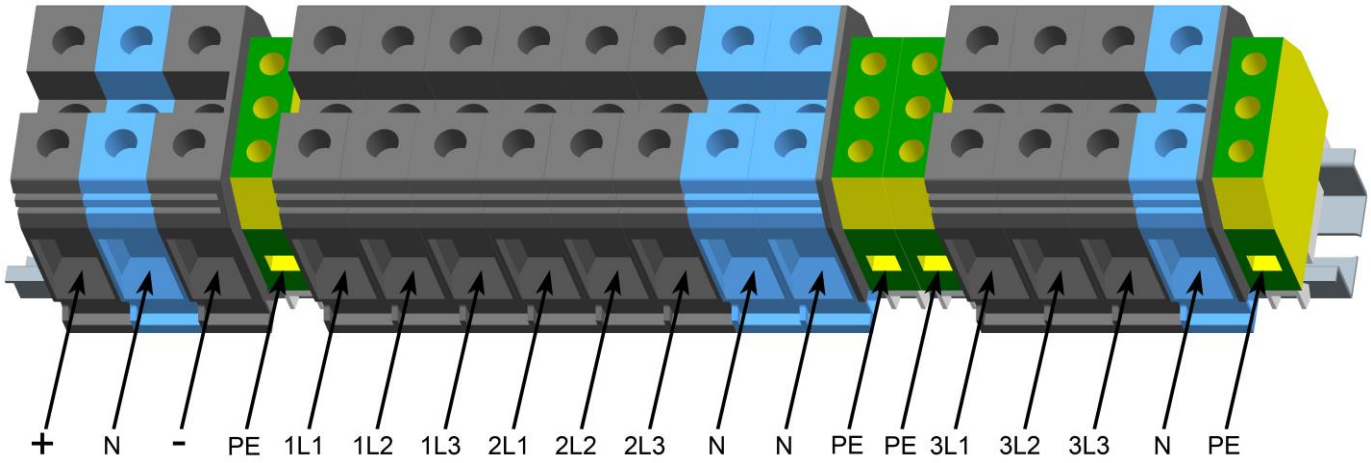
2.1.2.2 Cabinet C (25-30 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm^2]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm^2]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm^2]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm^2]	**Tightening Torque** [Nm]
(+ / N / -): **3 x 35** PE: **1 x 16**	**5 x 16**	**5 x 16**	**5 x 16**	35 mm^2: **3.5** 16 mm^2: **1.5**



2.1.2.3 Cabinet C (40-50 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm²]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm²]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm²]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm²]	**Tightening Torque** [Nm]
(+ / N / -): **3 x 35** PE: **1 x 16**	1L1, 1L2, 1L3 + N: **4 x 35** PE: **1 x 16**	2L1, 2L2, 2L3 + N: **4 x 35** PE: **1 x 16**	3L1, 3L2, 3L3 + N: **4 x 35** PE: **1 x 16**	35 mm²: **3.5** 16 mm²: **1.5**



2.1.3 CONNECTION DIAGRAM POWERSCALE

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

Block Diagram

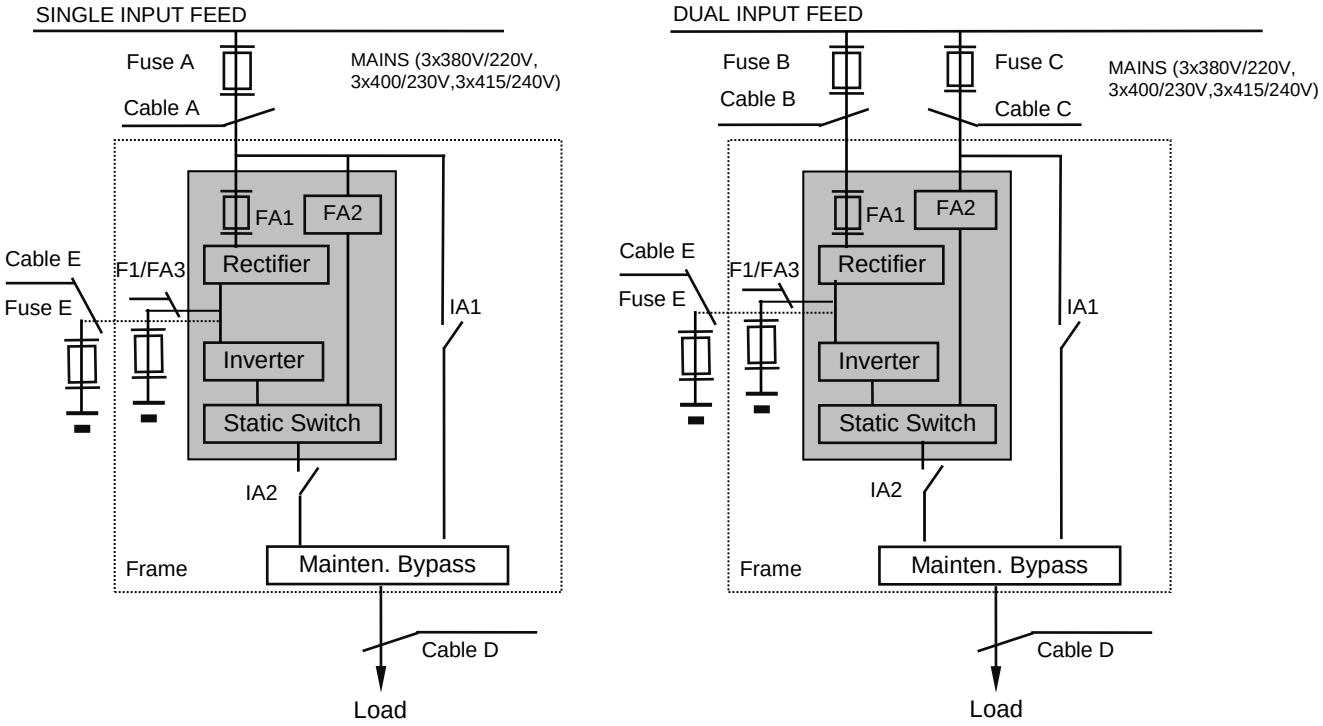


Figure 3: Block Diagram POWERSCALE from 10-50 kVA

SINGLE INPUT FEED – Cable sections and fuse ratings recommended according to IEC 60950-1

Power [kVA]	**UPS Cabinet**	**Fuse A** 1L1, 1L2, 1L3 [quantity x A]	**Cable A** 1L1, 1L2, 1L3, N, PE [quantity x mm²]	**Cable D** 3L1, 3L2, 3L3, N, PE [quantity x mm²]	**Fuse E** +, N, -, PE [quantity x A]	**Cable E** +, N, -, PE [quantity x mm²]
10	A, B	3 x 20	5 x 2.5	5 x 2.5	3 x 32	4 x 4
15	A, B	3 x 32	5 x 4	5 x 4		
20	A, B	3 x 40	5 x 6	5 x 6	3 x 50	4 x 10
25	B, C					
30	C	3 x 63	5 x 10	5 x 10	3 x 80	4 x 16
40	C	3 x 80	*(1L1, 1L2, 1L3, N)*: 4 x 25 *(PE)*: 1 x 16	*(3L1, 3L2, 3L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 100	*(+, N, -)*: 3 x 25 *(PE)*: 1 x 16
50						

DUAL INPUT FEED – Cable sections and fuse ratings recommended according to IEC 60950-1

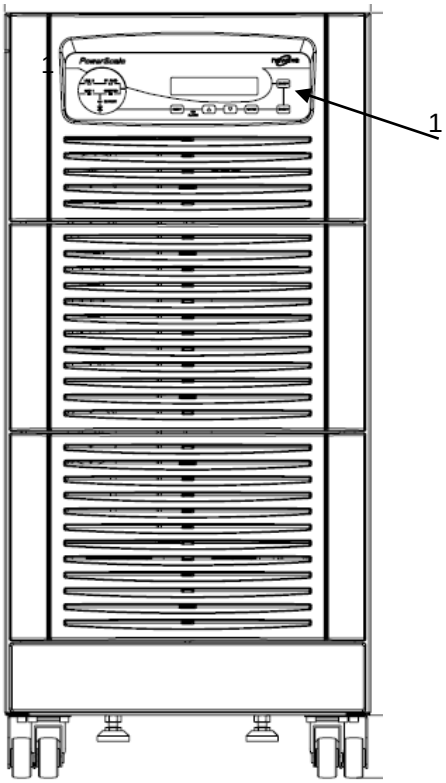
Power [kVA]	**UPS Cabinet**	**Fuse B** 1L1, 1L2, 1L3 [quantity x A]	**Cable B** 1L1, 1L2, 1L3, N, PE [quantity x mm²]	**Fuse C** 2L1, 2L2, 2L3 [quantity x A]	**Cable C** 2L1, 2L2, 2L3, N, PE [quantity x mm²]	**Cable D** 3L1, 3L2, 3L3, N, PE [quantity x mm²]	**Fuse E** +, N, -, PE [quantity x A]	**Cable E** +, N, -, PE [quantity x mm²]
10	A, B	3 x 20	5 x 2.5	3 x 20	5 x 2.5	5 x 2.5	3 x 32	4 x 4
15	A, B	3 x 32	5 x 4	3 x 32	5 x 4	5 x 4		
20	A, B	3 x 40	5 x 6	3 x 40	5 x 6	5 x 6	3 x 50	4 x 10
25	B, C							
30	C	3 x 63	5 x 10	3 x 63	4 x 10	5 x 10	3 x 80	4 x 16
40	C	3 x 80	*(1L1, 1L2, 1L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 80	*(2L1, 2L2, 2L3, N)*: 4 x 25 *(PE)*: 1 x 16	*(3L1, 3L2, 3L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 100	*(+, N, -)*: 3 x 25 *(PE)*: 1 x 16
50								

2.2 FRONT and REAR VIEW

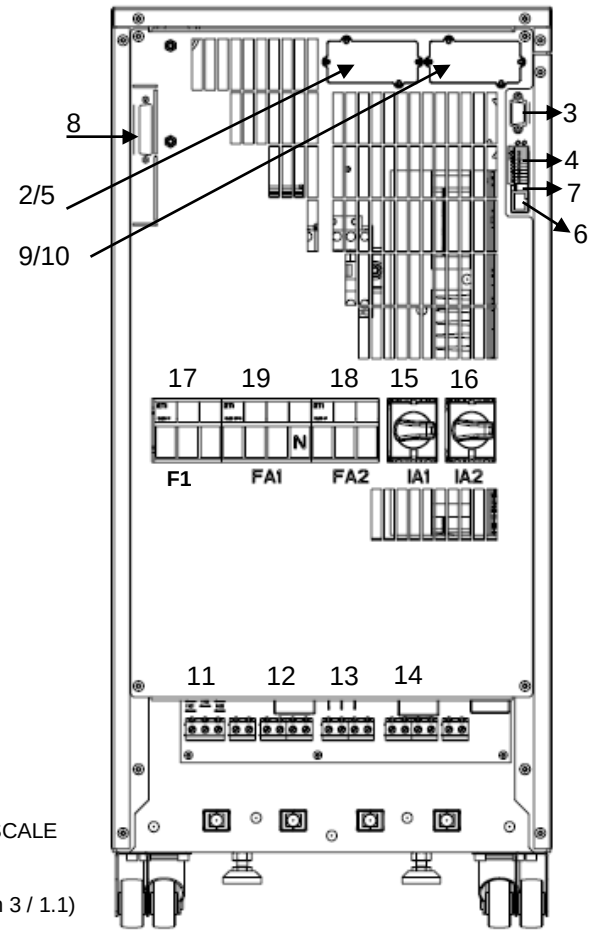
2.2.1 FRONT AND REAR VIEW OF POWERSCALE CABINET A

2.2.1.1 Front and Rear View PowerScale 10-20kVA in Cabinet A and Connection Terminals

FRONT VIEW



REAR VIEW

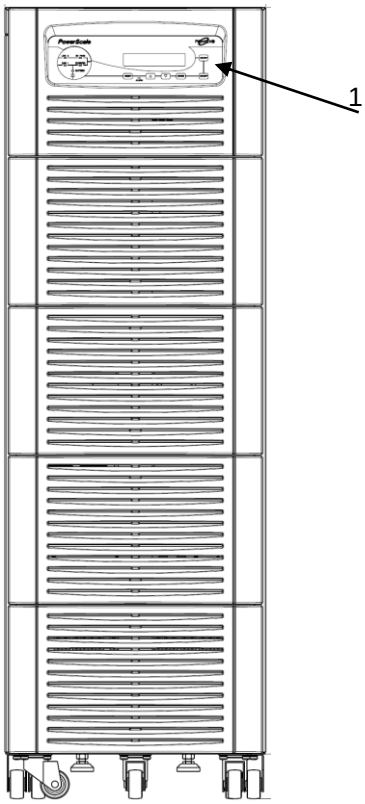


1	PMD	Power Management Display (PMD) of POWERSCALE
2	USB	PC Interface (Slot 1 Option)
3	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
4	X1	Customer Inputs
5	X2	Customer interface on Phoenix Terminals (Slot 1 Option): X2= Potential free contacts (detail see Section 3 / 1.2)
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 (Option)
	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 2.1.2
13	Input Bypass terminal for Dual Input feed	pag.2
14	Output Load terminal	
15	IA1	Maintenance Bypass
16	IA2	Parallel Isolator
17	F1 Battery Fuse A/B	
18	FA2 Bypass Line Fuse	
19	FA1 Rectifier Fuse	

