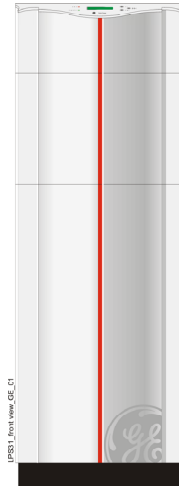




GE



OPERATING MANUAL

UNINTERRUPTIBLE POWER SUPPLY

LP 31

8 – 10 – 15 – 20 kVA
Series 1



GE Digital Energy SA

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LP Series UPS

Technology for the digital world



Model: **LP 31 / 8 – 10 – 15 – 20 kVA / Series 1**
Date of issue: 15.10.2003
File name: OPM_LPS_31E_8K0_20K_1GB_V010.doc
Revision: 1.0
Author: Raimondo Bizzozero
Identity No.:

Up-dating:

Revision	Concern	Date
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The illustrations and plans describing the equipment are intended as general reference only and are not necessarily complete in every detail.

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**Dear Customer,**

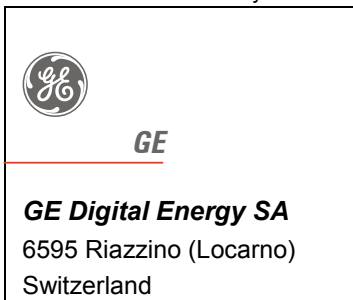
We thank you for selecting our products and are pleased to count you amongst our very valued customers at **GE**.

We trust that the use of the **LP 31** Uninterruptible Power Supply system, developed and produced to the highest standards of quality, will give you complete satisfaction.

Please read carefully the Operating Manual which contains all the necessary information and describes all you need to know about the use of the UPS.

Thank you for choosing **GE** !

Manufactured by:



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Your service contact:





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1. INTRODUCTION & SAFETY RULES

1.1 INTRODUCTION

More than ever before, today's advanced electronic equipment, with complex integrated circuits and other sensitive electronics, needs a stable and continuous AC power supply to operate correctly.

While the power coming from the wall socket outlet is often unreliable, a **LP 31** UPS provides the security of completely uninterrupted power.

A compact, truly on-line system, the **LP 31** UPS protects your equipment from all forms of power interference, including complete power failure.

A simple and elegant circuit design, together with extensive protection against abnormal operating conditions (e.g. overload, short circuit, overheating), makes the **LP 31** exceptionally reliable.

1.2 SAFETY RULES

1.2.1 General

This equipment can be operated by anyone, without any special training.

WARNING: RISK OF ELECTRICAL SHOCK

The UPS contains its own energy source: batteries.

The output terminals may be electrically live, even when the UPS is disconnected from the mains. Dangerous voltages may be present during battery operation.

The batteries must be disconnected during maintenance or service work.

The UPS contains potentially hazardous voltages.

Do not open the UPS, there are no user serviceable parts inside.

All maintenance and service work should be performed by qualified service personnel.

1.2.2 Installation

The UPS is intended to be used in normal domestic and office situations.

The UPS may only be installed by trained personnel.

The UPS should only be powered from a three-phase, four-wire AC source equipped with a protective earth connection.

Do not install the UPS in an excessively humid environment or near water.

Avoid liquids or any foreign object to get into the UPS.

The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C.

Optimal battery lifetime is obtained if the ambient temperature does not exceed 30°C.

It is important that ventilation air can move freely around and through the unit.

Do not block the air vents.

Avoid locations in direct sunlight or near heat sources.

Do not connect household appliances such as electric heaters, toasters or vacuum cleaners to the UPS.



1.2.3 Storage

Store the UPS in a dry location, storage temperature must be within -20°C to $+45^{\circ}\text{C}$.

If the unit is stored for a period exceeding 3 months, the batteries must be recharged periodically.

Connect the unit to the mains and switch it on for a period of approx. 48 hours, minimum every 3 months.

1.2.4 Batteries

- When replacing the batteries, use the same number and voltage (V) / capacity (Ah).
- Proper disposal or recycling of the batteries is required.
Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire: they may explode.
- Do not open or mutilate batteries: their contents (electrolyte) may be extremely toxic.

If exposed to electrolyte, wash immediately with plenty of water.

- Avoid charging in a sealed container.
- Never short circuit batteries. When working with batteries, remove watches, rings or other metal objects, and only use insulated tools.

2. FUNCTIONAL EXPLANATION

2.1 THE PRINCIPLES OF OPERATION

The **LP 31** UPS stores electric energy in batteries housed in the unit.

This allows the UPS to supply output power even when the incoming mains power is cut OFF completely.

Energy is stored as Direct Current (DC), while input and output energy must be Alternating Current (AC).

Therefore the UPS contains an input converter (AC to DC) and an output converter (DC to AC) (fig.1).

The **LP 31** UPS is a SECOND GENERATION On-line UPS with:

- battery not in line with the DC link, resulting in:
 - enhanced battery life;
 - optimal battery charging;
- full wave input converter with power factor correction;
- extremely wide input voltage and input frequency tolerance;
- output converter (inverter) using IGBT technology.

2.2 NORMAL CONDITIONS

Under normal conditions (see section 9 - Input Specifications), energy from the mains is channelled through the input converter, which supplies the output converter and, together with the battery charger, keeps the battery fully charged.

The output converter synthesises a completely new AC output sine wave to supply the load (electrical equipment).

