

**80 - 130 kVA single and
parallel UPS Systems
User's and Installation
Manual**

80 - 130 kVA single and parallel UPS Systems User's and Installation Manual

1017397

Revision D

CONTENTS

1. Introduction	5
2. System description	5
2.1 General description	5
2.2 UPS configuration	8
3. Safety information	10
3.1 Storage and transportation	10
3.2 Installation	10
3.3 User operations	10
4. Shipping and handling	10
4.1 Unpacking and incoming inspection	11
4.2 Moving	11
5. Installation	12
5.1 Environment	12
5.2 Floor loading	13
5.3 Installing 80 - 130 kVA UPS and battery cabinets	13
5.4 Power connections	16
6. Computer and alarm connections	24
6.1 Connecting the UPS to a computer	24
6.2 Potential free relay outputs	25
6.3 Emergency Power Off Input (EPO)	25
6.4 Inputs	26
6.5 X-Slot Modules	26
7. User's guide to operations	27
7.1 Graphical Control panel	27
7.2 Menu structure	28
7.3 Manual System Control	30
7.4 Using the maintenance bypass switch	31
7.5 Starting up the UPS	32
7.6 Shutting down the UPS	33
8. Parallel UPS System	34
8.1 Introduction	34
8.2 Selecting redundancy or capacity mode	35
8.3 Installation requirements	35
8.4 Starting up System	39
8.5 Switching off System	40
8.6 System Parallel Module (SPM 9340)	41
9. Maintenance	42
10. Warranty	43
11. Technical specifications	43

Copyright 2002

The contents of this manual are the copyright of the publisher and may not be reproduced (even extracts) unless permission granted.

Every care has been taken to ensure the accuracy of the information contained in this manual, but no liability can be accepted for any errors or omission. The right to make design modifications is reserved.

1. Introduction

This User's manual gives basic information about IGBT and SCR (rectifier) 80 - 130 kVA, uninterruptible power supplies: their basic function, their features, how to use them, and what to do in case of trouble. Instructions for shipping, storing, handling and installing the equipment are also given.

The planning guidelines of this manual describe only the specific demands of UPS units. Local legislation and regulations for electrical installations must be followed in the UPS installation.

This manual is mainly intended for the chief operator/system supervisor, electrical consultants and installation electricians.

The UPS system must be installed according to the instructions in this manual. Fixed installation may be performed by qualified personnel only. Failure to recognise the electrical hazards could prove fatal.

2. System description

A UPS (Uninterruptible Power Supply) protects different types of sensitive electrical equipment: computers, workstations, sales terminals, critical instrumentation, telecommunications systems, process control systems, etc. The UPS protects them from problems associated with utility power of poor quality, or a complete loss of power.

Sensitive electrical equipment needs protection from electrical interference. Interference from outside the facility (such as lightning, power company accidents and radio transmissions) and interference from inside the facility (from motors, air conditioners, vending machines and arc welders, for example) can create problems in the AC power line for the sensitive equipment. The problems can be: power outage, low or high voltage, slow voltage fluctuation, frequency variations, differential and common-mode noise, transients, etc.

The UPS cleans the utility AC power, maintains a constant voltage and if needed isolates the output to the critical load. These actions help to keep power line problems from reaching the critical system, where they can damage software and hardware and cause the equipment to operate erratically.

2.1 UPS features

This UPS is a double conversion on-line UPS for protection of computer systems and other intelligent devices such as measurement instruments and industrial automation applications. It conditions the raw mains and supplies continuous, clean three-phase power to the critical systems. While feeding the load the UPS also keeps the battery constantly charged. If utility power fails, the UPS will continue to supply clean power without any interruption at the UPS output.

If the power failure outlasts the backup time the UPS will shut down in order to prevent a total discharge of the battery. When the line voltage is restored the UPS will start up again automatically providing power to the critical load and charging the battery bank.

UPS block diagram

An UPS module consists of several blocks each having its own functions:

- Transients in the input and load are reduced by RFI filters.
- AC-power is rectified and regulated in the rectifier which provides the power to the inverter and charges the batteries. The rectifier keeps the battery fully charged.
- The battery provides power to the load during a mains failure.
- The inverter converts the DC-power back to AC-power, which is delivered to the load.
- The static bypass switch transfers automatically the load to the bypass line when the inverter is overloaded or the inverter is not able to feed the load.
- Maintenance bypass switch is used to bypass the single UPS during service.
- The control and monitoring circuitry measure, monitor and control the operation of the UPS-system. It gives the user the status of the system operation by visual and audible indicators.
- The UPS sends information about the system operation via potential free relay outputs and RS232 serial data interface This information includes data about the utility, the load and the UPS itself. The information can be used in a computer to ensure total protection of software and data.

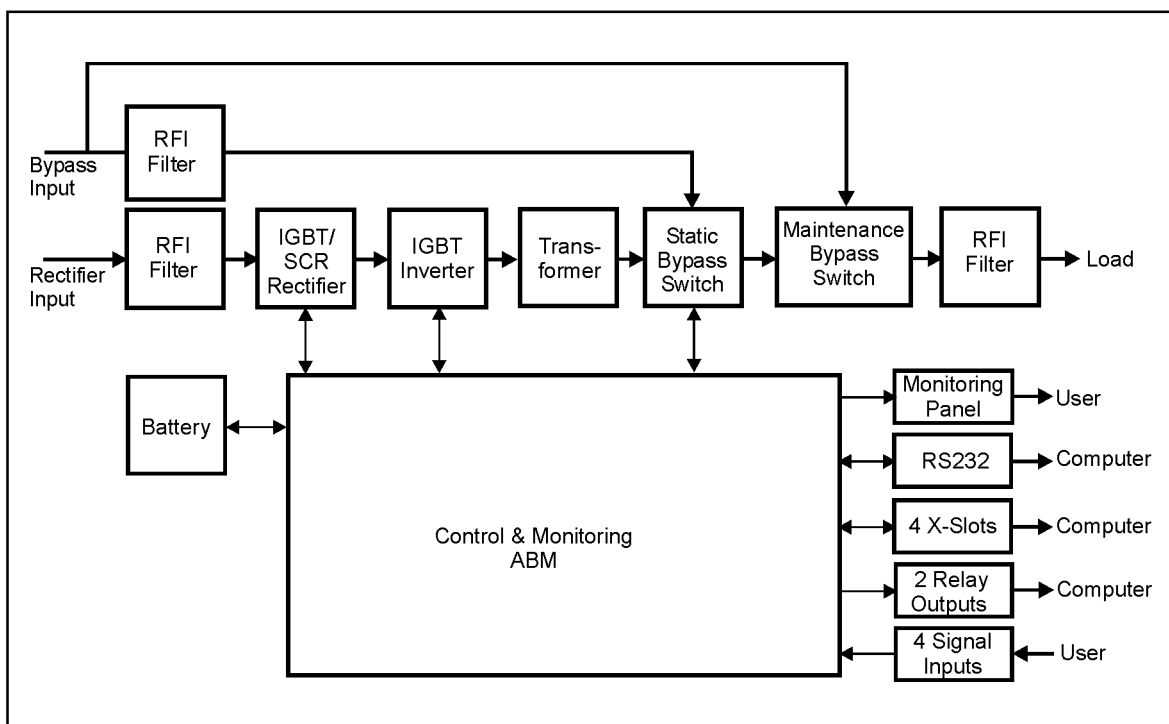


Figure 1. Block diagram of the UPS.

Harmonic Control™ with the IGBT rectifier

Harmonics cause deviations to the power quality (perfect sinusoidal waveform) and are present in current, voltage or both. Filtering is currently the most common method used to limit the effects that harmonics present to the rest of the system. Traditional filters consist of tuned series L-C circuits.

The advanced IGBT rectifier technology of PW9340 UPS modules reduce input harmonic content down to 3%. This leads to more reliable system operation and more economic generator sizing as losses in the generator windings are minimised. The benefit with the practically unity input power factor are the minimised maintenance, cabling and fusing costs. Moreover, the UPS saves installation space and investment cost because no additional filters are needed.

Harmonic currents and voltages cause the following:

- Additional losses in wires and cables
- Extra heating of transformers and generators with shortened service life
- False circuit breaker tripping and malfunction
- Erratic operation of computers, telecommunication, monitors, electronic test equipment etc.
- Resonance with power factor correction capacitors

Advanced Battery Management (ABM)™

ABM monitors the status of the battery and charges it only when the battery needs charging. The feature is very valuable since most of the time battery does not need any charging. Hence, the function of ABM system is to prolong the battery life up to 50% on average. It also monitors that the load never crashes because of bad or defected battery.

The key to long battery life is low corrosion inside the battery. The main cause for corrosion is current flowing through battery. The more current going through battery, the shorter the battery life. Current flows through battery when it is discharged or charged. There is very little that can be done for discharging, because it depends on number of power outages in utility line. However the charging can be controlled and initiated on the following occasions:

- When turning the unit on using the on/off switch.
- After 18 days without charging
- If the open cell voltage decreases below predetermined voltage level.

Traditional UPS charges batteries continuously. This means that there is current going through batteries all the time and this causes corrosion. In a traditional on-line the inverter also causes ripple-current to be fed to batteries causing corrosion.

Hot Sync™ for parallel UPS systems

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 common paralleling logic circuitry in the system. This logic circuitry gives out individual commands to all the different units. Unfortunately this can lead to a single point of failure for the whole system because if the logic circuitry system fails the whole UPS system will be in trouble.

That is exactly why the Powerware Hot Sync™ technology was developed. An industry leading paralleling technology in its own right, the patented Hot Sync enables you to set up a parallel redundant system giving you 100% conditioned power at all times. Its unique digital design eliminates the system level single point of failure inherent in traditional parallel UPS modules, and exponentially increases the reliability of the overall system.

Hot Sync allows two or more UPS units to cover the same load in parallel and redundant configuration, by working in complete synchronization. No common logic is needed in this patented design. It provides automatic load sharing and module level redundancy with nothing other than the power connecting the Hot Sync version of UPS modules.

2.2 UPS configurations

The UPS system consists of the UPS device itself and the external backup battery. In addition, several options may be included in the system.

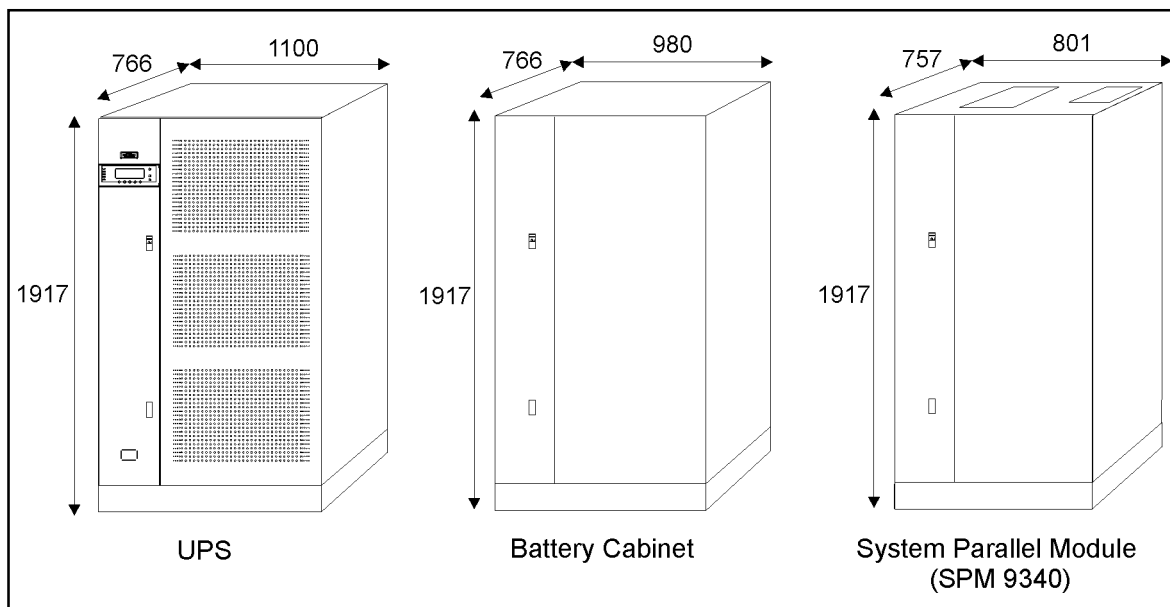


Figure 2. Dimensions of the UPS, battery and SPM9340 cabinets.

The main considerations in planning the UPS system are:

- The UPS output power rating shall be specified according to the total power demand of the protected system. Some margin should be allowed for potential expansion of the protected system, and for possible inaccuracy in calculating or measuring the actual power requirement.
- The battery shall be sized according to the desired backup time. Note that the backup time is longer if the load is less than the nominal power rating of the UPS.

Options

The options are used to tailor a matching solution to fulfil the site and load requirements of the installation.

The following options are available:

- External battery cabinets and racks
- External bypass switch cabinets
- External bypass isolation transformers
- External SPM9340 system parallel cabinet for parallel UPS systems
- Remote and multilingual ViewUPS display panel (p/n 1011747)
- X-slot boards for enhanced connectivity:
 - RS-232 communication adapter (p/n 1103992143)
 - SNMP/Web communication adapter (p/n IPK-0330)
 - Modbus/Jbus communication adapter (available y 2002)
 - AS/400 relay adapter (p/n 1018460)
 - Integral modem (p/n 1019017)

3. Safety information

Since the UPS unit operates on line power and contains a bank of high-current backup batteries, the information in this chapter is important to all personnel involved.

3.1 Storage and transportation

Because of the heavy weight of the cabinets and the high energy battery bank the equipment must be handled with care. The UPS must always be kept in the position marked on the package and must not be dropped.

3.2 Installation

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a safety hazard. Do not place the UPS in an airtight room.

The UPS system must be installed according to the instructions in this manual. Installation may be performed by qualified personnel only. Failure to recognise the electrical hazards could prove fatal.



WARNING!

Do not open the UPS or battery cabinet! Some components inside the cabinets carry high voltages. To touch them may prove fatal. All operations inside the cabinets must be carried out only by a service engineer from the manufacturer or from an agent authorised by the manufacturer.

3.3 User operations

The only user operations permitted are:

- Starting up and shutting down the UPS unit (not the initial start up).
- Operating the user interface.
- Connecting data interface cables.
- Monitoring the UPS with software provided by Powerware.

These operations must be performed according to the instructions in this manual. During any of these operations, the user must take greatest care, and perform only the prescribed operations. Any deviation from the instructions could be dangerous to the operator.

4. Shipping and handling

The UPS equipment is shipped on specifically designed pallets so that it is easy to move with a forklift or pallet jack.

Do not stack the pallets.

Because of the sensitive electronics and high energy stored within batteries, the UPS and the battery cabinet must be handled with care. The UPS and battery cabinet must always be kept in an upright position and must not be dropped.

Because of the heavy weight of the UPS system proper provision must be made for transportation. See technical specifications for dimensions and weights of the UPS.

If the UPS is not immediately installed the following must be remembered:

- The UPS should be stored in the original packing and shipping carton.
- The **recommended** storing temperature is between +15°C ... +25°C.
- The equipment must always be protected from dust, moisture and weather.

If the UPS is stored for a longer period of time the batteries of the UPS should be charged for at least 8 hours every 6 months to maintain the battery condition.

4.1 Unpacking and incoming inspection

Unpack the equipment and remove all the packing materials and shipping cartons.

- The equipment must be inspected for damage after shipment. If damage has occurred during transit, all the shipping cartons and packing materials should be stored for further investigation. If the damage is visible a claim for shipping damage must be filed immediately. Note: Check the shock/tilt indicator.

To file a claim for shipping damage:

- The carrier must be informed within 7 days of receipt of the equipment.

Remove the equipment from the pallet according to figure 3 and detailed instructions on shipping package.

The equipment must be checked against the packing list to verify that the shipment is complete.