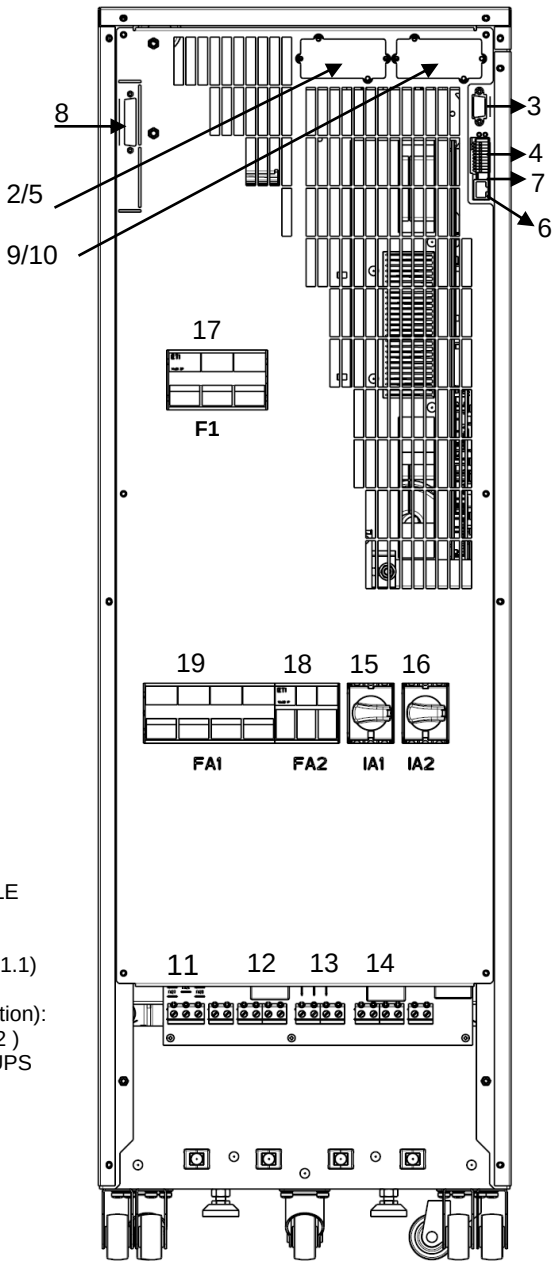
2.2.2 FRONT AND REAR VIEW OF POWERSCALE CABINET B

2.2.2.1 Front and Rear View PowerScale 10-25kVA in Cabinet B and Connection Terminals

FRONT VIEW



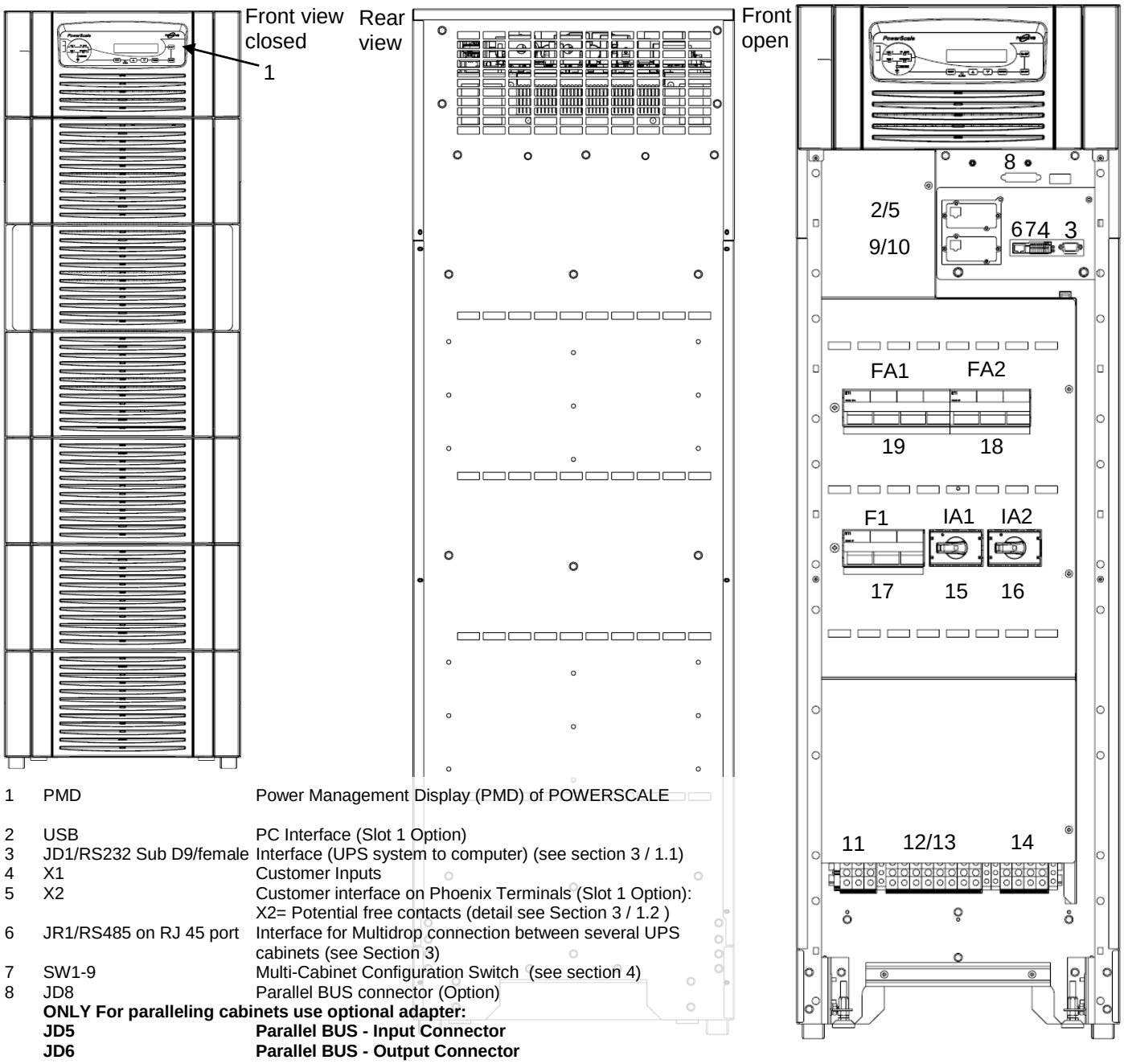
REAR VIEW



1	PMD	Power Management Display (PMD) of POWERSCALE
2	USB	PC Interface (Slot 1 Option)
3	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
4	X1	Customer Inputs
5	X2	Customer interface on Phoenix Terminals (Slot 1 Option): X2= Potential free contacts (detail see Section 3 / 1.2)
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 (Option)
	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 2.1.2
13	Input Rectifier terminal for Single feed	pag. 2
14	Output Load terminal	
15	IA1 Maintenance Bypass	
16	IA2 Parallel Isolator	
17	F1 Battery Fuse A/B	
18	FA2 Bypass Line Fuse	
19	FA1 Rectifier Fuse	

2.2.3 FRONT AND REAR VIEW OF POWERSCALE CABINET C

2.2.3.1 Front and Rear View PowerScale 25-50kVA in Cabinet C and Connection Terminals



1	PMD	Power Management Display (PMD) of POWERSCALE
2	USB	PC Interface (Slot 1 Option)
3	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
4	X1	Customer Inputs
5	X2	Customer interface on Phoenix Terminals (Slot 1 Option): X2= Potential free contacts (detail see Section 3 / 1.2)
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 (Option)
	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 2.1.2
13	Input Rectifier terminal for Single feed	pag. 2
14	Output Load terminal	
15	IA1 Maintenance Bypass	
16	IA2 Parallel Isolator	
17	F1 Battery Fuse A/B	
18	FA2 Bypass Line Fuse	
19	FA1 Rectifier Fuse	

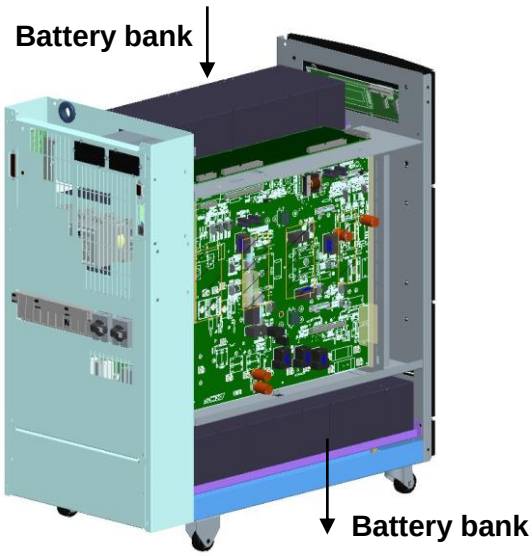
2.3 BATTERY CONNECTIONS

2.3.1 BATTERY BANKS CABINETS A, B, C AND EXTERNAL BATTERY

PowerScale has additional battery enclosure. In the drawing below the Battery enclosures are shown.

NOTE: Within the cabinets A & B in only 7/9Ah batteries are allowed (20-48 blocks), in Cabinet C also 28Ah batteries are allowed

Cabinet A (max. 48 blocks)



Cabinet B (max.96 blocks) (2x48 blocks)

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

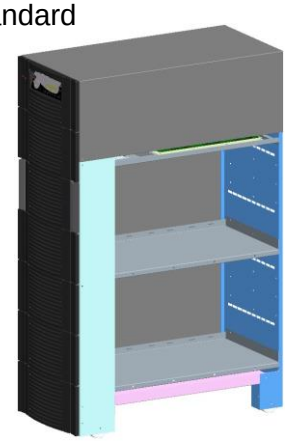
Cabinet C (max 144 blocks, 3x48 7/9Ah or max. 48 blocks 28Ah)

PS-Cabinet-C-48x28Ah

PS-Cabinet-C-96x9Ah

PS-Cabinet-C-144x9Ah

PS-Cabinet-C-Standard



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

Powerscale 10kVA, 9kW

	Load Power					
	6kW		8kW		9kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
6	1 x 24	1 x 20	1 x 32	1 x 24	1 x 34	1 x 26
8	1 x 28	1 x 22	1 x 38	1 x 26	1 x 42	1 x 28
10	1 x 32	1 x 24	1 x 46	1 x 32	1 x 48	1 x 34
12	1 x 40	1 x 28	2 x 26	1 x 36	2 x 30	1 x 40
15	1 x 48	1 x 32	2 x 32	1 x 42	2 x 36	1 x 48
18	2 x 28	1 x 38	2 x 36	1 x 48	2 x 40	2 x 28
20	2 x 30	1 x 40	2 x 40	2 x 28	2 x 44	2 x 30
22					2 x 48	2 x 32
25	2 x 36	1 x 48	2 x 48	2 x 32	n.a.	2 x 36
30	2 x 40	2 x 28	n.a.	2 x 38	n.a.	2 x 42
35	2 x 46	2 x 32	n.a.	2 x 42	n.a.	2 x 48
40	n.a.	2 x 36	n.a.	2 x 48	n.a.	n.a.
60	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
Limit batt min A	20 blocs		24 blocs		26 blocs	
Limit batt min B						

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 15kVA, 13.5kW

	Load Power							
	8kW		10kW		12kW		13.5kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
6	1 x 32	1 x 24	1 x 40	1 x 28	1 x 48	1 x 32		1 x 36
8	1 x 38	1 x 26	1 x 48	1 x 34	2 x 32	1 x 40	2 x 36	1 x 42
10	1 x 46	1 x 32	2 x 28	1 x 40	2 x 34	1 x 48	2 x 40	1 x 48
12	2 x 26	1 x 36	2 x 34	1 x 48	2 x 40		2 x 48	
15	2 x 32	1 x 42	2 x 40	2 x 28	2 x 48	2 x 32	n.a.	2 x 36
18	2 x 36	1 x 48	2 x 46	2 x 32	n.a.	2 x 38	n.a.	2 x 42
20	2 x 40	2 x 28	2 x 48	2 x 36	n.a.	2 x 40	n.a.	2 x 48
25	2 x 48	2 x 32	n.a.	2 x 40	n.a.	2 x 48	n.a.	n.a.
30	n.a.	2 x 38	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
35	n.a.	2 x 42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
40	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
60	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min A	24 blocs		28 blocs		32 blocs		36 blocs	
Limit batt min B								

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 20kVA, 18kW

	Load Power							
	9kW		12kW		16kW		18kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
4					1 x 48			
6	1 x 34	1 x 26	1 x 48	1 x 32		1 x 44		1 x 46
7						1 x 48	2 x 44	
8	1 x 42	1 x 30	2 x 32	1 x 40	2 x 40			
10	2 x 26	1 x 36	2 x 34	1 x 48	2 x 46		2 x 48	
11					2 x 48		n.a.	
12	2 x 30	1 x 40	2 x 40	2 x 32	n.a.	2 x 40	n.a.	2 x 44
15	2 x 36	1 x 48	2 x 48		n.a.	2 x 42	n.a.	2 x 48
17			n.a.		n.a.	2 x 48	n.a.	n.a.
18	2 x 40	2 x 28	n.a.	2 x 38	n.a.	n.a.	n.a.	n.a.
20	2 x 44	2 x 32	n.a.	2 x 40	n.a.	n.a.	n.a.	n.a.
25	2 x 48	2 x 36	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
30	n.a.	2 x 42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min A	26 blocs		32 blocs		40 blocs		44 blocs	
Limit batt min B								

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 25kVA, 22.5kW

	Load Power											
	12kW			16kW			20kW			22.5kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	1 x 48	1 x 32			1 x 44		2 x 46					
8	2 x 32	1 x 40		2 x 40	1 x 48		2 x 48			2 x 48		
10	2 x 34	1 x 48		2 x 46			3 x 40			3 x 46		
12	2 x 40	2 x 28		2 x 48	2 x 40		3 x 44	2 x 46		3 x 48	2 x 48	
13							3 x 48	2 x 48		n.a.		
15	2 x 48	2 x 32	1 x 24	3 x 42	2 x 44		n.a.	3 x 40		n.a.		
18	3 x 36	2 x 38	1 x 24	3 x 48	2 x 48	1 x 34	n.a.	3 x 42	1 x 40	n.a.	3 x 46	1 x 48
20	3 x 38	2 x 40	1 x 28	n.a.	3 x 36		n.a.	3 x 46		n.a.	3 x 48	n.a.
22	3 x 42	2 x 44	1 x 30	n.a.	3 x 38	1 x 40	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
24			1 x 32	n.a.			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	3 x 46	2 x 48		n.a.	3 x 42	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	3 x 48	3 x 34		n.a.	3 x 48		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.		1 x 36	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	3 x 36		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	3 x 38		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.		1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	3 x 40		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	3 x 42		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.		1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	3 x 44		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	3 x 46		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min B	32 blocs			40 blocs			46 blocs			48 blocs		
Limit batt min C	24 blocs			32 blocs			40 blocs			46 blocs		

