

# Installation Guide

Uninterruptible Power Supply

*SG Series 10 – 20 – 30 – 40*

10 – 20 – 30 – 40 kVA / 480Vac UL / S0

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**ISO 9001**

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The content of this publication may be subject to modification without prior notice.

**Dear Customer,**

We thank you for selecting our products and are pleased to count you amongst our very valued customers at **GE**.

We trust that the use of the **SG Series 10-20-30-40** Uninterruptible Power Supply system, developed and produced to the highest standards of quality, will give you complete satisfaction.

Please read carefully the *Installation Guide*, which contains all the necessary information and describes all you need to know about the installation of the UPS.

Thank you for choosing **GE** !



#### **START-UP AND COMMISSIONING**

**A GE GLOBAL SERVICES FIELD ENGINEER must perform start-up and commissioning of the UPS.**

**Please Contact GE. GLOBAL SERVICES at least two weeks prior to schedule start-up and commissioning at 1-800-637-1738, or by E-mail at [pqservice@ge.com](mailto:pqservice@ge.com) .**

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## Preface

Congratulations on your choice of a *SG Series 10-20-30-40* Uninterruptible Power Supply (UPS). It will help eliminate *Load* disturbances due to unexpected power problems.

This *Manual* describes the function of the UPS module, the purpose and location of the switches, the meaning of the system events related to the front panel indication, and provides procedures for starting and stopping the equipment.

Please refer to the accompanying *Installations Guide*, which describes how to prepare the installation site, and it provides weight, dimensions and procedures for moving, installing and connecting the UPS.

While every care has been taken to ensure the completeness and accuracy of this manual, GE assumes no responsibility or liability for any losses or damages resulting from the use of the information contained in this document.

**NOTE!**

*SG Series 10-20-30-40* is a product that needs to be installed by a licensed and knowledgeable contractor.

We recommend that this manual be kept next to the UPS for future references.

If any problems are encountered with the procedures contained in this manual, please contact your *Service Center* before you proceed.

This document shall not be copied or reproduced without the permission of GE.

Some of the information contained in this manual may be changed without notice to reflect technical improvements.

## Safety instructions

Read the safety instructions contained on the following pages carefully before the installation of the UPS, options and *Battery System*.

Pay attention to the rectangular boxes included in the text:

They contain important information and warning concerning electrical connections and personnel safety.

**RPA**

Redundant Parallel  
Architecture

### *Parallel version secured with RPA*

*When included in the text, this symbol refers to operation needed only for parallel system.*



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# 1 SAFETY RULES

## SAVE THESE INSTRUCTIONS

This manual contains important instructions for models **SG Series 10-20-30-40** that should be followed during installation and maintenance of the UPS and battery.

### GENERAL

- Move the UPS in an upright position in its original package to the final destination room.  
To lift the cabinets, use a forklift or lifting belts with spreader bars.
- Check for sufficient floor and elevator loading capacity.
- Check the integrity of the UPS equipment carefully.  
If you notice visible damage, do not install or start the UPS.  
Contact the nearest *Service Center* immediately.
- **WARNING! RISK OF ELECTRICAL SHOCK:**  
Do not remove covers, there are no user serviceable parts inside.
- After switching off takes 5 minutes for the DC capacitors to discharge because a lethally high voltage remains at the terminals of the electrolytic capacitors.
- All maintenance and service work should be performed by qualified service personnel.  
The UPS contains its own energy source (battery).
- The field-wiring outlets may be electrically live, even when the UPS is disconnected from the utility.
- Dangerous voltages may be present during battery operation.
- The battery must be disconnected during maintenance or service work.
- This UPS contains potentially hazardous voltages.
- Be aware that the inverter can restart automatically after the utility voltage is restored.
- End user must follow applicable regional occupational safety codes/regulations during installation, operation and equipment maintenance. This may require additional field marking or labeling defining appropriate level of PPE (Personal Protection Equipment) to reduce the risk of Arc-flash related injuries.  
Contact our Technical Support for product specific information.

### INSTALLATION

- This UPS must be installed and connected only by trained personnel.
- Verify accurately during Commissioning and Maintenance of the UPS, for the following:  
Damaged components, squeezed wires and cables, or not correctly inserted plugs.
- After removing the sidewalls of the UPS, make sure that all earth connections when reassembling, are correctly reattached.
- This UPS is intended for use in a controlled indoor environment free of conductive contaminants and protected against animals intrusion.
- **WARNING! HIGH EARTH LEAKAGE CURRENT:**  
Earth connection is essential before connecting to AC input!
- Switching OFF the unit does not isolate the UPS from the utility.
- Do not install the UPS in an excessively humid environment or near water.
- Avoid spilling liquids on or dropping any foreign object into the UPS.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 104°F (40°C).
- Optimal battery life is obtained if the ambient temperature does not exceed 77°F (25°C).
- It is important that air can move freely around and through the unit. Do not block the air vents.
- Avoid locations in direct sunlight or near heat sources.

### STORAGE

- Store the UPS in a dry location; storage temperature must be within -13°F (-25°C) to 131°F (+55°C).
- The optimal temperature for Battery storage is 68°F (20°C) to 77°F (25°C) and shall never exceed the range -4°F (-20°C) to 104°F (40°C).
- If the unit is stored for a period exceeding 3 months, the battery must be recharged periodically (time depending on storage temperature).

### BATTERY

- The battery-voltage is dangerous for person's safety.
- When replacing the battery, use the same cells number, voltage (V), capacity (Ah).  
All the battery used, shall be of the same manufacturer and date of production.
- Proper disposal or recycling of the battery is required.  
Refer to your local codes for disposal requirements.
- Never dispose of battery in a fire: they may explode.
- Do not open or mutilate battery: their contents (electrolyte) may be extremely toxic.  
If exposed to electrolyte, wash immediately with plenty of water.
- Avoid charging in a sealed container.
- Never short-circuit the batteries.  
When working with batteries, remove watches, rings or other metal objects, and only use insulated tools.
- In case of air shipment, the cables +/- going to the battery fuses/terminals shall be disconnected and isolated.

## Safety instructions when working with battery



**EXTERNAL BATTERY MUST BE INSTALLED AND CONNECTED TO THE UPS BY QUALIFIED SERVICE PERSONNEL.  
INSTALLATION PERSONNEL MUST READ THIS ENTIRE SECTION BEFORE HANDLING THE UPS AND BATTERY.**

### **DANGER!**

Full voltage and current are always present at the battery terminals.

The battery used in this system can provide dangerous voltages, extremely high currents and a risk of electric shock.

If the terminals are shorted together or to ground they may cause severe injury.

You must be extremely careful to avoid electric shock and burns caused by contacting battery terminals or shorting terminals during battery installation.

Do not touch uninsulated battery terminals.

A qualified service person, who is familiar with battery systems and required precautions, must install and service the battery.

The installation must conform to national and local codes.

Keep unauthorized personnel away from the battery.

The qualified service person must take these precautions:

- 1 Wear protective clothing, such as rubber gloves and boots and protective eye wear  
Batteries contain caustic acids and toxic materials and can rupture or leak if mistreated.  
Remove rings and metal wristwatches or other metal objects and jewelry.  
Do not carry metal objects in your pockets where the objects can fall into the battery cabinet.
- 2 Tools must have insulated handles and must be insulated so that they will not short battery terminals.  
Do not allow a tool to short between individual or separate battery terminals or to the cabinet or rack.  
Do not lay tools or metal parts on top of the battery, and do not lay them where they could fall onto the battery or into the cabinet.
- 3 Install the battery as shown on the drawing provided with the battery.  
When connecting cables, never allow a cable to short across a battery's terminals, the string of battery, or to the cabinet or rack.
- 4 Align the cables on the battery terminals so that the cable lug will not contact any part of the cabinet or rack, even if the battery is moved.  
Keep the cable away from any sharp metal edges.
- 5 Install the battery cables in such a way that the UPS or battery cabinet doors cannot pinch them.
- 6 Do not connect the battery terminal to Ground.  
If any battery terminal is inadvertently grounded, remove the source of the ground.  
Contacting any part of a grounded battery can cause a risk of electric shock.
- 7 To reduce the risk of fire or electric shock, install the battery in a temperature and humidity controlled indoor area, free of contaminants.
- 8 Battery system chassis ground (earth) must be connected to the UPS chassis ground (earth).  
If you use conduits, this ground conductor must be routed in the same conduit as the battery conductors.
- 9 Where conductors may be exposed to physical damage, protect the conductors in accordance with all applicable codes.
- 10 If you are replacing the battery or repairing battery connections, shut OFF the UPS and remove the battery fuses.

## Safety symbols and warnings



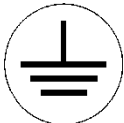





### Safety warnings

The text of this manual contains some warnings to avoid risk to the persons and to avoid damages to the UPS system and the supplied critical loads.

The non-observance of the warnings reminding hazardous situations could result in human injury and equipment damages.

Please pay attention to the meaning of the following warnings and symbols.

Throughout this manual the following symbols are defined:

	<b>WARNING</b> , if instruction is not followed injury or serious equipment damage may occur!
	<b>CAUTION</b> , internal parts have dangerous voltage present. Risk of electric shock!
	<b>PE (Earth) – GND (Ground)</b> <b>PROTECTIVE GROUNDING TERMINAL:</b> 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 an alternating (sine wave) current or voltage may be applied or supplied.
	A terminal to which or from which a direct current or voltage may be applied or supplied.
	This symbol indicated the word "phase".
	This symbol indicates the principal on/off switch in the on position.
	This symbol indicates the principal on/off switch in the off position.

## 2 LAYOUT

### 2.1 LAYOUT SG Series 10 & 20

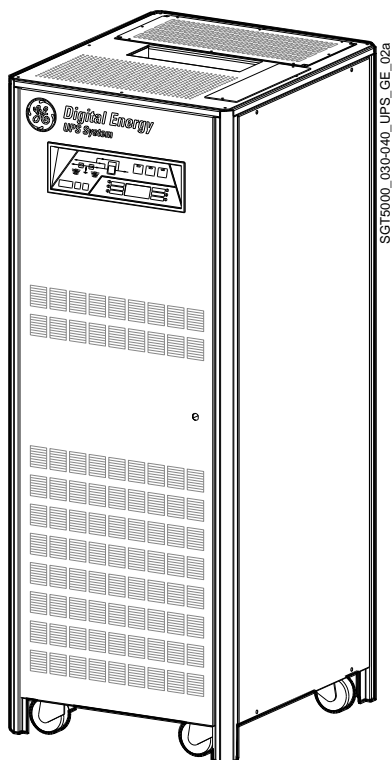


Fig. 2.1-1 SG Series 10 & 20 general view

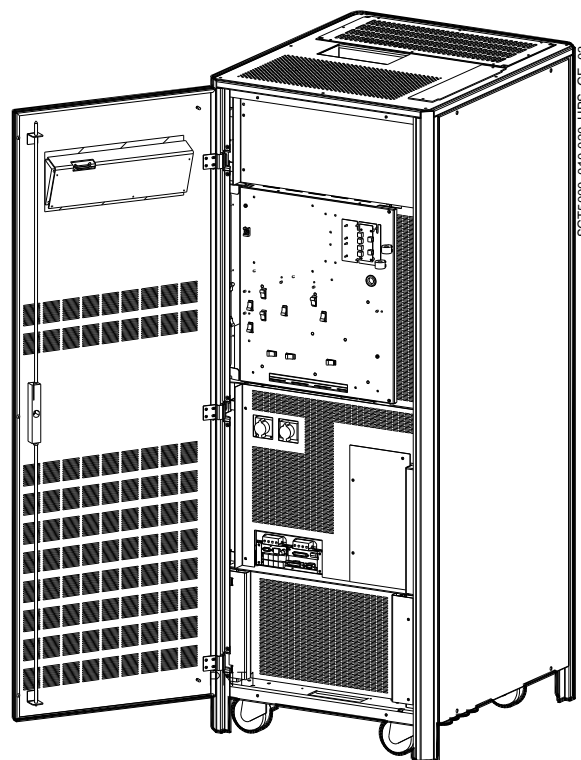


Fig. 2.1-2 SG Series 10 & 20 general view with open doors

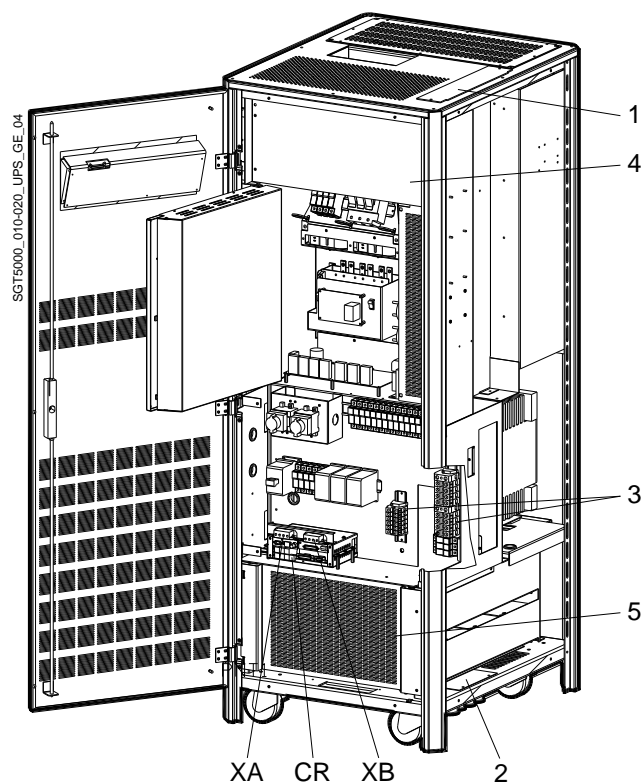


Fig. 2.1-3 SG Series 10 & 20 general view with optional 5<sup>th</sup> harmonic filter and removed protection panels

- 1 Opening for top cable entry
- 2 Opening for bottom cable entry
- 3 Terminals for Utility input and load output
- 4 Terminals for external Battery connection
- 5 Battery Shelf
- CR Connectivity Rack
- XA Terminals for 24Vdc Auxiliary Power Supply connection
- XB Terminals for EPO connection

## 2.2 LAYOUT SG Series 30 & 40

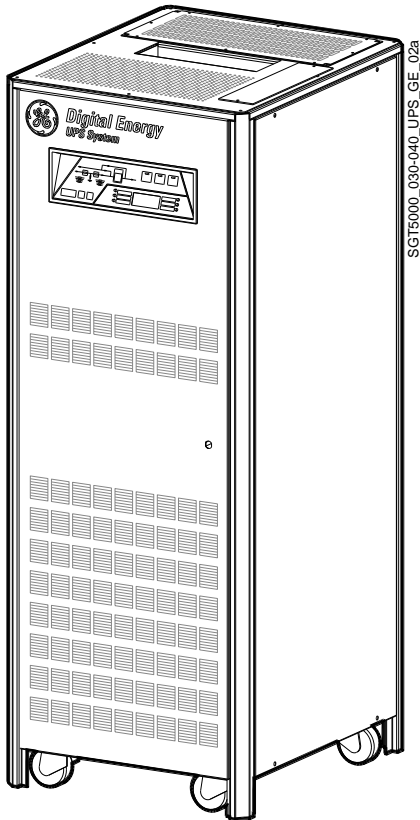


Fig. 2.2-1 SG Series 30 & 40 general view

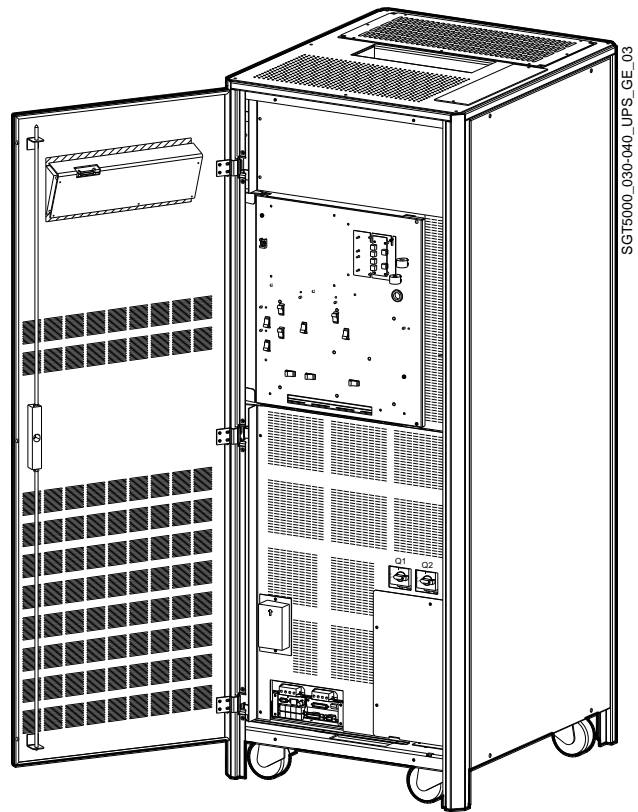


Fig. 2.2-2 SG Series 30 & 40 general view with open doors

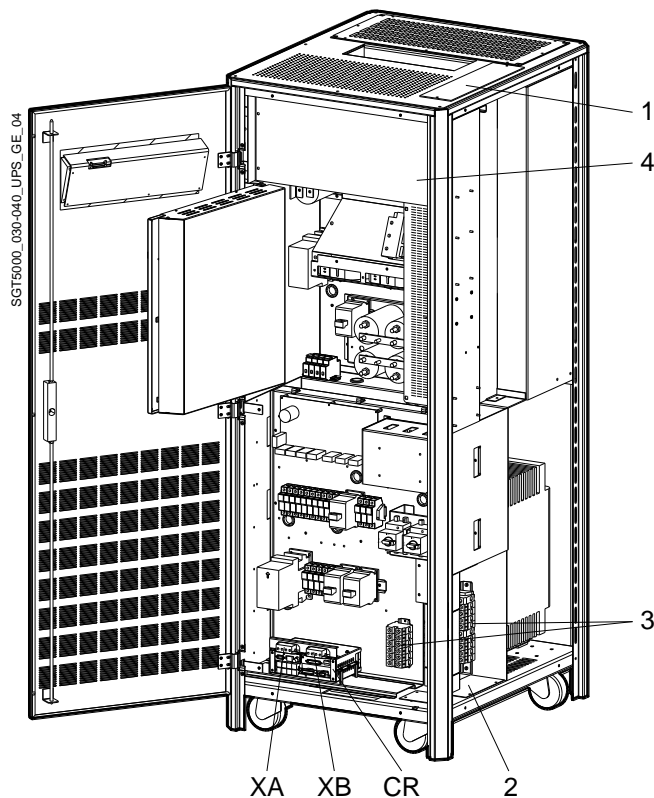


Fig. 2.2-3 SG Series 30 & 40 general view with optional 5<sup>th</sup> harmonic filter and removed protection panels

- 1 Opening for top cable entry
- 2 Opening for bottom cable entry
- 3 Terminals for Utility input and load output
- 4 Terminals for external Battery connection
- CR Connectivity Rack
- XA Terminals for 24Vdc Auxiliary Power Supply connection
- XB Terminals for EPO connection



## 3 INSTALLATION

### 3.1 TRANSPORT

#### Forklift



#### Crane

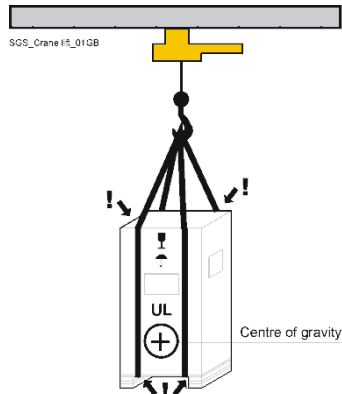


Fig. 3.1-1 UPS cabinets moving

**Transport UPS only in upright position!**

The UPS is packaged on a pallet suitable for handling with a forklift.

