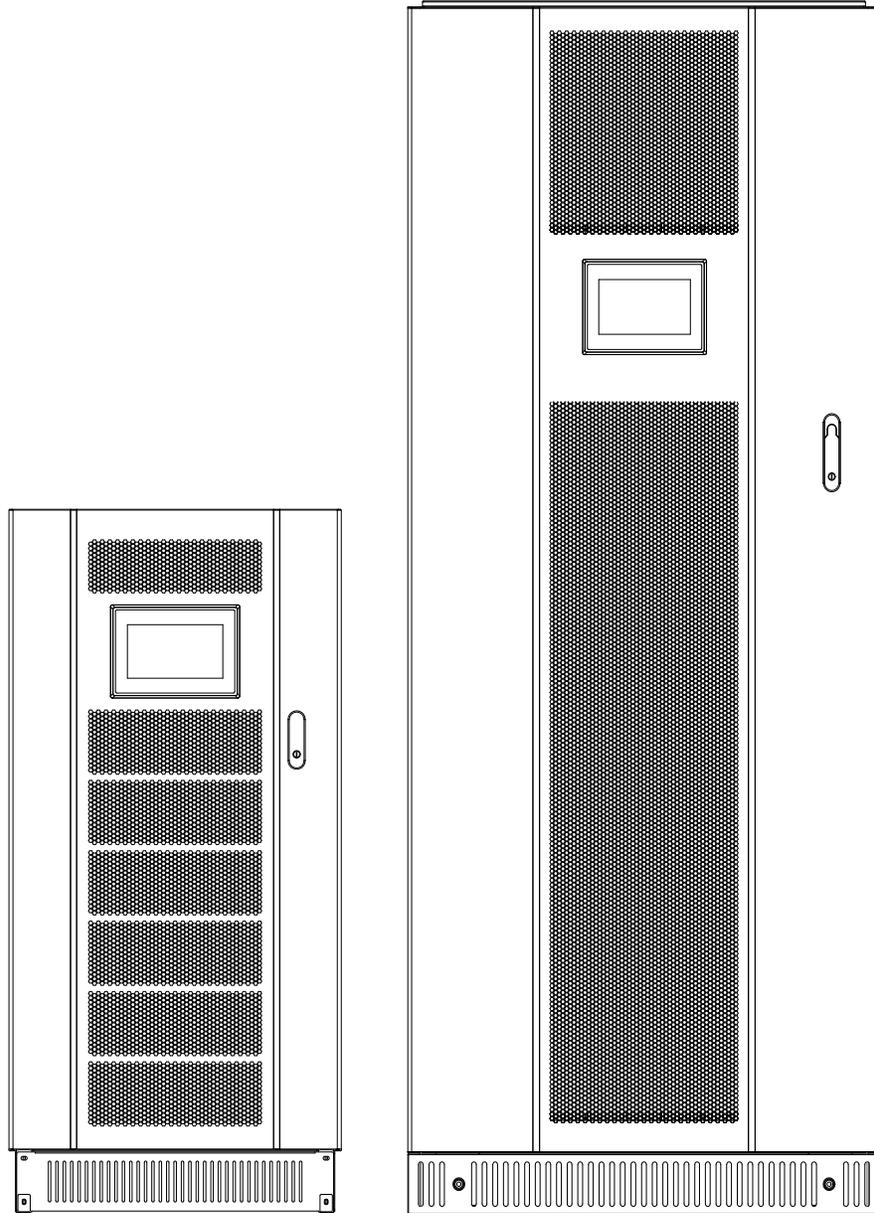


CNG310/CNG330 Series Uninterruptible Power Supply User Manual



**CNG310 8-100kva(3/1)
CNG330 10-250kva(3/3)**

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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 product must not be used unless it is connected to earth.

The first connection to make is the connection between the grounding leas and the terminal indicated with the symbol :



- All maintenance operations inside the product must be carried out only by trained personnel.
- High voltages are present inside the equipment even when the input and battery switch are off.
- If it is necessary to replace the fuses, they must be replaced with other fuses of the same type.(Please refer to the "Setting up Input/Output Wiring" chapter)
- If it is necessary to interrupt the power supply to the utilities, please cut off all the switches located behind the front door, or switch on the "SYSTEM 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. BECAUSE THE BATTERY MAY CONTAIN THE SUBSTANCES TAHT MAY POLLUTE THE ENVIRONMENT.

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 with 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: The product is a class A UPS.

In a residential environment, this product may cause radio interference, in which case the user may be required to take appropriate measures.

Example: When the TV or radio is interfered, this product can be moved to a suitable distance to reduce the interference situation.

STORAGE

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

Temperature: 0 ° -40 ° C (32 ° -104 ° F)

Relative humidity: <95% max

UPS with internal BATTERIES:

The batteries contained in the UPS are subject to self-discharging.

If the UPS is not immediately installed it 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 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, or other dust-like substances in the air.
- 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);

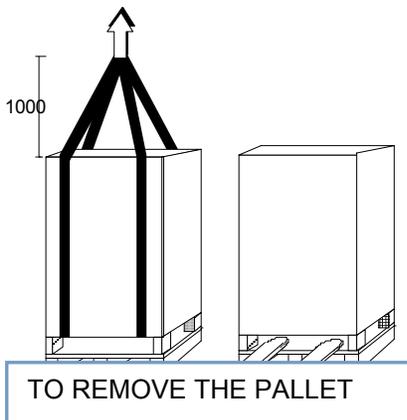
PRELIMINARY OPERATIONS

CHECKING THE PACKING CASE

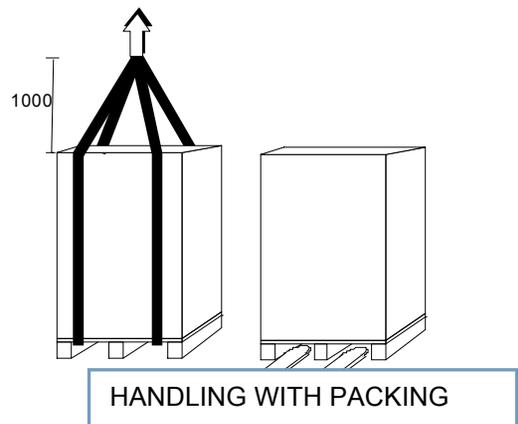
When you receive the UPS check that the packing case has not been damaged during transportation.

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.



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).

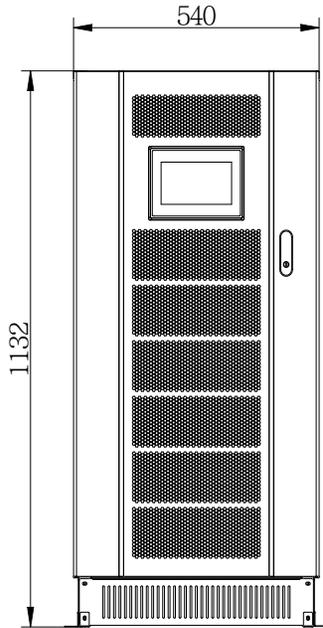
POSITIONING

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

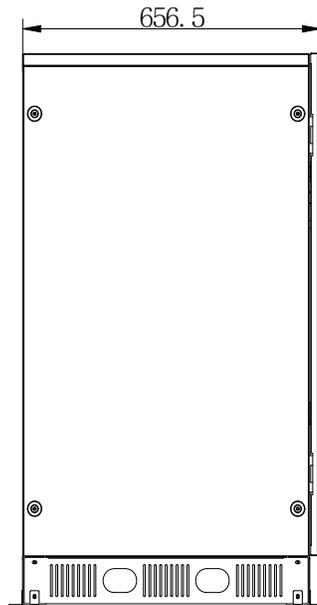
- A space of at least one metre must be kept in front of the machine to leave plenty of room for maintenance operations.
- A space of at least 20 cm. Must be left between the back of the UPS and the wall so as not to block the flow of air from the fans, and at least 40 cm. For maintenance operations 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 back of the UPS.