Cabinet B: max 2 x 48 x 7/9Ah batteries

Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 30kVA, 27kW

	Load Power											
	16kW			20kW			24kW			27kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	2 x 34	1 x 40		2 x 40			2 x 48			3 x 36		
7		1 x 48	1 x 16			1 x 20			1 x 24			1 x 28
8	2 x 40			2 x 48							3 x 28	1 x 30
10	2 x 44	2 x 32			2 x 40			2 x 48		3 x 48		1 x 36
12	2 x 48	2 x 40		3 x 44	2 x 44		3 x 48			n.a.		1 x 42
13				3 x 48	2 x 48		n.a.			n.a.	3 x 48	1 x 44
15	3 x 42	2 x 44		n.a.			n.a.	3 x 48		n.a.	n.a.	1 x 48
18	3 x 48	2 x 48	1 x 34	n.a.	3 x 42	1 x 40	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.
20	n.a.	3 x 36		n.a.	3 x 46		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	3 x 38	1 x 40	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	3 x 42	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	3 x 48		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	16 blocs			20 blocs			24 blocs			28 blocs		

Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 40kVA, 36kW

	Load Power											
	18kW			25kW			32kW			36kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	2 x 36	2 x 22		2 x 48	2 x 32			2 x 48		3 x 48	2 x 48	
7			1 x 18			1 x 26	3 x 48		1 x 32	n.a.	3 x 36	1 x 36
8	2 x 42	2 x 28		3 x 40	2 x 40		n.a.		1 x 34	n.a.		1 x 42
9	2 x 48		1 x 22				n.a.			n.a.	3 x 46	1 x 44
10	3 x 34	2 x 34		3 x 48	2 x 48	1 x 34	n.a.		1 x 40	n.a.	3 x 48	1 x 48
12	3 x 40	2 x 40	1 x 28	n.a.	3 x 38		n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
13	3 x 42	2 x 44		n.a.	3 x 40	1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
15	3 x 48	2 x 48	1 x 32	n.a.	3 x 44		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
16	n.a.	3 x 34		n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
18	n.a.	3 x 38		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
20	n.a.	3 x 40	1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	3 x 44	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.		1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	3 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	18 blocs			26 blocs			32 blocs			36 blocs		

Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 50kVA, 45kW

	Load Power											
	30kW			35kW			40kW			45kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	3 x 40	2 x 40	1 x 30	3 x 48	2 x 48	1 x 34	n.a.			n.a.		
7	3 x 44	2 x 44		n.a.			n.a.	3 x 40	1 x 40	n.a.	3 x 46	1 x 46
8	3 x 48	2 x 48	1 x 34	n.a.	3 x 40	1 x 40	n.a.	3 x 44		n.a.	3 x 48	1 x 48
9	n.a.	3 x 36		n.a.			n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
10	n.a.	3 x 40	1 x 40	n.a.	3 x 44	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
12	n.a.	3 x 44		n.a.	3 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
13	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
15	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
16	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
18	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	30 blocs			34 blocs			40 blocs			46 blocs		

Cabinet C: max 3 x 48 x 7/9Ah batteries

2.3.1.2 Connection of External Battery for PowerScale

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 4 the drawing shows how to connect the batteries in the external battery cabinet and the PowerScale frame.

NOTE!	**ALL THE OPERATIONS IN THIS MANUAL MUST BE PERFORMED BY CERTIFIED 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 **PowerScale** 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

2.3.1.3 Terminals for External Battery connection

External Battery for separate Batteries per UPS

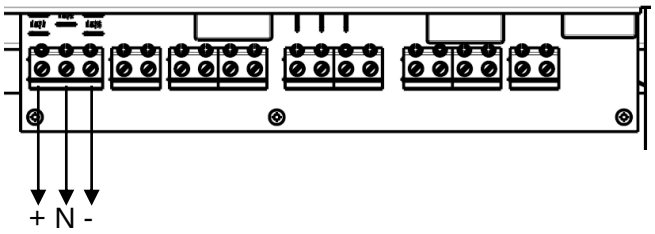


Figure. 4 Connection of external separate batteries

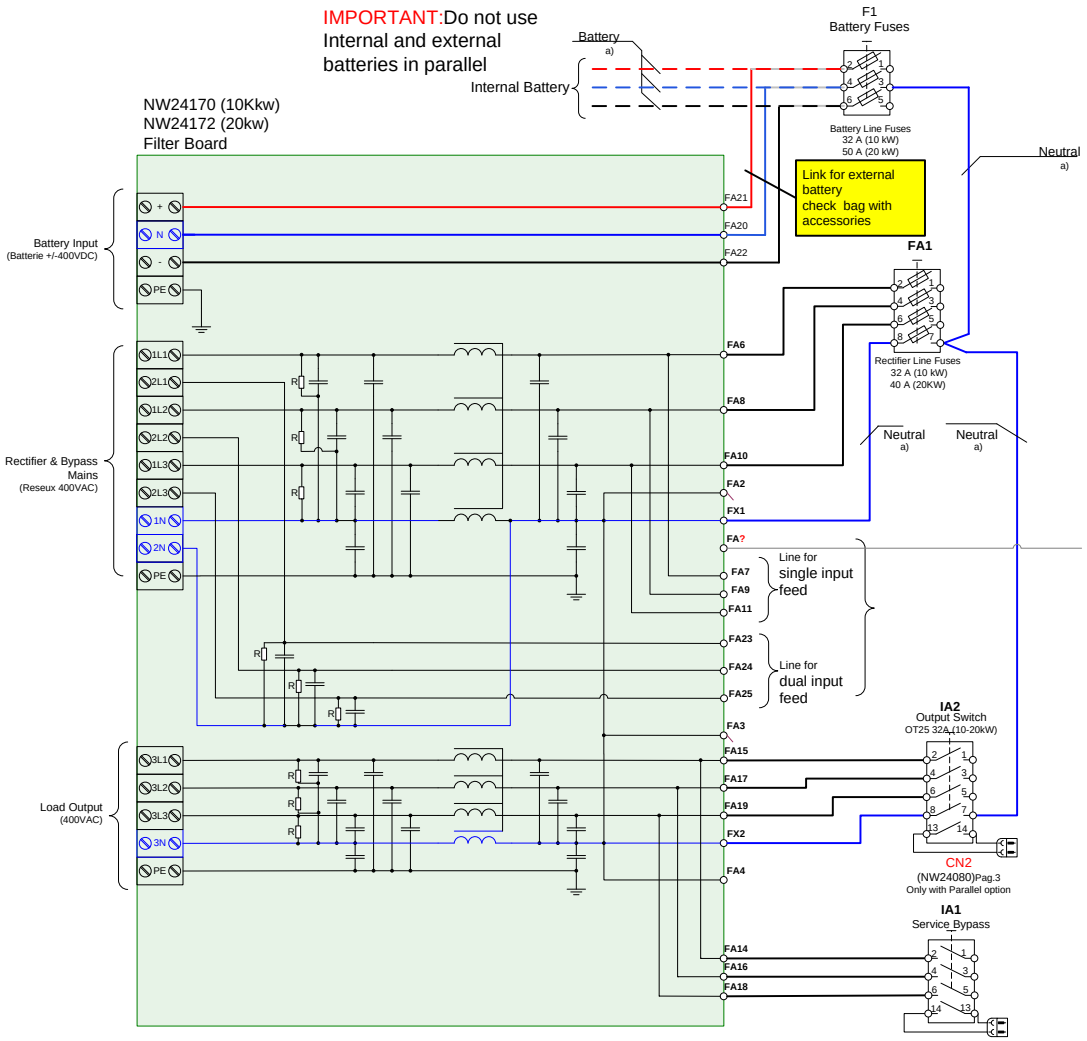


Figure. 5 UPS Configuration with external battery

If the UPS has to be configured with external batteries, the internal battery link to the position of F1 (Battery Fuse) has to be replaced by the short Links delivered separately at the bag of the accessories. The 3 links has to be installed between the following points.

NW24170 / NW 24172	FA21	F1 / 2
NW24170 / NW 24172	FA20	F1 / 4
NW24170 / NW 24172	FA22	F1 / 6

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CONTENTS SECTION-3

3.1 INTERFACING

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

STANDARD ITEMS

RS232 on Sub-D9 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 1 12 vdc source (max. 250 mA)
RJ45 port	For multidrop purpose
Power Management Display (PMD)	LCD display

OPTIONAL ITEMS

Relay card + USB Including: Customer Interfaces: 5 output DRY PORTS RS232 on USB port	• Common alarm • Load on bypass • Battery low • Load on inverter • Mains failure For remote signalling and automatic computer shutdown
SNMP Card (slot already included)	SNMP card For monitoring and integration in network management

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.

The software WAVEMON allows the computer to monitor the mains voltage and the UPS status continuously.

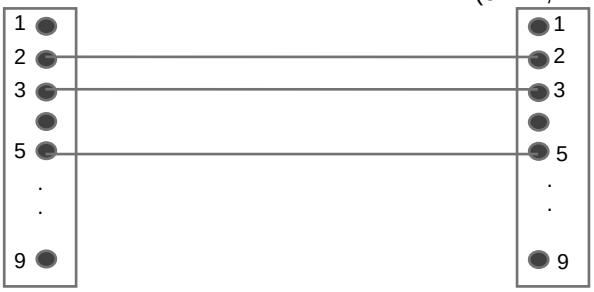
In the event of any changes the computer terminal will display a message. (For details see our Monitoring Package: ***WAVEMON***).

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 Connector Cable - PC Serial Port with 9-Pin Connection

3.1.2 CUSTOMER INTERFACE AND DRY PORTS (TERMINALS X1 STANDARD)

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

3.1.2.1 Input Interfaces Terminal block X1

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

3.1.2.2 Output Interfaces Terminal blocks X1 (option relay card/slot)

- 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.:

STANDARD

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		**GEN_OPERATION**
	X1 / 1	IN	+12Vdc		(NC = Generator ON)

OPTION (relay card and USB (Slot))

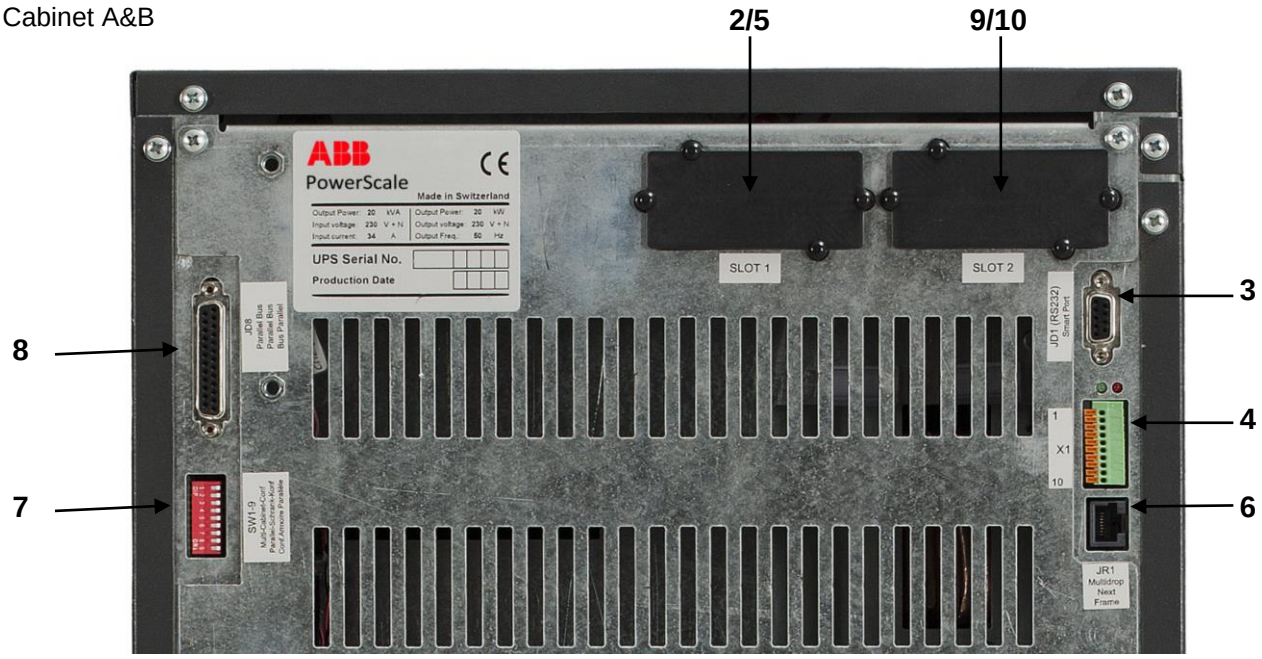
X1	X1 / 15	C	ALARM	COMMON_ALARM	Common
	X1 / 14	NC			NO Alarm Condition
	X1 / 13	NO			**Common Alarm** (System)
	X1 / 12	C	Message	LOAD_ON_MAINS	Common
	X1 / 11	NC			(Load on Inverter)
	X1 / 10	NO			**Load on bypass** (Mains)
	X1 / 9	C	ALARM	BATT_LOW	Common
	X1 / 8	NC			Battery OK
	X1 / 7	NO			**Battery Low**
	X1 / 6	C	Message	LOAD_ON_INV	Common
	X1 / 5	NC			(Load on Mains bypass)
	X1 / 4	NO			**Load on Inverter**
	X1 / 3	C	ALARM	MAINS_OK	Common
	X1 / 2	NC			**Mains Failure**
	X1 /1	NO			Mains Present
	+ USB				

Figure 2 Phoenix Terminals (X1) Connection

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.

