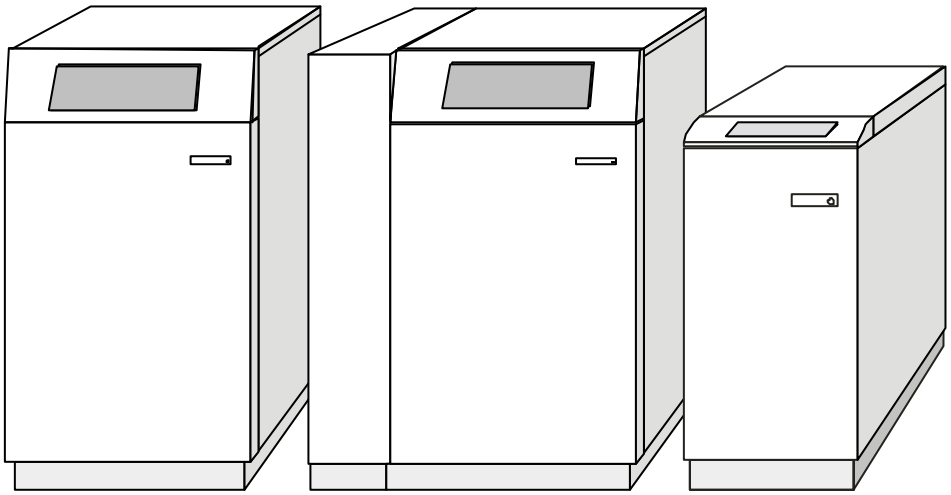
Uninterruptible Power Supply
Gruppo di Continuità



User Manual
Manuale d'Uso

8÷20kVA
Singlephase Output / Uscita Monofase

10÷80kVA
Threephase Output / Uscita Trifase

0MNAHH4NEA REV. 01 07/04

INDICE

SAFETY

ATTENTION

This manual contains instructions concerning the installation and putting into operation of the UPS. Read the manual carefully before carrying out installation, which must be done by a trained person.
Because this manual contains essential information on the usage of the equipment, it must be kept in a safe place and consulted before operating on the UPS.

SAFETY REGULATIONS

- the ups must not be used unless it is connected to earth
- the first connection to make is the connection between the grounding lead and the terminal indicated with the symbol: 
- high voltages are present inside the equipment even when the input and battery switches are open.
- all maintenance operations inside the UPS must be carried out only by trained personnel.
- if it is necessary to replace the fuses, they must be replaced with other fuses of the same type.
- to interrupt the power supply to the utilities in dangerous conditions, open all the switches located behind the front door, or switch on the “SYSTER OFF” command on the UPS from the control panel.

THE BATTERY SHOULD BE CHANGED IF NECESSARY ONLY BY QUALIFIED PERSONNEL. TO ELIMINATE REPLACED PARTS IT IS OBLIGATORY TO DELIVER THEM TO ONE OF THE SPECIAL CONSORTIUMS FOR DISPOSAL BY RECYCLING. THE BATTERIES ARE CLASSIFIED TOXIC WASTE BY LAW.

The Company reserves the right to make changes to the product described in this manual at any time and without notice for reasons of improvement.

EMC REQUIREMENTS

Uninterruptible Power Supply (UPS) "UPS " models, marked CE and used following the instructions listed below, have the essential requirements to comply whit the EMC directive 89/336 e 92/31 a 93/68 ECC.

Usage instructions.

The "UPS" are UPS dedicated to a professional usage in an industrial and commercial environment.

The connection to "REMOTE" and "RS232" connectors must be done by means of a shielded cable.

WARNING:

This is a product for restricted sales distribution to informed partners. Installation restrictions or additional measures may be needed to prevent disturbances.

STORAGE

The area used to store the equipment must have the following characteristics:

Temperature:	0°÷40°C (32°÷104°F)
Relative humidity:	95% max

Only for UPS with internal BATTERIES.
The batteries contained in the UPS are subject to self-discharging.
If the UPS is not immediately installed is necessary to take note of the batteries date recharge printed on the label fixed to the packing case (the date is present only if the UPS contains to its inside batteries), and provide to it recharges within such date.
To recharge batteries just power up the UPS and leave it on NORMAL OPERATION for at least 24 hours.
For advanced storage periods to contact the service assistance.

INSTALLATION ROOM

When choosing a suitable installation room, take note of the following:

- avoid dusty areas,
- check that the floor is strong enough to support the weight of the UPS and the battery cabinet (see paragraph "DIMENSIONS AND WEIGHTS")
- avoid rooms that are too narrow as this could make normal maintenance operations difficult
- check the ambient temperature when the UPS is running. It should be between 0 and 40°C

☞ *The UPS is able to function in an ambient temperature of between 0 and 40°C. The recommended operating temperature for the UPS and the batteries is between 20 and 25°C. If the operating temperature is increased to 30°C the batteries life is halved.*

- do not position the machine in areas exposed to direct sun light or hot air.

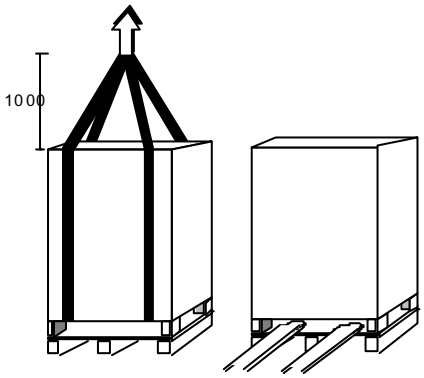
In order to keep the temperature of the installation room within the field of values mentioned above, it will be necessary to install a system for eliminating dissipated heat (the value of the kcal/kW/B.T.U. dissipated by the UPS is indicated in the paragraph "SPECIFICATIONS"). The following methods can be used:

- *natural ventilation*;
- *forced ventilation*, recommended if the exterior temperature is lower (e.g. 20°C) than the temperature at which you wish to run the UPS (e.g. 25°C);
- *air conditioning system*, recommended if the exterior temperature is higher (e.g.s.30°C) than the temperature set for running the UPS (e.g.s.25°C).

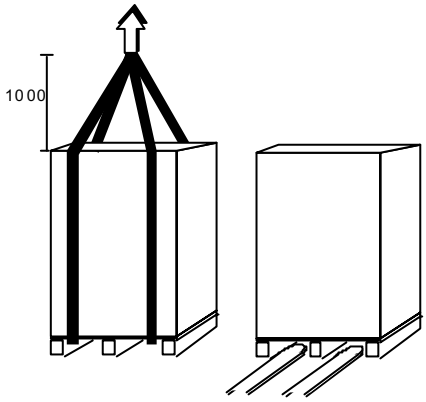
PRELIMINARY OPERATIONS

CHECKING THE PACKING CASE

When you receive the UPS check that the packing case has not been damaged during transportation.
Check that neither of the two anti-shock devices fixed to the packing case has become red. If this has happened follow the instructions given on the packing case.
Be careful when removing the packing materials so as not to scratch the UPS cabinet.



RIMOZIONE DEL PALLET / TO REMOVE THE PALLET



MOVIMENTAZIONE CON IMBALLO / HANDLING WITH PACKI

The equipment must be handled with care as it could be damaged if it is dropped or banged.

The UPS is delivered with:

- guarantee
- user instruction manual
- battery fuses (if battery is present).

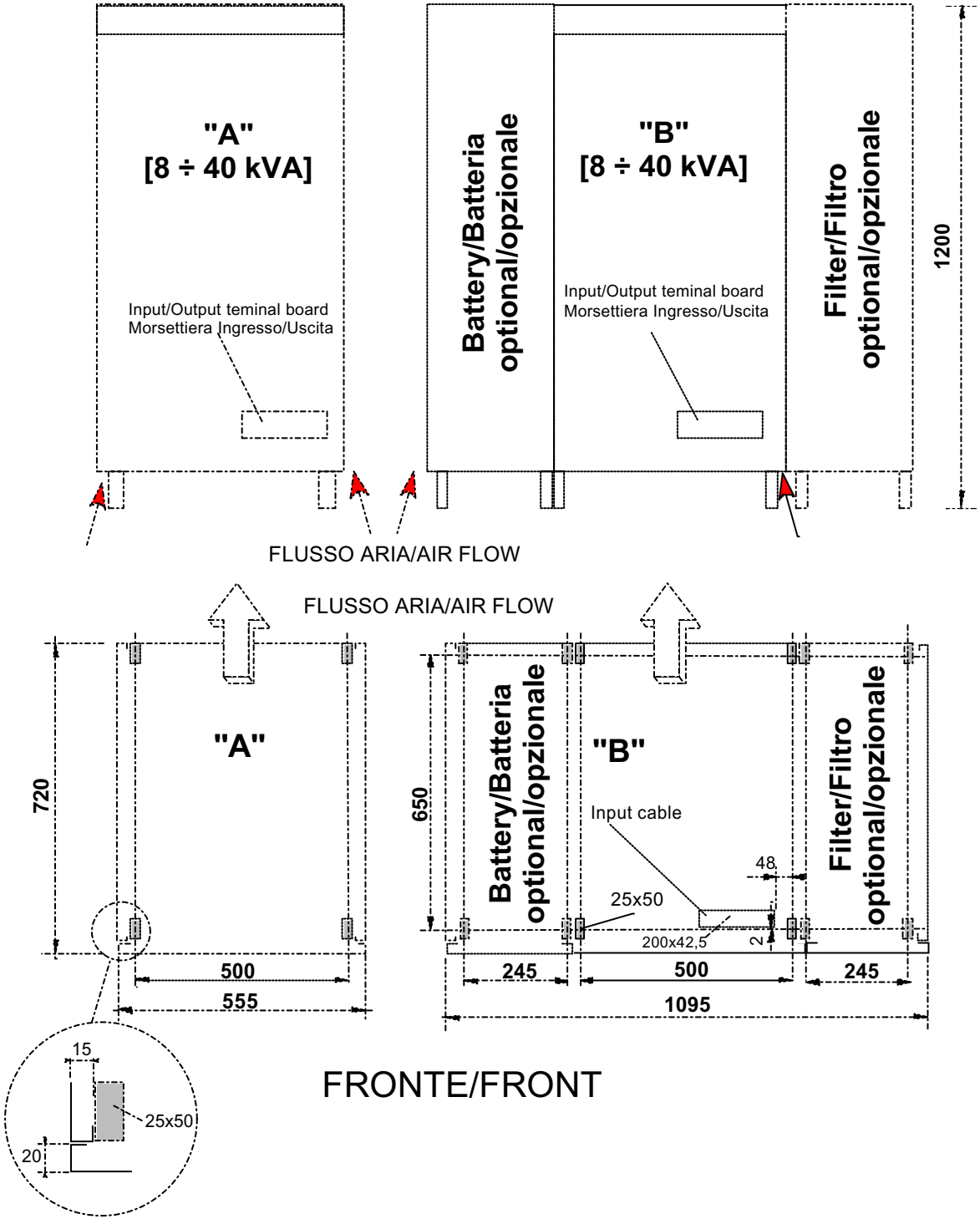
POSITIONING

You should bear in mind the following points when positioning the UPS:

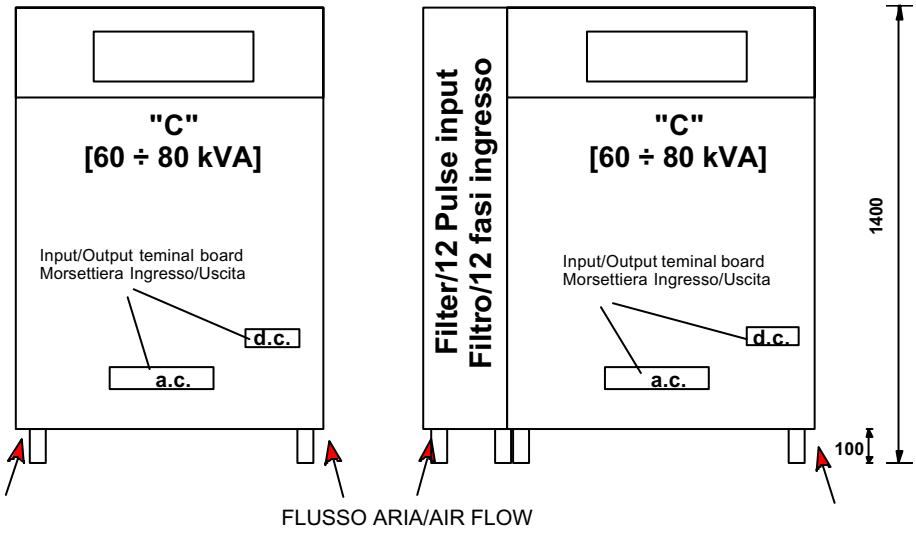
- a space of at least one metre must be kept in front of the machine to leave plenty of room for maintenance operations.
- a space of at least 20 cm. must be left between the back of the UPS and the wall so as not to block the flow of air from the fans, and at least 40 cm. for maintenance operations on the fans.
- no objects must be placed on the top of the machine.

The AC-DC INPUT/OUTPUT cables may enter from the bottom or from the back of the UPS.

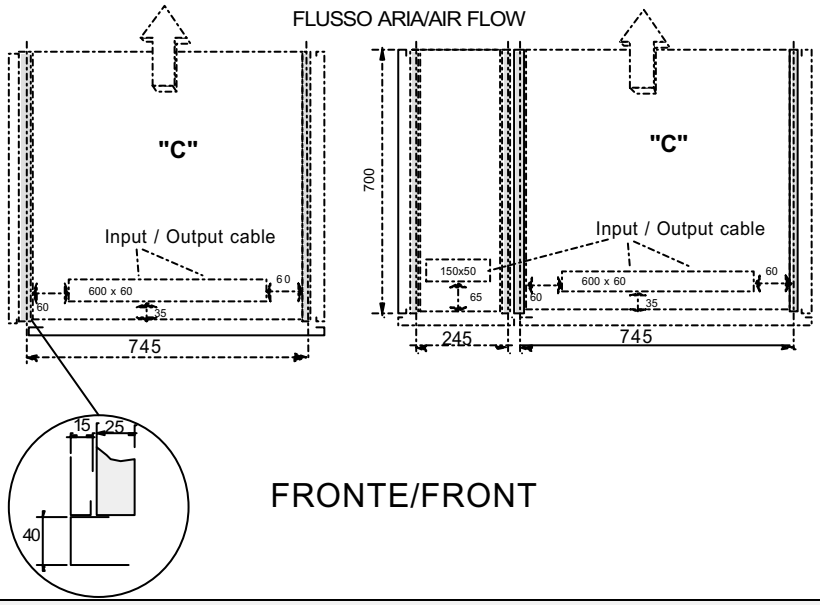
- UPS 8÷40kVA



- **UPS 60 ÷ 80kVA**



FRONTE/FRONT



FRONTE/FRONT

SETTING UP THE ELECTRICAL SYSTEM

PROTECTIONS

Inside the UPS.

The size of the switches and fuses installed on the UPS input/output lines are given below (consult the block diagrams paragraph for the initial). A fuse must always be replaced by a fuse of the same capacity and with the same characteristics as those mentioned in the table.

SINGLE PHASE OUTPUT UPS:

	Internal protections							
UPS Type	automatic breakers		switch		Battery fuse	By-pass fuse	Max.Input Current	Output current
[kVA]	Input rectifier	by-pass line input					[A]	[A]
	SWIN	SWBY	SWOUT	SWMB	FB1/2	FSCR	max	Nominal
8	20A(3P) type C	63A(2P) type C	63A (2P)		30A(10x38)	25A(10x38)gG	15	35
10	20A(3P) type C	63A(2P) type C	63A (2P)		30A(10x38)	25A(10x38)gG	18	43
15	32A(3P) type C	80A(2P) type C	100A (2P)		50A(14x51)	25A(10x38)gG	27	65
20	40A(3P) type C	100A(2P) type D	100A (2P)		80A(22x58)	25A(10x38)gG	36	87

THREE PHASE OUTPUT UPS:

	Internal protections						
UPS Type	automatic breakers		switch	Battery fuse	By-pass fuse	Max.Input Current.	Output current
[kVA]	Input rectifier	by-pass line input				[A]	[A]
	SWIN	SWBY	SWOUT SWMB	FB1/2	FSCR		Nominal
10	20A(3P) type C	20A(3P) type C	32A(3P)	30A(10x38)	16A (gG) 10x38	18	14
15	32A(3P) type C	32A(3P) type C	32A(3P)	50A(14x51)	16A (gG) 10x38	28	22
20	40A(3P) type C	40A(3P) type C	32A(3P)	50A(22x58)	16A (gG) 10x38	37	29
30	63A(3P) type C	63A(3P) type C	63A(3P)	80A(22x58)	32A (gG) 10x38	55	43
40	80A(3P) type C	80A(3P) type C	63A(3P)	100A(22x58)	32A (gG) 10x38	72	58
60	100A(3P) type C	100A(3P) type C	100A(3P)	160A(NH0)	32A (gG) 10x38	100	87
80	125A(3P) type C	125A(3P) type C	125A(3P)	160A(NH0)	32A (gG) 10x38	125	115

UPS Input.

When selecting the protections to install at the input of the continuity group, you must take into consideration the maximum current absorbed in the two operating conditions:

- In "NORMAL OPERATION", from the main line via the rectifier, the “max input current” is the one indicated in the table. The automatic breaker is present at the rectifier input, as shown in the table, "SWIN".
- "BY-PASS OPERATION", straight from the by-pass line, the max. value of the current is restricted by intervention of the “automatic breaker SWBY”.