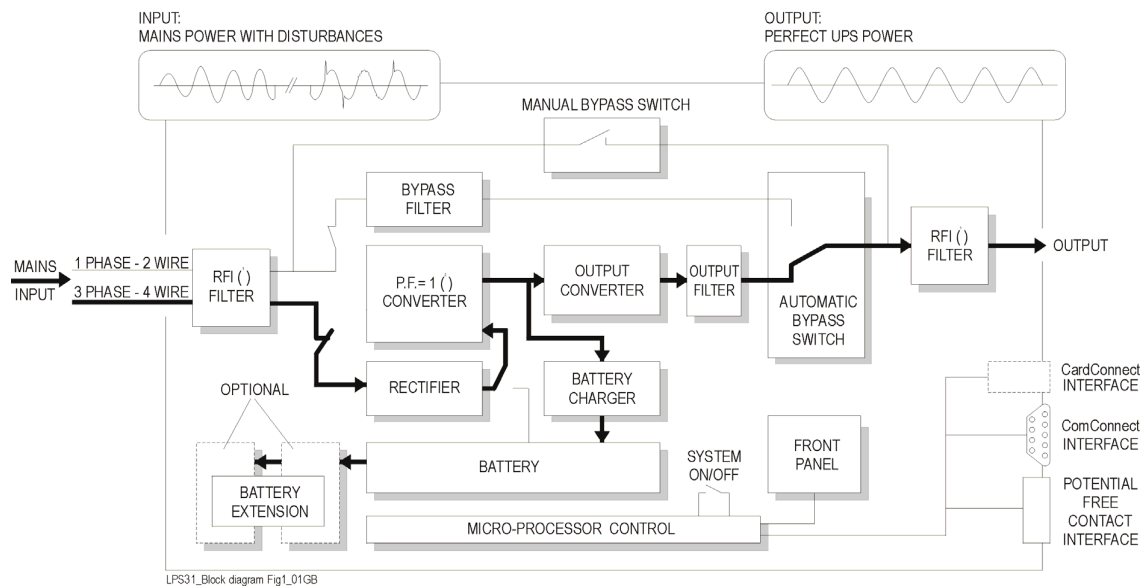


Figure 1 - Block diagram, mains present

(1) RFI = Radio Frequency Interference

(2) PF = Power Factor

2.3 MAINS FAILURE

In the event of a mains power failure (i.e. absent or outside tolerance) the system uses the energy reserve stored in the battery to continue to produce AC power, ensuring unbroken output (fig. 2). No interruption or alteration will ever be noticed in the output power.

In the event of an extended mains failure, the output converter will stop when the battery energy has been used up.

At this point, the UPS is no longer able to power the connected equipment.

When the mains is re-established within tolerance, the output converter will be supplied again by the input converter and the batteries will be recharged, making them ready to support future power.

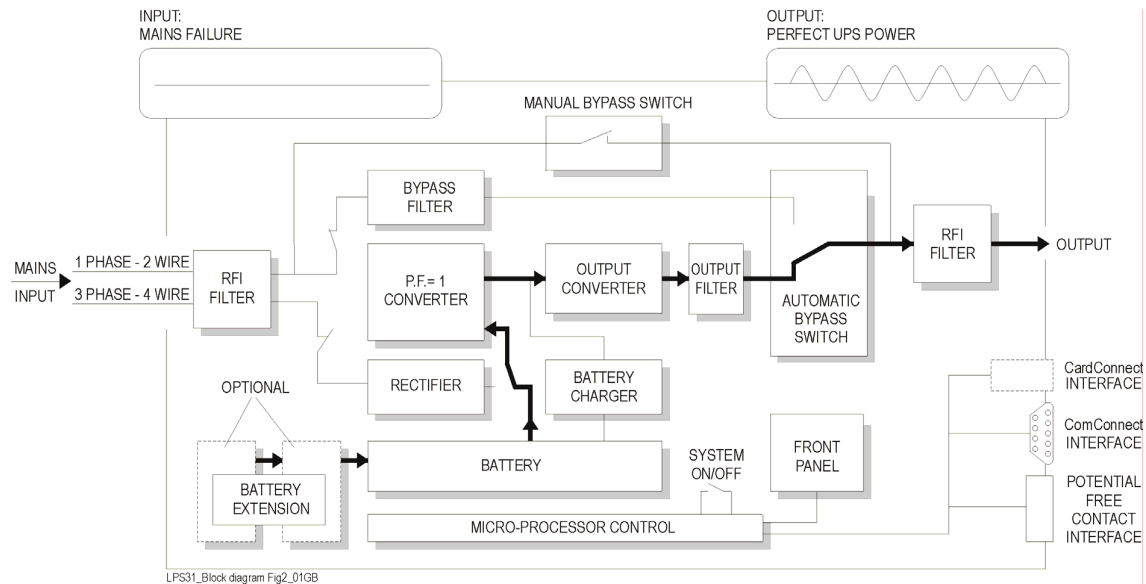


Figure 2 - Block diagram, mains failure

2.4 AUTONOMY TIME

The autonomy time, the time the output converter can operate on battery, depends on the capacity of the battery and on the power demand of the equipment supplied by the **LP 31** UPS.

Estimates of run-times are given.

LOAD	LP 31 8 kVA	LP 31 10 kVA	LP 31 15 kVA	LP 31 20 kVA
25 %	75 minutes	51 minutes	80 minutes	56 minutes
50 %	35 minutes	24 minutes	30 minutes	24 minutes
100 %	14 minutes	10 minutes	13 minutes	10 minutes

Units connected to battery cabinets will have longer autonomy times.

See section 6 - Options.

2.5 AUTOMATIC BYPASS SWITCH

If the output converter is unable to deliver the demanded output power (overload, overtemperature) the bypass switch will automatically transfer the load to the mains.

If bypass operation is caused by an overload situation, the UPS will only switch back to output converter if the load is reduced to less than 100%.

If bypass operation is caused by overtemperature, the UPS will only switch back when the temperature has dropped below the alarm level.

In case of a severe overload or short-circuit the magnetic bypass circuit breaker (front panel, see 4.1) may trip in order to protect the UPS.

If the current is insufficiently high to trip the breaker, the UPS will be switched OFF by the software in order to protect the UPS and connected equipment.

See also chapter 4.5 “overload protection in bypass mode” for more information.

When the normal situation is restored, and the UPS was not switched OFF due to software protection or bypass breaker trip, the load will be transferred back to the output converter without any interruption.

If a bypass power failure occurs during bypass operation, *load power is lost*.

If the UPS functions under overload conditions it may not be able to protect the load.