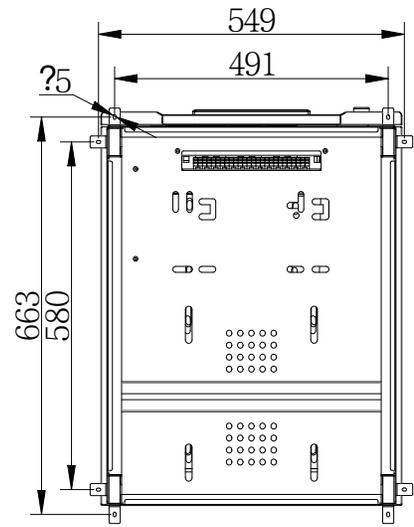
- UPS 8 - 40kVA



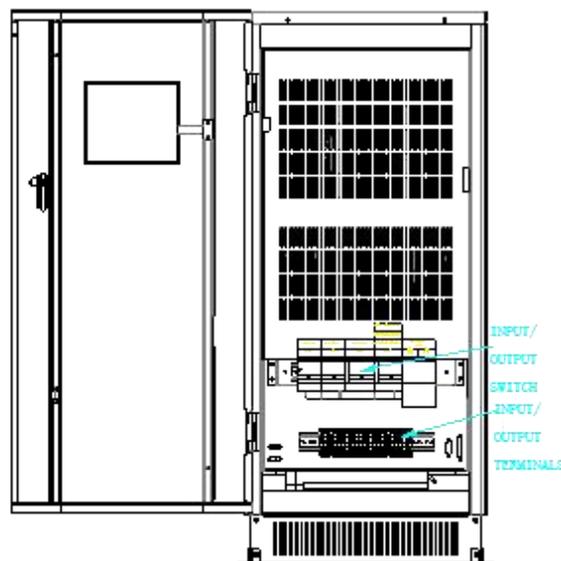
FRONT



SIDE

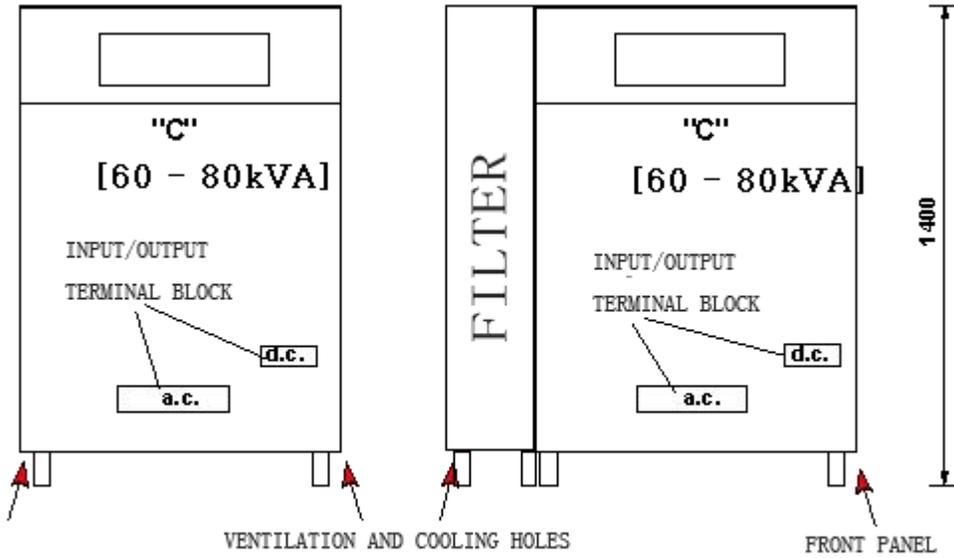


BOTTOM

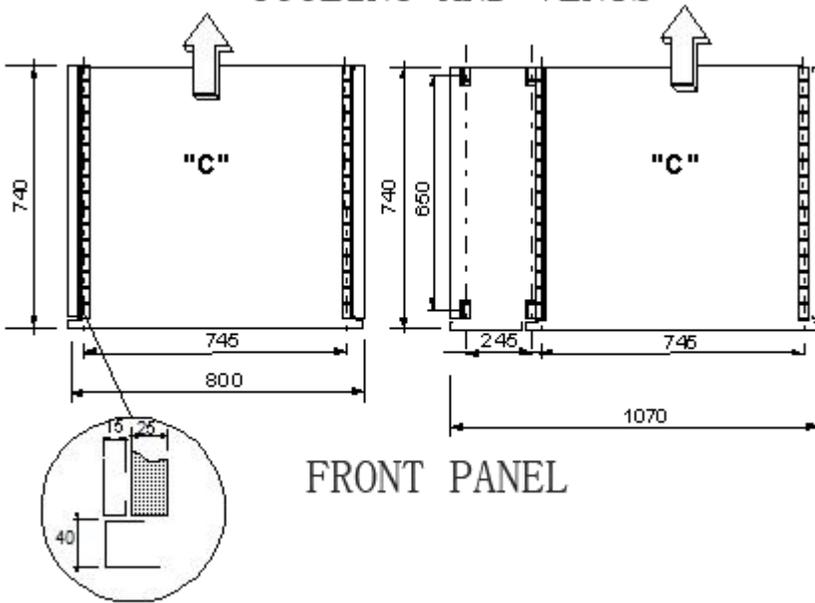


FRONT DOOR OPEN

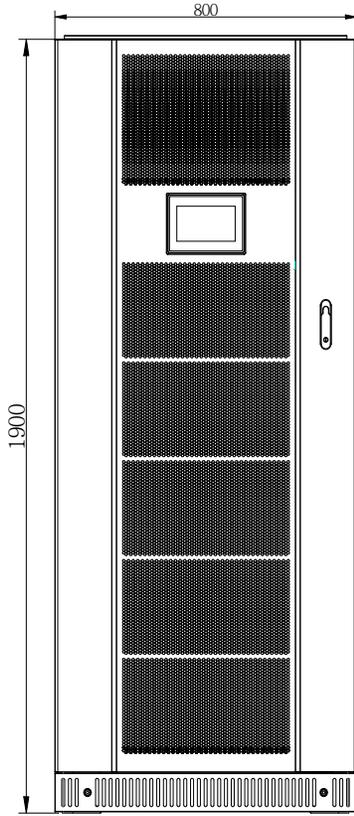
- UPS 60 - 80kVA



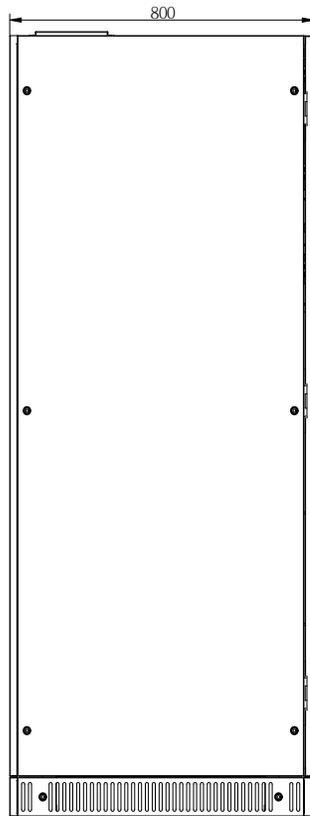
COOLING AND VENTS



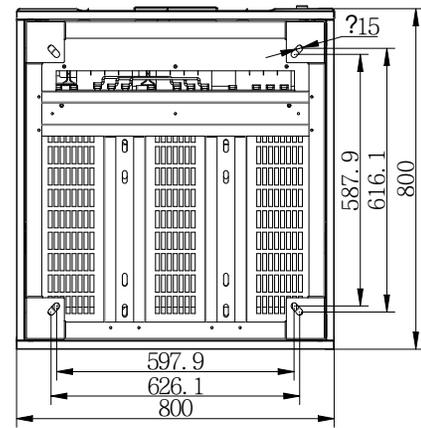
- UPS 100 - 120kVA



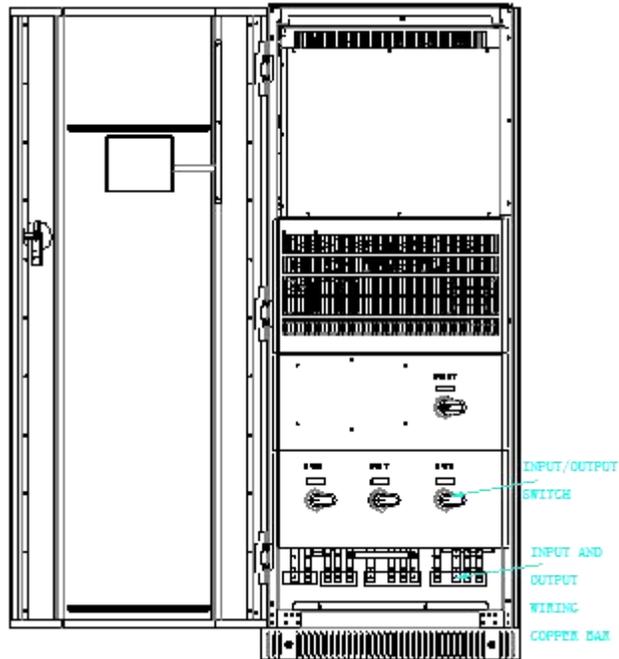
FRONT



SIDE

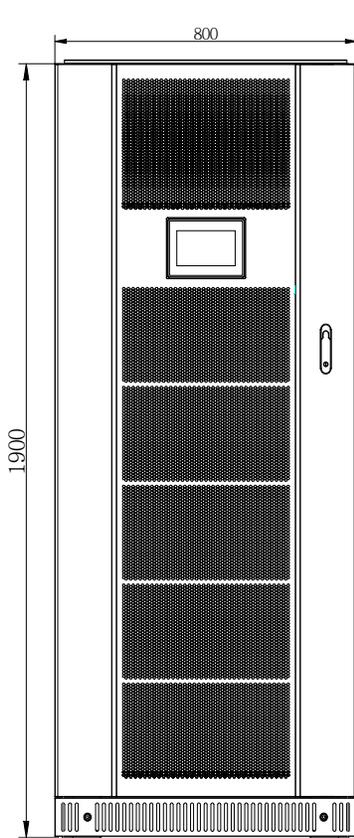


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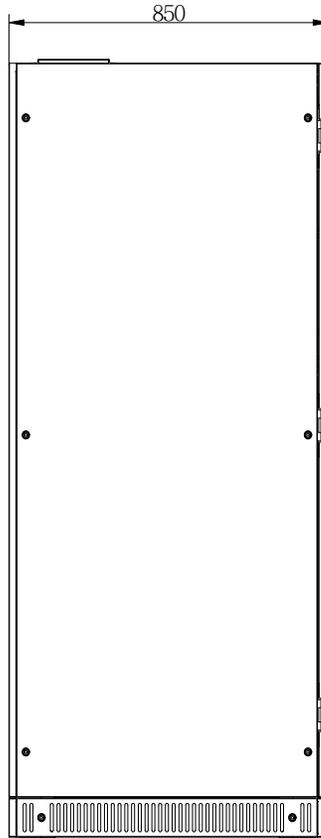


FRONT DOOR OPEN

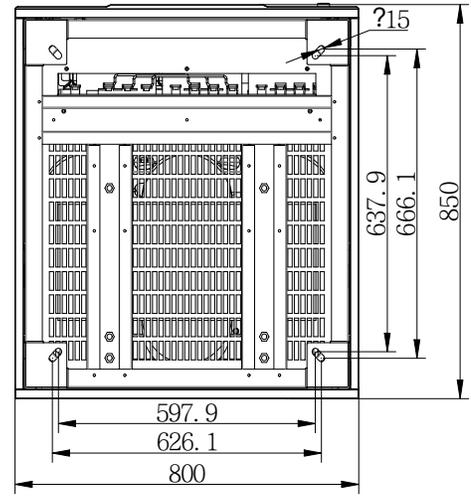
- UPS 160 - 200kVA



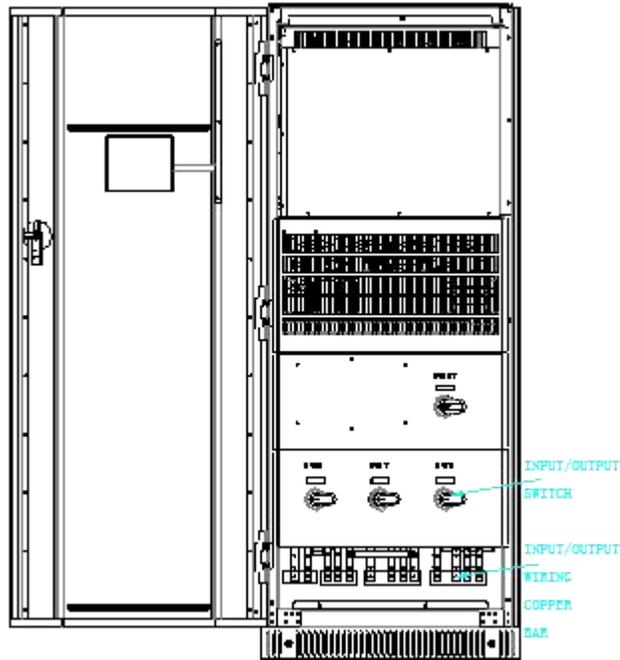
FRONT



SIDE



BOTTOM



FRONT DOOR OPEN

SETTING UP INPUT/OUTPUT WIRING

PROTECTION

Inside the UPS.

The size of the switches and fuses installed on the UPS input/output lines are given below. 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:

8-100K Internal Protections								
UPS Type	Breakers Plastic case switch for models above 80K		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	20A(3P) type C	20A(3P) type C		32A(10x38)	25A(10x38)gG	15	29
10	32A(3P) type C	32A(3P) type C	32A(3P) type C		32A(10x38)	25A(10x38)gG	18	36
15	32A(3P) type C	32A(3P) type C	32A(3P) type C		50A(14x51)	25A(10x38)gG	27	55
20	40A(3P) type C	40A(3P) type C	40A(3P) type C		80A(22x58)	25A(10x38)gG	36	73
30	63A(3P) type C	63A(3P) type C	63A(3P) type C		100A(22x58)	32A(10x38)gG	55	109
40	63A(3P) type C	63A(3P) type C	63A(3P) type C		100A(22x58)	32A(10x38)gG	63	145
60	100A(3P) type C	100A(3P) type C	100A(3P) type C		160A (NHO)	32A(10x38)gG	100	218
80	125A(3P) type C	125A(3P) type C	125A(3P) type C		160A (NHO)	32A(10x38)gG	125	290
100	225A(3P) type F	225A(3P) type F	225A(3P) type F		250A (NHO)	100A(22x58)gG	182	364

THREE PHASE OUTPUT:

10-80K Internal protections								
UPS Type [kVA]	breakers (Isolation switch for models above 80k)		Switch		Battery fuse	By-pass fuse	Max. Input Current	Rated output current
	Input rectifier	By-pass line input					[A]	[A]
	SWIN	SWBY	SWOUT	SWMB	FB1/2	FSCR	max	Nominal
10	20A(3P) type C	20A(3P) type C	20A(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	40A(3P)		80A(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	80A(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

100-250K Internal protections										
UPS Type [KVA]	Rectifier input fuse	Switch				Battery fuse	By-pass fuse	Max, Input current	Input protection	Output current
	FL 1,2,3	SWIN	SWBY	SWOUT	SWMB	FB1/2	FSCR	max	Min	Nominal
100	160A (NHO) Gg 500 Vac	250 A (3P)				160A (NHO) Gg 500 Vac	355 A LMT 240Vdc	160A	160A	145A
120	200A (NHO) Gg 500 Vac	250 A (3P)				200A (NHO) Gg 500 Vac	355 A LMT 240Vdc	192A	200A	174A
160	250A (NHO) Gg 500Vac	250 A (3P)				250A (NHO) Gg 500 Vac	400 A LMT 240Vdc	250A	250A	232A
200	315 A (NH2)Gg 500Vac	315A(3P)				400A 500Vac	400 A LMT 240Vdc	310A	315A	290A

250	400 A (NH2)Gg 500Vac	400A(3P)	550A 500Vac	400 A LMT 240Vdc	380A	400A	304A
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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, I_n , 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	30	40	50	60	80	100
Max. Current Fuse gG in UPS output[A]	10	12	16	20	30	40	50	60	80	100
1) for selectivity in BATTERY OPERATION	32	32	50	50	60	80	100	120	160	200
2) for selectivity in NORMAL OPERATION										

- THREE PHASE OUTPUT UPS

[KVA]	10	15	20	30	40	60	80	100	120	160	200	250
Max. Current fuse gG in UPS output[A]	6	6	10	12	16	20	25	35	40	55	80	100
1) for selectivity in “BATTERY OPERATION”	10	10	16	32	35	50	50	80	80	120	160	200
2) for selectivity in “NORMAL OPERATION”												

LEAKAGE CURRENT CIRCUIT BREAKER

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.