UPS output, Short circuits and selectivity.

Nominal current, In, output from the UPS is the one indicated in the table "output current".

Short circuit

When a fault occurs on the load, i.e. a short circuit, the UPS protects itself by restricting the value and the duration of the supplied current (short circuit current). These values also depend on the operating status of the unit at the time of the fault. We must distinguish between two situations:

- UPS in NORMAL OPERATION
  the load is immediately switched onto the by-pass line, guaranteeing, before the fuses intervene, the circuit current values indicated in “SPECIFICATION BY_PASS LINE” paragraph.
- UPS in BATTERY OPERATION
  The UPS protects itself by supplying an output current approximately double the nominal current for 0,1s.

Selectivity

In NORMAL OPERATION selectivity is carried out with a type gG fuse indicated in the line one of the table, if you want to guarantee selectivity when operating by battery also see the line two of the table.

- SINGLE PHASE OUTPUT UPS

[KVA]	8	10	15	20
max. current Fuse gG in UPS output [A]				
1) for selectivity in BATTERY OPERATION	10	12	16	20
2) for selectivity in NORMAL OPERATION	32	32	50	50

- THREE PHASE OUTPUT UPS

[KVA]	10	15	20	30	40	60	80
max. current Fuse gG in UPS output [A]							
1) for selectivity in “BATTERY OPERATION”	6	6	10	12	16	20	25
2) for selectivity in “NORMAL OPERATION”	10	10	16	32	35	50	50

Differential

In the standard version, where there is no separation transformer on the by-pass line, the neutral output from the mains is connected to the output from the UPS.

INPUT NEUTRAL CONNECTED TO OUTPUT NEUTRAL
THE ELECTRICAL SYSTEMS LOCATED UPSTREAM AND DOWNSTREAM OF THE UPS ARE IDENTICAL

When operating in the presence of mains voltage, a differential breaker installed at the input intervenes because the output circuit is not isolated from the input circuit.
When operating without mains voltage (battery feeding) the input differential breaker intervenes only if it is able to switch on as a result of leakage current without voltage at its poles (for example a differential with an auxiliary relay is not suitable). In any case it is always possible to install more differential breakers at the output, possibly co-ordinated with those at the input.

The differential switch located upstream must have the following characteristics:

- ***a minimum differential current of 300mA (to avoid inappropriate interventions)***
- ***class A or class B***
- ***delay greater or equal to 0,1s***

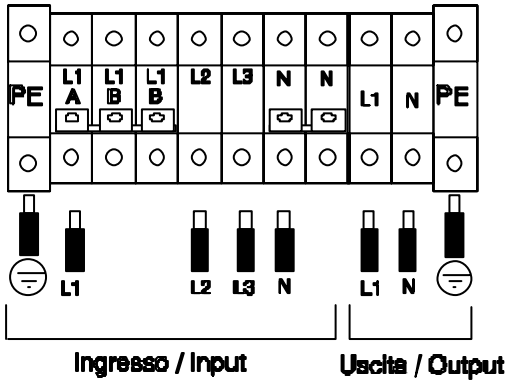
CONNECTIONS

To ascertain the position of the components mentioned in this paragraph see FIG. of the Appendix.
The following operations are to be performed with the UPS disconnected from the mains and all the equipment switches open (control lever down). Remove the panel covering the switches.

THE FIRST CONNECTION TO MAKE IS THE GROUNDING LEAD TO THE TERMINAL MARKED 'PE'.
THE UPS CANNOT OPERATE WITHOUT CONNECTION TO THE GROUNDING SYSTEM.

MAINS AND LOAD CONNECTIONS

SINGLE PHASE OUTPUT 8 ÷ 20 kVA (INPUT THREE PHASE WITH NEUTRAL)



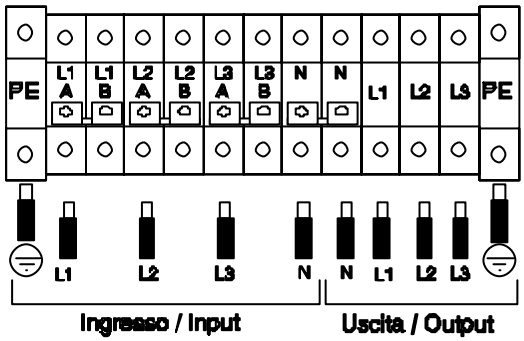
The jumper shown in figure is already in place.
For input and output wire size refer to the following table (between brackets max. wire size):

	Sez. [mmq]				
	INPUT			OUTPUT	
kVA	L1	L2/L3	N	PE	L1/N
8	10(25)	6(25)	10(25)	10(25)	10(25)
10	10(25)	6(25)	10(25)	10(25)	10(25)
15	16(25)	10(25)	16(25)	16(25)	16(25)
20	25(25)	10(25)	25(25)	16(25)	25(25)

THREEPHASE OUTPUT 10 ÷ 80 kVA (INPUT THREE PHASE WITH NEUTRAL)

The jumper shown in figure is already in place.

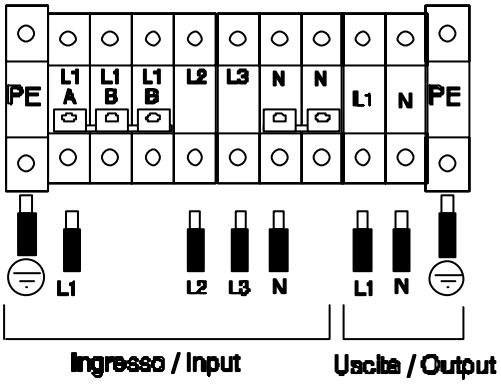
For input and output wire size refer to the following table (between brackets max. wire size):



	Sez. [mmq]		
	INPUT	OUTPUT	
kVA	L1/L2/L3/N	PE	L1/L2/L3/N
10	6(25)	6(25)	6(25)
15	6(25)	6(25)	6(25)
20	10(25)	10(25)	10(25)
30	16(25)	16(25)	16(25)
40	25(50)	16(50)	25(50)
60	35(70)	16(50)	35(70)
80	50(70)	16(50)	50(70)

DI BYPASS LINE SEPARATE CONNECTION

SINGLE PHASE OUTPUT 8 ÷ 20 Kva



after that connect the mains and bypass line:

Mains line	L1	terminal L1A
	L2	terminal L2
	L3	terminal L3
BYPASS line	L1	terminal L1B
	N	terminal N

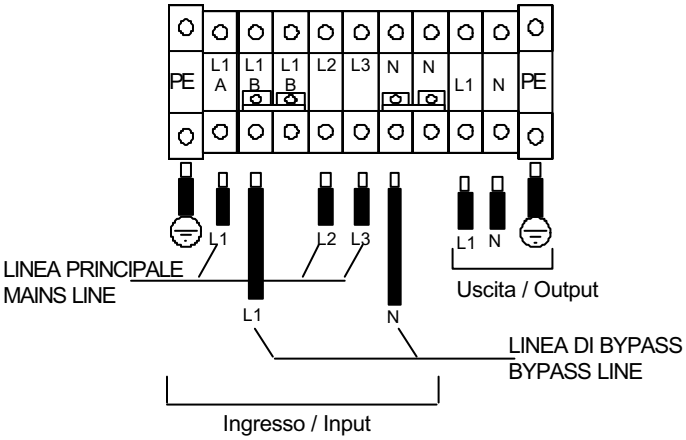
For input and output wire size refer to the following table (between brackets max. wire size):

MAINS and BYPASS line TOGETHER (terminal board with jumpers standard)

operations for new terminal board configuration:

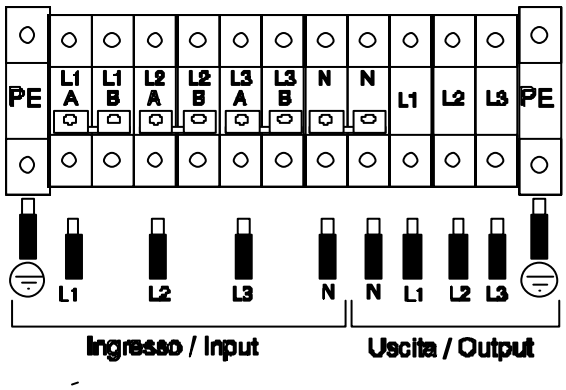
- remove jumper L1A-L1B-L1B
- cut three positions jumper (transform it in two positions jumper)
- place two position jumper as following indicated

MAINS and BYPASS line SEPARATE



	Sez. [mmq]			
	INPUT			OUTPUT
	L1A/L2/L3	L1B/N	PE	L1/N
8kVA	6(25)	10(25)	10(25)	10(25)
10kVA	6(25)	10(25)	10(25)	10(25)
15 kVA	10(25)	16(25)	16(25)	16(25)
20 kVA	10(25)	25(25)	16(25)	25(25)

THREE PHASE OUTPUT 10 ÷ 80 kVA



after that connect the mains and bypass line:

Mains line	L1	terminal L1A
	L2	terminal L2A
	L3	terminal L3A
BYPASS line	L1	terminal L1B
	L2	terminal L2B
	L3	terminal L3B
	N	terminal N

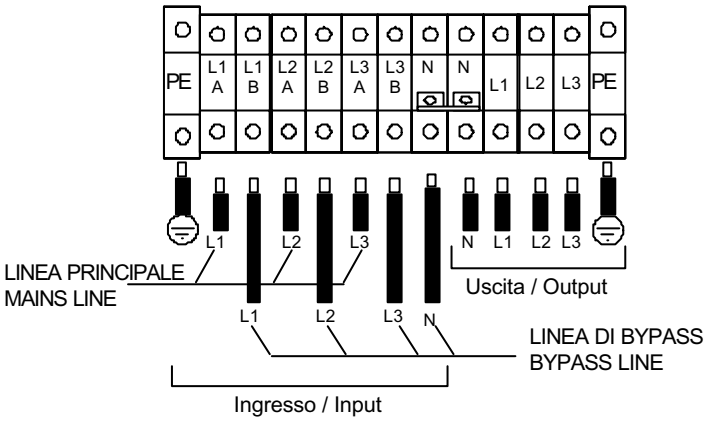
Neutral cable is indispensable.

MAINS and BYPASS line TOGETHER)terminal board with jumpers standard)

operations for new terminal board configuration:

- remove Nr.3 jumpers L1A-L1B, L2A-L2B, L3A-L3B

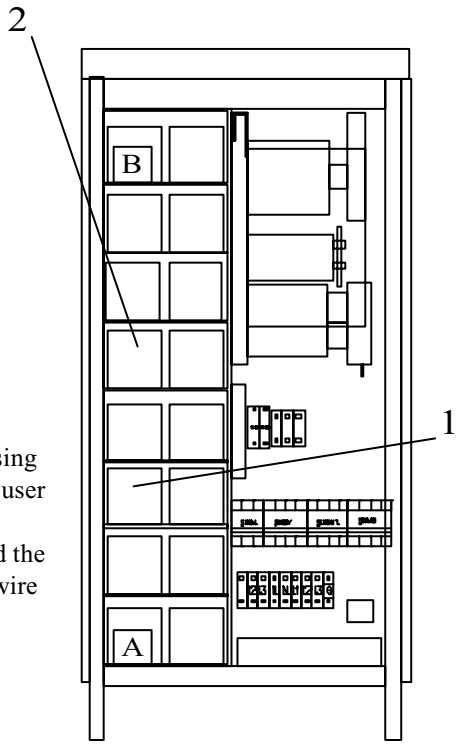
MAINS and BYPASS line SEPARATE



For input and output wire size refer to the following table (between brackets max. wire size):

	Sez. [mmq]		
	INPUT		OUTPUT
	L1-L2-L3/A/B/N	PE	L1/L2/L3/N
10kVA	6(25)	6(25)	6(25)
15kVA	6(25)	6(25)	6(25)
20 kVA	10(25)	10(25)	10(25)
30 kVA	16(25)	16(25)	16(25)
40 kVA	25(50)	16(50)	25(50)
60 kVA	35(70)	16(50)	35(70)
80 kVA	50(70)	16(50)	50(70)

BATTERY CONNECTIONS



For the versions with inner batteries, it is necessary to insert the fuse in equipment in the position A (1Kit battery present), or in position A+B. (2 Kit batteries present)

1 –first battery kit
2 –second battery kit

External battery cabinet

In the external battery cabinet the batteries must be inserted and be connected, using appropriate kit in equipment, following the procedure indicated on battery cabinet user manual.
For the connection of eventual external batteries they are of continuation indicated the minimal sections of connection cables, between brackets the connected maximum wire section to the fuseholder in input of the UPS

		BATTERY
	kVA	+/-
SINGLEPHASE UPS	8	6(10)
	10	6(10)
	15	6(35)
	20	16(35)

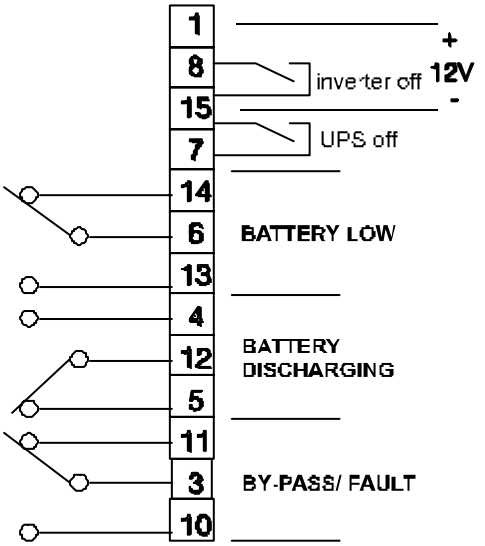
		BATTERY
	kVA	+/-
THREEPHASE UPS	10	6(10)
	15	6(35)
	20	16(35)
	30	16(50)
	40	25(50)
	60	35(70)
	80	50(70)

REMOTE CONTROL AND SIGNALS

In the front under the input terminal strip there are the REMOTE and RS232 connectors:

DB 15-pin female marked REMOTE.
DB 25-pin male marked RS232.

15-pin female marked REMOTE.



On the connector there are:
Nr. 1 aux power 12Vdc 80mA(max)
Nr. 3 Voltage free exchange contacts for alarms
Nr. 2 Controls for turning off INVERTER and UPS.
The pin arrangement of the connector is as follows (see figure opposite):

BATTERY LOW
BATTERY DISCHARGING
BY-PASS/FAULT

The contact positions shown are without alarm (NORMAL OPERATION).
The relay contacts can carry a current of 0.5A-42V.
REMOTE COMMANDS
Two commands are available as follows:
BY-PASS with STOP INVERTER command. Connecting pin 8 to pin 15 (after at least 2 seconds).
UPS LOCKUP command. Connecting pin 7 to pin 15 (after at least 2 seconds).

BY-PASS with STOP INVERTER

1. If the UPS receives the STOP INVERTER command when it is in "NORMAL OPERATION" mode, it switches the load supply onto the BY-PASS line (load unprotected from any mains failure).
2. If the UPS receives the STOP INVERTER command when it is in "EMERGENCY OPERATION" mode, it will switch itself off (load not fed)

In the two versions seen, if the jumper is maintained when the mains power returns the UPS will continue operating on the by-pass line. However, if the jumper has been removed, the UPS will start up again in NORMAL OPERATION mode

SYSTEM OFF

If the UPS receives the SYSTEM OFF command it will cut off the output voltage. LOAD NOT FEED.
To start up the UPS again, open and close SWBY switch.

25-pin male marked RS232.

The transmission protocol pre-set at the UPS factory is as follows: 9600 baud, -no parity, -8bit, -1 bit of stop
Transmission speed can be changed from 1200 to 9600 baud on the CUSTOMISE menu on the panel. Recommended transmission speeds for various distances are as follows:

9600(baud) 50m, 4800 100m, 2400 200m, 1200 300m

Cable to connect UPS and computer: (use shielded cable, connect the shield only to the housing of the P2 connector, AWG22-AWG28):

Side UPS		Side computer
P1, 25 pole female		P2, 9 pole female(computer)
pin 2	to	pin 2
Pin 3	to	pin 3
Pin 7	to	pin 5

CHECKING CONNECTIONS

After connecting the INPUT/OUT and terminal wires to the terminals of the UPS and before repositioning the switch covers panel, check to make sure that:

- all the input/output terminals are tightly screwed;
- all fuse holders have a fuse inserted and are in the closed position;
- the input/output protection wire (yellow/green earth wire) is correctly connected
- the internal panel panel is connected to the yellow/green uni-potential cable coming from the earth bar located on the base of the equipment.

START-UP PROCEDURE

After completing the electrical connection as indicated above and putting the internal panel into position, proceed to start up the UPS as follows:

feed line

- close the switches located in input of the continuity unit,

battery cabinet (if present)

- close the battery cabinet switches (first check the polarity of the connection),

UPS

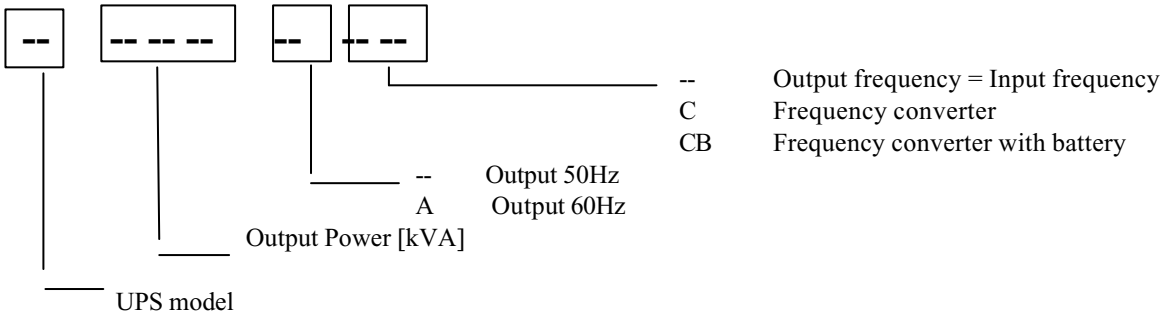
Close the following UPS switches (the code is given on the switch cover panel):
SWIN input switch, SWBY by-pass line switch, SWOUT output switch.

