META SYSTEM®

UNINTERRUPTIBLE POWER SUPPLIES

V9762A

HF LINE

GB

User's Manual

CE

GB

CE Statement of Conformity

Council directives applied:	73/23/CEE; 89/336/CEE modified with directives 92/31/CEE, 93/68/CEE
Standard to which conformity is declared:	EN 50091-1, EN 50091-2
Manufacturer:	Meta System S.p.A.
Address:	via Majakovskij, 10/b Reggio Emilia, Italia
Type of equipment:	Uninterruptible power supply
Models:	HF LINE 1 board, HF LINE 2 boards, HF LINE 3 boards, HF LINE 4 boards, HF LINE 4 boards/2, HF LINE 5 boards/2, HF LINE 6 boards/2, HF LINE 7 boards/2, HF LINE 8 boards/2
Year mark applied:	1997

The product has been tested in the typical installation configuration and with peripherals complying with the above-listed Directives. I, the undersigned, hereby declare that the above-mentioned equipment conforms to the requirements of the Directives specified above.

Reggio Emilia, 08/09/97

Mr. Cesare Lasagni

Technical Director

META SYSTEM®

TECHNICAL DATA AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

CONTENTS

Congratulations on your purchase of a Meta System product !
This manual contains information on safety, installation, and operation of the HF LINE Uninterruptible Power Supply (UPS) produced by Meta System, in both the single and double cabinet configurations.

Please read this manual carefully before proceeding to install the UPS and follow the instructions scrupulously.

The HF LINE UPS are designed primarily for civil, industrial, and electro-medical use, however in the latter case you should ascertain whether there are any particular national regulations in this regard in your country.

In the event of problems with the UPS, we recommend that you read the manual again before contacting the service centre. The “Trouble-shooting Guide” can help you resolve most of the problems that may occur in using the UPS.

Important note

We recommend that you keep the original packing materials, as they may be useful should you need to transport the UPS for repairs.

Any damage during transport of the UPS caused by poor packing is not covered by the warranty.

CONDITIONS OF USE

- The UPS has been designed to supply power to data processing equipment. The load applied must not exceed that indicated on the rear plate of the UPS
- The ON/OFF button of the UPS does not electrically insulate the internal parts. To insulate the UPS, disconnect it from the mains outlet.
- Never open the UPS cabinet, as there may be parts on the inside with dangerous voltage even when the mains plug is disconnected. In any case there are no parts inside the UPS that can be repaired by the user.
- The front control panel is used for manual operations. Do not press on this panel with sharp or pointed objects.
- The UPS has been designed to operate in rooms or spaces that are closed, clean, free of inflammable liquids and corrosive substances, and not excessively humid.

INTRODUCTION

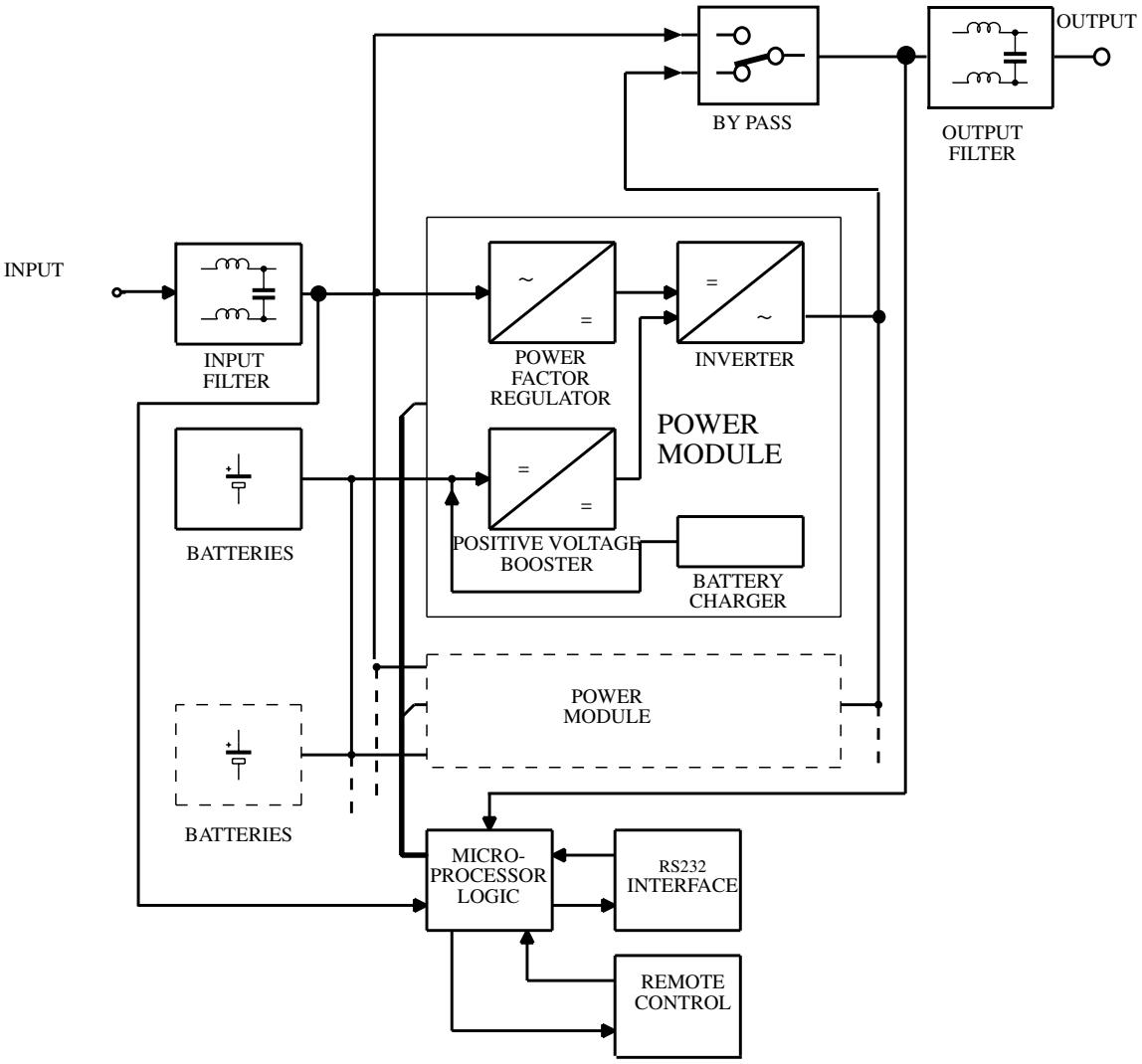
The HF LINE UPS have been designed to guarantee maximum safety and reliability in supplying power to I.T. systems independently of the condition of the mains electrical supply. The UPS is based on the combination of “intelligent” control logic governed by a powerful microprocessor, and modular “on-line” power modules that use high frequency PWM technology which ensures excellent performance featuring clean, precise output voltage, efficiency, reliability, and quiet operation.