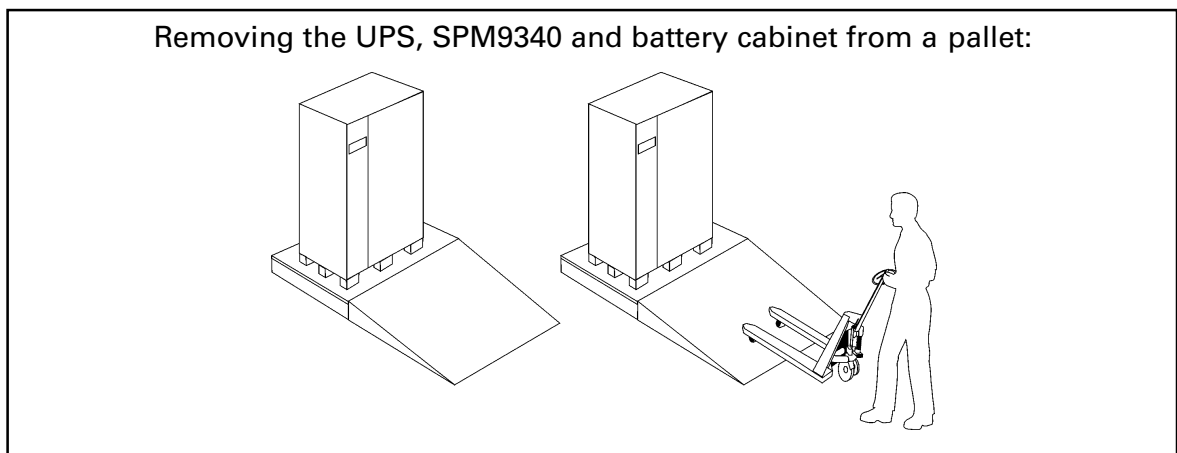


Figure 3. Fasten the slide to the pallet before unloading the UPS or battery cabinet.

The UPS is thoroughly inspected at the factory. If there are no damages or discrepancies, the installation may proceed.

4.2 Moving

The UPS units can be moved with fork lift or pallet jack. Because the UPS is heavy, it should be verified that surfaces on which it is moved are strong enough. Please, note the center of gravity, see specification.

5. Installation

The UPS unit is designed with all vital parts accessible from front. All cables and protective fuses must be dimensioned according to local regulations.

5.1 Environment

All the requirements concerning environment described in this chapter (Installation) or chapter 12 (Technical specifications) must be met. If they are neglected the manufacturer cannot guarantee the safety of personnel during installation or use, or that the unit will function properly.

When locating the UPS system and the battery options, the following points have to be remembered:

- Avoid temperature and humidity extremes. To maximise the life time of the batteries, an ambient temperature of 15°C to 25°C is recommended.
- Provide shelter from the elements (especially moisture)
- The UPS can be mounted against wall because the cooling air outlet locate on top of the UPS as standard. No space is required in rear or sides of the UPS. Always leave 250 mm free space above the UPS. Always leave enough space in front of the UPS (minimum 1 meter) for service and maintenance. See figure 4.
- The batteries are preferred to be installed next to the UPS. The right side is recommended due to control panel location and power cable fastening.

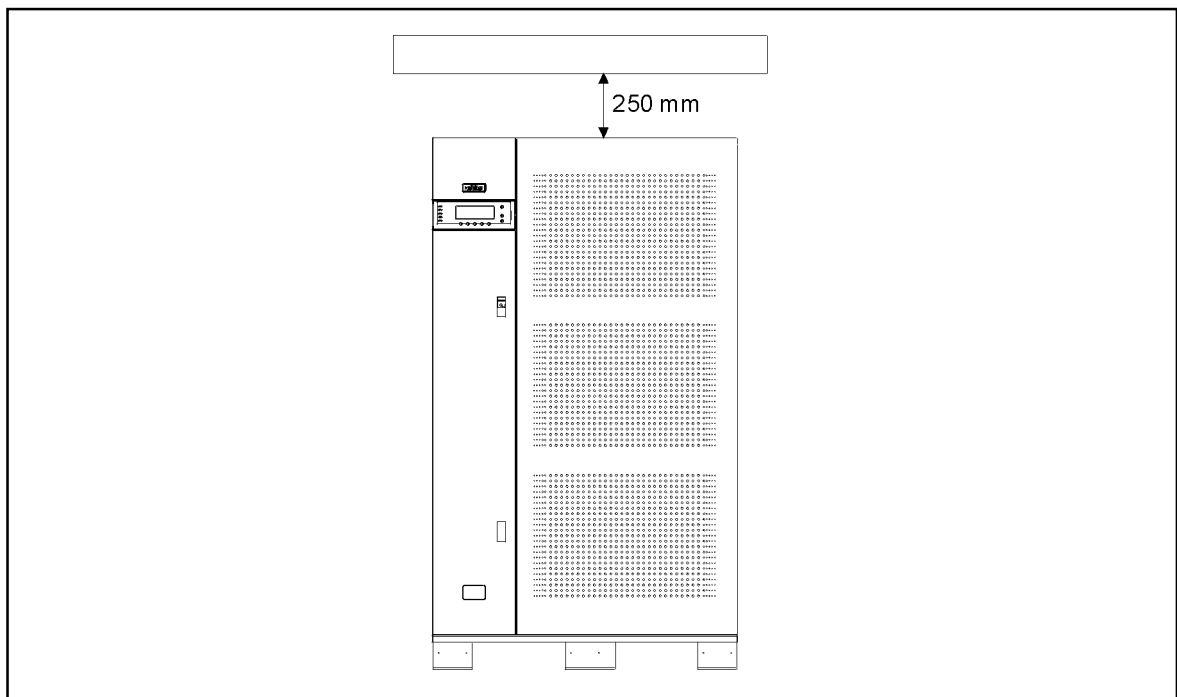


Figure 4. Ventilation and space requirements for 80 - 130 kVA UPS.

5.2 Floor loading

When planning the installation the floor loading must be taken into consideration because of the heavy weight of the UPS and battery cabinets.

The strength of the installation surface must be adequate for point and distributed loadings given in table 1.

Description	Weight (kg)	Point loading (kg/cm ²)	Distributed loading (kg/m ²)
80-130 kVA UPS modules/	1040/	0.89/	1234/
SPM 9340 module	310	0.28	382
BAT HR250 Battery cabinet	1050	0.92	1438
BAT HR305 Battery cabinet	1200	1.05	1644
BAT HR350 Battery cabinet	1350	1.18	1849
BAT CD475 Battery cabinet	1800	1.58	2465

Table 1. The UPS floor loading of UPS modules SPM 9340 modules and battery cabinets.

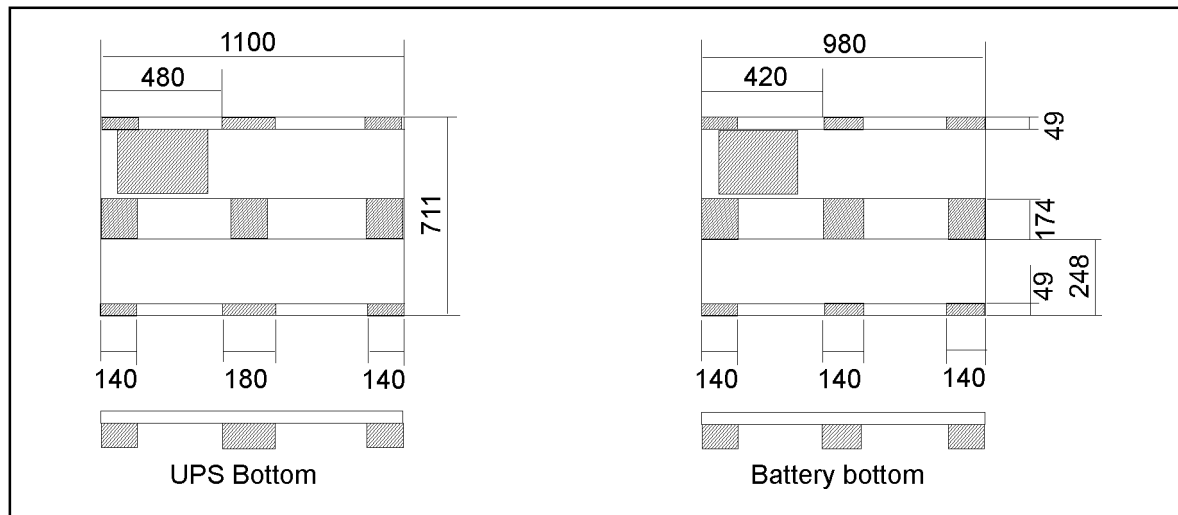


Figure 4a. Bottom view of UPS and battery cabinets (view angle is from below).

5.3 Installing UPS and battery system

The battery cabinets may be installed on either side of the UPS or in a separate place.

When connecting UPS and battery cabinets together the side plate of the UPS has to be removed. Removed UPS side plate shall be installed to the last battery cabinet in string. The battery cabinets are delivered with sheet metal plates to be installed between the UPS and battery cabinets, see figure 5.

Note!

Battery cabinets and racks made from metal must be either connected to the protective conductor or insulated from the battery and the place of installation (EN 50272-2).

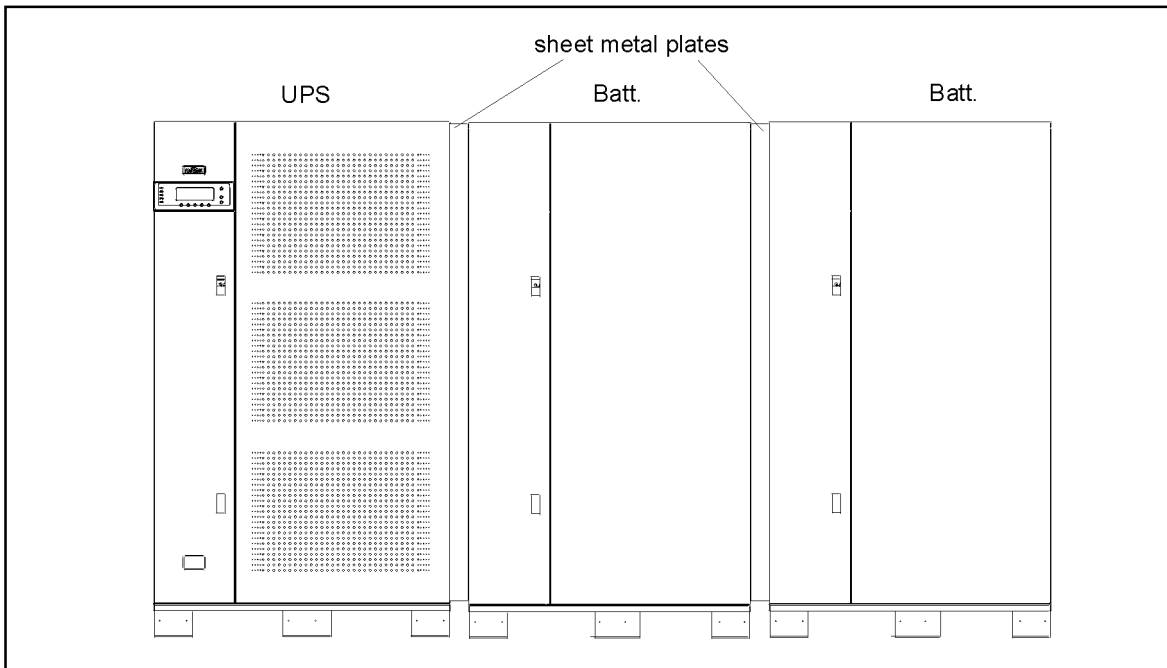


Figure 5. Connecting UPS and battery cabinets to each other.

Adding and removing a temperature sensor of battery cabinets

Each battery cabinet has temperature measurement and the cable from battery cabinet has to be connected to terminal block TB5 pins 5 and 6 in user interface area. Note proper polarity. See figure 6b. When several external cabinets are used the temperature information from battery cabinets has to be linked together. See figure 6b. The temperature sensor is located under the roof of the battery cabinet. Battery connections should be done according figures 6b and 7.

The temperature sensors in battery cabinets are monitored via DALLAS network (TB5 terminal in UPS) and each sensor has a unique serial number for identification. Follow the instructions step by step to add and remove a sensor.

After installing the cabinets and before starting the UPS connect the wires from UPS TB5 terminals 5 and 6 to terminal block X1 in first battery cabinet in string or to battery cabinet indicated as Cabinet 1. After this select Add New Temp Sensor from LCD display and press Select to verify new sensor. The sensor will be identified as sensor number 1 (battery cabinet 1). When the sensor is identified connect wires from cabinet number 2 to terminal block X2 in battery cabinet 1 and select Add New Temp Sensor and press Select to verify new sensor. Repeat this procedure as many times as all sensors are identified. Maximum number of battery cabinets or sensors is eight (8).

If removing sensors, go to Remove Temp Sensor from LCD display and select the sensor to be removed. Press Select to verify sensor removal. After this the temperature of that cabinet is no longer monitored. Notice that if battery cabinet is installed but no temperature sensor installed for cabinet, the temperature compensation doesn't necessary work correctly. The temperature compensation can be disabled by software.

When replacing a temperature sensor first remove desired sensor like described in previous column and then connect a new sensor and identify it like described in first column. The new sensor will identified as first available number for use in string.

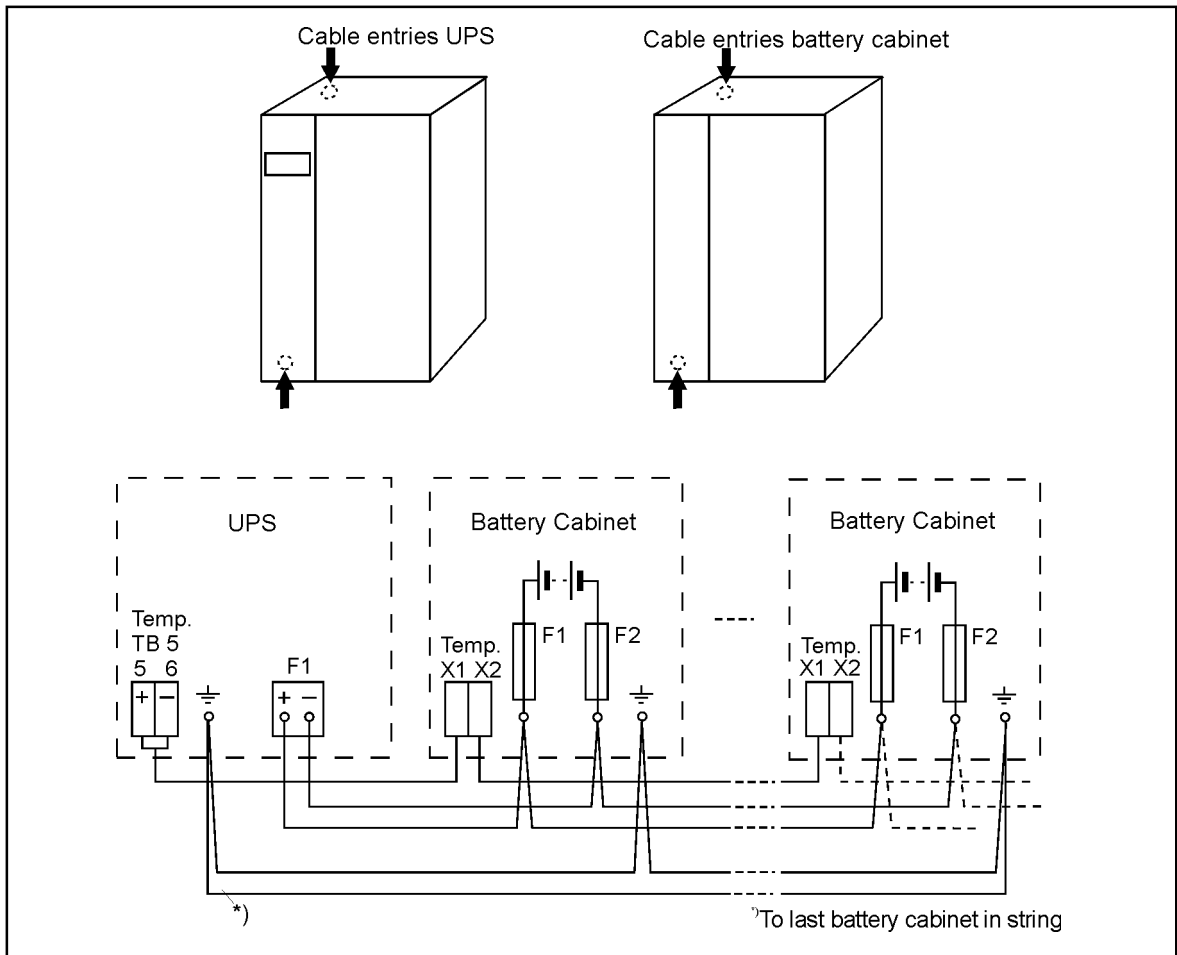


Figure 6a. Connecting battery cabinets 80-130 kVA UPS.