NOTE: the SWMB switch must be left open, during normal operation. The SWMB is closed only in order to directly feed the mains load excluding the UPS, e.g. for maintenance purposes (see chapter OPERATING MODES).

After you have carried out the above-mentioned operations, you will immediately hear the hum of the fans, and for about one minute, the noise of the buzzer. Press button 1 twice, select the language and then press button 8, to return to the base menu. The message NORMAL OPERATION will appear.

Carry out the battery test manually: press button 3 on the display panel, and then button 2 (BATTERY TEST). When the test is finished and the UPS is correctly started up, with the battery connected, the green IN LED (INPUT) and the green OUT LED (OUTPUT) lights should be lit without flashing.

The message NORMAL OPERATION should appear on the first line of the panel. The model of the UPS, according to the following code, will appear on the second line in the left-hand corner:



OPERATIONAL CHECK

After completing the start-up operations and waiting for at least four hours to allow the batteries to charge, with the UPS in normal operation, a Mains failure simulation may be carried out using the switch positioned above the continuity unit. You will immediately hear the sound of the buzzer (with 5=ON)[1] while on the Signal and Commands Panel the green LED OUT .and the yellow LED are lit without flashing.

Check that the power supply to the UPS is working. In this situation, Mains power failure, the energy supplied to the load is that which has previously been accumulated in the batteries

After a few minutes with the power supplied by the batteries you can return to normal operation condition by closing the input switch. The control Panel will indicate this by turning on the green LEDs IN and OUT. The re-charging of the batteries will happen automatically.

CUSTOMISATION

By inserting the access code 436215, using the COMMAND PANEL (from the main MENU press keys 3 "COMMANDS" and then 5 " CUSTOMISING"), it is possible to alter some of the electric parameters pre-set in the factory, within a certain field.

It is possible to customise the following values:

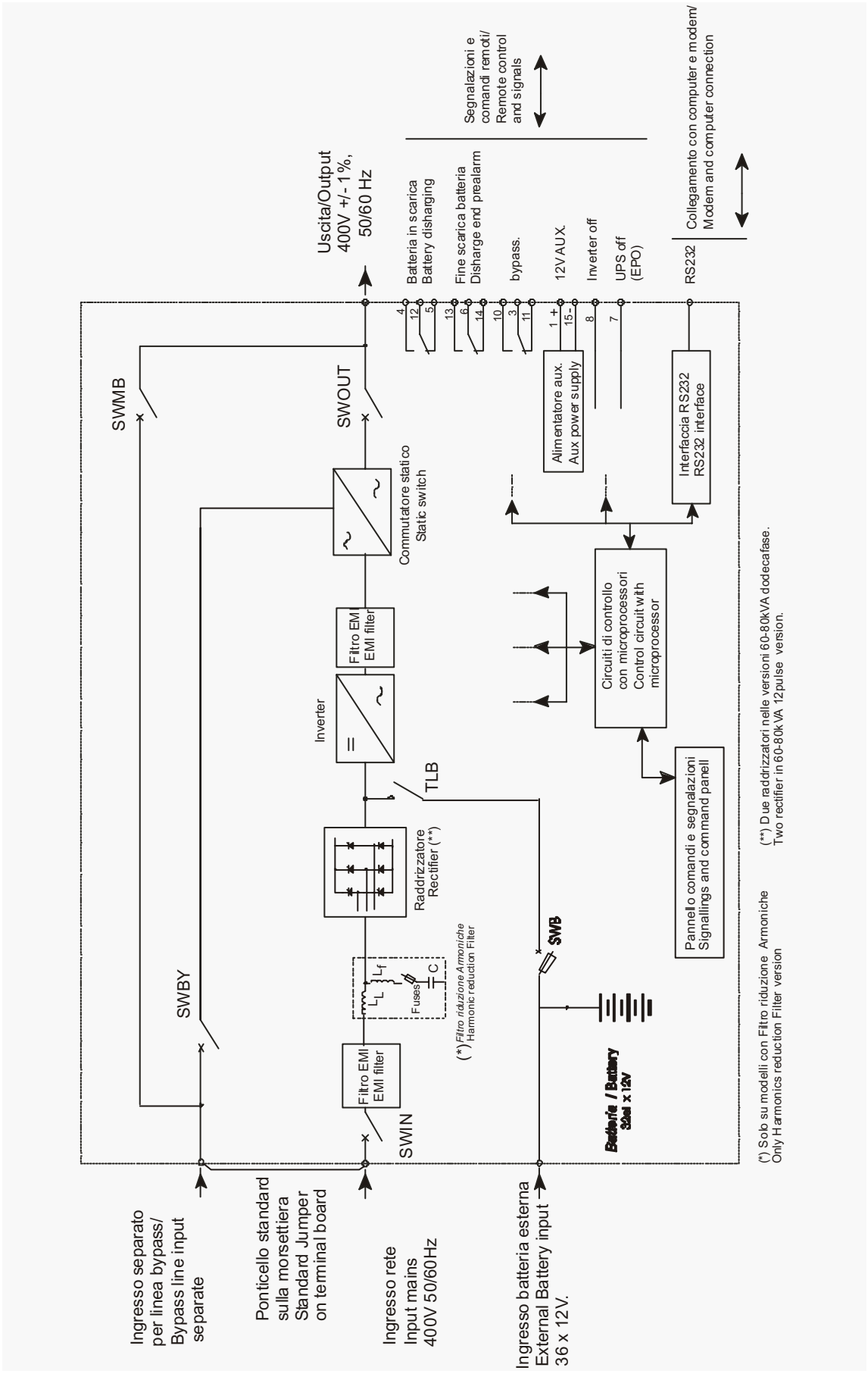
- value of the NOMINAL OUTPUT VOLTAGE,
- voltage field and the frequency of acceptance on the BY-PASS line,
- BATTERY parameters, pre-alarm for final battery discharge,
- power shut-off lower than a set value (AUTO-OFF power),
- daily scheduled shut-off (AUTO-OFF time)
- RS232 port,
- identification number of the UPS.

The procedure to follow and the fields to be modified are shown in the chapter SIGNAL PANEL DESCRIPTION

[1] Check the status of the buzzer, in the second line on the right of the display panel:
"5=OFF" buzzer disabled,
"5=ON" buzzer enabled, press button 5 to change the status.

MODES OF OPERATION

BLOCK DIAGRAM



BLOCK DIAGRAM COMPONENTS

The UPS consists of the following subassemblies:

RECTIFIER

Standard is six pulse rectifier, optional is twelve pulse to reduce input current distortion.
Represents the input stage and transforms the alternating voltage of the power line in continuous voltage. The functions carried out by the rectifier are the following:

- powering the inverter with direct current.
- charging the battery automatically. Battery charging is done in two phases: the first phase supplies 80% of power with limited current (recharging current) and growing voltage. The second supplies the remaining 20% of the charge with steady voltage (holding).

Recharging current is automatically limited to 15% of the capacity in Ah contained in the memory. This recharging current imposed applies only when the total power delivered to the battery and the load does not exceed maximum 110% of Pn.

HARMONIC REDUCTION FILTER (optional)

The filter is positioned to the entry of the rectifier, allows to reduce the input harmonic distortion of the input current. It is composed by two inductors and by a group of capacitors. The filter is protected in entry with some fusible.

EXTERNAL BATTERY

Provides the reserve energy for powering the load when there is no power input to the UPS.

INVERTER

This is the output stage. Converts direct voltage from the RECTIFIER or BATTERY into stabilized sinusoidal alternating voltage. It is always in operation and the load connected to the output of the UPS is always powered by the INVERTER.

STATIC SWITCH

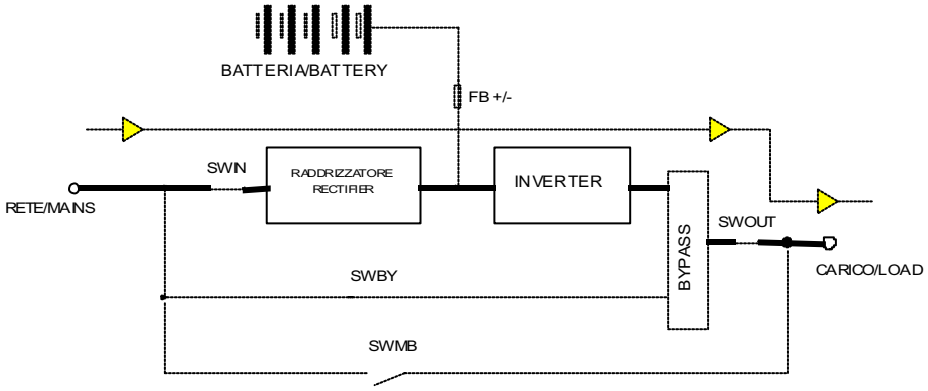
This device allows the instantaneous automatic or manual switching of the power feed from the secured line (INVERTER output) to an unsecured line (BY-PASS line) or vice versa.
The STATIC SWITCH is supplied with a device, ***BACKFEED PROTECTION*** that prevents the danger of current returns on the reserve line, in the case of Mains power failure due to a break on the SCR.

SWMB

Maintenance switch, by closing the SWMB and opening the other switches SWIN, SWBY, SWOUT the UPS is excluded, maintaining the output feed.
This operation is necessary when you have to carry out maintenance operations inside the equipment, without being obliged to interrupt the power feed.
With the SWMB closed and all the other switches open, there is no voltage inside the equipment (voltages are present only in the terminal board area and in the switches area, N.B. in the threephase output version the neutral conductor is not interrupted.).

NORMAL OPERATION

MAINS present, equipment powered. The switches SWIN, SWOUT, SWBY are closed. SWMB is open.

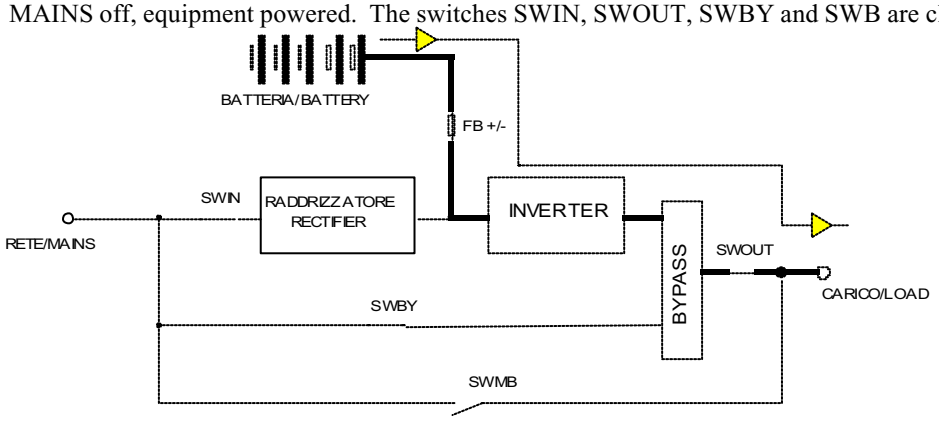


The connected equipment is powered by the inverter which receives the necessary energy from the mains through the rectifier.
The RECTIFIER charges the battery at the same time.
On the control panel the green LEDS MAINS and OUTPUT are lit.

In presence of a mains power failure, the output load remains fed by the UPS that uses the energy stored in the batteries.

BATTERY OPERATION

MAINS off, equipment powered. The switches SWIN, SWOUT, SWBY and SWB are closed.



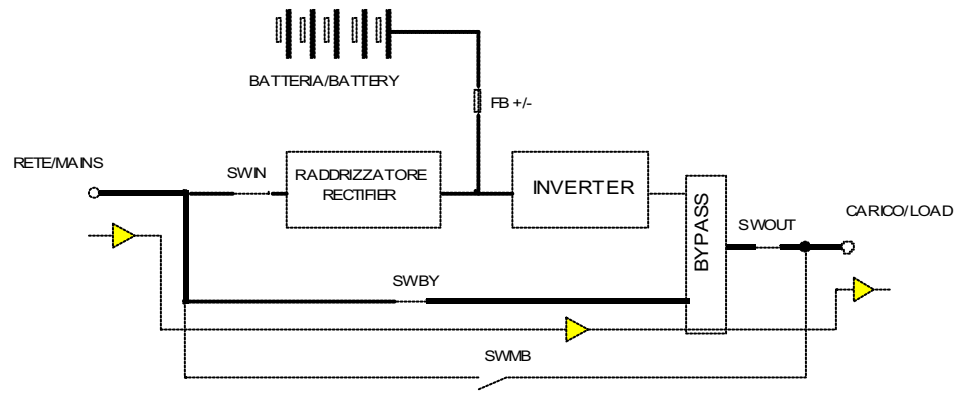
The UPS is in this operating condition when MAINS power is lacking in a blackout or is no longer in an acceptable range (over or under voltage).
In this phase of operation the energy required by the connected equipment is supplied by the battery, previously charged.
On the alphanumerical PANEL on the front of the UPS is displayed the time provided for residual AUTONOMY, calculated on the basis of the power delivered and the charge status of the batteries.
NOTE. The value displayed is approximate since the power required can change during discharge.
IT IS POSSIBLE TO INCREASE DURATION BY DISCONNECTING SOME OF THE CONNECTED EQUIPMENT.
The green LEDs for OUTPUT (steady light) are lit on the panel and the yellow LED for the battery (STEADY LIGHT) at the moment of mains failure sounds the buzzer intermittently.
When the remaining time drops below the preset value as LOW BATTERY alarm, the buzzer increases in frequency while the yellow BATTERY LED goes to flashing. Under this condition it is wise to save any work under way. When the mains failure continues and the battery exhausts its energy, the UPS cuts off power to the loads.

Upon return of mains power, the UPS recharges the batteries automatically.

OPERATION OF THE BY-PASS NETWORK

Temporary State of operation, or permanent operation state caused by a breakdown; in this last case contact the assistance centre.
The load isn't secured in case of mains failure.

MAINS present, load fed. The switches SWIN, SWOUT, SWBY RETE (MAINS) are closed.

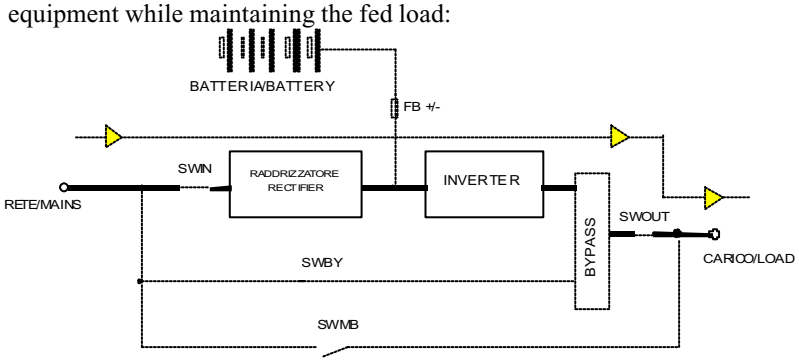


The UPS can find itself in this condition due to one of the following events:
- BY-PASS command (manual or automatic)
- excessive load in output (overload, see the paragraph ALARM MESSAGES))
- fault

On the control panel, the green INVERTER output LED is off, the yellow BY-PASS LED will be turned on steady if a command is present but will flash on and off in the presence of an overload or fault.
In case of a load greater than the nominal (overload) you will have to intervene to reduce it, otherwise the automatic breakers on the by-pass line will intervene, turning off the output (for times of intervention consult the SPECIFICATIONS paragraph).

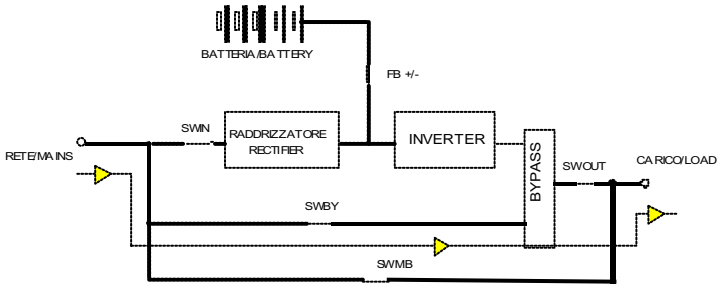
BYPASS FOR MAINTENANCE SWMB

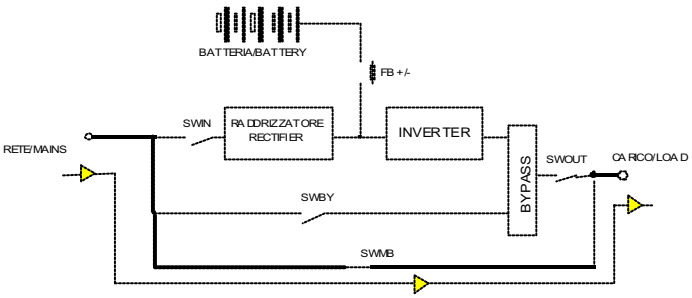
Series of operations to be carried out to place the UPS in maintenance by-pass to carry out maintenance operations on equipment while maintaining the fed load:



Status I
NORMAL OPERATION

Status II
SWMB switch closed (the control logic automatically disables the inverter).