In addition, the modular redundant structure makes it possible to have a continuous energy supply, though at reduced power, even in the event of a power module failure, thus offering a very high level of operating security. Particular attention has been paid to the design of the input stage which, in addition to the classic filter and line control functions, also handles current absorption from the mains, keeping it close to that of the ideal sinusoidal wave form. This eliminates repeated absorption peaks typical of power supplies used in I.T. systems, and takes the input power factor to values near 1 (in compliance with European regulations).

The main features of this innovative range of UPS units can be summarized as followed:

- Redundancy (when more than one power board is used).
- On-line dual conversion operation (maximum rejection of disturbance and line interruptions; absence of mains-battery switching).
- Possibility to increase standard power and autonomy by installing additional kits (modularity).
- Input power factor that is almost = 1 whatever type of load applied.
- Absolute stability of the output voltage independent of load and line voltage.
- "Intelligent" management of the intervention point of the internal storage batteries in relation to the line voltage and the applied load.
- High inrush capacity thanks to the oversized circuits.
- Incorporated sensor for the correct connection of the neutral conductor in input and electronic differential sensor in output, for the maximum safety of the operator and the loads connected.
- Very high energy efficiency.
- Quiet operation.
- No monitor disturbance
- Absolutely maintenance-free.
- RS232 serial output for computer interface for interrogating the UPS operating parameters and historical data.
- UPS remote control (option).

BLOCK DIAGRAM

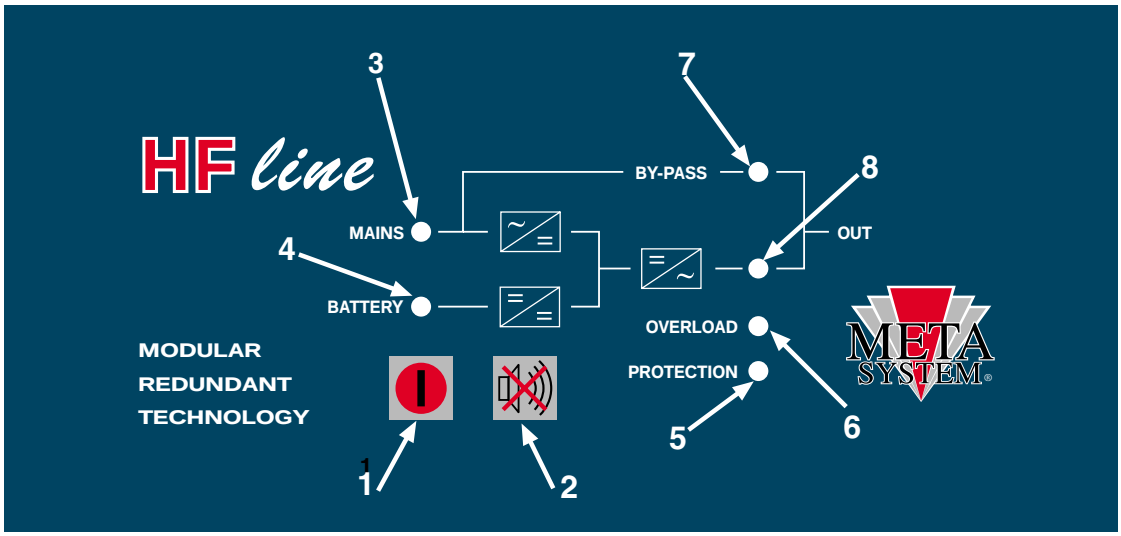


OPERATING PRINCIPLES

In the presence of mains supply, the input voltage is filtered and rectified by a special input circuit (power factor correction) that optimizes current absorption from the mains, making the power factor near to 1 and compensating for any voltage variations. This circuit can also supply the output inverter with very low mains voltages.
This feature is highlighted with very low loads, to the point that, with a load of about 50% of nominal, mains operation is possible up to 100V line voltage approximately without absorbing energy from the batteries.
This “intelligent” management of the switchover to battery power is designed to minimize battery use.
The voltage corrected by the first circuit is then used by a high frequency inverter to generate “clean” sinusoidal output voltage at very low distortion; a fast synchronized by-pass circuit intervenes during absorption peaks that exceed the inverter capacity, eg. when switching on certain peripherals, demagnetization of large colour monitors, and so on.
The absence or excessive drop of the mains voltage automatically activates the booster circuit which ensures interruption free power supply to the output inverter and, consequently, to the load using the batteries.
The type of circuit is with direct neutral; i.e. avoiding alteration of the neutral regime of the apparatus connected to the UPS.
During normal operation, a sensor checks the difference in potential between the neutral conductor and that of Earth and, if excessive, activates input protection and switches the unit to battery mode, signalling the anomaly. However, it is possible to have just the indication of anomaly by modifying the software setting.
On the output line, the UPS is equipped with an electronic differential sensor to guarantee the maximum safety of the operator and the connected loads.
All the UPS functions are managed by a microprocessor which also controls and stores particular operating conditions as well as managing the UPS computer interface via RS232 output. This makes it possible to check in real time the operating parameters and any anomalies.