**Pay attention to the center of gravity.**

The UPS must be moved in **upright position**.  
Do not tilt cabinets **more than  $\pm 10^\circ$**  during handling.

**Move the UPS in its original package to the final destination site.**

**Do not stack other packages on top:** This could damage the UPS.

If the UPS must be lifted by crane, use suitable lifting straps and spreader bars.

Note of the center of gravity marked on the package.

**Take all necessary precautions to avoid damage to the cabinet while hoisting the UPS.**



**NOTE !**

**Check for sufficient floor and elevator loading capacity.**

#### 3.1.1 Dimensions and weight

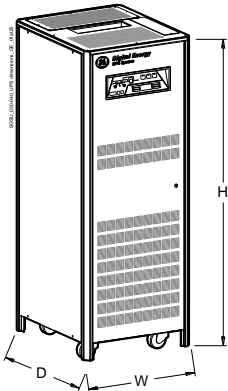


Fig. 3.1.1-1 UPS cabinet dimensions

**Dimensions SG Series 10-20-30-40**

(W x D x H)

26.78 x 31.50 x 70.90 inches

680 x 800 x 1,800 mm

**Weight SG Series 10-20-30-40**

UPS rating kVA	UPS without battery		UPS with battery	
	Weight lbs / kg	Floor loading lbs/sq.ft - kg/m <sup>2</sup>	Weight lbs / kg	Floor loading lbs/sq.ft - kg/m <sup>2</sup>
<b>SG Series 10</b>	735 / 333	126 / 613	1,121 / 508	192 / 934
<b>SG Series 20</b>	763 / 346	131 / 637	1,169 / 530	200 / 975
<b>SG Series 30</b>	970 / 440	166 / 809	–	–
<b>SG Series 40</b>	1,147 / 520	196 / 956	–	–

P.S.: Weights including the 5th harmonic filter.

## 3.2 DELIVERY

When delivered, inspect the **package integrity** and **the physical conditions of the cabinets** carefully.

In case of any damage sustained during transport, immediately inform the carrier and contact your local **Service Center**.

A **detailed report** of the damage is necessary for any insurance claim.

**NOTE !**

**A DAMAGED UPS MUST NEVER BE INSTALLED OR CONNECTED TO UTILITY OR BATTERY!**

## 3.3 STORAGE

### 3.3.1 Storage of the UPS

The UPS is carefully packed for transport and storage so that it is in perfect condition when installed. Never leave a UPS outside the building and don't store other packages on the top of the UPS.

It is advisable to store the UPS in its original package in a dry, dust-free room, away from chemical substances, and with a temperature range not exceeding **-13°F** (-25°C) to **131°F** (55°C).

In case the battery is included please refer to *Section 3.3.2*.

Some important functions of the UPS, such as the customized functions, are defined by parameters stored in a RAM memory.

A small backup battery located on the *Control Unit board* supplies the *RAM*.

If the storage time of the UPS exceeds **1 year**, these functions **should be verified** by an authorized *Service Center* before putting the UPS into operation.

### 3.3.2 Storage of battery

When the delivery includes a maintenance free battery, keep in mind that they are subject to self-discharge and therefore you must recharge the battery.

The storage time without battery recharge depends on the temperature of the storage site.

The optimal room temperature for *Battery* storage is **68°F** (20°C) to **77°F** (25°C) and shall never exceed the range **-4°F** (-20°C) to **104°F** (40°C).

**Recharge stored maintenance free battery every:**

**6 months when the storage temperature is 68°F (20°C)**

**3 months when the storage temperature is 86°F (30°C)**

**2 months when the storage temperature is 95°F (35°C)**



## 3.4 PLACE OF INSTALLATION

### 3.4.1 UPS location



#### **WARNING !**

**A QUALIFIED ELECTRICAL CONTRACTOR must carry out the installation and cabling of the UPS.**

**If optional cabinets and accessories are included with the UPS, please refer to those accompanying manuals for installation and operating instructions.**

It is important to have a clean, dust-free environment provided with proper ventilation and air-conditioning to keep the ambient temperature within the specified operating range.

The recommended air inlet temperature is from **68°F (20°C) to 77°F (25°C) (max. 104°F / 40°C)**. Refer to Section 3.5.

Check for sufficient floor load capacity before installing the UPS and the battery. Refer to Section 3.1.1.

For battery installation follow the local codes and the recommendation of the battery supplier.



#### **NOTE !**

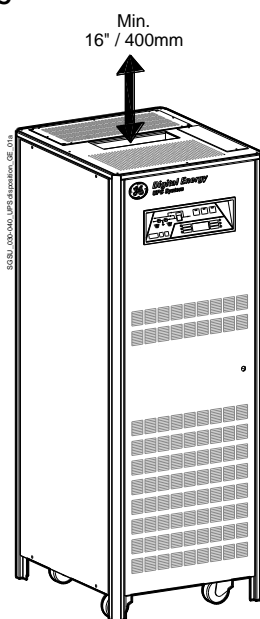
**Temperature is very important for valve-regulated batteries (maintenance free). Operation at temperatures higher than 77°F (25°C) will reduce battery life.**

The **SG Series 10-20-30-40** UPS can radiate radio frequency energy.

Although some RFI filtering is inherent to the UPS there is no guarantee that the UPS will not influence sensitive devices such as cameras and monitors that are positioned close by. If interference is expected, the UPS should be moved away from the sensitive equipment.

A single-phase power outlet (120Vac) should be provided near the UPS for connection of power tools, test equipment or connectivity devices. This outlet must be grounded.

#### **Positioning of the UPS SG Series 10-20-30-40**



The rear panel of the UPS may be mounted flush to a wall or other structure.

Clearance around the front of the unit should be sufficient to enable free passage of personnel with the doors fully open, and to allow sufficient airflow to the door vents.

**Check Section 110-26(A) of the NEC code for specific requirements.**

Recommended minimum clearance between ceiling and top of the UPS should be **16" (400 mm)** for proper cooling air exhaust.

In case of additional cabinets (external batteries or input, output transformers) these can be placed on either side of the cabinet.

Fig. 3.4.1-1 SG Series 10-20-30-40 clearances

## Openings for input and output cable connections

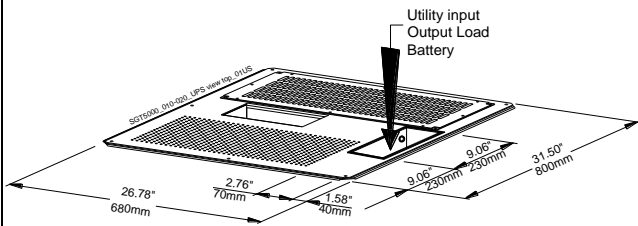


Fig. 3.4.1-2 Opening on top of the cabinet for input and cables of SG Series 10 & 20

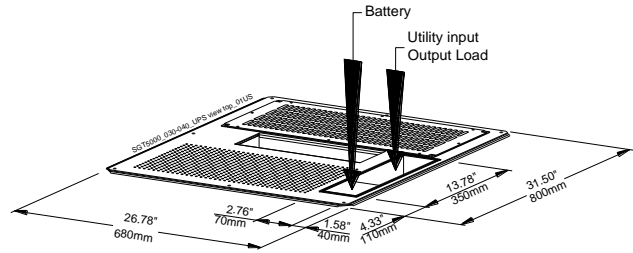


Fig. 3.4.1-3 Opening on top of the cabinet for input and cables of SG Series 30 & 40

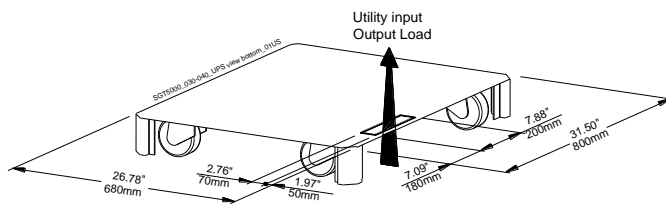


Fig. 3.4.1-4 Opening on the bottom of the cabinet for input and output cables SG Series 10-20-30-40

**SG Series 10-20-30-40** openings are provided on the top and the bottom of the UPS for the connection of input and output cables.

Pay attention to the position of these openings, when choosing the placement of the UPS.

These openings are covered with a protective plate.

## Positioning of the UPS cabinet

**SG Series 10-20-30-40** is equipped with wheels for easy placement of the UPS.

To make the UPS movable on wheels, the bolts on each leg of the cabinet have to be turned counter-clockwise, until they are free from the floor and thus the cabinet supported on wheels.

After having positioned the UPS at its final location, the cabinet has to be secured by rotating the bolts on each leg clockwise, but the wheels must still touch the floor.

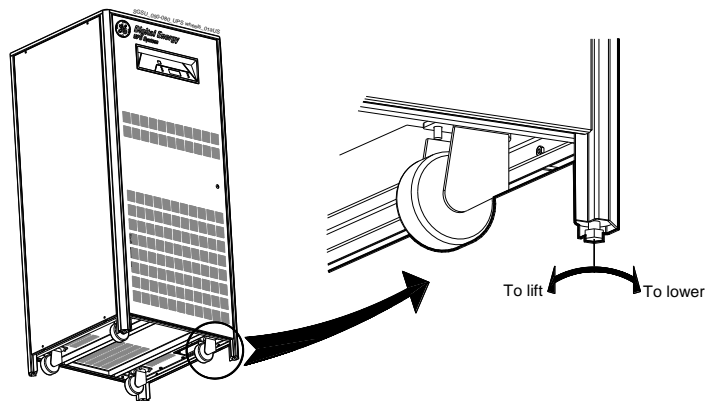


Fig. 3.4.1-4 Bolts for the regulation of the cabinet

The UPS cabinet is free standing and normally does not require to be bolted to the floor.

The UPS cabinet can be fixed however to the floor by bolting it with the supporting blocks to the floor.

The supporting blocks can be used in different positions (0° - 360°)

These supporting blocks are part of the shipping package. See Fig. 3.4.1-5.

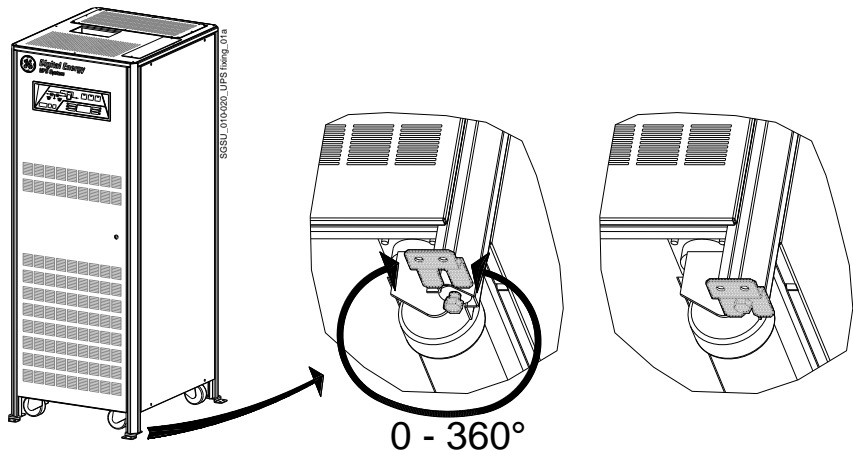


Fig. 3.4.1-5 Fixing of the UPS cabinet on the floor

# RPA

Redundant Parallel  
Architecture

In case of parallel system, try to place the UPS modules in sequence of their numbers (marked on the packing).

If the units are positioned "side by side", the side panels must be mounted on all units.

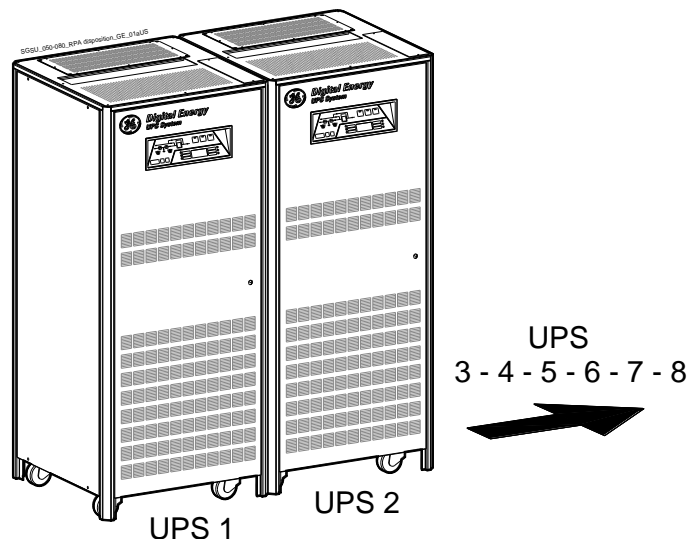


Fig. 3.4.1-6 RPA system disposition

## 3.4.2 Battery location

Batteries require a well-ventilated room with controlled temperature to obtain reliable operation.

The battery can be install immediately adjacent to the UPS (left or right side) or remotely from the UPS. If the battery is installed remotely from the UPS, a wall mounted DC disconnect device must be installed within line-of-site to both the UPS and the battery.

The optimal room temperature for *Battery* location is **68°F** (20°C) to **77°F** (25°C) and shall never exceed the range **-4°F** (-20°C) to **104°F** (40°C).

The life of valve-regulated batteries will be reduced by 50% for each additional **18°F** (10°C) that the battery ambient temperature is above **77°F** (25°C).

The battery system associated with larger UPS is usually either rack mounted or installed in multiple battery cabinets.

Installation and assembly must be made according to the local standards and battery system manufacturer's recommendations.

The battery circuit breaker or battery fuse box must be mounted as near as possible to the battery.

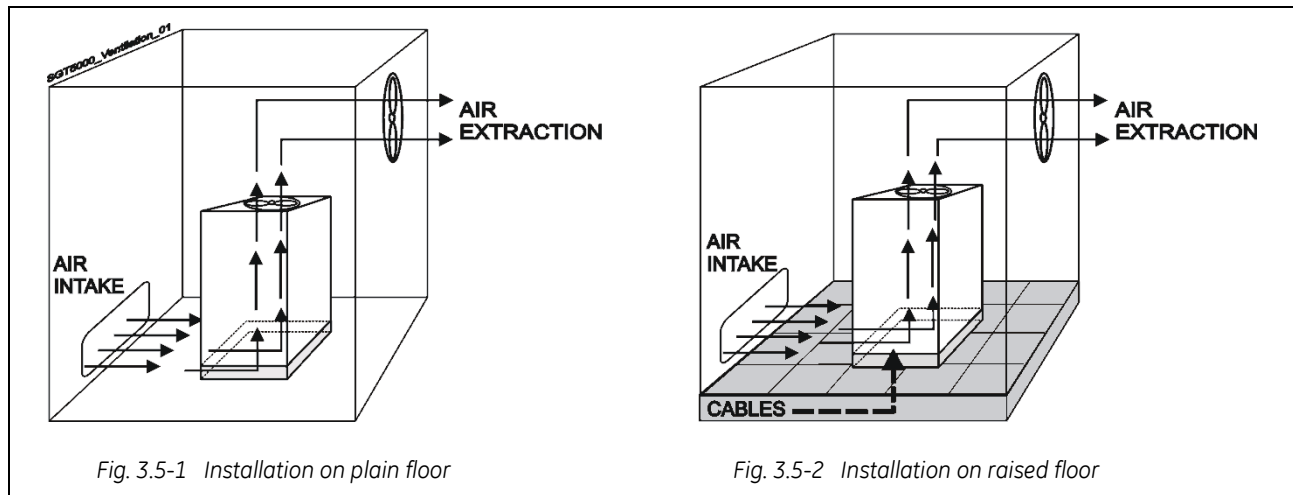


### NOTE !

Battery installation and connection must be performed by **QUALIFIED PERSONNEL ONLY**.