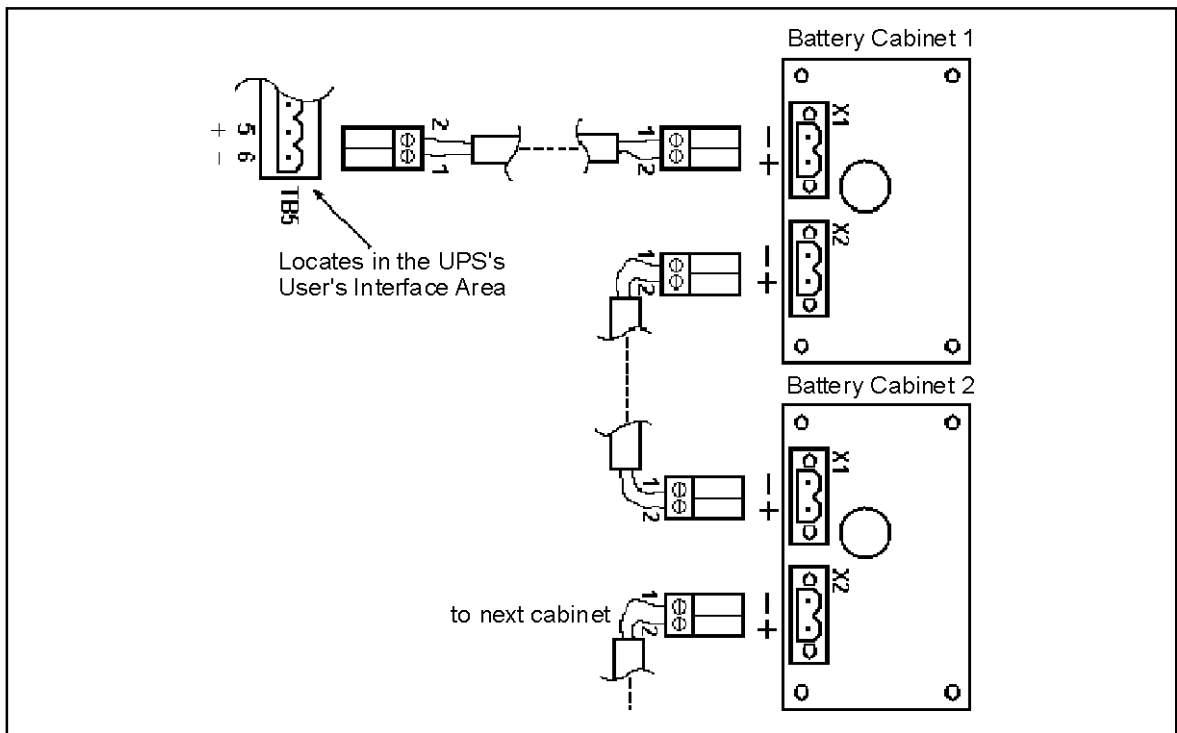


Figure 6b. Connecting temperature sensors for the battery cabinets.

5.4 Power connections

The electrical planning and the UPS installation must be done by qualified personnel only. All power connections shall be done with cable lugs.



WARNING!

The UPS contains high voltage and current which can injure or kill personnel and damage equipment.

The customer has to supply the wiring to connect the UPS to power lines.

The installation inspection and initial start up of the UPS and extra battery cabinet must be carried out by a service engineer from the manufacturer or from an agent authorised by the manufacturer.

The UPS unit has the following power connections:

- 3-phase and \oplus connection for rectifier input (also in IGBT model a non-functional termination point for the neutral wire, if provided)
- 3-phase and N and \oplus connection for bypass input
- 3-phase and N and PE connection for load output
- +, - and PE connection for batteries

All input and output wiring of the UPS connects to the terminals located behind the cover plates behind the doors. Wiring can be routed through the cable entry at the bottom of the UPS cabinet.

The UPS is provided with two single phase L-N power outlets. Connections are at terminals X5 (IGBT model only) and X6. These power supplies are protected with automatic 10 A fuses F14 and F15 (IGBT model only), see figure 8a.

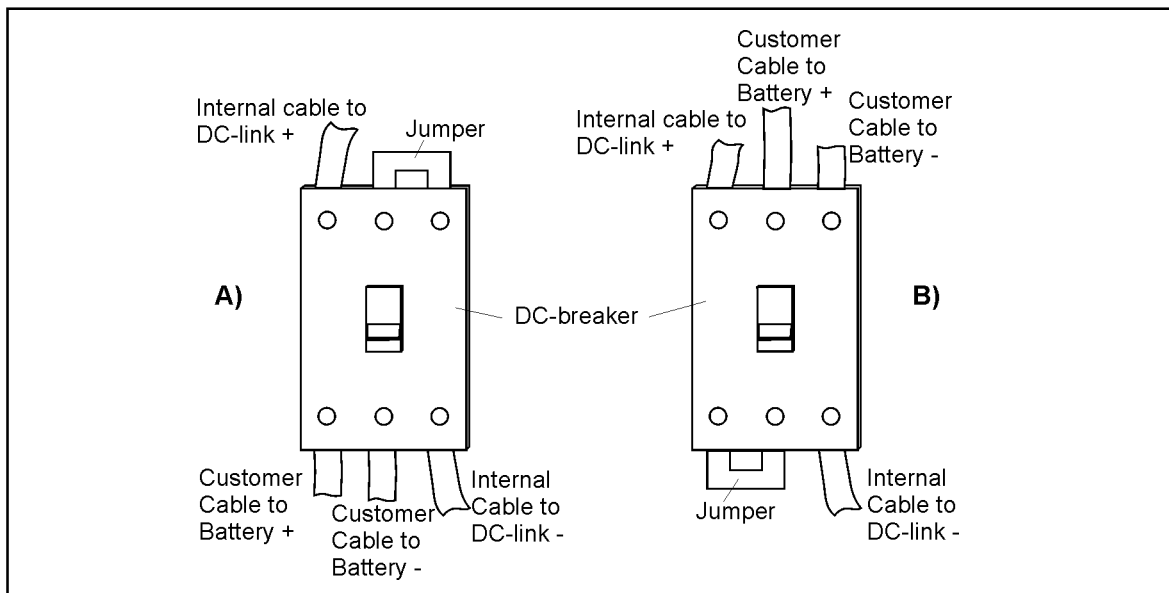


Figure 7. An IGBT 80-130 kVA UPS battery connections to the battery breaker F1 when cable entry from A) bottom B)top.

Note!

Change of jumper position in battery breaker F1. Do not change internal cabling. See figure 7.

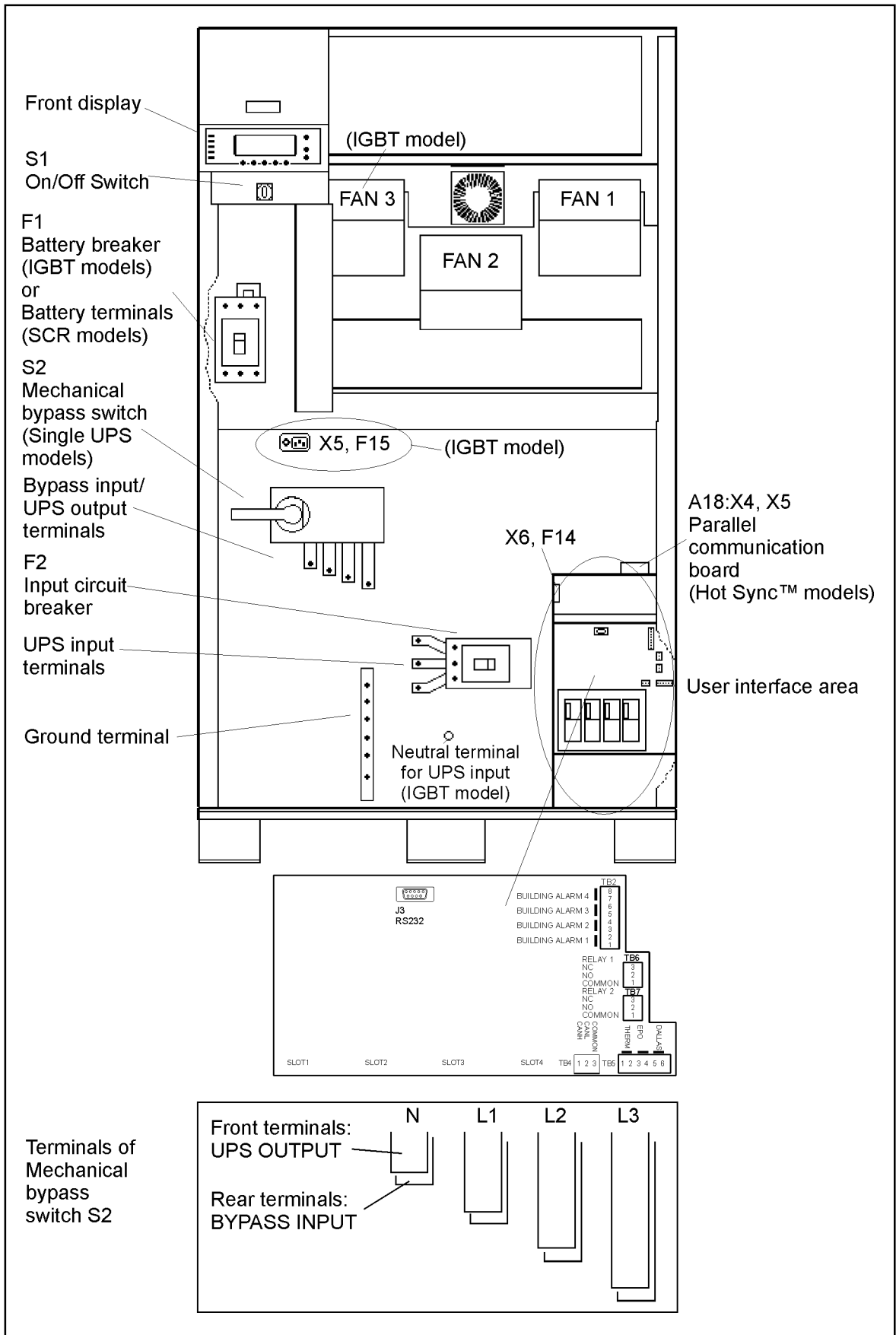


Figure 8a. Location of switches and terminals

Information about power terminals

Fastening torques for other terminals depends on type of the cable shoes and materials. If using aluminium shoes, please use anti-oxidizing paste in the connections. The UPS has all the bolts for the power connections. Please check the local safety rules for the installation when designing the cables:

Rectifier input

Flat copper bar 35*4mm
Neutral

Bolt M10 / 17 mm Hex Socket
Bolt M8 / 13 mm Hex Socket (IGBT model)

Bypass input/UPS Output

Flat copper bar 25*3mm
Neutral

Bolt M10 / 17 mm Hex Socket
Bolt M10 / 17 mm Hex Socket

Ground

Flat copper bar 30*5mm

Bolt M8/ 13 mm Hex Socket

Battery Input

Terminal 32 mm

Bolt M10 / 8 mm Hex Allen Keys with fatening torque of 28 Nm (IGBT model)

Cable shoe for the 150 mm² cable according DIN46234 should fit to the battery breaker terminal (IGBT model).

Note!

The fuses in the battery cabinets are 400 A and for the short-circuit protection. The battery breaker is working as overload protection and disconnect device. According general safety rules when using 400 A fuse, the minimum copper cable size is 95 mm². If you use two cables parallel for the batteries, the cable size must be 2*95 mm². These values of size may vary between countries.

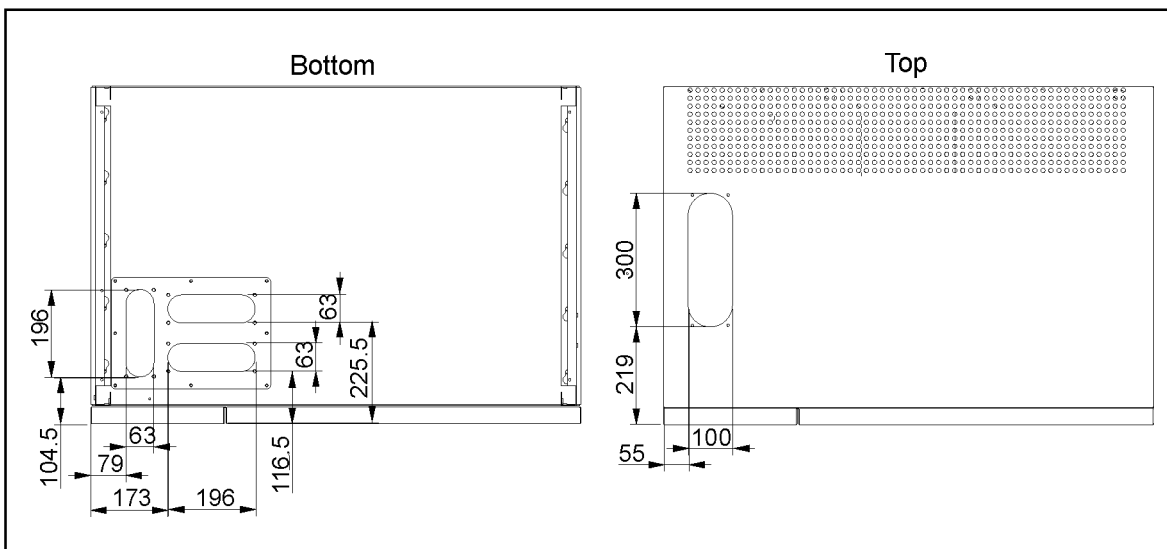


Figure 8b. Location of cable entries.

Mains and load connections

The proper connection order is as follows:

1. Switch off the supply to the distribution point to which the UPS unit is to be connected.
2. For extra safety, also remove the fuses from the selected lines.
Make absolutely sure with measurement that there is no power.
3. A readily accessible disconnect device must be incorporated in all fixed input wiring. The disconnect device shall have a contact separation of at least 3 mm.

