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Congratulations on your choice to purchase a LEGRAND® UPS !

This manual contains information regarding the safety, installation and operation of the Whad series of Uninterruptible Power Supplies manufactured by LEGRAND®.

We recommend you read this manual carefully before proceeding to install your Uninterruptible Power Supply and then to follow its instructions scrupulously.

The Whad series of UPS have been designed principally for use in civilian, industrial and electro-medical applications;

however, it is important to establish if there are particular regulations that apply to the latter application in the country where the UPS is to be used.

Should there be a problem with the UPS we recommend reading this manual before contacting your service centre: the section on 'Possible problems and solutions' can help resolve the majority of potential difficulties experienced during the use of UPS.

Important

We recommend you keep the equipment's packaging materials as they can be useful should the need arise to send the product back for repairs.

Damage caused by inadequate packaging of the UPS during transport is not covered by the guarantee.

2 Conditions for use

- The UPS was designed to supply power to appliances for data elaboration; the load applied must not exceed that stipulated on the label located on the rear of the UPS.
- The ON/OFF button of the UPS does not electrically insulate its internal parts. To insulate the UPS, disconnect it from the mains power outlet.
- Do not open the UPS case since there may be energised parts inside it that are dangerous even when the UPS is not connected to the mains power outlet. In any case, there are no parts inside the UPS that can be repaired by the consumer.
- The front control panel is for manual operation: do not use sharp or pointed objects.
- The UPS was designed to operate in a clean, closed environment that does not contain inflammable liquids and corrosive substances and is not excessively damp.

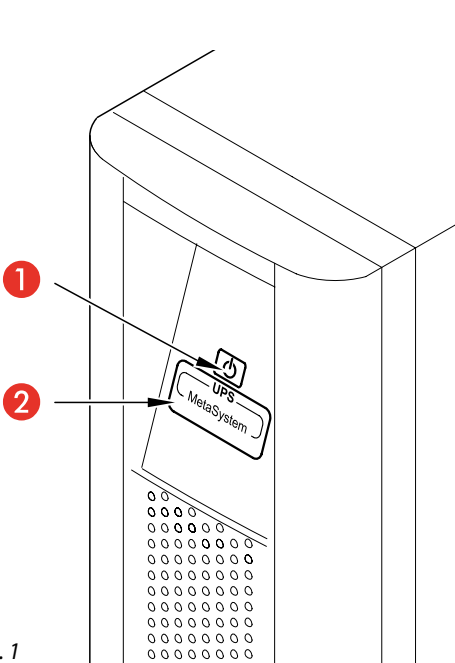


Fig. 1

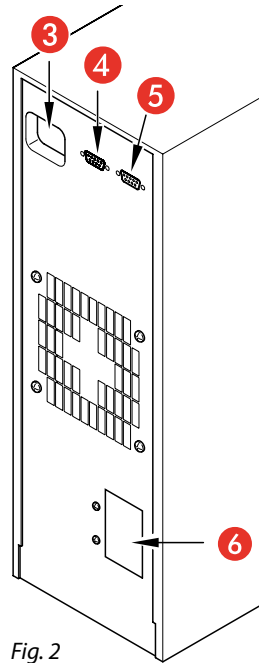


Fig. 2

KEY

1. ON / OFF button
2. Multicolor operating status indicator light (green/yellow/red)
3. Input/output plug-socket
4. Socket for remote control and logic interface
5. RS232 computer interface socket
6. Connector for installation of additional battery unit

The following connection points are located on the rear of the UPS:

- Input/output plug-socket [3]: connect the power supply cable and the output extension sockets to this connector, as indicated in the diagram.
- Socket for connection of RS 232 (9 pin female) type, computer serial interface [5]: to be used if the 'SuperviSor light' UPS diagnostics software is required.
- 1 socket to connect the remote control and the computer interface to logic signals (contacts) [4]: for use with the respective accessoires (optional)



WARNING

For reasons of safety, we recommend the cables supplied are not modified; in addition it is essential to ensure that the mains outlet used for the UPS is connected securely to the earth circuit.



WARNING

The mains outlet, or the circuit breaker, must be installed near the appliance and must be easily accessible.

3.1 Proceed with the installation as follows:

1. Locate the UPS so that the ventilation outlets are not obstructed.
2. Connect the power supply cable and the multiple-socket, output extension to the Input-Output connector [3] (see fig.1)
3. Check that the on/off switches of all the appliances to be connected to the UPS are OFF and connect them to the output extension.
4. Insert the power supply plug into a power outlet that is adequate for the voltage and current required.