Read all safety instructions before proceeding with the installation.

### 3.5 VENTILATION AND COOLING



The heat produced by the UPS is transferred to the environment by its ventilation.

Air inlets for UPS ventilation are located on the front of the UPS, while air outlets are on top of the cabinet.

A suitable ventilation or cooling system must be installed to extract the heat from the UPS room.

**NOTE !**

**Do not put anything on the top of the cabinet.**

Air filtration systems could be required when the UPS operates in a dirty environment. Contact your **Dealer** or the nearest **Service Center** for appropriate solutions.

In order to prevent overheating of the UPS, the available air intake flow rate must exceed the total air exhaust flow rate requirement of the UPS system.

The below table indicates the heat dissipation at full load at **PF = 0.8** lag. and charged battery, up to **3,280 ft** (1,000 m) altitude, for cooling air **77°F** (25°C) to **86°F** (30°C).

UPS rating kVA	Losses		Cooling air flow	
	BTU / hr	kW	CFM	m <sup>3</sup> / h
<b>SG Series 10</b>	3,036	0.89	135	230
<b>SG Series 20</b>	6,751	1.98	301	512
<b>SG Series 30</b>	8,104	2.37	361	614
<b>SG Series 40</b>	10,808	3.17	482	819

### 3.6 UNPACKING



#### NOTE !

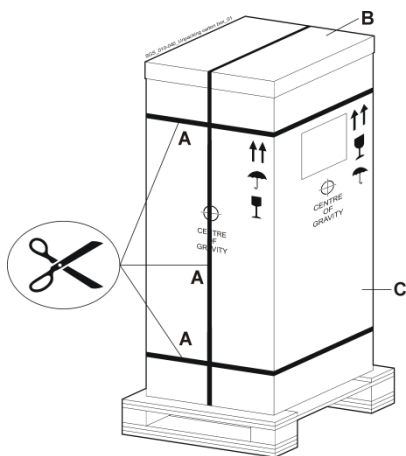
Check for sufficient floor and elevator loading capacity.  
Take care not to damage the UPS when moving by forklift.  
Remove the cabinet from the pallet with care because of the heavy weight of the equipment.

The UPS and battery cabinets may be shipped packaged in *carton boxes* or in *wooden crates* (if requested).

Move the cabinets as close as possible to the final location before removing from the pallet.

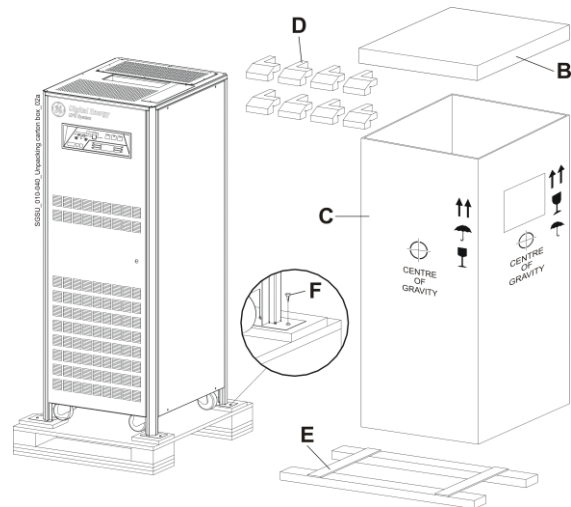
To unpack the cabinet packaged in **Carton Box** follow the instructions below:

1



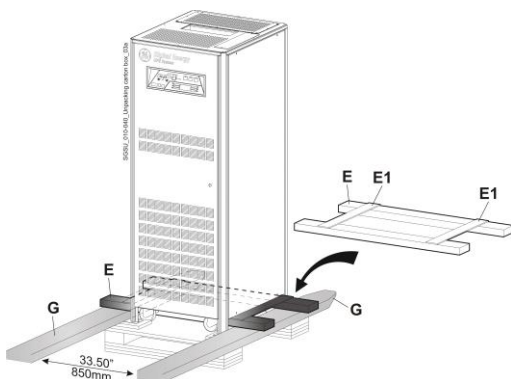
- Make sure to have sufficient space around the UPS before you start unpacking.
- Cut the three straps "A" fixing the carton box.

2



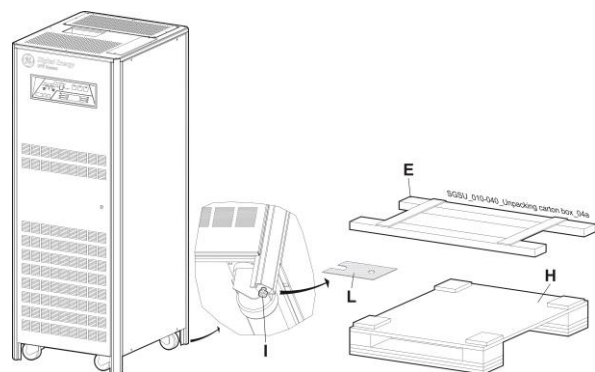
- Remove package "B" and "C".
- Remove the protection "D" outside the cabinet and the accessories bag.
- Remove the wooden support "E", which must be used to hoist the UPS.
- Unscrew anchoring bolt "F" from plate on all four legs.

3



- Position the fork lift "G" with an opening between the forks of 33.50" (850mm).
- Insert the wooden support "E" underneath the UPS, paying attention that the 2 guides "E1" are positioned with the UPS in the center.

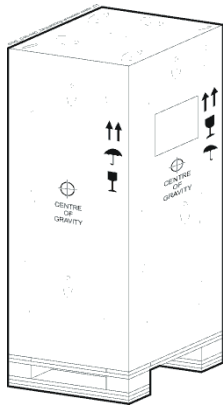
4



- Lift the UPS cabinet.
- Remove the wooden pallet "H".
- Loosen the 4 screws "I" and remove then the 4 anchoring plates "L".
- Put the UPS down on the floor.
- Remove finally the wooden support "E".

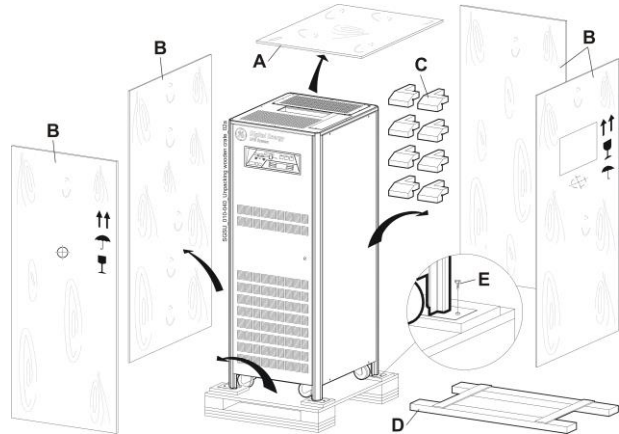
To unpack the cabinet packaged in **Wooden Crate** follow the instructions below:

1



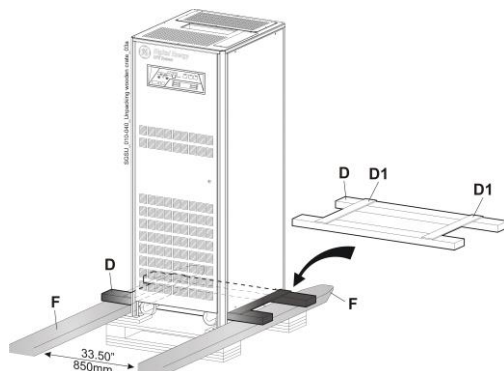
- Make sure to have sufficient space around the UPS before you start unpacking.

2



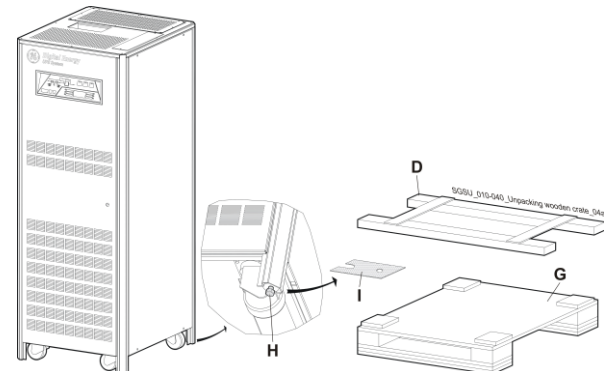
- Remove the wooden sides "A" and "B" loosening the appropriate screws.
- Remove the protection "C" outside the cabinet and the accessories bag.
- Remove the wooden support "D", which must be used to hoist the UPS.
- Unscrew anchoring bolt "E" from plate on all four legs.

3



- Position the fork lift "F" with an opening between the forks of 33.50" (850mm).
- Insert the wooden support "D" underneath the UPS, paying attention that the 2 guides "D1" are positioned with the UPS in the center.

4



- Lift the UPS cabinet.
- Remove the wooden pallet "G".
- Loosen the 4 screws "H" and remove then the 4 anchoring plates "I".
- Put the UPS down on the floor.
- Remove finally the wooden support "D".

Included in the delivery you can find the following parts:

- An accessories bag
- Control Bus cables (only for RPA parallel system)



**NOTE !**

**A damaged UPS must never be installed or connected to *mains* or *battery*!**  
**In case of any damage sustained during the transport, immediately inform the shipping agent!**  
**A detailed report of the damage is necessary for any indemnity claim.**



**Packing material recycling**

**GE**, in compliance with environment protection, use only environmentally friendly material.  
 UPS packing materials must be recycled in compliance with all applicable regulations.



### 3.7 ELECTRICAL WIRING



#### WARNING !

UPS installation and connection must be performed by QUALIFIED SERVICE PERSONNEL ONLY.

It is the responsibility of the installation technician to ensure that all local and national electric codes are adhered to.

#### 3.7.1 Utility input connection



#### NOTE !

Ensure that the AC and DC external isolators are OFF and locked out to prevent their inadvertent operation.

Do not apply power to the equipment prior to the commissioning by a qualified service engineer.

Before any other input connection, connect and check the grounding wire.

The UPS has available input terminations for the *Rectifier* and *Bypass*.

The unit may be powered from a *common input* source or *dual input* sources if desired.

#### Dual Input Configuration Rectifier & Bypass (recommended)

The *Bypass* and *Rectifier* inputs are to be powered from different *Utility supplies* (**F1** and **F2** inputs).

In this case, when the *Rectifier Input Fuses* are opened, the *Bypass* and the *Manual Bypass* are supplied by the other source.



In this case, **REMOVE** the interconnection links **BR1**, **BR2** and **BR3** on the input terminals or bus bars.

See Fig. 3.8.4-2 for SG Series 10 & 20 and Fig. 3.8.5-2 for SG Series 30 & 40.

#### Common input Rectifier & Bypass

The **same power source** is to be used for both *Bypass Supply* and *Rectifier Input* (input **F3**). Bear in mind that when the *Utility Fuses* are opened there is a supply failure to the *Rectifier* as well as to the *Bypass* and *Manual Bypass*.



In this case, the interconnection links **BR1**, **BR2** and **BR3** on the input terminals or bus bars **MUST REMAIN CONNECTED**.

See Fig. 3.8.4-2 for SG Series 10 & 20 and Fig. 3.8.5-2 for SG Series 30 & 40.

#### Dual Input Configuration Rectifier & Bypass

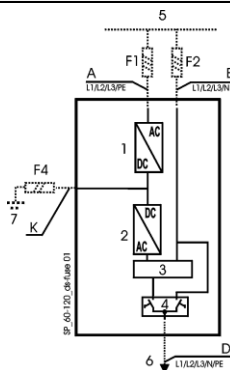


Fig. 3.7.1-1 Dual Input Configuration Rectifier & Bypass

1 = Rectifier  
2 = Inverter

3 = Automatic Bypass  
4 = Manual Bypass

#### Common input Rectifier & Bypass

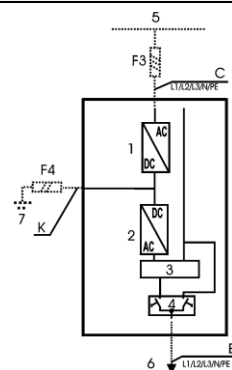


Fig. 3.7.1-2 Common Input Rectifier & Bypass

6 = Load  
5 = Utility input

7 = Battery

### 3.7.2 Input/output over current protection and wire sizing

The cabling of the UPS system has to be sized according to the UPS power rating.

Sizing of circuit breakers, fuses and cables for *Input Utility*, *Output Load* and *Battery* must meet the requirements of local and national electrical codes.

Before connecting the UPS, verify that the **Utility Voltage and Frequency**, the **Output Load Voltage and Frequency** and **Battery Data** (cells number, floating voltage, autonomy) are according to the required specifications.

Output load configuration may be such that one phase may carry a load current at 100% of that phases maximum current rating while the other two phases run at 0% or any combination in between.

Ensure that the load does not consist of any equipment that may require high starting currents such as electric motors, laser printers, etc.

This may cause the UPS to occasionally go into *Bypass* due to overload conditions

To choose the correct input fuses or circuit breaker, consider the available **short-circuit current** of the system up-stream.

Choose the correct fuse or breaker using current data shown in the chart and the appropriate NEC code.

The ratings indicated in the following chart do not consider any **line voltage drop**.

In case of optional input transformer the input protective devices should be sized to allow the transformer magnetization inrush current.

Caution when using **four-pole circuit breakers** as protection.

A potential problem exists for situations with **non-linear loads**:

**The neutral current could be greater than the phase currents.**

The three-phase *Utility* power supply must be symmetrical with respect to ground, due to the existence of voltage surge protection devices inside the UPS.



#### NOTE !

If you use ELCB breaker (Earth Limiting Circuit Breaker) to protect the input connections, consider the high leakage current generated by the noise suppression capacitors.

If these ELCB breakers are strictly necessary, we suggest using the largest type suitable for non-linear current and for delayed operations.

To ensure coordination when the UPS is configured for *Separate Bypass* and *Rectifier Inputs*, special care must be taken in choosing the **fuse or circuit breaker ratings** installed in the output distribution circuits. Protective devices on the output of the UPS should be coordinated with the *Bypass Input* circuit protection.

Due to the relatively low short circuit capability of the UPS inverter, a short circuit in the load will cause an immediate transfer to *Bypass*.

The largest fuse or circuit breaker in the output distribution should be rated at no more than 60% of the rating of the protective device supplying the *Bypass* line.

If circuit selectivity is required while the load is fed from the inverter (*Bypass Utility* not available), the largest fuse or circuit breaker should be rated at no more than 20% of the UPS output current rating.



### 3.7.3 Battery over current protection and wire sizing

- Please read the safety precautions at the front of this guide carefully, and thoroughly review the battery manufacturers installation and maintenance manual before connecting the batteries to the UPS.
- If the UPS system has been purchased with an accompanying battery cabinet, that cabinet should have an integral battery circuit breaker.  
If the UPS has been purchased without a battery cabinet or remote rack mounted batteries are to be used then DC over current protection must be provided by others.
- Choose an appropriate DC fuse or circuit breaker using the current data in the chart below.
- Minimum battery cable requirement is based on the current data below.

**The AC values below are current ratings per phase.  
These maximum and nominal ratings should be considered when choosing the appropriate AC  
over current protection device.  
NEC (National Electric Code) Section 210-20 a rules must be applied.  
DC current rating is the nominal battery discharge current which the UPS allows.  
(See Fig. 3.7.1-1 and 3.7.1.2)**

UPS rating	AC Input Rectifier		AC Input Bypass	AC Input		DC Input
	F1		F2	F3		F4
	Nom.	Max.		Nom.	Max.	
<b>SG Series 10</b>	17.2 A	20.2 A	12 A	17.2 A	20.2 A	19.6 A
<b>SG Series 20</b>	27.3 A	36.6 A	24.1 A	27.3 A	36.6 A	36 A
<b>SG Series 30</b>	40.4 A	53.1 A	36.1 A	40.4 A	53.1 A	55.2 A
<b>SG Series 40</b>	53.9 A	63.2 A	48.2 A	53.9 A	63.2 A	76 A

**Size of Branch Circuit Over current Protection - All Models: - "CAUTION - To reduce the risk of fire,  
only connect UPS to a circuit provided with (See below) maximum amperes branch circuit over  
current protection in accordance  
with the NEC (National Electric Code), NSI / NFPA 70**

UPS rating	AC Input Rectifier	AC Input Bypass	AC Input	DC Input
	F1	F2	F3	F4
<b>SG Series 10</b>	30 A	15 A	30 A	25 A
<b>SG Series 20</b>	50 A	35 A	50 A	50 A
<b>SG Series 30</b>	70 A	50 A	70 A	70 A
<b>SG Series 40</b>	80 A	70 A	80 A	100 A

**WIRING**

Wire sizing according to  
NEC Section 210-20 (a) Table 310-16  
Use 75°C (167°F) copper wire

**Wiring requirements:**

**AC INPUT RECTIFIER:** 3-Phase, 3 wire plus Ground  
**AC INPUT BYPASS:** 3-Phase, 4 wire plus Ground  
**AC OUTPUT:** 3-Phase, 4 wire plus Ground  
**DC INPUT:** 2 wire (positive and negative) plus Ground

**Maximum cable diameter that terminals can accept**  
**Refer to torque specifications table for torque requirements**

UPS rating	Rectifier Input	Bypass Input	DC Input	AC Output	GND
<b>SG Series 10</b>	3 AWG	3 AWG	3 AWG	3 AWG	3 AWG
<b>SG Series 20</b>	3 AWG	3 AWG	3 AWG	3 AWG	3 AWG
<b>SG Series 30</b>	1 AWG	1 AWG	1 AWG	1 AWG	1 AWG
<b>SG Series 40</b>	1 AWG	1 AWG	1 AWG	1 AWG	1 AWG

**NEC SECTION 210-20 (a)**

Table 310-16. Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 60°C Trough 90°C (140°F Trough 194°F) Not More than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F).