Status III
All machine switches open. Only the SWMB switch is kept closed (by-pass maintenance line).The signal panel remains off. With the load powered through the maintenance line (during maintenance) any disturbance such as a blackout on the power line of the UPS would have repercussions on the powered equipment (under this condition the operation batteries are desactivated).

When the maintenance operations are concluded restart the UPS: close SWIN, SWBY, SWOUT and then open SWMB. The UPS will return to NORMAL OPERATION.

MAINTENANCE

CAUTION Maintenance inside the UPS should only be done by qualified personnel. Inside the equipment there are voltages even with the input and battery switches open. Removal of the side panels of the UPS by unqualified personnel can cause harm to the operator and damage the equipment.

Preventive Maintenance

The only components of the UPS which require periodic checking are the blowers and batteries.

- Blowers should be checked for correct operation periodically.

- Batteries. CAUTION Any battery replacement should be done by qualified personnel. For disposal of the replaced parts it is obligatory to deliver them to one of the special consortiums for disposal by recycling. Batteries are classified 'toxic waste' by law. The system automatically checks battery efficiency every 24 hours and gives an alarm when it finds efficiency very much lower than that calculated on the basis of memorized capacity (see key menu 3.2 BATTERY TEST). Battery life depends on operating temperature (20÷25°C) and the number of charging and discharging cycles performed. Battery life is halved if operating temperature goes to 30°C. Capacity is not constant but increases after a few charging and discharging cycles, then remains constant for several hundred cycles and finally decreases.

Battery maintenance should include: - Holding operating temperature in the range 20-25°C.
- During the first month of use carry out two or three charge/discharge cycles.
- After the first month of use perform this operation every six months.

The battery should be changed if necessary only by qualified personnel. to eliminate replaced parts it is obligatory to deliver them to one of the special consortiums for disposal by recycling. the batteries are classified toxic waste by law.

SPECIFICATIONS

SYSTEM

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
Rated power [kVA]	8	10	15	20	10	15	20	30	40	60	80
output active power [kW]	6,4	8	12	16	8	12	16	24	32	48	64
Power factor range											
100 % load	0,5÷0,8 IND										
100÷80% load	0,8÷1 IND										
80% load	1÷0,8 CAP										
70% load	0,5÷0,8 CAP										
80% load	computer										
efficiency full load	91	92	92	92	90	90	91	91	92	92	92
half load	89	89	89	90	88	88	89	89	90	91	91
loss power with nominal load and battery charge kW / kcal /B.T.U.	0,63 500 2000	0,70 600 2400	1,04 900 3600	1,39 1200 4800	0,89 800 4367	1,33 1100 4400	1,58 1400 5560	2,37 2000 7940	2,78 2400 9500	4,17 3600 14000	5,57 4800 19000
flow rate allowing (for room installation) (*) [mc/h]	310	372	558	744	496	682	868	1240	1488	2232	2976
leakage current (mA) max.	100										
MTBF:	200.000 hours.										
remote signalling	three tension free exchange contacts (battery low, battery discharging, by-pass/fault); output 12Vdc 80mA										
remote command	EPO and bypass										
computer interface	RS232/C										
operating temperature	0 ÷ + 40 °C										
relative humidity max.	95% (without condensate)										
maximum operating altitude	1000 m at rated power An (-1% An for each 100m over 1000 m) max 4000 m										
cooling	forced ventilation (fan speed function of the load)										
acoustic noise, as measured at 1m from front of equipment (depend on load and temp)dBA	48 ÷ 54			53 ÷ 60	48 ÷ 54			53 ÷ 60		53 ÷ 62	
degree of protection	IP20										
cable input	bottom / rear										
Accessibility to maintenance	front/upper/right side										
Applicable Standards	Safety EN 50091-1, Electromagnetic Compatibility EN 50091-2 (restricted sales distribution)(**)										
standard	BACKFEED PROTECTION										
optional	harmonic reduction filter/12 pulse rectifier, insulation transformer on bypass line (external cabinet)										

(*) To calculate the air flow rate the following formula can be used: **$Q\ (m^3/h) = 3.1 * P_{diss}(kcal) / (t_a - t_e)\ (°C)$**

P_{diss} is the power dissipated expressed in kcal in the installation environment by all the installed equipment. ta=ambient temperature, te=outside temperature.To allow for losses the value taken should be increased by 10%. In the table in the appendix is shown an example of flowrate allowing a $(t_a - t_e)$ of 5°C.

(**) EN 50091-2 Liv. A only for 10 and 15kVA threephase output.

RECTIFIER INPUT

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
rated power [kVA]	8	10	15	20	10	15	20	30	40	60	80
rated voltage	400V 3PHASE										
number of phases	3										
voltage tolerance	± 20 %										
rated frequency	50 / 60 Hz auto learning										
frequency tolerance	45 ÷ 65										
soft start	0 - 100% 10 sec										
max input current[A]	15	18	27	36	18	28	37	55	72	100	130
current distortion, with rated voltage and 100% output load	30 %										
power factor	0,8										

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
	8	10	15	20	10	15	20	30	40	60	80
rectifier with harmonic reduction filter (optional)											
current distortion, with rated voltage and 100% output load	8 %									5%	
Total harmonic current distortion and power factor, p.f., in function of the output load: (nominal input Voltage):	Load 100% distortion 8% p.f. 0,9 50% 12% 0,94 30% 25% 0,96									5% p.f. 0,92 9% 0,99 16% 0,9	
Harmonic distortion and power factor, in function of the input voltage (load 100%):	Vinput 100% distortion 8% p.f. 0,9 86% 5% 0,94 114% 11% 0,84									5% p.f. 0,9 4% 0,97 7% 0,87	
rectifier with 12 pulse input (optional)											
current distortion, with rated voltage and 100% output load	8 %										
Total harmonic distortion and power factor, p.f., in function of the output load: (nominal input Voltage):	Load 100% 8% p.f. 0,8 50% 10% 0,8 30% 11% 0,75										
Harmonic distortion and power factor, in function of the input voltage (load 100%):	Vinput 100% 8% p.f. 0,8 86% 7% 0,9 114% 9% 0,7										

RECTIFIER OUTPUT

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
	8	10	15	20	10	15	20	30	40	60	80
maintenance voltage (20°C)	battery type 1 and 2 : V =435Vdc (2,26 x el.) type 3: V =424Vdc (2,2 x el.) type 0: to default the values are equal to type 1 and 2. Value adjustable V =400÷460Vdc										
charge voltage	battery type 1 and 2 : V (%recharge <95%)=445Vdc (2,3 x el.) type 3: V (%recharge <95%)=460Vdc (2,4 x el.) type 0: to default the values are equal to type 1 and 2. Value adjustable V =400÷460Vdc										
max output voltage	445 Vdc										
ripple voltage	< 1%										
max charge voltage	445Vdc										
rated current (battery in fully carged state)	16	20	30	40	20	30	40	60	80	120	160
max current	20	24	36	48	24	36	48	72	96	140	180

BATTERY

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
	8	10	15	20	10	15	20	30	40	60	80
battery type	lead sealed										
blocks / element number	32 / 192										
end of discharge voltage	battery type 1,2 and 3: Vmin=346 0A output battery current Vmin=316 out. battery current=Ah capacity of the battery Vmin=306 " " " > " " " type 0 : default Vmin=320Vdc; sectable Vmin=300÷360V										
recharge current micro setting	0,2A x C10										
max recharge current with output nominal load [A]	1,5	2	3	4	2	3	4	6	8	12	16
max recharge current/with load at…. [A] / %	9 / 50%	9 / 60%	9 / 70%	19 / 60%	9 / 60%	9 / 70%	19 / 60%	19 / 70%	35 / 60	35 / 70%	35 / 80%

INVERTER OUTPUT

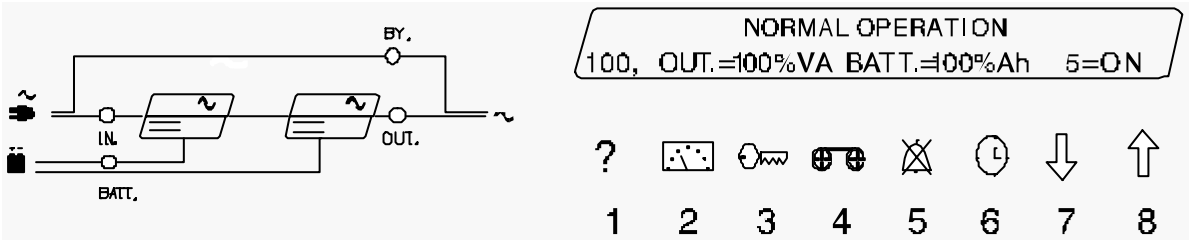
	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
rated power [kVA]	8	10	15	20	10	15	20	30	40	60	80
active power [kW]	6,4	8	12	16	8	12	16	24	32	48	64
number of phases	1				3 + N						
rated voltage V	230				400						
rated current [A]	35	43	65	87	14	22	29	43	58	87	115
phase voltage setting	200 ÷ 244 V (control panel)										
load crest factor at rated power (Ipeak/Irms)	3 : 1										
wave form	sinusoidal										
distortion with linear load	3 %										
voltage phase shift, with balanced load (degree)					± 1						
voltage phase shift, with unbalanced load (degree)					± 2						
phase voltage dissimetry with balanced load					± 1%						
Line to line voltage dissimetry with 100% unbalanced load					± 3 %						
distortion with non-linear load (peak factor 3:1)	8 %										
stability voltage at steady state	± 1 %										
stability voltage at transient state	± 5 % into 5 ms				± 5 % into 10 ms						
rated frequency	the same of the input										
frequency stability:											
without sincronzation	± 0,05 %										
with sincronization	±2 % (settable ± 5 % on the control panel)										
overload	110/125/150% rated current 300’ / 10’ / 1’										
short circuit current for 0,1s	2 In										
inverter efficiency % load 100%	92	93	93	93	91	91	92	92	93	93	93

BYPASS LINE

	SINGLEPHASE OUTPUT				THREEPHASE OUTPUT						
rated power (kVA)	8	10	15	20	10	15	20	30	40	60	80
output active power [kW]	6,4	8	12	16	8	12	16	24	32	48	64
Rated current	35	43	65	87	14	22	29	43	58	87	115
rated voltage	230V				400V						
number of phases	1				3 + N						
input voltage tolerance	±15 % (settable ± 10 % , ± 15 % from control panel)										
rated frequency	50 / 60 Hz (auto learning)										
input frequency tolerance	±2 % (configurable ± 5 % from control panel)										
inverter/bypass transfer switch time (overload)	0 ms										
inverter/bypass transfer switch time (fault inverter)	1 ms										
overload capacity xIn											
1h	2	1,6	1,3	1,2	1,5	1,6	1,5	1,6	1,5	1,3	1,2
10min.	2,2	1,7	1,5	1,3	1,7	1,8	1,7	1,7	1,7	1,4	1,3
1min	3	2,5	2	1,4	2,4	2,5	2,4	2,5	2,4	2	1,8
1s÷20ms	13	10	9	12	10	10	10	10	10	8	8
10ms	18	14	12	14	14	15	14	15	14	12	11

SIGNALLING PANEL FUNCTIONS

GENERAL DESCRIPTION



Signalling of operational status of the UPS is supplied by:

- a liquid crystal display (LCD) with two lines of 40 characters
- four warning lights:
  - IN. Power & bypass input lines
  - OUT. Bypass line output
  - BY. Bypass line output
  - BATT. Battery input.
- an audible signal.

Luminous warning lights: LED.

LED warning lights supply quick information directly onto the control panel of the system. They may be steady, flashing or turned off.

❒ LED IN (green): input lines

The luminous LED signal IN means:

- lit — when the input power and bypass voltages are present and correct
- flashing — when one of the two voltages is not correct
- extinguished — when both the voltages are neither present nor correct.

❒LED OUT (green): inverter output line

The luminous LED signal IN means:

- lit — when the system output is switched to the inverter, the output power is correct because less than 100%VA and only the output switch SWOUT is closed
- flashing — when the system output is switched to inverter the output power is greater than 100%VA, or SWMB is closed also
- extinguished — when the system output is switched to automatic bypass line or SWOUT is open

❒LED BY. (yellow): automatic inverter output line

The luminous LED signal BY. is:

- lit — when the system output is switched to the automatic bypass line
- flashing — when the system output is switched to the automatic bypass line with output power greater than 100%VA, or the manual bypass switch SWMB is closed
- extinguished — when the system output is switched to inverter or the output is switched to the bypass line and both switches SWOUT and SWMB are open, or is active SYSTEM OFF command

❒LED BATT (yellow): battery line

The luminous LED signal BATT is:

- lit — when the battery is delivering
- flashing — when the alarm PREALARM, LOW BATTERY VOLTAGE is active or the alarm BATTERY DISCHARGED OR SWB OPEN is active
- extinguished — when the battery is not delivering and its voltage is correct.

Acoustic Signal
The acoustic signal sounds intermittently and pauses for about 2 seconds under all conditions different from normal operation, i.e. different from the condition in which only the two green LED signals IN and OUT are lit.
The sound is intermittent without break when the LED BATT is flashing.
The acoustic signal never operates if it has been excluded with key 5, also it does not operate when the system was stopped by the AUTO-OFF function.
Its enablement status is visible in the basic menu: 5=ON indicates enablement and 5=OFF indicates exclusion.
Exclusion with key 5 is possible in all menus where the same key is not used for other functions.
Enablement is possible only in the basic menu.

Under normal operating conditions, without special requests for information or entry of commands with the keys or from the RS232 remote line, the LCD viewer shows basic messages referred to even with the basic menu or menu 0 or NORMAL menu names. It is possible to obtain other information or enter commands, acceding to submenus by pressing keys from 1 to 8 with appropriate sequences. With each key pressed there is a brief sound while the change of messages takes place only when an enabled key is pressed. Key functions in the menu 0 are suggested by the symbols associated while in other submenus they are indicated explicitly by the message. For some particular functions it is necessary to refer to the manual. Return to menu 0, in addition to being possible by pressing keys, takes place automatically also two minutes after the last pressing of a key.

ALARM MESSAGES

A list is given below of the alarm messages displayed on the first line of the display panel, the alarm number in brackets shows the priority level.

[1] DISTURBANCES ON BYPASS LINE

Alarm present when there are disturbances on the bypass line of the voltage peaks or harmonic distortions type, while voltage and frequency are correct. CAUTION. In this case the inverter is not synchronised with the bypass line, hence if the bypass is forced with the switch SWMB or the remote controls or panel there could be wrong switching between voltages in counterphase.

[2] BY-PASS MANUAL, SWMB - ON or cable defect

Manual BY-PASS SWMB Switch inserted and therefore return to normal operation is prevented. Load is fed by the input of the BY-PASS line and therefore isn't secured by the continuity unit. " cable defect" only for UPS in parallel version, logic has revealed an error in signals exchanged between the UPSs connected in parallel, and has therefore switched the entire system to BY-PASS.

[3] BYPASS VOLT. FAIL or SWBY, FSCR OFF

Alarm is present if:
- bypass line input voltage is wrong,
- bypass line turn-on switch SWBY is open,
- SCR fuse of the bypass line is open or burnt out following output short circuit.

[4] MAIN LINE VOLTAGE FAIL or SWIN OFF

Input voltage is wrong and battery is discharging.
The alarm appears if:
- input voltage or frequency are without range ,
- SWIN power switch is open,
- the rectifier does not recognize the voltage due to internal anomaly;

[5] PREALARM, LOW VOLTAGE ON BATTERY

The alarm is present if:
- the battery voltage is lower than calculated to supply approximately 5 minutes duration or the residual ;
- autonomy time is lower than the time set for the prealarm.

[6] BATTERY DISCHARGED OR SWB OPEN

The logic of the UPS has carried out A BATTERY TEST, during presence of mains feeding, the voltage of the battery was lower than the estimated value (see menu 3,2 BATTERY TEST).

[7] LOW VOLT. SUPPLY or OVERLOAD [W]

This alarm is present if one of the following conditions is verified:
- voltage of feeding in input is insufficient to feed load, (see general characteristics);
- load of output, in active power W, is higher than the nominal value .

[8] OUTPUT OVERLOAD

Indicates that the power absorbed by the load at the output is greater than allowed rated power, hence the indicated value expressed in %VA exceeds 100%. The same alarm is activated also when the peak absorbed current of the load exceeds the maximum admitted. When this alarm is on it is necessary to reduce the load, otherwise the system automatically goes on bypass within a time period inversely proportional to the amount of the overload.

[9] BY-PASS FOR VA OUTPUT < AUTO_OFF VALUE

This alarm is present when power in %VA, absorbed by the load is lower than the set value of" AUTO-OFF" (see menu' 3,5,6 CUSTOMISING . AUTO-OFF " VA").The value of %VA for AUTO-OFF is set to 0 in the factory (therefore this alarm condition can't happen).

[10] INTERNAL FAULT: number

The number indicates the different causes of fault:
1. indicates that the configuration circuit is defective or absent.
2. Inverter fault.
3. Inverter output line contactor fault (or bypass line contactor fault if present).
4. Rectifier fault.
5. Fault of an SCR on bypass line.
6. Main internal power supply fault or short circuit into one control card.
7. A voltage feeding the system control card is not correct.
8. Fault of one of the three sections of the rectifier because One of them does not absorb current or absorbs 30% less than the other.
9. Battery contactor fault.
10. Communication line between inverter and system not correct, fault on one of the two cards.
11. Fault of a power connections in SCR or bypass circuit.