BOX CONTENTS

- UPS
- User’s Manual
- I/O connector
- 3.5” disk containing the “UPS LINK” monitoring software
- CD-ROM containing the UPS Shutdown Software
- RS232 cable
- Battery unit (only in the double cabinet version)



KEY

1 ON/OFF SWITCH
2 BUZZER STOP AND BATTERY TEST ACTIVATION SWITCH
3 GREEN MAINS LED (mains present)
4 YELLOW BATTERY LED (battery operation)
5 RED PROTECTION LED (operating anomaly)
6 RED OVERLOAD LED (overload warning or overload)
7 YELLOW BY-PASS LED
8 GREEN INVERTER LED
9 INPUT/OUTPUT PLUG
10 LINE FUSE
11 SERVICE SWITCH (for special functions setting)
12 RS232 COMPUTER INTERFACE SOCKET
13 SOCKETS FOR REMOTE CONTROL AND LOGIC INTERFACE
14 SCREW FOR EARTH CONNECTION OF BATTERY UNIT(double cabinet)
15 BATTERY UNIT CONNECTION CABLE (double cabinet)
16 LOCKING SCREW OF BATTERY CONNECTOR (battery unit)
17 CONNECTOR FOR CONNECTION OF INVERTER UNIT(battery unit)

INSTALLATION

The HF LINE range is divided into two different series:
one with single cabinet, available in models with 1, 2, 3, or 4 boards; and one with double cabinet, available in models with 4, 5, 6, 7, 8 boards.

CAUTION

For safety reasons, it is not advisable to modify the cables supplied. Check the mains outlet to which the UPS is connected has a secure connection to earth .

CAUTION

The mains power socket, or the mains supply switch, must be installed in the vicinity of the UPS and must be easily accessible.

SINGLE CABINET VERSION

The following are located on the back of the UPS unit:

- Input/output plug [9]: connect to the pre-wired I/O connector, which is with the accessories supplied with the unit.
- Socket for RS232 serial computer interface connection (9-pin female) [12]: required for use of the UPS LINK monitoring software.
- Two sockets to connect the remote control and the computer interface to logic signals (contacts) (9-pin male) [13]: for use with the respective accessories (optionals).

Installation procedure:

1) Put the UPS in its final position checking that the ventilation slits are not obstructed. Read points 2) and 3) only if the I/O connector is not supplied pre-wired.
2) Wire the I/O connector supplied as shown in Figure 2, using a sheathed cable with internal conductors of at least **1.5 mm²** cross-section.
3) Insert the connector in the plastic cover and secure it with the screws, then secure the cables to the cover using the cable clamp (see Fig. 3).
4) Remove the cover of the plug [9] by taking out the attachment screws.
5) Connect the I/O connector to the plug [9] on the back of the UPS securing it to the frame using the screws (see Fig. 1).
6) Connect the loads to the UPS output making sure that the relative appliances are switched off.
7) Connect the power supply plug to a current outlet adequate for the voltage and current required.

Fig. 1

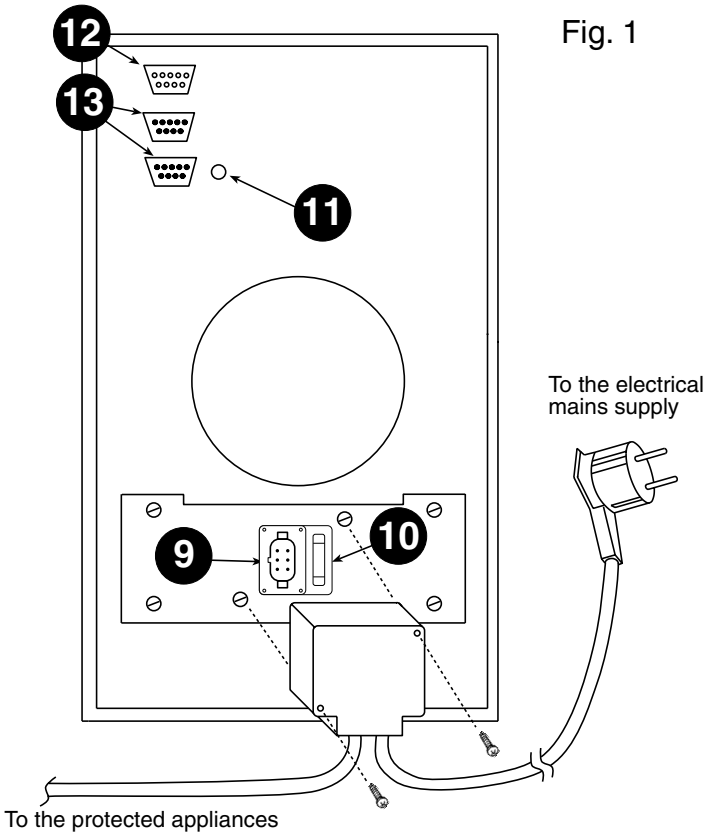


Fig. 2

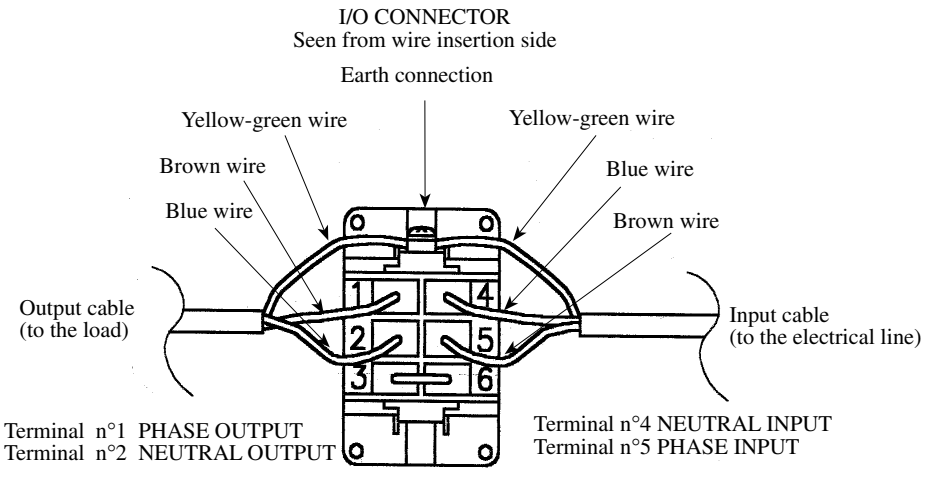
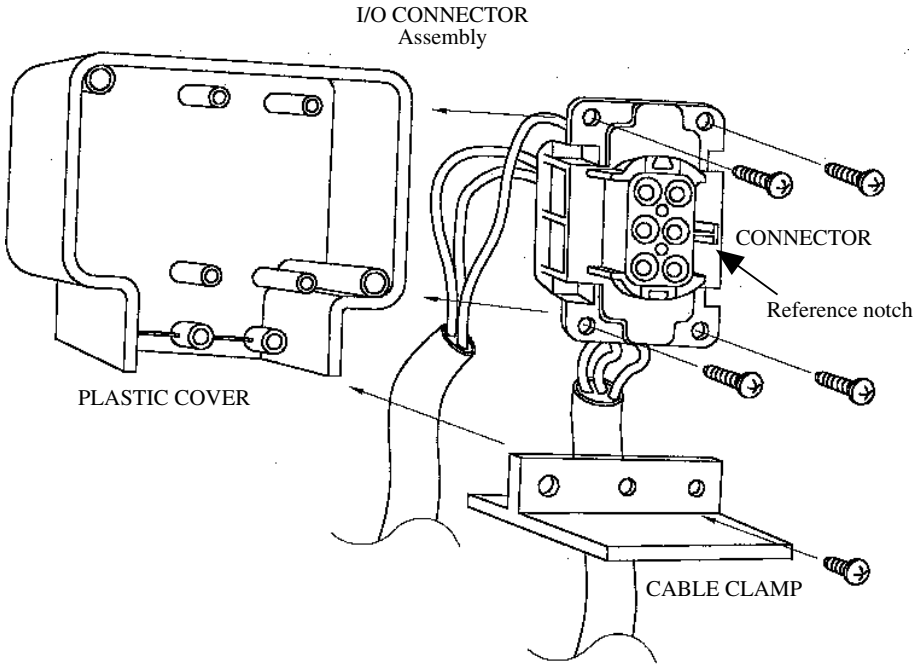