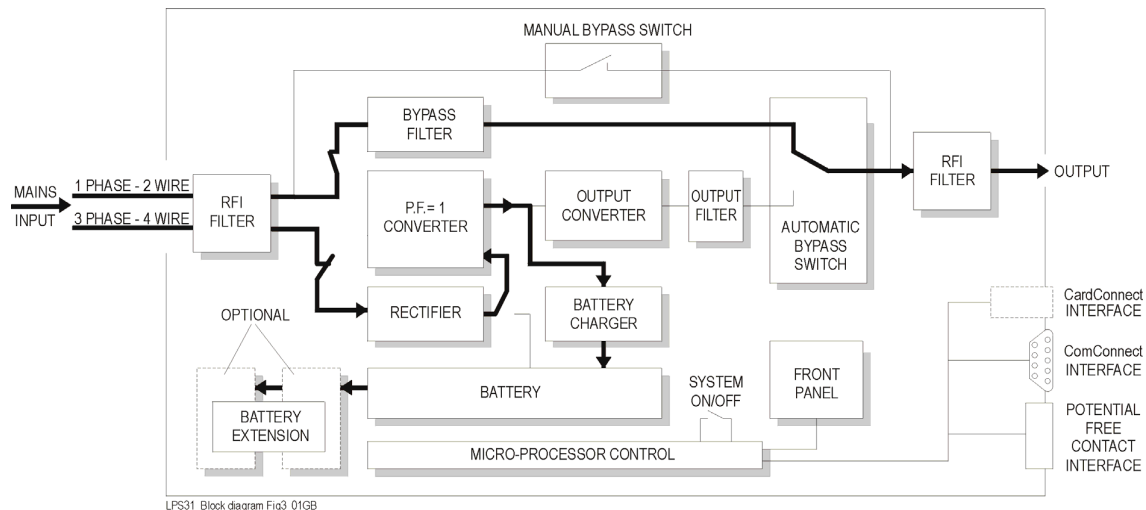


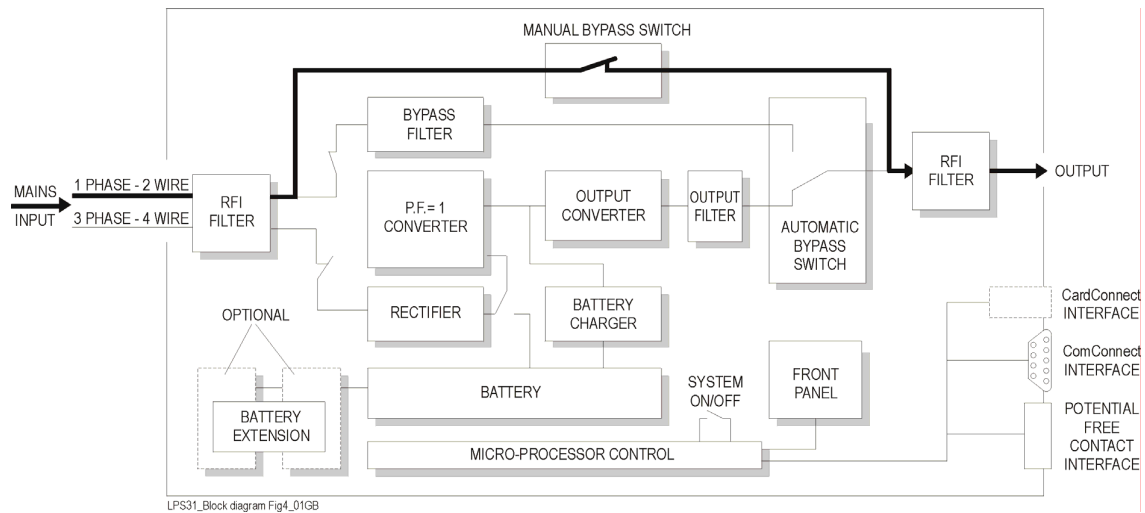
Figure 3 - Bypass operation: automatic bypass

2.6 MANUAL BYPASS SWITCH

The system can be bypassed manually using the manual bypass switch located at the rear panel.

It is a two-position switch: the normal position is "1": as in figures 1-2. Position "2" is the service position: the load is directly connected to the mains input.

This way, testing and maintenance of the UPS is possible without interruption of the power supplied to the load.





3. INSTALLATION

3.1 PACKAGE CONTENTS

The shipping box contains a **LP 31** UPS and this manual. Inspect the UPS for damage after unpacking.

If any damage is present please immediately notify the carrier and the **GE** distributor.

If a battery extension pack is to be connected to the UPS, a connection kit is required. This kit is delivered with each battery pack.

3.2 LOCATION

Please refer to chapter 1.2.2 - "Safety rules – installation".

3.3 INSTALLATION

IMPORTANT:

Before making any connection and switching on the **LP 31** UPS, please check the following conditions:

- the input voltage and frequency of your mains supply is 380/400/415 Volts and 50/(60)Hz; standard delivery is 400V/50Hz, the input is 3-phase 4-wire, *the neutral connection is essential*;
- the UPS has to be protected by distribution fuses, slow blow, connected to the mains input of the UPS.
For fuse values please refer to drawing "SINGLE LINE DIAGRAM";
- if an earth leakage circuit breaker is installed in the mains input circuit, be sure its rating is 1A (differential) or more.
Other circuit breakers may trip due to the return current of the load which partly passes through the bypass neutral;
- the total power requirements of the computer equipment to be protected does not exceed the rated output power of the UPS (see section 9 - Specifications).
Output power for your unit is indicated on the rating label on the rear panel of the unit.

 The UPS may only be installed by trained personnel.

The UPS must be grounded when in use: Connect the UPS to a three-phase, four-wire AC source equipped with an earth connection.

WARNING:

This is a Class A product.