Cabinet A&B



Cabinet C

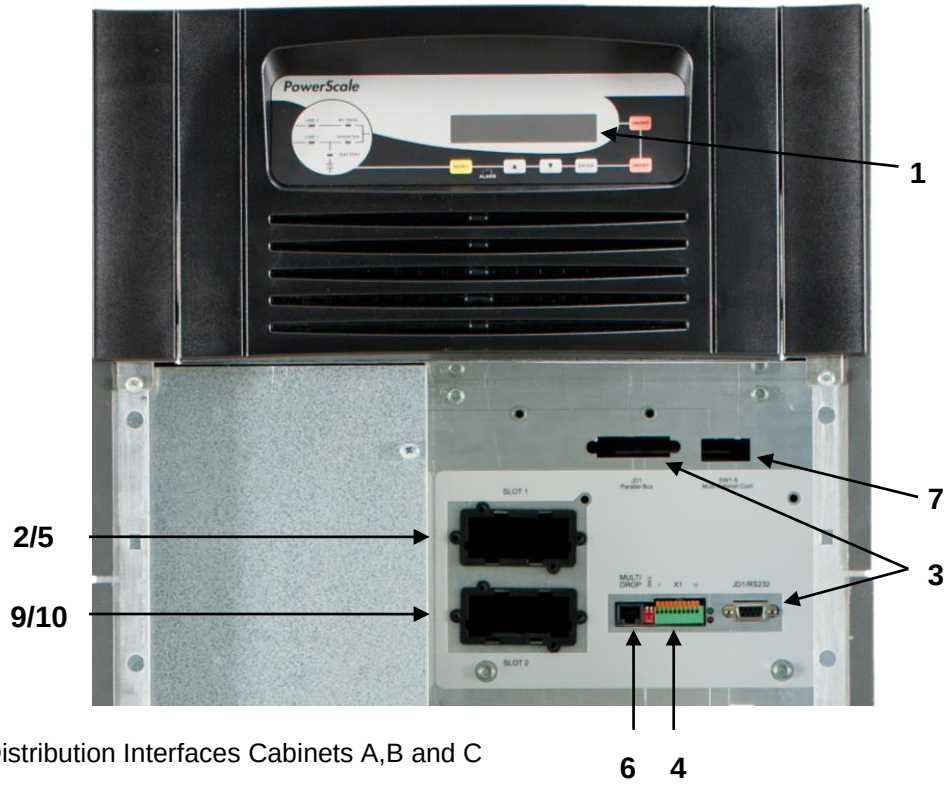


Figure 3 Distribution Interfaces Cabinets A,B and C

1	PMD	Power Management Display (PMD) of POWERSCALE
2	USB	PC Interface (Slot 1 Option)
3	JD1/RS232 Sub D9/female	Interface (UPS system to computer) (see section 3 / 1.1)
4	X1	Customer Inputs
5	X2	Customer interface on Phoenix Terminals (Slot 1 Option): X2= Potential free contacts (detail see Section 3 / 1.2)
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 (Option)
	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

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CONTENTS SECTION-4

4.1 OPERATION

4.1.1 COMMISSIONING

The PowerScale is a high quality electronic machine, that must be commissioned by a fully trained and certified 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 CERTIFIED BY THE MANUFACTURER.**

4.1.2 CONTROL PANEL

WARNING!	**ONLY PERSONS WHICH HAVE BEEN TRAINED BY SERVICE TECHNICIANS OF THE MANUFACTURER OR HIS CERTIFIED 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 OR FROM AN AGENT CERTIFIED BY THE MANUFACTURER.**

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

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

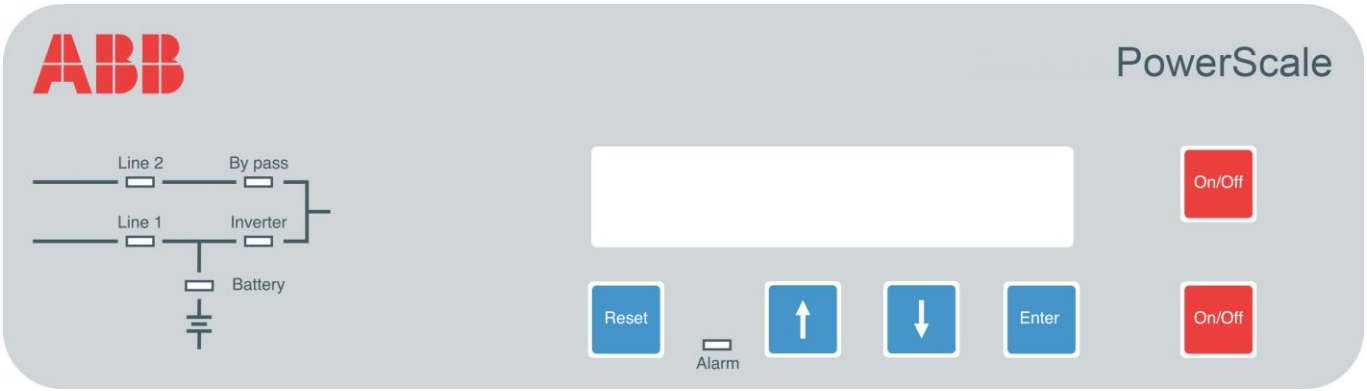


Figure 1.1 Control Panel

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.

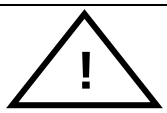
INDICATOR	INDICATOR STATUS	MEANING
ALARM	OFF RED	No alarm condition Alarm condition
LINE 1	GREEN RED	Mains rectifier available Mains rectifier not available
LINE 2	GREEN RED OFF	Mains bypass available Mains bypass not OK or not available UPS is turned off
BY-PASS	GREEN OFF	Load on bypass (Bypass-or Eco-Mode) Bypass not operating (switched-off)
INV	GREEN RED OFF	Load on inverter Inverter fault or load not transferable to inverter Inverter not operating (switched-off)
BATTERY	GREEN RED Flashing GREEN	Battery OK Battery fault or battery is discharged 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 HAVE TO BE PUSHED. IN THIS CASE THE POWER SUPPLY TO THE LOAD WILL BE INTERRUPTED

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) and the batteries are connected and o.k.	**LOAD S** **PROTECTED**
2	Load is not protected by UPS power. Load is supplied by mains power (load on bypass) or it is supplied by the inverter (Normal operation) and the batteries are not o.k.	**LOAD P1** **NOT PROTECTED**
3	Load not supplied. UPS is switched off To start the UPS press the two ON/OFF push buttons simultaneously	**LOAD OFF P2** **SUPPLY FAILURE**
4	The UPS is not supplying load anymore.	**LOAD DISCONNECTED P2**

NOTE: On the right hand side of the LCD there is the indication of single /parallel UPS.
If the UPS is configured as single the indication will be “S”
If the UPS is configured as parallel the indication will be “P” followed by the UPS number
The max no. of UPS units are 20 per system.

EXEMPLES:

S stands for Single UPS. The system consists of ONLY one UPS
P1 stands for Parallel UPS in a Multi-UPS system and 01 stands for the first Module (MASTER) in the Multi-UPS system.
P2 stands for Parallel UPS in a Multi-UPS system and 02 stands for the second Module (SLAVE) in the Multi- UPS system.

The configuration of the single / parallel UPS is achieved in the Menu “SET UP SERVICE”. See Service Manual section E

4.1.3.2 Main Menu Screen

	DESCRIPTION	LCD-DISPLAY
1	Logging Control. A log of the last 99 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”	→ **UPS 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 99 events is stored in the Power Management Display.	**01** 05-10-00 **LOAD TO INV.**	14-38-59
2	Every stored event is identified with a sequential number and time stamp.	**02** 05-10-00 **LOAD TO BYP.**	14-38-56
3	All events and alarms are indicated with their date and time of appearance.	**03** 05-10-00 **LOAD OFF**	14-37-14

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** **15-01-2009**
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 (not active yet)	→ **SET LANGUAGE** **SET DATE AND TIME**
	ENGLISH **FRANCAIS** **POLISH**
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 (the setting are active only with a Generator ON connection)	→ **SET GENERATOR OP.** **NO MORE SETTINGS**
	BATT.CHARGE LOCK **YES/NO**
	BYPASS LOCK **YES/NO**

4.1.3.8 Set-Up Service

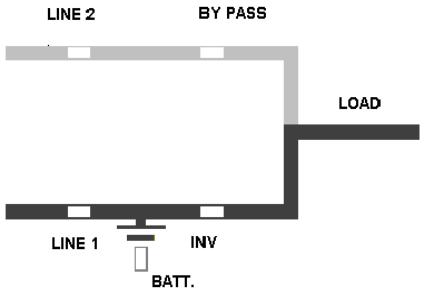
DESCRIPTION	LCD-DISPLAY
1 This Menu is reserved for certified service engineers. It is not to be used by End-Users	→ **SET-UP SERVICE** **PASSWORD**
2 Type in password	→ **PASSWORD.**

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.

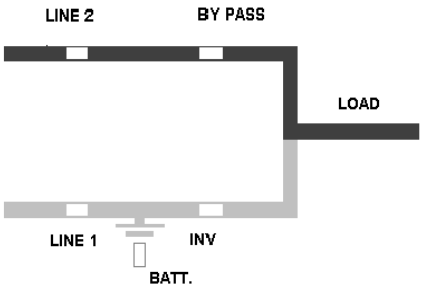
This operating mode is always recommended if the critical loads (computer systems) will not tolerate any interruption of the supply (not even the shortest).

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 ms (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).

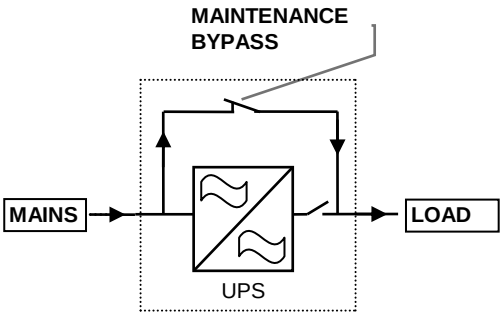
NOTE!

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 rear of the UPS: see *Section 2,chapter 2.2*

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.



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 is isolated from Parallel Bus for maintenance or module replacement (UPS is not supplying load)

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 CERTIFIED 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 Parallel Isolator Switch IA2 is open (Position OFF).
4. Verify that the Maintenance Switch IA1 is open and in Position OFF.
5. Make sure that the internal battery enclosure fuses and/or the external battery cabinets fuses are open.
6. Bypass fuses F2 and rectifier fuses F1 are inserted.

Start up procedure of PowerScale:

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-Systems 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 systems OFF. On the LCD's message "LOAD OFF, SUPPLY FAILURE" will appear
9. Close Parallel Isolator IA2 (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 UPS 1 the LCD: "LOAD PROTECTED" will appear.
11. Close Parallel Isolator IA2 (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 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
    Verify on mimic 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 Frequency.
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 POWERSCALE

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 CERTIFIED BY THE MANUFACTURER.

The **POWERSCALE** 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 POWERSCALE:

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 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 POWERSCALE 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 CERTIFIED BY THE MANUFACTURER.

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

The load is protected by PowerScale 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). (for parallel operation close all IA1) 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 Parallel Isolators 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 CERTIFIED 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 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 **POWERSCALE** UPS may be paralleled for power capacity or for redundancy up to 20 units. The standard version is not provided with this feature which is optional and field upgradable.

Fig. 1.1. **POWERSCALE** 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 **POWERSCALE** 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 **POWERSCALE**. 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 CERTIFIED 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.

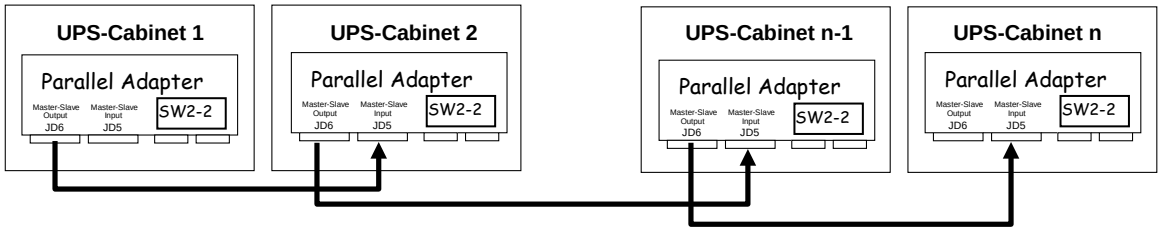
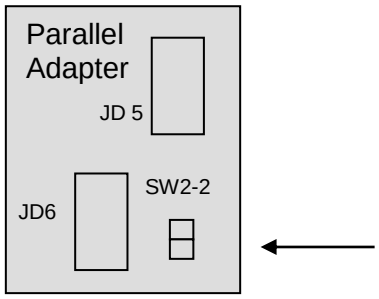


*Figure 1.2.*Connection of the Bus Lines when paralleling UPS-Cabinets by means of Parallel Adapters.

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.



	SingleUnit	First Unit	Middle Unit	Last Unit
SW 1	**ON**	**OFF**	**OFF**	**ON**
SW 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 SW1-9 to their correct positions.

6.1.2.4 DIP Switch SW1-9

The DIP Switch SW1-9 is located on every Cabinet (POWERSCALE) With this switch it is possible to determine the **"position of an POWERSCALE - Cabinet"** in a Multi-Cabinet Chain. Define each **POWERSCALE** - 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**	ON	OFF	ON
3	**ON**	ON	OFF	ON
4	**ON**	ON	OFF	ON
5	**OFF**	OFF	OFF	OFF
6	**ON**	OFF	OFF	ON
7	**ON**	ON	OFF	OFF
8	**ON**	ON	OFF	ON
9	**ON**	ON	OFF	ON

After having set the SW1-9 on all the **POWERSCALE** - 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 Module 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 **PowerScale** 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 the manufacturer 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 CERTIFIED 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 POWERSCALE - 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 PowerScale - 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.

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

WARNING!

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

7.1.1 USER RESPONSIBILITIES

There are no parts within the UPS which need to be serviced by the user, so the maintenance responsibilities of the user are zero. 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 (20°C - 25°C), dry, dust free and vibration free. The batteries should be hold fully charged.

7.1.2 PREVENTATIVE MAINTENANCE

The UPS system needs a regular and constant maintenance (preventative inspections) at least once a year, even during the warranty period.

These preventative maintenance inspections are essential to ensure a correct functionality and reliability of the UPS system. 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.