<b>Temperature Rating of Conductor (See table 310-13)</b>						
Size	60°C (140°F)	75°C (167°F)	90°C (194°F)	60°C (140°F)	75°C (167°F)	90°C (194°F)
AWG or kcmil	Types TW, UF	Types FEPW, RH, RHW, THHW, THW, THWN, XHHW, USE, ZW	Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types RH, RHW, THHW, THW, THWN, XHHW, USE	Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2
	COPPER			ALUMINIUM or COPPER-CLAD ALUMINIUM		
18	---	---	14	---	---	---
16	---	---	18	---	---	---
14	20	20	25	---	---	---
12	25	25	30	20	20	25
10	30	35	40	25	30	35
8	40	50	55	30	40	45
6	55	65	75	40	50	60
4	70	85	95	55	65	75
3	85	100	110	65	75	85
2	95	115	130	75	90	100
1	110	130	150	85	100	115
1/0	125	150	170	100	120	135
2/0	145	175	195	115	135	150
3/0	165	200	225	130	155	175
4/0	195	230	260	150	180	205
250	215	255	290	170	205	230
300	240	285	320	190	230	255
350	260	310	350	210	250	280
400	280	335	380	225	270	305
500	320	380	430	260	310	350
600	355	420	475	285	340	385
700	385	460	520	310	375	420
750	400	475	535	320	385	435
800	410	490	555	330	395	450
900	435	520	585	355	425	480
1000	455	545	615	375	445	500
1250	495	590	665	405	485	545
1500	520	625	705	435	520	585
1750	545	650	735	455	545	615
2000	560	665	750	470	560	630
<b>CORRECTION FACTORS</b>						
Ambient Temp. (°C)	For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor below					
21 - 25	1.08	1.05	1.04	1.08	1.05	1.04
26 - 30	1.00	1.00	1.00	1.00	1.00	1.00
31 - 35	0.91	0.94	0.96	0.91	0.94	0.96
36 - 40	0.82	0.88	0.91	0.82	0.88	0.91
41 - 45	0.71	0.82	0.87	0.71	0.82	0.87
46 - 50	0.58	0.75	0.82	0.58	0.75	0.82
51 - 55	0.41	0.67	0.76	0.41	0.67	0.76

## 3.8 WIRING CONNECTION



### WARNING!

UPS installation and connection must be performed by QUALIFIED SERVICE PERSONNEL ONLY.

### 3.8.1 Power connections

Input/output and DC connections are provided with terminal blocks.  
Please refer to chart for torque specifications.

Carefully read the following recommendations before proceeding:

- Ensure that the AC and DC external isolators are OFF and locked to prevent their inadvertent operation.
- Do not close any external isolators prior the commissioning of the equipment.
- The preferred power cable entry location for installation purposes is from the right side of the UPS, either top or bottom.  
In case of cable entry from the top of the cabinet, remove the cover plate fitted on the roof and provide for a suitable isolated protection cover.  
In case of cable entry from the bottom remove cover plate and perform the same procedure.
- The input/output cables must be connected in clockwise phase rotation for both *Bypass* and *Rectifier Input Terminals* if separate, taking care to avoid risk of short circuit between different poles.
- The grounding and neutral connection of the electrical system must be in accordance with local regulations.
- In case of additional cabinets containing batteries, input/ output transformers, etc, their ground terminals must be connected to the UPS main ground terminal.
- Once the power cables have been connected, re-install the internal safety shields and close the cabinets by re-installing all external panels.

Torque Specifications Mechanical Terminals Input / Output / Battery and GND			
UPS rating	WIRE SIZE RANGE	Lb - in	Nm
<b>SG Series 10 &amp; 20</b>	20 AWG to 3 AWG	27	3
<b>SG Series 30 &amp; 40</b>	16 AWG to 1 AWG	22	2.5

**SG Series 10 & 20**

How to access the terminals for the cable connections.

### Top entry cables

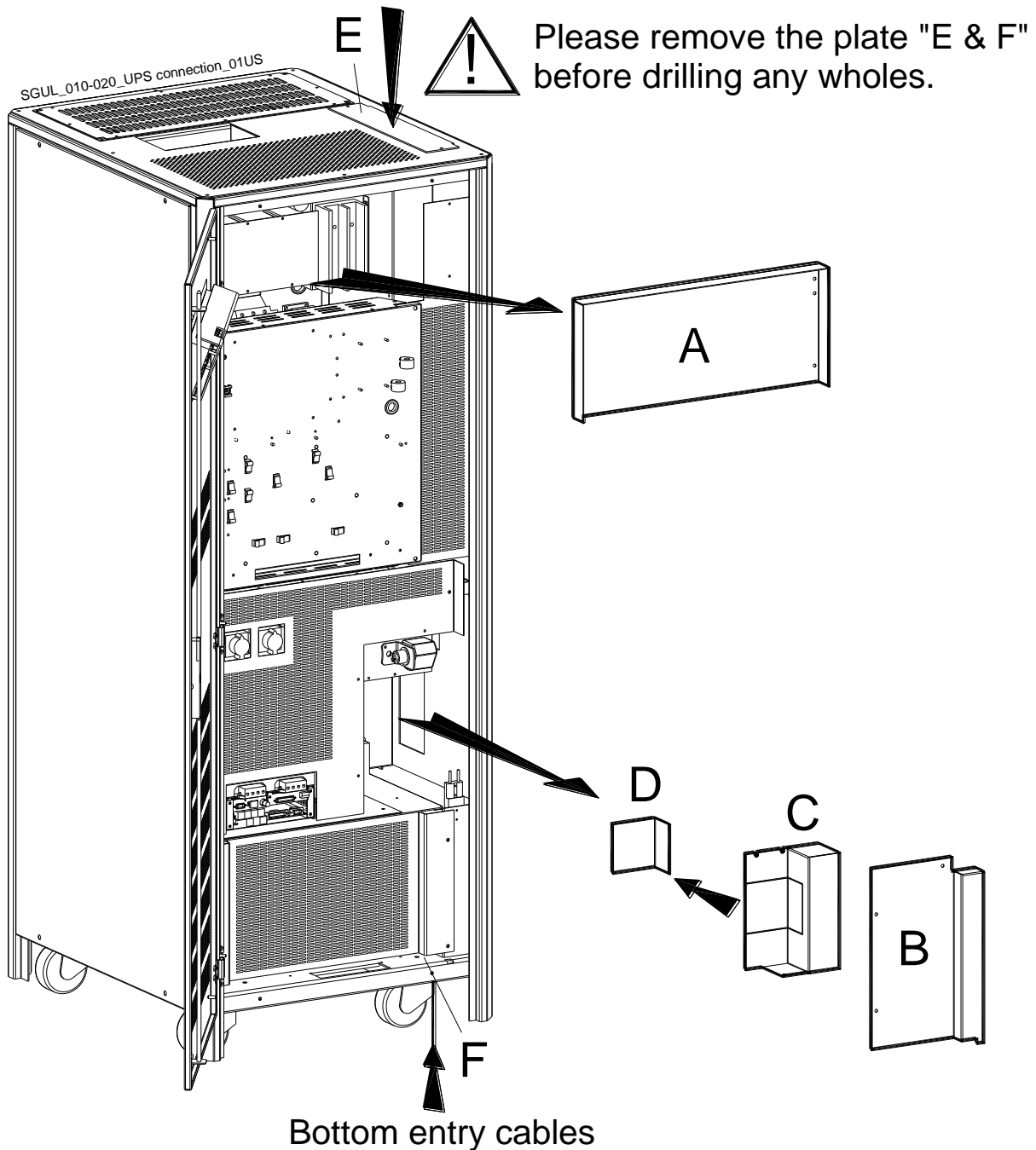


Fig. 3.8.1-1 Access to the input / output connections of SG Series 10 & 20

To access input, output and Battery connections proceed as follows:

- Remove protection panel "A".
- Remove protection panel "B".
- Remove UPS side panel "C".
- Only for *Dual Input Utility*:  
Remove with appropriate tool the metallic window "D" from the metal screen "C".

**SG Series 30 & 40**

How to access the terminals for the cable connections.

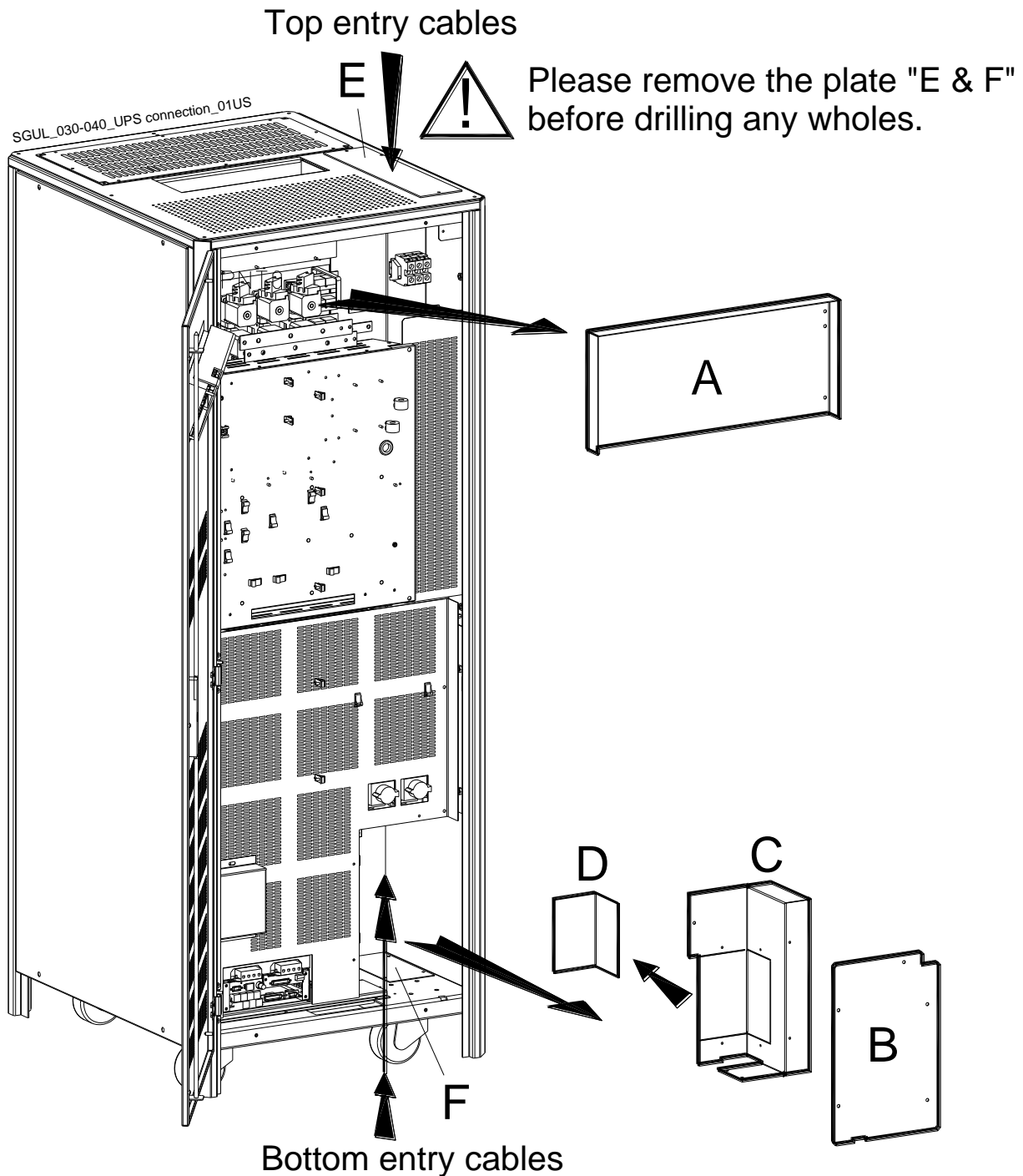


Fig. 3.8.1-2 Access to the input / output connections of SG Series 30 & 40

To access input, output and Battery connections proceed as follows:

- Remove protection panel "A".
- Remove protection panel "B".
- Remove UPS side panel "C".
- Only for *Dual Input Utility*:  
Remove with appropriate tool the metallic window "D" from the metal screen "C".

### 3.8.2 Power connection with common input utility of SG Series 10 & 20

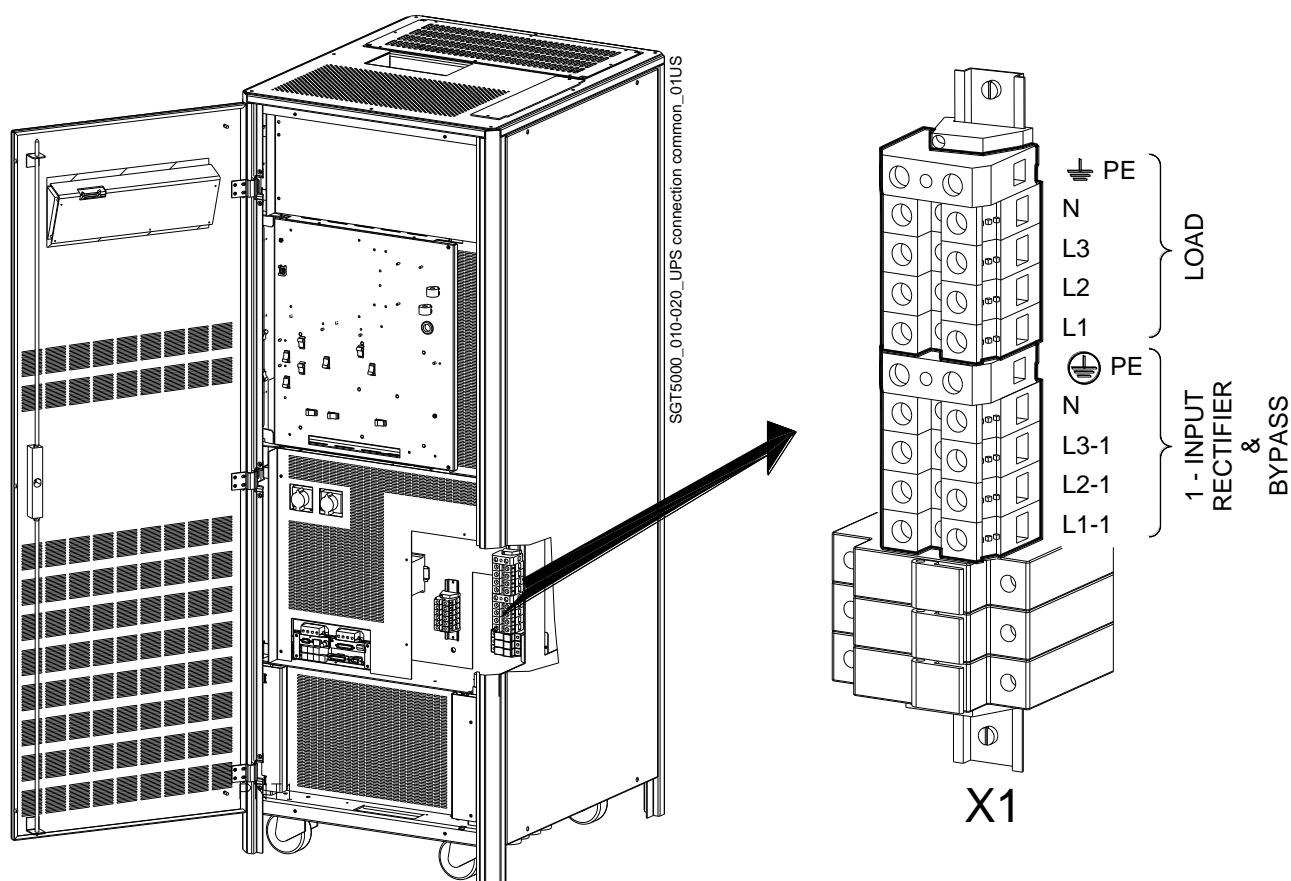


Fig. 3.8.2-1 Power connections Common Input Utility of SG Series 10 & 20

**SG Series 10 & 20**

Max. rating **X1** terminals: **3 AWG (25mm<sup>2</sup>)**

Common Input Rectifier / Bypass			
<b>L1-1</b>	Rectifier + Bypass Phase A		
<b>L2-1</b>	Rectifier + Bypass Phase B		
<b>L3-1</b>	Rectifier + Bypass Phase C		
<b>N</b>	Neutral	<b>PE</b>	Ground

Output Load			
<b>L1</b>	Load Phase A	<b>L2</b>	Load Phase B
<b>N</b>	Load Neutral	<b>PE</b>	Load Ground
		<b>L3</b>	Load Phase C

**The interconnection links *BR1*, *BR2* and *BR3* MUST REMAIN CONNECTED.**

Cable terminations are to the *Rectifier Input Terminals* and *Output Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and *DC* power connections on *Terminals*: see Section 3.8.1.



**NOTE !**

This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral.  
If the UPS is equipped with an input transformer, the secondary of the transformer must be wye-configured with neutral solidly grounded.