* When the input and output neutral lines are connected together, the power system of the front and rear stages of the UPS is consistent.

- 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.)

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

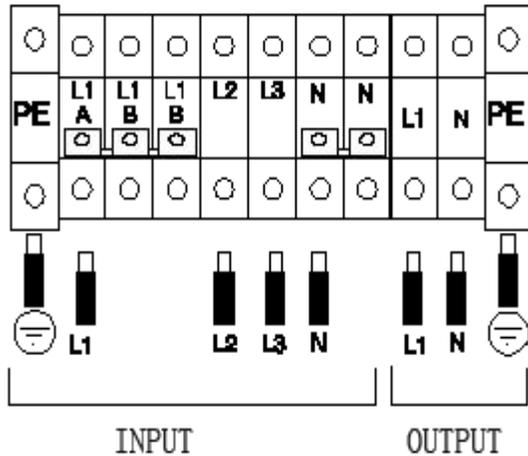
CONNECTIONS

When wiring, please make sure that the UPS is completely disconnected from the mains or input power and all switches are turned off (OPEN)!

**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 - 100 kVA (INPUT THREE PHASE WITH NEUTRAL)

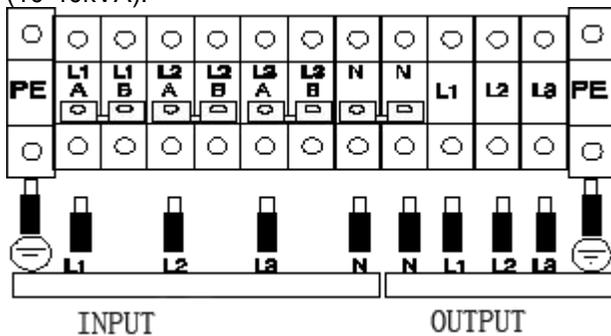


The jumper shown in figure is already in place.
For input and output wire size refer to the following table
(between brackets max. wire size):

kVA	Size [mm ²]				
	INPUT			OUTPUT	
	L1	L2/L3	N	PE	L1/N
8	10	6	10	6	10
10	10	6	10	6	10
15	16	10	16	6	16
20	25	10	25	6	25
30	35	10	25	6	35
40	50	16	35	6	50
60	75	25	50	10	75
80	75	25	75	10	75
100	95	35	90	10	95

THREE PHASE OUTPUT 10 - 250 kVA (INPUT THREE PHASE WITH NEUTRAL)

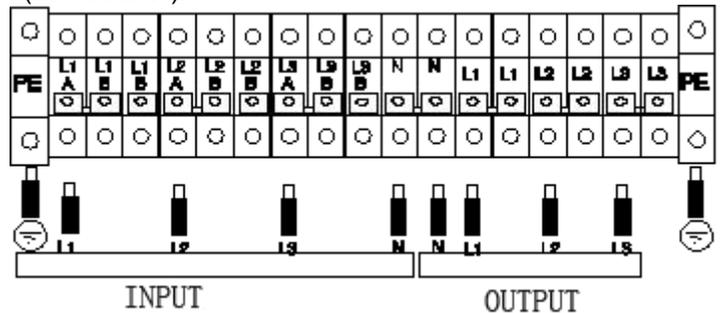
(10-40kVA):



INPUT/OUTPUT terminal block wiring diagram

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):

INPUT/OUTPUT terminal block wiring diagram
(60 - 80 kVA):

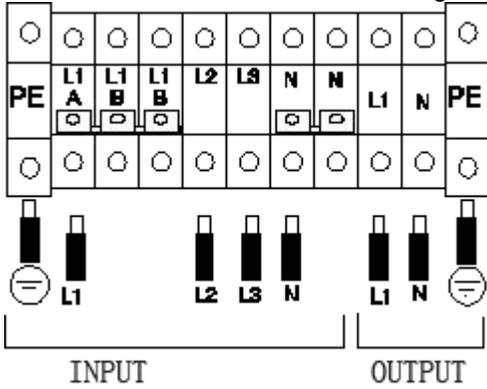


kVA	Size.[mm 平方]		
	Input	Output	
	L1/L2/L3/N	PE	L1/L2/L3/N
10	6	6	6
15	6	6	6
20	10	6	10
30	10	10	10
40	16	10	16
60	25	10	25
80	25	16	25
100	35	16	35
120	50	16	50
160	75	16	75
200	95	16	95
250	120	25	120

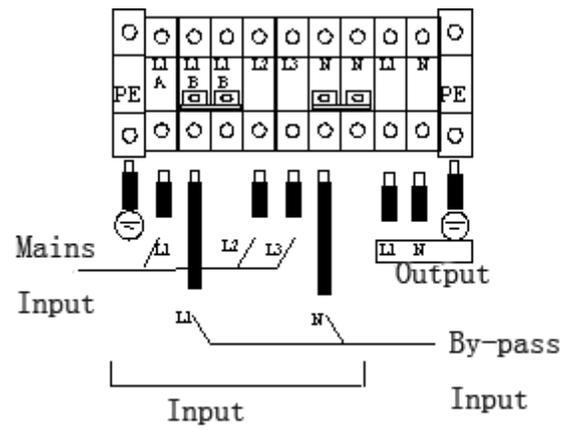
DUAL INPUT WIRING

SINGLE PHASE OUTPUT 8 - 100 kVA:

INPUT/OUTPUT terminal block wiring diagram (Original input wiring)



- Change to new dual input wiring:
- Remove jumper L1A-L1B-L1B
 - Cut three positions jumper (transform it in two positions jumper)
 - Place two position jumper as following indicated:



Mains line L1 terminal L1A
 L2 terminal L2
 L3 terminal L3

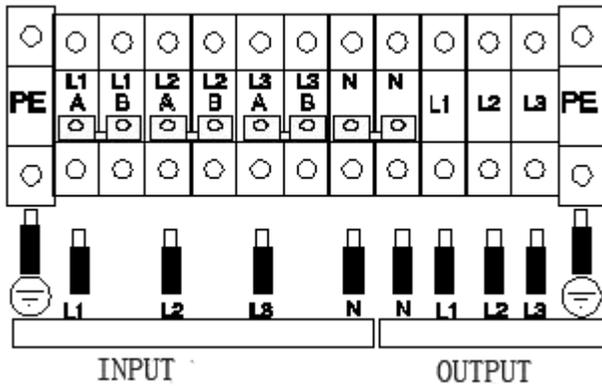
Bypass line L1 terminal L1B
 N terminal N

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

	Size. [mmq]			
	Main input	Bypass input	Ground wire	Output
	L1A/L2/L3	L1B/N	PE	L1/N
8 KVA	6	10	6	10
10 KVA	6	10	6	10
15 KVA	10	16	10	16
20 KVA	10	25	10	25
30 KVA	10	35	10	35
40 KVA	16	35	10	35
60 KVA	25	75	16	75
80 KVA	25	75	16	75
100 KVA	35	95	16	95

THREE PHASE OUTPUT 10 -250 KVA

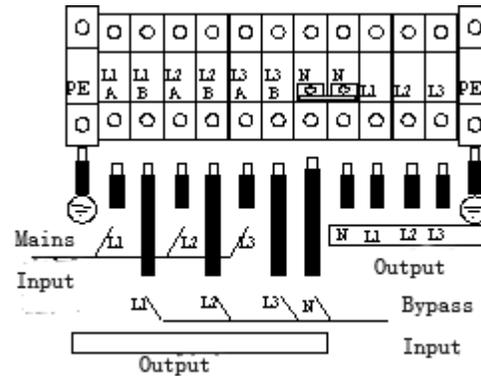
INPUT/OUTPUT terminal block wiring diagram (Original input wiring):



Change to new dual input wiring:

- Remove jumpers L1A-L1B, L2A-L2B, L3A-L3B
- Change the mains and bypass inputs to separate inputs (as shown in the figure below)

Mains and Bypass line separate:



Mains Input L1 terminal L1A
 L2 terminal L2A
 L3 terminal L3A

Bypass Input L1 terminal L1B
 L2 terminal L2B
 L3 terminal L3B
 N terminal N

* Neutral cable is indispensable.

	Size. [mmq]		
	Input	PE	Output
	L1-L2-L3/A/B/N		L1/L2/L3/N
10KVA	6	6	6
15KVA	6	6	6
20 KVA	10	6	10
30 KVA	10	6	10
40 KVA	16	10	16
60KVA	35	10	25
80KVA	35	10	35
100KVA	35	10	35
120KVA	50	10	50
160KVA	75	16	75
200KVA	95	16	95
250KVA	120	25	120

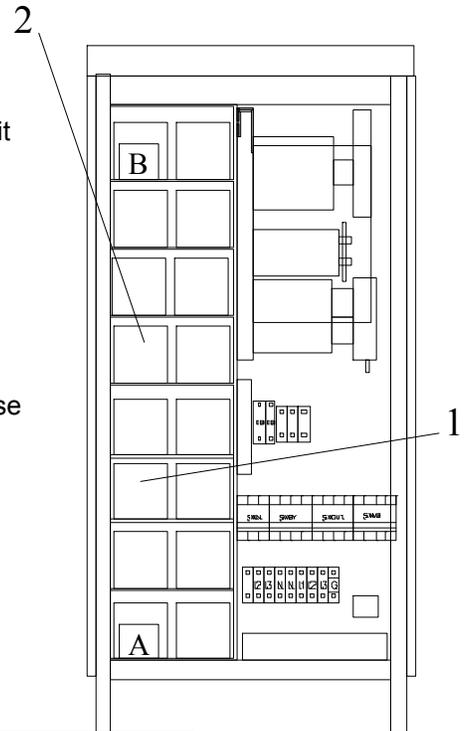
BATTERY CONNECTION

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

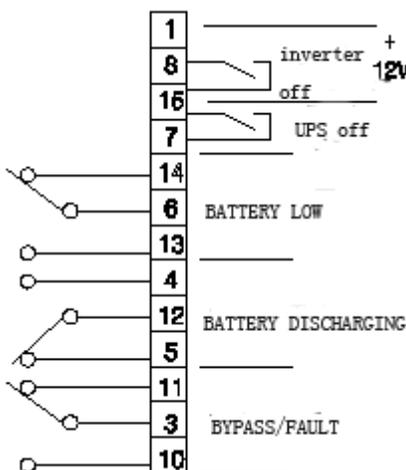
Use the appropriate wire size to install the external battery correctly. Please refer to the table below for the wire size.



SINGLE PHASE UPS	Size [mmq]
kVA	+/-
8	6
10	6
15	6
20	16
30	16
40	25
60	35
80	50
100	95

THREE PHASE UPS	Size [mmq]
kVA	+/-
10	6
15	6
20	16
30	16
40	25
60	35
80	50
100	95
120	95
160	120
200	120
250	95*2

REMOVE CONTROL AND SIGNALS



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

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

15-pin female marked REMOTE.

- Nr. 1 aux power 12Vdc 80mA(max)
 - Nr. 3 Common contact
 - 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 reactivate, press key 8 on the control panel to return to normal operation mode. When the system is completely shut down and reactivated, it will return to the operating mode before the shutdown, so it must be switched to normal mode using key 8 of the control panel. To reactivate the UPS, please turn the On/Off SWBY switch once (reset).

DB9-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.

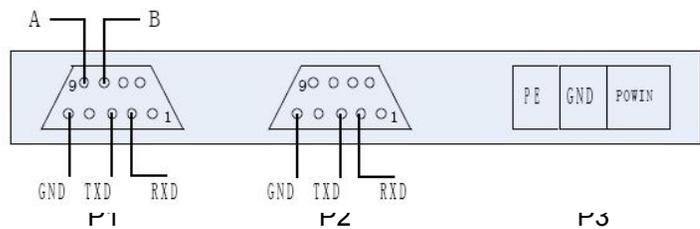
Recommended

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):

	UPS		Computer
	P1, 9pin female		COM, 9 pin female(computer)
	pin 2	to	pin 2
	Pin 3	to	pin 3
	Pin 5	to	pin 5
RS485 contact	UPS		
	P1, 9pin female		
	pin 9	to	A
	Pin 8	to	B
	Pin 5	to	GND



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:

- Close the switches located in input of the continuity unit.
- Close the battery cabinet switches (first check the polarity of the connection)
- 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.

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.

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).