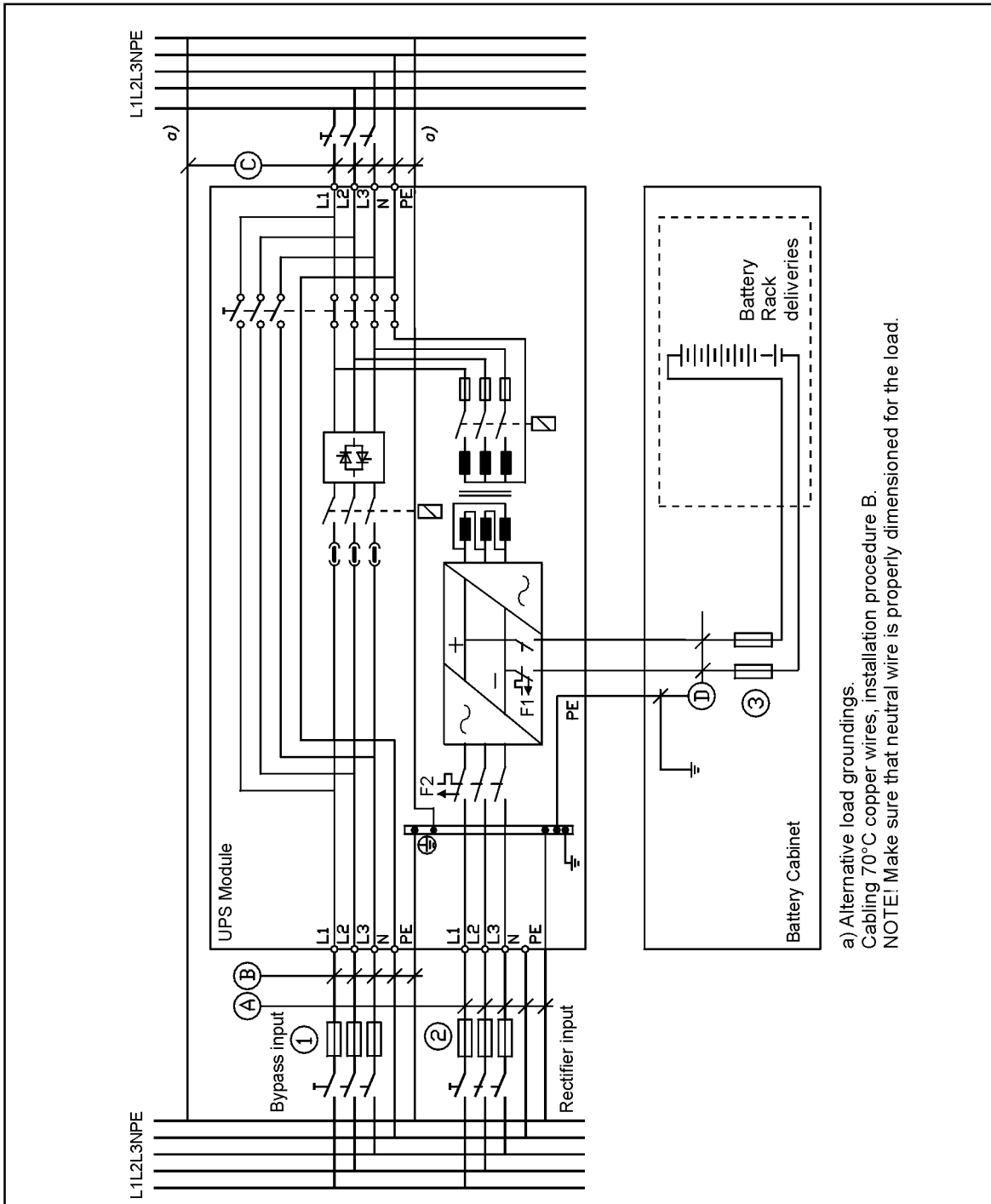
Since the SCR model does not have automatic backfeed isolation a warning label must be added on all primary power isolators installed remote from the UPS area to warn electrical maintenance personnel.

The warning label shall carry the following wording or equivalent:

ISOLATE UNINTERRUPTIBLE POWER SYSTEM (UPS) BEFORE WORKING ON THIS CIRCUIT.

4. Check that electrical connections to the installation site have been properly executed. Also check fuse or circuit breaker ratings and cable dimensions against tables 3 or 4 for 80-130 kVA systems. The figure to follow depends on use of two-cable or single-cable input.
5. The UPS should be connected in accordance with figures 9 and 10.
6. If one cable installation is considered, the interconnection cables provided with UPS shall be connected between rectifier and bypass input terminals. The interconnection cables are labelled L1, L2, L3.
7. Connect input cables and output cables to the UPS.
If load requires using of neutral wire, a neutral connection to bypass input shall be provided.
8. Make sure that the UPS unit output cable is connected to the load.
9. Also connect any computer and alarm connections according chapter 6.
These connections are in the user interface area behind the right-hand door.
10. If an external bypass switch will be used, contact your dealer first.

The UPS unit is now connected to the mains and to the load but there is no power.
Make sure that the connections are properly made.



a) Alternative load groundings.
Cabling 70°C copper wires, installation procedure B.
NOTE! Make sure that neutral wire is properly dimensioned for the load.

Figure 9a. Five-wire installation of UPS (IGBT models) with two-cable input.

Power	Fuse 1	Fuse 2	Fuse 3	Cable A	Cable B	Cable C	Cable D
80 kVA	160 A	160 A	400 A	70 mm ²	70 mm ²	70 mm ²	95 mm ²
100 kVA	160 A	200 A	400 A	95 mm ²	70 mm ²	70 mm ²	120 mm ²
130 kVA	200 A	250 A	400 A	120 mm ²	95 mm ²	95 mm ²	150 mm ²

Table 3a. Fuse and cable dimensions for five wire installations of UPS units from 80 to 130 kVA using two cable input. Note that the fuse numbers and the cable letters refer to the numbers/letters in figure 9a.

Please note that the battery cables delivered with the external battery cabinets are to install the external battery cabinet next to the UPS..

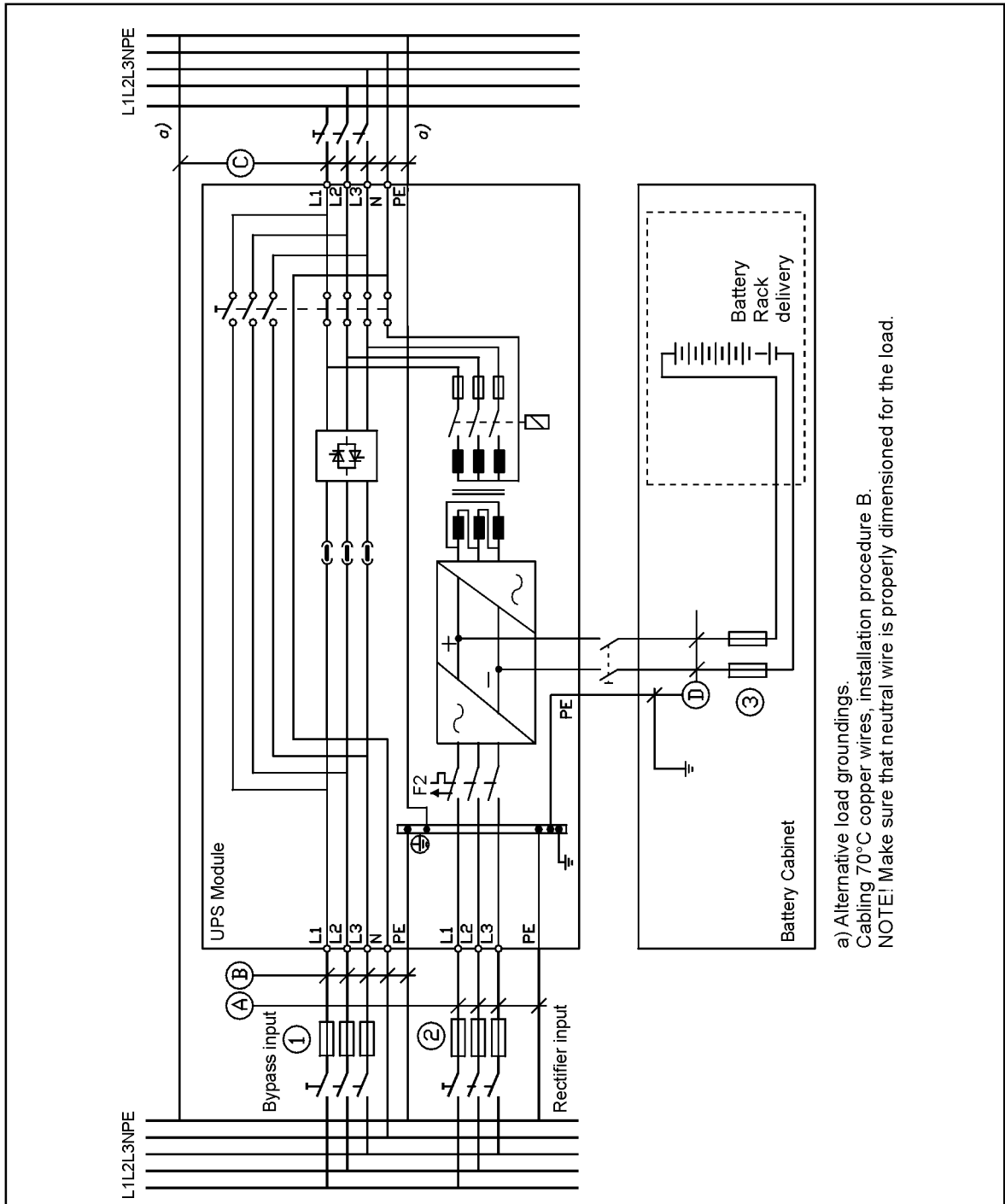
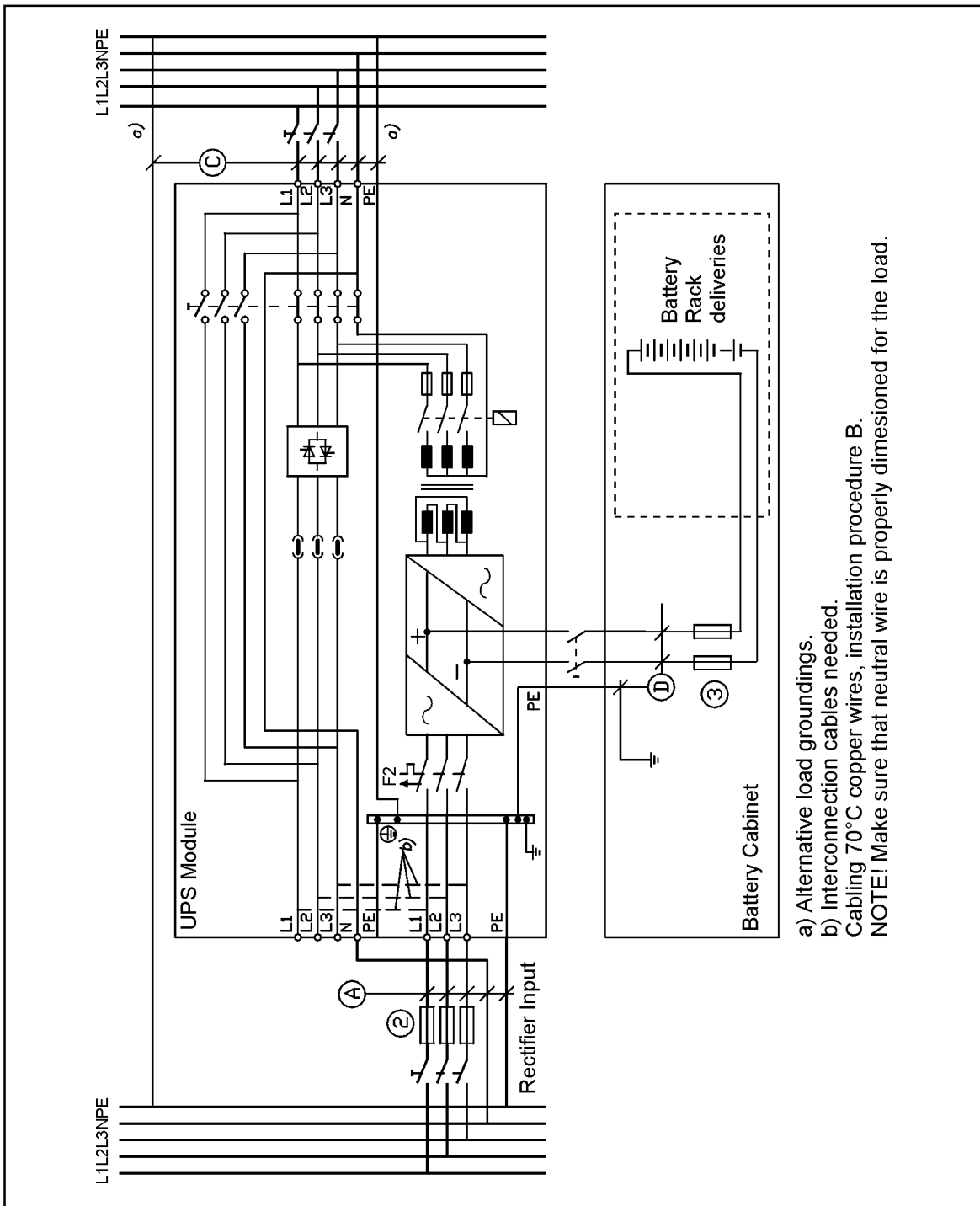


Figure 9b. Five-wire installation of UPS (SCR models) with two-cable input.

Power	Fuse 1	Fuse 2	Fuse 3	Cable A	Cable B	Cable C	Cable D
80 kVA	160 A	160 A	400 A	70 mm ²	70 mm ²	70 mm ²	95 mm ²
100 kVA	160 A	200 A	400 A	95 mm ²	70 mm ²	70 mm ²	120 mm ²
130 kVA	200 A	250 A	400 A	120 mm ²	95 mm ²	95 mm ²	150 mm ²

Table 3b. Fuse and cable dimensions for five wire installations of UPS units from 80 to 130 kVA using two cable input. Note that the fuse numbers and the cable letters refer to the numbers/letters in figure 9b.

Please note that the battery cables delivered with the external battery cabinets are to install the external battery cabinet next to the UPS.



- a) Alternative load groundings.
 b) Interconnection cables needed.
 Cabling 70°C copper wires, installation procedure B.
 NOTE! Make sure that neutral wire is properly dimensioned for the load.

Figure 10a. Five-wire installation of UPS (IGBT models) with single-cable input.

Power	Fuse 2	Fuse 3	Cable A	Cable C	Cable D
80 kVA	160 A	400 A	70 mm ²	70 mm ²	95 mm ²
100 kVA	200 A	400 A	95 mm ²	95 mm ²	120 mm ²
130 kVA	250 A	400 A	150 mm ²	150 mm ²	150 mm ²

Table 4a. Fuse and cable dimensions for five-wire installations of UPS units from 80 to 130 kVA using single cable input. Note that the fuse numbers and the cable letters refer to the numbers/letters in figure 10a.

Please note that the battery cables are delivered with the external battery cabinets to install the battery cabinet next to the UPS.

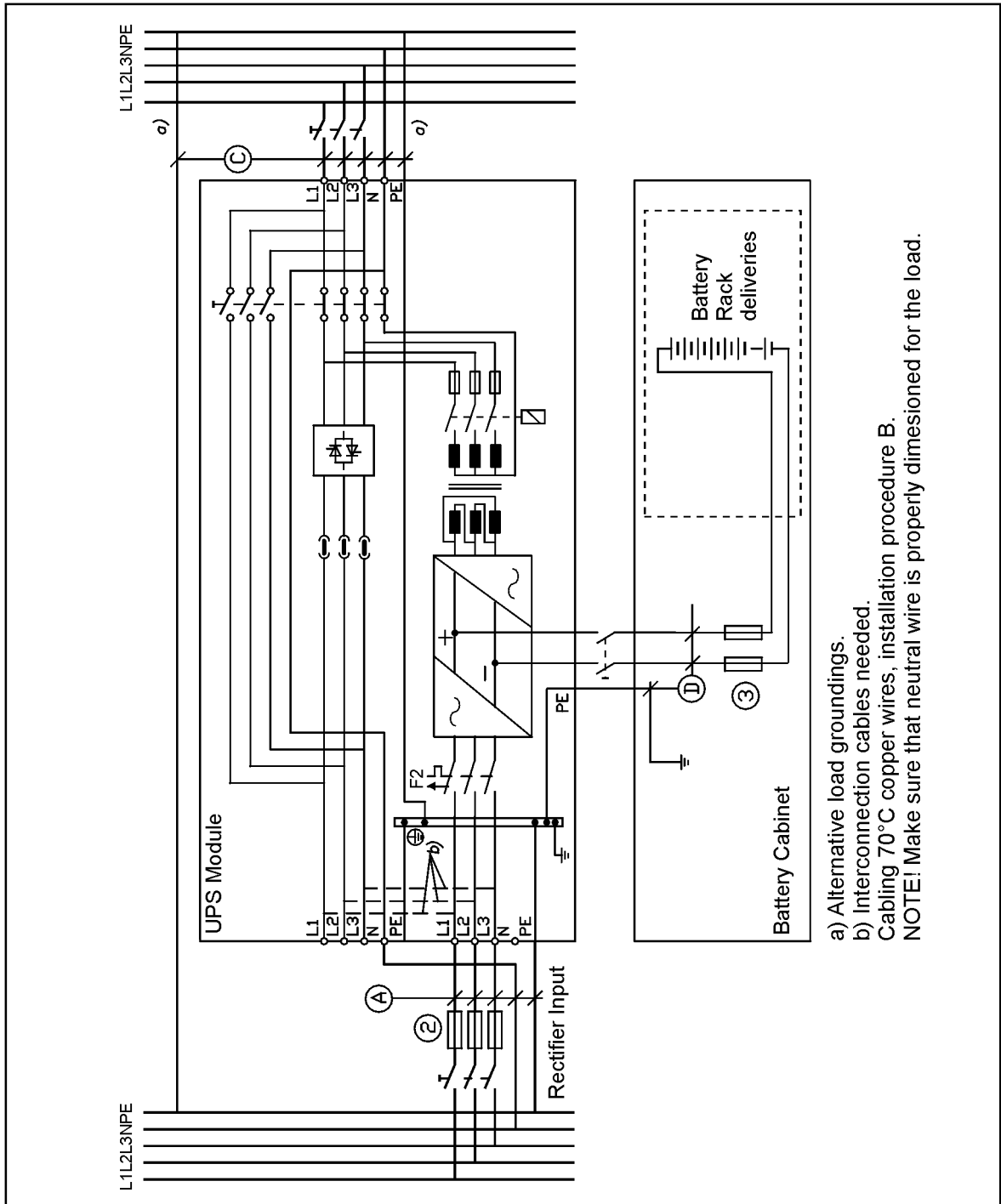


Figure 10b. Five-wire installation of UPS (SCR models) with single-cable input.