During a preventative maintenance the field service engineer might carry out some or all of following checks:

- Status and function check of UPS and batteries
- UPS and batteries visual inspection (dust, mechanical damages, ..)
- Visual inspection of screws and cable connections
- Check of air ventilation and room temperature
- Check the operation and function (commutations, remote monitoring and Signaling)
- Current, voltage and frequencies measures
- Measure and record the current load conditions
- Check the load sharing (only in parallel systems)
- Battery voltage check
- Battery discharge test
- Check transfer of the load from UPS to mains operation via static bypass
- Unit cleaning

7.1.3 DEEP 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.

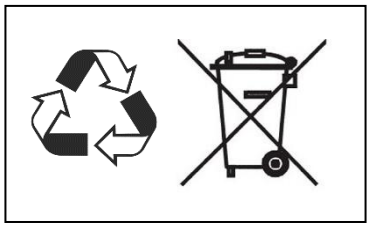
The battery testing can be carried out independently of the operation mode (OFF-LINE or ON-LINE) and whether or not the load is connected. The battery test procedure can be performed from the UPS display, in the service setup mode.

7.1.4 BATTERY MAINTENANCE, DISPOSAL AND RECYCLING

The battery maintenance shall be done by a certified Service Partner.

To ensure an optimum operation of the UPS system and a continuous and efficient protection of the connected load it is recommended to check the batteries every 12 months.

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 4.1.3.3*)
3. In case of doubts please contact the nearest certified 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.	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.	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 certified service centre for assistance.
INV. PHASE FAULT	Inverter is faulty.	Call the certified 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 certified service centre for assistance.

CONTENTS SECTION-9

9.1 OPTIONS

9.1.1 INTRODUCTION

The **PowerScale** is provided with the following accessories:

- REMOTE SHUT DOWN FACILITIES
- GENERATOR ON FACILITIES
- 1 CUSTOMER IN FUNCTIONS (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

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 **PowerScale** 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. 1.2

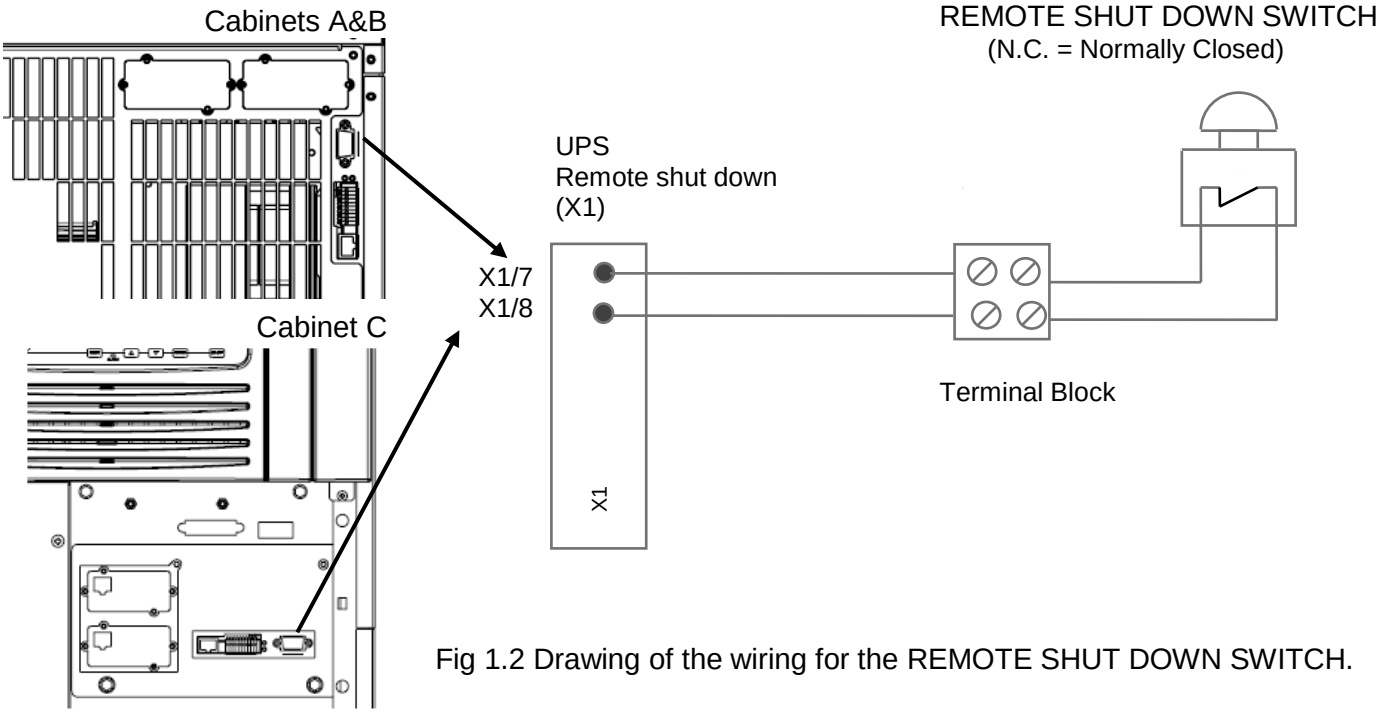


Fig 1.2 Drawing of the wiring for the REMOTE SHUT DOWN SWITCH.

9.1.3 GENERATOR ON FACILITIES

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 **PowerScale** 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*

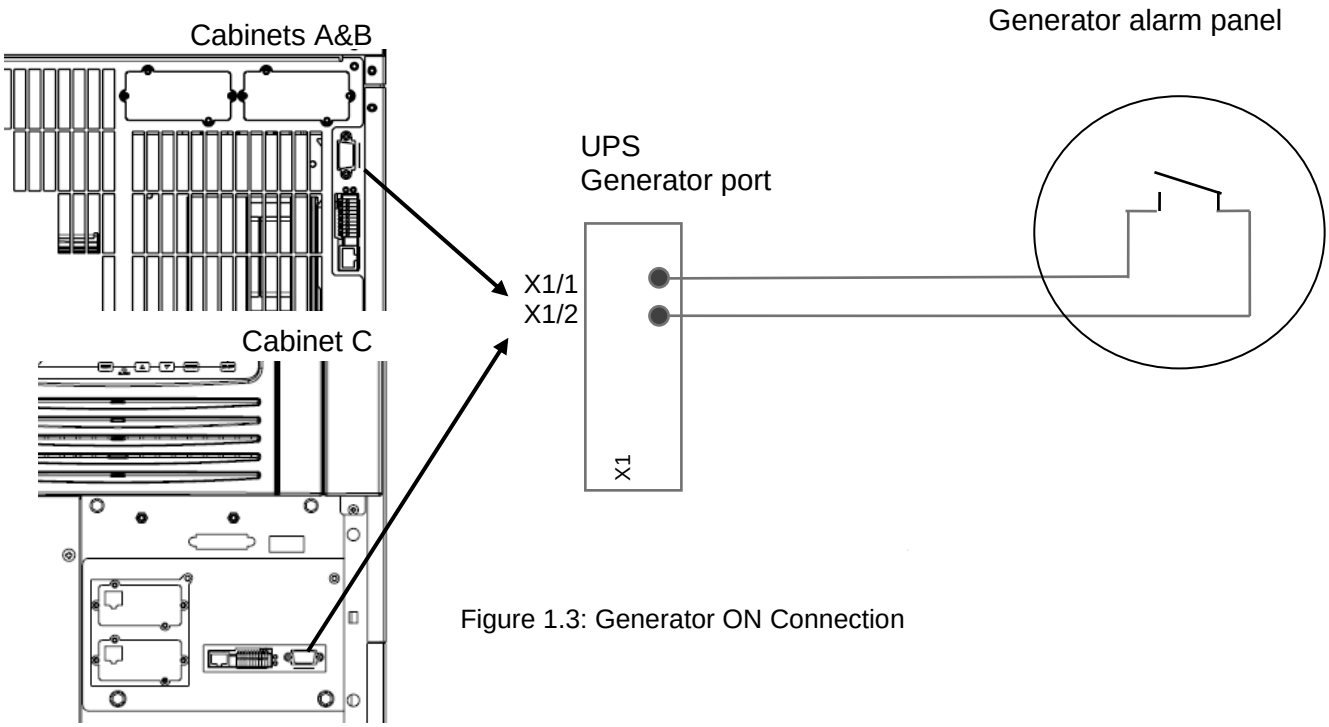


Figure 1.3: Generator ON Connection

9.1.4 WAVEMON SHUTDOWN AND MANAGEMENT SOFTWARE

9.1.4.1 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. The manufacturer 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 customers.

9.1.4.2 WAVEMON Shutdown and Monitoring Software

WAVEMON Software is an external monitoring and shutdown software which was designed to operate with all 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.

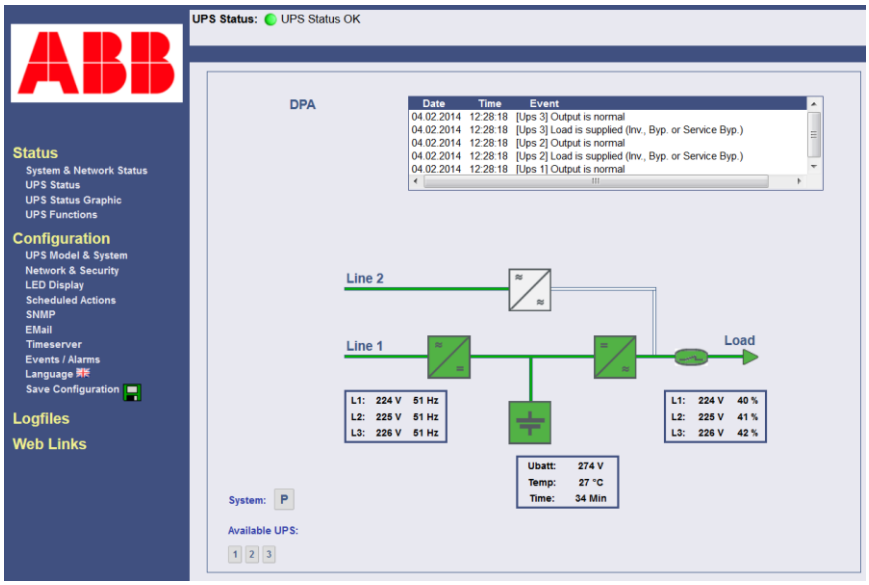


Figure 1.4.2. Monitoring image.

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, an 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.

9.1.5 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.

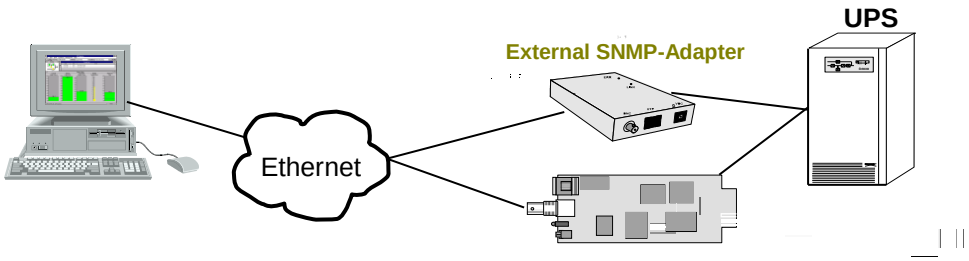


Figure 1.5 SNMP Adapter

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 1.5.1 External SNMP Adapter

The Internal SNMP-Card can be inserted into an appropriate extension slot of the **PowerScale.** 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 1.5.2 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.

PowerScale 10-50 kVA
Technical Specifications

Power and productivity
for a better world™

TABLE OF CONTENTS

10.1 POWERSCALE 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.
POWERSCALE 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.

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

When operating in parallel configuration, each POWERSCALE can take the leadership role avoiding single points of failure in the parallel chain ensuring the highest level of power availability.

The most demanding IT infrastructures start 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. POWERSCALE 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 POWERSCALE that can support to give answers to tender and end-user requirements. The POWERSCALE was designed to respond to the most stringent safety, EMC and other important UPS standards.

POWERSCALE is a stand-alone UPS which can be paralleled for power protection increase and/or for redundancy purpose. It offers 7 different power ranges: 10-15-20-25-30-40-50kVA in three different cabinet sizes.
Up to 20 UPS can be paralleled together and provide any redundant power capacity with common or separate battery configuration.

10.2 TECHNICAL CHARACTERISTICS

10.2.1 MECHANICAL CHARACTERISTICS POWERSCALE 10-20kVA Cabinet A

PowerScale Cabinet A


Power range	kVA	10	15	20
Dimensions (WxHxD)	mm	345x720x710		
Weight without battery	kg	60	62	64
Weight with battery with 48 block of 7Ah	kg	180	182	184
with standard packaging	kg	+ 4		
Colour		Graphite grey Pulverlacke No. 4222903402 serie 09RCCAT1 (RAL 7024)		

10.2.2 MECHANICAL CHARACTERISTICS POWERSCALE 10-25kVA Cabinet B

PowerScale Cabinet B


Max. Power connection	kVA	10	15	20	25
Dimensions (WxHxD)	mm	345x1045x710			
Weight without battery	kg	88	90	92	94
Weight with battery with 96 block of 7Ah	kg	328	330	332	334
with standard packaging	kg	+ 5			
Colour		Graphite grey Pulverlacke No. 4222903402 serie 09RCCAT1 (RAL 7024)			