Fig. 3



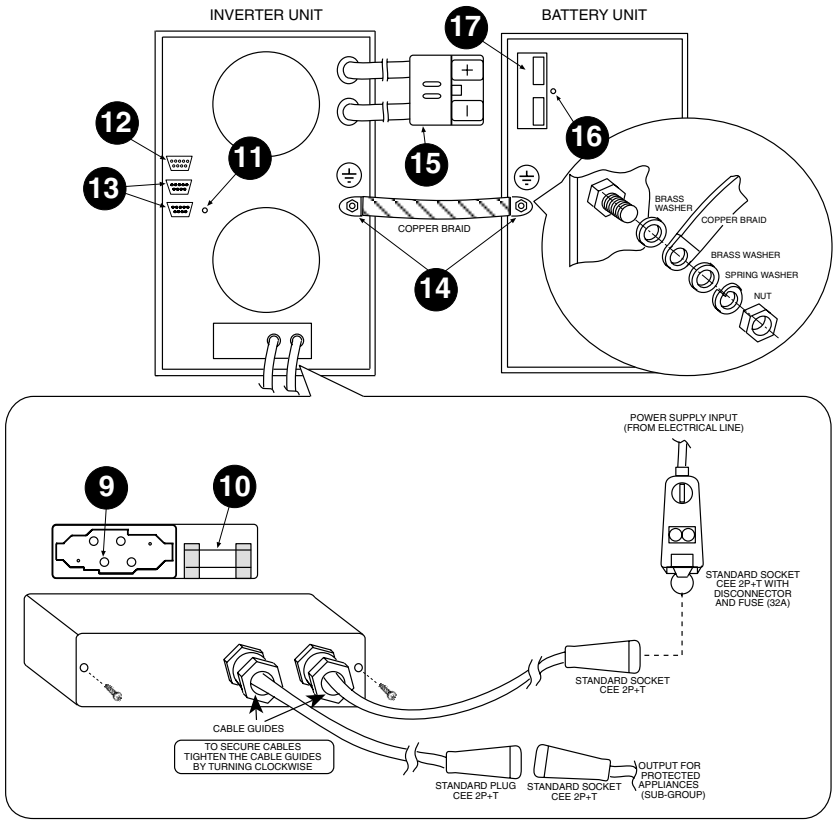
DOUBLE CABINET VERSION

The following are located on the back of the UPS:

Inverter Unit

- Input/output plug [9]: connect to the pre-wired I/O connector which is with the accessories supplied with the unit.
- Socket for RS232 serial computer interface connection (9-pin female) [12]: required for use of the UPS LINK monitoring software.
- Two sockets to connect the remote control and the computer interface to logic signals (9-pin male) [13]: for use with the respective accessories (optionals).
- Cable output for connection to battery cabinet with dedicated connector [15].
- Screws for connection of the battery unit to earth [14].

Fig. 4



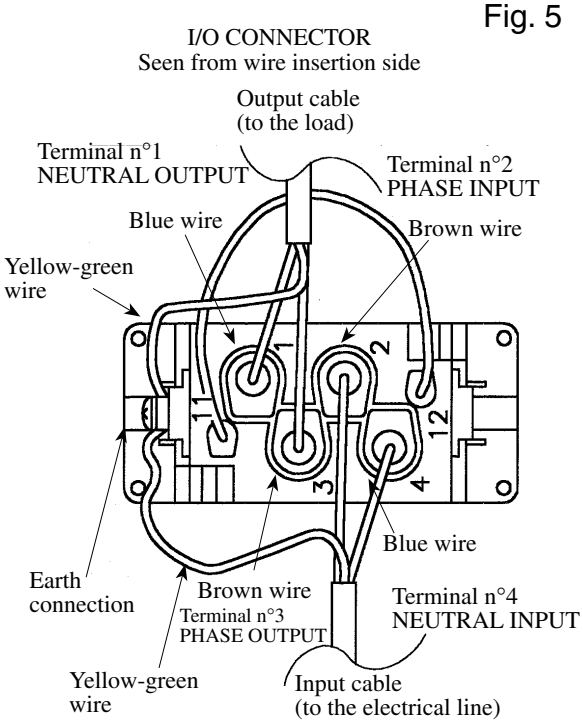
Battery Unit

• Dedicated connector for connection of Inverter Unit with locking screws [17].
• Screws for connection of the frame to earth [16].

Installation procedure:

1) Looking at the UPS from the front, place the Battery Unit to the left of the Inverter Unit; making sure that the ventilation slits are not obstructed.
2) Make the earth connection between the two units using the copper braid supplied, as shown in Fig. 4.
3) Connect the Battery Unit using the dedicated power connector [15] and [17], using the screw (to guarantee compliance with the safety regulations).
4) Wire the I/O connector supplied as shown in Fig. 5, using sheathed cable with internal conductors of at least **4 mm²** cross-section.
5) Insert the I/O connector in the plastic cover and secure it with the screws; then run the cables through the holes securing them with the two cable guides (see Fig. 6).
6) Remove the plug cover [9] by taking out the screws.
7) Insert the I/O connector in the plug [9] located on the back of the UPS, and secure it to the frame using the screws (see Fig. 4).
8) Connect the loads to the output socket, making sure that the various protected appliances are switched off.
9) Connect the power supply plug to a current outlet adequate for the voltage and current required.