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) 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. :

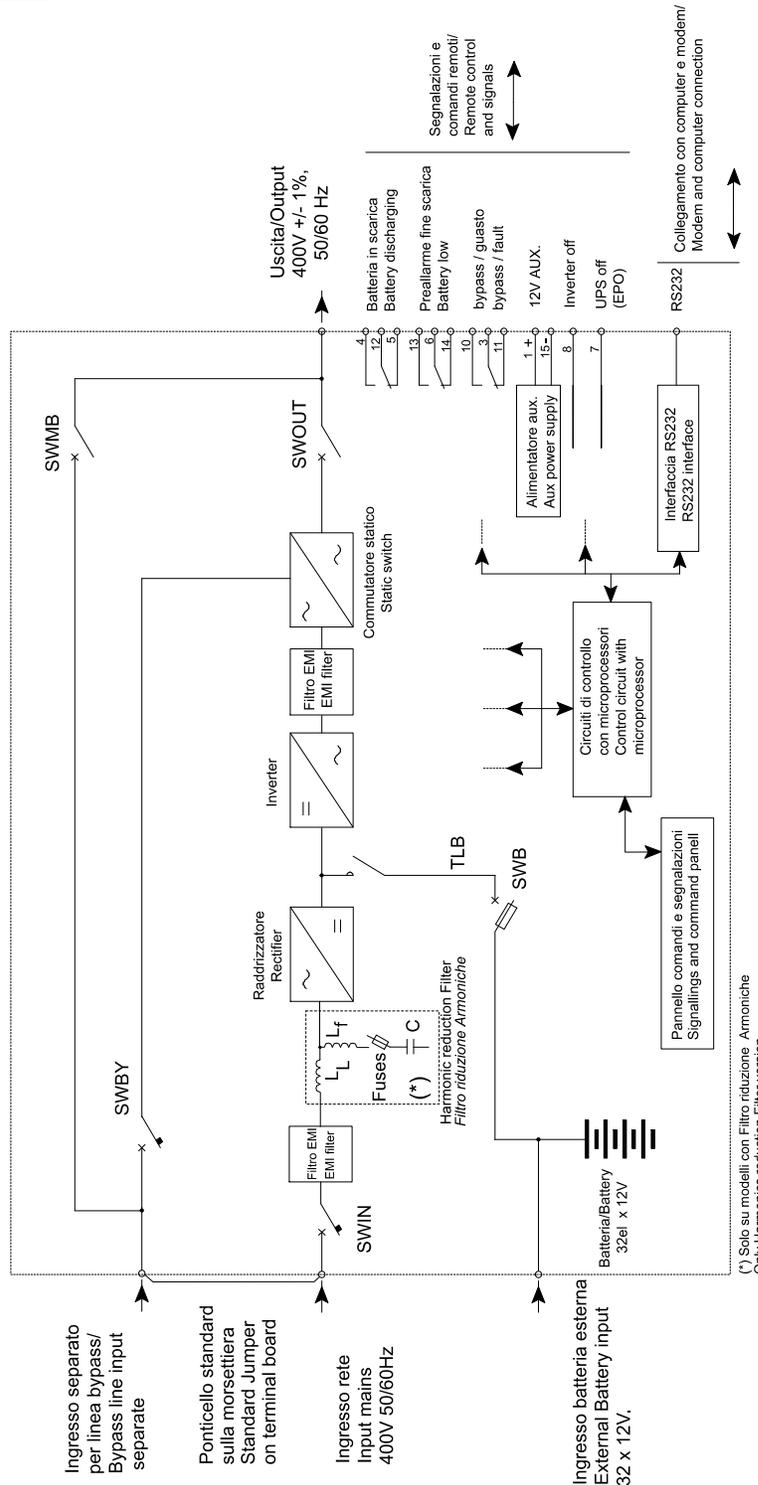
It is possible to customise the following values:

- 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)

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

MODES OF OPERATION

BLOCK DIAGRAM



(*) Solo su modelli con Filtro riduzione Armoniche
Only Harmonics reduction Filter version

BLOCK DIAGRAM COMPONENTS

The UPS consists of the following subassemblies:

RECTIFIER

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. Float to 80% first, then charge at constant voltage.

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.

EXTERNAL BATTERY

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

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.

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. The SCR are protect by FSCR fuses.

SWMB

Maintenance switch, by closing the SWMB and opening the other switches SWIN, SWBY, SWOUT the UPS is excluded, maintaining the output feed.

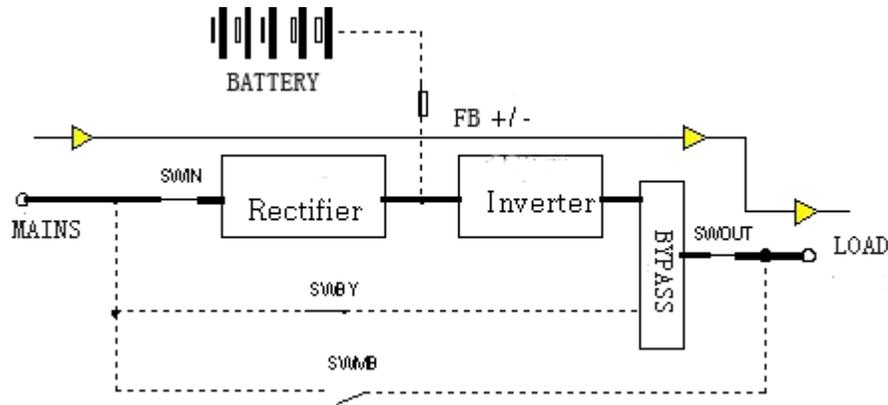
This operation is necessary when you have to carry out maintenance operations inside the equipment, without being obliged to interrupt the power feed.

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.

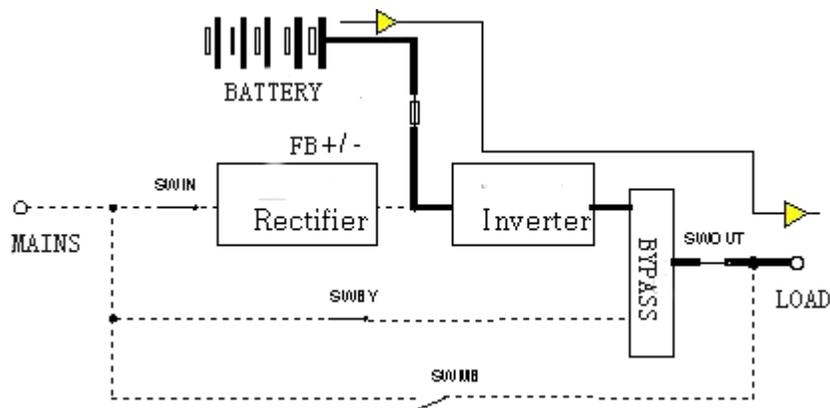


The connected equipment is powered by the inverter which receives the necessary energy from the mains through the rectifier.

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 alphanumeric 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.

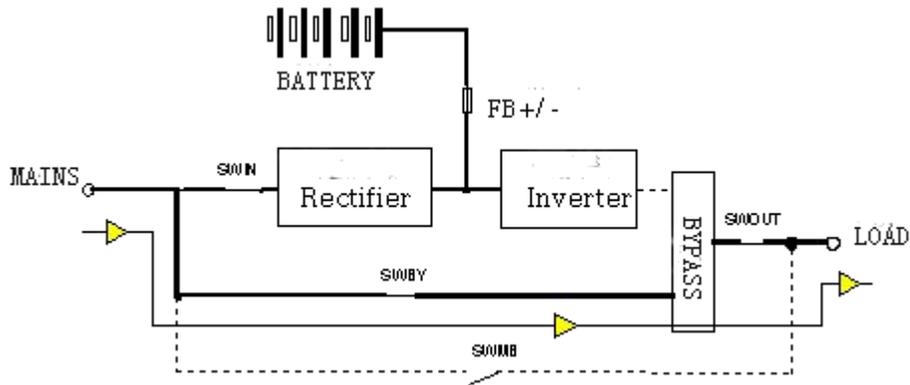
When the remaining time drops below the preset value as LOW BATTERY alarm, the buzzer increases in frequency while the yellow BATTERY LED goes to flashing. Under this condition it is wise to save any work under way. When the mains failure continues and the battery exhausts its energy, the UPS cuts off power to the loads.

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

OPERATION OF THE BYPASS 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.



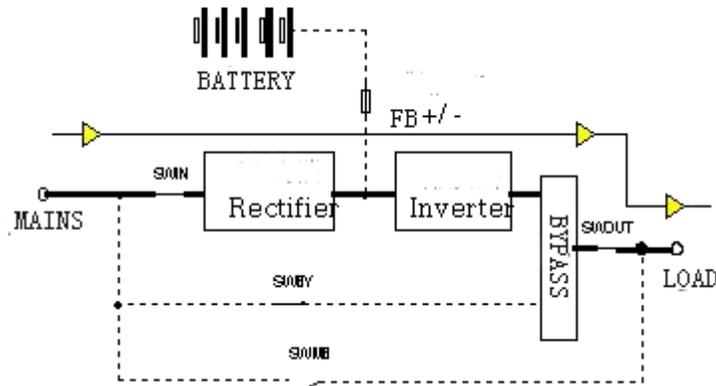
The UPS can find itself in this condition due to one of the following events:

- 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 BYPASS 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.

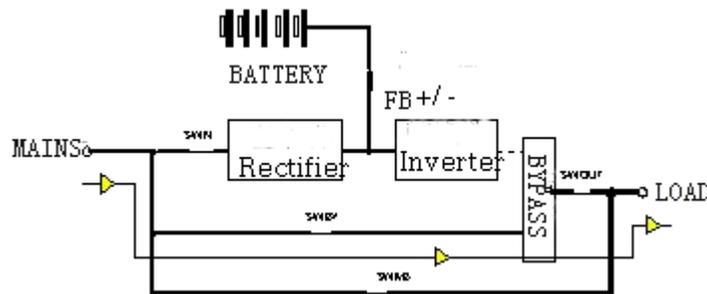
In case of a load greater than the nominal (overload) you will have to intervene to reduce it, otherwise the automatic breakers on the by-pass line will intervene, turning off the output (for times of intervention consult the SPECIFICATIONS paragraph).

BYPASS FOR MAINTENANCE SWMB

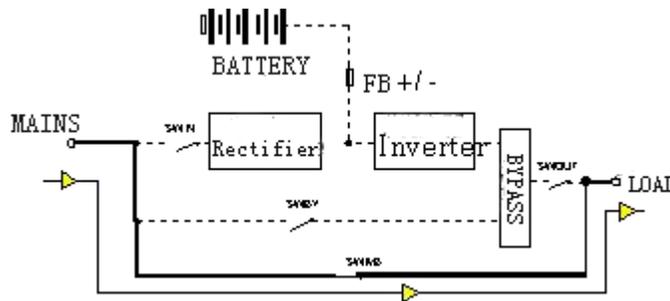


Series of operations to be carried out to place the UPS in maintenance by-pass to carry out maintenance operations on equipment while maintaining the fed load:

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 deactivated).

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 type menu 3.2 BATTERY TEST). Battery life depends on operating temperature ($20\pm 25^{\circ}\text{C}$) 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 $20\text{-}25^{\circ}\text{C}$.
- 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.

SPECIFICATIONS
SINGLE PHASE OUTPUT MODELS
SYSTEM

Rated power [kVA]	8	10	15	20	30	40	60	80	100
Output Power [KW]	6.4	8	12	16	24	32	48	64	80
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 with standard UPS	90	90	90	91	91	92	92	92	92
Full load	88	88	88	88	88	88	89	89	89
Half load									
Leakage Current (mA) max.	100.								
MTBF:	200,000 hours.								
Remote Signaling	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)								
Operating Altitude	4000 m (For places higher than 1000m, the output will be -1% of the nominal value for every 100m higher)								
Cooling	Forced ventilation (fan speed function of the load)								
Acoustic noise, as measured at 1m from front of equipment (depend on load and temperature) dBA	48 - 54		53 - 60		48 - 54		53 - 60		60- 65
Degree of protection	IP20								
Wiring	Bottom and back								
Cable input	Bottom/upper/side								
Applicable Standards	Safety EN 50091-1, Electromagnetic Compatibility EN50091-2 Class A								
Standard	BACKFEED PROTECTION								
Optional	Harmonic reduction filter/12 pulse rectifier, insulation transformer on bypass line (external cabinet).								