[11] TEMPORARY BYPASS, WAIT

Indicates that the load is powered by the bypass line and the system is in the previous phase of automatic return to normal operation powered from the inverter. This transitory operation occurs e.g. during the starting phase of waiting for return on inverter after bypass for overload.

[12] BY-PASS FOR OUTPUT OVERLOAD

It shows that the load is fed by the BY-PASS line and is over the nominal value, the alarm has not yet been memorised, the value shown on the panel, expressed in percentages %VA, is over 100%.
To return to the NORMAL OPERATION situation, reduce the load and wait a few minutes to allow cooling (e.g. time to return to NORMAL OPERATION is 60s if the load reduces to 50%, and 8 minutes if the load reduces to 75%).

[13] BYPASS COMMAND ACTIVE; 8=COMMAND OFF

The system has been disactivated and switched to bypass by a special command entered with the keyboard. The command does not remain in the memory after a shutdown due the end of battery discharging.
In that case, upon return of power the system returns to normal operation also if the intentional lockup were not disactivated.

[14] REMOTE BYPASS CONTROL: ACTIVE

The system has been disactivated and switched to bypass by special command applied to the connector 'remote controls and signals'. The command is not memorized and the system returns to normal operation when the command is cancelled provided power voltage is present.

[15] OVERTEMPERATURE or FAN FAILURE

Internal temperature on the system card, power modules of the inverter or on the power modules of the rectifier or on the output transformer have exceeded the maximum allowed as a result of operation in an environment with excessive heat or failure of the fans.

[17] INPUT VOLTAGE SEQUENCE NOT OK

Input phase sequences of the bypass line is not correct. Normally it is sufficient to reverse two phase to obtain normal operation.

[18] OUTPUT OFF, CLOSE SWOUT OR SWMB.

Output voltage is absent because both switches SWOUT and SWMB are open.

[19] SYSTEM OFF COMMAND ACTIVE ; 8=DISACTIVE.

Alarm present when total shut-down command has been inserted from the panel or through the RS232 connection, **COMMAND MEMORISED**.
The System carries out the shut-down command with a few seconds of delay to allow for possible cancellations.
The command remains memorised also during a shut-down due to lack of feeding.
When the feed returns, the system does not return to normal operation mode unless the deliberately SYSTEM OFF is disactivated. To disactivate it, close SWBY or, if required, press 8.

[20] SYSTEM OFF COMMAND ACTIVE; 8=COMMAND OFF.

Like previous alarm, with present command from REMOTE connector

[21] MEMORY CHANGED: CODE = number

Number shows the different cases.
Code 1 memory has been changed and the operation parameters have been set to standard values.
If previously non-standard values have been set it is necessary to carry out a new customising of these values.
To remove alarm from the display turn off then turn on

NOTE: codes different from 1 can only appear temporarily. During variations of customising they do not influence normal operation.

[22] AUTO-OFF Timer: T off= 0: 0', T on 0: 0'

The alarm appears when the internal daily timer is operating for a daily cycle of system self-starting and self-stopping (see menu CUSTOMISING).
This timer cycle is inhibited if Toff and Ton value are equal.

CONTROL PANEL MENU

BASIC MENU

```
          NORMAL OPERATION
__10,   OUT=100%VA   BATT=100%Ah   5=ON
```

In the basic menu the upper line presents a signalling message to describe the present status while the lower line indicates model, apparent power measurement by percentage output by the inverter or bypass line, charging status of the battery or time expected for duration of battery.
The viewer permits display of a single phrase at a time, hence a priority is established according to which the most important message is displayed, while other information is entrusted to the interpretation of the internal codes.
Under all operating conditions, after two minutes from the last command with the keys, the viewer returns to BASIC MENU in which are presented the signalling messages for operating status.

NORMAL OPERATION:
signalling message to indicate that all parts of the unit are operating correctly.

__10:
Example of identifying initials of the type of unit with 10kVA rated power.
OUT = 100%VA:
Example of indication of the percentage of power absorbed by the load at output when the inverter is operating.

The initials OUT change to BY when the load is not powered by the inverter but by the mains through the bypass line.
All the indication OUT=100%VA changes to OUT=SWMB when load is powered through line of maintenance bypass switch, hence it is not possible to supply measurement of the output load current.

The value 100%VA supplied in the example is taken from the measurement of the output current. The number indicates the output current with the value relative to the absolute rated value and the value indicated is the greater of effective current or peak current.

BATT=100%Ah:
Example of indication of present status of battery recharge percentage. The value 100%Ah is taken from measurement of the charging current and the time elapsed in recharging.
The number indicates the percentage of recharge based on the information of the capacity of the connected battery and the amount of charge used during battery operation. The system remains automatically on quick charge for the entire time necessary to supply the battery with the quantity of charge lost during discharge.
The indication %Ah changes to min. during operation in absence of mains power supply or with battery discharged. In this case the numerical value refers to the remaining minutes of operation calculated on the basis of the current delivered by the battery and the charge status thereof.

NOTE
The autonomy indicated is calculated on the basis of measurement of the discharge current at that moment, the value memorized for the capacity of the connected battery and the value memorized for the percentage of charge preceding the discharge. The autonomy value shown is always approximate because of the large number of factors involved.
If large differences are noted between the expected value and the real time of a discharge with steady load, check the memorized battery data and its status.

5=0N:
Example of the indication for sound alarm enablement status; in case of exclusion, the indication changes to 5=OFF.

Key menu 1, "?", HELP

?

```
1=?, 2=MEASURES, 3=COMMANDS,  4=HISTORY
 6= DATE/TIME,    7= CODES,    8=NORMAL
```

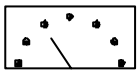
Access to the HELP menu is by pressing key 1 from the basic menu and indicating the menu to which to accede by pressing the other keys form the basic menu.
When many other menus are active push-button 1 returns to basic menu.

1=? indicates button 1 for access to language change menu
2=MEASURES indicates button 2 for access to measurements menu
3=COMMANDS indicates button 3 for access to command entry menu or selection or customizing of operating values.
4=HISTORY indicates button 4 for access to menu for viewing events recorded in internal memory.
6=DATE/TIME indicates button 6 for access to menu for viewing and management of internal clock and calendar.
7=CODES indicates button 7 for access to menu for viewing internal codes corresponding to operating status of all the internal subassemblies.
8=NORMAL indicates button 8 for immediate return to basic menu NORMAL which also takes place automatically after two minutes from the last pressing of key.

KEY MENU 1, 1: LANGUAGES

```
2=ITALIANO   3=ENGLISH   4=FRANCAIS
      5=DEUTSCH    6=ESPANOL
```

Access to the LANGUAGES menu is by key 1 only from HELP menu 1.
Pressing the key corresponding to the desired language selects the language with which the system supplies all the following messages.
Language selection remains memorized even after turning off and restarting the system.
To change current language always use LANGUAGES menu.



KEY MENU 2 "VOLTMETER": VOLTAGE MEASUREMENT

```
IN=100,100,100%V,50.0Hz; BATT=430V,+100A
BY=230V,50.0Hz      OUT=230V,50.0Hz,100%
```

Access to the menu VOLTAGE MEASUREMENTS is by key 2 only from basic menu.
Pressing key 1 returns immediately to the basic menu.
The contents of the measurements menu is different for single-phase and 3-phase units.
The measurements indicated have the following meanings:

IN=100,100,100%v, 50.0Hz	Examples of measurements of the three voltages measured at the power input. The voltage is expressed in percentage of rated value; the value 100%V indicates a voltage of 230Vln (ln = voltage between phase and neutral).
BATT.=430V	Example of voltage measured at the output of the rectifier to the battery.
+ 100A	Example of discharge current issuing from battery, the sign (-) indicates the value of the charging current entering the battery.
BY=230V, 60.0Hz	Example of measurement of frequency and voltage at the input of the bypass line.

NOTE:
In 3-phase systems the voltage indicated is the average of the three concatenated output voltages.

OUT= 230V,50.0Hz, 100%	Example of measurement of voltage, frequency and percentage power for rated power at the system output.

The mark OUT changes to BY when the load is fed from the bypass line.
The entire measurement changes from OUT=230v,50.0Hz,100% to OUT=SWMB when the maintenance bypass switch SWMB is closed because the internal system is excluded, hence not able to measure the load current.

Key menu 2, 6: TIME MEASUREMENT

```
 OUT= 10000h; BY= 10000h; BATT= 10000h
nBATT= 1000; n0%Ah= 100;     1993-01-12
```

Access to the menu TIME MEASUREMENT is by key 6 only from the SYSTEM MEASUREMENT menu.
Pressing key 1 causes return to the basic menu.

The values indicated have the following meanings:

OUT = 10000h	Example of indication of hours elapsed in operation with load on inverter.
BY = 10000h	Example of indication of hours elapsed in operation with load on bypass.
BATT = 10000H	Example of indication of hours elapsed in operation with battery in discharge.
nBATT = 1000	Example of indication of the number of times the battery started delivering and hence also the number of times supply voltage was lacking.
n0%Ah = 100	Example of indication of the number of times the battery was completely discharged to 0%Ah. The number of complete discharge cycles is useful for knowing and appraising the efficiency of the battery. The average life of ordinary sealed lead batteries is limited to 200-300 cycles of complete discharging.
1993-01-12	Example of indication of date memorized for day when the unit was activated for the first time.

The above data constitute the HISTORY and remain memorized even with the unit turned off and cannot be zeroed.

Key menu 2,2: CURRENT MEASUREMENT

Menu 2,2 in systems with 3-phase output.

```
IN=100,100,100%A;Ts=25°C,Tr=45°C,Ti=45°C
i=230Vln,430Vb      OUT=100,100,100%Arms
```

Access to the menu CURRENT MEASUREMENT is by key 2 only from menu 2.
Pressing key 2 causes return to menu 2; 1 returns to basic menu.

The measurements indicated have the following meanings:

IN=100,100,100%A	Example of measurement of the three currents at the power supply inlet, viewed by the three sections making up the input rectifier. Current is expressed in percentage of maximum input value.
Ts=25°C	Example of indication of temperature inside system.
Tr=45°C	Example of indication of temperature of rectifier power modules
Ti=45°C	Example of indication of temperature of inverter power modules

i=230Vln,430Vb	Example of measurement of alternating and continuous voltages inside inverter.
OUT=100%Arms,200%Apk (single-phase system)	Example of measurement of effective current and peak current percentages at the output during operation of the inverter. During operation by bypass the sign OUT changes to BY. During operation with the switch SWMB on for maintenance bypass, current measurements are not possible and the indication changes to OUT=SWMB.
OUT=100,100,100%Arms (3-phase system)	Example of measurement of the three effective current percentages for the three output phases during inverter operation. In the other cases the sign OUT changes as for single-phase.

Key menu 2, 2, 2: 3-PHASE VOLTAGE MEASUREMENT

```
BY=230,230,230Vln;     OUT=230,230,230Vln
                       OUT=100,100,100Apk
```

Access to the menu 3-PHASE VOLTAGE MEASUREMENT is by key 2 from menu 2,2, only in systems with 3-phase output voltage.
Pressing key 2 causes return to preceding menu 2,2. Key 1 returns to basic menu.

BY=230,230,230Vln	Example of measurement of the three voltages at the input of the bypass line measured between the phases 1,2,3 and neutral.
OUT=220,220,220Vln	Example of measurement of the three output voltages measured between phases 1, 2, 3 and neutral
OUT=100,100,100Apk	Example of measurement of the three peak current percentages for the three output phases during operation on the inverter. During operation on bypass the sign OUT changes to BY. During operation with the switch SWMB for the maintenance bypass current measurements are not possible, hence only the voltage measurements remain and the indication changes to OUT=SWMB.

KEY MENU 3 "KEY", COMMANDS

```
  2=BATTERY TEST  4=DISPLAY CONTRAST
5=CUSTOMIZING   6=BYPASS  7=SYSTEM OFF
```

In this case the viewer proposes the choice for the subsequent submenus.

Key menu 3, 2: BATTERY TEST

```
     BATTERY  TESTING FOR  6 sec.
BATT= 400V + 10A; Vbc= 430V;  999 min
```

Access to the BATTERY TEST menu is by key 2 from menu 3 COMMANDS.
In this case there is activated the cycle of efficiency status checks of the battery, which last 6 seconds.
Pressing key 8 interrupts the test and returns to the basic menu before the end of the period.
The values indicated are:

BATT= 400V + 10A	Example of indication of battery voltage and current measurement.
Vbc= 390V	Example of indication of calculated battery voltage
100 min.	Example of indication of calculated autonomy time.

The battery test cycle with rectifier output voltage drop permits evaluation of the battery with the true delivery on the load even during the presence of the power supply voltage. In any case, lowering of the output voltage of the rectifier takes place only if there is voltage on the bypass line so as to avoid any ANOMALY with output load without the bypass reserve.
At the end of the test cycle a comparison is made of the voltage supplied by the battery and a 'Vbc' voltage calculated on the basis of the measured delivered current at the capacity values of the battery and half the percentage of recharge contained in the memory.
If the voltage measured on the battery is less than calculated voltage:
- the alarm BATTERY DISCHARGE or SWB OPEN is activated;

- the memorized recharge percentage is halved;
- the next test cycle is prepared and will be activated automatically after 60 seconds.

The battery test cycle is activated:
- manually;
- automatically every 60 seconds after each failed test or each system starting;
- automatically every 24 hours starting from return of power;
- automatically and invisibly during operation without mains power supply.

At the end of each test, if the measured voltage is less than that calculated the alarm is activated followed by halving of the memorized charge and of the indicated autonomy time.

When 60 seconds have elapsed after activation of the alarm a new test is performed and if the result is negative the alarm is reactivated for another 60 seconds. The alarms continues to halve the memorized charge value until the value for which the battery voltage calculated is less than actually measured.
In practice, this battery check system produces an alarm each time the battery has less than the design charge.
The PERMANENT presence of this alarm indicates that the battery is inefficient or the battery circuit is broken or the battery switch SWB is open or one of the protective fuses has blown.
TEMPORARY presence indicates a loss of battery efficiency proportionate to the alarm frequency.

Disabling BATTERY TEST, type keys 3, 5: " CUSTOMISING", insert code 323232.
To reactivate insert code 323232 again.
On the BASIC MENU on the lower line in the 2 cases will appear::

BATT=XXX % with BATTERY TEST ON
BAT. =XXX % with BATTERY TEST OFF

Key menu 3, 4: DISPLAY CONTRAST

```
          DISPLAY CONTRAST : 10
ADJUSTMENT:                    7=-, 8=+
```

Access to the DISPLAY CONTRAST menu is with key 4 from menu 3 COMMANDS.
In this case it is possible to change the viewer contrast: decrease with key 7; increase with key 8. The value 6 expresses the contrast level and can change from 1 to 11. To leave the menu, press one of the other keys different from 7 and 8, e.g. key 1.

Key menu 3, 5: CUSTOMIZING

```
        TYPE CODE   ____________
 ..................................
```

Access to the CUSTOMISING menu starts with key 5 from menu 3 COMMANDS, after which an intermediate menu appears in which it is necessary to insert a series of keys to obtain the final menu.
The sequence "CODE OF CUSTOMISING" **is the same in all cases** and is 436215.

Access to the CUSTOMISING menu using the code must prevent unauthorised persons from modifying the operation parameters of the machine. Code isn't required again for 2 minutes after its first insertion.
Only with the insertion of the correct code can you have access to the following menu, otherwise you are returned to the main menu.

```
  1=Stby  2=RATED OUTPUT VOLTAGE  3=BATTERY
     4=PREALARM    6=AUTO-OFF  7=others
```

["1=Stby" only on enabled UPS)
By pressing key 7 you get the second part of the menu:

```
  2=BY. VOLT. RANGE  3=BY. FREQ. RANGE
  4=Conf.  5=RS232   6=ECHO   7=IDENT.
```

In the 2 cases by pressing one of the keys 2, 3, 4, 5 you have access to the following operative sub-menus, while with key 8 "↑", you are returned to menu 2 of base.
NOTE: the Sub-menu' 1 is visible and enabled only for UPSs with the function STANDBY ON.

Key menu 3, 5, code, 2: CUSTOMIZING RATED OUTPUT VOLTAGE

```
   RATED OUTPUT VOLTAGE =     225Vln
ADJUSTMENT:                    7=-, 8=+
```

code 436215. You can exit the menu by pressing a key different from 7 and 8.
Keys 7 and 8 are used to reduce or increase the rated output voltage in the range from 200V to 244V with increments of 1V.
In the example, the rated output voltage has been set for 225V measured between phase and neutral 'ln'.
Note that even in the systems only the voltage between phase and neutral 'Vln' is in referred to.
The value set in the example changes operation of the inverter so as to have output voltage of 225V between phase and neutral, during normal operation.
In addition, the reference voltage for the range of acceptance of the input voltage of the bypass line is also set at 225Vln. The range of acceptance of the power supply voltage remains unchanged and cannot be changed.

Key menu 3, 5, code ,3: BATTERY CUSTOMIZING

code 436215.
Keys 2/3 require to choose type.

```
   BATTERY Tipe=1          Capacity=15Ah
Adjustment:2-/3+   5/6=-/+10       7=-,8=+
```

With keys 5, 6, 7 and 8 it is possible to decrease or increase the value of the capacity of the battery contained in memory, with variations of 10 units or of 1 unit, in a field from 1 to 9998 Ah.
You must insert the nominal capacity value of the battery connected. This is usually also printed on the container of the battery itself.
All machines supplied complete with battery, are customised in the factory.
In the case of machines supplied without batteries it is necessary to insert the correct values, otherwise the system uses value of 12Ah.