Fig. 5



Switch-on

1) Switch on the UPS using the power button [1] (see "controls" in the section on functions and signals). At this point, if the neutral sensor does not detect any anomalies, the UPS will supply the output directly from the mains by way of the by-pass (yellow LED) [7], then it will switch to inverter mode after a few seconds and enter normal operating mode (green MAINS LED [3] and INVERTER LED [8]). If this does not take place, switch off the UPS by keeping the same button used for switch-on pressed down for a few seconds, reverse the plug or invert the two conductors for input phase and neutral on the connector, and then switch the UPS on again.

Note: Should the problem persist even after rotating the plug (or reversing the input conductors), it is possible that the mains supply line does not have earth connection or that the neutral has an anomalous potential respect to earth; therefore check the power supply source. **If necessary, it is possible to exclude the neutral sensor, as described in the section on special functions**.

2) Switch on the loads and make sure that normal operation is restored following a by-pass intervention. Green MAINS LED [3] and green INVERTER LED [8] are lit. If the connected loads are excessive, the by-pass remains active and the red OVERLOAD LED will flash [6].
3) A few seconds after switch-on, the UPS automatically does a battery test to check correct operation (refer to the *"Battery Test"* section).

CAUTION

Never disconnect the 230V power supply plug while the UPS is in operation, as this eliminates earth protection of both the UPS and the connected loads.

ATTENTION

(for the models with 1, 2, 3, or 4 boards)

As the leakage currents toward earth of all the loads are summed by the protection conductor (earth wire) of the UPS, check that the sum of these current values does not exceed 2.7 mA for safety reasons according to the EN 50091-1 regulation.

CAUTION

The UPS is equipped with a circuit to protect against any connection error, which is signalled by the red protection LED and the continuous beep of the incorporated buzzer. Should this occur when the UPS is switched on, disconnect the power plug immediately.

ATTENTION

If you notice a brief flash of the red overload LED every 3 seconds after all the connected loads have been switched on, the load connected to the UPS is at the maximum limit allowed.

I/O CONNECTOR ASSEMBLY

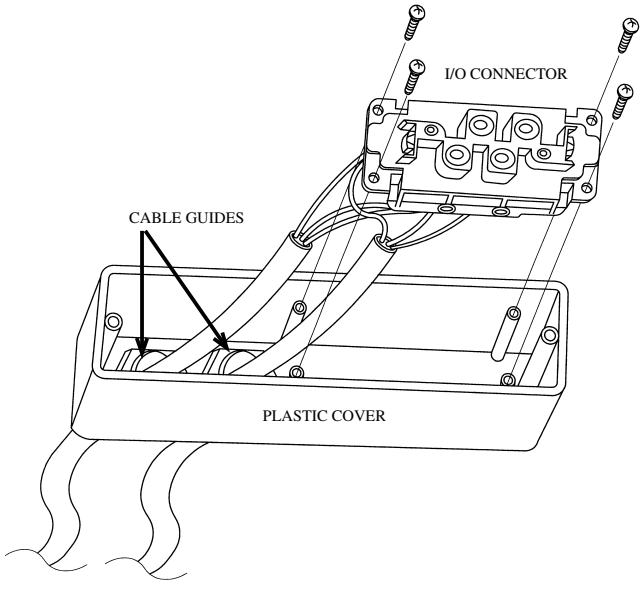


Fig. 6

FUNCTIONS AND SIGNALS

Visual signals:
the leds illustrated on page 6, have the following functions:

3 Green MAINS LED
- on: mains normal, inverter synchronized.
- flashing: mains out of tolerance level but present and sufficient for correct operation, or inverter not syncronized.
- off: mains absent or too low in relation to the load.
- on in service mode: neutral sensor enabled.
- off in service mode: neutral sensor inhibited.

8 Green INVERTER LED
- on: inverter operation.
- off: inverter disactivated or defective.
- on in service mode: Extended PLL Lock Range on.
- off in service mode: Extended PLL Lock Range inhibited.

4 Yellow BATTERY LED
- on: battery operation.
- flashing: battery reserve or negative battery test.
- off: mains operation.
- on in service mode: Autorestart on.
- off in service mode: Autorestart inhibited.

5 Red PROTECTION LED
- on: UPS operation blocked.
- flashing: failure of one or more power modules.
- alternating short-long flashing: intervention of the output differential or incorrect connection of the input neutral conductor.
- off: normal operation.
- on in service mode: 60 Hz operation.
- off in service mode: 50 Hz operation.

6 Red OVERLOAD LED
- on: output voltage anomalies.
- flashing: overload.
- off: normal operation.
- brief flashes every 3 seconds: overload warning.
- on in service mode: load waiting mode (LWM) operation.
- off in service mode: normal operation.

7 Yellow BY-PASS LED
- on: by-pass active (output supplied directly from mains).
- off: output supplied by the inverter.
- on in service mode: Dip Speed switched on.
- off in service mode: Dip Speed switched off.

Acoustic signals:
- Continuous beep: UPS shutdown.
- Slow intermittent beep (one beep every 12 seconds): battery operation.
- Fast intermittent beep: overload or fault.
- Alternating short-long beep: autonomy reserve or negative battery test or incorrect connection of neutral conductor.
- Single beep: indication of UPS switch-on or acknowledgement of battery test request or end of battery test with positive outcome or start of service mode or end of service mode.

Controls:
The UPS is controlled using the two buttons on the front panel, as seen in the figure on page 6.

1 On/Off button:
- Press to switch on the UPS. This is confirmed by a short illumination of all the LEDs and a brief acoustic signal (beep).
- Keep the button pressed for about two seconds to switch off the UPS, indicated by the intermittent beep of the buzzer.

2 Buzzer stop/battery test button:
- Press this button briefly to silence the buzzer. This annuls the acoustic warning in progress and the buzzer remains silent until it is necessary to signal another event.
- Keep this button pressed for about two seconds make a battery test request; for further details refer to the relative section of the manual.