RECTIFIER INPUT (NORMAL)

Rated power [kVA]	8	10	15	20	30	40	60	80	100
Rated Voltage	380/400/415V 3 相								
Number of phase	3								
Voltage tolerance	± 20 %								
Rated Frequency	50 / 60 Hz auto learning								
Frequency tolerance	45 - 65								
soft start	0 - 100% 10s								
Max. Input current[A]	15	18	27	36	54	72	108	144	182
Current distortion	30 %								
Power factor	0.8								

Rectifier standard with harmonic reduction filter (optional)						
Current Distortion (at rated voltage and 100% output load)	8%					
Total harmonic distortion, power factor and load relationship (at rated input voltage):	Load	Distortion	8%	p.f. 0.9	5% p.f. 0.92	
	100%		12%	0.94		
	50%		25%	0.96	9% 0.99	
	30%				16% 0.9	
Harmonic distortion, power factor and load relationship (100% load):	Input Voltage	Distortion	8%	p.f. 0.9	5% p.f. 0.	
	100%		5%		9	
	86%		11%	0.94	4% 0.97	
	114%			0.84	7% 0.87	
Rectifier with 12 pulse input (optional)						
Current Distortion (at rated voltage and 100% output load)	8%					
Total harmonic distortion, power factor and load relationship (at rated input voltage):	Load	100%	Distortion	8%	p.f. 0.9	
		50%		12%	0.8	
		30%		11%	0.75	
Harmonic distortion, power factor and input voltage relationship (100% load):	Input	100%	Distortion	8%	p.f. 0.8	
		86%		7%	0.9	
		114%		9%	0.7	

FILTER OUTPUT

	8	10	15	20	30	40	60	80	100
Maintenance Voltage (20°C)	Battery Type 1 and 2 : V =435Vdc (2,26 x el.) 3: V =424Vdc (2,2 x el.) 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.) 3: V (recharge <95%)=460Vdc (2,4 x el.) 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 charged state) A	16	20	30	40	60	80	120	160	200
Max. Current A	20	24	36	48	72	96	140	180	225

BATTERY

	8	10	15	20	30	40	60	80	100
Battery type	Lead sealed								
blocks / element number	2V-192 / 12V/32								
end of discharge voltage	Battery Type 1,2 and 3: Vmin=346 Battery current=0 Vmin=316 out. battery current=Ah capacity of the battery Vmin=306 " " " " " " 0 : default Vmin=320Vdc; sectable Vmin=300-360V								
Recharge current	0,2A x C10								
Max. charge current [A]	1,5	2	3	4	6	8	12	20	30

(with rated max. load)									
Max. charge current/with load at.... [A] / %	9 / 50%	9 / 60%	9 / 70%	19 / 60%	19 / 70%	35 / 60	35 / 70%	35 / 80%	35 / 80%

INVERTER OUTPUT

Rated power [kVA]	8	10	15	20	30	40	60	80	100
Output power [kW]	6,4	8	12	16	24	32	48	64	80
Number of phases	1								
Rated voltage [V]	220/230/240V								
Rated current [A]	35	43	65	87	130	174	260	348	435
Phase voltage setting	200 - 244 V (control panel)								
crest factor (I _{peak} /I _{rms})	3 : 1								
Wave form	sinusoidal								
Distortion with linear load	3 %								
Distortion with nonlinear load (peak factor 3:1)	8 %								
Voltage stability(steady state)	± 1 %								
Voltage stability(transient state)	± 5 % into 5 ms						± 5 % into 10 ms		
Rated frequency	The same of the input								
Frequency stability:									
With synchronization	± 0.05 %								
Without synchronization	±2 % (settable ± 1 % on the control panel)								
overload	110/125/150% rated current 300 / 10 / 1								
Short circuit current for 0.1s	2 times the input current								
Inverter efficiency % (load 100%)	92	93	93	93	92	92	92	92	93

BYPASS

Rated power [kVA]	8	10	15	20	30	40	60	80	100
Rated current	35	43	65	87	130	174	261	348	435
Rated voltage	220/230/240V								
Number of phases	1								
Input voltage tolerance	±15 % (settable ± 10 % , ± 15 %from control panel)								
Rated frequency	50 / 60 Hz (auto learning)								
Input frequency tolerance	±2 % (settable ± 5 %from control panel)								
Inverter/Bypass transfer switch time (overload)	0 ms								
inverter/bypass transfer switch time (fault inverter)	1 ms								
Overload capacity %I _n									
1h	1,2	1,2	1,2	1,2	1,2	1,3	1,2	1,2	1,2
10 min.	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3
1 min.	1,4	1,5	1,4	1,5	1,4	2	1,8	1,8	1,8
1s-20ms	10	10	10	10	10	8	8	8	8
10ms	14	14	14	14	14	12	11	11	11

THREE PHASE OUTPUT MODELS SYSTEM

Rated power [kVA]	10	15	20	30	40	60	80	100	120	160	200	250
Output power [KW]	8	12	16	24	32	48	64	80	96	128	160	200
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	90	90	91	91	92	92	92	93	93	94	94	94
Full load												
Half load	88	88	89	89	90	91	91	91	91	91	91	91
Leakage current max. (mA)	100.											
MTBF:	200,000 hours.											
Remote signaling	Three tension free exchange contacts (battery low, battery discharging, by-pass/fault); output 12Vdc 80mA											
Remote control	EPO and bypass											
Computer interface	RS232/C											
Operating temperature	0 - 40 °C											
Relative humidity max.	95 % (without condensate)											
Operating altitude	4000 m (For places higher than 1000m, the output will be -1% of the nominal value for every 100m higher)											
Cooling	forced ventilation (fan speed function of the load)											
acoustic noise, as measured at 1m from front of equipment (depend on load and temperature) dBA	48 - 54	53 - 60		48 - 54		53 - 60			53 - 62			
Degree of protection	IP20											
Wiring	Bottom and back											
Cable input	Bottom/Upper/Side											
Applicable standards	Safety EN 50091-1, Electromagnetic Compatibility EN50091-2 Class A											
Standard	BACKFEED PROTECTION											
Optional	harmonic reduction filter/12 pulse rectifier, insulation transformer on bypass line (external cabinet)											

RECTIFIER INPUT (NORMAL)

Rated power [kVA]	10	15	20	30	40	60	80	100	120	160	200	250
Rated voltage	380/400/415V 3 phase											
Number of phases	3											
Voltage tolerance	± 20 %											
Rated frequency	50 / 60 Hz auto learning											
Frequency tolerance	45 - 65											
soft start	0 - 100% 10 秒											
Max. Input current [A]	18	28	37	55	72	108	130	160	190	245	310	375
Current distortion	30 %											
Power factor	0.8											

Rated power [kVA]	10	15	20	30	40	60	80	100	120	160	200	250
-------------------	----	----	----	----	----	----	----	-----	-----	-----	-----	-----

Rectifier with harmonic filter (option)						
Current Distortion (at rated voltage and 100% output load)	8%					
Total harmonic distortion, power factor and load relationship (at rated input voltage):	Load	100%	Distortion	8%	p.f. 0.9	5%
		50%		12%	0.94	p.f. 0.92
		30%		25%	0.96	9%
						0.99
Harmonic distortion, power factor and load relationship (100% load):	Input voltage	100%	Distortion	8%	p.f. 0.9	5%
		86%		5%	0.94	p.f. 0.9
		114%		11%	0.84	4%
						0.97
						7%
						0.87
12 pulse rectifier input with harmonic reduction filter (optional)						
Current Distortion (at rated voltage and 100% output load)	8%					
Total harmonic distortion, power factor and load relationship (at rated input voltage):	Load	100%	Distortion	8%	p.f. 0.9	
		50%		12%	0.8	
		30%		11%	0.75	
Harmonic distortion, power factor and input voltage relationship (100% load):	Input	100%	Distortion	8%	p.f. 0.8	
		86%		7%	0.9	
		114%		9%	0.7	

FILTER OUTPUT

	10	15	20	30	40	60	80	100	120	160	200	250
Maintenance voltage (20°C)	Battery Type 1 and 2 : V =435Vdc (2,26 x el.) 3: V =424Vdc (2,2 x el.) 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.) 3: V (recharge <95%)=460Vdc (2,4 x el.) 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 charged state)	20	30	40	60	80	120	160	200	240	320	400	500
Max. current	24	36	48	72	96	140	180	225	270	360	450	563

BATTERY

	10	15	20	30	40	60	80	100	120	160	200	250
Battery type	Lead sealed											
Blocks / Element number	2V-192 / 12V/32											
End of discharge voltage	Battery type 1,2 and 3: Vmin=346 Battery current=0 Vmin=316 out. battery current=Ah capacity of the battery Vmin=306 " " " " 0 : default Vmin=320Vdc; sectable Vmin=300-360V											
Charge current	0,2A x C10											
Max. charge current with output nominal load [A]	2	3	4	6	8	12	16	20	20	30	30	30

Max. charge current/with load at.... [A] / %	9 / 60%	9 / 70%	19 / 60%	19 / 70%	35 / 60	35 / 70%	35 / 80%	35 / 80%	40 / 80%	40 / 80%	45 / 80%	45 / 80%
--	---------	---------	----------	----------	---------	----------	----------	----------	----------	----------	----------	----------

INVERTER OUTPUT

Rated power [kVA]	10	15	20	30	40	60	80	100	120	160	200	250
Output power [kW]	8	12	16	24	32	48	64	80	96	128	160	200
Number of phases	3 + N											
Rated voltage [V]	380/400/415											
Rated current [A]	14	22	29	43	58	87	115	144	173	231	289	361
Phase voltage setting	200 - 244 V (control panel)											
crest factor (I _{peak} /I _{rms})	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:												
With synchronization	± 0.05 %											
Without synchronization	±2 % (settable ± 1 % from control panel)											
Overload	110/125/150% rated current 300 / 10 / 1											
Short circuit current for 0,1s	2 times the input current											
Inverter efficiency % (load 100%)	91	91	92	92	93	93	93	94	94	94	94	94

BYPASS

Rated power [kVA]	10	15	20	30	40	60	80	100	120	160	200	250
Rated current	14	22	29	43	58	87	115	144	173	231	289	361
Rated voltage V	380/400/415											
Number of phases	1						3 + N					
Input voltage tolerance	±15 % (settable from ± 10 % , ± 15 % from the control panel)											
Rated frequency	50 / 60 Hz (auto learning)											
Input frequency tolerance	±2 % (settable ± 5 % from control panel)											
Inverter/bypass transfer switch time (overload)	0 ms											
Inverter/bypass transfer switch time (fault inverter)	1 ms											
Overload capacity %I _n												
1h	1,5	1,6	1,5	1,6	1,5	1,3	1,2	1,2	1,2	1,2	1,2	1,2
10 min.	1,7	1,8	1,7	1,7	1,7	1,4	1,3	1,3	1,3	1,3	1,3	1,3
1 min.	2,4	2,5	2,4	2,5	2,4	2	1,8	1,8	1,8	1,8	1,8	1,8

1s-20ms	10	10	10	10	10	8	8	8	8	8	8	8
10ms	14	15	14	15	14	12	11	11	11	11	11	11

HUMAN-MACHINE TOUCH SCREEN CONTROL PANEL



CONTROL PANEL

Control panel consists of LED status indicators and a 7-inch touch screen.