With keys 2 and 3 it is possible to decrease or increase the identification value of the type of battery.
In the case of batteries with high discharge intensity you must pass from a value of 1 (normally predetermined for normal batteries) to a value of 2, value 3 is used for lead-acid no sealed batteries.
By choosing type 0 and pressing key 4 again it is possible instead to set the following values manually:

```
Vb_min=320      Vb_ch=435       Vb_max=445
   Adjustment: 2-/3+ ,     5-/6+          7=-,8=+
```

Vb_min (end discharge voltage) =300÷360V
Vb_ch (maintenance voltage) = 400÷460V
Vb_max (charge voltage) = 400÷460V

The checking system uses data concerning the capacity and type of battery for:
- automatic check by the inverter of the efficiency of the battery;
- calculation of estimate of residual autonomy time;
- calculation of levels of battery voltage to activate the pre-alarm and afterwards the shut-down;
- establishing best value for the recharging current.

Key menu 3, 5, code 4: PREALARM CUSTOMIZING

```
(306Vmin, 345Vp)      Prealarm     5 min.
 ADJUSTMENT:                  7=-,  8=+
```

code = 436215. You can exit the menu by pressing a key different from 7 and 8.

Vmin= minimum voltage of the battery ;
Vp= voltage of the discharge pre-alarm (these two values of voltage Vmin and Vp aren't fixed values, but are a function of battery discharging Vp= Vmin+5V+10*(current of the battery [A]/capacity of the battery[Ah])

With keys 7 and 8 it is possible to decrease or increase the time required to activate the pre-alarm before the system lock itself due to the complete discharge of the battery. Variations of a minute are possible within a field ranging from 2 to 254 minutes. The pre-alarm signal activates itself when the estimated remaining time is less than the value set for the pre-alarm or when the battery voltage is lower than the value Vp of the pre-alarm voltage. It is important to allow a broad safety margin when using the pre-alarm function, since the value of autonomy required cannot foresee possible increases in absorption for the output load, and cannot take into consideration unexpected and unforeseen faults in the battery, such as, for example faulty single elements or connections.

Key menu 3, 5, code 6: AUTO-OFF CUSTOMIZING "VA"

```
AUTOMATIC SWITCH-OFF WHEN OUTPUT < 10%VA
 ADJUSTMENT: (5=Toff, 6=Ton)  7=-,  8=+
```

code 436215. To leave the menu press any key other than 7 and 8.
Keys 7 and 8 are used to reduce or increase the percentage of output load for the AUTO-OFF function. Increments of adjustment are by 1 % in the range from 0 to 99%.

When the AUTO OFF alarm is present , if the input main line voltage is present and the battery charge is lower than 60% there is only the display of:

```
BYPASS FOR OUTPUT VA < AUTO-OFF VALUE
H100, OUT=100%VA   BATT=  50%Ah    5=ON
```

The system does not start the "off procedure" because it waits to charge the battery over 60%.

When the alarm is present, if the input main line voltage is present and the battery charge is higher than 60%, or if the system is in battery operation, there is the display of:

```
BYPASS FOR OUTPUT VA < AUTO-OFF VALUE
H100, OUT=100%VA   OFF:  4 min,    5=ON
```

Moreover the "prealarm low battery" remote alarm contact switches on alarm position.
In the case of status displayed above, the system continue to operate for the next 4 minutes, after those it switches on bypass.
The interval of time between the arise of alarm and the switching on bypass is by default 5 minutes or it is equal to the value fixed when customizing PREALARM.
After the prealarm time, if the input bypass line voltage were present before, the system switches on bypass and it remains in standby status waiting for increasing of output load over the AUTO-OFF value.
If the input bypass line voltage is NOT present when the prealarm time is finished, the system switches off.
After that, when the input bypass line voltage will come back, the system will start again remaining on bypass in standby status waiting for increasing of output load over the AUTO-OFF value to perform automatic return to normal operation.
The AUTO-OFF function is more useful for turning off the system during battery operation by merely turning off the output load. In case of normal operation, the AUTO-OFF function is still useful for zeroing consumption since the power circuits are disactivated, the battery is isolated and only the control circuits with consumption equivalent to a light bulb remain active.

Key menu 3, 5, code, 6, 5 (6): AUTO-OFF Timer CUSTOMIZING

```
AUTO-OFF Timer: Toff >0: 0', Ton= 0: 0'
 ADJUSTMENT:  (5=Toff, 6=Ton)  7=-, 8=+
```

code 436215. To leave the menu press any key other than 7, 8, 5, 6.
Key 5 to adjust Toff, 6 to ajust Ton.

The Toff and Ton values fix the clock time in which operates the daily cycle for self-stopping and self-starting, look also at Alarm 22.

This timer cycle is inhibited if Toff and Ton value are equal.

When the alarm 22 is present, if the input main line voltage is present and the battery charge is lower than 60% there is only the display of:

```
AUTO-OFF Timer: Toff=20:00', Ton= 7:00'
H100, OUT=100%VA   BATT=  50%Ah    5=ON
```

The system does not start the "off procedure" because it waits to charge the battery over 60%.

When the alarm 22 is present, if the input main line voltage is present and the battery charge is higher than 60%, or if the system is in battery operation, there is the display of:

```
AUTO-OFF Timer: Toff=20:00', Ton= 7:00'
M100, OUT=100%VA   OFF:  4 min,    5=ON
```

Moreover the "prealarm low battery" remote alarm contact switches on alarm position.
In the case of status displayed above, the system continue to operate for the next 4 minutes, after those it switches on bypass.
If the input voltage of the by-pass line is present, the output voltage also remains present .

When the time is equal to Ton(7:00') the UPS return in normal operation.

Key menu 3, 5, code, 7, 2: BYPASS VOLTAGE RANGE CUSTOMIZING

```
BY. VOLTAGE RANGE          = +/- 10%
ADJUSTMENT:                7=-,  8=+
```

Access to the menu BYPASS VOLTAGE RANGE CUSTOMIZING begins with the key sequence 3, 5, requires the code 436215 and the keys 7 and 2. The code is not required for 2 minutes after its first previous entry.
To leave the menu press a key different from 7 or 8. Keys 7 and 8 are used to reduce or increase the percentage of the range of acceptance of the voltage at the bypass line input. The choice is between the values: 10%, 15% or 20% of the value set for RATED OUTPUT VOLTAGE.

Key menu 3, 5, code, 7, 3: BYPASS FREQUENCY RANGE CUSTOMIZING

```
BY. FREQUENCY RANGE        = +/- 10%
ADJUSTMENT:                7=-,  8=+
```

Access to the BYPASS FREQUENCY RANGE CUSTOMIZING menu begins with key sequence 3, 5, requires the code 436215 and then keys 7 and 3. The code is not required for 2 minutes after its first previous entry.
To leave the menu press any key other than 7 and 8. Keys 7 and 8 are used to reduce or increase the percentage of the range of acceptance of voltage at the bypass line input. The choice is between 1% and ±5% for rated value of the system of 50Hz or 60Hz. Rated frequency of the system can only be selected inside the unit.

Key menu 3, 5, code, 7, 4 : MODEM CUSTOMIZING

```
PREALARM BEFORE STOPPING   = 100min..
ADJUSTMENT:                7=-,  8=+
```

Access to the menu MODEM CUSTOMIZING begins with the key sequence 3, 5, requires the code 436215 and then keys 7 and 4. The code is not required for 2 minutes after its first previous entry.
To leave the menu press a key different from 7, 8, 5, 6.
Keys 7 and 8 are used to reduce or increase the control value for modem operation, the range is from 0 to 5 and 0 is default value.

Value 0 = the pin n. 20 (DTR) of RS232 connector is set to low level (-12V) to inhibit the operation of a connected modem.

NOTE: when a remote control panel is connected to the RS232 connector, instead of a modem, the value MUST BE SET to 0 otherwise the remote panel does not operate.

Value 1= the pin n. 20 (DTR) of RS232 connector is set to high level (+12V) to enable the operation of answer for a connected modem. (Remember that with this value a connected remote panel does not operate).

Value 2= the pin n. 20 (DTR) of RS232 connector is set to high level (+12V) to enable the operation of answer and automatic calling for a connected modem.

When the automatic calling is set, 30 seconds after all "INTERNAL FAULT n" alarm the system gives to the modem the command "ATD" followed by the memorized "Dial" number.
The modem must be previously set to recognize the "HAYES" command and to dial numbers with pulses or tones as required by the used telephone line.
After the ATD and Dial number, the system send to the modem the memorized "Send" number and a copy of the panel display with a=..... code and date/time.
For example, if Dial = 123456, Send = 456789, 30 seconds after starting of alarm "Internal Fault 5" the system sends to modem:

```
ATD123456.
```

The system, after receiving the message "CONNECT" from modem, sends to the modem the message:

```
UPS 456789
        INTERNAL FAULT
M100,  OUT=100%VA, BATT= 78%Ah,  5=On   a=00200300 1994-12-21, 13:24:28
```

The sytem sends also the sequence to close connection:

```
+++  ATH
```

As last the system put on low level the DTR signal for 0.5 sec.

In case of busy line or modem not giving the response "CONNECT", the system wait 5 minute than repeates again the commands ATD..... in order to try another phone call. The system continues to try calling every 5 minutes untill it receives the response "CONNECT" from modem or the alarm condiction desappears.

Value 3= like value 2 with the automatic calling for any kind of alarm.

Value 4= like value 2 with the automatic calling only with alarm 10 (Internal Fault) but with sending of display message only after received the character "}".
This operation can been used for avoiding the loss of a message, because the system sends its message only after receiving the special character "}" that can send only by a computer.

Value 5= like value 4 with the automatic calling for any kind of alarm.

Key menu 3, 5, code, 7, 4, 5 (6) : Modem 'Dial /Send' CUSTOMIZING.

```
MODEM dial n.=6543210///////// <=2..3=>
 ADJUSTEMENT: (5=dial, 6=send) 7=-, 8=+
```

Access to the menu "MODEM 'Dial /Send' CUSTOMIZING" begins with the key sequence 3, 5, requires the code 436215 and the keys 7, 4, 5, or 6. To have the optional code make a request complete of machine serial number.
The code is not required for 2 minutes after its first previous entry.
To leave the menu press a key different from 7, 8, 5, 6, 2, 3.
Keys 7 and 8 are used to reduce or increase the digit on which the cursor points.
The cursor position is shown in the first time by the simbol "_", its position can be moved left with key 2 and right with key 3. The digits can be set in the range 0, 1, 2 ... 9, /. The simbol / indicates a digit inhibited.
The correct setting requires only number starting from left. All number inserted after a "/ " are ignored.
A setting of "0123/45" will be recognized only as number 0123
Selecting the 35746 menu or pushing the key 6 when the 35745 menu is active, it is possible to adjust the "send" number.

Key menu 3, 5, code, 7, 5: RS232 CUSTOMIZING

```
RS232: 8bit,no parity,1b.stop, baud=9600
 ADJUSTMENT:                  7=-,  8=+
```

Access to the RS232 CUSTOMIZING menu begins with key sequence 3, 5, requires the code 436215 and then keys 7 and 5. The code is not required for 2 minutes after its first previous entry. To leave the menu press any key other than 7 and 8. Keys 7 and 8 are used to reduce or increase baud transmission speed. The choice is among 1200, 2400, 4800 and 9600.

Key menu 3, 5, code, 7, 6: ECHO CUSTOMIZING

```
        ECHO ON RS232:    = 1
ADJUSTMENT:                 7=-,  8=+
```

Access to the ECHO CUSTOMIZING menu begins with key sequence 3, 5, requires the code 436215 and then keys 7 and 5. The code is not required for 2 minutes after its first previous entry. To leave the menu press any key other than 7 and 8. Keys 7 and 8 are used to reduce or increase the check value of the ECHO function. The choice is between 0 and 1. 0 is starting value. When 1 is selected the ECHO function is activated. The ECHO function is useful for automatically sending to the serial outlet RS232 the same message as appears on the panel viewer.
Automatic sending occurs for each alarm or change in viewer content.
Using this function it is possible to automatically print all messages through a printer connected to the RS232 outlet.
The message includes:

- copying the characters on the viewer
- copying the internal code a=FFFF-FFFF
- date and hour of activation of the message.

NOTE: the ECHO must be set to 0 when using some special software to receive information from UPS by a computer, because in that case the message must be sent only under computer control.

Key menu 3, 5, code, 7, 7: IDENT. CUSTOMIZING

```
              IDENT. = 0
ADJUSTMENT:                 7=-,  8=+
```

Access to the IDENT. CUSTOMIZING menu begins with key sequence 3, 5, requires the code 436215 and then keys 7 and 8. The code is not required for 2 minutes after its first previous entry. To leave the menu press any key other than 7 and 8. Keys 7 and 8 are used to reduce or increase the identification number of a single unit in case of systems using several UPS units connected to a single RS232 serial line.
The basic number is 0 and can be changed among values from 0 to 7.

Key menu 3, 6: INVERTER-OFF/BYPASS

```
INVERTER OFF AND BYPASS COMMAND = 47263
 IT SHUTS OFF, IF BYPASS LINE IS NOT OK
```

Access to the INVERTER OFF AND BYPASS COMMAND menu begins with key sequence 3, 6 of the basic menu.
To leave the menu press key 8 or any key with a sequence other than that indicated.
Pressing keys 1, 7, 2, 6 and 3 in succession as shown on the viewer activates the bypass command and shuts off the inverter.
This command is mostly useful if sent through an RS232 remote connection if it is desired to disactivate only the power circuits while keeping the control circuit alive.
The action following the command is executed with a few minutes of delay to allow for cancellations.
When this command is active the viewer shows the alarm BYPASS COMMAND ACTIVE; 8=DISACTIVATION.
To return to normal operation even after shutting off the system it is necessary to cancel the command with key 8 or sending the key code through the RS232.
NOTE. To mask the code of the command, 47263, you must insert code 436213, in the CUSTOMISING menu on the panel (keys 3,5). Repeat the operation to display the code.

Key menu 3, 7: TOTAL SYSTEM SHUT-OFF COMMAND.

```
TOTAL SYSTEM SHUT-OFF COMMAND   = 47263
WARNING, THE OUTPUT VOLTAGE WILL BE OFF
```

Exit from the menu is obtained by pressing key 8 or any other key with a different sequence from that indicated.
By pressing keys 4, 7, 2, 6, 3, one after the other, as shown on the display, the activation of the command for the SYSTEM OFF is obtained. When this control is active, the display presents the alarm:

SYSTEM OFF COMMAND ACTIVE ; 8=DISACTIVE.
The action following the command is carried out with a few seconds of delay to permit possible cancellations. This control is useful in the event of an emergency to obtain complete disactivation, operating from a distance through line RS232. To reactivate the UPS close SWBY or, if required, press button 8 on the local or remote panel.
NOTE. To mask the code of the command, 47263, you must insert code 436213, in the CUSTOMISING menu on the panel (keys 3,5). Repeat the operation to display the code.

KEY MENU 4: "RECORDER": HISTORY = RECORDED EVENTS

```
        alarm message recorded
a=FFFF-FFFF;  n=100, 1992,12,31/14:45:50
```

Access to the RECORDED EVENTS menu is with key 4 of the basic menu.
Press key 1 to return to the basic menu.
Key 2 activates the sub menu MEASUREMENT OF RECORDED VOLTAGES.
Keys 3, 4 and 5 remain with normal functions.
Key 6 activates the sub menu 4, 6 RECORDED CODES and permits exchange of the alarm message memorized with display of the status codes corresponding to the moment of the memorized event and vice versa.
The status codes permit thorough analysis of the event. For interpretation see the menu of the key 7 INTERNAL CODES and the table of memorized codes.

Keys 7 and 8 secure display of the events preceding and following the event displayed. For example by pressing 7 the indication n=100 changes to n=99 and the 'memorized alarm message' of the previous event is shown.

The parts of the menu are:

memorized alarm message	Indicates one of the alarm messages corresponding to that displayed during the last event and contained in the memory of the events. The memory can contain up to 120 events. When the memory is full each new event is memorized and cancels the last one.
a=FFFF-FFFF	Indicates the memorized code for the other alarms present at the same time together with that indicated by the 'memorized alarm message'.
n=100	Indicates the number of events contained in the memory.
1992,12,31/14:45:50	Indicates the date and hour of the moment when the displayed event occurred. It is expressed in year, month, day / hour, minute, second

Key menu 4, 2 RECORDED VOLTAGES MEASUREMENT

```
IN=100,100,100%V,50.0Hz; BATT=430V,+100A
BY=230V,50.0Hz; n35 OUT=220V,50.0Hz,100%
```

Access to the menu RECORDED VOLTAGES MEASUREMENT is with key 2 only from menu 4 RECORDED EVENTS or menu 4,6 RECORDED CODES.
Press key 1 to return immediately to the basic menu.

In the example, n35 (flashing) indicates that the measurements shown are for the status of recorded event 35.
The meaning of the measurements is identical to those of menu 2.

