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Congratulations on your choice to purchase a LEGRAND<sup>®</sup> UPS!

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

**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.

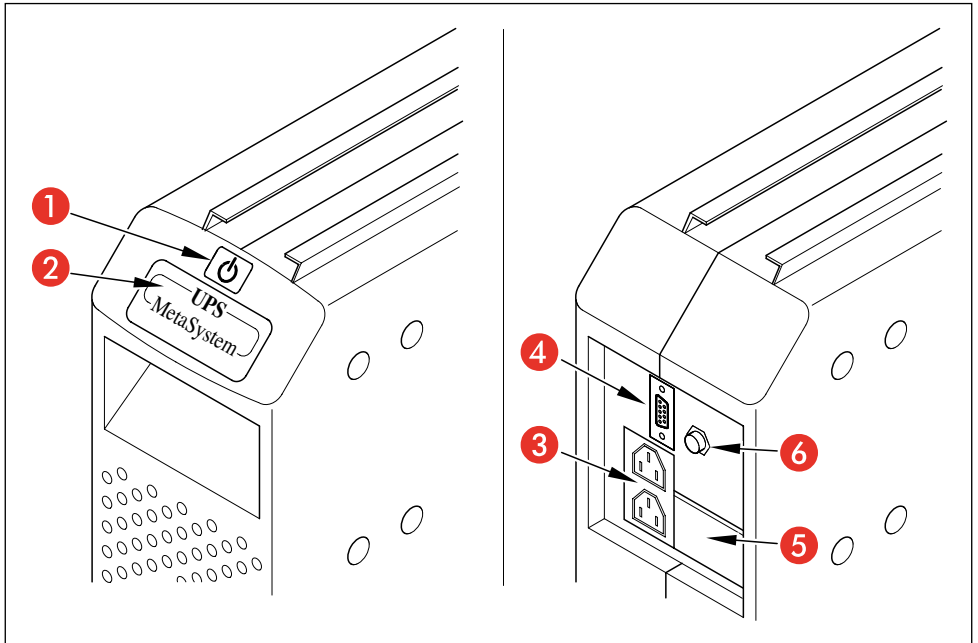
### **Important**

We recommend you to 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.



### Key

1. ON / OFF button
2. Functioning status indicator (green, yellow, red)
3. Input/output plug-socket
4. Rs232 computer interface socket
5. Connector for installation of additional battery units (optional)
6. Resettable circuit breaker

Nel retro del gruppo di continuità sono predisposti i seguenti collegamenti:

- 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.
- Socket for connection of RS 232 (9 pin female) type, computer serial interface (4): to be used if the diagnostics software is utilized.
- Layout for connection of additional batteries [5]



### **WARNING**

For reasons of safety, we recommend the cables supplied not to be modified; in addition, it is essential to ensure both that the mains outlet used for the UPS is connected securely to the earth circuit and that a suitable protection is provided as per regulations.



### **WARNING**

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

### **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.2)
- 3) Check 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.

### **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 Status Indicator) (2) and after a few seconds switches over to its inverter and enters its normal operation mode (the green Status Indicator [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 Status Indicator [2] is on. Should the connected loads be too large, the bypass will remain active and the red Status Indicator [2] will flash fastly.
- 3) A few moments after switching on, the UPS will automatically test its batteries to check if they are operating correctly (refer to the section on the 'Battery Test').

**WARNING**

Never remove the 230V 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 Status Indicator flashes briefly every 3 seconds after all the connected loads are switched on, it is a signal that the load connected to the UPS is at the limit of toleration.