Signaling of operational status of the UPS:

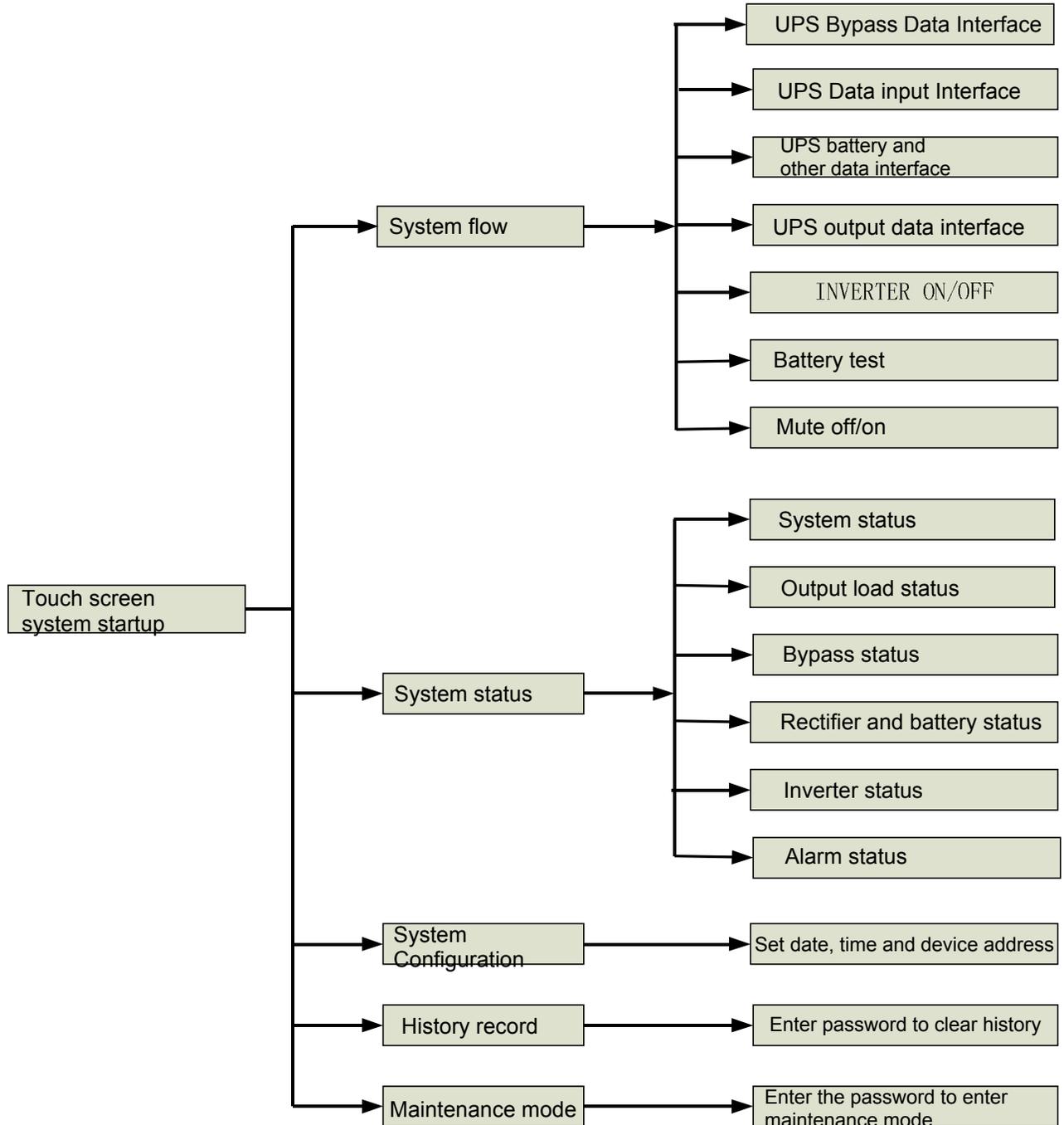
Quick information is provided by LED indicators on the control panel, which may be solid, flashing, or off in various states. 5 on the panel LED indicator:

- "Input" (green): Main input power status indicator;
- "By In" (green): Bypass input power status indicator,
- "Bypass" (yellow): Bypass operating mode indicator,
- "INV" (green): Inverter operating mode indicator,
- "Battery" (yellow) : Battery indicator.

The working status of the panel LED light is as follows.

LED light \ Operating status	Input	By In	Bypass	INV	Battery
Lit	Main input power normal	Bypass input power is OK	Bypass mode	Inverter mode	battery power mode
Flashing	No	Bypass Input Power Phase Sequence abnormal	maintenance mode, bypass output overload	Inverter output overload, low battery	Abnormal battery capacity or low battery
Extinguished	main input power Abnormal pressure and frequency	Bypass input power Abnormal voltage and frequency	non-bypass mode	non-inverting mode	battery is normal

Human-machine touch screen control interface flow chart



1. System process interface (three buttons below, turn on/off inverter, battery test, turn on/off mute).



Click the inverter on button "INVERTER ON" or the inverter off button "INVERTER OFF", the password input window will pop up, enter the password "000000", click "ENTER" to confirm, turn on or off the inverter.



2. UPS bypass data interface ("system flow interface" click "bypass input" or bypass

旁路	U (v)
A	
B	
C	

input form  to enter).



3. UPS input data interface ("System flow interface" click "Mains input" or the mains input form to enter).



4. UPS battery and other data interface ("System flow interface" click "Battery" or battery form to enter).





5. UPS output data interface (“system process interface” click “output” or output form to enter).



6. System status interface



7. Output load status

系统流程					
系统状态		系统配置		历史记录	
系统状态	状态	涵义	状态	涵义	
输出负载状态		Line1输出漏电流过高		-	
旁路状态		Line2输出漏电流过高		SWOUT输出开关开启	
整流器与电池状态		Line3输出漏电流过高		Line3平均输出电压错误	
逆变器状态		Line1输出过载		Line1瞬间输出电压错误	
告警状态		Line2输出过载		Line2瞬间输出电压错误	
		Line3输出过载		Line3瞬间输出电压错误	
		永久过载		Line1平均输出电压错误	
		TA DIFF. 讯号		Line2平均输出电压错误	

8. Bypass status

系统流程					
系统状态		系统配置		历史记录	
系统状态	状态	涵义	状态	涵义	
输出负载状态		程序命令动作：切至远旁路（转换器关闭）		转换器输出接点异常	
旁路状态		旁路静态开关（SCR）异常		逆变器输出开关闭合	
整流器与电池状态		旁路输入电压line no.1错误		旁路接点闭锁	
逆变器状态		旁路输入电压line no.2错误		旁路静态开关故障	
告警状态		旁路输入电压line no.3错误		旁路SCR开关永久闭锁	
		旁路输入频率错误		旁路无效	
		旁路1.2频率错误		转换器输出接点异常永久关闭	
		手动开关swb闭锁		切至旁路命令作动	

9. Rectifier and battery status

系统流程					
系统状态		系统配置		历史记录	
系统状态	状态	涵义	状态	涵义	状态
输出负载状态		line1输入电压过高		line2无输入电流	
旁路状态		line2输入电压过高		整流器限功率动作	
整流器与电池状态		line3输入电压过高		整流器调整错误	
逆变器状态		line1输入电压过低		整流器输入频率错误	
告警状态		line2输入电压过低		整流器过温	
		line3输入电压过低		整流器输出电压过高	
		line1无输入电流		整流器控制电源错误	
		line2无输入电流		整流器停止动作	
					整流器其中一路异常(软件版本<152)
					SGP电源异常
					手动旁路开关闭锁或者失载电压错误+
					-
					整流器永久异常(软件版本<152)
					整流器DRV1电压异常
					整流器DRV2电压异常
					整流器DRV3电压异常

10. Inverter status



11. Alarm status



12. System configuration interface (click the corresponding location to modify the date, time and device address).



13. History interface



14. Maintenance mode interface (requires a password first)

Click "Maintenance Mode" on the flowchart to enter the maintenance interface, query and set the working parameters of the UPS, and the initial operation password is "436215".



- IN. Mains and bypass input indicator
- OUT. Inverter output indicator
- BY. Bypass operation indicator
- BATT. Battery Status Indicator

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

- 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

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.

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

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.

R LED BATT (yellow): battery line

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.

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 (Displays continuously or flashes)

Flashing Display

The bypass has been overloaded and has been recorded in the history record. The abnormal overload condition must last for a period of time before it is recorded in the record:

150%	10 min.
175%	1 min.
200%	18 s

The load will be powered by the bypass. If it has not been unloaded, it will continue to supply power until the input SWBY switch or the bypass input fuse overload protection is activated. For models with a capacity of 100kVA or more, in the abnormal situation of bypass overload, it will not Apply power to the load. When proper unloading is taken, the alarm can be cleared and returned to normal operation by the following steps: Lock SWMB, disconnect SWBY; then lock SWBY and disconnect SWMB.

Keep Showing

When the load is powered by bypass and exceeds the rated value, this warning has not been logged, the overload value will be displayed on the panel (% VA). To return to normal operation mode before logging, unload and wait a few minutes for cooling (If the load is only 50%, wait 60 seconds; if the load is only 75%, wait 8 minutes).

[13] BYPASS COMMAND ACTIVE; 8=COMMAND OFF

The system has been deactivated 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 deactivated.

[14] REMOTE BYPASS CONTROL: ACTIVE

The system is switched to bypass via a remote control signal. The command is not recorded and the UPS reverts to normal operation when the command is cancelled (if the input power is normal!).

[15] OVERTEMPERATURE or FAN FAILURE

- 1) UPS internal ambient temperature
- 2) Power modules in the converter circuit
- 3) Power modules in the rectifier circuit
- 4) Output transformer

Exceeded maximum allowable temperature (due to operating environment or fan failure!)

[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.

When the system shutdown command is given by a key or a remote signal. The system will delay the execution of the shutdown command after a few seconds to allow the command to be canceled. The command will be recorded even if there is no input power after the system shutdown.

When input power is restored, the UPS will not return to normal operating mode if the SYSTEM OFF command is not canceled. To cancel the command, lock out

Switch SWBY or press button 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.