### 3.8.3 Power connection with common input utility of SG Series 30 & 40

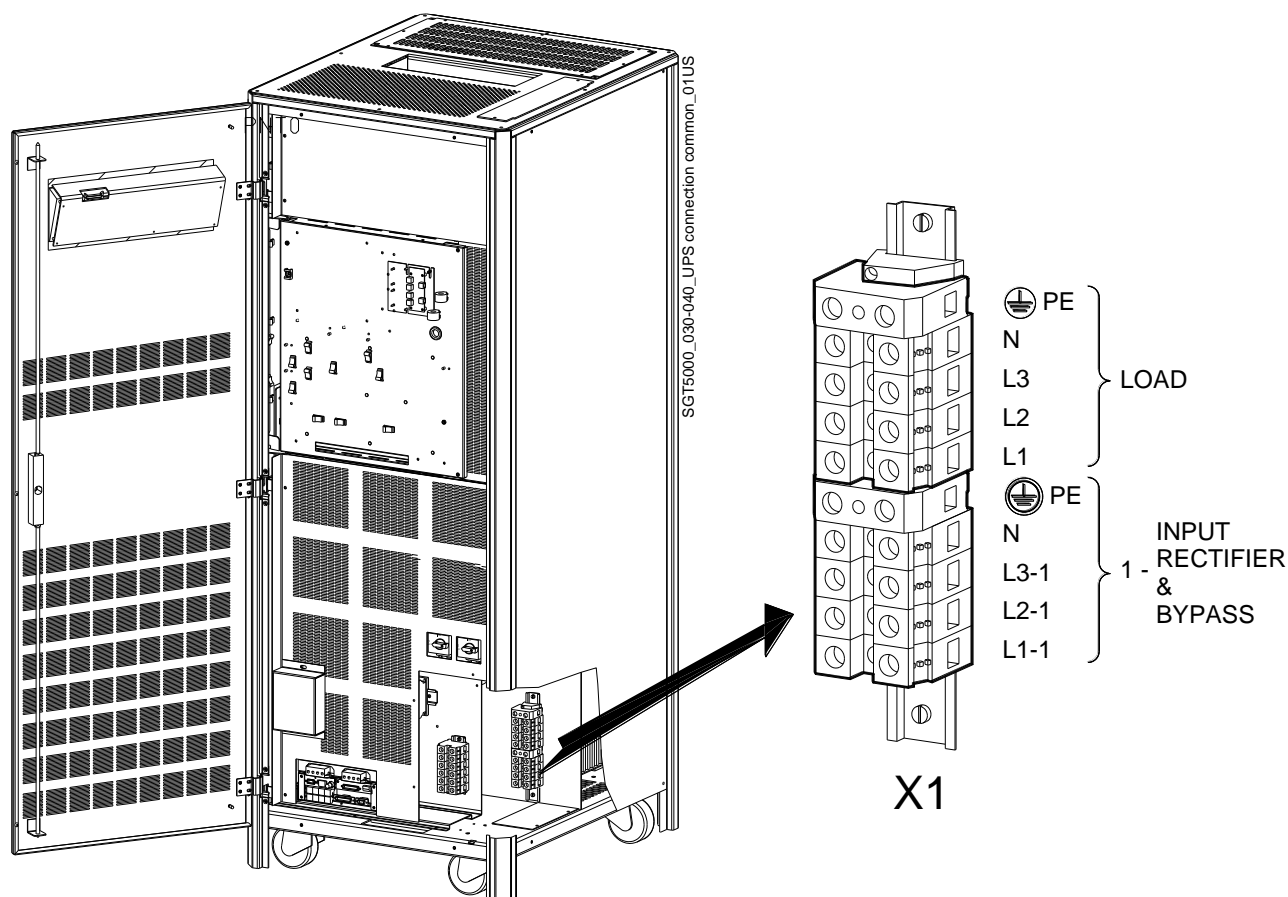


Fig. 3.8.3-1 Power connections Common Input Utility of SG Series 30 & 40

**SG Series 30 & 40**

Max. rating **X1** terminals: **1 AWG (50mm<sup>2</sup>)**

Common Input Rectifier / Bypass			
<b>L1-1</b>	Rectifier + Bypass Phase A		
<b>L2-1</b>	Rectifier + Bypass Phase B		
<b>L3-1</b>	Rectifier + Bypass Phase C		
<b>N</b>	Neutral	<b>PE</b>	Ground

Output Load			
<b>L1</b>	Load Phase A	<b>L2</b>	Load Phase B
<b>N</b>	Load Neutral	<b>PE</b>	Load Ground
		<b>L3</b>	Load Phase C

**The interconnection links *BR1*, *BR2* and *BR3* MUST REMAIN CONNECTED.**

Cable terminations are to the *Rectifier Input Terminals* and *Output Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and *DC* power connections on *Terminals*: see Section 3.8.1.



**NOTE !**

This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral.

If the UPS is equipped with an input transformer, the secondary of the transformer must be wye-configured with neutral solidly grounded.



### 3.8.4 Power connection dual input utility of SG Series 10 & 20

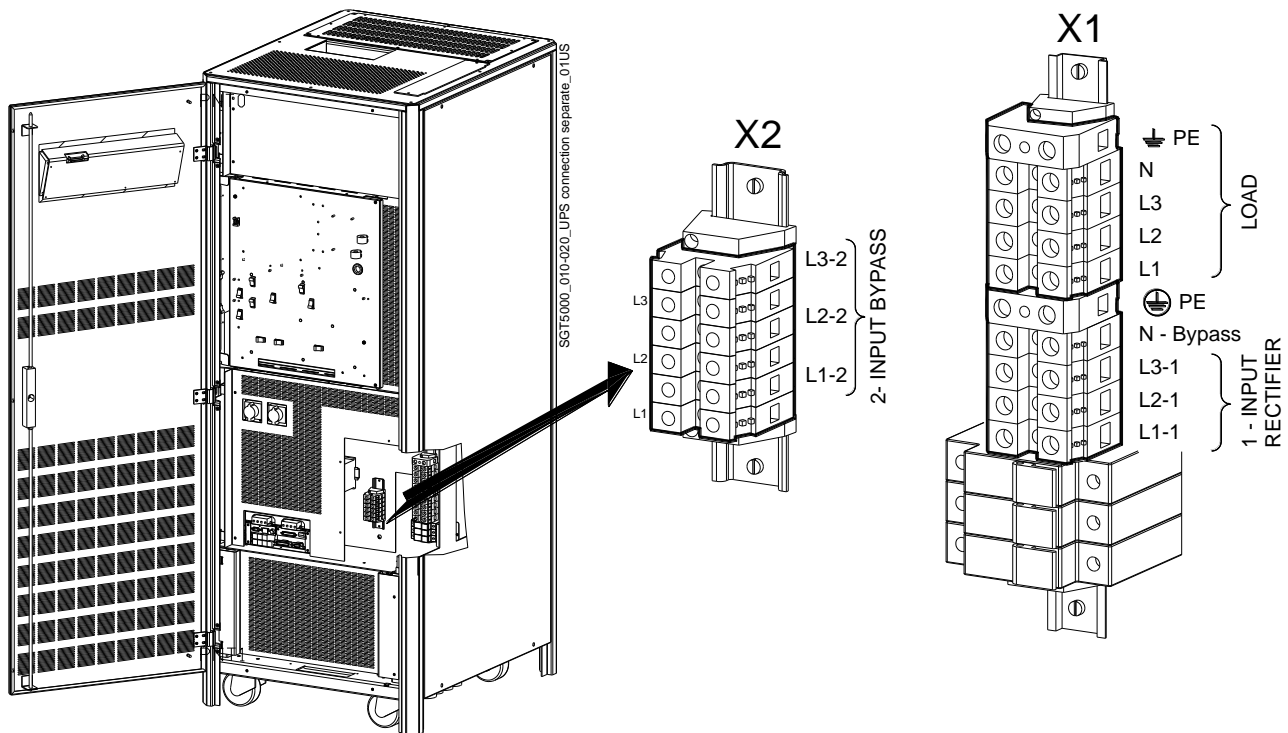



Fig. 3.8.4-1 Power connections Dual Input Utility of SG Series 10 & 20

SG Series 10 & 20:

Max. rating **X1** and **X2** terminals:

**3 AWG** (25mm<sup>2</sup>)


Dual Input Configuration Rectifier / Bypass			
<b>L1-1</b>	Rectifier Phase A	<b>L1-2</b>	Bypass Phase A
<b>L2-1</b>	Rectifier Phase B	<b>L2-2</b>	Bypass Phase B
<b>L3-1</b>	Rectifier Phase C	<b>L3-2</b>	Bypass Phase C
<b>PE</b>	Ground	<b>N - Bypass</b>	Bypass Neutral
 For dual input configurations, a neutral conductor is required from the bypass source only. <b>The interconnection links <i>BR1</i>, <i>BR2</i> and <i>BR3</i> <u>MUST BE REMOVED</u></b> (see Fig. 3.8.4-2).			

Output Load			
<b>L1</b>	Load Phase A	<b>L2</b>	Load Phase B
<b>N</b>	Load Neutral	<b>PE</b>	Load Ground
		<b>L3</b>	Load Phase C

Cable terminations are to the *Rectifier / Bypass Input Terminals* and *Load Output Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and DC power connections on *Terminals*: see Section 3.8.1.

		<p><b>NOTE !</b></p> <p>This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral.</p> <p>If the UPS is equipped with an input transformer, the secondary of the transformer must be wye-configured with neutral solidly grounded.</p>
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## Notices for installation

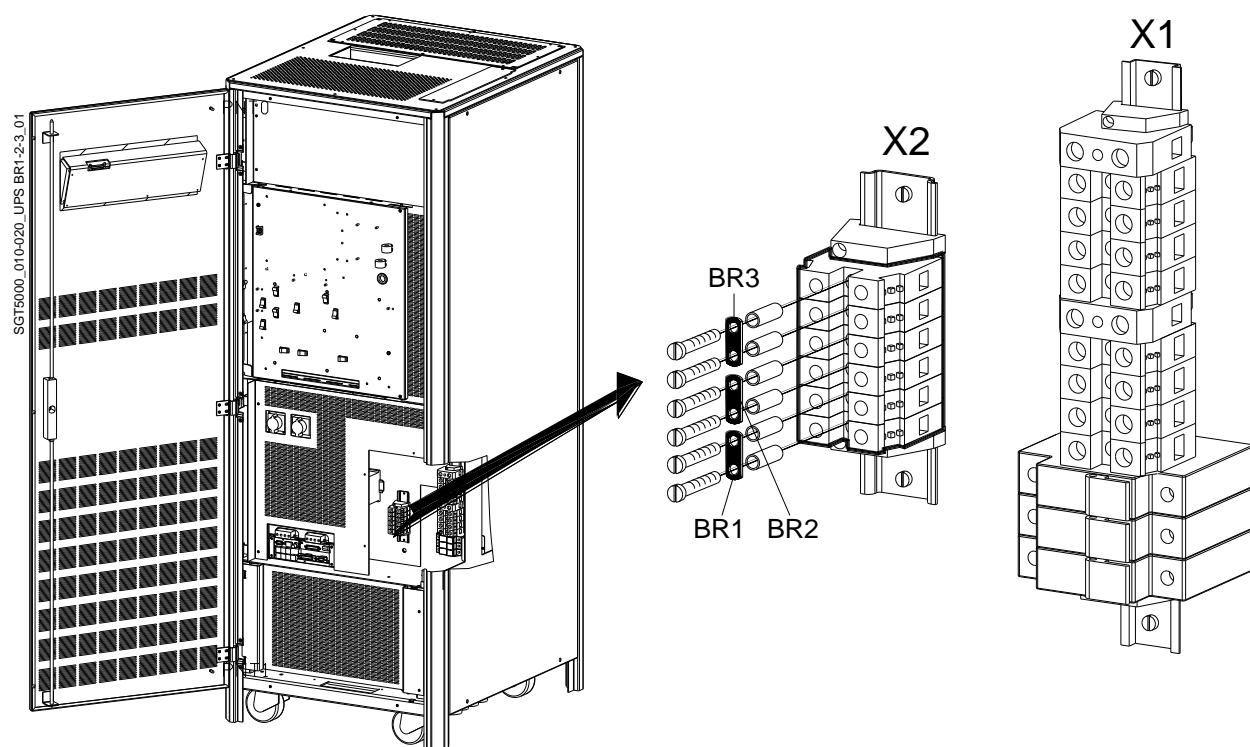


Fig. 3.8.4-2 Interconnection links BR1, BR2 and BR3 of SG Series 10 & 20

For separate *Bypass* and *Rectifier Input* configuration, the interconnection links **BR1**, **BR2** and **BR3** **MUST BE REMOVED.**

### 3.8.5 Power connection dual input utility of SG Series 30 & 40

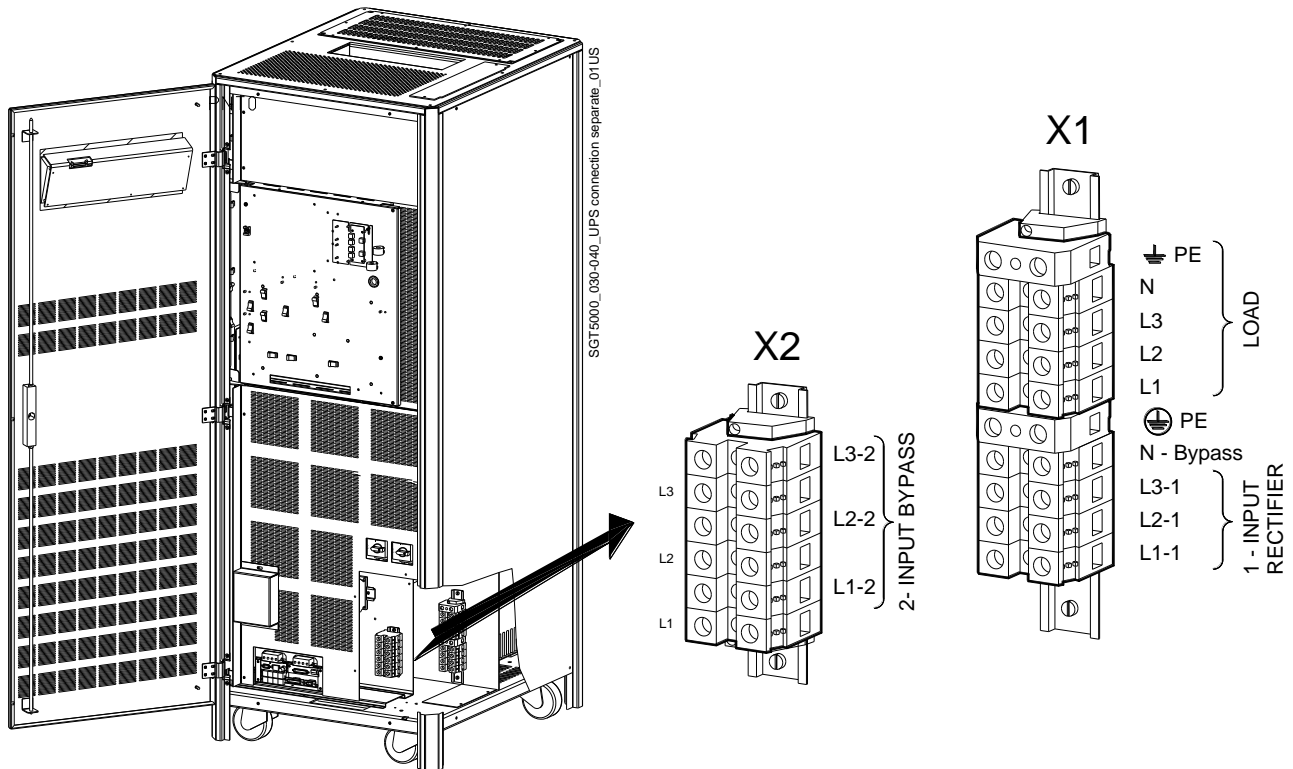



Fig. 3.8.5-1 Power connections Dual Input Utility of SG Series 30 & 40

SG Series 30 & 40

Max. rating **X1** and **X2** terminals:

**1 AWG** (50mm<sup>2</sup>)


Dual Input Configuration Rectifier / Bypass			
<b>L1-1</b>	Rectifier Phase A	<b>L1-2</b>	Bypass Phase A
<b>L2-1</b>	Rectifier Phase B	<b>L2-2</b>	Bypass Phase B
<b>L3-1</b>	Rectifier Phase C	<b>L3-2</b>	Bypass Phase C
<b>PE</b>	Ground	<b>N - Bypass</b>	Bypass Neutral
 For dual input configurations, a neutral conductor is required from the bypass source only. <b>The interconnection links <i>BR1</i>, <i>BR2</i> and <i>BR3</i> MUST BE REMOVED</b> (see Fig. 3.8.5-2).			

Output Load			
<b>L1</b>	Load Phase A	<b>L2</b>	Load Phase B
<b>N</b>	Load Neutral	<b>PE</b>	Load Ground
		<b>L3</b>	Load Phase C

Cable terminations are to the *Rectifier / Bypass Input Terminals* and *Load Output Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and *DC* power connections on *Terminals*: see Section 3.8.1.

	<b>NOTE !</b>
	This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral. If the UPS is equipped with an input transformer, the secondary of the transformer must be wye-configured with neutral solidly grounded.