Power	Fuse 2	Fuse 3	Cable A	Cable C	Cable D
80 kVA	160 A	400 A	70 mm ²	70 mm ²	95 mm ²
100 kVA	200 A	400 A	95 mm ²	95 mm ²	120 mm ²
130 kVA	250 A	400 A	150 mm ²	150 mm ²	150 mm ²

Table 4b. Fuse and cable dimensions for five-wire installations of UPS units from 80 to 130 kVA using single cable input. Note that the fuse numbers and the cable letters refer to the numbers/letters in figure 10b.

Please note that the battery cables are delivered with the external battery cabinets to install the battery cabinet next to the UPS.

6. Computer and alarm connections

An interface for direct communication with your computer system is supplied in the UPS unit. The interface consists of RS232 serial data interface, four optional X-slots, two potential free relays and four programmable inputs for building alarms. These interfaces are located behind the right-hand door. Communication cables connected to these terminals should be connected to cable holders behind the door and routing of these cables should be under the door. (See figure 11 and 8b).

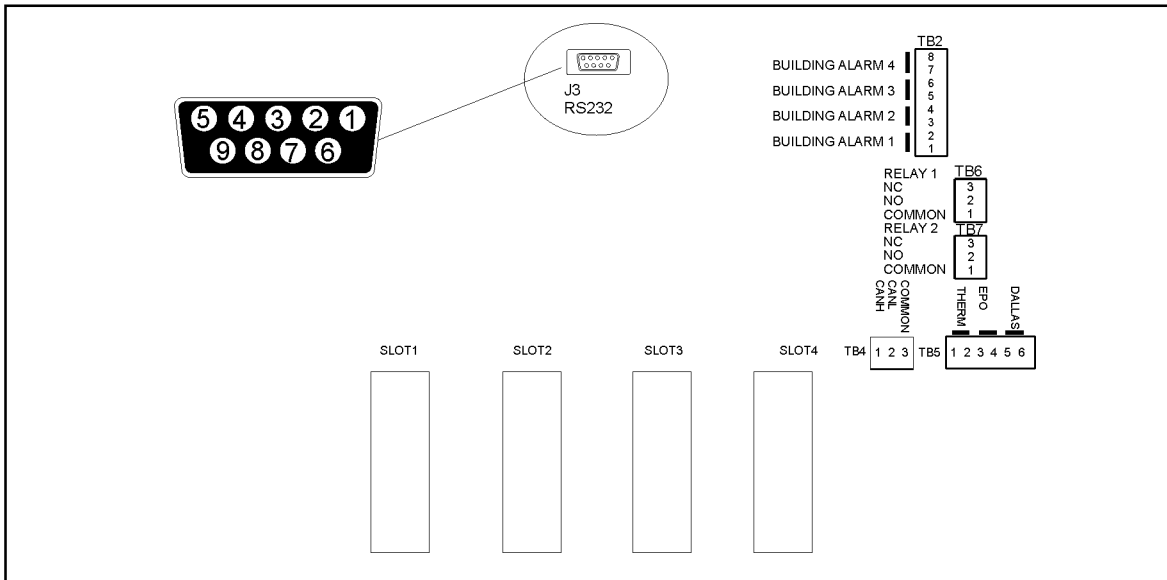


Figure 11. The user interface area



NOTE

All connections mentioned in chapter 7 must not be galvanically connected to any mains connected circuits. Reinforced insulation to the mains is required. The routing of the cables shall be done separate from any power cables

6.1 Connecting the UPS to a computer

The UPS is delivered as a complete solution package with accompanying Software Suite. To connect the UPS to the computer, use the communication cable provided with the package. (Note: If using other cable, verify the PIN configuration from Table 5.) Check from the software documentation that the platform running on your computer is supported. Follow the instructions of the Software Suite to choose and complete the required software installation. For other operating systems, SNMP and more advanced power protection solution combinations, please contact your local dealer.

RS232 serial data interfaces

The RS232 interface J3 uses 9-pin female D-sub connector. The information includes data about the utility, load and the UPS itself. The connector J3 is to be used with a computer connection or a modem connection. See below the meaning of the pins. The RS232 must not be galvanically connected to any mains connected circuits. Reinforced insulation to the mains is required.

The baud rate can be configured for 1200/2400/9600/19200 bps from the LCD display. For appropriate baud setting refer to software manuals. The serial port can have the following format:

- Data bits 8
- Parity None
- Stop bits 1
- Handshake None

Pin #	Signal name	Direction from the UPS	Description
2	RxD	Out	Received data
3	TxD	In	Transmitted data
5	GND	–	Signal ground
9	+V	Out	Power source 8 to 12 volts DC

Table 5. RS232 connection (J3) for the computer, 9-pin female D-sub.

6.2 Potential free relay outputs

This relay interface consists of two potential free relays providing complete isolation between the UPS and the computer. The default function for Relay 1 is UPS On/OK / UPS Alarm. When Relay 1 is energized the UPS is On/OK. Default function for Relay 2 is On Batteries. When the UPS is supplying the load from the batteries Relay 2 is energized. In figure 12 the relays are shown as de-energized.

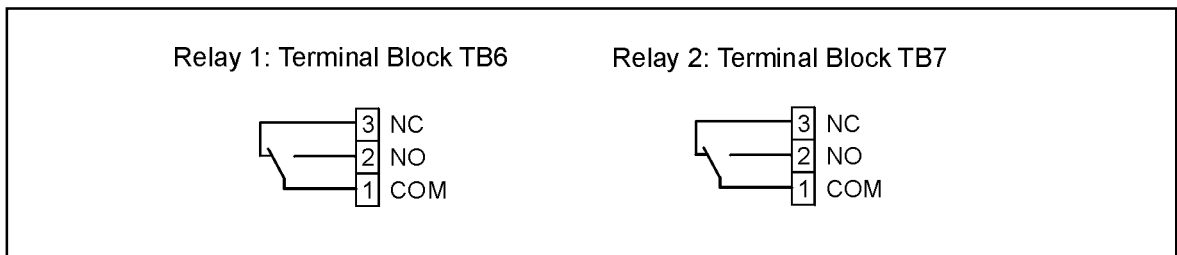


Figure 12. Programmable output relay configuration. All potential free contacts.

Note!

The relay contacts are rated for maximum 1 A/30 Vac or 0,2 A/60 Vdc. All relay outputs are galvanically isolated from the other circuits of the UPS (IEC 60950, EN 50091-1-1). The relay contacts must not be galvanically connected to any mains connected circuits. Reinforced insulation to the mains is required.

6.3 Emergency Power Off Input (EPO)

This input is used to shut down the UPS from a distance. This feature can be used for emergency power down, or for shutting down the load and the UPS by thermal relay for instance in the event of room overtemperature. Remote shut down wires are connected to terminal block TB5 pins 3 and 4. (see figure 11).

The pins of EPO have been connected together at factory. When this connection is open, the logic hard wire circuitry will immediately shut down the UPS, thus preventing the UPS from supplying the load. In order to have the UPS running again the pins of EPO have to be connected and the UPS manually restarted. The pins must be shorted in order to keep the UPS running. Maximum resistance is 10 ohm. The EPO must not be galvanically connected to any mains connected circuits. Reinforced insulation to the mains is required.

6.4 Inputs

The UPS communication device includes four inputs (terminal block 2: 1-2, 3-4, 5-6, 7-8) for building alarms. These inputs can be for example informing when UPS gets power from generator, shutting down and starting up inverter remotely or turning to bypass mode remotely. These inputs can be activated by connecting the two pins together of the particular terminal.

These inputs have the following values:

Generator On Input TB2:1,2

The generator on input is used for inhibiting the transfer to static bypass line when the UPS is supplied by an unstable ac source.

The generator auxiliary contact wires are connected on terminal block 2: 1,2 (see figure 11). In normal operations the terminals 1 and 2 are not be connected together. When these pins are connected together by floating contacts of the generator control device, the logic circuitry in the UPS will prevent the transfer to unstable power source. When the unit is delivered the connection on terminals 1 and 2 will be open.

Remote Output On/Off Input TB2: 3, 4

The remote output on/off input is used to turn off the output of the UPS from a distance. Remote output on/off wires are connected on terminals 3 and 4 (see figure 11).

The terminals 3 and 4 are not to be connected together in normal operation. When the pins are connected together by floating contact the inverter will be turned off and also the static bypass line will be turned off. In order to turn on the inverter and the static bypass line the connection between these pins have to be opened.

External Bypass Switch Input TB2: 5, 6

If the UPS system is equipped with an external bypass switch, its status can be monitored by the UPS via terminals 5 and 6. The external bypass switch auxiliary contact wires are connected on terminals 5 and 6 (see figure 11). For normal UPS operation the connection shall be open as default. If an external bypass switch will be used, contact your dealer first.

Environment Alarm Input TB2: 7, 8

The environment alarm input is used for connecting the UPS to your building alarms, such as overtemperature or smoke detector alarms.

The environment alarm input contact wires are connected on terminals 7 and 8 (see figure 11). When this alarm is activated it will be indicated to the user through RS232 ports. When connection in terminals 7,8 is open, the alarm is inactive as default.

Note!

The programmable auxiliary inputs (Generator ON, External Bypass Switch, Remote Output On/Off, Environment Alarm) must not be galvanically connected to any mains connected circuits. Reinforced insulation to the mains is required for equipments and cables connected to these connections.

Note!

The programmable auxiliary inputs are NOT galvanically isolated from each other. Use dry contacts.

6.5 X-Slot Modules

Optional X-Slot modules allow the UPS to communicate in a variety of networking environments and with different types of devices. The Powerware 9340 is compatible with any X-slot module, including:

- RS232 Module - has one serial communication port.
- Modbus/Jbus Module - connects to an industrial automation system
- AS400 Relay Module - provides additional relay outputs
- SNMP/Web Module - has a flexible SNMP/Web communication port.
- Modem Module - provides modem functions for remote monitoring

7. User's guide to operations

This chapter contains the necessary information on how to use the UPS.

The control panel informs the user the status of the UPS, measurements, alarms and history log. It is also used to controlling and configuring the UPS with the function buttons underneath the display.

During commissioning the manufacturer representative will train the users to operate the UPS system.

7.1 Graphical Control panel

The monitor panel shows the status of UPS operation with five LED indicators and with a LCD screen. The display also generates audible alarm if the user should be alerted.

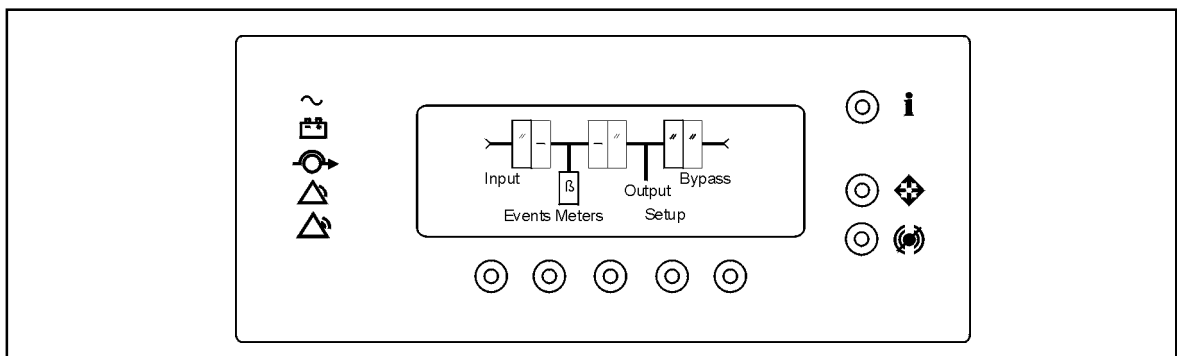


Figure 13. Control panel with the main screen

LED indicators



This green LED is lit when there is voltage at the output terminals and when the UPS is in normal or static bypass mode.



This yellow LED is lit when the UPS is operating in battery mode.



This yellow LED is lit when UPS is on and is operating in bypass mode.



This yellow LED is lit when there is an active notice that doesn't require immediate action.



This red LED is lit when there is an active alarm that requires immediate action.

There are five pushbuttons underneath of the LCD display that are used to access the menu structure.

7.2 Menu structure

The UPS main menu allows you to display data in the information area to help you monitor and control UPS operation. The following menus and options are available:

Events Displays the list of Active Events and a historical log of system events.

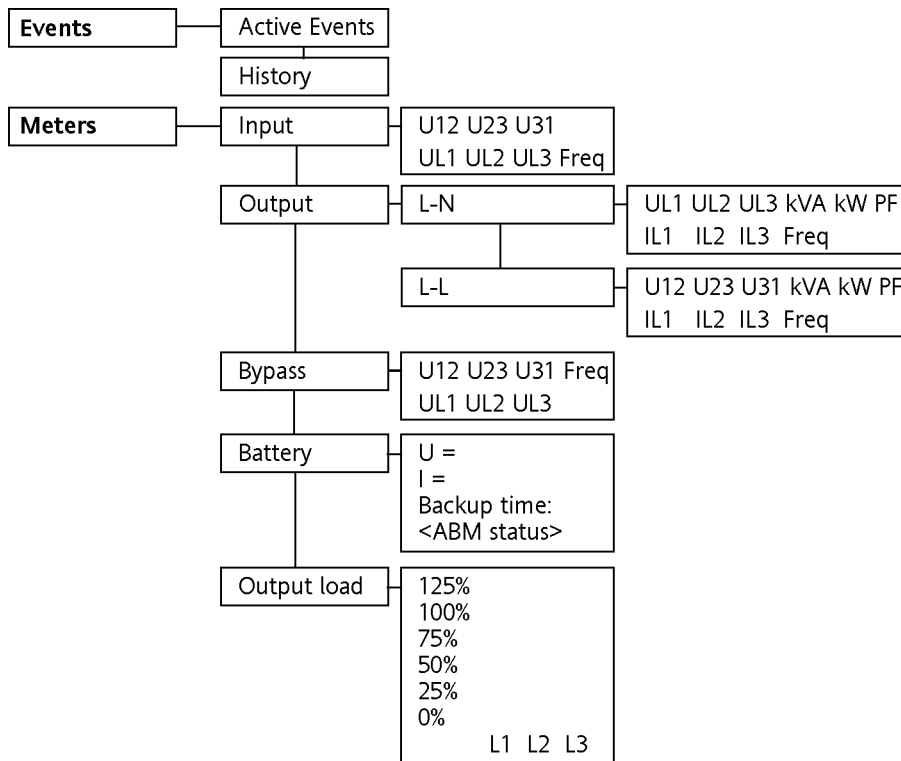
Meters Displays performance meters for the system or critical load.