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

**Installation procedure:**

1. Please refer to figure 6 in chapter 4.1 and drawing "TERMINALS" for the location of terminals.
2. Remove the rear grid by loosening the 4 screws.
3. Remove the middle front panel that covers the MCB-switches.
Hold the panel at both sides and pull firmly.
4. Remove the lower front panel that covers the battery drawers. Lift the panel and pull.
5. The input terminals are mounted at the rear side of the UPS.
Connect the mains supply wires to the terminals 7 (L1), 8 (L2), 9 (L3) and 10 (Neutral) and the earth wire to the EARTH terminal.
6. Connect the load wires to the terminals 1 (Line) and 2 (Neutral) and the earth wire to the EARTH terminal (3).
7. Connect the bypass supply wires to the terminals 4 (L1) and 5(N) and the earth wire to the EARTH terminal (6).
8. Use the clamps that came with the unit to attach the wires to the rear of the cabinet.
Position the clamps in the slots (20, see fig. 6).
9. If you want to install battery extension packs proceed with step 10.
If you are not using battery extension packs skip to step 19.
10. Please refer to drawing "BATT. PACK CONNECTION".
Battery extension pack(s) are shipped with all materials necessary to connect them to the UPS (see chapter 3.1).
The pack(s) can be connected to the terminals at the rear panel of the UPS.
The internal DC wires are already connected to the rear terminals 12,14 (plus) and 13,15 (minus).
11. Be sure that all MCBs are in OFF position.
12. Be sure that the mains supply voltage and the bypass voltage are not present on the input terminals.
13. Make sure that all battery fuses at the front of the cabinet are removed.
14. Use a voltmeter to check that there is no DC voltage between terminals 12 and 13 and between terminals 14 and 15.
15. Make sure that all battery fuses of the battery cabinet are removed.
16. First install the left plus (red) and minus (black) wire of the battery cabinet to the left plus and minus of the UPS (terminals 12 and 13).
Then install the right plus (red) and minus (black) to the right plus and minus of the UPS (terminals 14 and 15).
17. Install all battery fuses at the front of the battery cabinet and in the front of the UPS.



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4. OPERATION

4.1 DESCRIPTION OF FRONT AND REAR PANEL

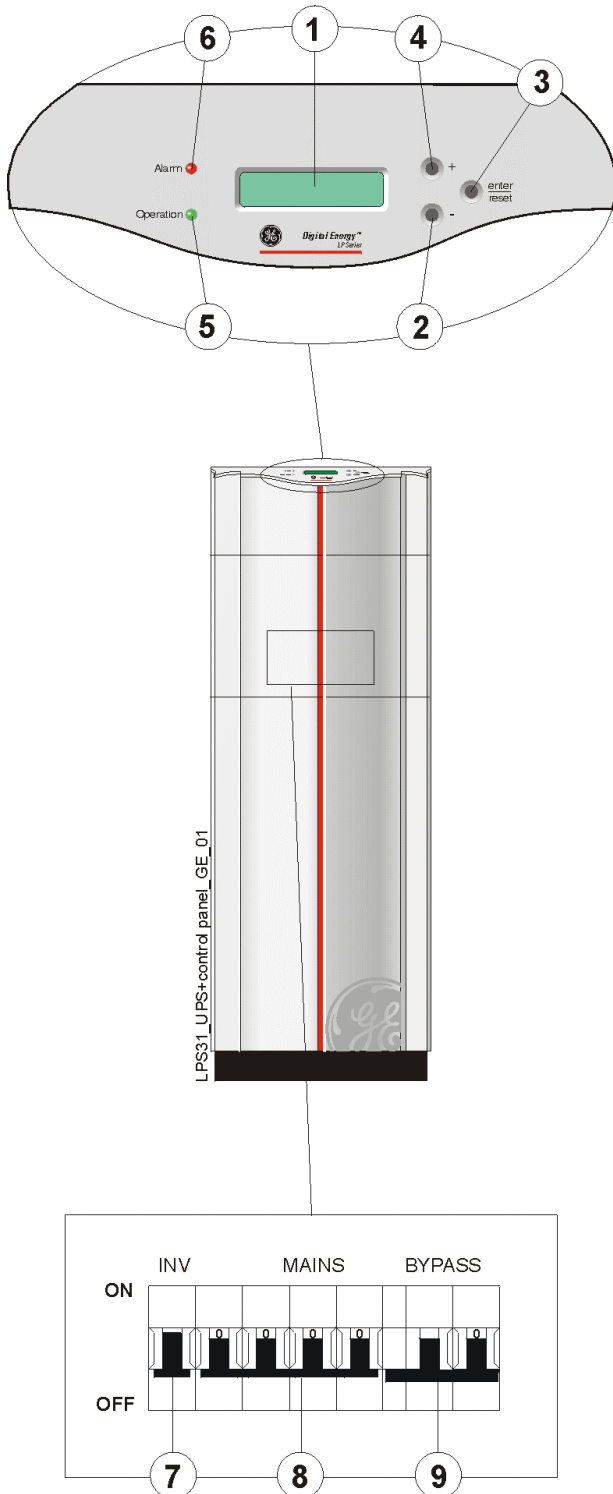


Figure 5 - Front panel

1 LCD screen

2x16 characters, shows UPS system data, status messages, settings.

2 - 4 Push-buttons

With the button keypads “-” (2) and “+” (4) you can scroll through the several screens, with keypad “reset/enter” (3) a selection is confirmed.

Keypad activity is accompanied by a short beep.

If there is no keypad activity during 20 seconds the LCD screen will return to the default screen (except for the service screens, see chapter 4.3.3).

5 LED “operation”

Normal operation.

6 LED “alarm”

Indicates an alarm situation, accompanied by alarm message(s) on the display and a sounding buzzer.

See chapter 4.3.2 for more information

7 Inverter ON/OFF switch

Turn ON/OFF the inverter.

ATTENTION!

This switch does not switch OFF the bypass.

When (7) is switched into OFF position, the bypass voltage will be supplied to the load.

8 Line fuse (MCB)

Protection fuse for mains input and battery charger.

9 Bypass fuse (MCB)

Protection fuse in case of overload or short circuit in the UPS load.