3.2 Switching on

1. Switch the UPS on with the appropriate button [1] (refer to the section on 'Functions and Signals' at the paragraph 'controls'): The UPS initially supplies the output directly with mains power using its bypass (signalled by the yellow LED) [2] and after a few seconds switches over to its inverter and enters its normal operation mode (the green MAINS LED [2] is on).
2. Switch the connected loads on and, after any bypass intervention, check that normal operation is resumed: at this point the green MAINS LED [2] is on. Should the connected loads be too large, the bypass will remain active and the red ALARM LED [2] will flash.
3. A few moments after switching on, the UPS will automatically test its batteries to check they are operating correctly (refer to the section on the 'Battery Test').

**WARNING**

Never remove the 230 V power plug whilst the UPS is in operation: this would disconnect the earth protection of both the UPS and of the connected loads.

**WARNING**

Since current dispersion towards earth of all the loads are added together in the UPS protection connector (earth wire), it is essential to check that the sum of these currents does not exceed 2.7 mA for safety reasons, according to standard EN 62040-1.

**WARNING**

If the red ALARM LED flashes briefly every 3 seconds after all the connected loads are switched on, it is to signal.

4.1 Luminous signals:

With reference to the diagram on page 12, the luminous signal [2] has the following functions:

- **Green MAINS LED**
 - On fixed: mains is regular, inverter is synchronous.
 - Flashing: mains is out of tolerance, but present and sufficient for correct operation, or inverter is not synchronous.
 - Off: mains is not present or too low in respect to the load.
- **Yellow BATTERY LED**
 - On fixed: battery operation
 - Flashing: battery reserve level, or end of autonomy, or negative battery test.
 - Off: mains operation.
- **Red ALARM LED**
 - On fixed: UPS operation is blocked.
 - Flashing: fault in one power module.
 - Alternating short-long flashing: wrong connection of neutral, input conductor (if neutral sensor is enabled).
 - Off: normal operation
 - On fixed: anomaly in output voltage
 - Flashing: overload
 - Off: normal operation
 - Short flashing every 3 sec: warning of imminent overload
- **Yellow BYPASS LED**
 - On fixed: bypass in operation (output supplied directly by mains)
 - Off: output supplied by inverter.

4.2 Acoustic signals:

- Continuous sound: UPS operation is blocked.
- Slow intermittent sound (one beep every 12 seconds): battery operation.
- Fast intermittent sound: overload or fault.
- Alternating, slow-fast intermittent sound: autonomy reserve, or negative battery test, or wrong connection of neutral, input conductor (if neutral sensor is enabled).
- Single beep: signals switching on of UPS, or recognition of request for battery test, or end of battery test with positive result.

4.3 Controls:

The UPS is managed by means of the button on the front panel, illustrated in the diagram on page 12.

1 On / Off Button:

- Press briefly to switch the UPS on: confirmation is given by the momentary lighting up of LED [2] and by a short acoustic signal (beep).
- Keep the same button pressed for approximately 2 seconds to switch the UPS off, confirmed by the intermittent beeping of the buzzer.



WARNING:

- In normal operating conditions, the green MAINS LED [2] is lit.
- During operation with battery power, the yellow BATTERY LED [2] is lit.
- The UPS indicates it is operating with battery power by emitting a slow acoustic sound (one beep every 12 seconds).

Battery reserve, i.e. the opportune moment for the user to shut down the open procedures on the computer connected to the UPS, is indicated by an alternating, slow-fast intermittent sound together with the corresponding flashing of the yellow BATTERY LED [2]. The end of battery autonomy is signalled by the flashing of the yellow BATTERY LED and the continuous sounding of the buzzer for a total length of 15": in this state, the load is no longer supplied.

- The red ALARM LED flashes to indicate the presence of an excessive load on the output.

In this case, if mains is present, the load is supplied through the bypass with mains power, otherwise the operation of the UPS will be blocked after 15 seconds of continuous overload.

If the red ALARM LED [2] flashes with a rapid intermittence it signals a fault in one or more of the power modules; if the intermittence is alternating short-long it signals an anomaly in the connection of the UPS (wrong connection of neutral conductor).

If the neutral is wrong invert the plug on the UPS power supply cable.

- In all cases, when the operation of the UPS is blocked due to any anomaly, it completely and automatically shuts down after approximately 15 seconds.

The UPS is supplied with software for Windows environments (16 and 32 bit) called.

This software offers the following functions:

- Display of all the operating and diagnostics data in case of problems.
- Configuration of the special functions.
- Automatic shutdown of the local computer (with Windows operating system).

To download a free copy of the software and/or to get a detailed list of the supported systems, visit our Internet website www.ups.legrand.com.

