PRODUCT MANUAL

UNINTERRUPTIBLE POWER SUPPLIES

English

- ***B9000FXS 60kVA (3PH / 3PH)***
- ***B9000FXS 80kVA (3PH / 3PH)***
- ***B9000FXS 100kVA (3PH / 3PH)***
- ***B9000FXS 125kVA (3PH / 3PH)***
- ***B9000FXS 160kVA (3PH / 3PH)***

- The present manual is an integrant part of the products technical back-up documentation. Read the warnings with attention as they give important instructions concerning safety.
- This equipment must be used only for its appointed operation. Any other use is to be considered incorrect and therefore dangerous. The manufacturer cannot be held responsible for damages caused by incorrect, wrong and unreasonable use.
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1. UPS GENERAL DESCRIPTION

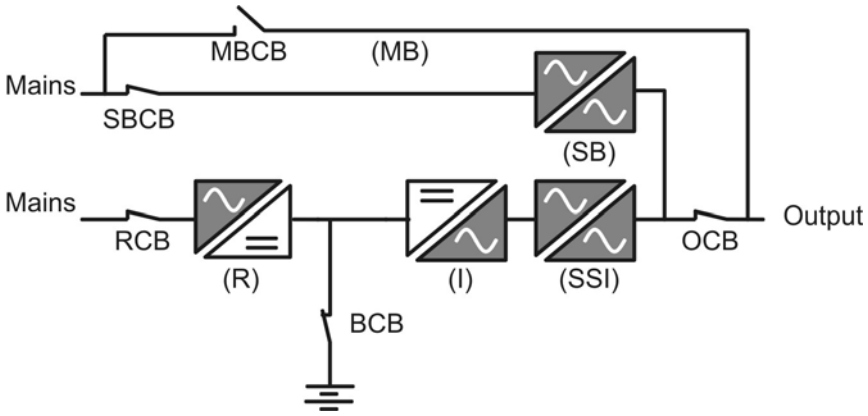
The UPS of the B9000FXS 60÷160kVA series is the type “ON LINE DOUBLE CONVERSION” and is connected between main power and user loads (see picture 1). As far as architecture and lay-out is concerned, this project is optimised with particular care in order to make it suitable for applications where reliability and high performances are fundamental for critical loads.

The UPS operation is optimised by microprocessor digital control and the IGBT inverter is based on a high frequency PWM waveform.

The whole UPS is monitored by a DSP 32 bit microprocessor, implementing full digital control of the system.

Procedures for power-on, power-off, switching to and from bypass are described step by step on LCD display, so to help users to easily operate the UPS.

Results of electrical measurement, alarm, work condition, event log and battery state are indicated real time on the display.



Picture 1 – UPS block diagram

With this configuration UPS guarantees high quality output, needed by loads requiring stable and clean source of power. The main features are:

- Protection for black-out, in the limits of battery autonomy
- Complete filtering of mains power noise
- High quality output power, provided under any condition of input power and loads
- Stable output frequency, independent from input frequency
- Full compatibility with every type of load
- Configurable with any neutral wire configuration (under request)
- Automatic control of battery, during both charging and discharging phases
- Easy to interface with monitoring devices
- Auto-diagnostic feature and troubleshooting support
- Flexibility of complete bypass configuration
- Full access from the front and from the roof for maintenance

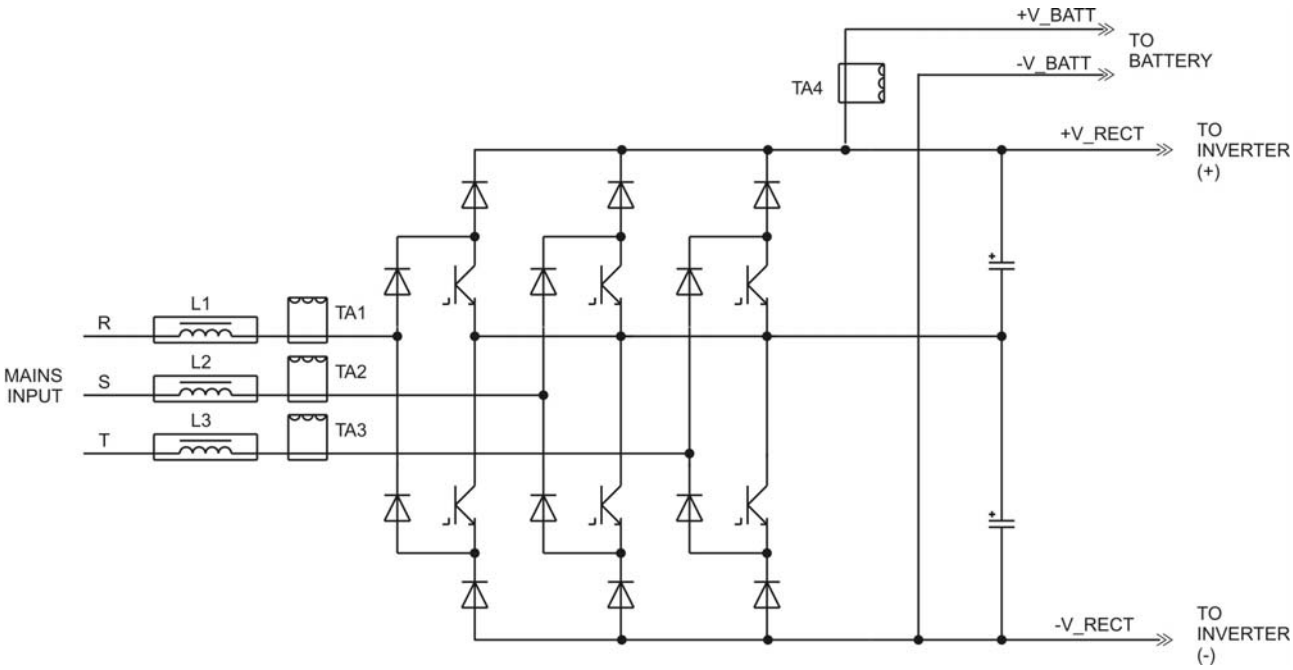
The block diagram shows the UPS subsystems that will be analysed in the following chapters:

- Rectifier/Battery Charger (R)
- Inverter (I)
- Battery (B)

- Static Switch: Static Inverter Switch (SSI) and Static Bypass Switch (SB)
- Manual Bypass (MB)

1.1 RECTIFIER / BATTERY CHARGER

The Rectifier/Battery charger converts the AC input voltage to DC voltage, feeding the inverter and keeping the battery charged.



Picture 2 – Rectifier

The AC/DC conversion is carried out by a three-phase three-level PWM rectifier, combining a three-phase diode bridge with a DC/DC step-up converter. The full-digital control of the IGBT bridge allows to minimize the harmonics re-injected into the mains and reduces the harmonic distortion of the current to a very low value even with low loads. The trend of the power absorbed by the mains is almost sinusoidal with a power factor higher than 0.99, thanks to the PFC (Power Factor Correction) technology.

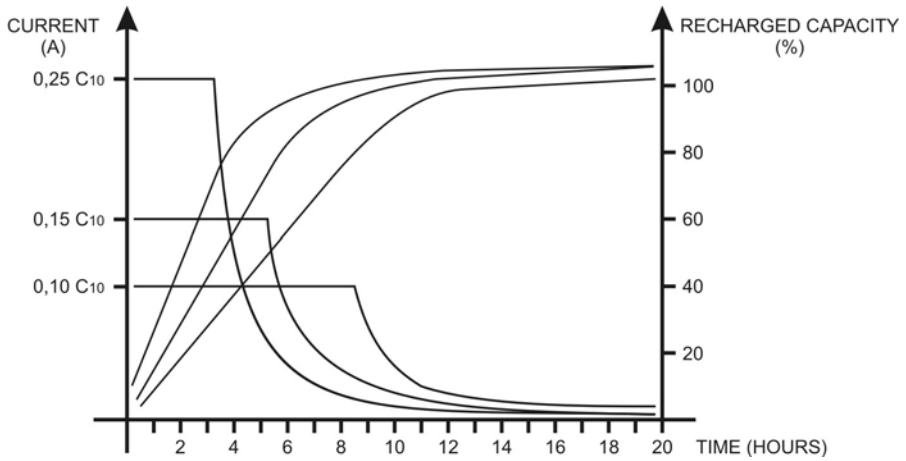
The current transducers TA1-TA2-TA3 provide the feedback for the input current waveform, that is used by the microprocessor to vary the modulation (PWM) of the IGBT's.

The battery recharging current is automatically limited by the control software, using the feedback signals provided by the transducer TA4.

1.1.1 Operation with ONE charging level

This type of charge is generally used with sealed lead acid batteries that, owing to the manufacturing technology, have a very narrow voltage range. In fact, the nominal charging voltage ranges between 2.25÷2.27 V/cell, with a maximum value of 2.3 V/cell.

The picture below shows the charging curves at different charging currents; the higher is the current, the higher is the restored capacity versus time, the lower is the recharging time.



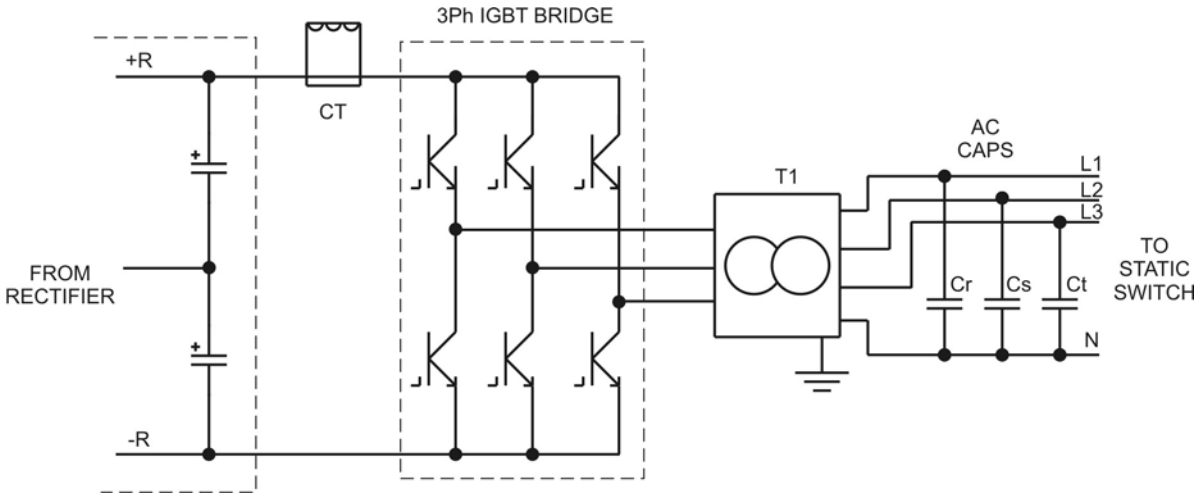
Picture 3 – Operation with ONE charging level

1.2 INVERTER

The inverter converts the DC input voltage to AC voltage, stabilized in frequency and RMS value.

The DC voltage is converted by the IGBT bridge, that uses six switches, controlled using PWM (Pulse Width Modulation) technology at high commutation frequency. The PWM generation as well as the control of the operating variables is completely managed by the microprocessor.

The current transducer CT provides for the monitoring of the input current. Its feedback signal is managed by the microprocessor to activate the current limitation (see 2.2.3) and the IGBT protection (see 2.2.4).



Picture 4 – Inverter

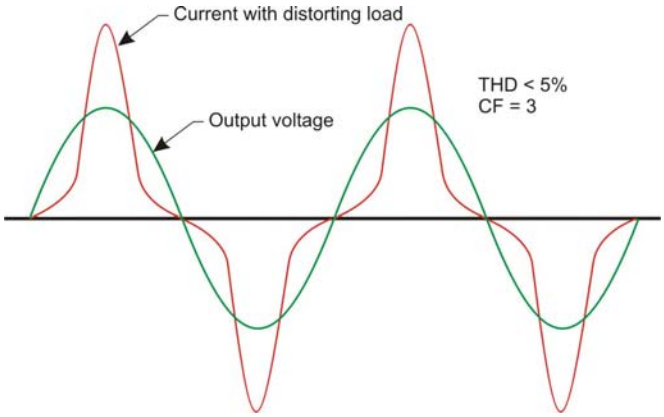
The output transformer provides galvanic insulation between DC and AC side, as well as voltage adaptation. Its integrated inductance forms, together with the AC

capacitors, a low-pass filter that provides to eliminate the high frequency ripple and keep the total harmonic distortion (THD) of voltage lower than 2% (with linear load).

The inverter, thanks to its manufacturing technology and to the microprocessor control, is able to supply indifferently inductive or capacitive loads. . In case the load is highly capacitive (p.f. < 0.9) contact the sales department to verify whether a slight power de-rating is necessary or not.

1.2.1 Operation with non-linear load

A non-linear load is characterized by a high peak current versus its RMS value, that in normal condition would introduce a distortion on the output voltage waveform. The inverter is provided with an instantaneous voltage correction facility, completely managed by the microprocessor, that provides to vary the PWM generation according to the actual output waveform, in order to keep the THD within 5% even with loads having crest factor equal to 3.



Picture 5 – Operation with non-linear load

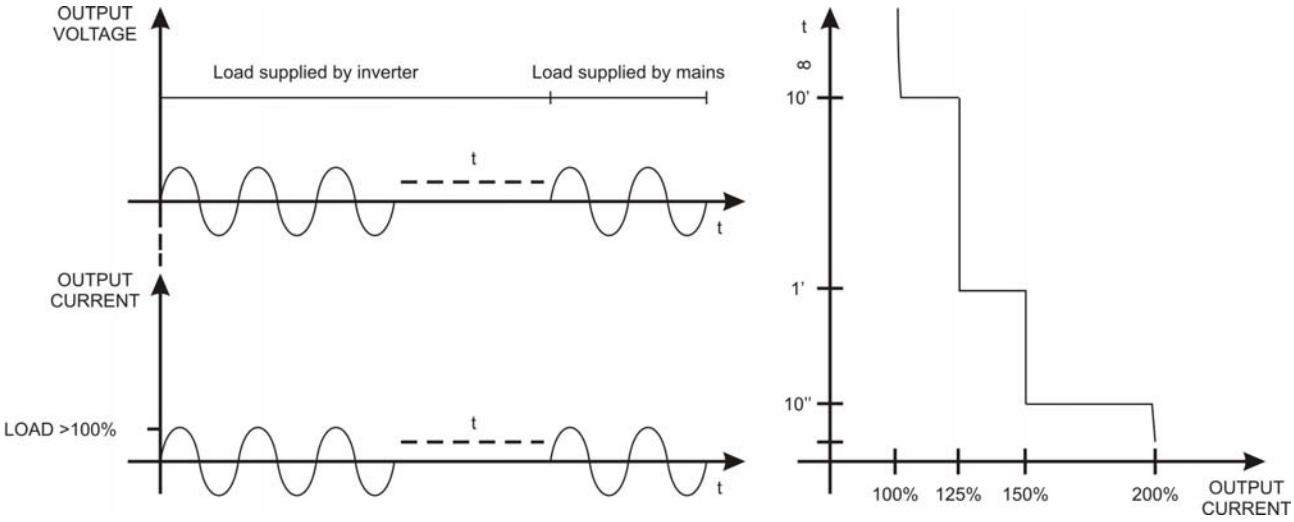
1.2.2 Overload management

Inverter can provide continuously 100% of nominal load and can tolerate overload conditions up to 125% for 10 minutes or 150% for 1 minute.