Maintenance Mode Control Panel

BASIC MENU

```

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

In the basic menu, the first line shows the current status; the second line shows the model, output capacity, battery power status or battery life.

The displayed message is only one sentence at a time, so it will be displayed according to the priority, and other messages will be explained by means of codes.

In any mode, if no key is executed, it will return to the basic menu after two minutes.

NORMAL OPERATION:

__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:

Displays the status of battery power. This value is taken from charging current and charging time.

After the battery has been discharged, the UPS will automatically take fast charging to make up for the lost power. " %Ah " will become " min " when the input power is abnormal or the battery is discharged. The value at this time represents the remaining time that the battery can supply power.

Notice!

The displayed value is based on the battery discharge current at that time, as well as the battery's capacity record and charging value. This display is only an approximation because there are too many influencing factors.

If there is a big difference between the actual situation and the display, please check the status of the battery and the recorded battery data.

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 : 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.

Language selection remains memorized even after turning off and restarting the system.

KEY MENU 2 : VOLTAGE MEASUREMENT



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

Displays various voltage values

For single-phase and three-phase models, it will be different.

:

IN=100,100,100%v, 50.0Hz Input voltage value. Displayed in percentage; 230VIn (In = phase voltage, that is, between each phase and neutral line N voltage).

BATT.=430V Rectifier output voltage to battery.

+ 100A represents the current value of the battery discharging, and the minus sign (-) represents the current value of the battery being charged.

BY=230V, 60.0Hz represents the input voltage and frequency of the bypass.

Notice !:

In three-phase models, it represents the average voltage of the three phases.

OUT= 230V, 50.0Hz, 100% output voltage, frequency, load condition.

" OUT " will become " BY " when the load is bypassed.

When the manual bypass switch is activated, " OUT=230v, 50.0Hz, 100% "will become " OUT=SWMB " because the output current value cannot be detected.

Key menu 2 → 6 : TIME MEASUREMENT

OUT= 10000h; BY= 10000h; BATT= 10000h
nBATT= 1000; n0%Ah= 100; 2006-01-12

Access to the menu TIME MEASUREMENT is by key 6 only from the SYSTEM MEASUREMENT 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	It represents the number of times the battery has been discharged. It also represents the number of times the input power has been abnormal.
n0%Ah = 100	Represents the number of times the battery has been fully discharged. This data can be used to understand the efficiency of the battery. The normal battery can be fully charged and discharged about 200-300 times.
1993-01-12	Date the system was first activated

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

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

To return to Key menu 2 just press " 2 " again.
The measurements indicated have the following meanings:

IN=100,100,100%A	Displays the input current value of the three-phase, measured by the input of the rectifier. Displayed as a percentage of the maximum input current.
Ts=25°C	Temperature inside the UPS
Tr=45°C	Rectifier power module temperature
Ti=45°C	Converter power module temperature

i=230Vln,430Vb	converter voltage.
OUT=100%Arms,200%Apk (single-phase system)	Under the converter output, the output effective current (effective current) and the peak current (peak current) percentage value. "OUT" will become "BY" in case of bypass output. When the manual bypass switch is activated, the tone cannot detect the current, so it will become "OUT=SWMB"
OUT=100,100,100%Arms (3-phase system)	Under the converter output, the output effective current (effective current) percentage value. Otherwise, it is the same as the single-camera model.

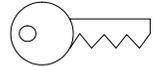
Key menu 2 → 2 → 2: 3-PHASE VOLTAGE MEASUREMENT

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

Pressing key 2 causes return to preceding menu 2,2. Key 1 returns to basic menu.

BY=230,230,230Vln	Bypass input voltage value of each phase
OUT=220,220,220Vln	Output voltage value of each phase
OUT=100,100,100Apk	In the converter output mode, the output peak current of each phase. In bypass mode " OUT " will become " BY ". When the manual maintenance switch SWMB is actuated (locked), since the current cannot be measured, it will become " OUT=SWMB ".

KEY MENU 3 "KEY", COMMANDS



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

Key menu 3 → 2: BATTERY TEST

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

Conduct a battery efficiency test that lasts 6 seconds.
Pressing button 8 at this point will interrupt the test and return to the basic menu.
The values indicated have the following meanings:

BATT= 400V + 10A	Detected values of battery voltage and current.
Vbc= 390V	Calculated value of battery voltage
999 min.	Remaining power time

When the bypass voltage is normal, by reducing the output voltage of the rectifier, the battery test can be performed without affecting the load power supply.
After each test, the battery voltage is compared with the 'Vbc' voltage (by the measured current, the battery capacity and the memorized charge ratio calculated).

- If the battery voltage is less than Vbc:
- There will be a "BATTERY DISCHARGE" or "SWB OPEN" warning.
 - The memory value of the charging ratio is halved.
 - After 60 seconds the next test will be executed automatically.

- A battery test is performed under the following conditions:
- Manual activation.
 - 60 seconds after activation or 60 seconds after the test fails.
 - Automatically execute every 24 hours after power recovery.
 - When the battery is discharged (ie after a mains power failure!).

The test will be re-executed 60 seconds after the alarm, if there is still an abnormality, another test will be performed after 60 seconds.

When the alarm is displayed continuously, it means that the battery efficiency is insufficient, or the battery circuit is faulty, or the switch SWB is disconnected or the fuse is blown.
When the warning is displayed temporarily, it means that the battery efficiency is insufficient.

Cancel the battery test function: Press button 3 5 to enter "CUSTOMISING", enter password 323232.
Re-enter the password once to restore this functionality.

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=+

To correct the contrast of the display: Press key 7 to decrease the contrast value; press key 8 to increase the contrast value. The range that can be adjusted is 1 - 11. Press any other key to exit this function.

Key menu 3 → 5: CUSTOMIZING

TYPE CODE _____
.....

A password will be asked to enter in all cases the same : 436215.

This is to prevent anyone from modifying the parameters without authorization. Input will be requested again two minutes after the first input.

When the entered password is wrong, it will return to the main screen, otherwise it will enter the following screen:

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

Press button 7 to go to the second layer of parameter options, the screen is as follows :

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

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 → 1: Standby economy mode (when the model has this function!)

ADJUSTMENT: Stby=0
7=-, 8=+

Pressing a key other than "7" or "8" will leave this function.

When pressing key 8, STBY=1. The UPS will switch to "normal operation mode", otherwise it will switch to STANDBY mode.

Key menu 3 → 5 → 2: OUTPUT VOLTAGE

RATED OUTPUT VOLTAGE = 225V1n
ADJUSTMENT: 7=-, 8=+

Press button "7" to decrease, button "8" to increase. The adjustable range is 200V ~ 244V, and the adjustment amount is 1V.

The output voltage refers to the phase voltage (the voltage between the phase and the input Neutral).

When the setting is completed, the converter will adjust the operation so that the output voltage in normal mode =225V.

In addition, the allowable value of the bypass input voltage is also set to 225V. However, the allowable range value of the input voltage will remain unchanged (and not allowed to change!).

Key menu 3 → 5 → 3: BATTERY CUSTOMIZING

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

Buttons 5, 6, 7 and 8 can change the rated capacity of the battery (10 for each press of 5 and 6; 1 for each press of 7 and 8), the changeable range is from 1 to 9998 Ah. Enter the value It must conform to the actual battery capacity. Generally, the battery is marked on the outer casing.

The models with batteries have been set before leaving the factory; users must set the models without batteries by themselves (otherwise the factory default value is 12Ah).

Buttons 2 and 3 are used to change the type code of the battery.

When the battery is "High Discharge Density" type code = 2

When the battery is "lead acid unsealed" type code = 3

If you set the battery type to 0 and then press button 4, the following parameters can be set:

32 battery UPS:

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

Vb_min (minimum battery discharge voltage limit) =300-360V
 Vb_ch (maintenance voltage) = 400-460V
 Vb_max (maximum charging voltage) = 400-460V

36 battery UPS:

Vb_min=360	Vb_ch=489	Vb_max=500
Adjustment: 2-/3+	5-/6+	7=-,8=+

Vb_min (minimum battery discharge voltage limit) =337-405V
 Vb_ch (maintenance voltage) = 450-510V
 Vb_max (maximum charging voltage) = 488-510V

40 battery UPS:

Vb_min=400	Vb_ch=543	Vb_max=555
Adjustment: 2-/3+	5-/6+	7=-,8=+

Vb_min (电池放电最低电压限制) =374-450V
 Vb_ch (维护电压) = 500-566
 Vb_max (最大充电电压) = 542-566V

The battery capacity and type information here is used to:

- - Automatically detect the efficiency of the battery by the converter
- - Calculate estimated battery discharge time
- - Calculate the warning value of low battery voltage and the minimum value of system shutdown
- Calculate the optimal charging current

Key menu 3 → 5 → 4: PREALARM CUSTOMIZING

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

Vmin= battery discharge minimum voltage
 Vp= battery warning low voltage (Vmin and Vp are not fixed values, but their mutual relationship is $Vp = Vmin + 5V + 10 * (\text{current of the battery [A]} / \text{capacity of the battery [Ah]})$)

Buttons 7 and 8 can set the lead time of the system shutdown (low battery voltage) warning. The settable range is 2 to 254 minutes. It will be executed when the battery supply time is lower than the set value or the battery voltage is lower than Vp Warning.

The setting of the pre-warning time can be used as a safety guarantee, because some uncertainties are difficult to foresee in advance. For example, load changes, battery failure or abnormal connection.

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

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

Buttons 7 and 8 are used to set the output load value for automatic shutdown. The increment is 1 % each time, and the range is from 0 to 99%.

When the automatic shutdown warning appears, if the input voltage is normal but the battery capacity is lower than 60%, it will display:

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

The system will not perform the shutdown procedure immediately, it will wait until the battery capacity exceeds 60%.

When the automatic shutdown warning appears, if the input voltage is normal but the battery capacity is higher than 60%, or the system is in battery power mode, will show:

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

And the remote warning contact of "Battery Low Voltage Warning" will be activated. At this point the system will continue to operate normally for 4 minutes and then switch to bypass mode. The default value is 5 minutes or the same as the user-defined warning time.

When the pre-alarm starts, if the bypass input voltage is normal, the system will automatically switch to bypass mode until the output load exceeds the automatic shutdown setting. If the bypass voltage is still abnormal at the end of the warning time, the system will automatically shut down; when the bypass voltage returns to normal, the system will automatically turn on and enter the bypass mode, until the output load exceeds the automatic shutdown setting value and returns to normal operation model.

The special feature of this function is that it can shut down the system to reduce unnecessary battery discharge when in battery power mode; when in normal operation mode, this function can reduce power consumption because the system switches to bypass mode.

Key menu 3 → 5 → 6 → 5 (6): AUTO-OFF TIMER CUSTOMIZING

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

Button 5 can adjust the timer off time (Toff), and button 6 can adjust the timer activation time (Ton).

Set daily automatic start and stop times.

When Toff and Ton are equal, there will be no action.

- When the input voltage is normal and the battery capacity is lower than 60%, it will only display:

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

The system will not execute the shutdown procedure and must wait until the battery capacity exceeds 60%.

- When the input voltage is normal and the battery capacity is higher than 60%, or the system is in battery discharge mode, it will only display:

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

And the remote warning contact of "Battery Low Voltage Warning" is activated!. The system will continue to operate for the set time and then switch to bypass mode.

For models with standby-on function, when the system performs automatic shutdown, there will be no output voltage; while for other models, if the bypass input voltage is normal, the output voltage will continue to be supplied by Bypass provided.

When the time reaches Ton, the UPS will resume normal mode operation.

Key menu 3 → 5 → 7 → 2: BYPASS VOLTAGE RANGE CUSTOMIZING

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

To enter the bypass voltage setting, password 436215 and keys 7 and 2 are required. After entering, the password will not be asked again.

Buttons 7 and 8 can adjust the range of bypass input voltage. There are three options in total: 10%, 15% or 20% (based on rated output voltage!).

Key menu 3 → 5 → 7 → 3: BYPASS FREQUENCY RANGE CUSTOMIZING

BY. FREQUENCY RANGE	= +/- 1%
ADJUSTMENT:	7=-, 8=+

To enter the bypass frequency setting, the password 436215 and keys 7 and 3 are required. After entering, the password will not be asked again.

Buttons 7 and 8 can adjust the range of bypass input frequency. The range is between 1% and ± 5% (based on rated frequency 50Hz or 60Hz!).

Key menu 3 → 5 → 7 → 4: MODEMCUSTOMIZING

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 → 7 → 4 → 5 (6) : MODEM "DIAL/SEND" CUSTOMIZING

```

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

To enter the modem settings, the password 436215 and the keys 7, 4, 5 (dial) or 6 (transmit) are required. Once entered, the password will not be asked again.

Keys 7 and 8 are used to increment or decrement the digit where the cursor is located. The position of the cursor is displayed with the symbol "_" and can be moved with keys 2 and 3. Each digit can be set from 0 to 9 and the symbol "/".
"/" stands for invalid.

All numbers after the sign "/" will be ignored. (For example, 0123/45 will only be accepted as 0123).

Key menu 3 → 5 → 7 → 5: RS232 CUSTOMIZING

```

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

To enter the communication port settings, the password 436215 and keys 7 and 5 are required. After entering, the password will not be asked again. The keys 7 and 8 can be used to increase or decrease the transmission speed (baud transmission speed). There are 1200, 2400, 4800 and 9600 option.

Key menu 3 → 5 → 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 → 7 → 7: IDENT. CUSTOMIZING

```

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

To enter the communication port setting, the password 436215 and keys 7 and 7 are required. After entering, the password will not be asked again. The keys 7 and 8 are used to change the UPS identification code, so as to avoid multiple UPSs connected to the same RS232 communication port. The range of numbers that can be changed is 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
    
```

To leave this option, press button 8. Press buttons 4, 7, 2, 6 and 3 in sequence to switch the system to bypass mode and turn off the converter. This feature is especially useful when remote via the RS232 communication port. control, so that the system shuts down the power circuit but the control circuit is still active. When the setting is completed, there will be a delay of several minutes so that it can be canceled.

When the setting is activated, the display panel will show "BYPASS COMMAND ACTIVE; 8=DISACTIVATION". After the system has shut down the converter, to return to normal operation mode, either press button 8 or send it via RS232.

Attention! To hide the password 47263, you must enter the password 436213 in the "User Settings" start screen. Re-enter it again to restore the display.

Key menu 3 →7: TOTAL SYSTEM SHUT-OFF COMMAND

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

Press key 8 to leave this option.

When the setting is completed, the display panel will appear: SYSTEM OFF COMMAND ACTIVE ; 8=DISACTIVE. After setting, there will be a delay of several seconds to cancel. The purpose of this function is to remotely shutdown via RS232 in emergency.

To reactivate the UPS, block switch SWBY or press button 8.

Attention! To hide the password 47263, you must enter the password 436213 in the "User Settings" start screen. Re-enter it again to restore the display.

KEY MENU 4: RECORDED EVENTS

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

Press button 4 in the basic menu to enter the event log function. Press button 1 to return to the basic menu.

Under this function:

Press button 2 to re-enter the sub-menu "MEASUREMENT OF RECORDED VOLTAGES".

Keys 3, 4 and 5 remain normal.

Press button 6 to enter the sub-menu "RECORDED CODES", you can see the system status at the time of the event stored in the internal code,

In order to analyze the situation at that time. Please refer to the chapter "Code Page" for the meaning of the alarm code.

Buttons 7 and 8 are used to select the previous or next event.

alarm message recorded	The most recent event is displayed at the beginning, and a specific message is displayed according to the operation. A maximum of 120 records can be stored. When it exceeds, the oldest record will be deleted to save new records.
a=FFFF-FFFF	Alert code relative to this event
n=100	The sequence number of the event record
1992,12,31/14:45:50	Date and time when the event occurred. Displayed in the format year, month, day/hour:minute:second

Key menu 4 →2 RECORDED VOLTAGES

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

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.

Key menu 4 →2 →2: RECORDED CURRENT

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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
    
```

(Internal codes for non-recorded data). These are for field testing only.
 ver. 10001 is just an example of this machine code.