Key menu 4, 2, 2: RECORDED CURRENT MEASUREMENT

Menu 4.2.2.

```
IN=100,100,100%A;Ts=25°C,Tr=45°C,Ti=45°C
i=230Vln,430Vb;n 35 OUT=100,100,100%Arms
```

Access to the menu RECORDED CURRENT MEASUREMENT is with key 2 only from menu 4, 2.
Press key 2 to return to menu 4,2; key 1 to return to basic menu.
In the example, n35 (flashing)
indicates that the measurements shown are for the status of recorded event 35.
The meaning of the measurements is identical to those of menu 2.

Key menu 4, 2, 2, 2: RECORDED 3-PHASE VOLTAGE MEASUREMENT

```
BY=230,230,230Vln;    OUT=230,230,230Vln
                n 35   OUT=100,100,100Apk
```

Access to the menu 3-PHASE VOLTAGE MEASUREMENT is with key 2 from menu 4,2,2.
Press key 2 to return to menu 4,2,2; key 1 to return to basic menu.
In the example, n35 (flashing)
indicates that the measurements shown are for the status of recorded event 35.
The meaning of the measurements is identical to those of menu 2.

Key menu 4, 6: RECORDED CODES

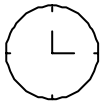
```
s=FFFF c=FFFF b=FFFF r=FFFF-FF i=FFFF-FF
a=FFFF-FFFF;  n=100, 1992,12,31/14:45:50
```

Access to the menu RECORDED CODES is with key 6 from menu 4 RECORDED EVENTS and menus 4,2; 4,22; 4,2,2,2, i.e. those of recorded measurements.
Press key 1 to return to basic menu.
The other keys except 6 and the indications of the bottom line have the same functions as those of menu 4.
The top line: s=FFFF c=FFFF b=FFFF r=FFFF-FF i=FFFF-FF,
shows the internal codes, recorded at the same time as the event.
Press key 6 to return to menu 4 keeping the event current, then it is possible to go several times from the description of the event with the 'memorized alarm message' to that with the internal codes.

KEY MENU 5: ACOUSTIC ALARM EXCLUSION

During operation with the presence of the basic menu the operator can exclude or again enable permanently the audible alarm by pressing key 5.
In the basic menu 5=ON appears when the audible alarm is enabled and 5=OFF appears when the audible alarm is excluded.
In other menus, when other functions are not provided, key 5 can be used only for sound exclusion.

KEY MENU 6: "CLOCK": DATE/TIME



```
DATE/TIME=  ymd/h =  2000 12 31/24:60'60
              TYPE CODE ....
```

Access to the DATE/TIME menu is with key 6 from the basic menu.
The viewer shows the present contents of the internal calendar and clock in the format:

DATE/TIME = ymd/h=year,month,day/hour,minute,second

It is possible to change the contents by recalling the related menu by entry of the customizing code 436215.
The code is not required for 2 minutes after the first previous entry thereof.
Only entering the correct code secures access to the next menu, otherwise one returns to the basic menu.

```
DATE/TIME=  ymd/h =  1993 12 31/24:60'60
Adj.:  2=ye. 3=mo. 4=day. 5=hours 7=min..
```

The number to be changed is selected with one of the keys 2, 3, 4, 5 or 7.

```
DATE/TIME=  Xmd/h =  1993 12 31/24:60'60
 ADJUSTMENT:                  7=-,  8=+
```

In this case it was decided to change the year, the flashing symbol X superimposed on the letter a recalls the field selected. Pressing key 7 or 8 increases or decreases by one unit the value selected. Pressing one of the other keys exits from menu.

KEY MENU 7 "ARROW DOWN": INTERNAL CODES

```
s=FFFF c=FFFF b=FFFF r=FFFF-FF i=FFFF-FF
a=FFFF-FFFF;  INTERNAL CODES;  ver.10001
```

(memorized internal codes)

Access to the INTERNAL CODES menu is with key 7 from the basic menu.

Press key 7 again to accede to the second menu of internal codes. Press any other key to exit.

```
e=FFFF g=FFFF u=FFFF y=FFFF j=FFFF-FFFF
k=FFFF v=FFFF p=FFFF l=FFFF m=FFFF-FFFF
```

(UNmemorized internal codes). N.B. these codes are used only during the testing in factory
In the first menu, ver. 10001 is an example of an identifying number of the system programme version.

KEY MENU 8 "ARROW UP": NORMAL

```
            NORMAL OPERATION
M100,   OUT=100%VA   BATT.=100%Ah   5=ON
```

Access to the menu NORMAL is with key 8 from menu 1 HELP and from all the other menus in which no other function is provided. In addition, the system returns AUTOMATICALLY to the menu NORMAL, i.e. the basic menu, always after two minutes after last pressing a key. All functions are those explained for the basic menu.

REMOTE PANEL WITH RS232 TERMINAL

Connecting a serial terminal to the RS232 line is an easy way to provide a remote panel.
The connection requires:
- a connecting lead with only three conductors for the signals TX, RX and GND equipped with standard 25-pole RS2332 connectors.
- a terminal with baud rate and protocol the same as that of the UPS (see also RS232 customization) capable of displaying ASCII characters received from the UPS and transmitting ASCII numbers from 0 to 9.
An ordinary personal computer in which one of the application programs for terminal emulation has been activated can be used as the terminal.For example the terminal included in Microsoft WINDOWS software can be used.
Communication with the terminal is achieved by activating the function ECHO on the UPS or on command by the terminal.

For ECHO communication:
- the terminal always receives the characters sent automatically by the UPS upon each alarm or change of messages on the panel display;
- the terminal can transmit the ASCII characters corresponding to the numerical keys from 0 to 8 to achieve execution of the commands on the UPS:

For communication on command:
- the terminal must open the communication by sending in sequence two ASCII characters corresponding to the numerical keys 9 and 0 spaced with an interval between 0.5 and 2 seconds.
If the UPS is customized with a new identification number, the second character to send changes from 0 to the one which is the same as the new identification number.

-After opening of the new communication, the terminal can transmit the ASCII characters corresponding to the numerical keys from 0 to 8 to achieve execution of the commands on the UPS and reception of the copy of the characters of the display complete with internal code a=.. and date/time,

- while the communication is opened, transmitting the character 9 it is possible to receive the same message without execute any command,

- The terminal can close the communication by sending any character other than those given above.

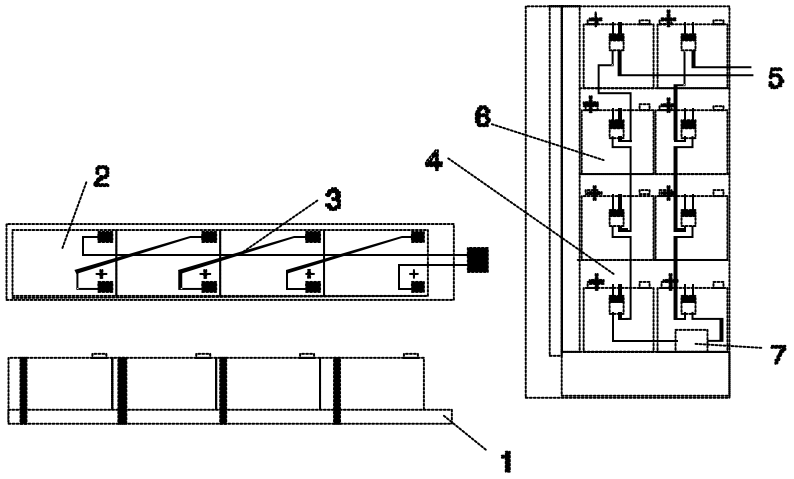
Connection with Computer

It is possible to connect any kind of computer to the UPS in order to have the automatic saving of computer data before a UPS shutoff caused by a blackout longer than battery autonomy.
To have this performance it needs also to ask for some special software.
When asking for this software it needs to specify which operating system has the computer.
It is possible also, to have some special software in order to receive all UPS information into a computer.

APPENDIX

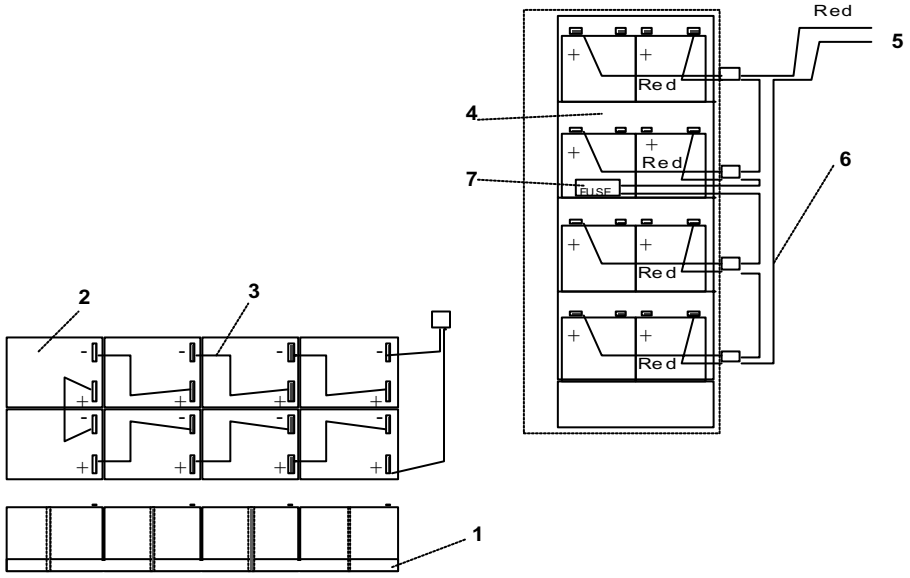
BATTERY PACK UPS COMPACT

Nr. Vassoio con 4 batterie



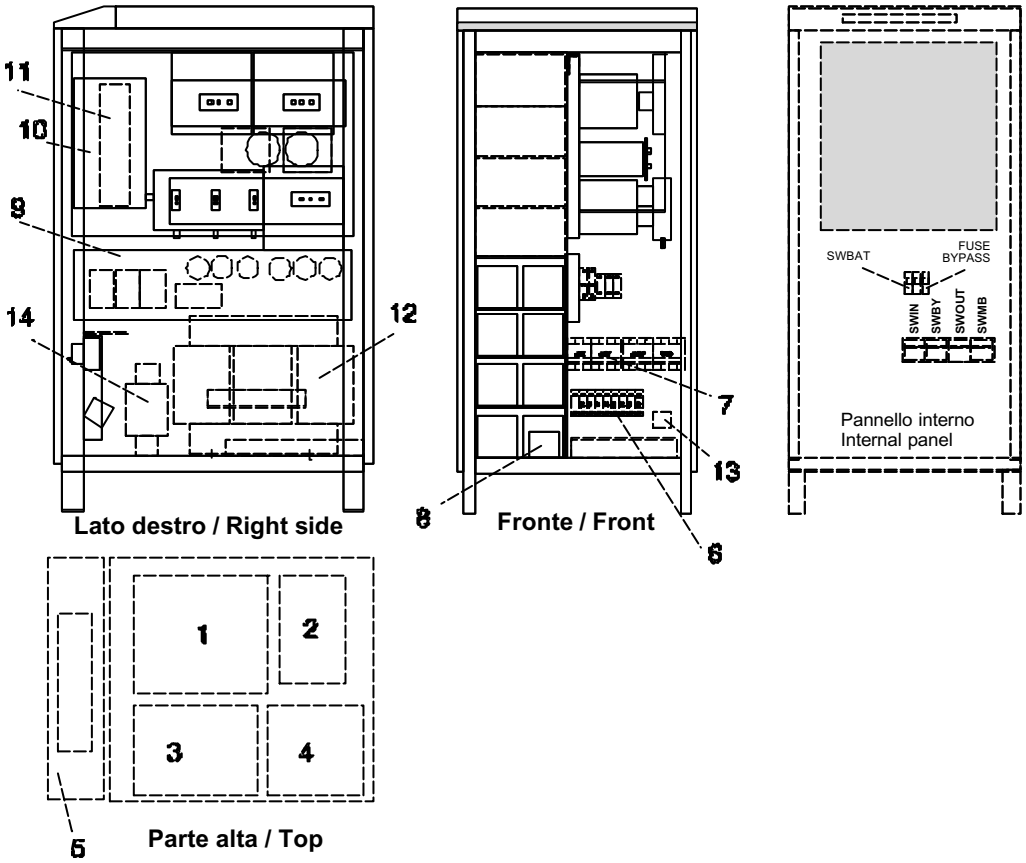
1 BATTERY PACK
2 Battery
3 Battery Cable Connection
4 Battery Box
5 to UPS fuses
6 Battery Pack Cable Connections
7 Switch Fuse Battery

Nr. 8 Batteries tray version



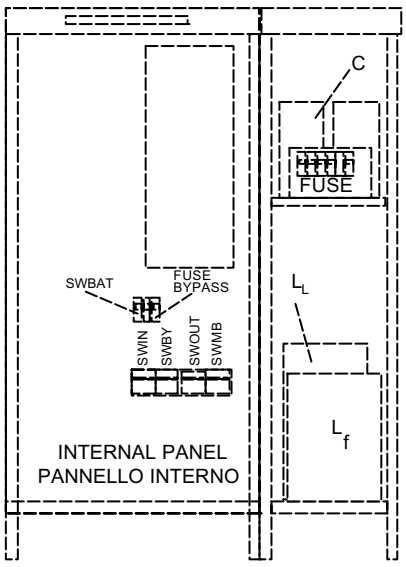
LAY-OUT

8÷20kVA singlephase; 10 ÷ 20kVA 3phase



1	Sistem card
2	Power supply card
3	Interface card
4	Bypass card (3phase only)
5	Command panel
6	Input termal board
7	Breakers
8	Battery fuse
9	Contactor assembly
10	Inverter control card
11	Rectifier control card
12	Transformer
13	REMOTE and RS232 connectors
14	Inductor