10.2.3 MECHANICAL CHARACTERISTICS POWERSCALE 25-50kVA Cabinet C

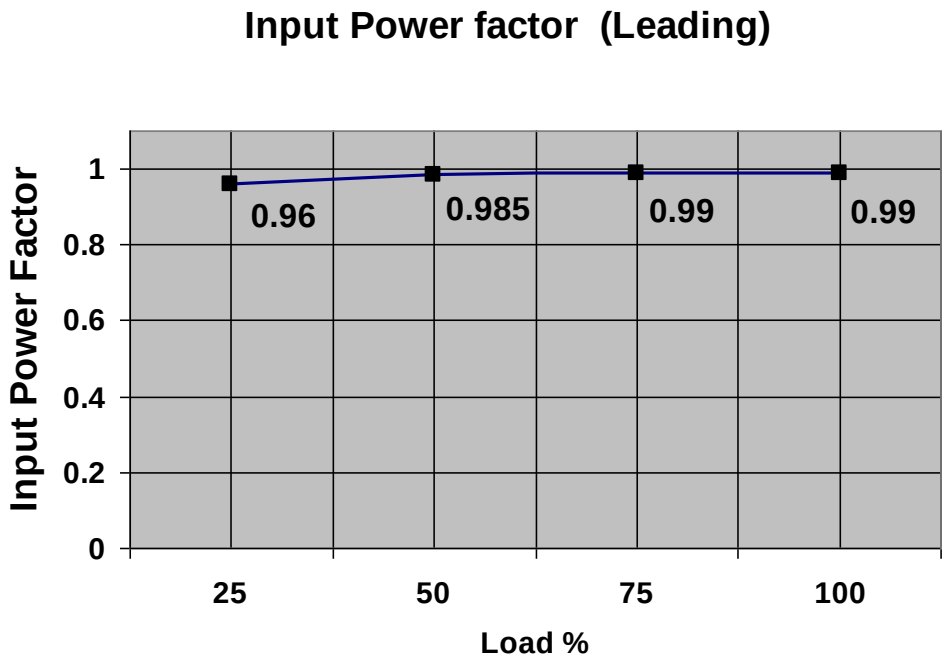
PowerScale Cabinet C


Max. Power connection	kVA	25	30	40	50
Dimensions (WxHxD)	mm	440x1400x910			
Weight without battery	kg	(9Ah/28Ah) 151/135	(9Ah/28Ah) 160/145	9Ah/28Ah 165/150	9Ah/28Ah 170/155
Weight with battery					
144 blocks of 7/9Ah	kg	540	550	555	560
48 blocks of 28Ah	kg	605	615	620	625
with standard packaging	kg	+ 5			
Colour		Graphite grey Pulverlacke No. 4222903402 serie 09RCCAT1 (RAL 7024)			

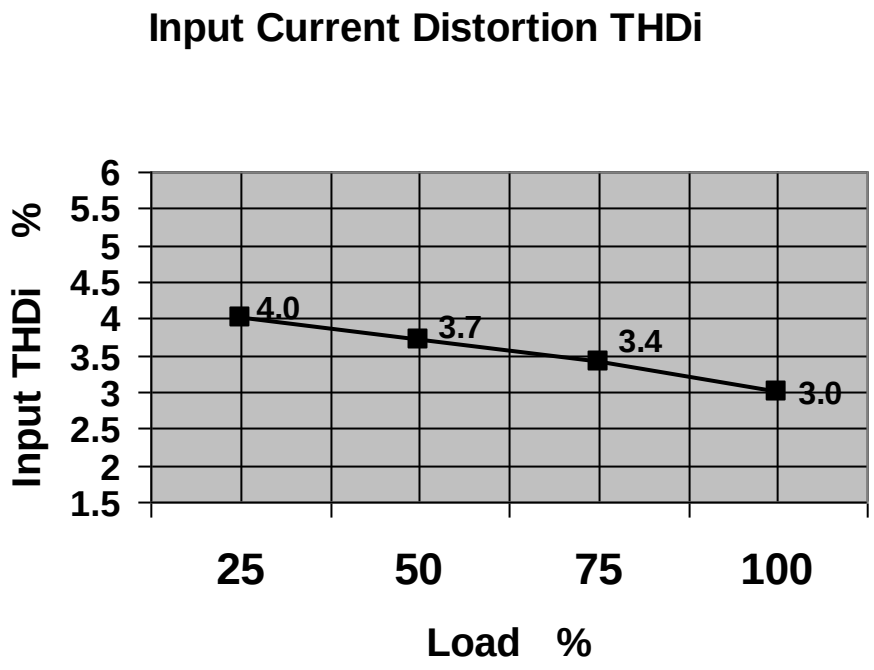
10.3 INPUT CHARACTERISTICS

UPS Model		PS 10	PS 15	PS 20	PS 25	PS 30	PS 40	PS 50
Output Power rating	*kVA*	*10*	*15*	*20*	*25*	*30*	*40*	*50*
Nominal Input Voltage	V	3x380/220V+N, 3x400V/230V+N, 3x415/240V+N						
Input Voltage Tolerance (ref to 3x400/230V) for Loads in %:	V	(-10%/+15%) 3x308/177 V to 3x460/264 V for <100 % load (-20%/+15%) 3x280/161 V to 3x460/264 V for < 80 % load (-30%/+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	max. In						
Input Distortion THDi		Sine-wave THDi < 3 % @ 100% load						
Max. Input Power with rated output power and charged battery (output cosφ = 0.9)	kW	9.6	14.4	19.1	23.9	28.7	38.3	47.9
Max. Input Current with rated output power and charged battery (output cosφ = 0.9)	A	13.9	20.8	27.8	34.7	41.6	55.5	69.4
Max. Input Power with rated output power and discharged battery (output cosφ = 0.9)	kW	10.5	15.7	21	26.2	31.4	41.9	52.4
Max. Input Current with rated output power and discharged battery (output cosφ = 0.9)	A	15.2	22.8	30.4	37.9	45.5	60.7	75.9

10.3.1 GRAPH: INPUT PF VERSUS % LOAD



10.3.2 GRAPH: INPUT DISTORTION THDi VERSUS % LOAD



NOTE: Depending on power ratings

10.4 BATTERY CHARACTERISTICS

UPS Range / Cabinet Type		10kVA		15kVA		20kVA		25kVA		30kVA	40kVA	50kVA
		A	B	A	B	A	B	B	C	C	C	C
Min/Max number of 12V Battery Blocks per string	No.	20-50(*)		24-50(*)		26-50(*)	26-50(*)	32-50(*)		16-50(*)	18-50(*)	30-50(*)
Min/Max number of 12V NiCd-Cells	No.	200-500(*)		240-500(*)		260-500(*)	260-500(*)	320-500(*)		160-500(*)	180-500(*)	300-500(*)
Maximum Battery Charger Current	A	4A								6A		
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										

Note : (*****) Depending of the effective load in kW used by system (see table below and table in chapter 10.10.1).

Max no. for internal batteries is 48, max no. for extern batteries is 50

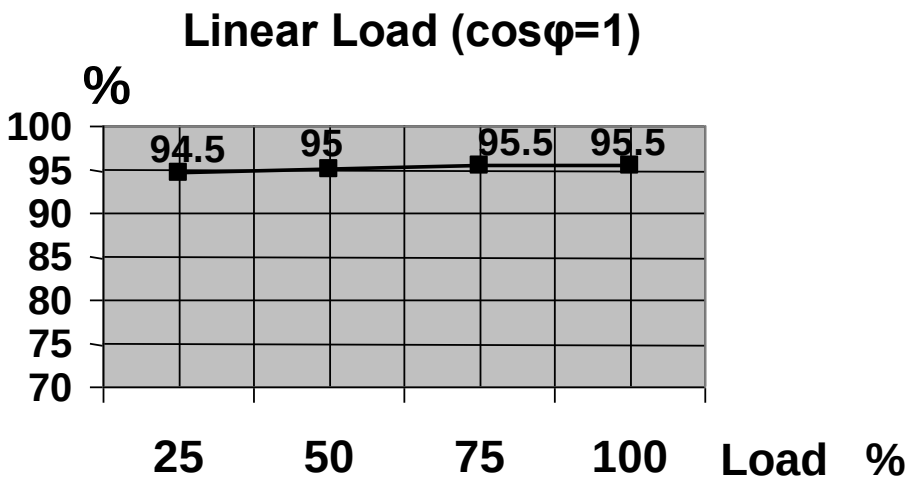
Description	10 kVA						15 kVA								20 kVA								25 kVA			
Cabinet Type	A			B			A				B				A				B				B			
Maximum Power in [kW]	6	8	9	6	8	9	8	10	12	13.5	8	10	12	13.5	9	12	16	18	9	12	16	18	12	16	20	22.5
Minimum number of battery blocks per String	20	24	26	20	24	26	24	28	32	36	24	28	32	36	26	32	40	44	26	32	40	44	32	40	46	48
Maximum number of battery blocks intern the PSC cabinet	48	48	48	2x 48	2x 48	2x 48	48	48	48	48	2x 48	2x 48	2x 48	2x 48	48	48	48	48	2x 48	2x 48	2x 48	2x 48	2x 48	2x 48	2x 48	2x 48

Description	25 kVA				30 kVA				40 kVA				50 kVA			
Cabinet Type	C				C				C				C			
Maximum Power in [kW]	12	16	20	22.5	16	20	24	27	18	25	32	36	30	35	40	45
Minimum number of battery blocks per String	24	32	40	46	16	20	24	28	18	26	32	36	30	34	40	46
Maximum number of internal battery blocks 7/9 Ah	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48	3x48
Maximum number of internal battery blocks 28 Ah	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48	1x48

10.5 OUTPUT CHARACTERISTICS

UPS Model		PS 10	PS 15	PS 20	PS 25	PS 30	PS 40	PS 50
Output rated power	kVA	10	15	20	25	30	40	50
Output rated current (In) @ rated power in kVA and @ 400VAC	A	14.4	21.7	28.9	36.1	43.3	57.7	72.2
Output rated power	kW	9	13.5	18	22.5	27	36	45
Output rated current (In) @ rated power in kW and @ 400VAC	A	13.0	19.5	26.0	32.5	39.0	52.0	65.0
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 (according to IEC/EN 62040-3) < 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 196 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	min	110% Load → 5 min 125% Load → 20 seconds				110% Load → 10 min 125% Load → 1 min		
Output short capability current (RMS) on inverter for 40 ms	A	3.0 x In	2.1 x In	2.2 x In	2.5 x In	2.1 x In	2.3 x In	2.6 x In
Output short capability current (RMS) on static-bypass for 10 ms	A	approx. 10 x output rated current (In) (RMS)						
Crest – Factor (Load supported)		3 : 1						

10.5.1 GRAPH: AC – AC EFFICIENCY with Linear load up to cosφ 1



NOTE: Depending on power rating

10.6 ENVIRONMENTAL CHARACTERISTICS

UPS range		10kVA	15kVA	20kVA	25kVA	30kVA	40kVA	50kVA
Audible Noise with 100% / 50% Load	dBA	60/53	60/53	58/50	58/50	58/50	58/50	65/51
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		Rear access			Front access			
Positioning		Min. 20 cm rear space (required for fan)						
Input and Output Power Cabling		Rear side bottom			Front side bottom			
Efficiency AC-AC (at cosφ1.0) (depending on power rating)	%	*Load* : *100 %* 95.5%	*75 %* 95.5%		*50%* 95%	*25%* 94.5%		
Eco-Mode efficiency at 100% load	%	98 %						

10.7 STANDARDS

Safety	IEC/EN 62040-1, IEC/EN 60950-1	
Electromagnetic Compatibility	IEC/EN 62040-2, IEC/EN61000-3-2, IEC/EN61000-6-2	
EMC Classification for	10kVA	15-50kVA
Emission Class	C2	C3
Immunity Class	C3	
Performance	IEC/EN62040-3	
Product certification	CE	
Degree of protection	IP 20	

10.8 COMMUNICATION

STANDARD ITEMS

RS232 on Sub-D9 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 1 12 vdc source (max. 250 mA)
RJ45 port	For multidrop purpose
Power Management Display (PMD)	LCD display

OPTIONAL ITEMS

Relay card + USB Including: Customer Interfaces: 5 output DRY PORTS RS232 on USB port	• Common alarm • Load on bypass • Battery low • Load on inverter • Mains failure For remote signalling and automatic computer shutdown
SNMP Card (slot already included)	SNMP card For monitoring and integration in network management

10.8.1 POWER MANAGEMENT DISPLAY (PMD)

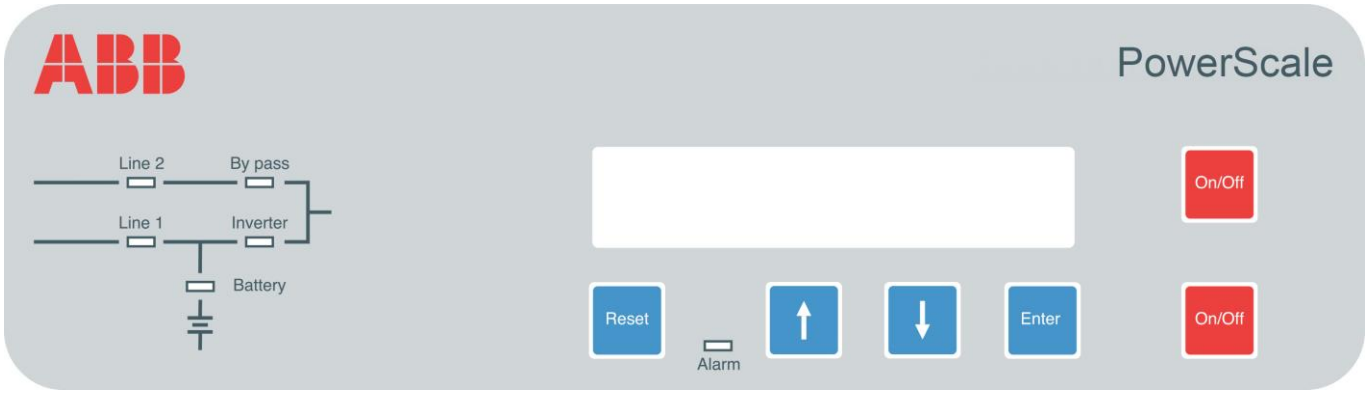
The user-friendly PMD consists of three parts the MIMIC DIAGRAM, CONTROL KEYS and LCD that provides the necessary monitoring information about the UPS.

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. 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.

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 UPS or load transfer from UPS to BYPASS and vice-versa and finally it serves for the DIAGNOSIS (SERVICE MODE) for adjustments and testing.