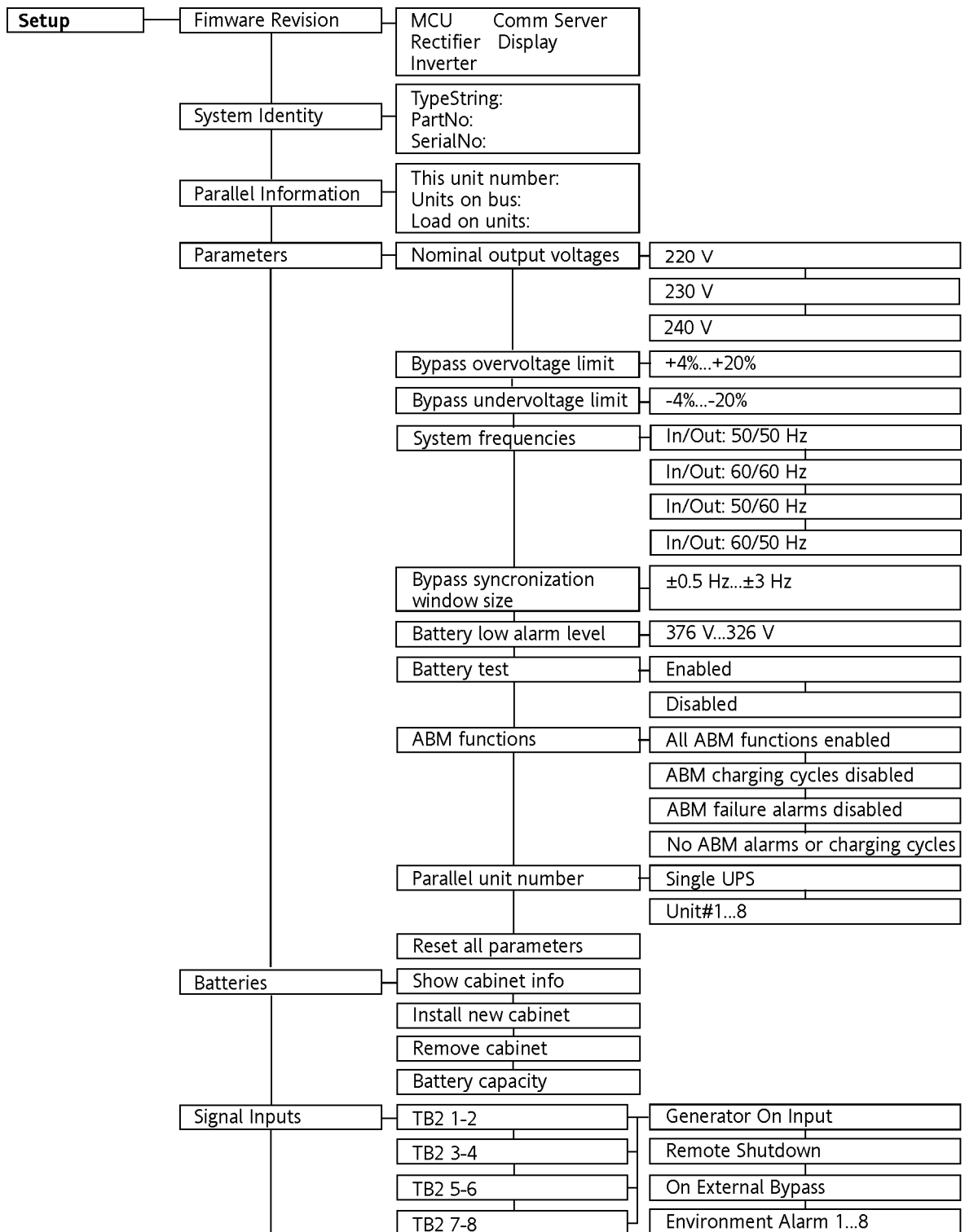
Setup Allows one to view contrast, date & time, firmware versions, system identity and parallel information. Configuration of the UPS requires a password. The password for changing defaults is **USER**.

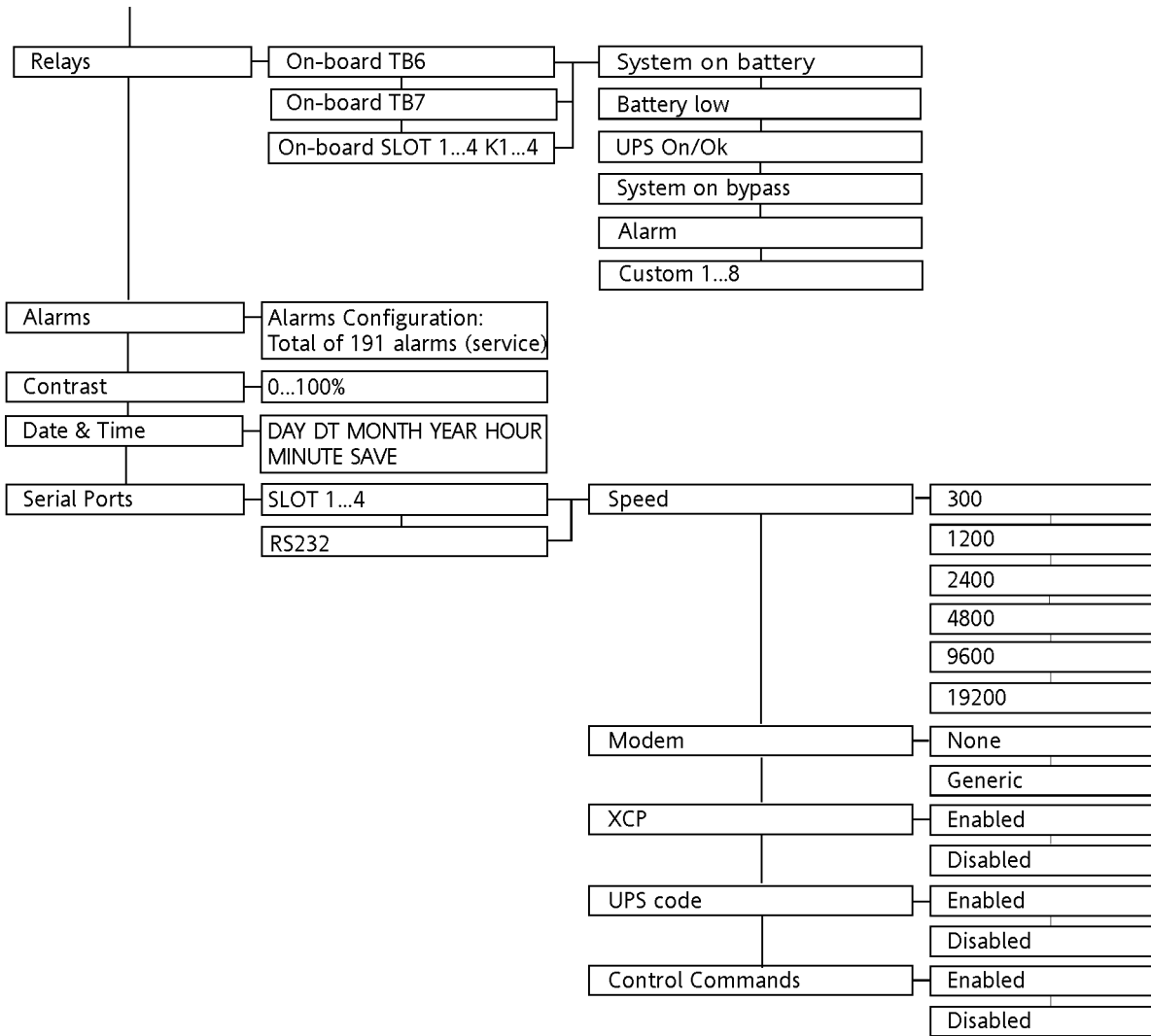
←┘ Returns to Main Menu and displays a real-time graphic representation of the flow of the current through the internal UPS components.

You can access the above mentioned menus by pressing the function button underneath the respective menu.

To scroll through the menu selections use ↑ or ↓ pushbuttons from the display menu.



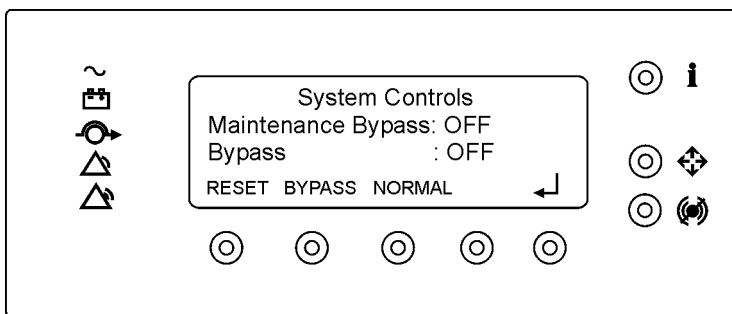







7.3 Manual System Control

The System Controls screen appears when the  pushbutton is pressed.

The transfer to bypass and back to normal mode are controlled from this screen by pressing the Bypass and Normal pushbuttons. As safety feature the UPS can be locked to bypass mode via software and alarm will be given. To return to normal operation press Reset and UPS will transfer to normal operation. These operations are controlled by the UPS firmware and allowed if the conditions for the transfers are acceptable.



Pushbuttons

-  This button is for accessing the language selection menu (future)
-  This button is used to access the manual system control menu:
RESET - BYPASS - NORMAL
-  This button is used to acknowledge the alarms and silence the horn.

7.4 Using the maintenance bypass switch

The UPS unit is provided with a maintenance bypass switch. This switch is used to bypass the UPS during maintenance or servicing.

Maintenance bypass switch is located behind the door.


The maintenance bypass switch is a three position switch having the following positions:

- UPS - normal position, inverter/static switch is supplying power to the load.
- BYPASS- the UPS is mechanically bypassed and the load is supplied from the bypass input power line. This position allows testing of the UPS without disturbing the load. When the 80-130 kVA UPS is turned off and the maintenance bypass switch is in bypass position, and F1, F2 opened, the UPS is isolated from the input and output power lines.
- MIDDLE this position is used only during transfer from maintenance bypass mode to normal mode. In this position the UPS is not galvanically isolated from the bypass and the load is supplied through mechanical and static bypass. Do not leave the switch in this position.

Note!


Maintenance bypass switch is used only on rare occasions. If the bypass input frequency or voltage is not correct and the UPS is not synchronized to mains or static switch is not gated, turning the switch to bypass or UPS position may cause short break to output voltage. If the load is connected to maintenance bypass, the UPS is no longer protecting the critical load!

Going to the maintenance bypass mode

Before going to maintenance bypass, transfer the unit to static bypass mode by pressing the Bypass pushbutton in System Control menu on LCD screen. After this verify that UPS is on bypass mode (Bypass LED lit)  .

Turn the maintenance bypass switch S2 into Bypass-position.

Going to the UPS mode

Before turning the maintenance bypass switch from bypass to UPS position, verify that the bypass LED is lit . Verify that the UPS returns to Normal mode. It may be necessary to transfer the UPS to normal mode by pressing the Normal pushbutton in System Control menu. (See chapter 8.1)

If the rectifier input voltage is not present or within limits, the UPS will stay on bypass mode as long as the bypass input voltage is within limits. If the bypass goes out of limits or the rectifier input voltage returns within limits, the unit will transfer to normal mode.

7.5 Starting up the UPS

Make sure that UPS installation has been carried out correctly and battery line, neutral and protective earth inputs have been connected. Figures 7 and 8a show the location of the switches and breakers.

The UPS is also provided with a battery start up possibility. When the following start-ups are done, the UPS will also start up if the input power line is not available or acceptable. In this case the UPS will be in battery mode supplying power from the batteries or in the static bypass mode if the bypass line voltage and frequency are acceptable. During the battery start-up the UPS won't transfer to normal mode if the bypass is within limits. The UPS will transfer to normal mode when the rectifier input voltage returns within limits or bypass voltage is no longer acceptable.


During battery start up UPS will charge the DC link capacitors from batteries and this causes longer start-up time.

Starting up the UPS, load energized

(bypass switch S2 is in bypass position and voltage is present in the output terminals, see figure 8a)

- Open the doors of the UPS
- Check that on/off switch S1 is in OFF position
- Check that the maintenance bypass switch S2 is in bypass position
- Turn the circuit breakers F1 (IGBT models) and F2 to ON position
- Close the right door
- Start the UPS by turning the switch S1 to ON position

The UPS will now check its internal functions. The UPS starts after 10 – 15 s. (Approx. 1 min. if the rectifier input voltage is not present)

- Check that the yellow bypass LED is lit .
- Check that there is no active alarms that require immediate action.
- Turn the maintenance bypass switch S2 to UPS position
- Close the left door of UPS

Starting up the UPS, load de-energized

(bypass switch S2 is in bypass or UPS position and voltage is not present in the output terminals, see figure 8a)

- Open the doors of the UPS
- Check that on/off switch S1 is in OFF position
- Check that the maintenance bypass switch S2 is in UPS position
- Turn the circuit breakers F1 (IGBT models) and F2 to ON position
- Close the right door
- Start the UPS by turning the switch S1 to ON position


The UPS will now check its internal functions. The UPS starts after 10 – 15 s. (Approx. 1 min. if the rectifier input voltage is not present)

- Close the left door of UPS

7.6 Shutting down the UPS

The UPS unit does not have to be shut down at the end of each day. The unit is designed to cope with a continuous load from the day it is installed until a change is needed in the backup battery bank.

Shutting down to Maintenance Bypass:

- Go to System Control menu in LCD display (see chapter 8.1) and press Bypass pushbutton to transfer to static bypass mode.
- Verify that the Bypass LED is  lit.
- If the bypass LED is not lit, check the active events to verify the reason.
- Open the doors of the UPS.
- Turn the maintenance bypass switch S2 to the Bypass-position.
- Turn the on/off switch S1 to Off-position.
- Turn the circuit breakers F1 (IGBT models) and F2 off.
- The UPS stops supplying power and it will be disconnected internally from the batteries. The load is supplied through mechanical bypass.

Shutting down and disconnecting load:

- Open the doors of the UPS.
- Turn the on/off switch S1 to Off-position.
- Turn the circuit breakers F1 (IGBT models) and F2 off.
- The UPS stops supplying power and it will be disconnected internally from the batteries and the load is disconnected.

8. Parallel UPS System

8.1 Introduction

Up to four UPS modules (Hot Sync™) may be installed together in the parallel for Redundancy or Capacity system.