## Notices for installation

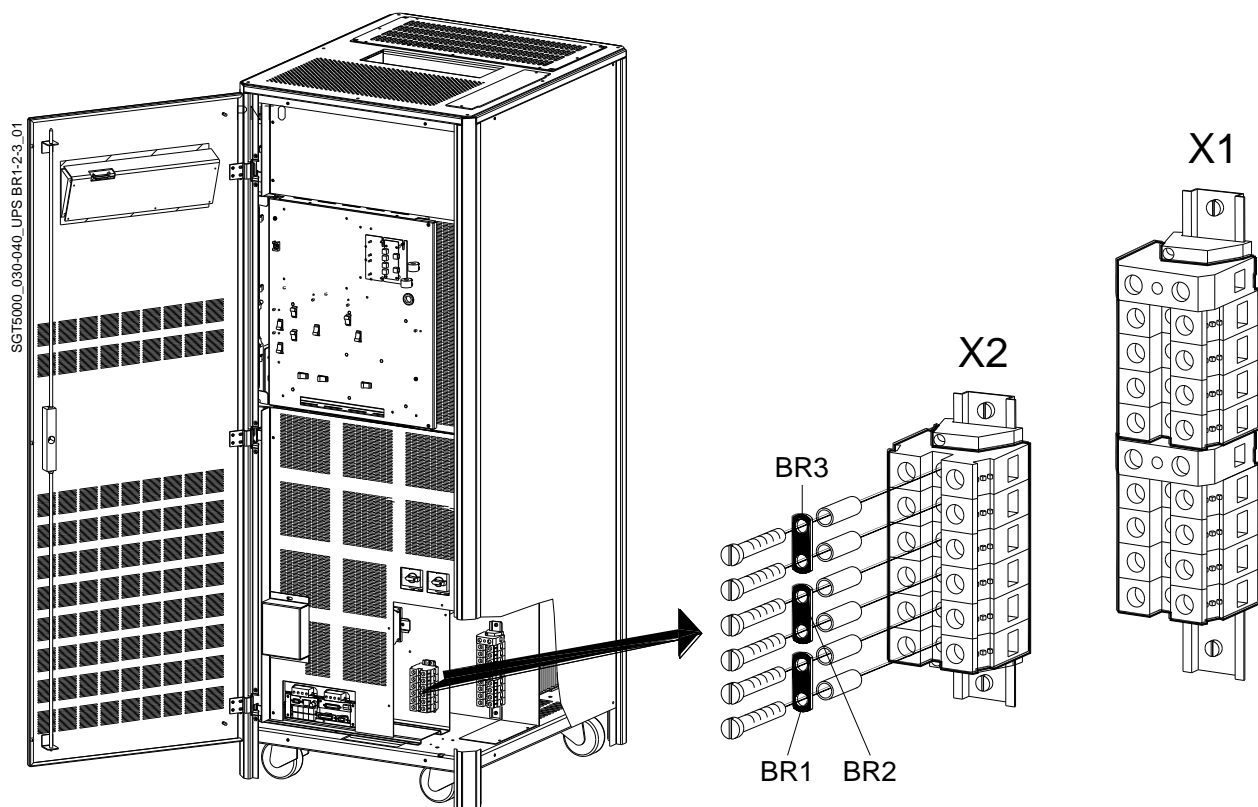


Fig. 3.8.5-2 Interconnection links BR1, BR2 and BR3 of SG Series 30 & 40

For separate *Bypass* and *Rectifier Input* configuration, the interconnection links **BR1**, **BR2** and **BR3** **MUST BE REMOVED.**

### 3.8.6 Battery connection of SG Series 10 & 20

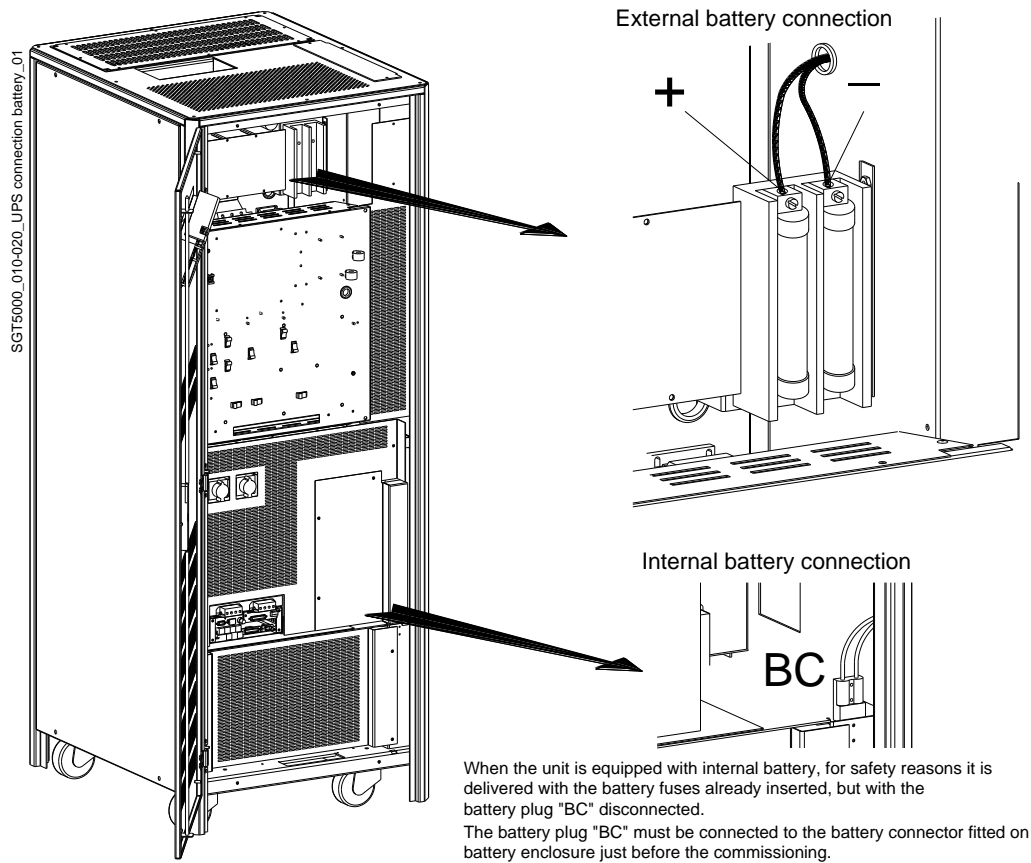


Fig. 3.8.6-1 Power connections of internal / external battery for SG Series 10 & 20

Max. rating **Battery terminals:**      **3 AWG** (25mm<sup>2</sup>)

Battery	
+	Positive pole of the Battery
-	Negative pole of the Battery
	<b>Do not insert the Battery Fuses before the commissioning.</b>

Battery cable terminations are to the *Positive* and *Negative Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and *DC* power connections on *Terminals*: See section 3.8.1.

	<p><b>NOTE !</b></p> <p>To meet standards concerning electromagnetic compliance, the connection between the UPS and external battery must be done by using a shielded cable or suitable shielded (metal) conduit!</p> <p>This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral.</p> <p>If the UPS is equipped with an input transformer for, the secondary of the transformer must be wye-configured with neutral solidly grounded.</p>
--	--

	<p><b>NOTE !</b></p> <p>When an additional battery cabinet is connected, no batteries must be installed inside the UPS cabinet.</p>
--	---

### 3.8.7 Battery connection of SG Series 30 & 40

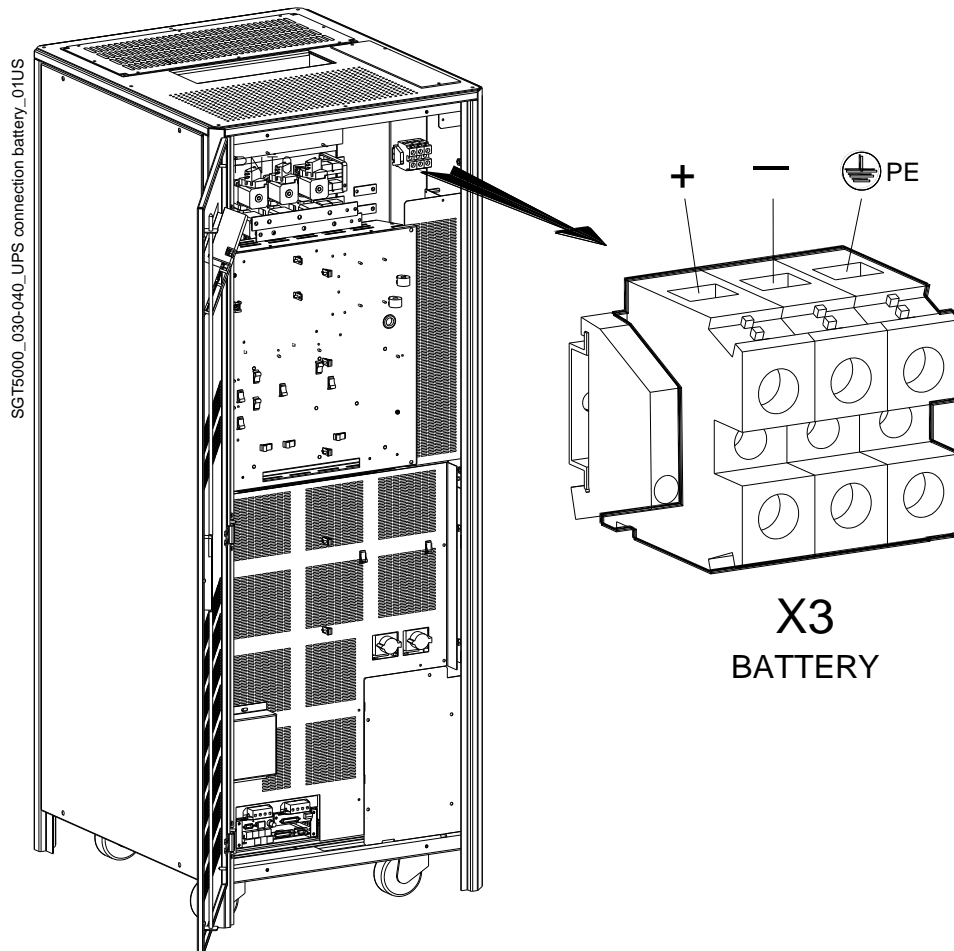



Fig. 3.8.7-1 Power connections battery of SG Series 30 & 40


Max. rating **Battery terminals:**      **1 AWG (50mm<sup>2</sup>)**

<b>Battery</b>	
<b>+</b>	Positive pole of the Battery
<b>-</b>	Negative pole of the Battery
	<b>Do not insert the <i>Battery Fuses</i> before the commissioning.</b>

Battery cable terminations are to the *Positive* and *Negative Terminals* as shown above.

Connect wire to the *Terminals* using appropriate tools and appropriate torque.

Torque specification for *Input / Output* and DC power connections on *Terminals*: See section 3.8.1.

	<p><b>NOTE !</b></p> <p>To meet standards concerning electromagnetic compliance, the connection between the UPS and external battery must be done by using a shielded cable or suitable shielded (metal) conduit!</p> <p>This UPS is only designed to operate in a wye-configured electrical system with a solidly grounded neutral.</p> <p>If the UPS is equipped with an input transformer for, the secondary of the transformer must be wye-configured with neutral solidly grounded.</p>
---	--



### 3.8.8 Set-up for SG Series 10-20-30-40 when functioning as frequency converter



#### NOTE !

The set-up for SG Series 10-20-30-40 when functioning as frequency converter requires a particular installation and adequate setting of some parameters, (accessible only through password), and can therefore only be done by a QUALIFIED SERVICE ENGINEER GE.

When the SG Series 10-20-30-40 is utilized for **different output frequency compared to the input frequency**, the *Automatic Bypass* and *Manual Bypass* functions are disabled, therefore the load cannot be transferred to *Utility* in case of overload, short circuit, or inverter failure.

In situations where the UPS needs to be powered down for maintenance purposes, the critical load must also be powered down during this time, the **UPS cannot be transferred to Manual Bypass, serious damage to the load could result.**

The handle of the switch Q2 - *Manual Bypass* should be removed to avoid attempts to transfer to *Manual Bypass* when the UPS is being used as a frequency converter.

As an added measure of safety the interconnection links **BR1**, **BR2** and **BR3** should also be removed.

See Fig. 3.8.4-2 (SG Series 10 & 20) or Fig. 3.8.5-2 (SG Series 30 & 40).

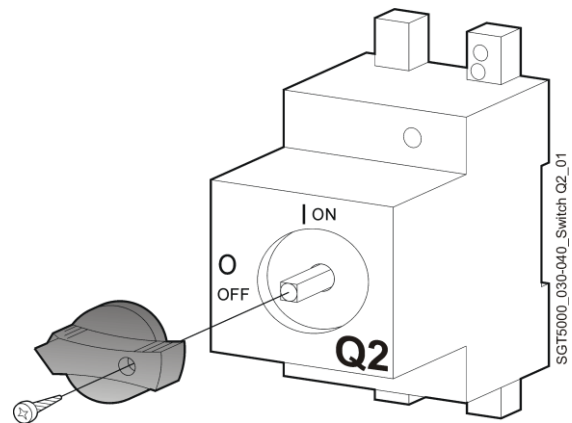


Fig. 3.8.8-1 Switch Q2 – Manual Bypass



#### NOTE !

The standard SG Series 10-20-30-40 UPS may be operated at 50Hz input with 60Hz output frequency conversion.

It is recommended that the static switch bypass be electronically blocked if the UPS is to operated as a frequency converter in order to prevent damage to the load.

Check with a Global Services Field Service Engineer to facilitate the parameter change.



#### CAUTION !

The output transformer of the UPS is designed for 60Hz only.

Operation at 50Hz, 480V output may overheat the transformer.

The optional 5th harmonic filter is designed for 60Hz operation.

If the UPS is purchased with this internal filter it may not be operated at 50Hz input or damage to the filter could result.

## 3.9 RPA PARALLEL SYSTEM CONNECTION



### WARNING !

This operation must be performed by **QUALIFIED SERVICE PERSONNEL ONLY** before the initial start-up.

**ENSURE THAT THE UPS INSTALLATION IS COMPLETELY POWERED DOWN.**

### 3.9.1 Power wiring of parallel units

To guarantee good *Load* sharing between the units of a parallel system, we recommend that the cable length from the input distribution board (5) to the output distribution board (10) is equal for each unit ( $a+b = c+d = e+f = g+h = i+l = m+n = o+p = q+r$ ).

Tolerance: **+/-10%**.

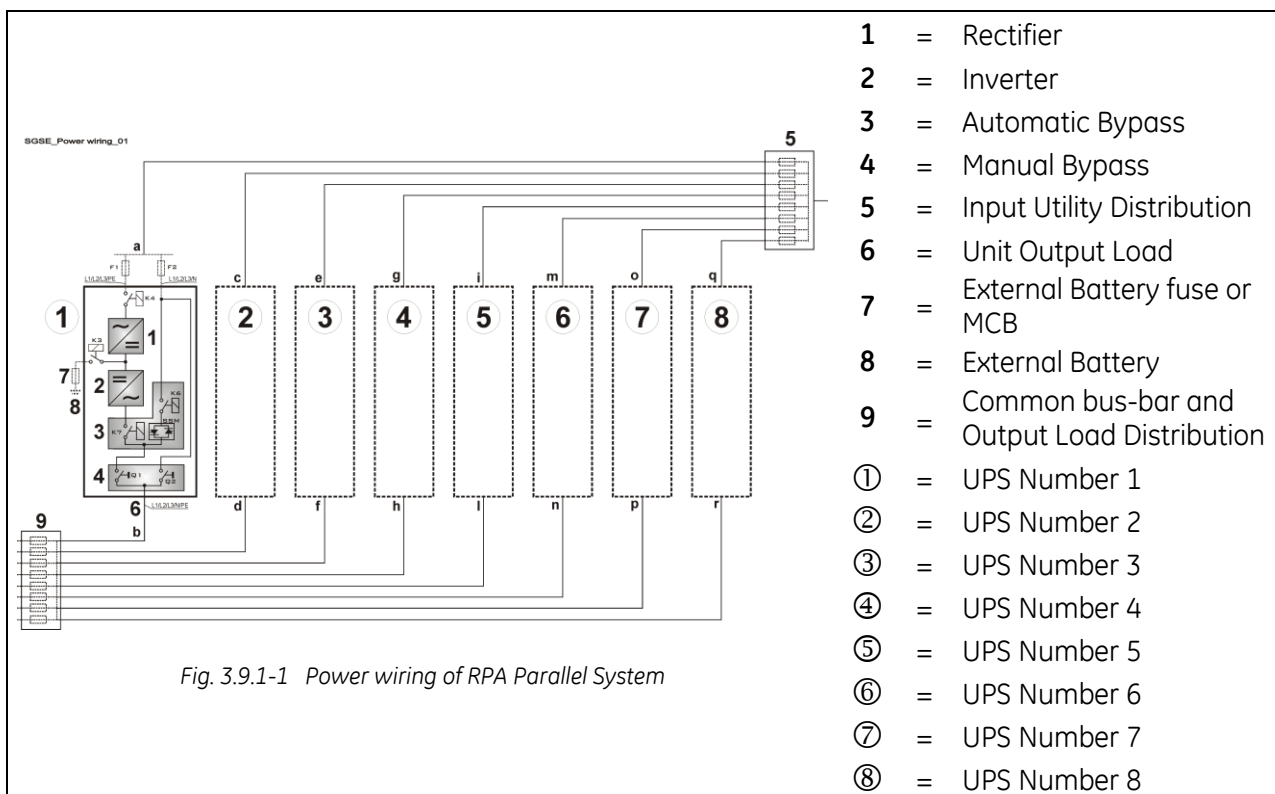
The AC input power of the *Bypass* must be the same for all units of the parallel system - no phase shift allowed between units.



### NOTE !

It is strongly recommended that no transformers, automatic circuit breakers or fuses should be inserted between the unit's output and the *Load* common bus bars.

However, it is recommended that a disconnection or isolation switch is installed in order to totally isolate a unit if needed.





### 3.9.2 Parallel control bus connection

In cases of parallel operation, the communication between the units takes place through the **control bus cables**.

Each parallel unit is equipped with an additional board "**P13 – RPA Board**" where the connectors **J52 (A)** and **J62 (B)** are located.

A short control cable provided with a ferrite ring core links the parallel board "**P13 – RPA Board**" with the parallel bus socket on which must be connected the **control bus cables JA** and **JB** on PCB "**P34 – Bus Interface**".

All the parallel units are connected to the same control bus.

This connection allows:

- The microprocessors of each unit to communicate with each other.
- The oscillators of each unit to be locked together.
- The regulation loops to compare the output current of each unit in order to equally share the load current.

For increased reliability, this connection is made with redundant cables.

In this way, communication is maintained between units in case one of the control cables should fail or be accidentally damaged or disconnected.

The standard length of the control bus cable between two parallel unit is **40 ft / 12 m**.