## 4 Visual and acoustic warning signals

Status Indicator	Acoustic Signal	Description
<b>Green</b>	---	Normal operation with mains present and loads within the set limits
<b>Green</b> Fast flashing	---	The UPS is indicating that the output voltage frequency is not synchronised with the input voltage. The cause of this may be: <ul style="list-style-type: none"> <li>- PLL disabled</li> <li>- Frequency of the input voltage is outside the set limits for the UPS</li> </ul>
<b>Yellow</b>	Short intermittent sound (every 20sec)	Battery operation
<b>Yellow</b> Fast flashing	---	By-Pass operation
<b>Red</b> Fast flashing	Short and fast intermittent sound	UPS failure <b>ATTENTION! We recommend you switch off the ups and contact your service centre</b>  Overload <b>ATTENTION! We recommend removing some of the appliances connected to the ups so that consumption by the load returns below set limits</b>
<b>Red</b>	Continuous sound	UPS error failure <b>ATTENTION! We recommend you switch off the ups and contact your service centre</b>
<b>Red</b> 1 flash every 10 secs.	---	Above 90% of MAX load
<b>Red</b> Alternating short long flashing	Alternating short, long intermittent sound	Autonomy reserve. During battery operation Incorrect battery connection Incorrect Neutral

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## Controls:

The UPS is managed by means of the button on the front panel, illustrated in figure 1 in the diagram on page 11.

### 1 On / Off Button:

- Press briefly to switch the UPS on: confirmation is given by the momentary lighting up of all the Status Indicator's and by a short acoustic signal (beep).
- Keep the same button pressed for longer than 2 seconds to switch the UPS off, confirmed by the intermittent beeping of the buzzer.

## Warning:

- In normal operating conditions, the green Status Indicator is lit.
- During operation with battery power, the yellow Status Indicator is lit.
- The UPS indicates it is operating with battery power by emitting a slow acoustic sound (one beep every 20seconds). 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 red Status Indicator. The end of battery autonomy is signalled by the flashing of the red Status Indicator 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 Status Indicator 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 Status Indicator (4) flashes with a rapid intermittence, it signals a fault in the UPS; 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.

## 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 UPS Communicator interface programme for Windows and Linux(\*) environments, by connecting a serial port on the PC to the interface socket [7] 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 (Software).



## 5 UPS diagnostic software

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It is possible to download a free copy of a software for Windows and Linux environments (16 and 32 bit) and/or to get a detailed list of the supported systems visit our internet website [www.ups.legrand.com](http://www.ups.legrand.com).

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).

Windows is a registered brand of Microsoft Corporation.

## 6 Battery test

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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<sup>®</sup> patented circuit: therefore even if the battery test gives a negative result, there will be no interruption of the output power.

## 7 Possible problems and solutions

Problems	Solutions
When the UPS is switched on, the buzzer sounds and the red Status Indicator makes intermittent short-long flashes, then the UPS switches off after 15 seconds	<ul style="list-style-type: none"> <li>- The connection of the neutral conductor is wrong: make a 180° inversion of the power supply plug, or exclude the neutral sensor (using the UPS Communicator software supplied)</li> </ul>
The UPS works but every 20 seconds there is a short beep and the yellow Status Indicator is always lit up.	<ul style="list-style-type: none"> <li>- Check that power is present at the mains socket.</li> <li>- Check that the UPS power supply cable is correctly inserted in both the mains socket and in the UPS connector</li> </ul>
The UPS works but it emits an alternating, slow-fast intermittent sound, the red Status Indicator flashes fastly	<ul style="list-style-type: none"> <li>- 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.</li> </ul>
The UPS beeps continuously and the Status Indicator is continuously yellow, after which the UPS switches off.	<ul style="list-style-type: none"> <li>- 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</li> </ul>
The UPS works but the green Status Indicator flashes quickly	<ul style="list-style-type: none"> <li>- 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.</li> </ul>
The UPS emits an alternating, slow-fast intermittent sound, and the red Status Indicator flashes quickly	<ul style="list-style-type: none"> <li>- The thermic 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).</li> <li>- There is a fault on one of the internal circuits. Contact your nearest service centre.</li> </ul>