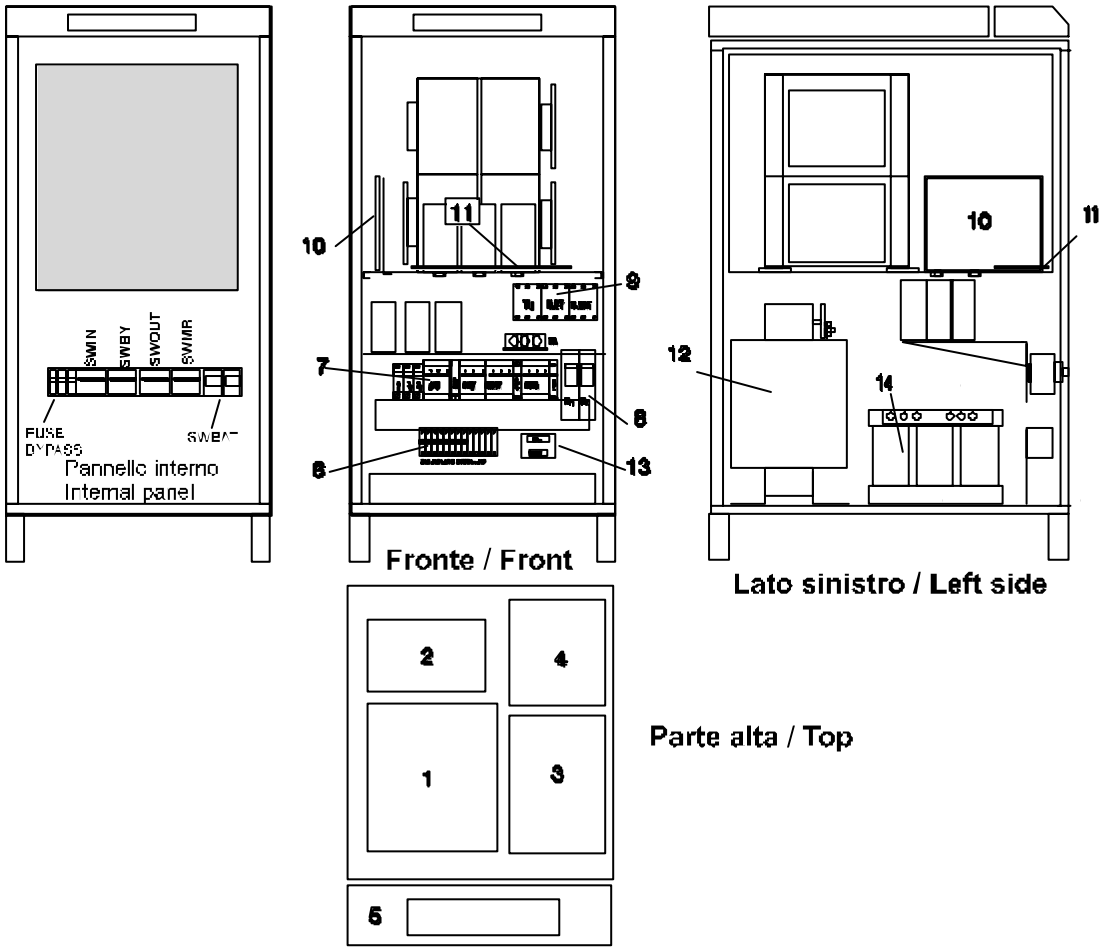
Only with filter version



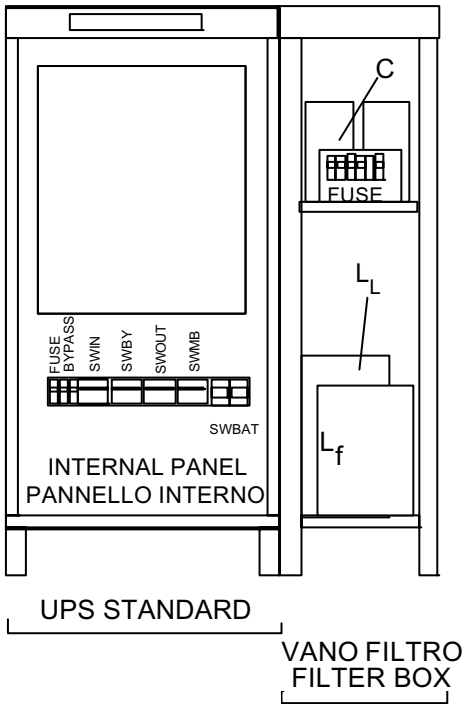
C capacitor

Ll, Lf inductors

30 ÷ 40kVA 3phase



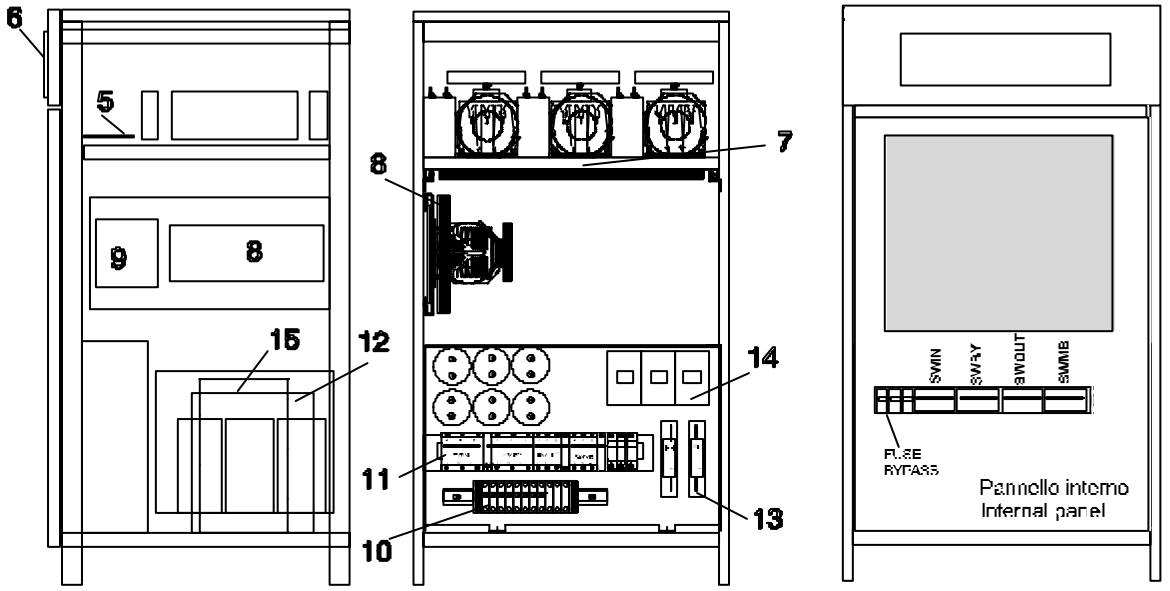
Only with filter version



1	Sistem card
2	Power supply card
3	Interface card
4	Bypass card (3phase only)
5	Command panel
6	Input termal board
7	Breakers
8	Battery fuse
9	Contactor assembly
10	Inverter control card
11	Rectifier control card
12	Transformer
13	REMOTE and RS232 connectors Inductor

C *capa*citor
Ll, Lf inductors

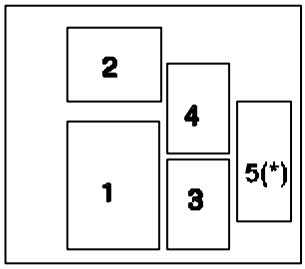
60-80 kVA 3phase



Lato destro / Right side

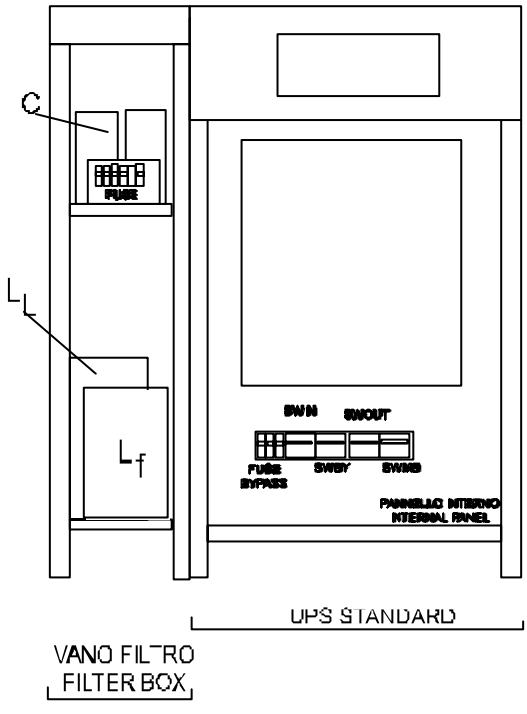
Fronte / Front

Fronte / Front



Parte alta / Top

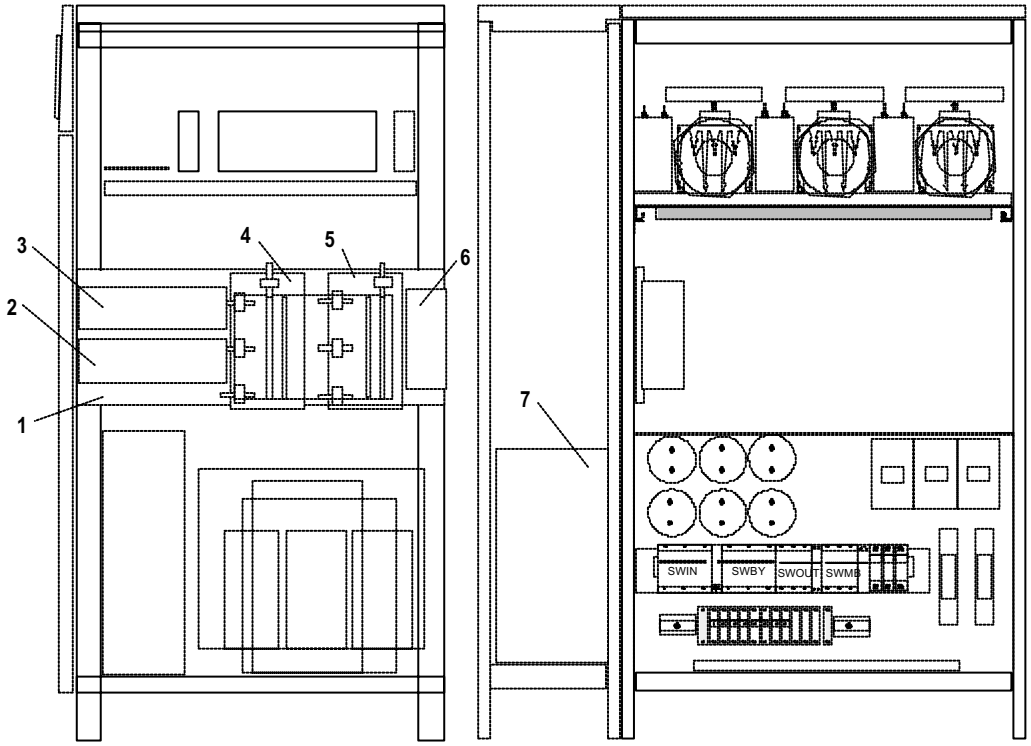
Only with filter version
/solo per versione con filtro



C	capacitor
Ll, Lf	inductors

1	Sistem card
2	Power supply card
3	Interface card
4	Bypass card
5	Inverter control card 60kVA
5(*)	Inverter control card 80kVA
6	Command panel
7	Inverter assembly
8	Rectifier assembly
9	Rectifier control card
10	Input termal board
11	Breakers / Interruttori
12	Inverter transformer
13	Battery fuse
14	Contactor
15	Input inductor

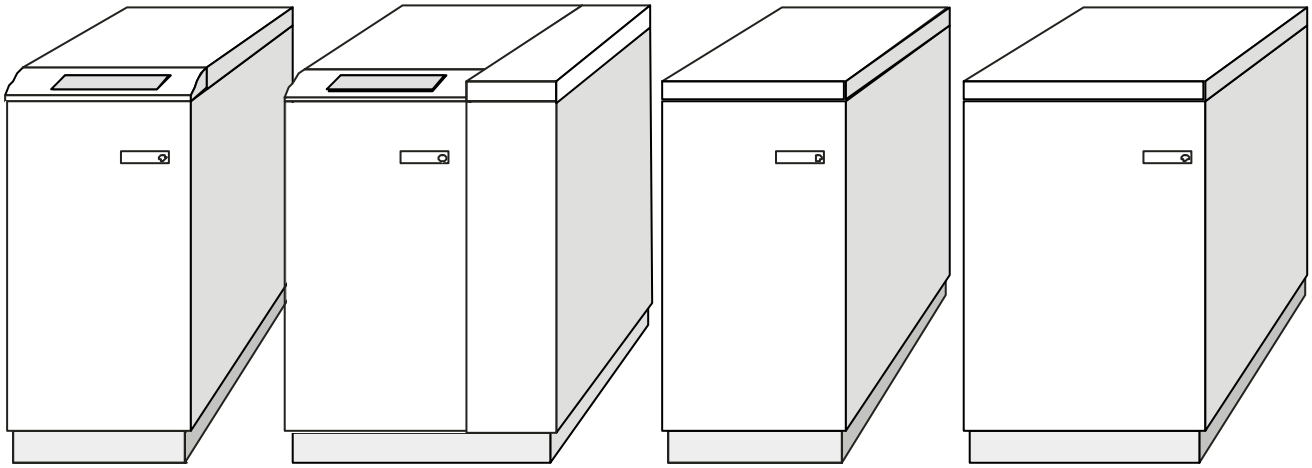
Only for 12-pulse rectifier



1 12-pulse bridge
2 Rectifier slave control card
3 Rectifier master control card
4 Rectifier bridge master
5 Rectifier bridge slave
6 Rectifier fan
7 Input transformer

DIMENSION WEIGHT

8÷40KVA



A **B** **EXP. 1** **EXP. 2**

A	UPS Standard
B	UPS Standard con vano / Standard UPS with box
EXP 1	Armadio batteria max 38Ah / 38Ah max battery cubicle
EXP 2	Armadio batteria max 65Ah / 65Ah max battery cabinet

SINGLEPHASE OUTPUT

P p.f.0.8 [kVA]	Fasi/phases ing/inp	usc/out	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
8	3+N	1+N	A(B)	0		555(825)	720	1200	190(270)
8	3+N	1+N	A(B)	32	7	555(825)	720	1200	287(367)
8	3+N	1+N	A(B)	32	12	555(825)	720	1200	325(405)
8	3+N	1+N	A(B)	32+32	12+12	555(825)	720	1200	460(540)
8	3+N	1+N	A(B)	32+32	12+7	555(825)	720	1200	422(502)
10	3+N	1+N	A(B)	0		555(825)	720	1200	200(280)
10	3+N	1+N	A(B)	32	7	555(825)	720	1200	297(377)
10	3+N	1+N	A(B)	32	12	555(825)	720	1200	335(415)
10	3+N	1+N	A(B)	32+32	12+12	555(825)	720	1200	470(550)
10	3+N	1+N	A(B)	32	12+7	555(825)	720	1200	432(512)
15	3+N	1+N	A(B)	0		555(825)	720	1200	220(315)
15	3+N	1+N	A(B)	32	7	555(825)	720	1200	317(412)
15	3+N	1+N	A(B)	32	12	555(825)	720	1200	355(450)
15	3+N	1+N	A(B)	32+32	12+12	555(825)	720	1200	490(585)
15	3+N	1+N	A(B)	32+32	12+7	555(825)	720	1200	452(547)
20	3+N	1+N	A(B)	0		555(825)	720	1200	230(325)
20	3+N	1+N	A(B)	32	12	555(825)	720	1200	365(460)
20	3+N	1+N	A(B)	32+32	12+12	555(825)	720	1200	500(595)
20	3+N	1+N	A(B)	32+32	12+7	555(825)	720	1200	462(557)

(Values among brackets for versions with harmonics reduction filter only / I valori tra parentesi validi solo per versioni con filtro riduzione armoniche).

THREEPHASE OUTPUT

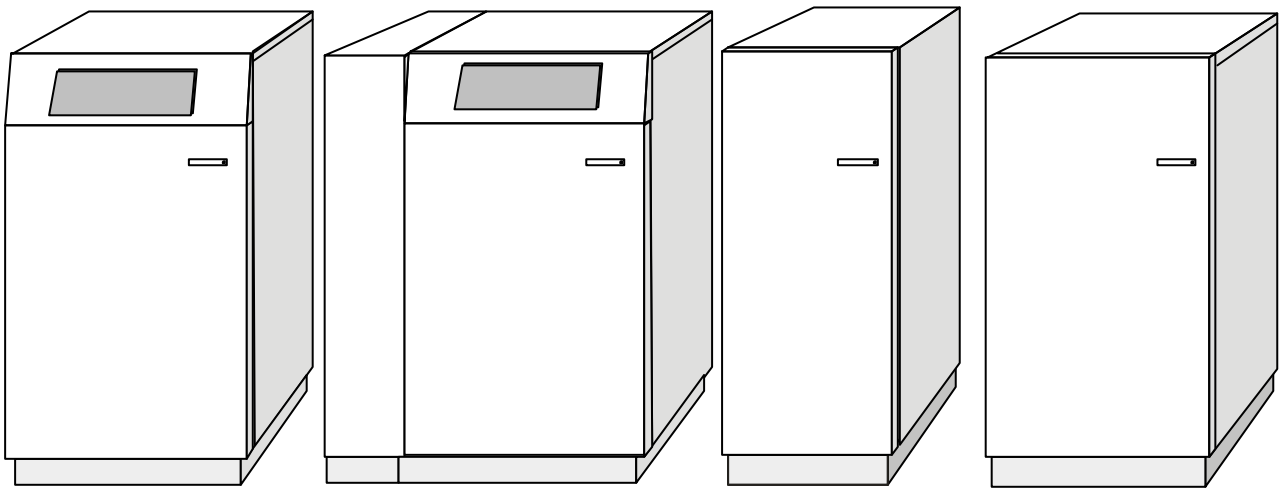
P p.f.0.8 [kVA]	Fasi/phases ing/inp	usc/out	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
10	3+N	3+N	A(B)	0	0	555(825)	720	1200	210(290)
10	3+N	3+N	A(B)	32	12	555(825)	720	1200	345(425)
10	3+N	3+N	A(B)	32+32	12+12	555(825)	720	1200	480(560)
10	3+N	3+N	A(B)	32+32	12+7	555(825)	720	1200	442(522)
15	3+N	3+N	A(B)	0	0	555(825)	720	1200	220(315)
15	3+N	3+N	A(B)	32	12	555(825)	720	1200	355(450)
15	3+N	3+N	A(B)	32+12	12+7	555(825)	720	1200	452(549)
15	3+N	3+N	A(B)	32+32	12+12	555(825)	720	1200	490(585)
20	3+N	3+N	A(B)	0	0	555(825)	720	1200	230(325)
20	3+N	3+N	A(B)	32+32	12 + 7	555(825)	720	1200	462(557)
20	3+N	3+N	A(B)	32+32	12 + 12	555(825)	720	1200	500(595)
30	3+N	3+N	A(B)	0	0	555(825)	720	1200	282(387)
30	3+N	3+N	B	32 + 32	12 + 12	825	720	1200	552
40	3+N	3+N	A(B)	0	0	555(825)	720	1200	330(435)

(Values among brackets for versions with harmonics reduction filter only / I valori tra parentesi validi solo per versioni con filtro riduzione armoniche).

BATTERY CABINET H1200

tipo/type	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
SENZA BATT./WITHOUT BATT.	EXP 1	-	-	555	720	1200	105
CON BATT./WITH BATT.	EXP 1	32	38/40	555	720	1200	563
SENZA BATT./WITHOUT BATT	EXP 2	-	-	860	720	1200	135
CON BATT./WITH BATT.	EXP 2	32	65	860	720	1200	875

60÷ 80KVA



A **B** **EXP. 1** **EXP. 2**

A	UPS Standard
EXP 1	Armadio batteria max 40Ah / 40Ah max battery cubicle
EXP 2	Armadio batteria max 100Ah / 100Ah max battery cabinet

THREEPHASE OUTPUT

P p.f.0.8 [kVA]	Fasi/phases ing/inp	usc/out	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
60	3+N	3+N	A(B)	0	0	800(1070)	740	1400	450(595)
80	3+N	3+N	A(B)	0	0	800(1070)	740	1400	555(700)

(Values among brackets for versions with harmonics reduction filter only / I valori tra parentesi validi solo per versioni con filtro riduzione armoniche).

12-PULSE INPUT

P p.f.0.8 [kVA]	Fasi/phases ing/inp	usc/out	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
60	3+N	3+N	B	0	0	1070	740	1400	600
80	3+N	3+N	B	0	0	1070	740	1400	700

BATTERY CABINET

tipo/type	contenitore cabinet	Nr. batt.12V	batt. cap. Ah	dimensioni/dimensions L/W [mm]	P/D [mm]	H [mm]	pesi/weight [kg]
WITHOUT BATT.	EXP 1	-	-	555	740	1400	120
WITH BATT.	EXP 1	32	38/40	555	740	1400	578
WITHOUT BATT.	EXP 2	-	-	860	740	1400	150
WITH BATT.	EXP 2	32	65	860	740	1400	890