Each parameter is in the form of hexadecimal: 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

The 6 groups of numbers in the first-level menu represent the internal state of the system when each event is recorded. All the parameters of the second-level menu are not memorized.

The meaning of the first group of parameters:
 s=system c=output load, b=bypass, r=rectifier and battery, i=converter, a=alarm.
 The meaning of the second group of parameters:
 e=input, g=general, u=output, y=bypass, j=converter, k=load, v=voltage, p=external, l=LED, m=memory.

The four numbers of each parameter represent different meanings. For example s=... :
 (1 = true, 0 = false) System temperature is too high
 (2 = true, 0 = false) initialized correctly
 (4 = true, 0 = false) remote shutdown command started
 (8 = true, 0 = false) system auxiliary input start

When s=F..., because F = 1 + 2 + 4 + 8 in hexadecimal, the meaning of the representation is:

1=System temperature is too high	=TRUE, i.e. System temperature is too high
2=Initialized correctly	=TRUE, i.e. Initialized correctly
4=Remote shutdown command starts	=TRUE, Remote shutdown execution
8=System Auxiliary Input Start	= TRUE, Entered correctly

If it is s=A... , because A = 2 + 8, it means:

1=System temperature is too high	=FALSE, i.e. System temperature is normal
2=Initialized correctly	=TRUE, i.e. Incorrect system initialization
4=Remote shutdown command starts	=FALSE, Remote shutdown command not issued
8=System Auxiliary Input Start	=TRUE, normal input

KEY MENU 8 (“ARROW UP”): NORMAL

```

NORMAL OPERATION
H100, OUT=100%VA BATT.=100%Ah 5=ON
    
```

Button 8 returns to normal display (in other menus, as long as button 8 has no default function). In addition, the system will automatically return to normal display after 2 minutes if no key is entered.

REMOTE PANEL WITH RS232TERMINAL

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 RS232 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.

CODE PAGE

[s=system, c=load, b=bypass, r=rectifier, i=converter, a=alarm]

s=X...	1		3		5		7		9		B		D		F	System temperature is too high	
		2	3			6	7				A	B			E	F	initialization error
	(1)				4	5	6	7					C	D	E	F	System shutdown command action.
									8	9	A	B	C	D	E	F	System Card Auxiliary Input
s=.X..	1		3		5		7		9		B		D		F	System card power error	
		2	3			6	7				A	B			E	F	There is a temporary error in the power card
	(2)				4	5	6	7					C	D	E	F	System card sync error
									8	9	A	B	C	D	E	F	System card detection output frequency error
s=..X.	1		3		5		7		9		B		D		F	Battery voltage or rectifier low voltage	
		2	3			6	7				A	B			E	F	Battery or rectifier low voltage warning
	(3)				4	5	6	7					C	D	E	F	battery contacts open
									8	9	A	B	C	D	E	F	The battery contacts are permanently abnormal
s=...X	1		3		5		7		9		B		D		F	power card error (only ver.<=152)	
		2	3			6	7				A	B			E	F	DSR_ON signal of RS232 exists
	(4)				4	5	6	7					C	D	E	F	Configuration circuit not present.
									8	9	A	B	C	D	E	F	Jumper (Jumper) CONFIG2 does not exist
c=X...	1		3		5		7		9		B		D		F	line 2 output overload	
		2	3			6	7				A	B			E	F	line 3 output overload
	(1)				4	5	6	7					C	D	E	F	line 3 output overload
									8	9	A	B	C	D	E	F	TA DIFF. Signal present
c=.X..	1		3		5		7		9		B		D		F	Line 1 output leakage current is too high	
		2	3			6	7				A	B			E	F	line2 output leakage current is too high
	(2)				4	5	6	7					C	D	E	F	line3 output leakage current is too high
									8	9	A	B	C	D	E	F	line 1 output overload
c=..X.	1		3		5		7		9		B		D		F	Line 2 momentary output voltage error	
		2	3			6	7				A	B			E	F	Line 3 momentary output voltage error
	(3)				4	5	6	7					C	D	E	F	line 1 average output voltage error
									8	9	A	B	C	D	E	F	line 2 average output voltage error
c=...X	1		3		5		7		9		B		D		F	-	
		2	3			6	7				A	B			E	F	SWOUT output switch on
	(4)				4	5	6	7					C	D	E	F	line 3 average output voltage error
									8	9	A	B	C	D	E	F	Line 1 momentary output voltage error
b=X...	1		3		5		7		9		B		D		F	Bypass input voltage line no. 3 error	
		2	3			6	7				A	B			E	F	Bypass input frequency error
	(1)				4	5	6	7					C	D	E	F	Sequence error in phases 1 and 2 at bypass line input
									8	9	A	B	C	D	E	F	Manual bypass switch SWMB lockout
b=.X..	1		3		5		7		9		B		D		F	Remote command action: switch to bypass (converter closed).	
		2	3			6	7				A	B			E	F	Bypass static switch (Static switch SCR) abnormal
	(2)				4	5	6	7					C	D	E	F	Bypass input voltage line no. 1 error
									8	9	A	B	C	D	E	F	Bypass input voltage line no. 2 error
b=..X.	1		3		5		7		9		B		D		F	Bypass SCR switch permanently blocked	
		2	3			6	7				A	B			E	F	Bypass is disabled
	(3)				4	5	6	7					C	D	E	F	The converter output contact is abnormally closed permanently
									8	9	A	B	C	D	E	F	Cut to Bypass Command Action
b=...X	1		3		5		7		9		B		D		F	Converter output contact abnormality	
		2	3			6	7				A	B			E	F	Converter output contacts open
	(4)				4	5	6	7					C	D	E	F	Bypass Contact Blocking
									8	9	A	B	C	D	E	F	Bypass contact abnormal

r=X...-	1	3	5	7	9	B	D	F	line 2 input voltage is too low		
	2	3		6	7	A	B	E	line 3 input voltage is too low		
			4	5	6	7		C	Line 1 no input current		
						8	9	A	Line 2 no input current		
(1)								D	E	F	
r=X...-	1	3	5	7	9	B	D	F	Line 1 input voltage is too high		
	2	3		6	7	A	B	E	Line 2 input voltage is too high		
			4	5	6	7		C	Line 3 input voltage is too high		
						8	9	A	Line 1 input voltage is too low		
(2)								D	E	F	
r=..X..-	1	3	5	7	9	B	D	F	Rectifier temperature is too high		
	2	3		6	7	A	B	E	Rectifier output voltage is too high		
			4	5	6	7		C	Rectifier control power error		
						8	9	A	Rectifier stops		
(3)								D	E	F	
r=...X..	1	3	5	7	9	B	D	F	Line 3 no input current		
	2	3		6	7	A	B	E	Rectifier power limit action		
			4	5	6	7		C	Rectifier adjustment error		
						8	9	A	Rectifier input frequency error		
(4)								D	E	F	
r=...-X.	1	3	5	7	9	B	D	F	Rectifier permanently abnormal (only ver. <=152)		
	2	3		6	7	A	B	E	Rectifier DRV1 voltage is abnormal		
			4	5	6	7		C	Rectifier DRV2 voltage is abnormal		
						8	9	A	Rectifier DRV3 voltage is abnormal		
(5)								D	E	F	
r=...-X	1	3	5	7	9	B	D	F	One circuit of the rectifier is abnormal (only ver. <=152)		
	2	3		6	7	A	B	E	-(SGP power abnormality*)		
			4	5	6	7		C	(Manual bypass switch is locked or parallel cable error *)		
						8	9	A	-		
(6)								D	E	F	
i=X...-	1	3	5	7	9	B	D	F	Converter connection error		
	2	3		6	7	A	B	E	Converter power error		
			4	5	6	7		C	(parallel syncro fail *)		
						8	9	A	(host in parallel *)		
(1)								D	E	F	
i=X...-	1	3	5	7	9	B	D	F	The wires of the indicator light are reversed (only ver. <=152)		
	2	3		6	7	A	B	E	Lockup by card or module 3 in inverter		
			4	5	6	7		C	Lockup by card or module 2 in inverter.		
						8	9	A	Instantaneous overcurrent		
(2)								D	E	F	
i=..X..-	1	3	5	7	9	B	D	F	Converter output voltage is too high		
	2	3		6	7	A	B	E	Converter input voltage is continuously too high (Vdc)		
			4	5	6	7		C	The converter sensor 1 has detected too high temperature		
						8	9	A	The converter sensor 2 has detected too high temperature		
(3)								D	E	F	
i=...X..	1	3	5	7	9	B	D	F	Inverter is abnormal		
	2	3		6	7	A	B	E	Bypass out of sync with inverter		
			4	5	6	7		C	Converter control automatic reset (Auto reset)		
						8	9	A	Auxiliary feeder error for IGBT modules		
(4)								D	E	F	
i=...-X.	1	3	5	7	9	B	D	F	Converter output AC voltage is too low		
	2	3		6	7	A	B	E	Converter output DC voltage is too low		
			4	5	6	7		C	Converter control manual reset		
						8	9	A	Converter permanent exception (only ver. <=152)		
(5)								D	E	F	
i=...-X	1	3	5	7	9	B	D	F	The converter sensor 3 has detected too high temperature		

(6)	2	3		6	7			A	B			E	F	Lock machine (by card or converter module 1)			
			4	5	6	7					C	D	E	F	(parallel serial data fail *)		
							8	9	A	B	C	D	E	F	The converter stops working		
a=X...-....	1		3		5		7		9		B		D		F	Battery voltage is too low	
		2	3			6	7				A	B			E	F	Input voltage too low or overload (power)
	(1)				4	5	6	7					C	D	E	F	The battery is discharged or the switch SWB is turned on
									8	9	A	B	C	D	E	F	output overload
a=.X...-....	1		3		5		7		9		B		D		F	Bypass interference	
		2	3			6	7				A	B			E	F	Manual bypass switch SWMB actuation
	(2)				4	5	6	7					C	D	E	F	Abnormal bypass voltage or switch SWBY, FSCR open
									8	9	A	B	C	D	E	F	The input voltage is abnormal or the switch SWIN is turned on
a=..X...-....	1		3		5		7		9		B		D		F	Internal exception 3: Output contact	
		2	3			6	7				A	B			E	F	Internal exception 4: Rectifier lockup
	(3)				4	5	6	7					C	D	E	F	Internal exception 5: Bypass SCR
									8	9	A	B	C	D	E	F	Internal exception 6: Power
a=...X-....	1		3		5		7		9		B		D		F	Temporarily or permanently switch to bypass	
		2	3			6	7				A	B			E	F	Bypass output (VA) is less than the automatic shutdown setting
	(4)				4	5	6	7					C	D	E	F	Inner exception 1 : no circ configuration.
									8	9	A	B	C	D	E	F	Internal exception 2 : Converter locked
a=....-X...	1		3		5		7		9		B		D		F	Bypass output overload	
		2	3			6	7				A	B			E	F	Bypass output command action; 8= command terminated
	(5)				4	5	6	7					C	D	E	F	Remote bypass command action
									8	9	A	B	C	D	E	F	-
a=....-X..	1		3		5		7		9		B		D		F	Internal Error 7 : System Card Power	
		2	3			6	7				A	B			E	F	Internal error 8 : a certain group of lines of the rectifier
	(6)				4	5	6	7					C	D	E	F	Internal Error 9 : Battery Contact
									8	9	A	B	C	D	E	F	Internal error 10 : Converter-rectifier signal
a=....-X.	1		3		5		7		9		B		D		F	Remote shutdown command action	
		2	3			6	7				A	B			E	F	memory changed: CODE=....
	(7)				4	5	6	7					C	D	E	F	Internal error 11 : Converter or bypass output connection
									8	9	A	B	C	D	E	F	Internal timer stopped
a=....-X	1		3		5		7		9		B		D		F	Too high temperature or abnormal fan	
		2	3			6	7				A	B			E	F	input phase error
	(8)				4	5	6	7					C	D	E	F	SWOUT or SWMB latched but no output
									8	9	A	B	C	D	E	F	System shutdown action; 8= Command terminated

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