Windows is a registered brand of Microsoft Corporation.

5.1 Connection

The UPS has a standard RS232 interface and it is possible to use this, in conjunction with a computer, to access a series of data regarding the operation and the history of the UPS.

The function can be used by means of the interface programme for Windows (*) environments, by connecting a serial port on the PC to the interface socket [5] located on the rear of the UPS using a RS 232 cable.

It is also possible to configure the UPS, enabling or disabling the special functions (Hardware).

6 Configuration of special functions

1. **Neutral sensor:** The neutral sensor is able to inhibit the operation of the UPS should the neutral potential move excessively away from that of earth.
2. **Autorestart:** This function enables the automatic restarting of the UPS when mains power returns after the operation of the UPS was blocked due to the end of battery autonomy.
3. **Dip speed:** This function is included for use with loads that make brief and repeated peaks of consumption (for example laser printers). When it is enabled, the intervention of the bypass is delayed for 10 ms which allows the UPS to overcome shorter peaks without it intervening.
4. **Extended PLL lock range:** This enables the increase of the range of mains frequencies from +/- 1Hz to +/-10Hz.
5. **Enable load waiting mode:** The UPS can be set to operate in 'load waiting mode' (LWM). This type of operation enables the automatic switching on and off of the UPS according to whether the connected load is switched on or off.
6. **60 Hz operation:** The UPS can be set to operate with 60 Hz mains voltage.

For further details of these and other, less important functions, please refer to the in line Help function supplied with the diagnostics software.

7 Battery test

The battery test can be done during UPS operation on mains power as follows:

1. Automatically: after programming by means of the optional shutdown software
2. Every time the UPS is switched on by means of the software.

The test is done with the UPS operating on mains power (that is without forcing the operation of the UPS onto battery power) thanks to a particular LEGRAND® patented circuit: therefore even if the battery test gives a negative result, there will be no interruption of the output power.

8 Possible problems and solutions

| Problems | Solutions |
|--|--|
| When the UPS is switched on, the buzzer sounds and the red ALARM LED makes intermittent short-long flashes, then the UPS switches off after 15 seconds | <ul style="list-style-type: none"> - The connection of the neutral conductor is wrong: invert the power supply plug, or exclude the neutral sensor (using the software supplied) |
| The UPS works but every 12 seconds there is a short beep and the yellow BATTERY LED is always lit up. | <ul style="list-style-type: none"> - Check power is present at the mains socket. - Check that the UPS power supply cable is correctly inserted in both the mains socket and in the UPS connector |
| The UPS works but it beeps intermittently, the red ALARM LED flashes and the yellow BYPASS LED is always lit up. | <ul style="list-style-type: none"> - There is an overload on the UPS output. Reduce the quantity of appliances connected so that the load does not exceed the maximum power that the UPS can supply. |
| The UPS beeps continuously and the yellow BATTERY LED flashes for about 15 seconds, after which the UPS switches off. | <ul style="list-style-type: none"> - The UPS has completely flattened its batteries; it can only start up again when the input line is present. Check the magneto-thermal or differential switches that precede the UPS |
| The UPS works but the green MAINS LED flashes quickly | <ul style="list-style-type: none"> - The mains supply is out of the limits permitted for the voltage and/or frequency, but it can still be used by the UPS. However, the bypass function is not operational. |
| The UPS beeps intermittently and the red ALARM LED flashes quickly | <ul style="list-style-type: none"> - The thermal protection has intervened. Switch the UPS off and wait for a few minutes so that the internal temperature of the UPS can get back to normal. Check that the fans operate correctly and that the relative airflow is not obstructed (e.g. if the UPS is too close to a wall). - There is a fault on one of the internal circuits. Contact your nearest service centre. |

If the ALARM LED and / or BYPASS LED are not lit up, the UPS can operate normally although the power will be reduced.