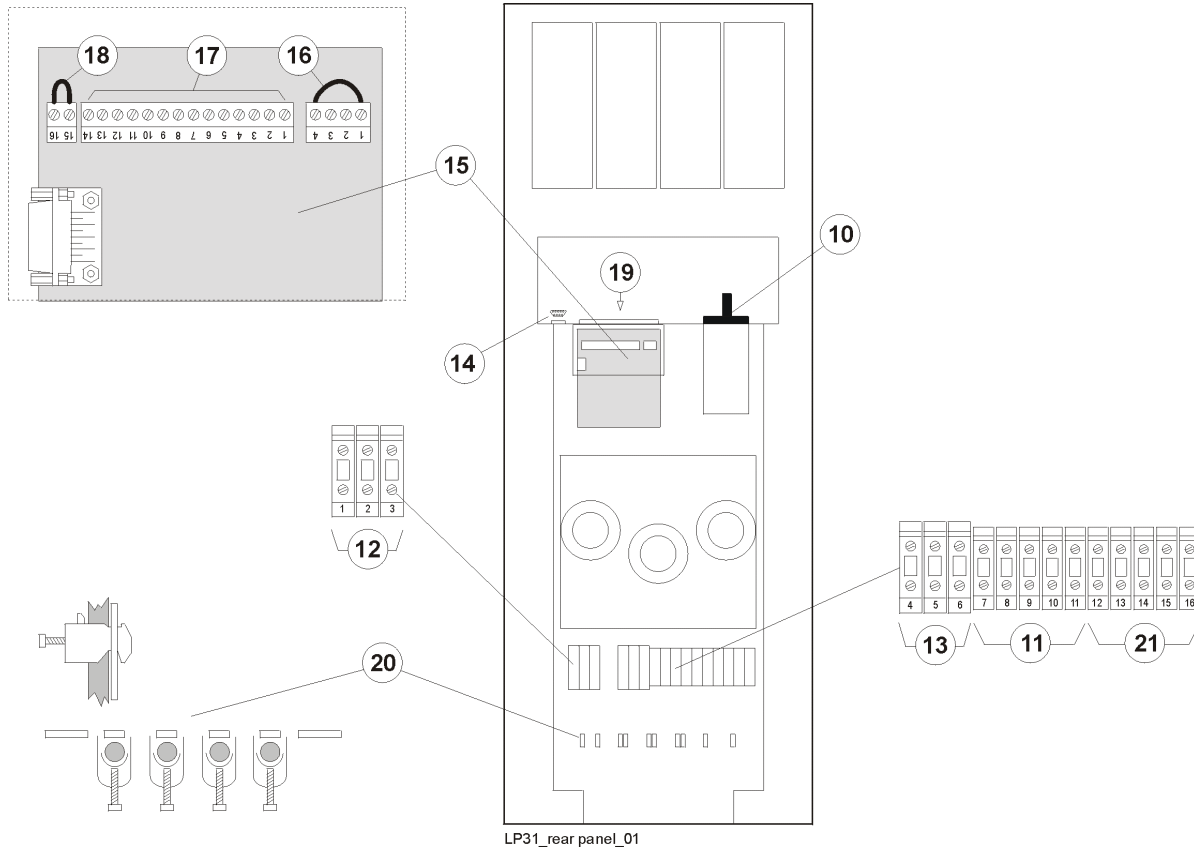


Figure 6 – Rear panel

- 10 Manual Bypass Switch:**
- 1 = load on UPS
 - 2 = load on bypass
- 11 Input terminals:**
- 7 (L1) / 8 (L2) / 9 (L3)
 - 10 = neutral
 - 11 = protective earth
- 12 Output terminals:**
- 1 (L) / 2 (N),
 - 3 = protective earth
- 13 Bypass input terminals:**
- 4 (L) / 5 (N)
 - 6 = protective earth
- 14 ComConnect Interface Port (RS232 - see chapter 5.1)**
- 15 Interface PCB, with:**
- 16 Alarm connector of the optional battery extension MCB.
 - 17 Potential free contacts (see chapter 5.2), pin 1 = common, pin 2 = NC (not connected).
 - 18 Emergency shutdown (EPO – Emergency Power Off).
 - 19 Slot for optional SNMP plug-in card (behind PCB) (see chapter 5.3).
- 20 Slots to fasten cable clamps.**
- 21 Battery extension connection terminals: 12, 14 (plus), 13, 15 (minus) e 16 (GND)**



4.2 START-UP

1. Switch on the UPS with switch “*inverter ON/OFF*” (7), MCB “*mains ON/OFF*” (8) and MCB “*bypass ON/OFF*” (9).
If battery extension packs are part of the system, turn the DC-MCBs on the UPS as well as on the extension pack(s) into “ON” position.
The green LED “*operation*” will illuminate.

The UPS is capable of handling the high inrush currents of the (starting) load. This means that all equipment protected by the UPS can be switched on by simply switching on the UPS.
The simultaneously occurring inrush currents of the loads do not immediately cause bypass operation.

After switch-on the UPS will perform a self-test and the display will show:

SELFTEST
IN PROGRESS

After completion of the self-test the output voltage of the UPS is available. The display will show the default screen: model and actual load (values are examples).

LP 15-31
load 37%

In case of a system failure the self-test results in a failure message; this message is displayed for 30 seconds before the self-test is repeated automatically.
If the faulty situation persists, switch OFF the UPS and contact your dealer.

2. Though the batteries (the internal energy reserve) were fully charged when the UPS left the factory, they might have lost some energy during transportation and storage. It is recommended to allow the UPS to recharge the batteries during a few hours period: provided that mains power is present, leave the UPS switched on and:
 - either do not connect computer equipment yet;
 - or connect the computer equipment to the bypass supply for a few hours by turning the manual bypass switch (10) into position “2”.

This way you ensure that the UPS can provide sufficient autonomy time in case of a mains power failure (see chapters 2.3 and 2.4).

3. If not yet switched on, the equipment connected to the **LP 31** UPS can be switched on now; operate as usual.



4.3 USE

Once the unit is in operation, there is no need to switch the unit ON/OFF during use.

If an emergency shutdown switch has been installed (see chapter 3.3) the UPS will stop immediately when the switch is opened.

Restart is only possible after closing the switch and turning the UPS OFF and on again with switch “*inverter ON/OFF*” (7) on the front panel.

The UPS is operated via the push buttons and the LCD display on the front panel.

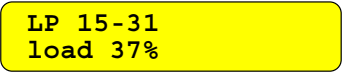
Furthermore the UPS can be controlled via the ComConnect interface port.

For more information see chapter 4.5 and section 5 – “Interface features”.

The menus on the display can be divided into 4 groups:

- 1 standard menu;
- 2 information menu (see chapter 4.3.1);
- 3 status- en alarm menu (see chapter 4.3.2);
- 4 service menu (see chapter 4.3.3).

The *standard menu* shows UPS model and actual load.



LP 15-31
load 37%



4.3.1 Information screens

When the default screen is displayed the first information screen can be entered by depressing the “+” key (4).