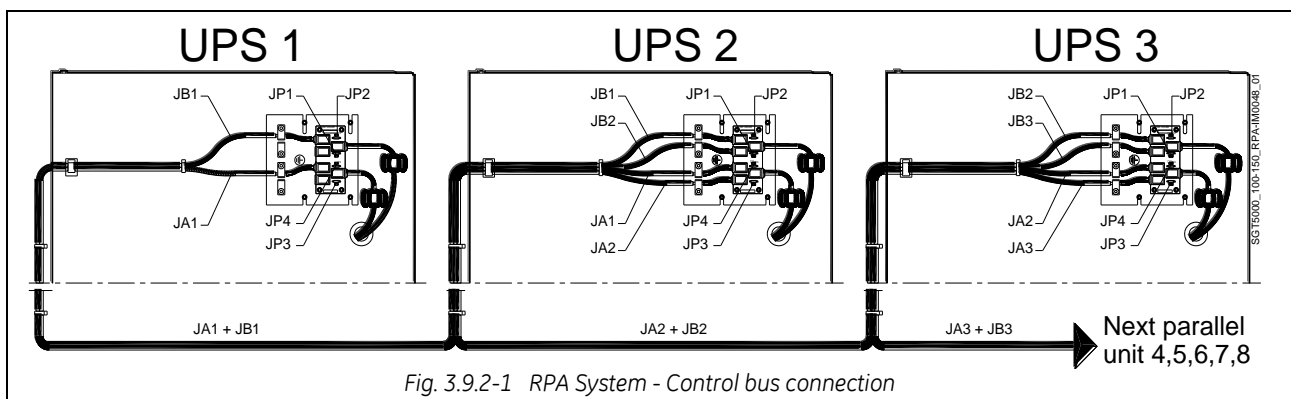
Maximal overall length of bus connection, between the first and the last unit, should not be longer than **276 ft / 84 m**.

Verify that control wiring is run in individual separate steel conduit.



#### NOTE !

Under no circumstance should the control bus cable connecting **JA (1/2/3/4/5/6/7)** and **JB (1/2/3/4/5/6/7)** be connected or disconnected after the system has been powered On.



The shield of the control bus cable, connected on **JA** and **JB** must be connected to ground with the appropriate cable clamps fitted on parallel bus socket.

It is important to place the units in sequence of their assigned number.

A unit number from **1** to **8**, is defined by the setting of parameters and displayed on the panel.

This number is also marked inside and outside the packaging.

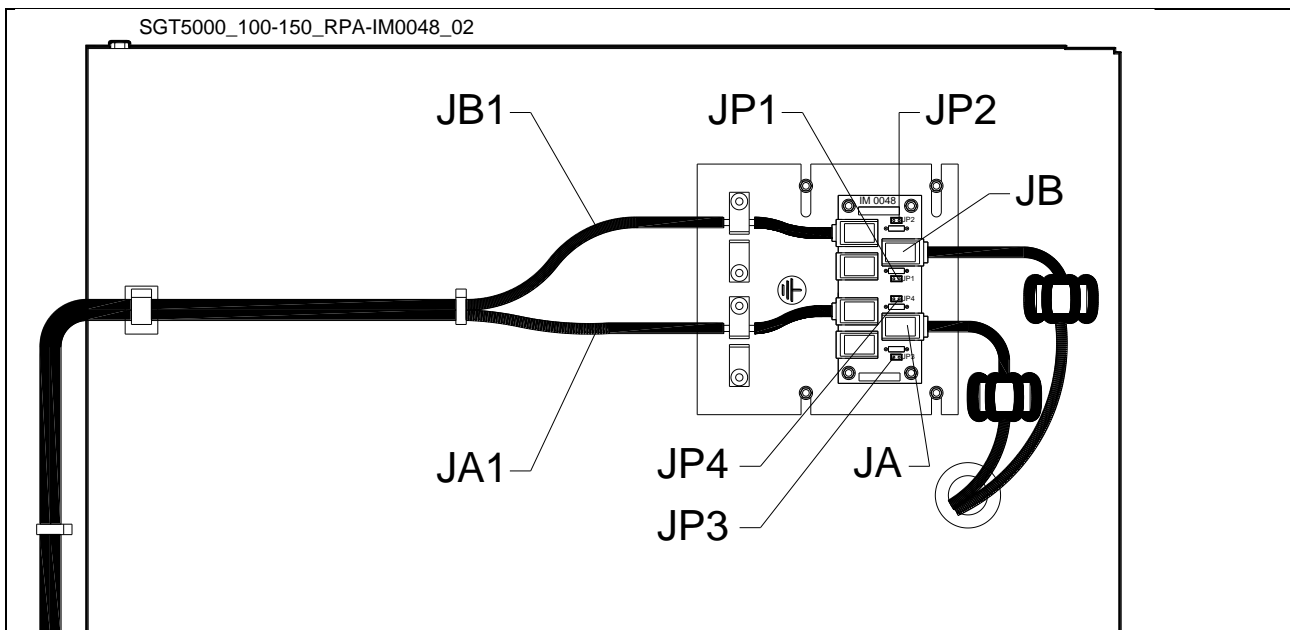


Fig. 3.9.2-2 Bus connection on terminal units

**Terminal units**

On the parallel bus PCB "**P34 – Bus Interface**", of the **first and last** units (terminal) of the parallel system the Jumpers **JP1, JP2, JP3** and **JP4** **MUST BE INSERTED**.

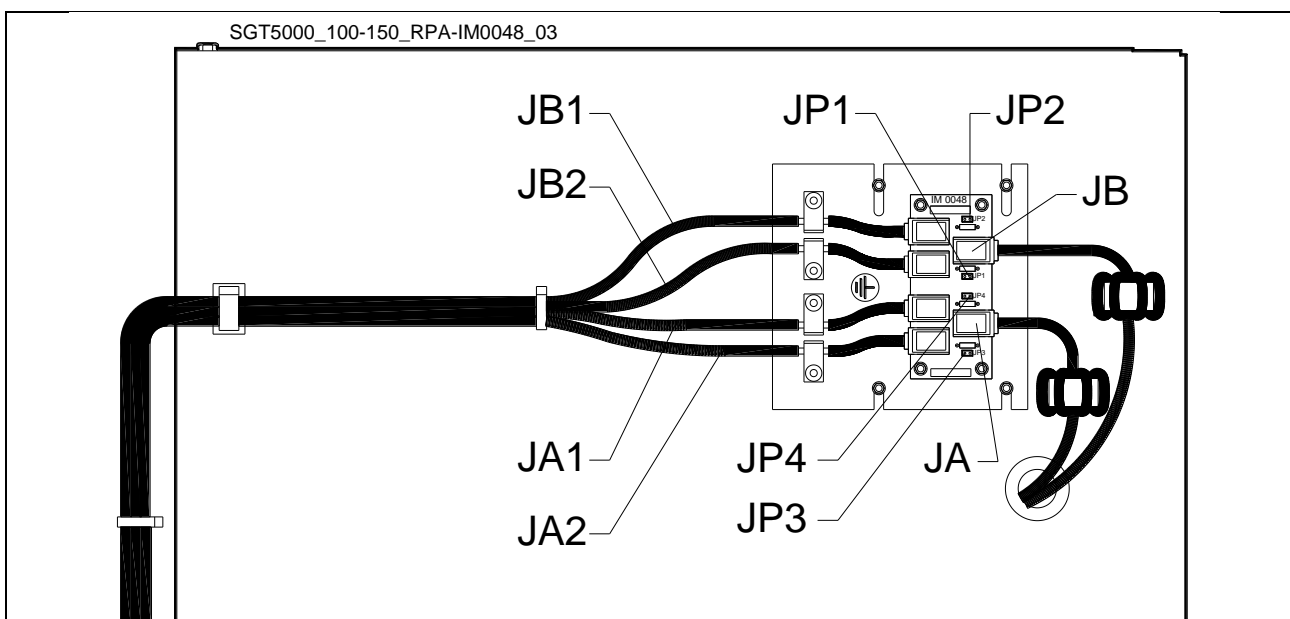


Fig. 3.9.2-3 Bus connection on intermediate units

**Intermediate units**

On the parallel bus PCB "**P34 – Bus Interface**" of the **intermediate units** of the parallel system the Jumpers **JP1, JP2, JP3** and **JP4** **MUST BE REMOVED**.

**NOTE !**

In a parallel system composed of 2 or more units, only the first and last units (having 1 input JA and JB free) have the Jumper JP1, JP2, JP3 and JP4 inserted on parallel bus PCB "**P34 – Bus Interface**" (see Fig. 3.9.2-2).

### 3.9.3 Control bus cable location



#### WARNING !

This operation must be performed by **QUALIFIED SERVICE PERSONNEL ONLY** before the initial start-up.

**ENSURE THAT THE UPS INSTALLATION IS COMPLETELY POWERED DOWN.**

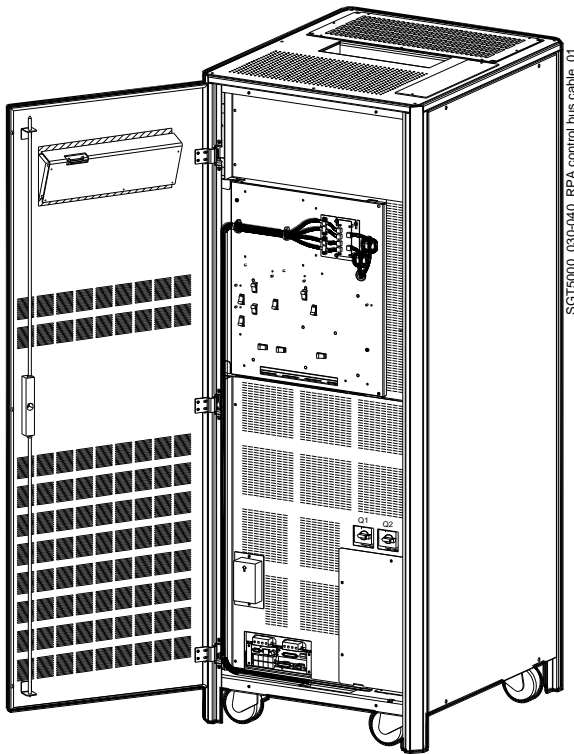


Fig. 3.9.3-1 View electronic module on intermediate unit

#### Access to the control bus connection.

The control bus connection between parallel units must be made on the front of the **electronic module** fitted behind the front doors.

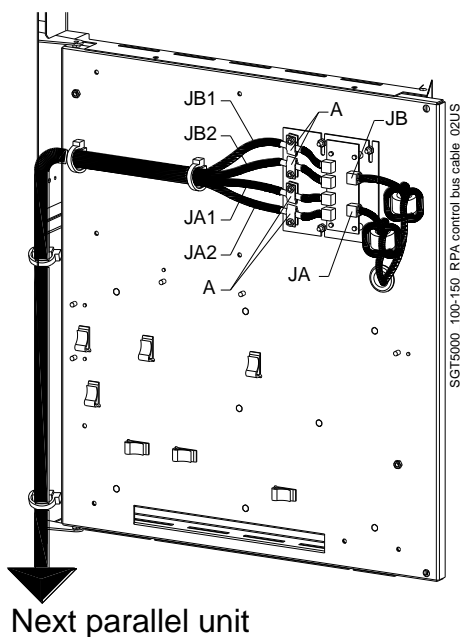


Fig. 3.9.3-2 Front view electronic module on intermediate unit

#### Control bus cables connection.

- Plug the cables **JA** (1/2/3/4/5/6/7) and **JB** (1/2/3/4/5/6/7) onto the RJ connectors **JA** and **JB** located on parallel bus PCB "**P34 – Bus Interface**" (going to "**P13 – RPA Board**" J52(A) and J62(B).
- Fix both cables **JA** (1/2/3/4/5/6/7) and **JB** (1/2/3/4/5/6/7) to parallel bus socket connecting the cable shield to ground by means the cable clamps "**A**".

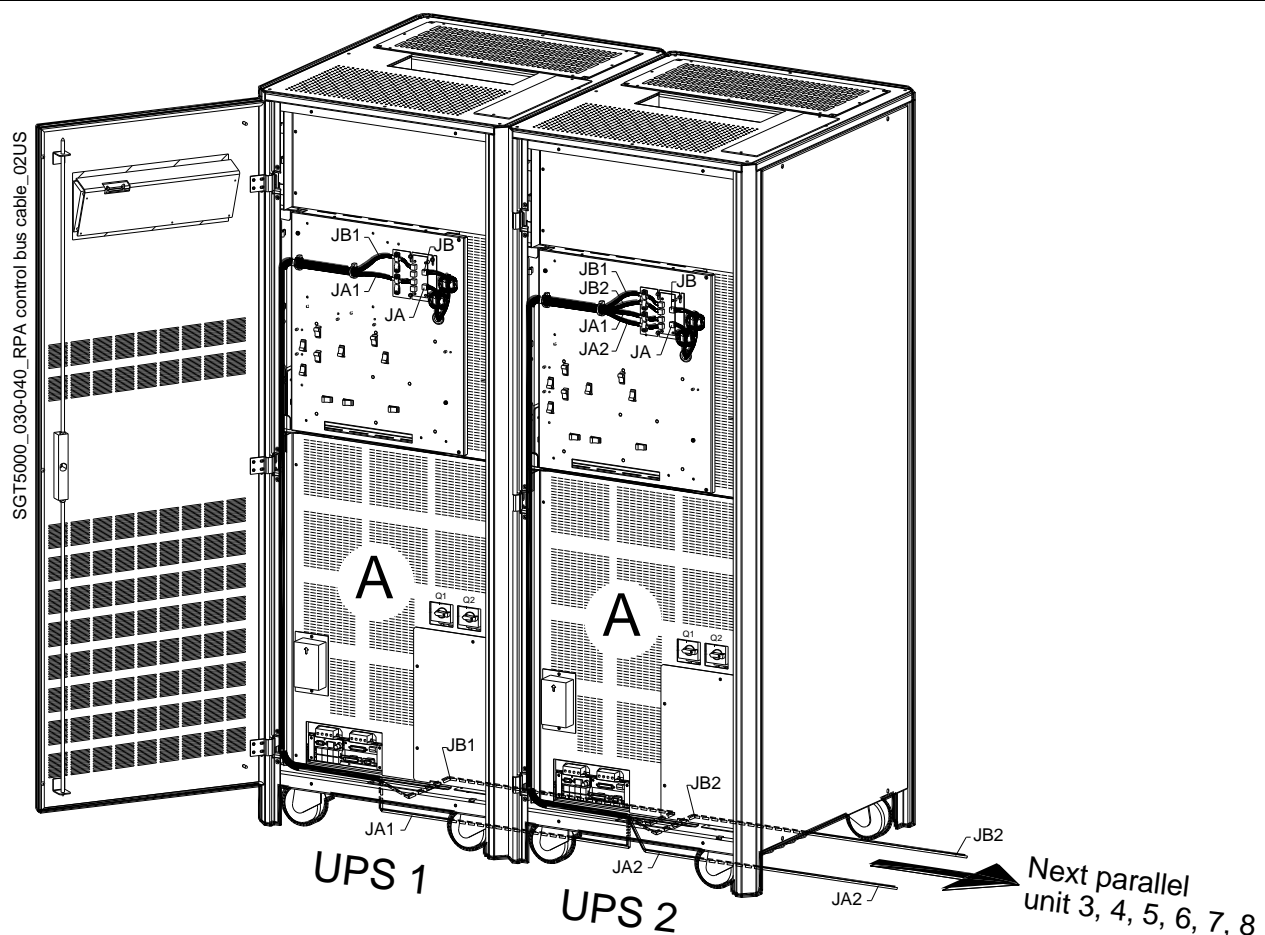


Fig. 3.9.3-3 Control Bus cable routing and connection

### Control bus cables routing

Place and fix the cables *JA-1/2/3/4/5/6/7* and *JB-1/2/3/4/5/6/7* with the appropriate clamps inside the UPS cabinets in the position shown in the drawing Fig 3.9.3-1.

Pay attention to the fact, that routing of cables shall allow the removal of the protection covers "A".



#### NOTE !

Pay attention when cabling and routing the bus cables *JA* and *JB* inside the UPS cabinet.

In case one unit should be removed from the parallel system, the bus cables *JA* and *JB* must be removed from the cabinet without disconnecting them from the metal plate where the sockets *JA* and *JB* are located.

For reliability reasons the cables *JA-1/2/3/4/5/6/7* and *JB-1/2/3/4/5/6/7* connecting the units should be run in separated protected conduits (as indicated in Fig. 3.9.3-3) separated from the power cables.

It is important that the cable *JA* must be the same length as cable *JB*.



#### WARNING !

Connection and commissioning of an additional UPS to an existing parallel system, must be performed by a GE SERVICE ENGINEER from of your *Service Center*.