9 Technical specifications

| | 3 100 96 3 101 09 3 101 10 | 3 100 97 3 101 11 3 101 12 |
|--|--|----------------------------------|
| Construction specifications | | |
| Weight | 25 Kg | |
| Size L x H x P in mm | 160 x 460 x 420 | |
| Technology | PWM high frequency both for input stage and output stage. Microprocessor control logic. | |
| Computer interface | Standard serial RS232 for interfacing with personal computer using the diagnostic software supplied, output to 9 pin, female, SELV insulated, DB9 connector | |
| Protection features | Electronic protection against overloads, short circuits and excessive battery discharge. Operation block at end of autonomy. Inrush current limitation when switching on. Sensor for correct neutral connection Back feed protection (electrical insulation for the safety of the input plug during operation in battery mode) | |
| Internal, synchronised bypass | Automatic. Intervenes in case of overload and operation anomaly | |
| Environmental specifications | | |
| Maximum altitude for storage | 1000 metres | |
| Storage temperature range | from -20°C to +50°C | |
| Operating temperature range | from 0°C to 40° C | |
| Range of relative humidity for operation | From 20% to 80% non condensing | |
| Grade of protection according to IEC529 | IP21 | |
| Noise level at 1 metre | 42 dBA | |
| Nominal input voltage | | |
| Nominal input voltage | 230 V | |
| Range of input voltage (nominal load) | From 184V to 264V | |
| Range of input voltage (50% nominal load) | From 110V to 264V | |
| Nominal input frequency (selectable by the operator) | 50Hz/60HZ +/- 2% | |


9 Technical specifications

| | 3 100 96 3 101 09 3 101 10 | 3 100 97 3 101 11 3 101 12 |
|---|--|---|
| Nominal input current | 7,4 A rms | 9,2 A rms |
| Maximum input current | 9 A rms | 11,4 A rms |
| Distortion of input current with nominal load | <10% | |
| Input power factor | >0.99 at 80% of nominal load | |
| In-rush current | 100% of nominal current | |
| Number of input phases | Single phase | |
| Line fuse | 20 A FF | |
| Output wave form | | |
| With mains operation | Sinewave | |
| With battery operation | Sinewave | |
| Type of operation | No break, on line UPS with passing neutral and double conversion | |
| Electrical output specifications with mains operation | | |
| Nominal output voltage | 230V +/-1% | |
| Nominal output frequency | 50Hz/60Hz synchronised | |
| Output current with linear load P.F.=0,7 | 8,7 Arms | 10,86 Arms |
| Tolerated crest factor on output current | 3,5 | |
| Nominal output power | 2000 VA | 2500 VA |
| Active output power with linear or non-linear load PF = 0.7 | 2800 W | 3600 W |
| 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 bypass intervention 200 % for 5 seconds without bypass intervention | |
| Power factor range with applied load | From 0,7 to 1 | |
| Number of output phases | Single phase | |

Whad 2, 2.5 kVA

| | 3 100 96 3 101 09 3 101 10 | | 3 100 97 3 101 11 3 101 12 | |
|--|---|-----|----------------------------------|-----|
| AC-AC conversion efficiency with linear load PF = 1 and charged batteries With 50% load With 75% load With 100% load | | | 80% 84% 90% | |
| Electrical output specifications with battery operation | | | | |
| Nominal output voltage | 230V +/-1% | | | |
| Output frequency | 50Hz/60Hz +/-1% | | | |
| Nominal output power | 2000 VA | | 2500 VA | |
| Active output power with linear or non-linear load PF = 0.7 | 1400 W | | 1750 W | |
| Total harmonic distortion of output voltage | < 1% | | | |
| Overload capacity | 160% for 15 seconds | | | |
| Power factor range tolerated with nominal load | from 0,7 to 1 | | | |
| DC-AC conversion efficiency with linear load PF = 1 and charged batteries With 50% load With 75% load With 100% load | | | 80% 80% 80% | |
| Battery operation | | | | |
| Applied load in percentage | 50% | 80% | 50% | 80% |
| Approximate autonomy in minutes with charged batteries | 22 | 10 | 16 | 8 |
| Recharge time up to 90% of total load | 5-6 hours according to level of discharge | | | |
| Technical data and quantity of batteries | N° 3 pcs 12V 7Ah, sealed, lead-acid, maintenance free batteries connected in series for each powerboard | | | |
| Reserve signal | From 32.2V to 36V can be programmed by operator | | | |
| Minimum voltage for battery operation | From 27V to 31.5V with automatic selection according to load or can be programmed by operator | | | |

9 Technical specifications

| | 3 100 96 3 101 09 3 101 10 | 3 100 97 3 101 11 3 101 12 |
|---|--|----------------------------------|
| Average battery life | 3-6 years according to use and working temperature  WARNING! The batteries in the UPS are subject to a reduction in capacity according to their age (a feature of lead batteries declared by their manufacturer in the technical manual). For example, the reduction in the capacity of a 4-year-old battery can reach 40% with a proportional reduction of autonomy times of the UPS when operating in battery mode. | |
| Bypass Specifications | | |
| Type of bypass | Electro-mechanical | |
| Standards | | |
| Safety: | Conforms to standard EN 62040-1 | |
| Electromagnetic compatibility: Immunity - emission | Conforms to standard EN 62040-2 | |
| Performance and features | Conforms to standard EN 62040-3 | |