Using “+” and “-” (2) you can scroll through the several information screens.
After the last information screen the default screen will appear.
The default screen can be displayed immediately with “enter/reset” (3).

The screens display the following information:

LINE IN 50.0Hz
230V 230V 230V

Mains voltage and frequency.

BYPASS IN 50.0Hz
230V

Bypass voltage and frequency.

OUTPUT 50.0Hz
230V 10.0A

Output voltage, frequency and current.

LOAD PF 0.76
CF 2.13

The power factor and crest factor of the connected equipment.

BATTERY 23 °C
+270V -269V 0.1A

The temperature near the batteries, the battery voltage and the battery current (charge: + value, discharge: - value).

RUNTIME 83%
LEFT >0:10:12

The autonomy time if a mains failure occurs.
The autonomy value is initially based on the capacity of *new* batteries.

As batteries age, as a result of which their capacity deteriorates, the initial battery capacity may be too unreliable for a proper autonomy prediction.

The UPS is able to keep track of the ageing process, if regularly a “deep battery test” (battery calibration test) is executed.

During such a test the condition of the batteries is tested, and the result of the test is used by the UPS system to calculate the autonomy.

For more information see chapter 4.4.3 - “Deep Battery Test”

OPERATING TIME
0 YEARS 29 DAYS

The total operating time of the UPS.



4.3.2 Status Messages and Alarm Messages

The **LP 31** UPS alerts the user with a standard alarm screen that the operating mode has changed and/or that an alarm situation occurs:

ON LINE
ALARM (press up)

The actual operating mode, the possible modes are mentioned below. The lower line -if displayed- shows that an alarm occurred.
More information can be retrieved with the “+” key. If no further information is available, the second line is blank.

Possible operating modes:

ON LINE

The normal operating mode.
For more information see chapter 2.2.

ON BYPASS

Overload or failure situation.
For more information see chapter 2.5.

ON BATTERY

For a detailed description of this mode see chapter 2.3.

OUTPUT OFF

No power is delivered to the load.
This can be the result of a command via the ComConnect Port, or because no electric energy is available (mains failure, empty batteries).

ON MANUAL BYPASS

Service mode.
For more information see chapter 2.6.

From the standard alarm screen depressing “+” shows which alarms are active, in priority order. Scroll through the screens with “+” and “-”.

Alarm message texts can succeed each other.

The following messages are possible

LOADnotPROTECTED
CAP. C1 DEFECT

The output capacitor C1 is defective.
Contact your dealer.

UPS OVERLOADED
REDUCE LOAD

The load exceeds the rated output power of the UPS, and the output voltage can no longer be guaranteed.
This text alternates with the following screen:

UPS OVERLOADED
Load 107%

Showing the actual load as % of the nominal UPS rating.

These messages are displayed if the load is > 100%.

If the load exceeds 150% the UPS will immediately switch to bypass, assuming that the conditions for a transfer to bypass are fulfilled.

If an overload condition between 100-150% persists, the UPS can eventually also switch to bypass operation due to temperature protection.

If a transfer to bypass is inhibited (due to voltage or frequency errors of the mains supply) the UPS may automatically switch OFF within a few seconds (load dependent).

Output power is lost at that moment.

To avoid these problems, be absolutely certain that the power demands of the protected equipment are within the limits of the UPS.

**LOADnotPROTECTED
TEMP TOO HIGH**

The temperature of the cooling plates or output transformer is too high.

As a result the load may be transferred to bypass.

The operating temperature can rise intolerable as a result of:

- extreme environmental temperature;
- lack of proper ventilation;
- an overload situation;
- fan failure.

If the UPS operates in “on line” mode, it will switch to bypass mode (if allowed, see explanation in alarm “UPS overloaded” above) until the temperature is normal again.

If however the UPS operates “on battery”, a shutdown will occur and output power is lost.

**LOADnotPROTECTED
VOLTAGE TOO HIGH**

The DC inter-circuit voltage is too high, internal failure

**BATTERY CHARGER
VOLTAGE TOO HIGH**

The output voltage of the battery charger is too high, internal failure.

**BATTERY CHARGER
TEMP TOO HIGH**

The battery temperature is too high due to a battery failure or a too high ambient temperature.

**BATTERY CHARGER
NO FLOAT**

After 24 hours of charging time, the battery voltage did not reach the normal float voltage.
This may be caused by faulty batteries, many battery packs connected or a charger fault.

**CAPACITOR C2
CAPACITY LOW**

One or more of the DC-capacitors needs replacement due to ageing or failure.

**CAPACITOR C3
CAPACITY LOW**

One or more of the DC-capacitors needs replacement due to ageing or failure.

**LOADnotPROTECTED
INVERTER OFF**

Due to a failure the output converter's output is not available.
As a result the load may have been transferred to bypass.

**LOADnotPROTECTED
BATTERY DEPLETED**

The remaining autonomy is zero.
As a result the load may have been transferred to bypass.



**LOADnotPROTECTED
BATTERY LOW**

The remaining autonomy is less than the set time (standard 2 minutes).

This text alternates with the following screen:

**UPS SHUTDOWN
LEFT 2 MINUTES**

The output voltage can be lost after the indicated time due to discharged battery. Controlled shutdown of any computer equipment is absolutely necessary at this point.

(Using the ComConnect communications interface, this procedure can be initiated automatically on unattended systems).

If the UPS operates at 100% load, the shut-down procedure should be completed within 2 minutes after the “*battery low*” alarm started.

When the batteries are fully discharged, the UPS is no longer able to power the connected equipment.

**INTERNAL BATTERY
FUSE FAILURE**

One of the internal battery fuses is defective; this may have been caused by an internal system failure.

This alarm also appears if no batteries are installed.

**EXTERNAL BATTERY
FUSE FAILURE**

The battery extension MCB is in “OFF” position (down): energy reserve of the battery extension pack is not available.

If not manually operated, this may have been caused by faulty wiring or battery failure.

REPLACE BATTERY

The batteries are (almost) chemically worn out.

If the batteries are aged, they must be replaced as soon as possible to ensure full protection for your equipment (see chapter 7.3).

**INPUT out LIMITS
137V 138V 140V**

The mains voltage or mains frequency are outside UPS input tolerance (see section 9 - Specifications).