## 8 Technical specifications

CONSTRUCTION SPECIFICATIONS	3 100 87	3 100 90	3 100 93
	3 100 88	3 100 91	3 100 94
	3 100 89	3 100 92	3 100 95
Weight	12 Kg.		
Size W x D x H in mm	88 X 390 X 355		
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 that can be downloaded free of charge from the website <a href="http://www.ups.legrand.com">www.ups.legrand.com</a> , 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		
<b>Environmental specifications</b>			
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	< 40 dBA		
<b>Nominal input voltage</b>			
Nominal input voltage	230 V		
Range of input voltage	From 184V to 265V with nominal load From 110V to 265V with 50% of nominal load		
Nominal input frequency	50Hz/60Hz +/-5% selectable by the operator		
Nominal input current	3 Arms	3,5 Arms	5,25 Arms
Maximum input current	3,7 Arms	4,5 Arms	6,75 Arms

## Whad 0.8, 1, 1.5 kVA

CONSTRUCTION SPECIFICATIONS	3 100 87	3 100 90	3 100 93
	3 100 88	3 100 91	3 100 94
	3 100 89	3 100 92	3 100 95
Distortion of input current at 100% of nominal load	<3%		
Input power factor	>0.99 at 80% of nominal load from 20% to 100% of nominal load		
Overload current	100% of nominal current		
Number of input phases	Single phase		
Line fuse	Automatic Resettable 10 A		
Battery charger direct from mains	Deeply discharged batteries are recharged in 12 to 15 hours when mains power is present, even should the UPS not be operating.		
<b>Output wave form</b>			
With mains operation	Sinewave		
With battery operation	Sinewave		
Type of operation	No break, on line UPS with passing neutral and double conversion		
<b>Electrical output specifications with mains operation</b>			
Nominal output voltage	230V stepwise setting with step of 1V in the range of 184V to 255V		
Nominal output frequency	50Hz/60Hz synchronized		
Output current with linear load PF=0,7	3,5 Arms	4,4 Arms	6,6 Arms
Tolerated crest factor on output current	3,5	3,5	3,5
Nominal output power	800 VA	1000 VA	1500 VA
Active output power with linear or non-linear load PF=0,7	560 W	700 W	1050 VA
Total harmonic distortion of output voltage with linear nominal load	< 0,5%		
Total harmonic distortion of output voltage with non-linear nominal load PF=0,7	< 1%		
Overload capacity	300% for at least 1 second without bypass intervention 200 % for at least 5 seconds without bypass intervention 150% for at least 30 seconds without bypass intervention		

## 8 Technical specifications

CONSTRUCTION SPECIFICATIONS	3 100 87	3 100 90	3 100 93
	3 100 88	3 100 91	3 100 94
	3 100 89	3 100 92	3 100 95
Power factor range with applied load	From 0,7 to 1		
Number of output phases	Single phase		
AC-AC conversion efficiency with linear load PF = 1 and charged batteries			
With 50% load	80%		
With 75% load	84%		
With 100% load	90%		
<b>Electrical output specifications with battery operation</b>			
Nominal output voltage	230V +/-1%		
Output frequency	50Hz/60Hz +/-1%		
Nominal output power	800 VA	1000 VA	1500 VA
Active output power with linear or non-linear load PF = 0,7	560 W	700 W	1050 VA
Total harmonic distortion of output voltage with non-linear nominal load PF=0,7	< 1%		
Overload capacity	200% 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	80%		
With 75% load	80%		
With 100% load	80%		
<b>Battery operation</b>			
Approximate autonomy in minutes with charged batteries			
50% of the applied load	29 min.	23 min.	5.5 min.
80% of the applied load	17 min.	13 min.	8 min.
Recharge time up to 90% of total load	5-6 hours according to level of discharge		
Technical data and quantity of batteries	N° 4 pcs 12V 5,4Ah, sealed, lead-acid, maintenance free batteries connected in series		
Reserve signal	From 32.2V to 36V can be programmed by operator		

CONSTRUCTION SPECIFICATIONS	3 100 87 3 100 88 3 100 89	3 100 90 3 100 91 3 100 92	3 100 93 3 100 94 3 100 95
Minimum voltage for battery operation	From 27V to 31.5V with automatic selection according to load or can be programmed by operator		
Average battery life	3-6 years according to use and working temperature <b>Warning!</b> 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.		
<b>Bypass Specifications</b>			
Type of bypass	Static and Electro-mechanical		
<b>Normative</b>			
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		