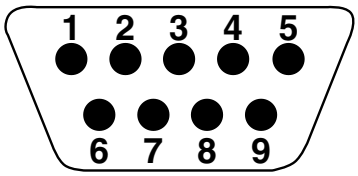
Please Note:
- Under normal operating conditions, the green MAINS LED [3] and INVERTER LED [8] are on.
- During battery operation, the green INVERTER LED [8] and yellow BATTERY LED [4] are on.
- Battery operation is indicated by a slow beep (one beep every 12 seconds). Autonomy reserve, i.e. when shutdown of procedures on the computer connected to the UPS must start , is indicated by an intermittent alternating short-long beep accompanied by similar flashing of the BATTERY LED [4].
- When running on the battery, if the battery runs down completely, the back-up power supply will switch off, the buzzer will sound continuously and the yellow “battery” LED will flash to signal this condition. After about 15 seconds, if the mains supply has not come back, the UPS will shut down completely, the buzzers will stop and all the status indicator lights will switch off. The unit cannot be switched back on even in manual mode until mains the power supply has not been restored.
- Flashing of the red OVERLOAD LED [6] indicates an excessive output load. In this event, if mains is present, the load is supplied by mains through the by-pass; otherwise, the UPS shuts down after 15 seconds of continuous overload.
- Flashing of the red PROTECTION LED [5] if the intermittence is quick, this indicates the failure of one or more power modules, or if the intermittence is alternating short-long, an anomaly in the UPS connection (tripped “differential” or incorrect neutral conductor connection). In the case of incorrect neutral, invert the phase and neutral wires in the I/O connector or reverse the UPS power cable plug.
- When the UPS shuts down due to any anomaly, it is automatically and completely switched off after about 15 seconds.

LOGIC SIGNAL AND REMOTE CONTROL INTERFACE

On the back of the UPS unit there are two, identical and interchangeable 9-pin sockets [13], which enable the operational remote control and/or transmission of logic signals to computers equipped with special hardware and software. The logic signals are electrically insulated from the rest of the UPS and indicate whether the unit is operating on mains or battery and whether the batteries are in reserve. Normally, these signals are used for informing the operator of the status of the UPS so that he can close any procedure in progress before the autonomy of the UPS runs out, thus preventing data loss. In fact, with certain operating systems it is necessary to give special commands to the computer before being able to switch it off safely; the autonomy reserve

signal can be used to manage these procedures automatically.

Function of the connector pins for logic signal interface and remote control interface:



Pin 1: Voltage input from remote control (max. voltage +15V, same effect as pressing the on/off switch on the front panel)
Pin 2: +15V (Impedance 100Ω)
Pin 3: Reserve logic output 0/15V (Impedance 2.2 kΩ)
Pin 4: Battery logic output 0/15V (Impedance 2.2 kΩ)
Pin 5: GND (Common)
Pin 6: Buzzer output at 7.5 kHz (Open collector)
Pin 7: Reserve output (Open collector active low)
Pin 8: GND (Common)
Pin 9: Battery output (Open collector active low)

All the pins are galvanically insulated from the circuits of the UPS.

GUIDE TO USING THE UPS LINK DEDICATED SOFTWARE

Connection

The UPS is equipped with the standard RS232 interface, which makes it possible to access a series of data by computer related to the operation and history of the UPS. This function can be used with the UPS LINK interface program for WINDOWS(*), connecting a serial port of the PC to the interface socket [12] on the back of the UPS using an RS232 serial cable.

Installing UPS LINK software for WINDOWS(*)

To install the UPS LINK software, follow the steps below in sequence:

1. Start WINDOWS(*).
2. Insert the installation disk supplied with the UPS in drive A.
3. Select File / Run from the main menu of Program Manager.
4. Type A:\SETUP on the command line and then select OK.
5. The Select Directories window appears, which proposes the default directories in which the program files will be installed. Select OK.
6. An information window asks for confirmation to start installation. Select OK to start or CANCEL to abandon the installation.
7. At the end of installation, a group called Meta System UPS LINK is created which contains two icons:

-Meta System UPS LINK : Enquiry program

-Meta System UPS LINK Uninstaller : Program to remove the installation

Make sure that the UPS is connected to a free serial port of the PC and double click the Meta System UPS LINK icon.

To install the shutdown software (UPS Management Software), refer to the manual supplied with the CD-ROM.

* Windows is a registered trademark of Microsoft Corporation.

BATTERY TEST

The battery test can be carried out during mains operation as follows:

1. automatically, after set up using the UPS Shutdown Software.
2. by pressing the buzzer silencing button [2] for a few seconds.
3. at each switch-on of the UPS by means of the UPS LINK monitoring software.

To acknowledge the request, the UPS emits a brief acoustic signal (beep), after which, the test is carried out if the mains is present and there are no anomalous conditions such as overload, incorrect neutral, etc.; otherwise, the command is ignored.
On completion of the test, the appropriate following indication is given by the LEDs on the front panel:

5 LEDs flashing = 100% battery charge
4 LEDs flashing = 80% battery charge
3 LEDs flashing = 60% battery charge
2 LEDs flashing = 40% battery charge
1 LED flashing = 20% battery charge
1 LED flashing + acoustic signal = battery charge less than 20%.

The test is carried out in mains operation mode (i.e. without forcing the switch to battery mode), thanks to a special circuit patented by META SYSTEM; therefore even should the test result be negative, there is no interruption of the output voltage.

KB - AUTONOMY EXPANSION KIT (optional)
This kit makes it possible to increase the battery run time of the UPS by adding one or more pairs of batteries inside the UPS in the single cabinet version and inside the battery unit in the double cabinet version.

HF/2 Line - Battery Splitter Kit (optional)
This accessory enables parallel connection of additional battery units to the standard battery unit supplied, to increase the autonomy of the UPS.

HF Line Battery (optional)
An additional battery unit complete with battery connection cables which can house from 1 to 16 AUTONOMY EXPANSION KITS. One or more HF LINE BATTERY units can be connected in parallel to the standard battery unit by means of one or more HF/2 LINE Battery Splitters.

K 1 - POWER EXPANSION KIT (optional)
This kit makes it possible to increase the power of the UPS by adding one or more power modules inside the unit, up to a maximum of four in the single cabinet version and eight in the double cabinet version. K 1 is supplied complete with additional batteries.