**BYPASS out LIMITS
170V 52.7Hz**

The mains voltage or mains frequency are outside bypass input tolerance but inside UPS (rectifier) input tolerance (see section 9 - Specifications).

Bypass operation is inhibited: if for whatever reason the output converter is not able to deliver the required output, output power is lost

**INPUT AND OUTPUT
NOT SYNCHRONIZED**

The output frequency is not synchronised to the mains (input) frequency.

The automatic bypass switch is not able to transfer the load from output converter to bypass and reverse (see chapter 2.5).

This requires synchronisation of the output frequency with the mains supply frequency.

Synchronisation is only possible if the mains frequency remains within certain limits (see section 9 - Specifications).

If output converter and mains are not synchronised bypass operation is inhibited.

If for whatever reason the output converter is not able to deliver the required output, output power is lost.

**RUNTIME
LEFT 0:09:41**

The remaining autonomy time.

This figure is counted down during battery operation until either the mains returns or the batteries are empty.

**OUTPUT OFF
NO INPUT POWER**

The output is switched OFF due to a faulty situation, indicated by the second line, e.g. no input power and depleted batteries.

**PROG. SHUTDOWN
WITHIN 0:09:17**

The output will be switched OFF via ComConnect.

The second line indicates the time until shutdown.

**PROG. SHUTDOWN
LEFT 0:14:03**

The output is switched OFF via ComConnect.

The second line indicates the time until wake-up.

**IMMEDIATE
SHUTDOWN**

The wire on connector 18 (rear panel, see figure 6) is interrupted.

The output is no longer available.

To restart the unit, restore the connection and turn ON/OFF switch (7) OFF and ON again.



4.3.3 Service screens

When the default screen is displayed you can enter the first service screen by depressing the keys “-” (2) and “enter/reset” (3) simultaneously during approx. 1 second.
Using “+” and “-” (2) you can scroll through the several service screens.

SERVICE SCREENS
ENTER/RESET exit

The intro service screen.
“Enter/reset” returns to the default screen.

SERIAL NUMBER
D154/02 9731A001

The serial number of the UPS.

SOFTWARE VERSION
R1.x

Release number of the installed software.

ECO ENABLED
ENTER/RESET CHNG

ECO-Mode feature (see paragraphe 4.5.1):
ENABLED = is enabled DISABLED = is disabled

FAN SPEED 10
INV.DC: +380-380

Service information about fan speed (min. 10, max. 30) and internal DC voltage.

HEATSI.TEMP: 567
BATT.TEMP: 23 °C

Service information on internal temperature levels, values in mV over the temperature sensors.

FLOAT CHARGE: 1
OUTPUT FAST: 0

Upper line: “1” = batteries have reached float voltage.
Second line: service information on output converter.

INVERTER: 1
Q4: 1

Service information on internal UPS components.

FREQ RANGE: 2%
NO LOAD: 1

Frequency tracking range:

output converter frequency will follow the bypass frequency within these limits before returning to its own internal frequency.

Standard setting: nominal $\pm 2\%$.

Can be changed into nominal $\pm 4\%$ or $\pm 6\%$. Contact your dealer.

No-load shutdown: after a 10 minutes delay the UPS will shut down during mains failure if the load is $< 2\%$.

It will restart after the mains returns or when the unit is switched OFF and ON again.

Default setting = 1 (active).



QUICK BATTERY
TEST PRESS ENTER

Start of the manual Quick Battery Test.
See for more information chapter 4.4.2 “Quick Battery Test”.

CALIBRATE BAT
Press DOWN+ENTER

Start of the manual Deep Battery Calibration Test.
See for more information chapter 4.4.3 “Deep Battery Calibration Test”.

IC: I1h1
+ 5.7A -5.9A

Service information on internal UPS components.

BYPASS OK
BYPASS off

Service information on internal UPS components.

LAST TEST TIME
10:17:15 14.0Ah

Duration of latest test performed, hh/mm/ss,
(hours/minutes/seconds).

FORCE BYPASS
press DOWN+ENTER

The UPS transfers the load to bypass when the keys “-” (2) and “enter/reset” (3) on the front panel are depressed simultaneously during approx. 2 seconds.
If the bypass supply is not within limits, the lower line will show the text “UNAVAILABLE”.

AUTOMATIC BYPASS
ENABLED

Service set up information whether the bypass is enabled (default) or disabled. If disabled: UPS will NOT go to bypass.

BATTERY 14Ah
BAT. CHARGE 99%

Service set up information about the total battery capacity.
Information about the actual battery charge condition.

PLL LOCK SPEED
NORMAL

Service set up information about frequency tracking speed for the inverter to follow the bypass frequency, NORMAL (1Hz/sec.) is the normal value and default.
HIGH (5Hz/sec.) may be suitable if the UPS is connected to a generator with fast frequency changes and the UPS must be synchronised to prevent alarms.



4.3.4 Setup menu

To enter the setup menu:

- 1- Be sure the UPS is *switched OFF*.
- 2- Press push-button “*enter/reset*” (front panel) and *simultaneously* turn switch “UPS ON/OFF” (front panel) into position “ON” (up).

Using push-buttons “+” and “-” you can scroll through the several setup screens, “*enter/reset*” confirms a screen choice.

After selecting a setup screen you can scroll through its settings using the push-buttons “+” and “-”, a setting is confirmed by pressing “*enter/reset*”.

To abort the setup procedure (i.e. without changing the setting) just wait the 20 seconds time-out period after which the default screen will return.

SETUP SCREENS
ENTER/RESET exit

The intro setup screen.
“*enter/reset*” return to the default screen.
You can also wait 20 seconds: the time-out period of no key activity.
Pressing “+” display the screens in the following order:

WARNING: OUTPUT
CHANGE ON LINE

A short reminder that the new settings will be valid immediately after pressing the “*enter/reset*” key.

LANGUAGE
ENGLISH

Changes the language of the screen messages: you can select: English, German, French, Italian and Spanish.

OUTPUT FREQUENCY
50.0Hz

The system output frequency. Range: 50/60 Hz.

CAUTION ! Changing of the output frequency can cause severe damage of equipment connected to the UPS:
 Be sure that the new frequency is suitable for the connected equipment.