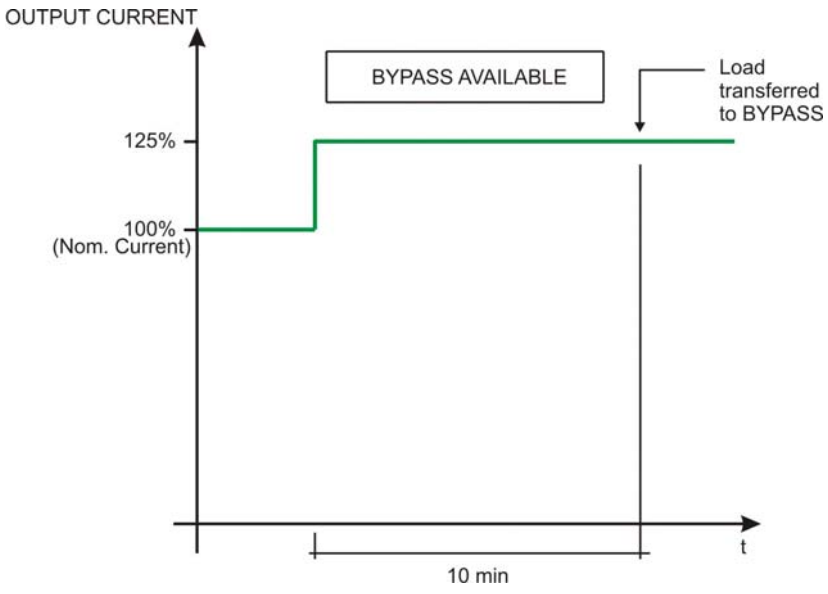
Peak conditions such as take-off of engines or magnetic parts are managed limiting the output current to 200% for 5 cycles, then reducing to 125%.

Any times output power grows above 100% the inverter keeps feeding the loads, while the microprocessor activates the “thermal image” algorithm to calculate the power overload based on the output current and duration of the overload.

User loads are powered by inverter output up to the end of maximum allowed time, then the static switch transfers the load to the emergency line without interruption of output power.



Picture 6 – Thermal image characteristic



Picture 7 – Overload with bypass available

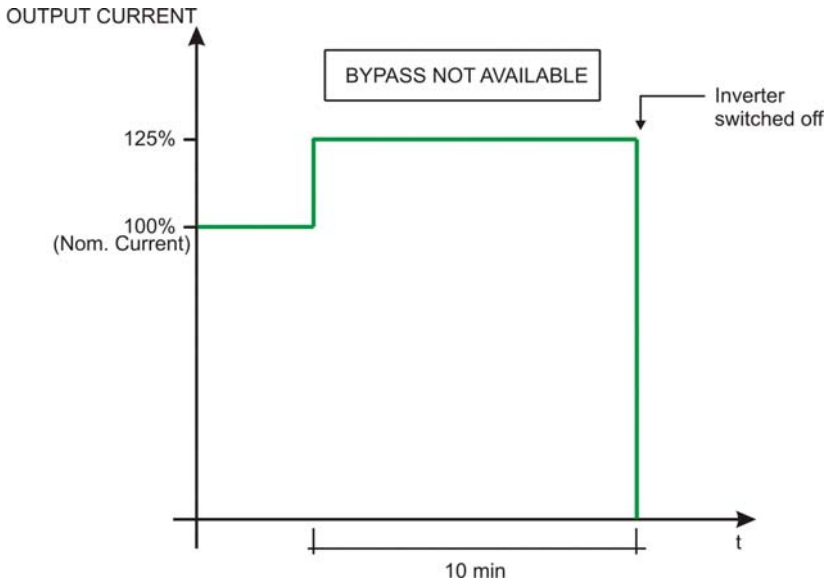
1) BYPASS AVAILABLE

As soon as an overload is detected the algorithm starts to calculate the increment of the energy.

When the threshold value is reached the load is transferred to bypass.

To allow a safe cooling of the components (IGBT’s, transformer) the inverter is switched off for **30 minutes.**

When this time has elapsed the inverter is switched on again and the load transferred back to the primary supply.



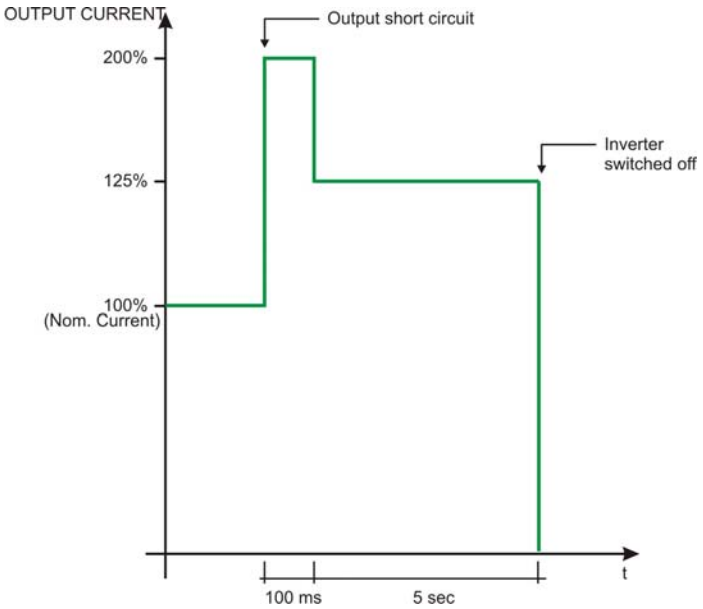
Picture 8 – Overload with bypass not available

2) BYPASS NOT AVAILABLE
As soon as an overload is detected the algorithm starts to calculate the increment of the energy.
When the threshold value is reached the inverter is switched off to avoid severe damages to the components.
As soon as the bypass is available again the load is supplied by the static bypass switch.
After **30 minutes** the inverter is switched on again and the load is transferred again to the primary supply.
WARNING: this operation causes the loss of the supply to the load

1.2.3 Short-circuit operation

As soon as an output short-circuit is detected (alarm A25), the load is transferred immediately to the emergency line that provides to eliminate the fault thanks to its higher short-circuit current.

In case the bypass is not available, the inverter reduces its output voltage and limits its current to 200% for 100ms, and then to 125% for 5 seconds, after that it is switched off (according to EN 62040-3 / EN 50091-3).



Picture 9 – Short-circuit characteristic (Bypass not available)

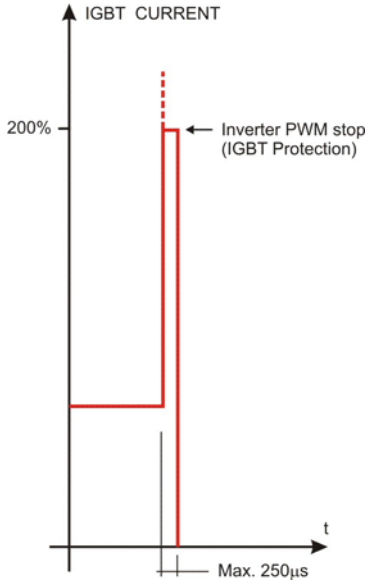
1.2.4 IGBT bridge protection

The inverter input current monitoring is carried out by the current transducer connected upstream the inverter bridge. Therefore the control logic is able to distinguish an output short-circuit from an IGBT short-circuit.

The behaviour of the inverter in case of short-circuit on the load has been described at 2.2.3; the output current is limited and the IGBT bridge current does not reach the protection threshold.

In case of short-circuit in the inverter bridge, the DC input current increases immediately and there is no possibility of limitation but stopping the PWM.

In this case the alarm A12 – Max Current Stop is activated and must be reset manually after having verified the status of the semiconductors.



Picture 10 – IGBT bridge protection

1.3 BATTERY

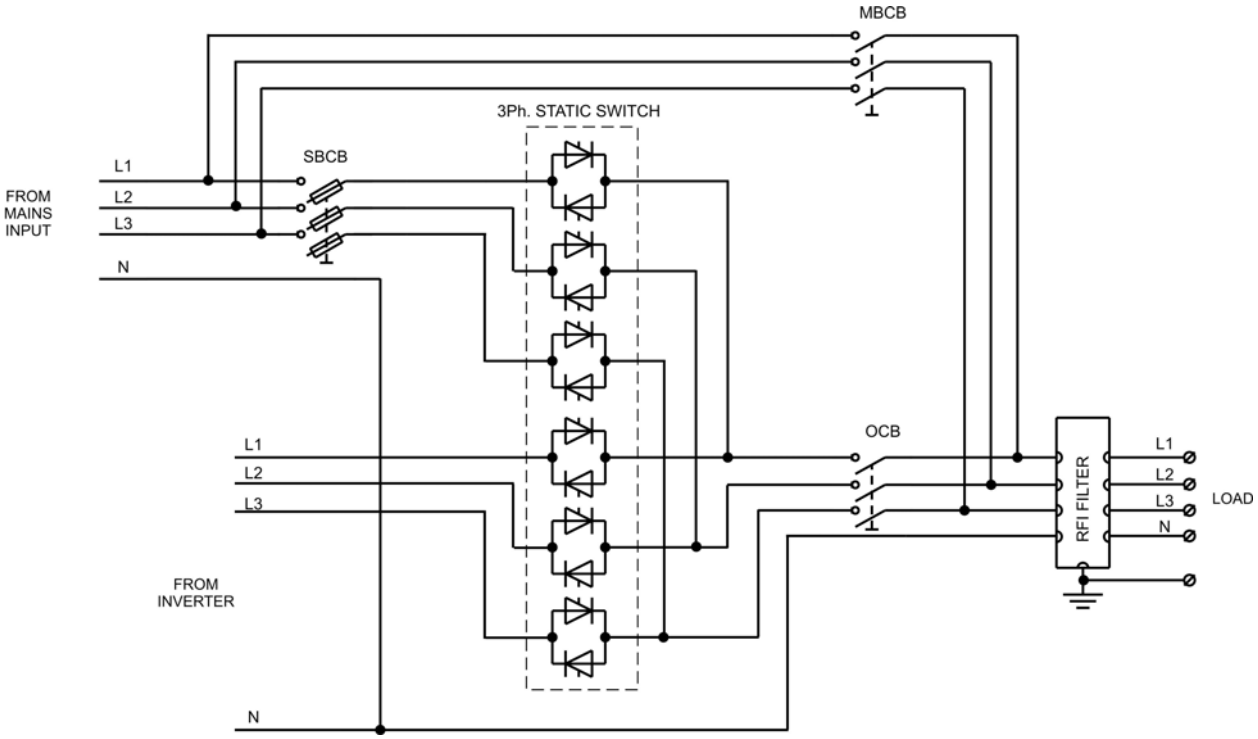
On the B9000FXS 60÷160kVA UPS, the battery is always installed in external additional cabinets.

The battery charger control logic is completely integrated inside the rectifier control board; the battery is charged, according to the DIN 41773 Standard, every time it has been partially or completely discharged. It is kept floating, even when it is charged, to compensate any auto-discharge.

1.4 STATIC SWITCH

Static switch is composed of thyristors, rated to work continuously at 150% of nominal output power.

The components connected to the bypass line are protected by fuses.



Picture 11 – Static switch and manual bypass

Thanks to the transfer logic integrated in the control, the load is supplied by the bypass line even in case of microprocessor failure.

1.4.1 Inverter → Emergency Line Transfer

The transfer is activated only if the emergency line is in tolerance (in less than 0.5 ms), for the following reasons:

CAUSES	COMMUTATION CONDITIONS
Output short-circuit	Emergency line within tolerance limits
Fault of inverter or inverter voltage out of tolerance	Emergency line within tolerance limits
DC voltage out of tolerance (Inverter OFF)	Emergency line within tolerance limits
Over-temperature	Emergency line within tolerance limits
Thermal image shut down	Emergency line within tolerance limits
Forced commutation by “BYPASS SWITCH” (test or service)	Emergency line within tolerance limits and SYNCHRONIZED inverter

1.4.2 Emergency Line → Inverter Transfer

As soon as inverter is correctly working and synchronized, UPS automatically switches the load to inverter in less than 1 msec. If UPS switches back and forth more than 6 times in two minutes an alarm will be generated, to inform the user, and the load will be locked to emergency line. A manual reset is necessary to switch the supply back to the inverter.

1.5 MANUAL BYPASS

To safely allow maintenance and repair of the unit, UPS is provided with a manual bypass switch.

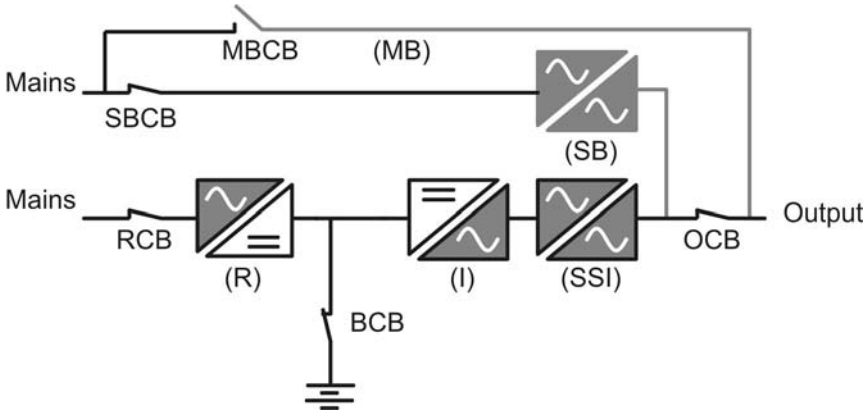
In this mode all the testing activities to verify the efficiency of the system can be carried out safely. Manual bypass must be inserted by following the instructions given in the operating manual. During the transfer to manual bypass there is no interruption of the supply to the load.

2. OPERATING MODES

2.1 NORMAL OPERATION

During normal operation all the circuit breakers/isolators are closed, except for MBCB (maintenance bypass).

The three-phase input AC voltage feeds the rectifier via the filter inductor; the rectifier supplies the inverter and compensates mains voltage fluctuations as well as load variation, maintaining the DC voltage constant. At the same time it provides to keep the battery in stand-by (floating charge or boost charge depending on the type of battery). The inverter converts the DC voltage into an AC sine-wave with stabilized voltage and frequency, and also supplies the load via its static switch SSI.