SPECIAL FUNCTIONS SET UP
To set special functions, **when the UPS is switched-off**, press the SERVICE button [11] on the rear panel of the UPS. The UPS will beep and the LEDs on the front panel will show the status of the following options:

- MAINS LED [3] on → neutral sensor is enabled
- BATTERY LED [4] on → autorestart is enabled
- BYPASS LED [7] on → Dip Speed is on
- INVERTER LED [8] on → Extended PLL lock range is activated
- OVERLOAD LED [6] on → load waiting mode is enabled
- PROTECTION LED [5] on → operation at 60 Hz

To select the desired function press the Buzzer Off button [2] (the corresponding LED will flash). Pressing the On/Off button [1] inverts the operating status; the corresponding LED stops flashing and the new status is displayed.
To exit service mode, press the SERVICE button [11] again. Otherwise this takes place automatically 30 seconds after the last pressing of a button.

1 - Neutral sensor
The neutral sensor can inhibit UPS operation in the event that the neutral potential shifts excessively from that of earth; during installation, it is used to verify the correct direction of the power cable connection and to block operation in the event of error. To enable startup in this case, invert the neutral and phase input cables and restart the UPS. The neutral anomaly is signalled by modulated flashing of the red PROTECTION LED accompanied by the buzzer. This function is normally enabled.

2 - Autorestart
This function enables the automatic restart of the UPS when the mains supply is restored after UPS shutdown due to end of battery autonomy. Restart takes place in normal operation or in the mode selected using the SERVICE button. This function is normally enabled.

3 - Dip Speed
This function has been included for use with loads that create brief and repeated sags (e.g. laser printers). When this function is activated, by-pass intervention is delayed by 10 ms, permitting the

UPS to overcome brief sags without tripping the by-pass. The output voltage of the UPS will be slightly lower during the brief period of the sag (without jeopardizing the operation of any equipment connected). This function is normally enabled.

4 - Extended PLL lock range

This function makes it possible to extend the lock range of the mains frequency from ±2% to ±20% (advisable when operating with power supply from generating sets). This function is normally not enabled.

5 - Load Waiting Mode

The UPS can be configured to operate in "Load Waiting Mode" (LWM). This feature permits automatic switch-on and switch-off of the UPS in correspondance to the switch-on of the load connected. This makes it possible to reduce the period of operation of the UPS to the time strictly necessary for the function of the connected load (even when these are managed by automatic switch-on/off procedures). When the on/off switch is pressed, the UPS goes into stand-by, supplying the output directly from the mains through the by-pass; in this status (indicated by the flashing of the yellow BY-PASS LED), the batteries are recharged if necessary. If at this point there is absorption at the output (a load is switched on), the ensuing increase in current is detected by the microprocessor, which starts the switch-on procedure, activates the inverter, and switches by-pass to the normal position once the initial spike has terminated. Switching off the load restores the UPS to stand-by, where it awaits a new switch-on (if there is a blackout during the load waiting status, the internal microprocessor automatically switches off the UPS and switches it on again when mains current is restored. This protects the batteries from unnecessary discharge). It is possible to programme the threshold of load absence recognition using the UPS LINK monitoring software supplied with the UPS and a computer with WINDOWS operating system (see the specific description). This function is normally not enabled.

6 - 60 Hz Operation

The UPS can be configured to operate with line voltage at 60 Hz. This function is normally not enabled.

TROUBLE-SHOOTING GUIDE

Problem	Solution
• When the UPS is switched on, the buzzer beeps and the red PROTECTION LED flashes alternately short-long and then goes off after 15 seconds.	- Incorrect connection of the neutral conductor. Rotate the power plug or invert the direction of the connection of the neutral and phase input cables, or exclude the neutral sensor.
• The UPS operates but beeps briefly every 12 seconds and the yellow BATTERY LED remains on.	- Make sure that there is voltage at the mains supply output. - Check that the power cable of the UPS is connected securely to the mains supply outlet and to the connector of the UPS itself. - Check the fuse situated next to the I/O connector under the plastic cover (see Figure 1 or 4).
• The UPS operates but beeps intermittently and the red OVERLOAD LED + yellow BYPASS LED flash.	- There is an overload on the UPS output. Reduce the number of appliances connected so that the load does not exceed the maximum power that the UPS can deliver. Alternatively, if the UPS is not already in the maximum configuration, you can increase the UPS power by adding one or more modules (K 1) inside the UPS.

Problem	Solution
• The UPS beeps continuously, the red PROTECTION LED is on, and the yellow BATTERY LED flashes for about 15 seconds, after which the UPS switches off.	- The batteries are completely discharged and the UPS can only start up again if the mains line is present. Check the cutoff or differential switches upstream from the unit or the input fuse.
• The UPS operates but the green MAINS LED is flashing.	- The mains is outside the admissible limits of voltage and/or frequency, but still tollerated by the UPS. However, the by-pass is not operational.
• The UPS emits an intermittent beep and the red PROTECTION LED flashes quickly.	- The thermal protection has been tripped. Switch off the UPS and wait for few minutes for the internal temperature to normalize. Check to make sure that the fan is functioning correctly and that the air flow is not obstructed (e.g. UPS too close to a wall). - Failure of an internal circuit. Contact your service centre.

If the OVERLOAD and/or BY-PASS LEDs do not light up during operation, the UPS can function even with reduced power.