## 4 CUSTOMER INTERFACE

### 4.1 CUSTOMER INTERFACE

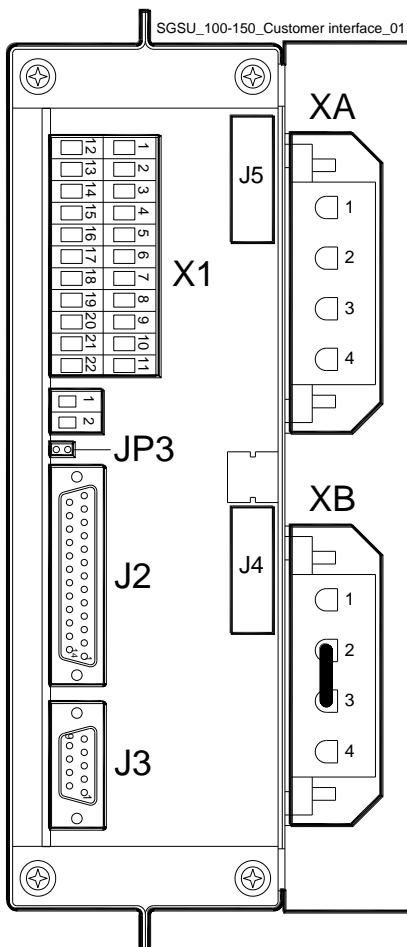



Fig. 4.1-1 Customer interface

Serial port J3 - RS 232 (sub D - female 9 pin) (see Section 4.1.1) Suitable for JUMP protocol			
Pin 2: TX (out)		Pin 3: RX (in)	Pin 5: GND
J2 (subD-female 25p) – Output signals on voltage free contacts(see Section 4.1.2)			
J2/1, 2, 3	NO, C, NC	Utility Failure	(default Parameter RL=1)
J2/4, 5, 6	NO, C, NC	Load on Inverter	(default Parameter RL=3)
J2/7, 8, 9	NO, C, NC	Stop Operation	(default Parameter RL=5)
J2/14, 15, 16	NO, C, NC	Load on Utility	(default Parameter RL=2)
J2/17, 18, 19	NO, C, NC	General Alarm	(default Parameter RL=4)
J2/20, 21, 22	NO, C, NC	Acoustic Alarm	(default Parameter RL=6)
	Signals on terminals X1 and on connector J2 are in parallel and therefore not separated galvanically from each other.		
The programmable signals on X1 and J2 will be disabled with Q1 open, with the exception of the signals for "16 - Manual Bypass ON" and "26 - EPO".			
XB - Terminals for EPO connection(see Section 4.1.7)			
XB/1, 4 or J2/12, 25		NC	EPO (Emergency Power Off)
Note: to enable this function, remove cable short-circuiting XB / 2 – 3 and the Jumper JP3 on P4 – Customer Interface.			
X1 – Output signals on voltage free contacts – terminals (see Section 4.1.2)			
X1/1, 2, 3	NO, C, NC	Utility Failure	(default Parameter RL=1)
X1/4, 5, 6	NO, C, NC	Load on Inverter	(default Parameter RL=3)
X1/7, 8, 9	NO, C, NC	Stop Operation	(default Parameter RL=5)
X1/12, 13, 14	NO, C, NC	Load on Utility	(default Parameter RL=2)
X1/15, 16, 17	NO, C, NC	General Alarm	(default Parameter RL=4)
X1/18, 19, 20	NO, C, NC	Acoustic Alarm	(default Parameter RL=6)
Input contacts (see Section 4.1.3)			
X1/10, 21 or J2/10, 23		Programmable (default = RL1)	
X1/11, 22 or J2/11, 24		Programmable / Generator ON (NO) (def. = RL2)	
NO = Normally Open		C = Common	NC = Normally Closed

NO = Normally Open

C = Common

NC = Normally Closed

The connectors **J4** and **J5** can be used for additional **3-ph SNMP/WEB plug-in adapter** or an additional **Customer Interface** (installation only when the UPS is switched Off).

**XA:** terminals for 24Vdc Auxiliary Power Supply connection.

**XB:** terminals for EPO connection.

Programmable user relays	Programmable functions on contacts (X1 - J2)																																								
<p>On terminals <b>X1</b> or <b>J2</b> connector, six of the following <b>26 signals</b> can be selected from the display, entering with the appropriate password.</p> <table> <tr> <td>0- No Information</td><td>14- Rectifier Utility Failure</td></tr> <tr> <td>1- Buzzer</td><td>15- Battery Discharge</td></tr> <tr> <td>2- General Alarm</td><td>16- Manual Bypass ON</td></tr> <tr> <td>3- Load on Utility</td><td>17- Rectifier ON</td></tr> <tr> <td>4- Stop Operation</td><td>18- Inverter ON</td></tr> <tr> <td>5- Load on Inverter</td><td>19- Boost Charge</td></tr> <tr> <td>6- Utility Failure</td><td>20- Battery Earth Fault</td></tr> <tr> <td>7- DC Over Voltage</td><td>21- Battery Fault</td></tr> <tr> <td>8- Low Battery</td><td>22- Relay Input 1</td></tr> <tr> <td>9- Overload</td><td>23- Relay Input 2</td></tr> <tr> <td>10- Over Temperature</td><td>24- Relay Output ON</td></tr> <tr> <td>11- Inverter-Utility not syncr.</td><td>25- Relay Output OFF</td></tr> <tr> <td>12- Bypass Locked</td><td>26- EPO (Emergency Power Off)</td></tr> <tr> <td>13- Bypass Utility Failure</td><td></td></tr> </table>	0- No Information	14- Rectifier Utility Failure	1- Buzzer	15- Battery Discharge	2- General Alarm	16- Manual Bypass ON	3- Load on Utility	17- Rectifier ON	4- Stop Operation	18- Inverter ON	5- Load on Inverter	19- Boost Charge	6- Utility Failure	20- Battery Earth Fault	7- DC Over Voltage	21- Battery Fault	8- Low Battery	22- Relay Input 1	9- Overload	23- Relay Input 2	10- Over Temperature	24- Relay Output ON	11- Inverter-Utility not syncr.	25- Relay Output OFF	12- Bypass Locked	26- EPO (Emergency Power Off)	13- Bypass Utility Failure		<p>Some UPS functions can be activated with parameters when an external Normally Open contact is closed on:</p> <p><b>X1-10, 21 / J2-10, 23 or X1-11, 22 / J2- 11, 24</b></p> <p>Selectable functions by changing <b>parameters</b> (password required) are:</p> <table> <tr> <td><b>0 - No function</b></td><td><b>1 - Inverter ON</b></td></tr> <tr> <td><b>2 - Inverter OFF</b></td><td><b>3 - Print All</b></td></tr> <tr> <td><b>4 - Status Relay</b></td><td><b>5 - Generator ON</b></td></tr> <tr> <td><b>6 - External Bypass ON</b></td><td></td></tr> <tr> <td><b>7 - External Battery Fuses, or External K3</b></td><td></td></tr> <tr> <td colspan="2"><b>See Alarm 4104 - "Battery Fuses"</b></td></tr> </table> <p><b>Voltage free contacts:</b> Max. DC / AC: 24V / 1.25A IEC 60950 (SELV circuit) Min. Signal Level: 5Vdc/5mA</p>	<b>0 - No function</b>	<b>1 - Inverter ON</b>	<b>2 - Inverter OFF</b>	<b>3 - Print All</b>	<b>4 - Status Relay</b>	<b>5 - Generator ON</b>	<b>6 - External Bypass ON</b>		<b>7 - External Battery Fuses, or External K3</b>		<b>See Alarm 4104 - "Battery Fuses"</b>	
0- No Information	14- Rectifier Utility Failure																																								
1- Buzzer	15- Battery Discharge																																								
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8- Low Battery	22- Relay Input 1																																								
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10- Over Temperature	24- Relay Output ON																																								
11- Inverter-Utility not syncr.	25- Relay Output OFF																																								
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<b>6 - External Bypass ON</b>																																									
<b>7 - External Battery Fuses, or External K3</b>																																									
<b>See Alarm 4104 - "Battery Fuses"</b>																																									

### 4.1.1 Serial Port J3

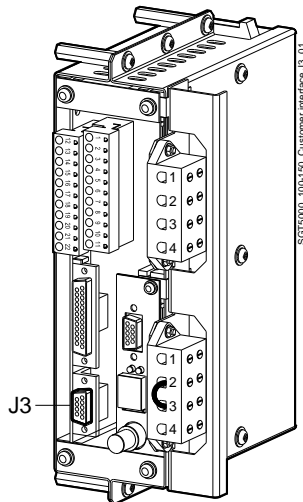


Fig. 4.1.1-1 Serial port J3

**Serial port J3 - RS-232 (sub D, female 9 pin) that allows:**

Total remote management of the system using software *GE Power Diagnostics*, *GE Data Protection* or *GE Service Software* for system protection and management of the UPS systems.

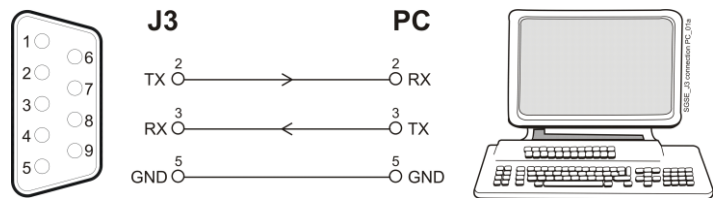
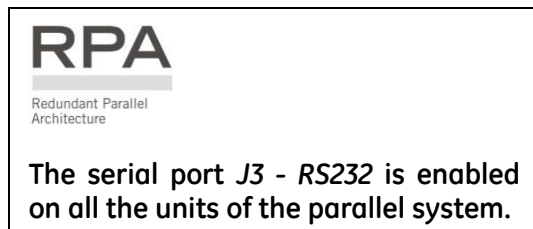


Fig. 4.1.1-2 Serial port J3 connection to PC with RS232 1:1 cable DB9m - DB9f

### 4.1.2 Output free potential contacts

The interface board provides **6 voltage free relay contacts** giving some UPS critical alarms and operation mode.

These signals are available either on connector **J2- (sub D, female 25 pin)** or terminal blocks **X1**.

The meaning of the alarms on the free contacts in standard configuration (default) is the following:

<b>X1 / 1, 2, 3</b>	or	<b>J2 / 1, 2, 3</b>	<b>(NO, C, NC)</b>	<b>Utility Failure</b>
<b>X1 / 4, 5, 6</b>	or	<b>J2 / 4, 5, 6</b>	<b>(NO, C, NC)</b>	<b>Load on Inverter</b>
<b>X1 / 7, 8, 9</b>	or	<b>J2 / 7, 8, 9</b>	<b>(NO, C, NC)</b>	<b>Stop Operations</b>
<b>X1 / 12, 13, 14</b>	or	<b>J2 / 14, 15, 16</b>	<b>(NO, C, NC)</b>	<b>Load on Utility</b>
<b>X1 / 15, 16, 17</b>	or	<b>J2 / 17, 18, 19</b>	<b>(NO, C, NC)</b>	<b>General Alarm</b>
<b>X1 / 18, 19, 20</b>	or	<b>J2 / 20, 21, 22</b>	<b>(NO, C, NC)</b>	<b>Acoustic Alarm</b>

In case different alarms or operating status are required, they can be configured on the same terminals via software from the *control panel*.

The configuration can be changed in **Parameters Mode** by a trained operator using the appropriate password.



**NOTE !**

The programmable signals on X1 and J2 will be disabled with Q1 open, with the exception of the signals for "16 - Manual Bypass ON" and "26 - EPO".



### 4.1.3 Programmable input free contacts

Some programmable UPS functions (indicated in *Section 4.1*), can be activated by closing an external contact, if connected, on:

<b>X1 / 10, 21</b>	or	<b>J2 / 10, 23</b>	<b>User Input 1 (default = Not used)</b>
<b>X1 / 11, 22</b>	or	<b>J2 / 11, 24</b>	<b>User Input 2 (default = Emergency GEN ON)</b>

### 4.1.4 Gen Set Signaling (GEN ON)

If an emergency generator set supplies the UPS in case of *Mains Failure* and the generator is considerably unstable in frequency, it should be suitable to install the signal "**Generator ON**" on **X1 / 11, 22** or **J2 / 11, 24**). See Fig. 4.1-1 / X1 and J2.

Since the Parameter for of the reading of the Generator function is password protected, call the nearest *Service Center* for it's activation.

When this contact closes, it changes certain (programmable) functions such as:

- Enabling or disabling of synchronization and consequently the *Load* transfer to generator.
- Reduction or elimination or delay of *Battery* recharging during the generator operation.



**In a parallel system a separate NO (Normally Open) contact must be connected to each individual unit.**

### 4.1.5 AUX external Maintenance Bypass

If the UPS system is equipped with an external *Maintenance Bypass Switch*, it is possible to connect a NO (Normally Open) voltage-free aux. contact from the *External Bypass Switch* to the programmable input **X1 / 10, 21** or **J2 / 10, 23**, making the UPS operate as if the internal switch **Q2** has closed.

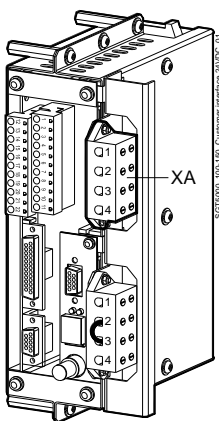
This function can be activated by changing a dedicated parameter (password required).

When this NO (Normally Open) contact closes, the output *Inverter Contactor* **K7** it is automatically opened and the *Load* transfer back to *Inverter* will be inhibited.



**In a parallel system, the input on the customer interface of each unit must be connected to a separate AUX contact of the External Maintenance Bypass Switch.**

### 4.1.6 Auxiliary Power Supply (APS) 24 Vdc



<b>XA - 1</b>	24Vdc
<b>XA - 2</b>	GND
<b>XA - 3</b>	24Vdc
<b>XA - 4</b>	GND

Fig. 4.1.6-1 Terminals for connection 24Vdc



#### 4.1.7 "EPO - Emergency Power Off" command connection



**Be aware:**

The reliability of the system depends on this contact NC (Normally Closed)!

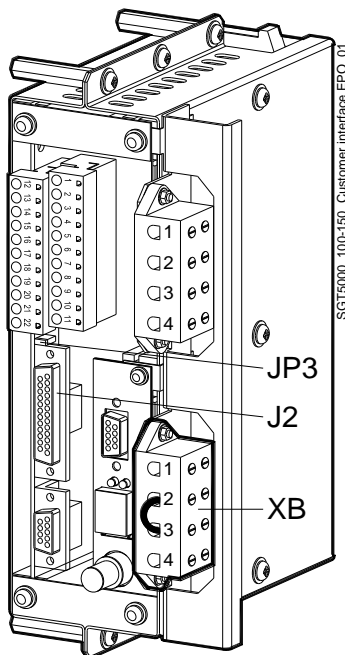


Fig. 4.1.7-1 Terminals for connection EPO

An external Emergency switch (Normally Closed voltage-free contact) can be connected on terminals **XB / 1 - 4** or connector **J2 / 12 - 25** of the "**P4 - Customer Interface**".



**NOTE !**

To enable this function, remove cable short-circuiting **XB / 2 - 3** on the **Terminal XB** and the **Jumper JP3** on "**P4 - Customer Interface**", when the cables have been already connected on **XB** or **J2**.

When opened, this contact causes the immediate opening of the **Contactors K3, K4, K6, K7** and **K8**, as well as the shut-down of **Rectifier, Inverter** and **Static-Switch**.



**NOTE !**

This procedure could imply a load shut-down.



**NOTE !**

In case of parallel **Customer Interface** the **EPO** contact must be connected to one "**P4 - Customer Interface**" only, but the bridge on **X2** and jumper **JP3** on the "**P4 - Customer Interface**" must be removed on all other boards.

**In a Parallel System a separate NC (Normally Closed) contact must be connected individually to each unit.**

**RPA**  
Redundant Parallel  
Architecture

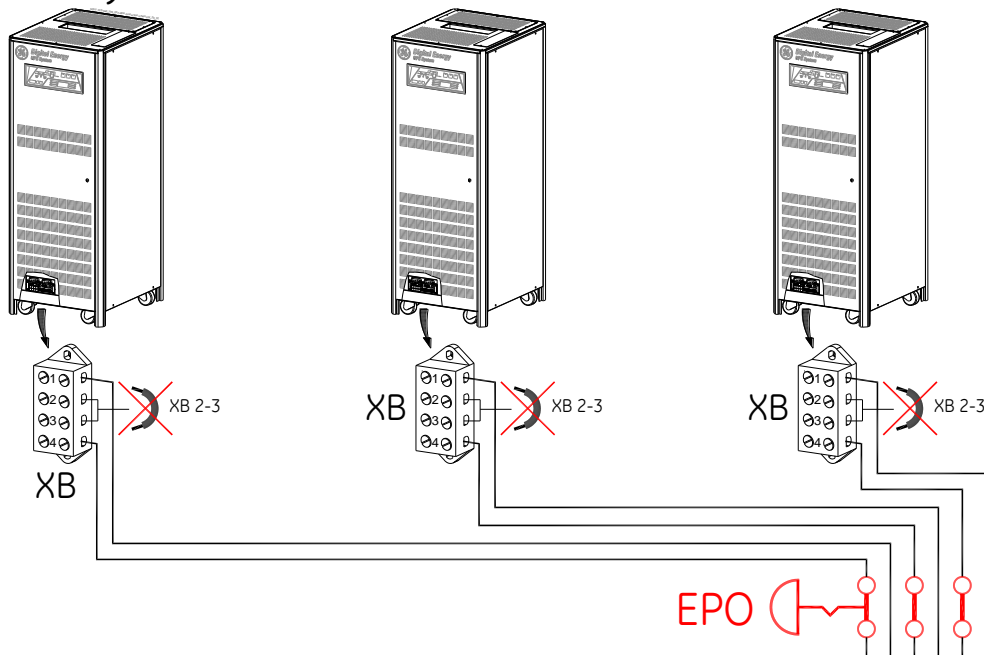


Fig. 4.1.7-2 XB "EPO - Emergency Power Off" – RPA Parallel System connection schematics

When the **"EPO - Emergency Power Off"** has been activated, the system must be restored as follows:

- Realize the push-button **"EPO - Emergency Power Off"** (contact on XB / 1, 4 is closed again).
- Press the key **"O"** (*Inverter OFF - Shut-down*) on the Control Panel.  
(see *User Manual* to Section 5.2).



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***In case of a Parallel System press the key "O" (Inverter OFF) on the Control Panel of each unit connected on the Parallel Bus and having its output switch Q1 closed.***

It is recommended to note in this section **Notes**, with date and short description all the operations performed on the UPS, as: maintenance, components replacement, abnormal situations, etc.

Modifications reserved  
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