Picture 12 – Normal operation

2.2 BATTERY OPERATION

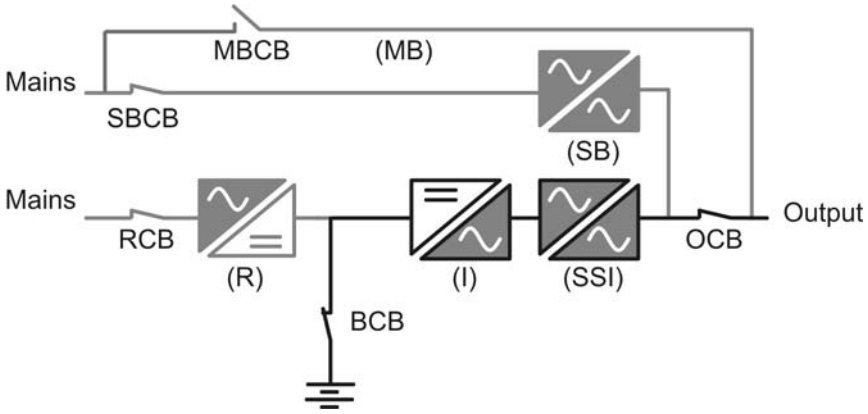
In the event of mains failure, or rectifier failure, the battery feeds the inverter without interruption. The battery voltage drops as a function of the magnitude of the discharge current. The voltage drop has no effect on the inverter output voltage since it is kept constant by varying the PWM modulation. As the battery approaches the discharge limit an alarm is activated.

In case the power is restored before the limit is reached the system switches automatically back to normal operation. If not, the inverter shuts down and the load is transferred to the bypass (bypass operation). If the bypass mains is not available or outside the tolerance range the complete system shuts down as soon as the lowest battery level is reached (*black-out*).

As soon as the power is restored the rectifier charges the battery. In the standard configuration, the loads are supplied again via static switch SSB when mains is available again. The inverter is restarted when the battery has partially restored its capacity.

The system restart from the *black-out* condition can be customized based on the requirements of the plant, in three different modes:

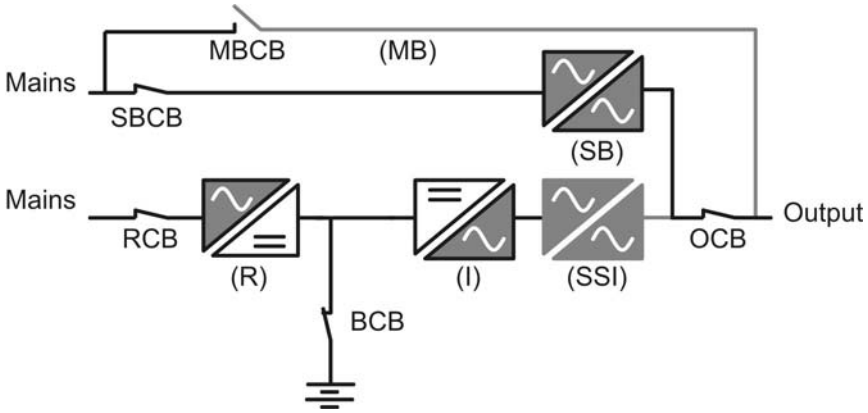
- Bypass → loads are supplied as soon as the bypass line is available (factory configuration).
- Inverter → loads are supplied by the inverter (even if the bypass line is available) when the battery voltage has reached a programmed threshold, after the rectifier restart.
- Man. Inverter → the output supply is NOT restored automatically. The system requires a confirmation to restart which can only be done manually by the user via the front panel.



Picture 13 – Battery operation

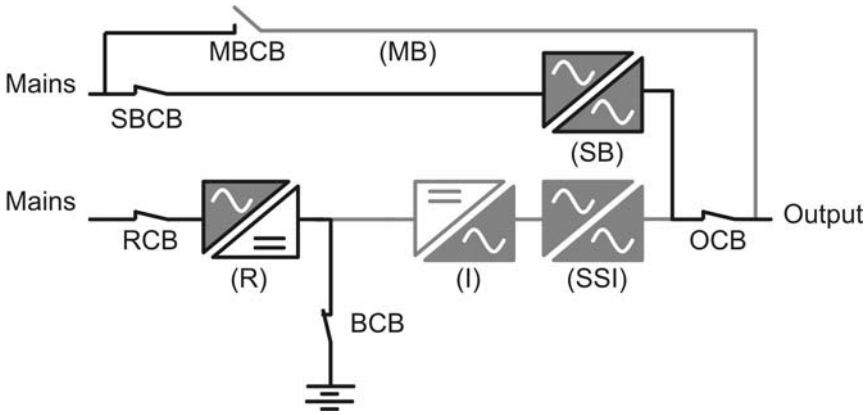
2.3 BYPASS OPERATION

Bypass operation may occur for both manual or automatic change-over. The manual transfer is due to the BYPASS SWITCH, that forces the load to bypass. In the event of a bypass failure the load is transferred back to inverter without interruption.



Picture 14 – Bypass operation (manual changeover)

The automatic change-over occurs for the reasons explained in paragraph 2.4.1; basically when the power supply to the load within the specified tolerance cannot be assured by the inverter.



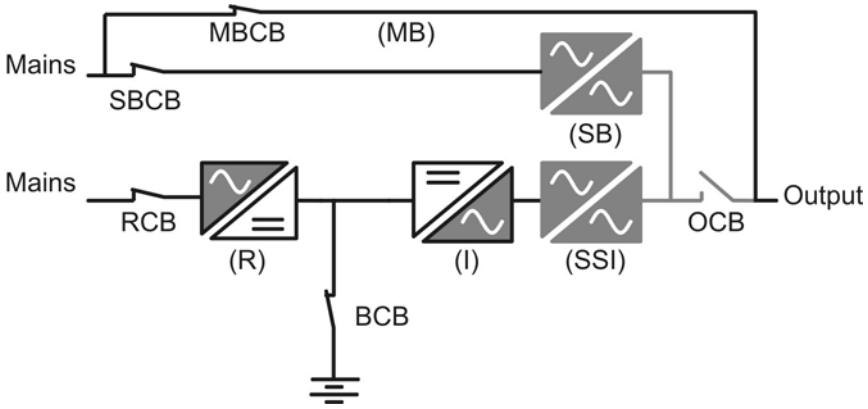
Picture 15 – Bypass operation (automatic changeover)

2.4 MANUAL BYPASS

The manual bypass operation is necessary every time the functionality of the UPS needs to be checked or during maintenance or repair works.

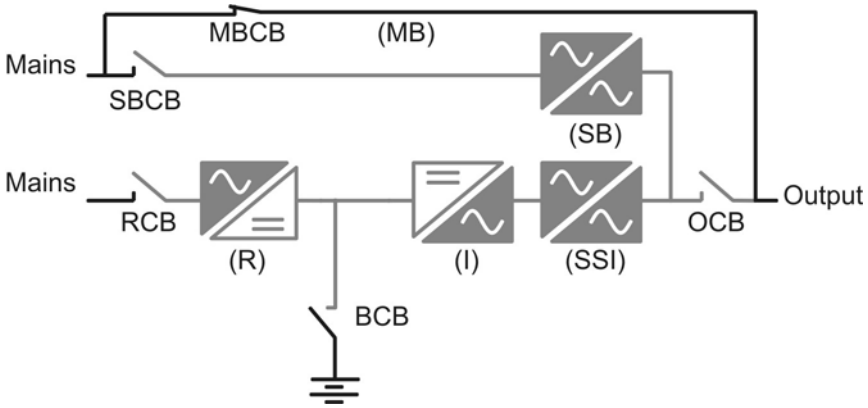
The manual bypass procedure is described in the UPS operating manual and must be followed carefully in order to avoid damages to the UPS.

During the functional check of the UPS, all the breakers can be closed, except for the output breaker OCB, and the full functionality can be tested.



Picture 16 – Manual Bypass for functional tests

During the manual bypass operation for repair or maintenance, the UPS is completely switched off and the load is supplied directly by the bypass mains.

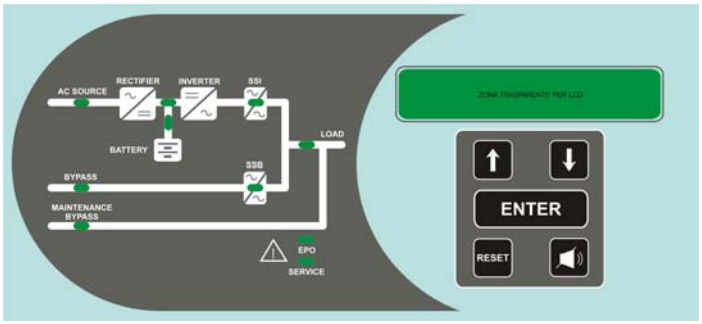


Picture 17 – Manual Bypass for repair or maintenance works

3. FRONT PANEL

The front panel of the UPS, consisting of a double row alphanumeric display plus 5 function keys, allows the complete monitoring of the UPS status.

The mimic flow helps to understand the operating status of the UPS. For the full navigation of the display, refer to the Operating Manual of the UPS.



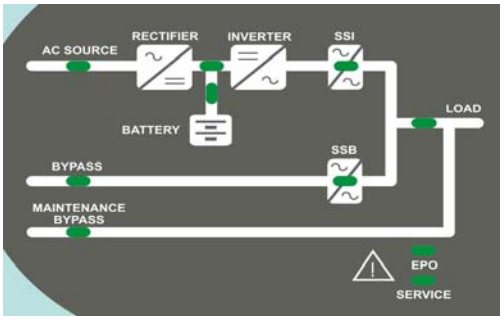
Picture 18 – UPS front panel

3.1 FUNCTION BUTTONS

The front panel of the UPS is provided with 5 buttons whose functions are indicated in the following table:

Button	Assigned functions
	➢ Scrolls up the menus ➢ Increases the values by one unit ➢ Selects a value
	➢ Scrolls down the menus ➢ Increases the values by one unit ➢ Selects a value
	➢ Selects a menu ➢ Confirms changes
	➢ Silences the buzzer (activated due to an alarm or a failure)
	➢ Returns to the previous menu

3.2 FUNCTION OF MIMIC PANEL LED'S



Picture 19 – UPS mimic panel

LED 1		GREEN	AC line on rectifier input within tolerance
		GREEN	Wrong phase rotation
		OFF	AC mains failure on rectifier input
LED 2		GREEN	AC bypass line within tolerance
		GREEN	Wrong phase rotation
		OFF	AC bypass line out of tolerance AC bypass line failure
LED 3		GREEN	Rectifier off or faulty
		RED	DC voltage out of tolerance
		GREEN	Rectifier on and DC voltage within tolerance
LED 4		GREEN	circuit breaker BCB closed and battery charging
		GREEN	Battery discharging or under TEST
		ORANGE	Circuit breaker BCB open
		RED	Battery fault (following a battery test)
		OFF	Battery not available
LED 5		GREEN	Inverter voltage within tolerance and static switch closed
		GREEN	Inverter overload or short-circuit
		OFF	Inverter off or voltage out of tolerance
LED 6		ORANGE	Re-transfer blocked
		ORANGE	Static bypass switch closed
		OFF	Static bypass switch open
LED 7		GREEN	output circuit breaker OCB closed
		OFF	Output circuit breaker OCB open
LED 8		ORANGE	Manual bypass switch MBCB closed
		OFF	Manual bypass switch MBCB open
LED 9		RED	Emergency power off (EPO) activated
		OFF	Normal operation
LED 10		ORANGE	Maintenance request (slow flashing)
		ORANGE	Critical alarm (fast flashing)
		OFF	Normal operation

3.3 ALARMS AND OPERATING STATUS

ALARMS

A1 MAINS FAULT
A2 INPUT WRONG SEQ
A3 BOOSTER STOPPED
A4 BOOSTER FAULT
A5 DC VOLTAGE FAULT
A6 BATTERY IN TEST
A7 BCB OPEN
A8 BATTERY DISCHARGE
A9 BATTERY AUT END
A10 BATTERY FAULT
A11 SHORT CIRCUIT
A12 STOP TIMEOUT SC
A13 INV OUT OF TOL
A14 BYPASS WR SEQ
A15 BYPASS FAULT
A16 BYPASS --> LOAD
A17 RETRANSFER BLOCK
A18 MBCB CLOSED
A19 OCB OPEN
A20 OVERLOAD
A21 THERMAL IMAGE
A22 BYPASS SWITCH
A23 EPO PRESSED
A24 HITMP INV/DC FUS
A25 INVERTER OFF
A26 COMMUNIC ERROR
A27 EEPROM ERROR
A28 CRITICAL FAULT
A29 MAINTENANCE REQ
A30 COMMON ALARM
A31 MBCB BUS CLOSED
A32 EPO BUS CLOSED
A33 ASYMMETRIC LOAD
A34 SERVICE REQUIRED
A35 DIESEL MODE
A36 DC FASTSHUTDOWN
A37 HIGH TEMP RECT
A38 INV --> LOAD
A39 INV ERROR LOOP
A40 SSI FAULT
A41 RECT ERROR LOOP
A42 INP FUSES BLOWN
A43 CURR ERROR LOOP
A44 DESAT IGBT INV
A45 HIGH TEMP SSW
A46 PAR LOST REDUND
A47 SEND PARAM ERROR
A48 RCV PARAM ERROR
A49 TEST MODE ERROR
A50 SSW BLOCKED
A51 BATT TEMPERATURE
A53 FIRMWARE ERROR
A54 CAN ERROR
A55 PAR CABLE DISC
A56 MAINS UNBALANCE
A63 START SEQ BLOCK

STATUSES

S1 BOOSTER OK
S2 BATTERY OK
S3 INVERTER OK
S4 INVERTER FEEDS LOAD
S5 BYPASS INVERTER SYNCHR
S6 BYPASS OK
S7 BYPASS FEEDS LOAD
S8 BOOST CHARGE
S9 MASTER INVERTER SYNCHR

3.4 MEASUREMENTS ON THE DISPLAY

The measures shown on the display are listed below.

Sub-menu	Displayed data	Accuracy
INPUT	Rectifier input voltage (1) (2)	1 V
	Rectifier input current (3)	1 A
	Frequency	0.1 Hz
	Input power	1 kVA
OUTPUT	Voltage (1) (2)	1 V
	Current (3)	1 A
	Frequency	0.1 Hz
	Active power	1 kW
	Apparent power	1 kVA
	Load percentage	1 %
BYPASS	Voltage (1) (2)	1 V
	Frequency	0.1 Hz
INVERTER	Voltage (1) (2)	1 V
	Frequency	0.1 Hz
AC/DC	Rectifier output voltage	1 V
BATTERY	Voltage and current	1 V / 1 A
	Nominal capacity	1 Ah
	Residual autonomy	1 min / 1 %

(1) The voltage measures are always referred to the phase-to-neutral value
(2) The three voltages are displayed in one screen as “xxx yyy zzz V”
(3) The three line currents are displayed in one screen as “xxx yyy zzz A”

4. GENERAL TECHNICAL INFORMATION

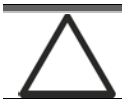
4.1 TECHNICAL DATA

For information regarding the technical data of the product, please refer to the technical specification.