Power Management Display (PMD) of POWERSCALE

10.8.4 CUSTOMER INTERFACES: Terminals X1 Standard

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 X1 (optional relay slot card)

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

STANDARD

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		**GEN_OPERATION**
	X1 / 1	IN	+12Vdc		(NC = Generator ON)

OPTION (relay card and USB (Slot))

X1	X1 / 15	C	ALARM	COMMON_ALARM	Common
	X1 / 14	NC			NO Alarm Condition
	X1 / 13	NO			**Common Alarm** (System)
	X1 / 12	C	Message	LOAD_ON_MAINS	Common
	X1 / 11	NC			(Load on Inverter)
	X1 / 10	NO			**Load on bypass** (Mains)
	X1 / 9	C	ALARM	BATT_LOW	Common
	X1 / 8	NC			Battery OK
	X1 / 7	NO			**Battery Low**
	X1 / 6	C	Message	LOAD_ON_INV	Common
	X1 / 5	NC			(Load on Mains bypass)
	X1 / 4	NO			**Load on Inverter**
	X1 / 3	C	ALARM	MAINS_OK	Common
	X1 / 2	NC			**Mains Failure**
	X1 /1	NO			Mains Present
	+ USB				

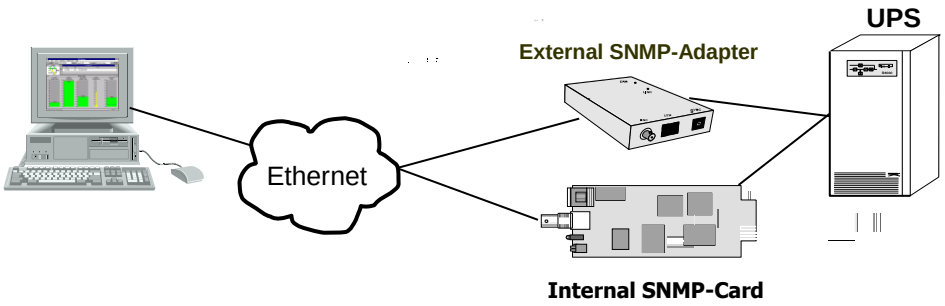
Phoenix Spring Terminals (X1) Connection

10.9 OPTIONS

- SNMP card and WaveMon Management Software , Modbus Protocol, USB
- External Battery Cabinets
- Parallel kit
- In/output Transformer for special voltages
- Back-feed protection
- Temp. sensor for battery temp. control
- Relays and USB card

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.



10.10 BATTERY AUTONOMIES

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

Powerscale 10kVA, 9kW

	Load Power					
	6kW		8kW		9kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
6	1 x 24	1 x 20	1 x 32	1 x 24	1 x 34	1 x 26
8	1 x 28	1 x 22	1 x 38	1 x 26	1 x 42	1 x 28
10	1 x 32	1 x 24	1 x 46	1 x 32	1 x 48	1 x 34
12	1 x 40	1 x 28	2 x 26	1 x 36	2 x 30	1 x 40
15	1 x 48	1 x 32	2 x 32	1 x 42	2 x 36	1 x 48
18	2 x 28	1 x 38	2 x 36	1 x 48	2 x 40	2 x 28
20	2 x 30	1 x 40	2 x 40	2 x 28	2 x 44	2 x 30
22					2 x 48	2 x 32
25	2 x 36	1 x 48	2 x 48	2 x 32	n.a.	2 x 36
30	2 x 40	2 x 28	n.a.	2 x 38	n.a.	2 x 42
35	2 x 46	2 x 32	n.a.	2 x 42	n.a.	2 x 48
40	n.a.	2 x 36	n.a.	2 x 48	n.a.	n.a.
60	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
Limit batt min A	20 blocs		24 blocs		26 blocs	
Limit batt min B						

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 15kVA, 13.5kW

	Load Power							
	8kW		10kW		12kW		13.5kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
6	1 x 32	1 x 24	1 x 40	1 x 28	1 x 48	1 x 32		1 x 36
8	1 x 38	1 x 26	1 x 48	1 x 34	2 x 32	1 x 40	2 x 36	1 x 42
10	1 x 46	1 x 32	2 x 28	1 x 40	2 x 34	1 x 48	2 x 40	1 x 48
12	2 x 26	1 x 36	2 x 34	1 x 48	2 x 40		2 x 48	
15	2 x 32	1 x 42	2 x 40	2 x 28	2 x 48	2 x 32	n.a.	2 x 36
18	2 x 36	1 x 48	2 x 46	2 x 32	n.a.	2 x 38	n.a.	2 x 42
20	2 x 40	2 x 28	2 x 48	2 x 36	n.a.	2 x 40	n.a.	2 x 48
25	2 x 48	2 x 32	n.a.	2 x 40	n.a.	2 x 48	n.a.	n.a.
30	n.a.	2 x 38	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
35	n.a.	2 x 42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
40	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
60	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min A	24 blocs		28 blocs		32 blocs		36 blocs	
Limit batt min B								

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 20kVA, 18kW

	Load Power							
	9kW		12kW		16kW		18kW	
Autonomy (min)	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt	7Ah batt	9Ah batt
4					1 x 48			
6	1 x 34	1 x 26	1 x 48	1 x 32		1 x 44		1 x 46
7						1 x 48	2 x 44	
8	1 x 42	1 x 30	2 x 32	1 x 40	2 x 40			
10	2 x 26	1 x 36	2 x 34	1 x 48	2 x 46		2 x 48	
11					2 x 48		n.a.	
12	2 x 30	1 x 40	2 x 40	2 x 32	n.a.	2 x 40	n.a.	2 x 44
15	2 x 36	1 x 48	2 x 48		n.a.	2 x 42	n.a.	2 x 48
17			n.a.		n.a.	2 x 48	n.a.	n.a.
18	2 x 40	2 x 28	n.a.	2 x 38	n.a.	n.a.	n.a.	n.a.
20	2 x 44	2 x 32	n.a.	2 x 40	n.a.	n.a.	n.a.	n.a.
25	2 x 48	2 x 36	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.
30	n.a.	2 x 42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	2 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min A	26 blocs		32 blocs		40 blocs		44 blocs	
Limit batt min B								

Cabinet A: max 1 x 48 x 7/9Ah batteries

Cabinet B: max 2 x 48 x 7/9Ah batteries

Powerscale 25kVA, 22.5kW

	Load Power											
	12kW			16kW			20kW			22.5kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	1 x 48	1 x 32			1 x 44		2 x 46					
8	2 x 32	1 x 40		2 x 40	1 x 48		2 x 48			2 x 48		
10	2 x 34	1 x 48		2 x 46			3 x 40			3 x 46		
12	2 x 40	2 x 28		2 x 48	2 x 40		3 x 44	2 x 46		3 x 48	2 x 48	
13							3 x 48	2 x 48		n.a.		
15	2 x 48	2 x 32	1 x 24	3 x 42	2 x 44		n.a.	3 x 40		n.a.		
18	3 x 36	2 x 38	1 x 24	3 x 48	2 x 48	1 x 34	n.a.	3 x 42	1 x 40	n.a.	3 x 46	1 x 48
20	3 x 38	2 x 40	1 x 28	n.a.	3 x 36		n.a.	3 x 46		n.a.	3 x 48	n.a.
22	3 x 42	2 x 44	1 x 30	n.a.	3 x 38	1 x 40	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
24			1 x 32	n.a.			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	3 x 46	2 x 48		n.a.	3 x 42	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	3 x 48	3 x 34		n.a.	3 x 48		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.		1 x 36	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	3 x 36		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	3 x 38		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.		1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	3 x 40		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	3 x 42		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.		1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	3 x 44		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	3 x 46		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min B	32 blocs			40 blocs			46 blocs			48 blocs		
Limit batt min C	24 blocs			32 blocs			40 blocs			46 blocs		

Cabinet B: max 2 x 48 x 7/9Ah batteries

Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 30kVA, 27kW

	Load Power											
	16kW			20kW			24kW			27kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	2 x 34	1 x 40		2 x 40			2 x 48			3 x 36		
7		1 x 48	1 x 16			1 x 20			1 x 24			1 x 28
8	2 x 40			2 x 48							3 x 28	1 x 30
10	2 x 44	2 x 32			2 x 40			2 x 48		3 x 48		1 x 36
12	2 x 48	2 x 40		3 x 44	2 x 44		3 x 48			n.a.		1 x 42
13				3 x 48	2 x 48		n.a.			n.a.	3 x 48	1 x 44
15	3 x 42	2 x 44		n.a.			n.a.	3 x 48		n.a.	n.a.	1 x 48
18	3 x 48	2 x 48	1 x 34	n.a.	3 x 42	1 x 40	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.
20	n.a.	3 x 36		n.a.	3 x 46		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	3 x 38	1 x 40	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.			n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	3 x 42	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	3 x 48		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	16 blocs			20 blocs			24 blocs			28 blocs		

Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 40kVA, 36kW

	Load Power											
	18kW			25kW			32kW			36kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	2 x 36	2 x 22		2 x 48	2 x 32			2 x 48		3 x 48	2 x 48	
7			1 x 18			1 x 26	3 x 48		1 x 32	n.a.	3 x 36	1 x 36
8	2 x 42	2 x 28		3 x 40	2 x 40		n.a.		1 x 34	n.a.		1 x 42
9	2 x 48		1 x 22				n.a.			n.a.	3 x 46	1 x 44
10	3 x 34	2 x 34		3 x 48	2 x 48	1 x 34	n.a.		1 x 40	n.a.	3 x 48	1 x 48
12	3 x 40	2 x 40	1 x 28	n.a.	3 x 38		n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
13	3 x 42	2 x 44		n.a.	3 x 40	1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
15	3 x 48	2 x 48	1 x 32	n.a.	3 x 44		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
16	n.a.	3 x 34		n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
18	n.a.	3 x 38		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
20	n.a.	3 x 40	1 x 40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	3 x 44	1 x 44	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.		1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	3 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	18 blocs			26 blocs			32 blocs			36 blocs		

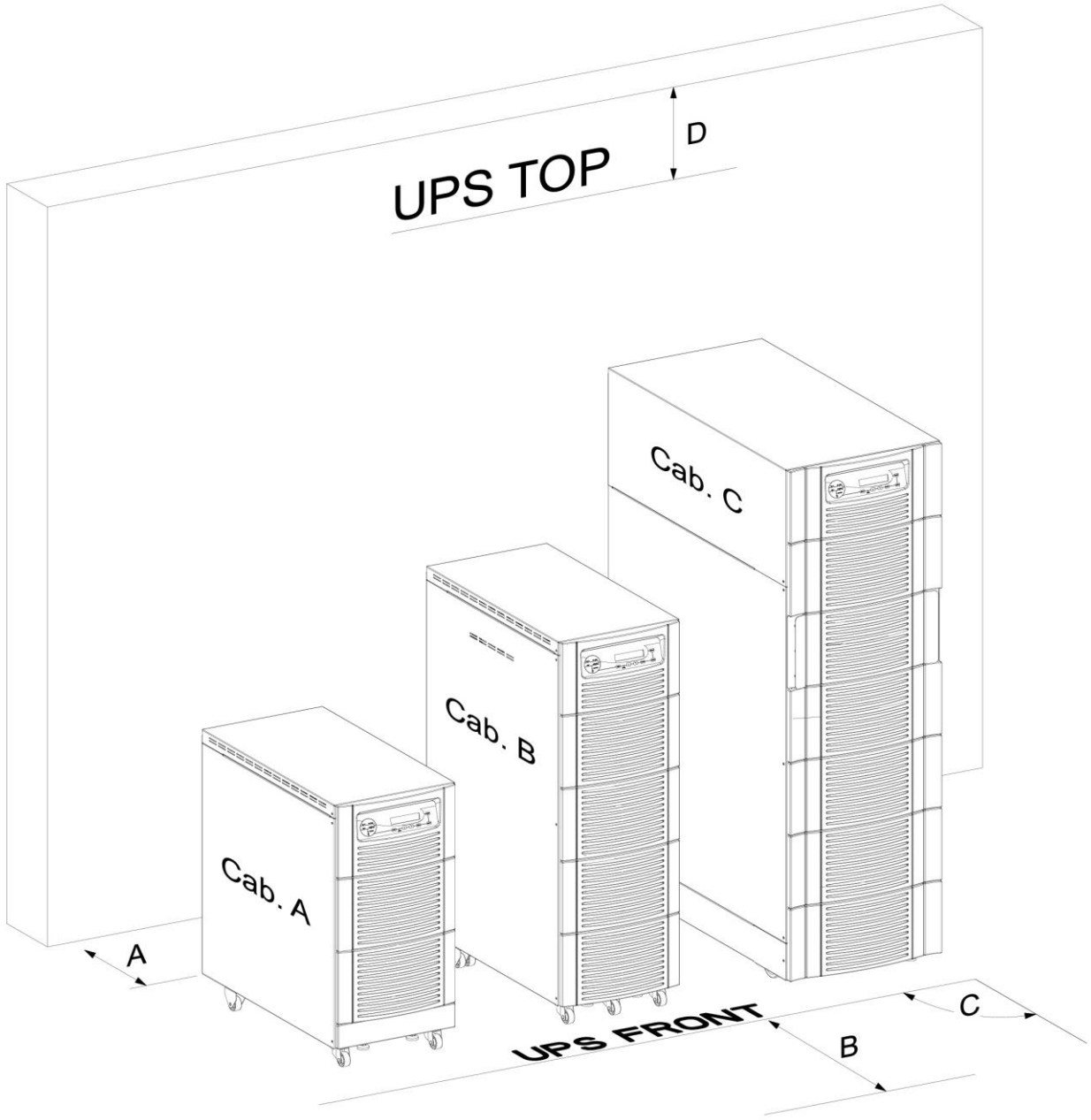
Cabinet C: max 3 x 48 x 7/9Ah batteries

Powerscale 50kVA, 45kW

	Load Power											
	30kW			35kW			40kW			45kW		
Autonomy (min)	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt	7Ah batt	9Ah batt	28Ah batt
6	3 x 40	2 x 40	1 x 30	3 x 48	2 x 48	1 x 34	n.a.			n.a.		
7	3 x 44	2 x 44		n.a.			n.a.	3 x 40	1 x 40	n.a.	3 x 46	1 x 46
8	3 x 48	2 x 48	1 x 34	n.a.	3 x 40	1 x 40	n.a.	3 x 44		n.a.	3 x 48	1 x 48
9	n.a.	3 x 36		n.a.			n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.
10	n.a.	3 x 40	1 x 40	n.a.	3 x 44	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
12	n.a.	3 x 44		n.a.	3 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
13	n.a.	3 x 48	1 x 48	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
15	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
16	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
18	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
22	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
24	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
28	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
29	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
31	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
35	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
36	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
37	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
39	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
41	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Limit batt min C	30 blocs			34 blocs			40 blocs			46 blocs		