TECHNICAL FEATURES

Construction Specifications	**HF LINE 1Board**	**HF LINE 2Boards**	**HF LINE 3Boards**	**HF LINE 4Boards**	**HF LINE 4Boards/2**	**HF LINE 5Boards/2**	**HF LINE 6Boards/2**	**HF LINE 7Boards/2**	**HF LINE 8Boards/2**
Weight (Kg.)	20,5	28	35,5	43	24 + 40	26,5 + 45	29 + 50	31,5 + 55	34 + 60
Dimensions (L x H x D)	270 x 480 x 560 mm				270 x 480 x 560 mm x 2 cabinets				
Technology	High frequency PWM for both the input and output stages. Microprocessor control logic.								
Expandability	Possibility to expand to higher power configurations by adding one or more modules inside the same cabinet, up to a maximum of 4. Possibility to increase autonomy by means of extra batteries up to a maximum of 7 pairs of 7 Ah - 12V batteries inside the main UPS.				Possibility to expand to higher power configurations by adding one or more modules inside the same cabinet, up to a maximum of 8. Possibility to increase autonomy by extra batteries up to a maximum of 16 pairs of 7 Ah - 12V batteries inside the battery cabinet.				
Computer interface	Contact for interface with optional kits. 9-pin male connector output, SELV insulation. Standard RS232 serial connection for PC interface with the monitoring software provided. 9-pin female connector output with SELV insulation.								
Remote control	9-pin male connector output with SELV insulation for optional remote control. Possibility for programmed switch-on and switch-off and display of main UPS information.								
Protection	Electronic protection against overload, short circuit, and excessive battery discharge. Operation shutdown at end of autonomy. Switch-on spike limiter. Electronic differential output sensor. Correct neutral connection sensor. Back-feed protection (electrical safety insulation of the input plug during battery operation).								
Synchronized by pass	Both manual and automatic. Tripped for overload or operating anomaly.								
Environmental Specifications									
Maximum storage altitude	10,000 metres								
Storage temperature range	from -20°C to +50°C								
Operating temperature range	from 0°C to +35°C								
Relative humidity operating range	20-80% non condensating								
Protection (IEC529)	IP21								
Acoustic noise at 1m.:	42 dB (A)								

Construction Specifications	HF LINE 1Board	HF LINE 2Boards	HF LINE 3Boards	HF LINE 4Boards	HF LINE 4Boards/2	HF LINE 5Boards/2	HF LINE 6Boards/2	HF LINE 7Boards/2	HF LINE 8Boards/2
Input features									
Nominal input voltage	230 V								
Input voltage range	from 184V to 264V with nominal load - from 110 to 264 V at 50% of nominal load								
Nominal input frequency	50Hz or 60Hz ±2%, programmable by user								
Nominal input current	3,3A rms	6,4A rms	9,6A rms	12,9A rms	12,9A rms	16,1A rms	19,3A rms	22,5A rms	25,7A rms
Maximum input current	4,1A rms	8A rms	12A rms	16A rms	16A rms	20A rms	24A rms	28A rms	32A rms
Input current distortion	<20%								
Input power factor	>0,95								
Spike current	100% of nominal current								
No. input phases	single-phase								
Line fuse	20A EF				40A EF				
Output wave form									
Mains operation	sinusoidal								
Battery operation	sinusoidal								
Operating type	No-break, on-line UPS with direct neutral and dual conversion.								
Output features: mains operation									
Nominal output voltage	230 V ±1%								
Nominal output frequency	50Hz / 60Hz synchronized								
Output current with linear load, power factor 0.7	3,9A rms	7,8A rms	11,7A rms	15,6A rms	15,6A rms	19,6A rms	23,5A rms	27,4A rms	31,3A rms
Crest factor	3,5								
Nominal output power	900 VA	1800 VA	2700 VA	3600 VA	3600 VA	4500 VA	5400 VA	6300 VA	7200 VA
Active output power with linear or non-linear load P.F. 0.7	630 W	1260 W	1890 W	2520 W	2520 W	3150 W	3780 W	4410 W	5040 W
Operating power with switching load	1200 VA	2400 VA	3600 VA	4800 VA	4800 VA	6000 VA	7200 VA	8400 VA	9600 VA
Total harmonic distortion of output voltage with linear load	<0.5%								
Total harmonic distortion of output voltage with non-linear load P.F. 0.7	< 1%								
Overload capacity	300% for 1 second without by-pass intervention 200% for 5 seconds without by-pass intervention 150% for 30 seconds without by-pass intervention								

Construction Specifications	**HF LINE 1Board**	**HF LINE 2Boards**	**HF LINE 3Boards**	**HF LINE 4Boards**	**HF LINE 4Boards/2**	**HF LINE 5Boards/2**	**HF LINE 6Boards/2**	**HF LINE 7Boards/2**	**HF LINE 8Boards/2**
Power factor range of the load applied	from 0.7 to 1								
No. of output phases	single-phase								
AC-AC conversion efficiency with linear load P.F. 1 and charged batteries 50% load 75% load 100% load	 80% 84% 90%								
Output features: battery operation									
Nominal output voltage	230V ±1%								
Output frequency	50Hz / 60Hz ±1%								
Nominal output power	900 VA	1800 VA	2700 VA	3600 VA	3600 VA	4500 VA	5400 VA	6300 VA	7200 VA
Active output power with linear or non-linear load, P.F. 0,7	630 W	1260 W	1890 W	2520 W	2520 W	3150 W	3780 W	4410 W	5040 W
Operating power with switching load	1200VA	2400VA	3600VA	4800VA	4800VA	6000VA	7200VA	8400VA	9600VA
Total harmonic distortion of output voltage	< 1%								
Overload capacity	160% for 15 seconds								
Admissible power factor range of the load applied	from 0.7 to 1								
DC-AC conversion efficiency with linear load P.F. 1 at 50% of load at 75% of load at 100% of load	 82% 84% 83%								

Battery operation												
Standard UPS	**HF Line 1 Board**			**HF Line 2 Boards**			**HF Line 3 Boards**			**HF Line 4 Boards**		
Applied load in percentage	50%	80%	100%	50%	80%	100%	50%	80%	100%	50%	80%	100%
Approximate autonomy in minutes with charged batteries	11	5	3	11	5	3	11	5	3	11	5	3
Recharge time to 90%	5-6 hours depending on discharge.											
Technical data and quantity of batteries	2 sealed lead-acid batteries, maintenance-free, 12V 7Ah, connected in series for each module											
Reserve	from 21.5V to 24V, programmable by user.											
Minimum battery operation voltage during discharge	from 18V to 21V with automatic selection according to the applied load, or programmable by user.											
Average battery lifetime	3-6 years depending on use and operating temperature. **Attention!** The batteries contained in the UPS are subject to diminishing capacity over time (a typical feature of lead batteries declared by the manufacturer in the technical manual). For example, the decrease in capacity of a battery with 4 years life can be up to 40%, with consequent proportional drop in UPS battery autonomy time.											
By-pass features												
Type of by-pass	Electromechanical											
Standards												
Safety: designed to comply with standard	EN 50091-1											
Electromagnetic compatibility: immunity emission	Complies with EN 50091-2 standard Complies with EN 50091-2 standard											