4.2 INSTRUCTIONS FOR INSTALLATION

4.2.1 Receipt of the UPS

Please inspect the device before installing it. In case any damage is noticed from the conditions of the package and/or from the outside appearance of the equipment, contact the shipping company or your dealer immediately. The damage statement must be made within 6 days from receipt of the product and must be notified to the shipping carrier directly. Should the product need to be returned to the manufacturer, please use the original package.

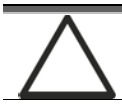


Danger to persons due to transport damages

Mechanical damage to the electrical components constitutes a serious danger to persons and property. In case of doubt regarding the non-integrity of the package or of the product contained therein, contact the manufacturer before carrying out the installation and/or the start-up.

4.2.2 Storage

The package normally ensures protection from humidity and possible damages during transport. Do not store the UPS outdoor.



Risk of damage due to inappropriate storage

- For the environmental storage conditions, refer to the indications given for the installation of the device.
- The device must only be stored in rooms protected from dust and humidity.
- The device cannot be stored outdoor.

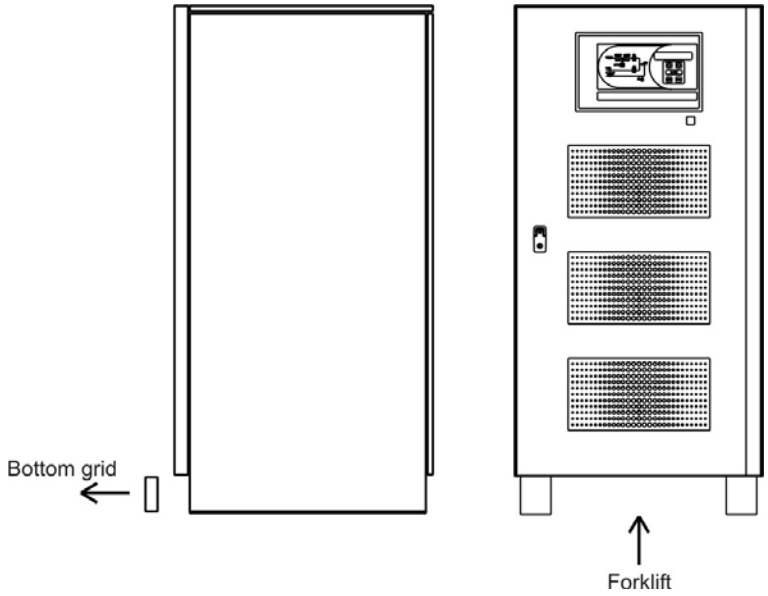
4.3 HANDLING OF THE UPS

The UPS is packed on a pallet. It is handled from the transport vehicle to the installation (or storage) place via a fork lift.

The device has a heavy weight

- Avoid turnover during the transport of the UPS.
- Cabinets must always be handled in upright position.
- During loading and unloading operations, always respect the indications regarding the device barycentre marked on the package.

To handle the UPS remove the lower front and rear panel and insert the forks of a fork lift.



Picture 20 – Handling of UPS B9000FXS

4.4 POSITIONING AND INSTALLATION

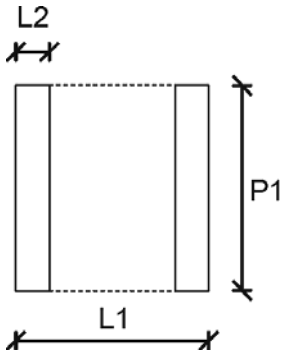
The UPS B9000FXS must be installed indoor, in a clean and dry room, preferably without dust or humidity infiltrations.

Special environmental conditions

It is necessary to implement specific protective measures in case of unusual environmental conditions:

- harmful smoke, dust, abrasive dust;
- humidity, vapour, salt air, bad weather or dripping;
- explosive dust and gas mixture;
- extreme temperature variations;
- bad ventilation;
- conductive or radiant heat from other sources;
- fungus, insects, vermin.

4.4.1 Base plan, static load and weights



Picture 21 – Base plan

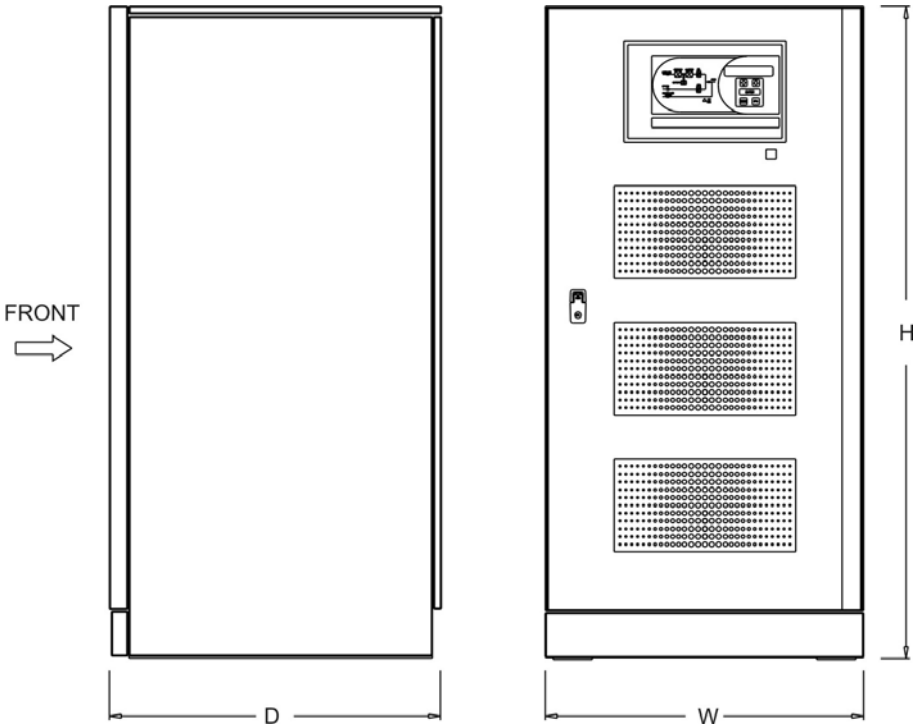
UPS (kVA)	60	80	100	125	160
L1 – mm	815				
P1 – mm	825				
L2 – mm	70				

The supporting base of the UPS must be designed to carry the UPS weight and to ensure its steady and safe support.

Its carrying capacity must be adequate to the static loads indicated in the table below.

UPS (kVA)	60	80	100	125	160
Weight - kg	570	600	630	662	720
Static load – kg/m^2	948	998	1048	1101	1198

4.4.2 Overall dimensions



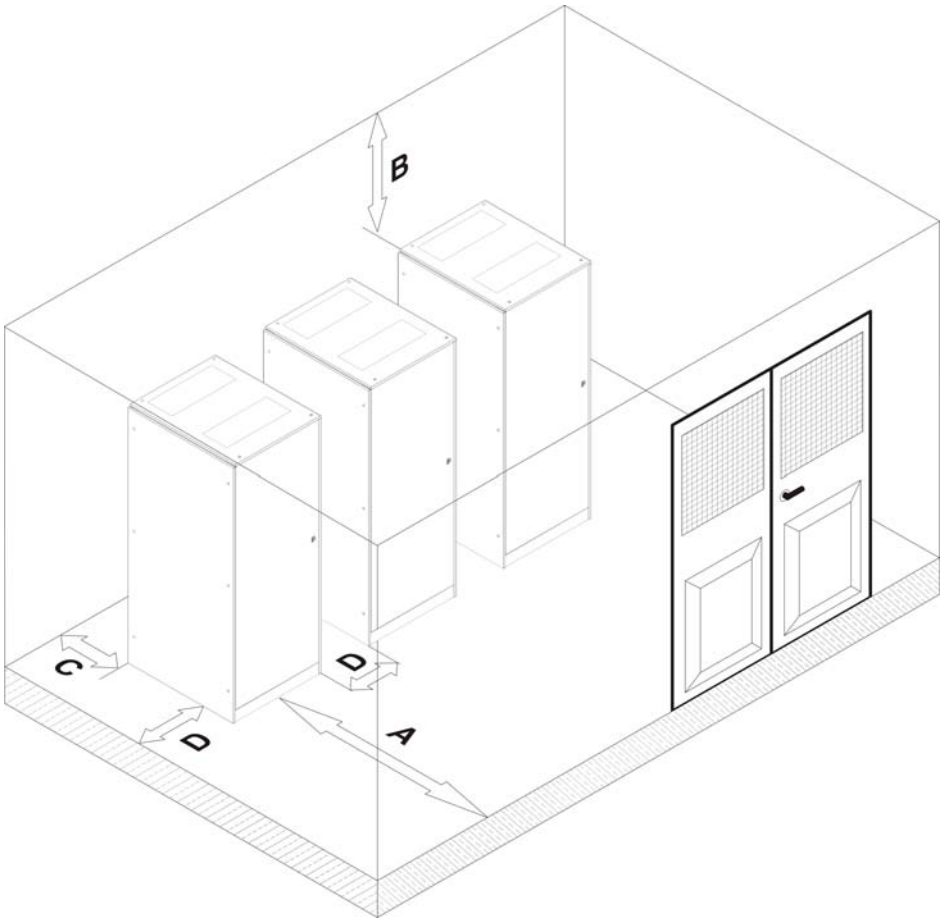
Picture 22 – Overall dimensions of UPS B9000FXS

UPS (kVA)	60	80	100	125	160
L – mm	815				
P – mm	825				
H – mm	1670				

4.4.3 Minimum distances from the walls and ventilation

The UPS must be so installed as to ensure its serviceability and to allow a correct air flow as much as possible.

With regard to the minimum distances from the walls, for all of the UPS sizes the same installation conditions apply as indicated in the table below.



Picture 23 – Minimum distances from the walls

A (mm)	B (mm)	C (mm)	D (mm)
1000	700	200	50

The table below shows the air volume required for an optimal ventilation and cooling of the UPS.

A (mm)	B (mm)	C (mm)	D (mm)
1000	700	200	300

UPS (kVA)	60	80	100	125	160
Air volume (m^3/h)	1600	1800	2100	2300	2500

4.4.4 Environmental installation conditions

The air is classified by the EN 60721-3-3 standard (Classification of environmental parameters and their severities – Stationary use at weather-protected locations) based on climatic and biological conditions as well as on mechanically and chemically active substances.

Therefore the place of installation must meet specific requirements to ensure compliance with the conditions for which the UPS was designed.

- **Climatic conditions according to the technical specification of B9000FXS**

Environmental parameter	
Minimum operating temperature (°C)	– 10
Maximum operating temperature (°C)	+ 40
Minimum relative humidity (%)	5
Maximum relative humidity (%)	95
Condensation	NO
Rainfall with wind (rain, snow, hail, etc.)	NO
Water with an origin other than rain	NO
Ice formation	NO

- **Classification of biological conditions (EN 60721-3-3)**

Environmental parameter	Class		
	3B1	3B2	3B3
a) Flora	NO	Presence of mildew, fungus, etc.	Presence of mildew, fungus, etc.
b) Fauna	NO	Presence of rodents and other animals that are harmful to products, excluding termites	Presence of rodents and other animals that are harmful to products, including termites

- **Classification of mechanically active substances (EN 60721-3-3)**

Environmental parameter	**Class**			
	3S1	3S2	3S3	3S4
a) Sand [mg/m^3]	No	30	300	3000
b) Dust (suspension) [mg/m^3]	0,01	0,2	0,4	4,0
c) Dust (sedimentation) [mg/(m^2·h)	0,4	1,5	15	40
Places where precautions have been taken to minimize the presence of dust. Places away from dust sources	x			
Places without any special precaution to minimize the presence of sand or dust, however not in proximity to sand or dust sources		x		
Places in proximity to sand or dust sources			x	
Places in proximity to working processes that generate sand or dust, or in geographic areas having a high proportion of sand brought by the wind or of dust suspended in the air				x

➢ Classification of chemically active substances (EN 60721-3-3)

Environmental parameter	Class					
	3C1R	3C1L	3C1	3C2	3C3	3C4
a) Sea salt	No	No	No	Salt fog	Salt fog	Salt fog
b) Sulphur dioxide [mg/m^3]	0,01	0,1	0,1	1,0	10	40
c) Hydrogen sulphide [mg/m^3]	0,0015	0,01	0,01	0,5	10	70
d) Chlorine [mg/m^3]	0,001	0,01	0,1	0,3	1,0	3,0
e) Hydrochloric acid [mg/m^3]	0,001	0,01	0,1	0,5	5,0	5,0
f) Hydrofluoric acid [mg/m^3]	0,001	0,003	0,003	0,03	2,0	2,0
g) Ammonia [mg/m^3]	0,03	0,3	0,3	3,0	35	175
h) Ozone [mg/m^3]	0,004	0,01	0,01	0,1	0,3	2,0
i) Nitric oxide (expressed in equivalent values of nitrogen dioxide) [mg/m^3]	0,01	0,1	0,1	1,0	9,0	20
Places where atmosphere is strictly monitored and regulated (“clean spaces” category)	X					
Places where atmosphere is permanently monitored		X				
Places located in rural and urban regions where industrial activities are few and where traffic is moderate			X			
Places located in urban regions with industrial activities and/or considerable traffic				X		
Places in proximity to industrial sources with chemical emissions					X	
Places located in industrial installations. Emissions of highly concentrated chemical pollutants						X

UPS B9000FXS is designed to be installed in an environment that meets the following classifications.

K	Climatic conditions	**In accordance with the technical specification**
B	Biological conditions	**3B1 (EN 60721-3-3)**
C	Chemically active substances	**3C2 (EN 60721-3-3)**
S	Mechanically active substances	**3S2 (EN 60721-3-3)**

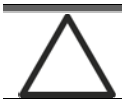
In the event that the environmental conditions of the installation room do not comply with the specified requirements, additional precautions must be taken to reduce excessive values to the specified limits.

4.5 ELECTRICAL CONNECTION

The electrical connection is part of the work which is normally provided by the company that carries out the product installation. For this reason, the UPS manufacturer shall not be held responsible for any damages due to wrong connections.

Use qualified personnel only

All the operations related to the electric connection must be carried out by qualified and trained personnel.



Work in compliance with the local standards

The installation of UPS B9000FXS must be carried out in compliance with national and local regulations.

Connection of ground cable

The grounding of the UPS via the relevant terminal is mandatory. It is strongly recommended to connect the ground terminal as first terminal.

Check the position of selector “SR”

Before using the UPS, make sure changeover switch “SR” (Service switch) is in “NORMAL” position and keep it in the same position during operation. To use this changeover switch, refer to the service manual.

The electrical connection is part of the work which is normally provided by the company that carries out the electrical installation and not by the UPS manufacturer. For this reason, the following recommendations are only an indication, as the UPS manufacturer is not responsible for the electrical installation. In any case we recommend to carry out the installation and the electrical connections of the input and output in compliance with the local standards.