Cabinet C: max 3 x 48 x 7/9Ah batteries

10.11 INSTALLATION PLANNING



PowerScale Cabinets		*Cab. A*	*Cab. B*	*Cab. C*
A	Back clearances for ventilation (forced air outlet) / access for wiring in case the unit cannot be pulled forward	200 / 500 mm	200 / 500 mm	200 mm / front wiring
B	Front clearances for pulling the unit forward (to get rear access for wiring or side access for battery. replacement)	800 mm	800 mm	1000 mm
C	Maximum door opening angle (there is no door)	-	-	-
D	Top Clearance, not needed	0 mm	0 mm	0 mm
	Side clearances R for vent. (natural air-exchange) / access for battery replacement in case the unit cannot be pulled forward	50 / 800 mm	50 / 800 mm	0 / 800 mm
	Side cl. L for ventilation (natural air-exchange)	50 mm	50 mm	0 mm

10.11.1 HEAT DISSIPATION PER UPS RANGE WITH NON-LINEAR LOAD

UPS Range		10kVA	15kVA	20kVA	25kVA	30kVA	40kVA	50kVA
Heat Dissipation with 100% Non-linear Load per range (EN 62040-3)	W	600	900	1100	1400	1700	2300	2900
Heat Dissipation with 100% Non-linear Load per range (EN 62040-3)	BTU/h	2048	3072	3754	4778	5802	7850	9898
Airflow (25° - 30°C) with 100% Non-linear Load per range (EN 62040-3)	m^3/h	150	150	150	150	570	570	570
Heat Dissipation without load	W	120	150	150	170	250	300	350

10.12 BLOCK DIAGRAMS

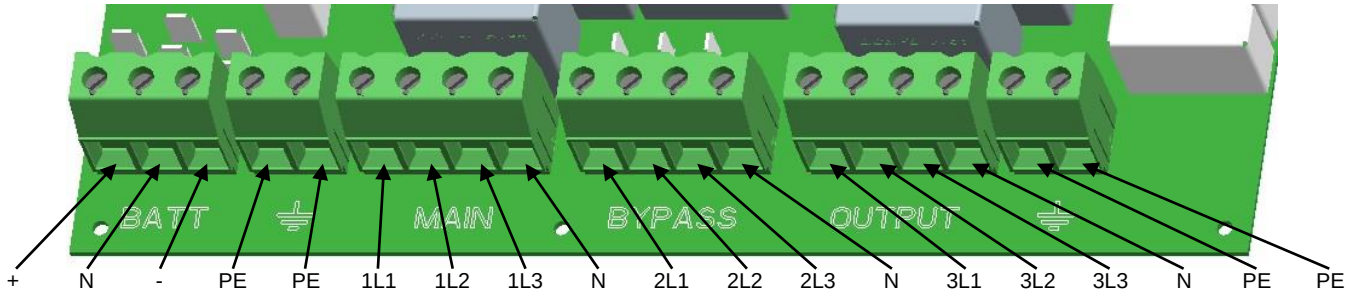
10.12.1 WIRING AND BLOCK DIAGRAMS

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 certified by the manufacturer

10.12.2 RECOMMENDED CABLE SECTIONS & FUSE RATINGS

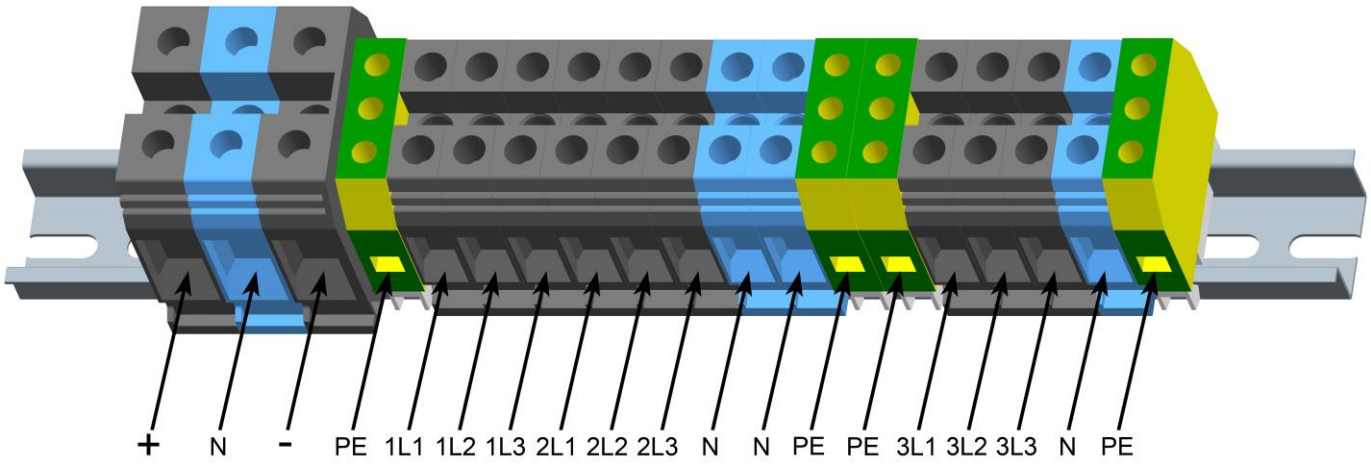
Cabinet A (10-15-20 kVA) & Cabinet B (10-15-20-25 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm^2]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm^2]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm^2]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm^2]	**Tightening Torque** [Nm]
4 x 16	**5 x 16**	**5 x 16**	**5 x 16**	**1.5**



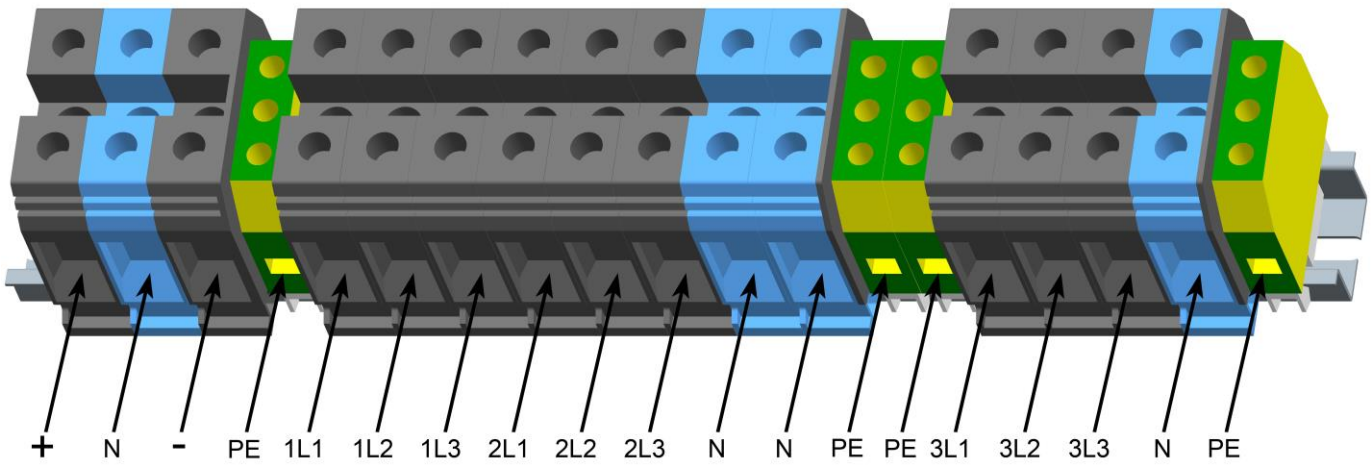
Cabinet C (25-30 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm²]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm²]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm²]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm²]	**Tightening Torque** [Nm]
(+ / N / -): **3 x 35** PE: **1 x 16**	**5 x 16**	**5 x 16**	**5 x 16**	35 mm²: **3.5** 16 mm²: **1.5**



Cabinet C (40-50 kVA) terminal connections overview

Battery (+ / N / -) + PE [quantity x mm²]	**Input Rectifier** 1L1, 1L2, 1L3 + N + PE [quantity x mm²]	**Input Bypass** 2L1, 2L2, 2L3 + N + PE [quantity x mm²]	**Output load** 3L1, 3L2, 3L3 + N + PE [quantity x mm²]	**Tightening Torque** [Nm]
(+ / N / -): **3 x 35** PE: **1 x 16**	1L1, 1L2, 1L3 + N: **4 x 35** PE: **1 x 16**	2L1, 2L2, 2L3 + N: **4 x 35** PE: **1 x 16**	3L1, 3L2, 3L3 + N: **4 x 35** PE: **1 x 16**	35 mm²: **3.5** 16 mm²: **1.5**



10.12.3 CONNECTION DIAGRAM POWERSCALE

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

Block Diagram

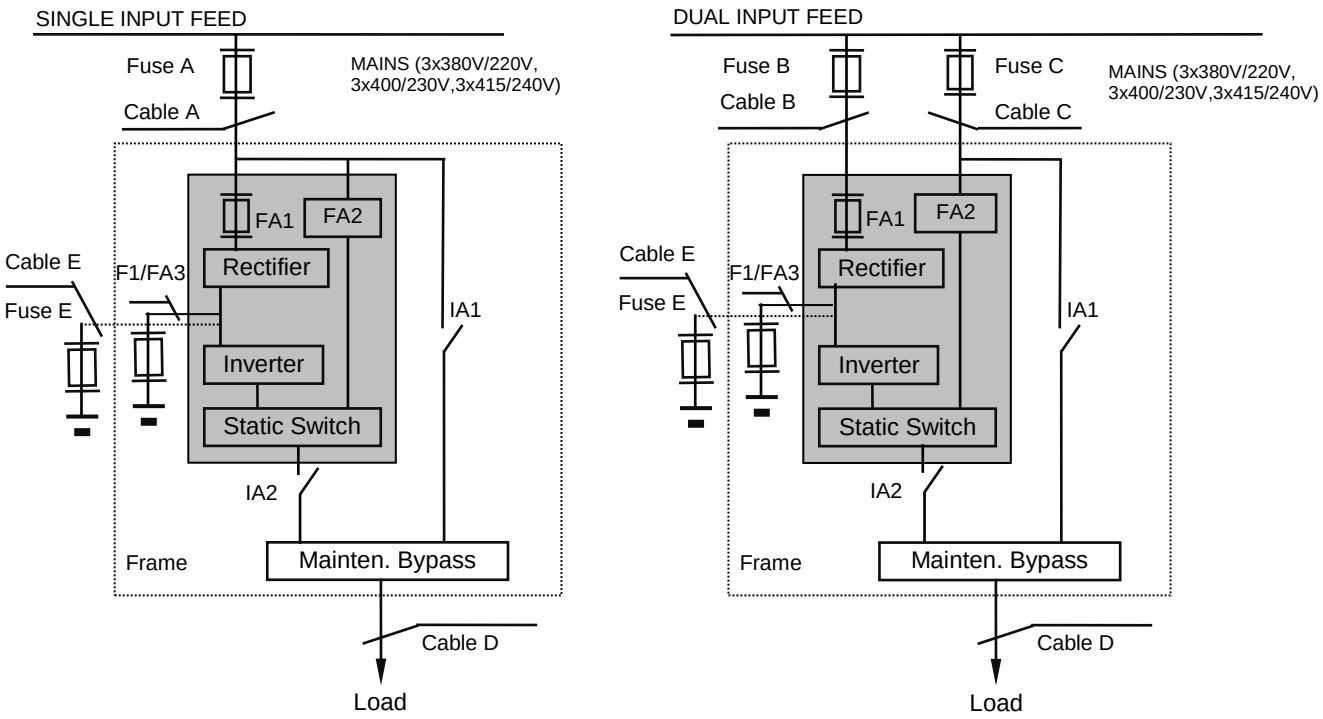


Figure 3: Block Diagram POWERSCALE from 10-50 kVA

SINGLE INPUT FEED – Cable sections and fuse ratings recommended according to IEC 60950-1

Power [kVA]	**UPS Cabinet**	**Fuse A** 1L1, 1L2, 1L3 [quantity x A]	**Cable A** 1L1, 1L2, 1L3, N, PE [quantity x mm²]	**Cable D** 3L1, 3L2, 3L3, N, PE [quantity x mm²]	**Fuse E** +, N, -, PE [quantity x A]	**Cable E** +, N, -, PE [quantity x mm²]
10	A, B	3 x 20	5 x 2.5	5 x 2.5	3 x 32	4 x 4
15	A, B	3 x 32	5 x 4	5 x 4		
20	A, B	3 x 40	5 x 6	5 x 6	3 x 50	4 x 10
25	B, C					
30	C	3 x 63	5 x 10	5 x 10	3 x 80	4 x 16
40	C	3 x 80	*(1L1, 1L2, 1L3, N)*: 4 x 25 *(PE)*: 1 x 16	*(3L1, 3L2, 3L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 100	*(+, N, -)*: 3 x 25 *(PE)*: 1 x 16
50						

DUAL INPUT FEED – Cable sections and fuse ratings recommended according to IEC 60950-1

Power [kVA]	**UPS Cabinet**	**Fuse B** 1L1, 1L2, 1L3 [quantity x A]	**Cable B** 1L1, 1L2, 1L3, N, PE [quantity x mm²]	**Fuse C** 2L1, 2L2, 2L3 [quantity x A]	**Cable C** 2L1, 2L2, 2L3, N, PE [quantity x mm²]	**Cable D** 3L1, 3L2, 3L3, N, PE [quantity x mm²]	**Fuse E** +, N, -, PE [quantity x A]	**Cable E** +, N, -, PE [quantity x mm²]
10	A, B	3 x 20	5 x 2.5	3 x 20	5 x 2.5	5 x 2.5	3 x 32	4 x 4
15	A, B	3 x 32	5 x 4	3 x 32	5 x 4	5 x 4		
20	A, B	3 x 40	5 x 6	3 x 40	5 x 6	5 x 6	3 x 50	4 x 10
25	B, C							
30	C	3 x 63	5 x 10	3 x 63	4 x 10	5 x 10	3 x 80	4 x 16
40	C	3 x 80	*(1L1, 1L2, 1L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 80	*(2L1, 2L2, 2L3, N)*: 4 x 25 *(PE)*: 1 x 16	*(3L1, 3L2, 3L3, N)*: 4 x 25 *(PE)*: 1 x 16	3 x 100	*(+, N, -)*: 3 x 25 *(PE)*: 1 x 16
50								