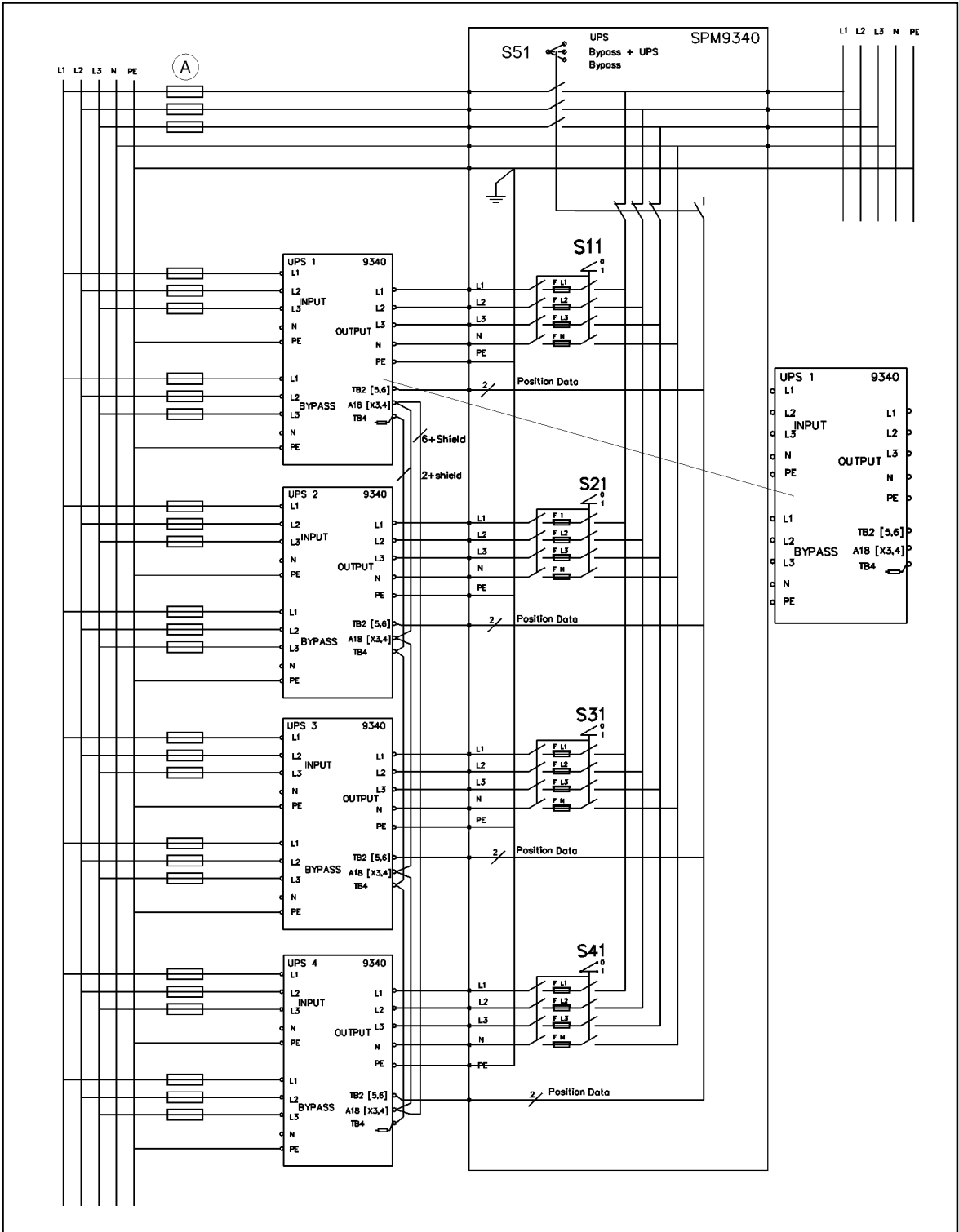


Figure 14. System wiring diagram of 1-4 parallel UPS modules with the manufacturer's SPM9340 cabinet (optional).

8.2 Selecting redundancy or capacity mode

A parallel system is parameter selectable (available in 2002) between N+1 redundancy and capacity modes. The parameters are displayed in the LCD control panel. Factory default is the parallel system for N+1 redundancy where user gets an alarm if the +1 redundancy level is exceeded in the load.

8.3 Installation requirements

The system is designed with all vital parts accessible from front. Power cable entries are from bottom. Separately from the power cabling, signal cable routing is recommended through the hollow in the lower edge of right front door.

Power cables

All input cables, bypass cables, output cables and system bypass cables of the parallel UPS system must be dimensioned according to local regulations.

UPS	a) '1+1'xUPS modules (redundancy) b) 1xUPS module (capacity)	a) '2+1'xUPS modules (redundancy) b) 2xUPS modules (capacity)
PW9340-80I	80 kVA	160 kVA
PW9340-100I	100 kVA	200 kVA
PW9340-130I	130 kVA	260 kVA
UPS	a) '3+1' x UPS modules (redundance b) 3xUPS module (capacity)	a) – b) 4xUPS modules (capacity)
PW9340-80I	240 kVA	320 kVA
PW9340-100I	300 kVA	400 kVA
PW9340-130I	390 kVA	520 kVA

Table 6. Output ratings of parallel UPS systems for a) redundancy or b) capacity.

1. The cable must be able to carry the nominal current. Pay attention to proper dimensioning of neutral (N) according to the load type.
2. The cable must be rated for at least 70°C maximum operating temperature and copper cables should be used to fit terminals.
3. The cable must fulfil the requirements of the short circuit protection level with the correct fuse size.

Note!

The total length of UPS bypass and output cables must be inside $\pm 10\%$ tolerances and the same type. Due to the same cabling impedance, the equal cables mean equal load sharing for the static bypass mode. Negligence of the instructions may cause the parallel UPS system to lock in the bypass mode after overload or load transient situation.

Recommended cables and fuses

All cables and fuses must be dimensioned according to local safety regulations, appropriate mains voltage and the rated current.

UPS Module	Current	Cable (Cu)	Fuse (S11/21/31/41)
80 kVA	116 A	70 mm ²	125 A
100 kVA	145 A	70 mm ²	160 A
130 kVA	188 A	95 mm ²	200 A

Table 7. Recommended cables and fuses for the output of UPS modules, ref. SPM9340 wiring diagram of fuse switches S11/21/31/41.

System bypass	Current	Cable (Cu)	Fuse A
2xPW9340-080I=160 kVA	232 A	150 mm ²	250 A
2xPW9340-100I=200 kVA	290 A	185 mm ²	315 A
3xPW9340-080I=240 kVA	348 A	300 mm ²	400 A
2xPW9340-130I=260 kVA	377 A	300 mm ²	400 A
3xPW9340-100I=300 kVA	435 A	2 x 150 mm ²	500 A
3xPW9340-100I=300 kVA	435 A	2 x 150 mm ²	2 x 250 A
4xPW9340-080I=320 kVA	464 A	2 x 150 mm ²	500 A
4xPW9340-080I=320 kVA	464 A	2 x 150 mm ²	2 x 250 A
3xPW9340-130I=390 kVA	565 A	2 x 240 mm ²	630 A
3xPW9340-130I=390 kVA	565 A	2 x 185 mm ²	2 x 315 A
4xPW9340-100I=400 kVA	580 A	2 x 240 mm ²	630 A
4xPW9340-100I=400 kVA	580 A	2 x 185 mm ²	2 x 315 A
4xPW9340-130I=520 kVA	754 A	2 x 300 mm ²	800 A
4xPW9340-130I=520 kVA	754 A	2 x 300 mm ²	2 x 400 A

Table 8. Recommended cables and fuses for the input of system bypass, ref. SPM9340 wiring diagram of system bypass switch S51.

System communication with a CANBUS interface

A 10-meter CANBUS interconnection cable with termination resistors (2*120 ohm) are supplied for parallel UPS modules. The CANBUS cable must be connected between the TB4 terminals of two successive UPS modules as shown in the earlier wiring diagram of parallel UPS system. A shielded, twisted pair cable with maximum length of 40 meters must be used.

The CANBUS is a linear communication interface. It must not form a loop configuration. Intermediate termination resistors are removed in parallel systems of 3-4 UPS modules. Only the first and last UPS modules in the CANBUS chain must have a termination resistor fitted in cable end connected to TB4 terminals pin 1 'CANH' and pin 2 'CANL'.

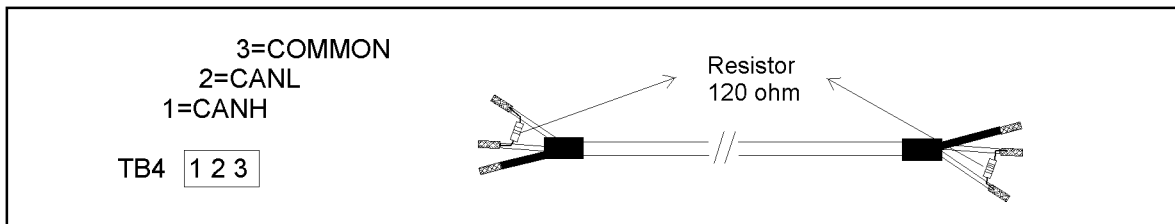


Figure 15. TB4 communication terminals of UPS modules and CAN cable with resistors.

Note!

Pay attention to the signal polarity because pins 1 'CANH' and pin 2 'CANL' must not be interchanged between UPS modules. The shield is connected to pin 3 'COMMON' on the TB4 terminal from both ends.

Hot Sync™ communication with a 6-pin parallel interface

In addition to the CANBUS cable, a 6-pin parallel intercommunication cable (10-meters) is supplied with parallel UPS modules. The cable forms a redundant communication interface between successive 'A18' communication boards of UPS modules.

The 'A18' communication boards have parallel terminals X3 and X4. The 6-pin parallel cable must be connected between these two terminals of UPS modules. It's recommended that the cabling form a loop configuration to increase redundancy level of parallel communication. The shield of each parallel intercommunication cable must be connected to PE from one of the cable ends. The PE connection is located next to the 'A18A' communication board in the frame of UPS cubicle.

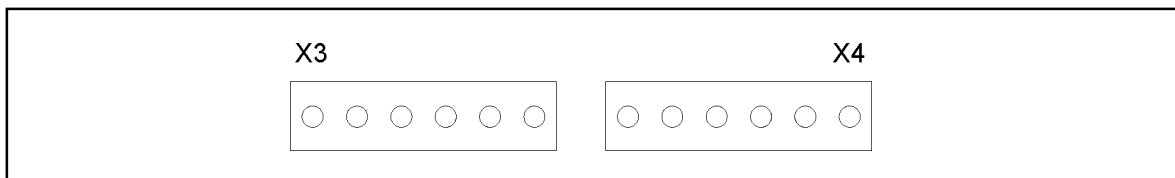


Figure 16. X3 and X4 communication terminals in the 'A18' communication board.

Contact signal from the system bypass switch S51

Parallel UPS system for redundancy or capacity has normally an external make-before-break system bypass switch function installed as shown in the SPM9340 wiring diagram.

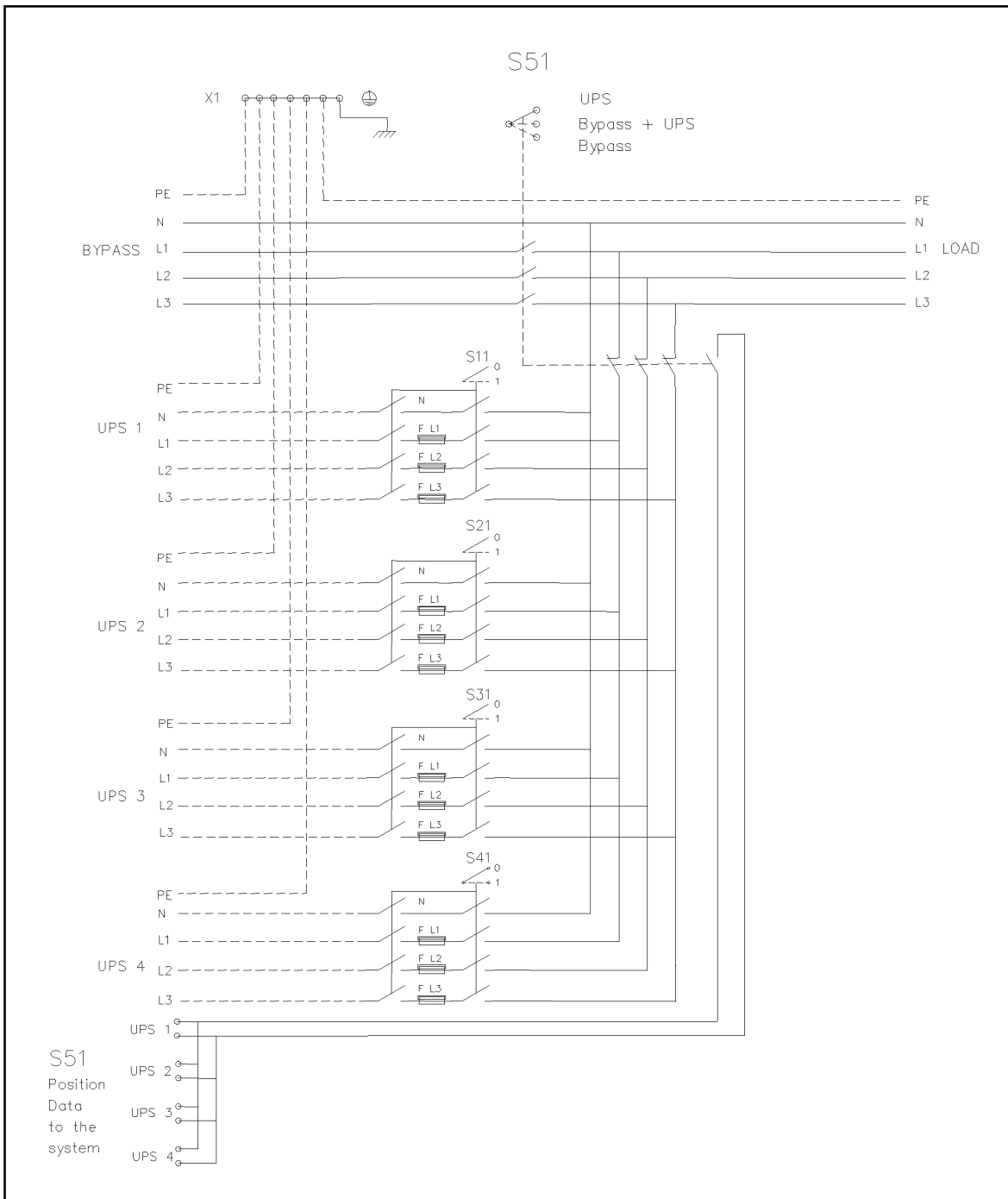


Figure 17. SPM9340 wiring diagram.

An auxiliary contact from the system bypass switch S51 must be provided for each individual UPS module. It's connected to the TB2 'BUILDING ALARM 3' terminal and between pins 5 and 6.

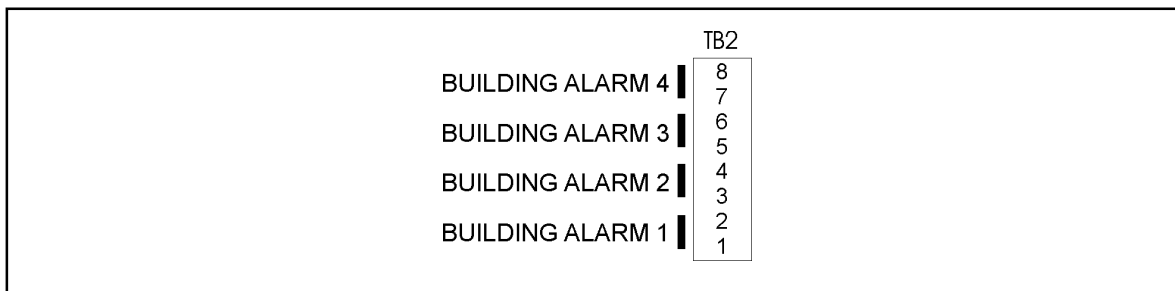


Figure 18. TB2 signal terminal of UPS modules.

Note!

Pay attention to the signal polarity because the signal must be the same for all UPS modules. Negligence of the instructions may cause a high inrush currents to bypass line/UPS output, and cause a load dump. Moreover, it in under no circumstances allowed to operate the UPS internal mechanical bypass switch. The handle must be removed if it is fitted to the UPS modules.

For proper transfer the auxiliary contact must close before the main power contacts when switching from UPS position to BYPASS position. The auxiliary contact from the bypass switch should be with minimum of 10 ms leading operation. The common system bypass signal initiates parallel UPS modules to gate static switch regardless of internal bypass condition or inverter synchronization.

8.4 Starting up System

Check that the power and control wiring has been done correctly before starting up any UPS modules. There should be voltage in both rectifier and internal bypass input. Make sure that ground connections have been done in the tie panel for UPS module outputs.

The parallel UPS system 1-2-3-4 should be started in the orderly manner:

1. Check that the UPS modules are in the start-up condition and open front door:
 - Main switch S1, input circuit breaker F2, and battery breaker F1 are in OFF position.
2. Check that the system bypass switch S51 is in the 'BYPASS' position, and the service switches S11/21/31/41 are in the ON position (refer to SPM9340 design with local tie panels).