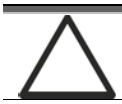
Cables must be selected bearing in mind technical, financial and safety aspects. The selection and the sizing of cables from a technical viewpoint depend on the voltage, on the current absorbed by the UPS, on the bypass line and on the batteries, on the ambient temperature and on the voltage drop. Finally, the kind of cable laying must be taken into particular consideration.

For more explanations regarding the selection and the sizing of cables, please refer to the relevant IEC standards, in particular to IEC 64-8 standard.

“Short-circuit currents” (very high currents with a short duration) and “overload currents” (relatively high currents with a long duration) are among the main causes of cable damage. The protection systems normally used to protect the cables are: thermal magnetic circuit breakers or fuses. Protection circuit breakers must be selected according to the maximum short-circuit current (max Isc) that is needed to determine the breaking power of automatic circuit breakers, and to the minimum current (min Isc)

that is needed to determine the maximum length of the line protected. The protection against short-circuit must operate on the line before any thermal and electrothermal effects of the overcurrents may damage the cable and relevant connections.

During the electrical installation take particular care to respect the phase rotation. The terminal boards for cables connection are positioned at the front of the UPS, under the breakers. To access the terminals remove the front protection, extracting the fixing bolts.



Mains connection

The connection to the mains must be carried out with protection fuses between the mains and the UPS.

The use of differential protection devices in the line supplying the UPS is unadvisable. The leakage current to ground due to the RFI filters is rather high and it can cause spurious tripping of the protection device.

According to IEC EN62040-1 standard, in order to take into account the UPS' leakage current, residual current devices having adjustable threshold can be used.

Electrical connection data						
Power (kVA)		**60**	**80**	**100**	**125**	**160**
Input Fuses (A)	Rectifier	3x125	3x150	3x200	3x250	3x315
	Bypass	3x150	3x200	3x315	3x315	3x400
Input cables (mm^2)	Rectifier	3x50	3x70	3x95	3x95	3x120
	Bypass	4x95	4x120	4x150	4x185	4x185
Ground cables (mm^2)		95	120	185	240	240
Output cables (mm^2)		4x95	4x120	4x150	4x185	4x185
Battery cables (mm^2)		2x50	2x70	2x95	2x120	2x150

4.6 BACKFEED PROTECTION DEVICE

The back-feed protection device, as indicated by the EN 62040-1 Standard, is optional and can be installed during the UPS production phase; the installation on site can only be carried out by skilled personnel.

The device is a contactor that automatically disconnects the bypass line in case of failure of the static switch, in order to avoid voltage feed-back on the input terminals during the a mains failure.

The use of a device installed inside the UPS allows a higher flexibility of use, as only the bypass line is cut leaving the rectifier battery charger in operation.

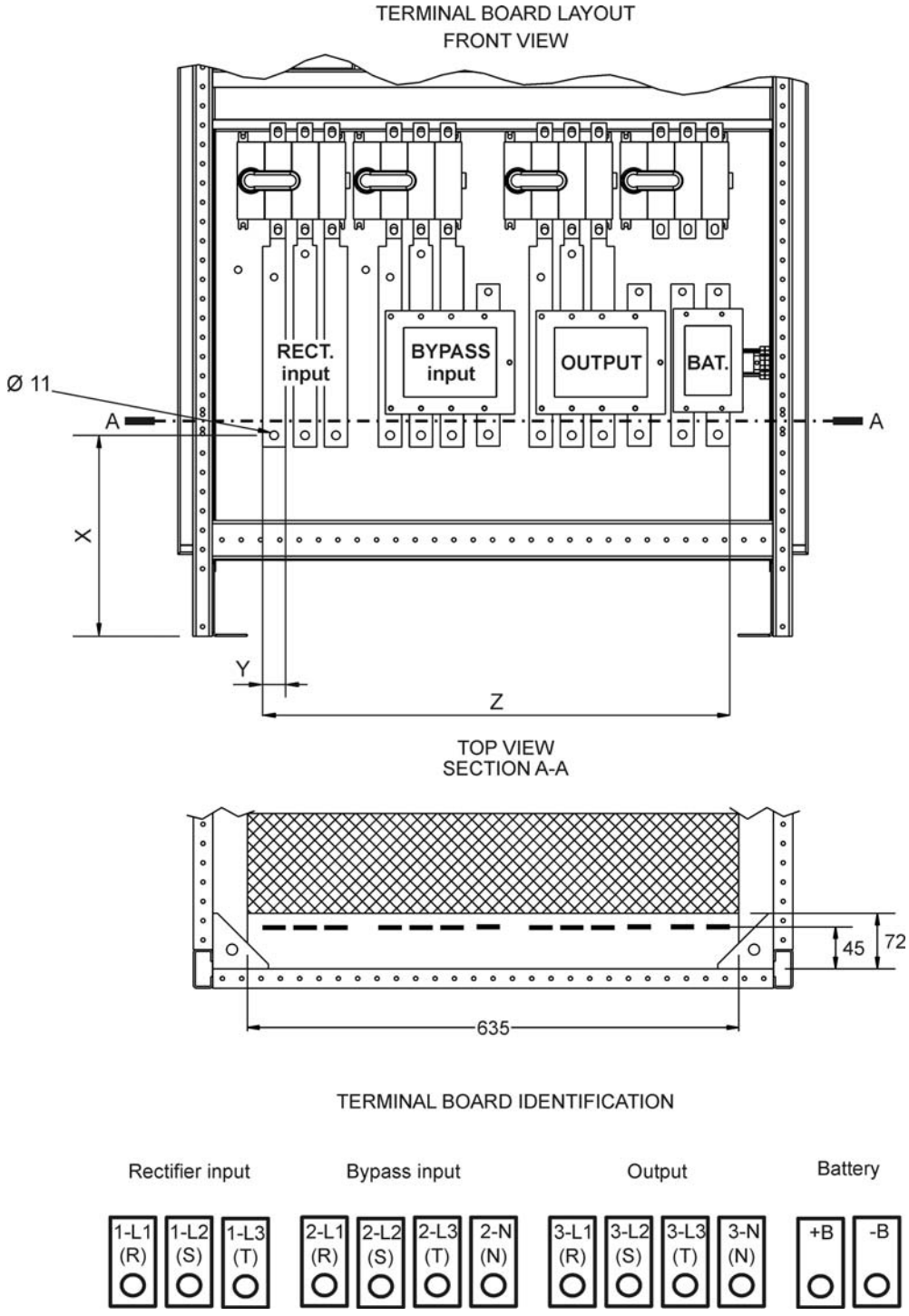
The use of an external device forces the user to separate the UPS supply lines (rectifier and bypass) if the flexibility and availability of the UPS are supposed to be kept unaltered.

The following table shows the main electrical characteristics of the external sectioning device in case this solution is chosen.

Backfeed protection device					
UPS power (kVA)	**60**	**80**	**100**	**125**	**160**
Maximum operating voltage (Vac)	690				
Minimum rated current (A)	130	180	220	270	350
Category	AC-1				

4.7 TERMINAL BOARDS

UPS B9000FXS is provided with terminal boards for the power connections and auxiliary contacts.



Picture 24 – Position of power terminals of B9000FXS

UPS (kVA)	60	80	100	125	160
X – mm	270		260		
Y – mm	18		30		
Z – mm	598		615		

Connection data of terminal boards					
UPS (kVA)	**60**	**80**	**100**	**125**	**160**
Section (mm^2)	35	35	70	25x6	30x5
Hole diameter (mm)	11	11	11	11	11
Cable terminal hole	M6	M6	M8	M10	M10
Max. cable section (mm^2)	35	35	70	2x95	2x150
Tightening force (Nm)	5	5	10	15	20

4.8 CONNECTION OF POWER CABLES

For the electric connection of UPS B9000FXS, connect the following cables:

- DC supply from the battery;
- AC supply from the rectifier and bypass supply mains;
- AC output to the loads.

Injury hazard due to electric shock!

Very high voltages are present at the ends of the cables coming from the battery:

- isolate the battery via DC circuit breakers before connecting it to the UPS;
- connect the ground cable to the relevant bar before carrying out any other connection inside the device.

Risk of damages to the device due to insufficient insulation

- The cables must be protected from short-circuits and leakage currents to earth;
- the connection points must be hermetically sealed to prevent the air from being sucked through the cable passage.

Risk of damages to the device due to incorrect wiring

To connect the device, follow the electrical drawing scrupulously and respect the polarity of cables.

4.9 CONNECTION OF AUXILIARY CABLES

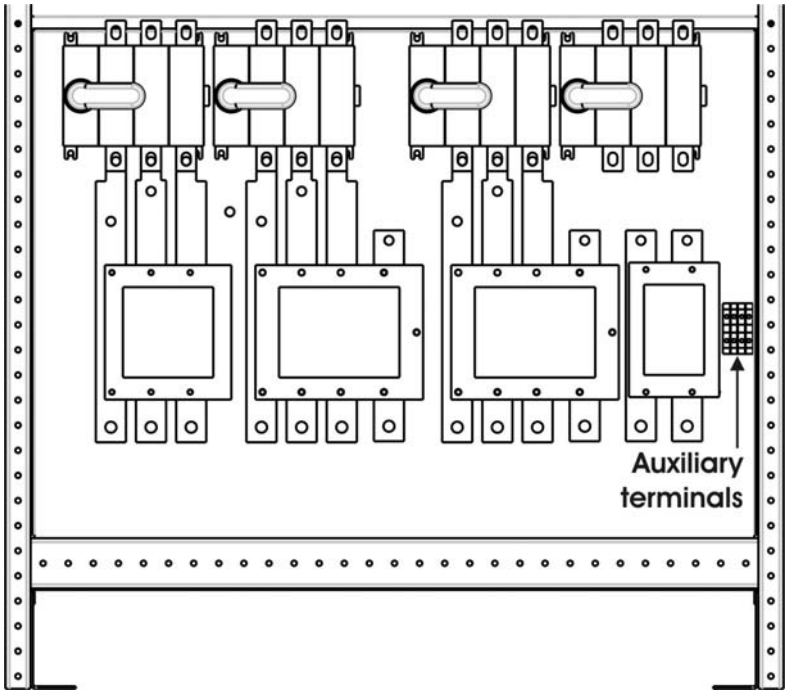
The UPS systems of the B9000FXS line can be connected to external controls/components specifically designed to improve the safety and reliability of the device.

The standard UPS B9000FXS is already provided with the FCI card (Free Contact Interface) which allows to place some external controls remotely, such as:

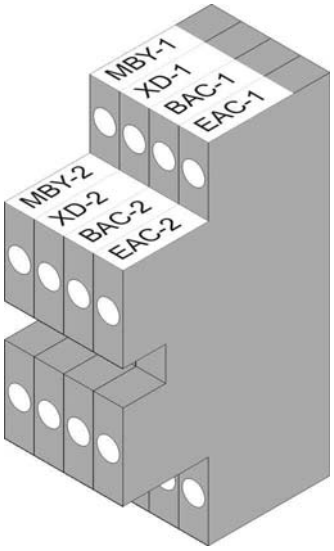
- External manual bypass
- Diesel generator
- Auxiliary battery contact
- Remote emergency power off button (EPO)

The auxiliary cables are connected using a special terminal board placed aligned with the power terminal boards.

The section of the terminals used is 6 mm^2.



Picture 25 – Position of auxiliary terminals of B9000FXS



Picture 26 – Auxiliary terminals of B9000FXS

4.9.1 External manual bypass

Auxiliary contact of the External Manual Bypass Switch on terminals MBY1-MBY2.

A normally open contact has to be connected to the UPS terminals (MBY1-MBY2); when the contact is closed (see Manual Bypass procedure), the microprocessor will acquire the status of the contact and shut down the inverter.

4.9.2 Diesel generator (DIESEL MODE)

Auxiliary contact of the Diesel Generator on terminal XD1-XD2.

A normally open contact has to be connected to XD1-XD2 terminals, when the contact is closed (if diesel mode is enable) the microprocessor will acquire the status of the contact and the rectifier will reduce the voltage to the value set.

4.9.3 Auxiliary battery contact

Aux battery contact on terminals BAC1-BAC2.

This auxiliary contact is necessary to indicate the position of the isolator (open-closed) and the fuse status.

4.9.4 Remote emergency power off

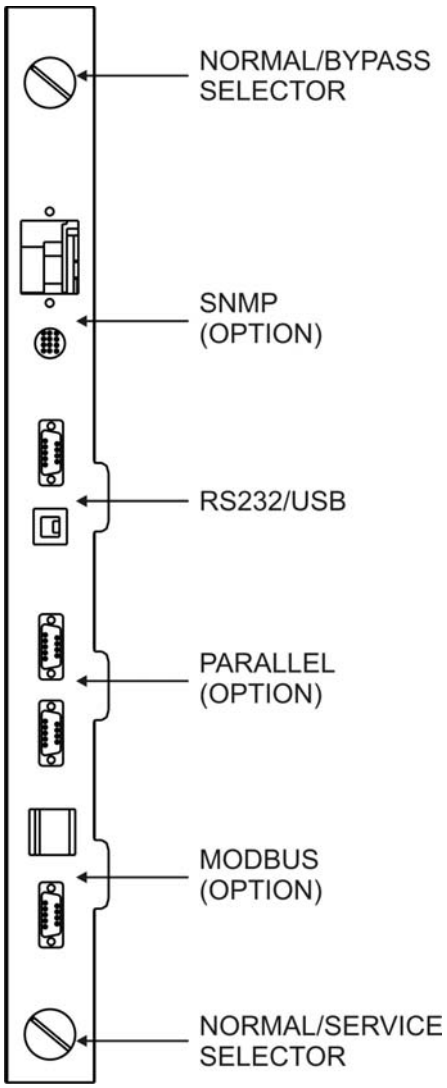
Aux EPO contact on terminals EAC1-EAC2.

The voltage supply to the loads can be interrupted from a remote location by using this contact (i.e. for safety requirements). A normally closed contact must be connected to the UPS terminals (EAC1-EAC2); when this contact is open the static inverter and by-pass switches are opened so that the output supply is interrupted.

4.10 SERIAL INTERFACES

The UPS is provided with serial interfaces for the external communication of the operating status and parameters.

- RS232/USB: is used for connection to the proprietary programming and control software.
- MODBUS (OPTIONAL): is used for the transmission of data to the outside via MODBUS protocol (RS485).
- Parallel (OPTIONAL): is used for communication between paralleled UPS units.
- SNMP (OPTIONAL): is used for the external transmission of data via LAN.
- NORMAL/BYPASS selector
- NORMAL/SERVICE selector



Picture 27 – Interfaces of UPS B9000FXS

4.11 POSITIONING AND CONNECTION OF BATTERIES

CAUTION

A battery can present a risk for electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

a) Remove watches, rings or other metal objects;
b) Use tools with insulated handles;
c) Wear rubber gloves and boots;
d) Do not lay tools or metal parts on top of batteries;
e) Disconnect the charging source prior connecting or disconnecting battery terminals;
f) Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

IMPORTANT

For the installation of batteries, the EN62040-1-2 standard must be strictly adhered to, as well as all the national rules or specifications which can be applied to the premises or building.

To obtain the battery life indicated by the battery manufacturer, the operating temperature must remain between 0 and 25 °C. However, although the battery can operate up to 40 °C, there will be a significant reduction of the battery life.

To avoid the formation of any kind of potentially explosive hydrogen and oxygen mixture, suitable ventilation must be provided where the battery is installed (see EN62040-1-2).

For the materials installed in France, we have to apply the rules according to NFC 15-100 article 554.2: the volume of the renewed air has to be at least 0,05 NI m^3 per hour, where N is the number of the elements inside the battery and I is maximum current of the rectifier.

The batteries are installed inside external cabinets and it is recommended to install them when the UPS is capable of charging them. Please remember that, if the battery is not charged for periods over 2-3 months it can be subject to irreparable damage.

4.10.1 External battery

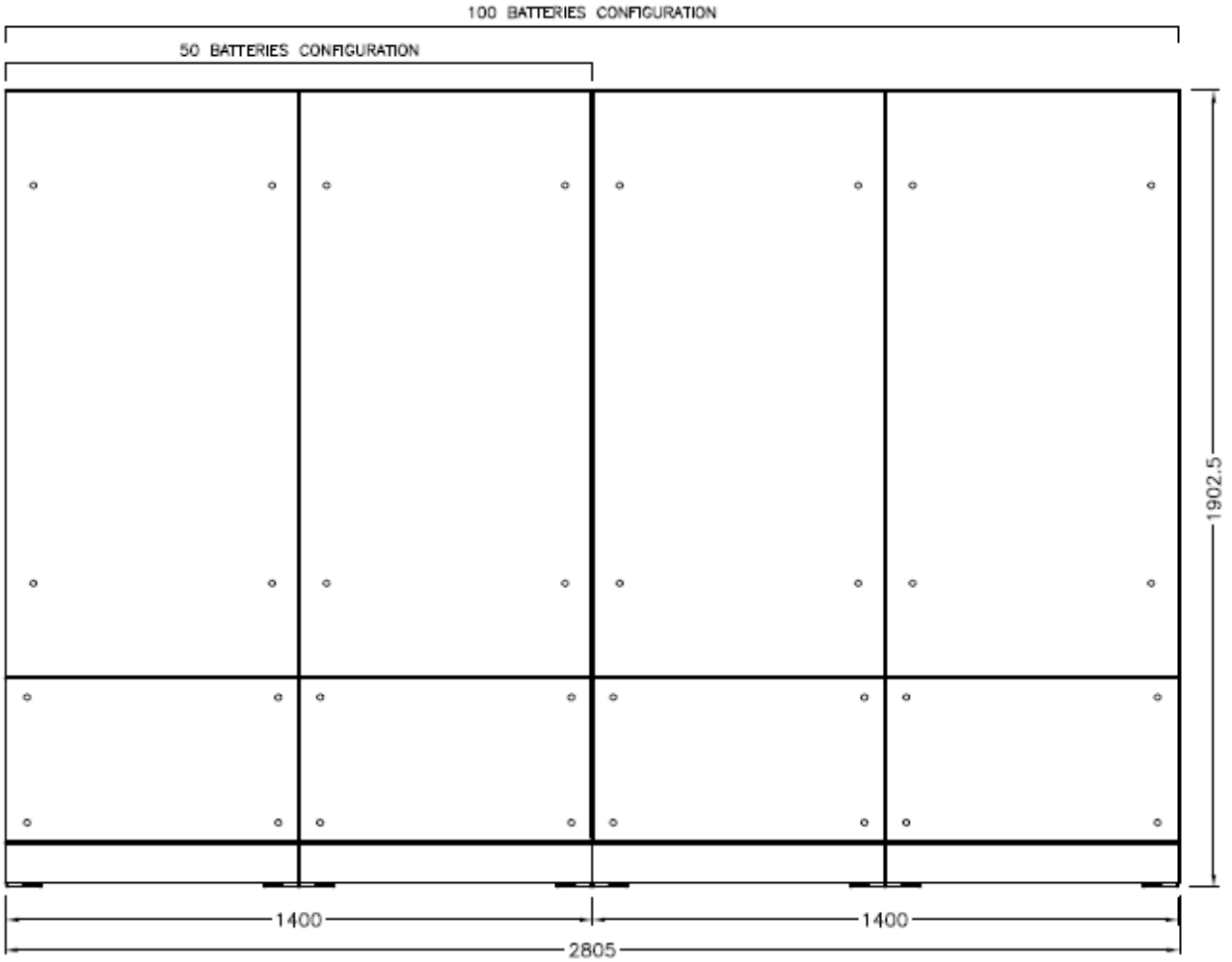
The external batteries, (consisting of 50-52 battery blocks, with 6 cells each for 300-312 cells in total), are installed in the external cabinet:

- AS764 for 65÷140Ah batteries

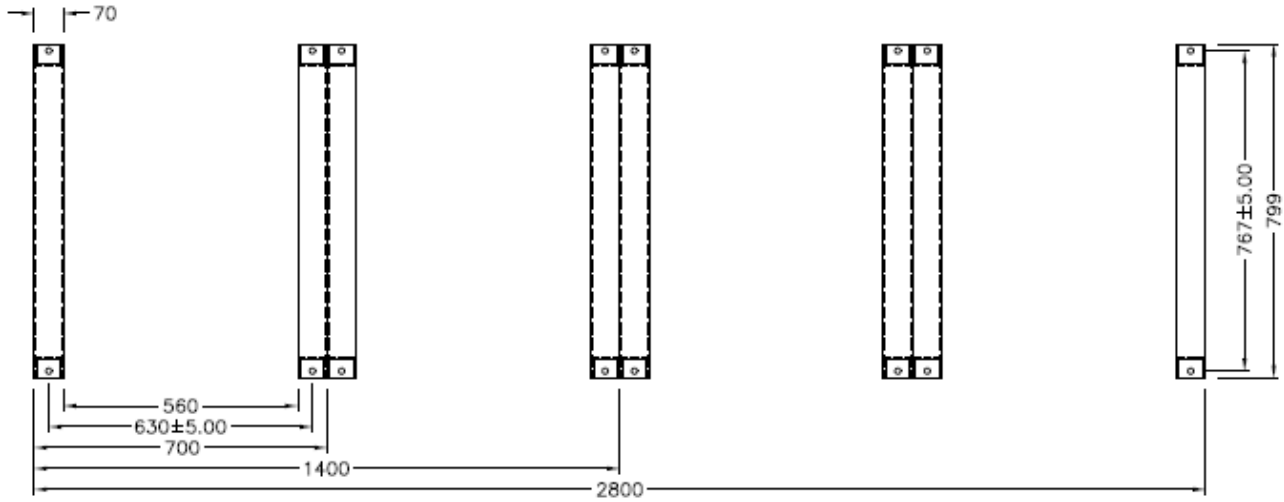
The battery circuit breaker is installed on the external cabinet, so it is not provided in the UPS. With regard to the installation of the external battery cabinet, refer to the details given in paragraph 5.10.

The connection cables with the UPS are included inside the battery cabinet (standard length 5m). The standard colour for the external battery cabinet is RAL 5026; the protection level is IP20.

4.11.1.1 Dimensions and weights



Picture 28 – Dimensions of the external battery cabinet



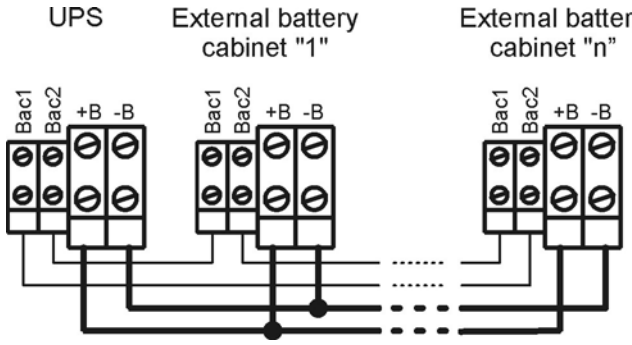
Picture 29 – Base plan of the external battery cabinet

Cabinet	AS764 (50 blocks)	AS764 (100 blocks)
Weight without battery - kg	360	720

Cabinet	AS764 (50 blocks)	AS764 (100 blocks)
Number of 12V blocks	50	100
Max. dim. of single block (mm)	350x190x290	350x190x290
Max. nominal capacity per block	140 Ah	140 Ah
Weight of single block	45 kg	45 kg

4.11.1.2 Connections

The following picture shows the electrical connections between the UPS and the external battery cabinets.



Picture 30 – Battery cabinets connections

The connection cables are two power cables, whose section is shown in the following table and length ranging from 2 to 50m. Longer cables are subject to excessive voltage drop, so their section must be increased accordingly.

UPS (kVA)	60	80	100	125	160
Battery cables (mm^2)	2x50	2x70	2x95	2x120	2x150

5. OPTIONS

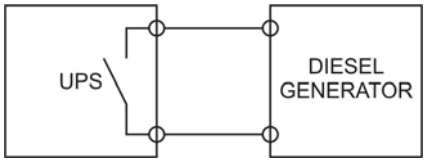
5.1 STANDARD OPTIONS INCLUDED TO BE SET VIA SOFTWARE

1. Diesel generator
2. Off-line
3. Two-level charge
4. Programmable rectifier soft-start (Walk-In)
5. Sequential rectifier start for parallel systems (Hold-off)
6. Frequency converter
7. DCM function

5.1.1 Diesel generator

The Diesel Mode function can be enabled via the Test Software. The UPS is already provided with the internal wiring as well as with terminals XD1-XD2 to be connected to the Generator. The diesel generator interface provides to limit the rectifier output voltage in order not to recharge the batteries during the Gen Set operation. In this way the rectifier needs a lower current to feed the DC loads (inverter) and a considerable amount of energy is saved, therefore the rating of the generator power can be lower.

A contact indicating the Gen Set operation must be connected to two terminals XD1 XD2 already provided on the UPS terminal board.



Picture 31 – Block diagram of Diesel Generator interface

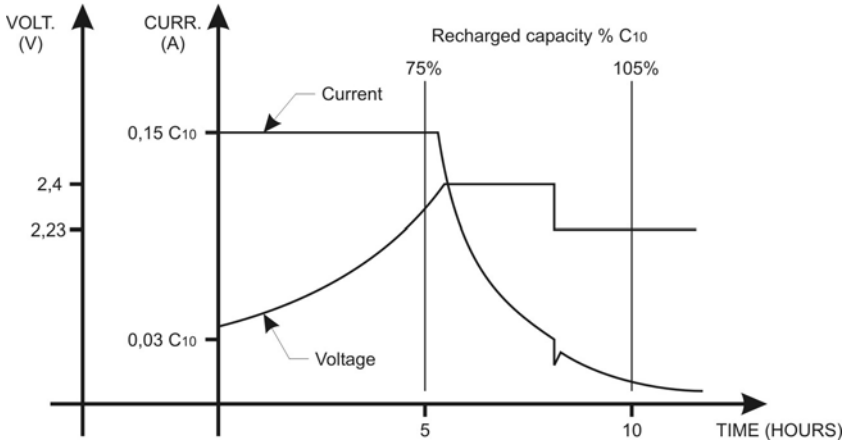
5.1.2 Off-line

The OFF-LINE function can be enabled in the “single configuration” via the Test Software. The load will be supplied by the electronic bypass until the bypass is present and within tolerance. In the event of a bypass line failure, the load is transferred to the inverter without interruption.

5.1.3 Two-level charge “Boost Charge”

The function values of the two-level charge “BOOST CHARGE” can be enabled and set via the Test Software.

This type of charge, according to DIN41773, is used with vented lead acid (open type) or Ni-Cd batteries that have a wide voltage range (Pb: 2,2÷2,7 V/cell.).



Picture 32 – BOOST charge diagram

In order to design the correct number of cells, the following table shows the voltage limits of the UPS. The maximum capacity is a function of the maximum recharging current, that can be found in the technical specification.

Minimum battery voltage	**495Vdc**
Maximum rectifier voltage	**750Vdc**

As soon as the charging current exceeds a certain threshold (generally 0.08C_{10}) the rectifier switches to BOOST charge (2.4 V/cell for lead acid batteries, 1.55 V/cell for Ni-Cd batteries) and starts a charging cycle with the first part at constant current and increasing voltage. When the voltage reaches the boost charge level the current begins to decrease until it reaches the second threshold (generally 0.03C_{10}) and the rectifier is switched back to FLOATING charge.

During the charging phase, the battery emits hydrogen owing to the chemical reaction that also causes the heating of the elements. In order to avoid the over-heating or excessive consumption of the electrolyte, the microprocessor is equipped with a safety timer that provides to stop the rectifier in case the boost charge exceeds 12 hours. An alarm indication on the display informs about the failure.

5.1.4 Programmable rectifier soft-start (Walk-in)

The values of the “Walk-In” Soft-Start function can be enabled and set via the Test Software. The setting range of the values is 5 to 30 seconds.

The Walk-in function allows to change the rectifier soft-start from the DC voltage generated by the SCR bridge to the one imposed by the Battery charge or by the floating voltage. The Walk-in function, like the delayed start function of the rectifier, allows to reduce disturbances to the diesel generator due to the supply of the UPS systems.

5.1.5 Sequential rectifier start for parallel systems (Hold-off)

The values of the Sequential Rectifier Start function can be enabled and set via the Test Software. The setting range of the values is 1 to 300 seconds.

The delayed rectifier start function is useful when several UPS systems are supplied by the same diesel generator. In fact in this case it might be useful to restart the UPS rectifiers at different time intervals, in order to temporally distribute the load supplied by the generator.

5.1.6 Frequency converter

The values of the Frequency Converter function can be enabled and set via the Test Software.

The frequency converter function allows to have a 60 Hz frequency on the UPS output, whereas the input frequency is 50 Hz or vice versa. When enabling this function, the bypass will be automatically disabled as it is no longer possible to synchronize the two sources.

5.1.7 DCM function

The values of the DCM function can be enabled and set via the Test Software.

The DCM function allows to increase the battery charging current proportionally, based on the current absorbed on the UPS input. The maximum settable values are indicated in the technical specification.