Note! Battery start of parallel UPS modules must be made in the 'UPS' position of system bypass switch S51.
3. Start all UPS modules within 30 sec. to prevent start of a single module with overload:
 - Turn on the input breakers F2 and battery circuit breakers F1 to the 'ON' position.
 - Start the UPS modules by turning switch S1 to the 'ON' position.

4. Check that the UPS modules have started:
 - Green UPS ON led is lit if mains power is available, yellow BATTERY led is lit only if the UPS modules are on battery power.
5. Check that yellow BYPASS led is lit in the front panel. This verifies that auxiliary contact signal from the external system bypass switch S51 is ok (refer to SPM9340 design with local tie panels).
6. Transfer the critical load to the parallel UPS system by turning the external system bypass switch S51 to 'UPS' position (refer to SPM9340 design with local tie panels).
7. Check from LCD display of UPS modules that the parallel system is running on inverter power instead of static bypass. Hence, the critical load should be now supplied by the parallel UPS system.

8.5 Switching off System

The UPS system does not have to be shut down at the end of each day. The system is designed to cope with a continuous load from the day it is installed until a change is needed in the backup battery bank.

In the N+1 redundancy mode, it is possible to shut down a single UPS module for service. In the capacity mode, the external system bypass switch S51 must be first used to transfer the system load to external bypass power (refer to SPM9340 design with local tie panels).

The redundant UPS module of the parallel UPS system can be switched off in the following manner if no critical UPS alarms are present:

1. Check that all UPS modules are in the operational condition and open front door of the selected UPS module:
 - Main switch S1, input circuit breaker F2, and battery breaker F1 are in 'ON' position
2. Check from control panel that the parallel UPS system is in the N+1 redundancy mode.

Note! The external system bypass switch S51 must be used for transfer operation if the system has capacity mode and load exceeds N+1 redundancy level. Hence, the load must be disconnected if the parallel UPS system does not contain the system bypass switch S51 (refer to SPM9340 design with local tie panels).
3. Turn the main switch S1, input circuit breaker F2 and the battery circuit breaker F1 to 'OFF' position:
 - The selected UPS module has now stopped to supply output power.
4. Turn the appropriate service switch S11/21/31/41 to 'OFF' position in the external SPM9340 cabinet or equivalent tie panel. This prevents high voltage to be present in the output of the disconnected UPS module.

8.6 System Parallel Module (SPM9340)

A tie panel is needed for the outputs of parallel UPS modules. Powerware's optional system bypass module (SPM9340) is a ready-made solution for the maximum system of four parallel UPS modules. It includes four service disconnect switches S11/21/31/41 and a make-before-break system bypass switch S51.

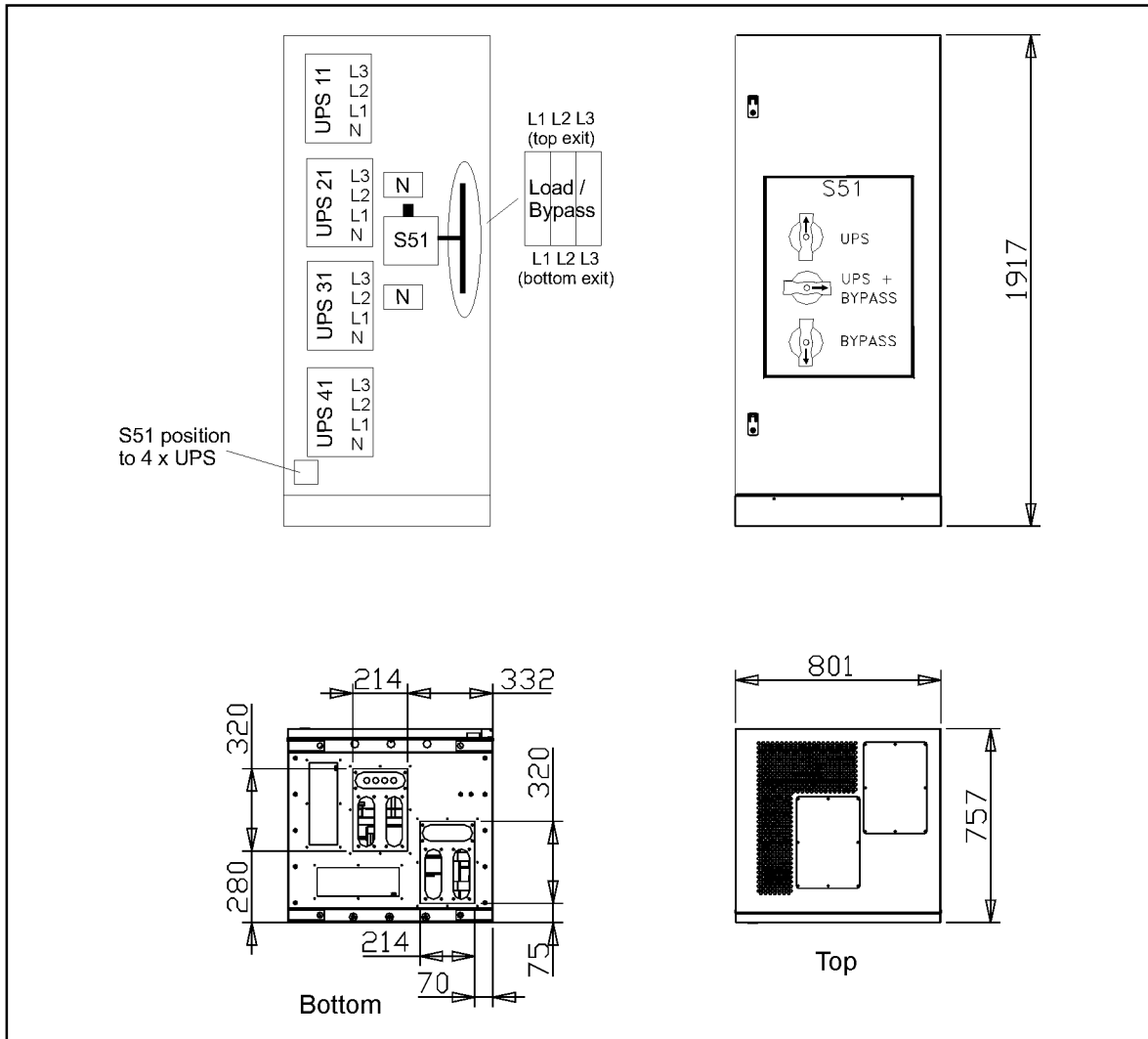


Figure 19. Dimension drawing for the manufacturer's SPM9340 cabinet.

Note!

UPS modules should be transferred to static bypass from the LCD control panel before operating the system bypass switch S51. This procedure ensures UPS modules to check for the internal bypass condition and inverter synchronization. A safe transfer is not guaranteed if the system bypass switch S51 is operated without first transferring UPS modules to static bypass mode. Remember to check from the LCD control panel that UPS modules return to online mode in the 'UPS' position of system bypass switch S51.

The cabling procedure for SPM9340 is following:

1. Open door and remove front mechanics to access the system bypass switch S51.
2. Connect cables from the load to the system bypass switch S51.
3. Connect cables from the system bypass to the system bypass switch S51
4. Reinstall front mechanics
5. Connect input cables from UPS modules to the SPM9340 cabinet.
6. Close door

9. Maintenance

All operations inside the unit must be carried out only by a service engineer from the manufacturer or from an agent, authorized by a manufacturer.

Battery maintenance

The condition of the batteries is crucial to correct operation of the UPS. The UPS units are provided with the automatic battery test, which continuously monitors the condition of the battery bank. When the capacity of the battery bank has decreased remarkably, the UPS will indicate this by audible and visual alarms.

In addition to the automatic battery test it is recommended that a battery discharge test is done once or twice per year. This test is recommended to be done together with the preventive maintenance by service engineer from the manufacturer or by an agent authorised by the manufacturer.

Scrapping the UPS

Before scrapping UPS or its battery cabinet the batteries must be removed. Due to high energy and high voltage, removal of batteries is allowed only for authorised service personnel. Local requirements must be followed in battery recycling or discard.



WARNING!

HAZARDOUS MATERIALS. Batteries may contain **HIGH VOLTAGES**, and **CAUSTIC, TOXIC** and **FLAMMABLE** substances. Batteries can injure or kill people and damage equipment if used improperly. **DO NOT DISCARD** unwanted batteries or battery material in the public waste disposal system. Follow **ALL** applicable, local regulations for storage, handling and disposal of batteries and battery materials.



10. Warranty

The product is warranted against defects in material and workmanship for a period of 12 months from its original date of purchase.

11. Technical specifications

1. General characteristics

1.1 UPS models	80 kVA: PW9340-80I-N / -NHS PW9340-80I-SCR / -SCRF
N = IGBT rectifier version with Harmonic Control™ NHS = Parallel Hot Sync® version	100 kVA: PW9340-100I-N / -NHS PW9340-100I-SCR / -SCRF
SCR = Thyristor rectifier version SCRF = SCR with an integral input filter	130 kVA: PW9340-130I-N / -NHS PW9340-130I-SCR / -SCRF
1.2 Technology	Double conversion online UPS topology with automatic bypass switch and maintenance bypass switch
- EN 50091-3 and IEC 62040-3	
1.3 Performance	Class VFI-SS-111 voltage and frequency independent operation
1.4 Efficiency	92% at nominal load, 90% at half load
1.5 Standards	Performance ENV50091-3, IEC 62040-3 Safety EN50091-1-1, IEC 60950 EMC EN50091-2
1.6 Conformity	CE, GOST, ISO 9001

2. Mechanical construction

2.1 Dimensions	UPS cabinet: 1100 x 766 x 1917 mm (*)
- width x depth x height	Battery cabinet: 980 x 766 x 1917 mm SPM9340 cabinet: 801 x 757 x 1917 mm
2.2 Weight	1040 kg (-N / -NHS UPS models) 1030 kg (-SCRF UPS model) 990 kg (-SCR UPS model) 310 kg (SPM9340 cabinet)
2.4 Enclosure	IP20
2.3 Color	RAL 7035
2.5 Cabling direction	Bottom or top

(*) Centre of gravity with x-, y-, z- coordinates: 580 mm (x=width), 700 mm (y=height), 470 mm (z=depth)

3. Electrical characteristics / Input

3.1 Nominal voltage	220/380, 230/400, 240/415 V; 50/60 Hz
3.2 Fluctuation	342 to 456 V; 45 to 65 Hz
3.3 Current	80 kVA: 3 x 102 A (-N / -NHS) 3 x 120 A (-SCRF) 3 x 147 A (-SCR) 100 kVA: 3 x 127 A (-N / -NHS) 3 x 153 A (-SCRF) 3 x 181 A (-SCR) 130 kVA: 3 x 165 A (-N / -NHS) 3 x 200 A (-SCRF) 3 x 230 A (-SCR)
3.4 Power factor / THD	0.99 / 3% (-N / -NHS) 0.84 / 15% (-SCRF) 0.73 / 30% (-SCR)

4. Electrical characteristics / Output

4.1 Nominal power	80 kVA / 100 kVA / 130 kVA at PF 0.8
4.2 Nominal voltage	220/380, 230/400, 240/415; 50/60 Hz
4.3 Crest factor	3:1 computer and server loads
4.4 Linear loads	0.8 lagging to 0.9 leading
4.5 Voltage regulation	±1% at static, ±5% at dynamic operation;
4.6 Current	80 kVA: 3 x 116 A 100 kVA: 3 x 145 A 130 kVA: 3 x 188 A
4.7 Short circuit capability - max 300 ms duration	520 Amp phase to neutral, 300 Amp phase to phase or limited by the bypass line impedance and fusing.
4.8 Voltage distortion (VHD)	Max. 3% with linear loads; Max. 5% with non linear loads
4.9 Synchronisation to bypass input	±0.5, ±1.0, ±1.5, ±2.0, ±2.5 or ±3 Hz with slew rate of changes <0.5 Hz per second; ±0,05 Hz free running.
4.10 Parallel load sharing - Hot Sync® models only (-NHS)	±5% of the rated load

Parallel HotSync™ systems

Redundancy mode		Power rating		
Nr of UPS modules	80 kVA modules	100 kVA modules	130 kVA modules	
1 + 1 x UPS	80 kVA	100 kVA	130 kVA	
2 + 1 x UPS	160 kVA	200 kVA	360 kVA	
3 + 1 x UPS	240 kVA	300 kVA	390 kVA	
Capacity mode		Power rating		
Nr of UPS modules	80 kVA modules	100 kVA modules	130 kVA modules	
2 x UPS	160 kVA	200 kVA	260 kVA	
3 x UPS	240 kVA	300 kVA	390 kVA	
4 x UPS	320 kVA	400 kVA	520 kVA	

5. Environmental

Ambient temperature	±0°C to + 40°C in normal UPS condition, -25°C ... +60°C in storage condition; +15°C to +25°C recommended for batteries
Altitude	Max. 1000 m in normal UPS condition
Humidity	5 to 95% RH, non-condensing
Heat dissipation	80 kVA: 5.1 kW 100 kVA: 6.4 kW 130 kVA: 8.3 kW
Cooling air	Variable speed controlled fan cooling: Max. 1900 m ³ /h (528 l/s)
Audible noise - ISO 7779	65 to 67 dB(A)

6. DC circuit

6.1 Battery type	Valve Regulated Lead Acid; 32 pcs 12V blocks with 10 years design.
6.2 Battery charging	Advanced Battery Management™ or traditional float charging
6.3 Nominal battery voltage	384 VDC (192 cells)
6.4 DC bus reference in float mode	2.31VPC (10...25°C), 2.26VPC (50°C)
6.5 Battery cut-off voltage	1.7 VPC (voltage per cell)
6.6 Battery charging current	30 A

Battery cabinets and back-up times

Cabinet	Battery size	Pcs	Type	Dimensions W x D x H mm	Weight kg
BAT HR250	55 Ah 12 V	32	12 HR250	980 x 677 x 1917	1050
BAT HR305	67 Ah 12 V	32	12 HR305	980 x 677 x 1917	1200
BAT HR350	78 Ah 12 V	32	12 HR350	980 x 677 x 1917	1350
BAT CD475	124 Ah 12 V	32	12 CD475	980 x 677 x 1917	1800

UPS Output power	BAT HR250	BAT HR305	BAT HR350	BAT CD475
UPS 80 kVA (64 kW)	8 min	11 min	15 min	22 min
UPS 100 kVA (80 kW)	5 min	8 min	10 min	16 min
UPS 130 kVA (104 kW)	-	-	6 min	9 min

Battery racks and back-up times

Description	Type of rack	Dimensions I x W x H	Back-up time when UPS load in kVA									
			20	40	60	70	80	90	100	110	120	130
Rack 1x32/12HR250	4L3095	900x715x1736	46	23	13	10	8	6	5	0	0	0
Rack 1x32/12HR305	4L3125	1200x715x1736	59	27	17	13	11	9	8	7	0	0
Rack 1x32/12HR350	4L3125	1200x715x1743	126	32	21	17	15	12	10	8	7	6
Rack 2x32/12HR250	4L4125	1200x930x1736	109	50	31	29	24	21	18	16	13	11
Rack 2x32/12HR305	4L4155	1500x930x1736	143	64	40	34	29	26	23	20	18	16
Rack 2x32/12HR350	4L4155	1500x930x1743	177	82	48	41	34	31	27	24	22	20
Rack 3x32/12HR250	4L3245	2400x715x1736	177	82	52	46	37	32	28	28	25	22
Rack 3x32/12HR305	4L3275	2700x715x1736	227	110	66	57	46	41	35	34	30	27
Rack 3x32/12HR350	4L3305	3000x715x1743	278	137	85	67	56	50	43	40	35	32
Rack 4x32/12HR305	4L4275	2700x930x1736	320	156	95	77	68	59	53	46	45	36
Rack 4x32/12HR350	4L4305	3000x930x1743	379	192	114	96	87	69	64	55	51	44