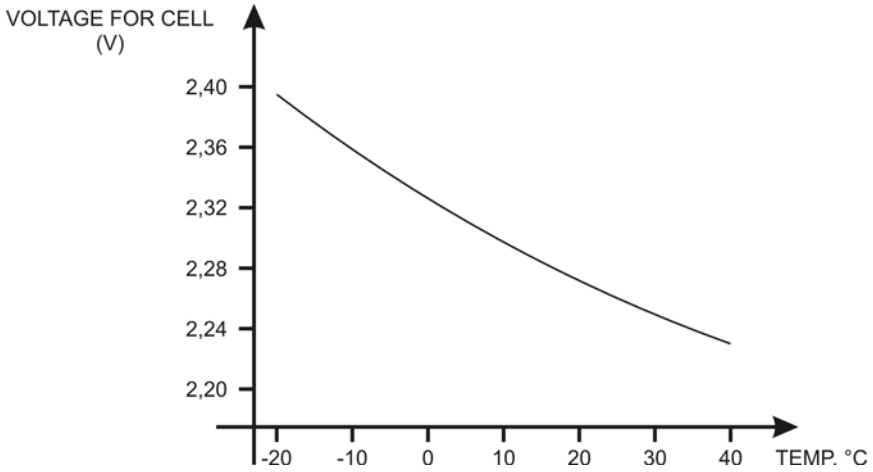
5.2 OPTIONS PROVIDED ON REQUEST

1. Thermal compensation of battery voltage
2. Insulation transformer on bypass line
3. Auto-transformer for the adaptation of input voltage
4. Alarm card
5. RS485 serial interface (MODBUS protocol)
6. SNMP accessory
7. Remote panel
8. Parallel kit
9. Battery cabinet
10. Wall mounted isolator with battery fuses
11. Cables inlet/outlet from top
12. Special painting
13. “Load-sync bus” kit
14. Back feed (protection from power return to mains)

5.2.1 Thermal compensation of battery charge

This option provides a temperature sensor to be installed near the battery room in order to detect the operating temperature. This transducer is able to interface with the control logic of the rectifier in order to modify its floating voltage based on temperature, according to the typical curve supplied by the battery manufacturer. It is normally used for sealed batteries, which are particularly temperature sensitive.

The temperature measured by the probe can be visualized on the front display. If it is outside the limits set with the software, the UPS will activate an alarm.



Picture 33 – Charging voltage / temperature curve

The temperature sensor installed is provided with a connection cable that must be connected to an interface card installed in the UPS' terminal board section. The temperature sensor can be installed at a maximum distance of 15 meters from the UPS.

5.2.2 Bypass insulation transformer

It is used when the input line is without neutral, or the galvanic isolation between the mains and the loads is required.

During normal operation the inverter transformer provides for this task, while during the bypass condition the mains feeds the load directly. Generally the insulation transformer is used when the output neutral conductor must be different from the input, thus discriminating two different grounding systems.

5.2.3 Voltage adaptation transformers

A voltage adaptation transformer can be connected at the UPS output terminals to adapt the standard output voltage to the value requested by the loads. It can also be connected at the input terminals to adapt the actual mains voltage to the values defined in the technical specification. In case the galvanic isolation is not required an auto-transformer can be used.

5.2.4 Alarm card SRC (ALARM RELAY CARD)

Card SRC is an interface used to make the main UPS statuses and alarms available on volt free contacts (NO/NC switching contacts).

During normal operation, without alarms, all the relays are energized.

Relay	Alarms/Status	Status	M1		Led	
			Pins	Status	Name	Status
RL1	Alarm = General alarm	Not energized	2-3	Open	D1	Off
			1-2	Closed		
RL2	Alarm = Mains fault	Not energized	5-6	Open	D2	Off
			4-5	Closed		
RL3	Alarm = Battery low	Not energized	8-9	Open	D3	Off
			7-8	Closed		
RL4	Alarm = Inverter out of tolerance	Not energized	11-12	Open	D4	Off
			10-11	Closed		
RL5	Alarm = Bypass feeds load	Not energized	14-15	Open	D5	Off
			13-14	Closed		
RL6	Status = Booster OK	Energized	17-18	Closed	D6	On
			16-17	Open		
RL7	Status = Inverter feeds the load	Energized	20-21	Closed	D7	On
			19-20	Open		
RL8	Status = Bypass OK	Energized	23-24	Closed	D8	On
			22-23	Open		

Relay specification: Voltage 120 VAC Current 1A
Voltage 50 VDC Current 1A DC1

The package contains:

- interface card SRC
- 4 plastic nuts for the installation
- installation and user manual

5.2.5 Serial interface RS-485 (Mod-Bus protocol)

It consists of an additional card which must be installed in a specific space provided on the UPS front. This card contains a “+”, “-“ and “ground” three-pole connector, as well as a serial port RS485 which must be used for the connection to the MODBUS-master. The operating parameters of the UPS converted into MODBUS protocol are also available on this card.

5.2.6 SNMP adapter

On the Evo line, the SNMP adapter can be directly installed on the UPS front. For the standard UPS these are provided with a supply cable and flat ribbon cable to exchange data with the microprocessor card.

The SNMP adapter converts the UPS protocol into SNMP protocol (Simple Network Management Protocol) and it is possible to see from the network both the UPS function and UPS status.

It is also possible to configure the SNMP adapter as RCCMD (Remote Console CoMmanD) to start a shutdown of one or more PCs when the UPS has a problem.

To enable this function it is necessary to install the RCCMD software onto each PC required to start the “shutdown”; (the SNMP adapter has ,as standard, only one shutdown license), additional licenses must be purchased separately.

5.2.7 Remote panel

The remote panel is used to display 4 independent visual alarms. Each event activates the flashing of the last LED “General Alarm” and an acoustic signal that can be silenced by the user. The regular operating conditions of the UPS are indicated by the lighting of LED “UPS OK”.

5.2.8 Parallel kit

The parallel kit allows to prearrange a UPS configured as a single unit for its connection and configuration in a parallel redundant system. Thanks to the DSP microprocessor and to the CAN-BUS communication system, configuring the UPS from single to parallel operation is very easy, basically plug-and-play. Moreover, the UPS units composing the parallel system can also be located in different rooms, with a maximum length of the parallel cable of 30 m.

There are two types of parallel which can configured by software: parallel redundant and power parallel.

In both cases the system can consist of “n” UPS units (up to 6). Only the manual bypass can be external and the same for all the units.

The parallel redundant system ensures an uninterrupted power supply even in case of various failures in the system.

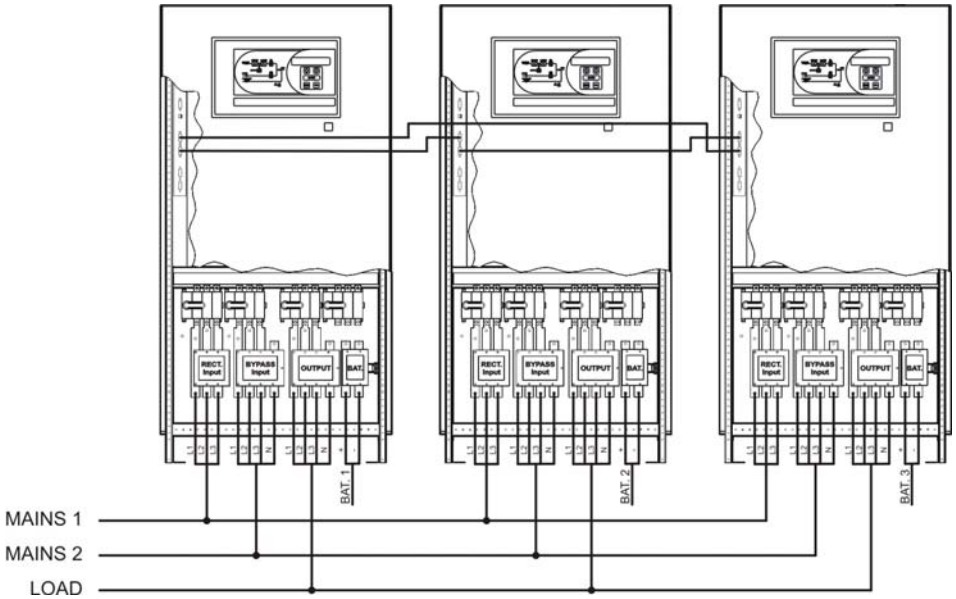
This is possible because all the units are constantly running, and each of them supplies the load in parallel to the “total load / n”, where “n” is the number of units.

The automatic sharing control of AC current equalizes the currents of “n” units and reduces the offset to less than 10% under any load condition. The load is supplied by the inverters in parallel also in the event of an instantaneous overload ≤ “n x 200%” of the nominal load of the single unit. In case of a failure in one unit, the other units supply the load. The load is supplied by the mains only if there is an additional failure in the other units.

Also for the power parallel system, the automatic sharing control of AC current equalizes the currents of “n” units and reduces the offset to less than 10% under any load condition.

The load is supplied by the inverters in parallel also in the event of an instantaneous overload ≤ “n x 200%” of the nominal load of the single unit.

In the event that a failure occurs to one of the units, the load is switched to the Emergency Line (Bypass), like in the case of a UPS in single configuration.



Picture 34 – Example of UPS units connected in parallel

5.2.9 Battery cabinet

Please refer to chapter 4.10.1.

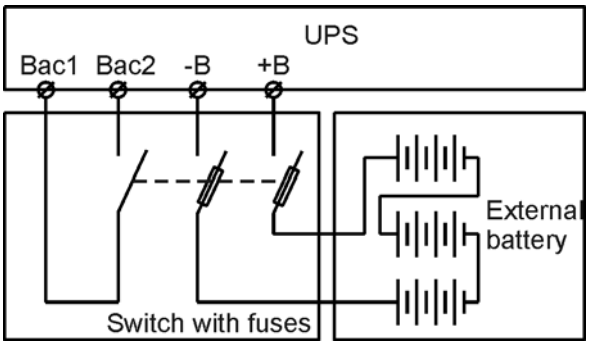
5.2.10 Wall mounted isolator with battery fuses

The isolator with battery fuses is used to separate the UPS from the external battery. The isolator is required in plants where the battery is installed in a dedicated room, therefore it is necessary to use an isolation device between the UPS and the battery.

It is installed in a separate box and equipped with an auxiliary contact to indicate the position of the isolator (open-closed) and the fuse status.

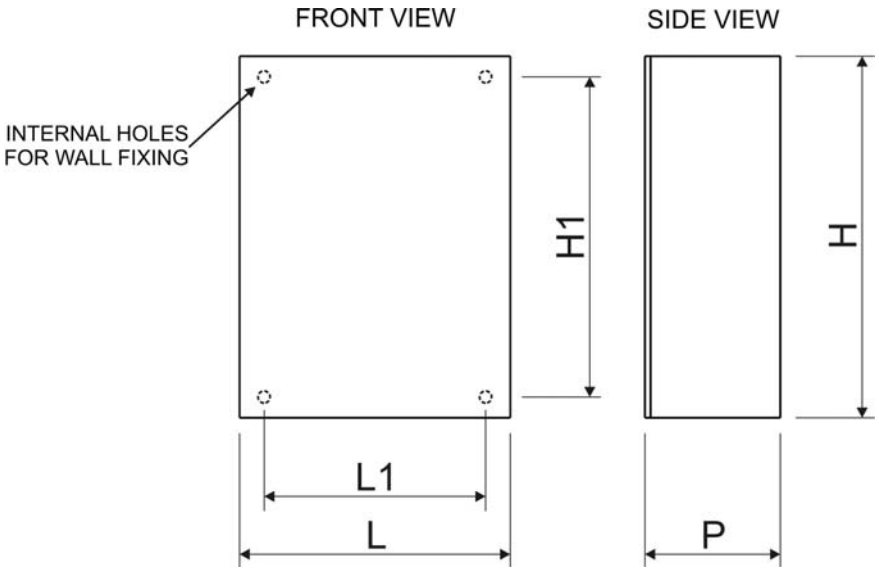
5.2.11 Connections

The battery isolator is connected between the UPS and the external battery as indicated in the following picture.



Picture 35 – Battery isolator connection

5.2.12 Technical data



Picture 36 – Technical data of battery isolator

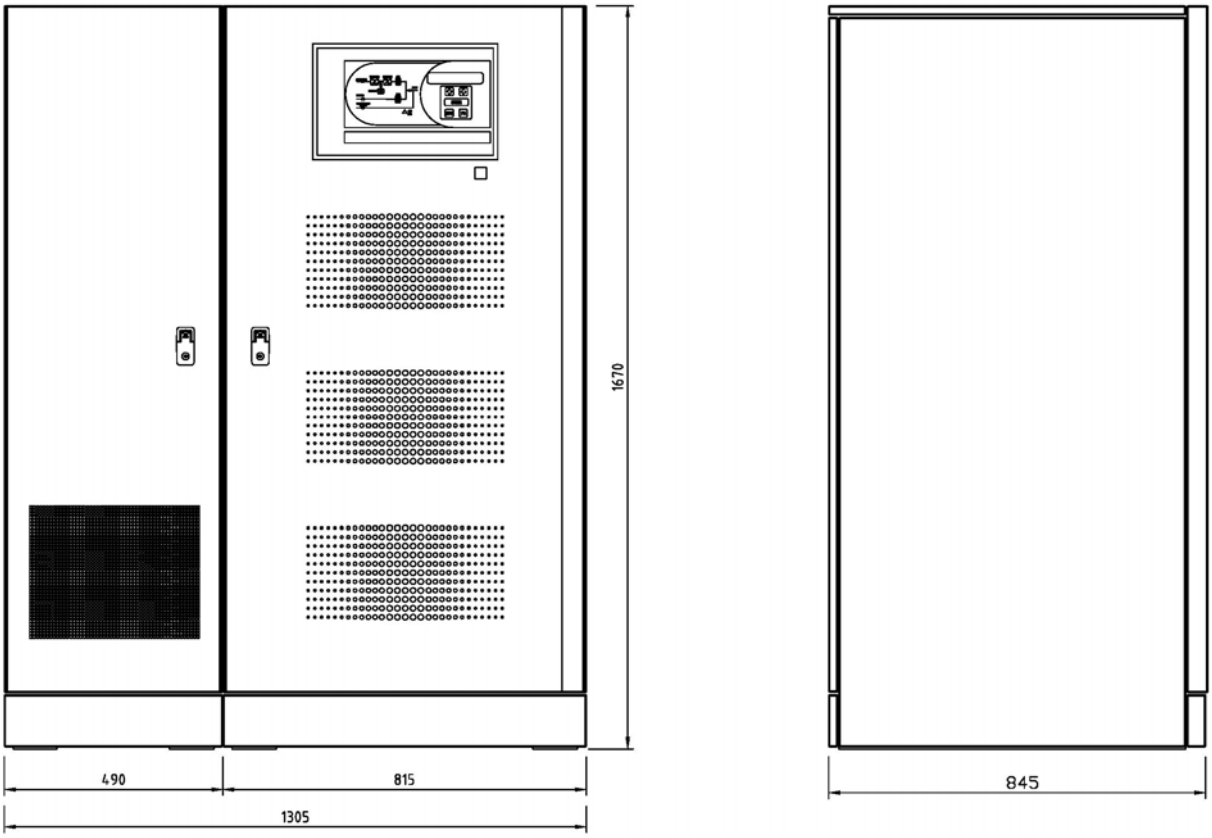
- Colour: RAL 7035
- Protection degree: IP20

UPS (kVA)	60	80	100	125	160
L – mm	500				
P – mm	250				
H – mm	700				
L1 – mm	460				
H1 – mm	660				

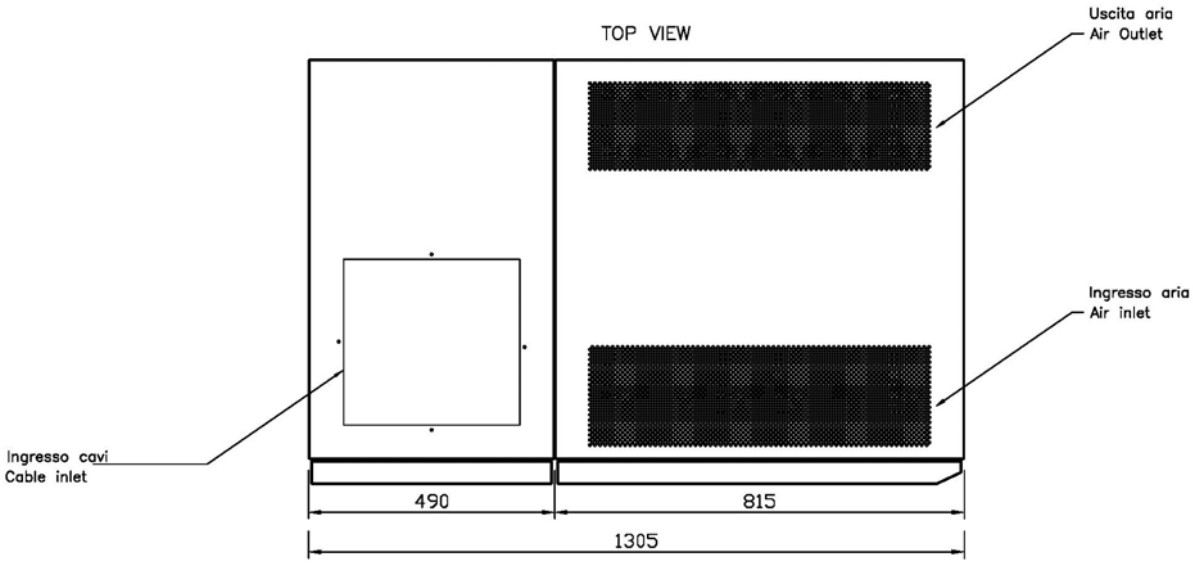
UPS (kVA)	60	80	100	125	160
Isolator type	4-pole Isolator + Fuses				
Fuse size (A)	200 gG	200 Gg	200 Gg	250 Gg	315 Gg

5.2.13 Cables inlet from the top

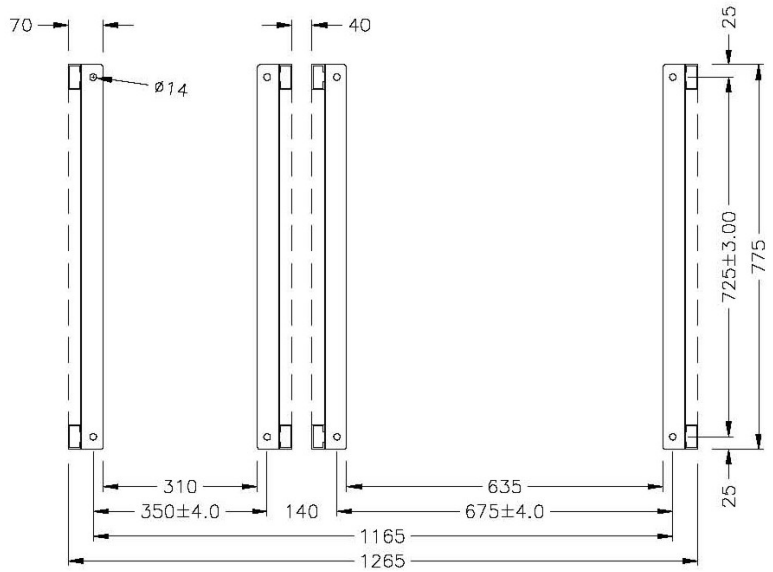
This option allows to obtain the cables inlet from the top with an additional cabinet.



Picture 37 – UPS dimensions with additional cabinet for cables inlet from the top



Picture 38 – UPS dimensions with additional cabinet for cables inlet from the top



Picture 39 – Base plan of UPS with additional cabinet for cables inlet from the top

5.2.14 Special painting

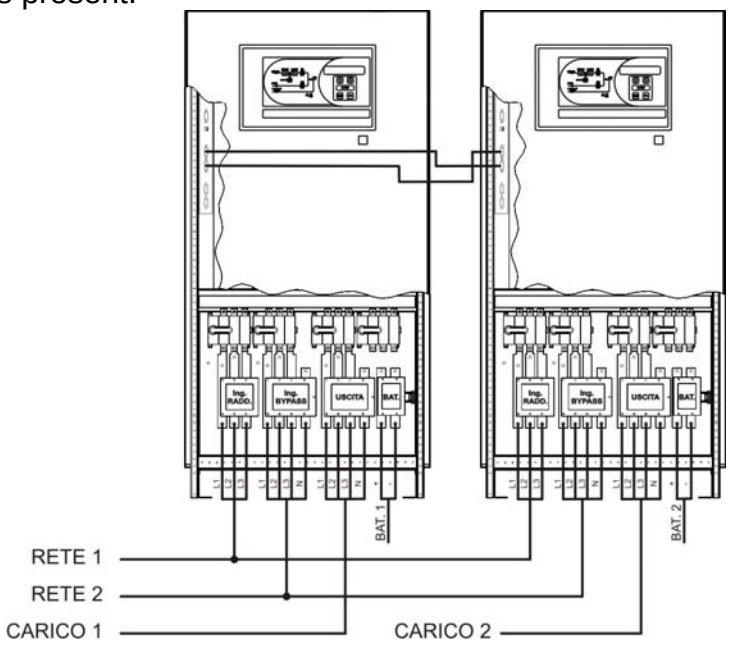
All the RAL colours can be requested with an additional cost.

5.2.15 “Load-Sync-Bus” kit for single unit

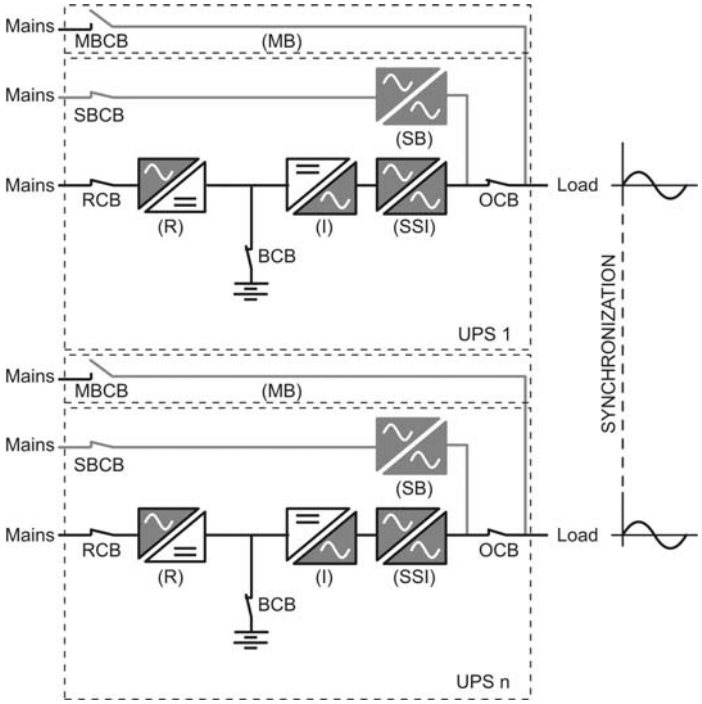
The “Load-Sync-Bus” function for single unit is available only for two UPSs. This is a special operating mode which allows to have the UPS outputs synchronized in the different operating statuses. With regard to the load management, the UPS units behave as if they were single units independent of each other. So NEVER CONNECT THEIR OUTPUTS TOGETHER.

If one or more UPS units have the emergency line available, **which must be the same** for all the systems, the UPS configured with the lowest position will synchronize with the emergency line. All the other UPS units will synchronize with such UPS, so they will be synchronized in their turn with the emergency line whether it is present on the UPS or not.

The emergency line will be available as an alternative power source only for the systems where it is present.



Picture 40 – Example of UPS units in Sync-Load configuration – single configuration



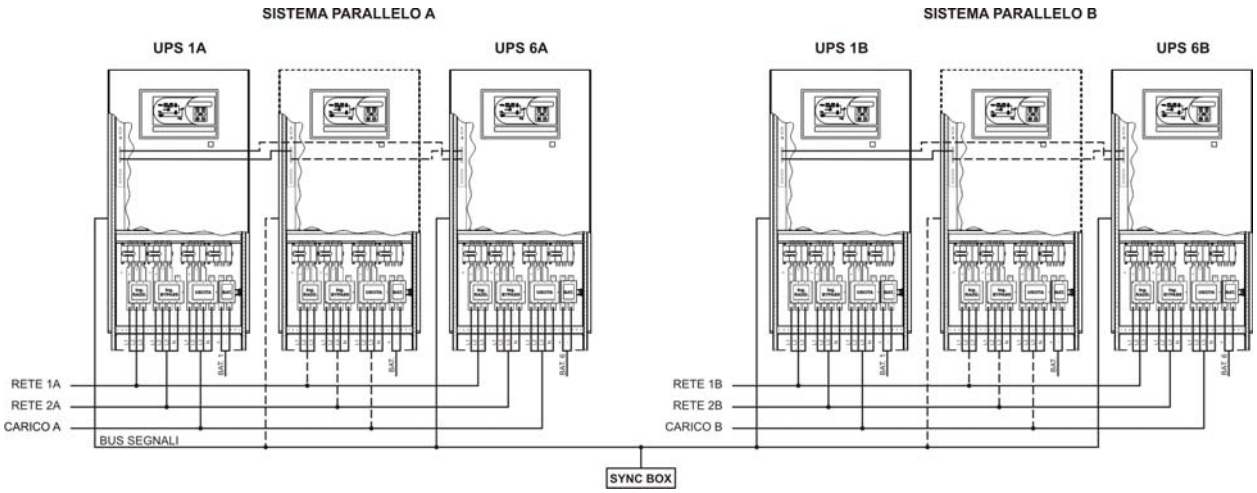
Picture 41 – Example of UPS units in Sync-Load configuration – single configuration

5.2.16 Kit "Parallel system Load-Sync-Bus"

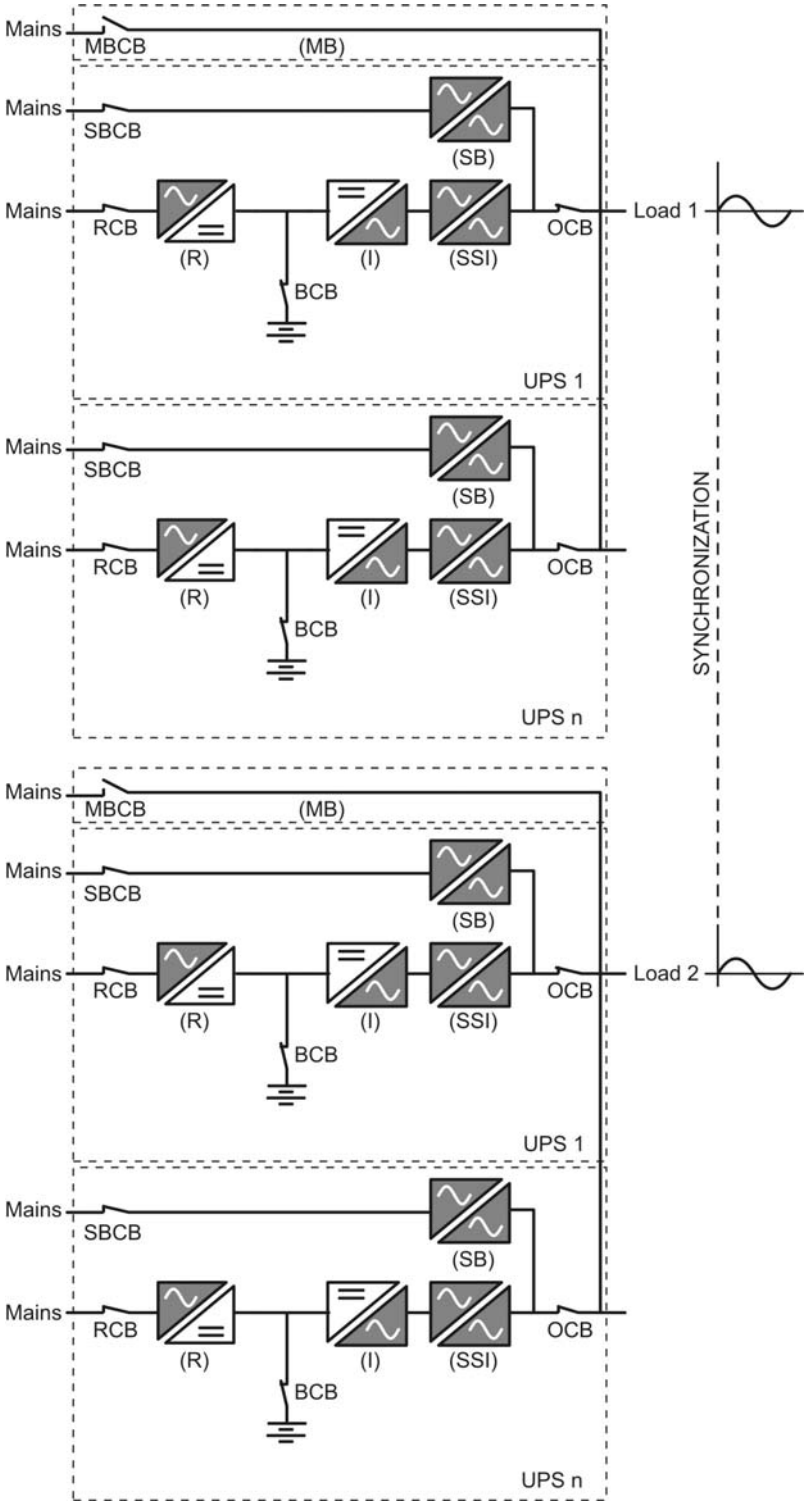
The "Load Sync Bus" function can also be available for parallel systems with up to maximum 6 UPS in parallel configuration. Picture 43 explains the interconnection of two systems "A" and "B" in the sync load operation .

The external "SYNC BOX" is connected by CANBUS cable to the system "A" and system "B".

After the "sync load" function is enabled in both systems, the "SYNC BOX" will provide to keep the systems output synchronised on various operating conditions.



Picture 42 – Example of UPS units in Sync-Load configuration – parallel configuration



Picture 43 – Example of UPS units in Sync-Load configuration – parallel configuration

5.2.17 Back feed (protection from power return to mains)

This option prevents the risks deriving from power return to mains and from the faults caused by the failure of the SCR's of the static bypass switch.