FREQUENCY RANGE
2%

The frequency tracking range (in which the output converter frequency will follow the bypass frequency).
Range: 2/4/6 %.
If the bypass frequency is beyond the setting, the output converter will return to the fixed crystal controlled frequency.

PLL LOCK SPEED
NORMAL

The frequency tracking speed range (in which the output converter frequency will follow the bypass frequency).
Range: NORMAL (1Hz/sec), HIGH (5Hz/sec).



OUTPUT VOLTAGE
230V

The system output voltage.
Range: 220/230/240 VAC.

BATTERY CAPACITY
7Ah

Battery capacity.
Range: 7 through 590 Ah, in 1 Ah steps.

WARNING ! If you proceed, the information about the actual battery condition (as a result of a deep battery test) is lost.
For more info see chapter 4.4.2 – “Quick Battery Test”.



FAN CURVE
SMALL

The fan speed.
Range: SMALL/LARGE.
Proper setting optimizes the cooling capacity of the fans installed.

DO NOT READJUST!

Incorrect setting may lead to reduced lifetime of the power semiconductors.

NO-LOAD SHUTDOWN
YES

Setting “YES” means that the function is activated: the UPS switch OFF during a mains failure when the load is less than 2% of the maximum load.
Range: YES/NO.

AUTOMATIC BYPASS
ENABLED

Controls functioning of the automatic bypass switch.
Range: ENABLED/DISABLED.
If the UPS is used as a frequency converter you may change the setting to “DISABLED”.
Bypass operation will then inhibited and all alarms related to “bypass out of limits” are suppressed.



4.4 TEST SCREENS

These screens show the test procedure, either started from the service menu (front panel keys) or via the UPS monitoring software (ComConnect Port).

The upper line indicates the kind of test, the second line its proceeding.

Upper lines:

GENERAL SYSTEM	(Overall test of system).
QUICK BATTERY	(Quick battery test).
CALIBRATE BAT	(Deep discharge battery test).
BYPASS	(Bypass test).

Lower lines:

TEST START	The test will start soon.
TEST ACTIVATED	The test is running.
TEST SUCCESSFUL	The test has been completed successfully.
TEST FAILED	The test has not been completed successfully.

4.4.1 Battery Test, general

Automatic test The **LP 31** UPS conducts periodic automatic battery tests to ensure that the batteries and the wiring are healthy and able to support power failures.
The tests do not cause any interruption in the function of the unit and are conducted after every 500 operating hours.

Manual test A manual battery test can be activated:
- either through an interface kit, via the ComConnect Interface Port (please refer to the manual of your interface package), or
- via the front panel: see below.

4.4.2 Quick Battery Test

From the standard menu first enter the service menu (press “-” and “enter/reset” simultaneously during 2 seconds).

Subsequently press “-” until the following screen appears:

**QUICK BATTERY
TEST PRESS ENTER**

Key enter/reset confirms the selection, and the screen shows:

**QUICK BATTERY
TEST START**

The test status (indicated by the second line) can be:

TEST ACTIVATED	=	testing.
TEST SUCCESSFUL	=	the test has been completed successfully.
TEST FAILED	=	the test could not be executed properly: not all test conditions were fulfilled.
NOT AVAILABLE	=	battery capacity too low to start the test.

If the batteries are dangerously close to being worn out, a low priority alarm “**REPLACE BATTERY**” will be generated.

The batteries must be replaced as soon as possible (see chapter 7.3).

NOTE: if the manual test is started immediately after installation or after a power failure, the UPS may generate a false “replace battery” alarm as the batteries have been (partly) discharged during transport/storage or during the power failure.

4.4.3 Deep Battery Test

The calculation of the autonomy shown by the LCD, is based on the actual load and (initially) on the condition - and thus capacity - of *new* batteries.

Due to ageing of the batteries this capacity will deteriorate, and gradually there will grow a difference between the *calculated* autonomy (shown in the screen) and the *real* autonomy.

During a deep battery test the UPS will check and store the actual capacity of the batteries.

This information will be used during future autonomy calculations.

In order to ensure accurate autonomy prediction we advise to execute a deep battery test on a regular basis: every 6 months under normal operating conditions.

If battery operation occurs more than once a week, the interval between the tests should be shorter.

Software start: please refer to the manual of the appropriate monitoring software package for more information.

Manual start:

Test conditions: a deep battery test can be started via the front panel under the following conditions:

- the load should be more than 30% of the nominal load;
- the batteries should be fully charged, this means that they should not have been (partly) discharged during the last 24 hours;
- no alarm situation may exist.

**Procedure**

From the standard menu first enter the *service menu* (press “-” and “enter/reset” simultaneously during 2 seconds).

Subsequently press “-” until the following screen appears:

CALIBRATE BAT
Press DOWN+ENTER

Press “-” (2) + “enter/reset” (3) simultaneously, during at least 1 second.

The following screen appears:

CALIBRATE BAT
TEST ACTIVATED

The test is executed, this may take a few minutes with standard battery and full load.

Partial load and/or batt. extension packs can lengthen the test period considerably.

Do not change the load during the test, i.e. do not switch OFF or ON connected equipment!

The deep battery test discharges the batteries to “battery low” alarm level (see chapter 4.3.2 “battery low”).

Please note that immediately after a deep battery test the expected autonomy time is very short: allow the UPS to recharge its batteries:

allow the UPS to recharge its batteries.

After the test the second line informs about the result:

TEST SUCCESSFUL = The test has been completed successfully.

TEST FAILED = The test could not be executed properly: not all test conditions were fulfilled.
The UPS system was not informed about the actual battery condition!



4.5 OTHER FEATURES

4.5.1 ECO-mode

The UPS is equipped with the “ECO-Mode” feature.

If the feature is enabled, the load is operated on mains through the electronic bypass switch.

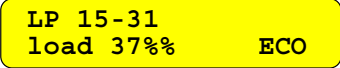
If the mains is interrupted or out of limits the load is automatically transferred to the inverter.

Operating the load on mains improves the efficiency of the UPS with 5-8% and saves on energy cost.

As the unit produces less heat in ECO-mode also the energy cost of an airco installation will be reduced.

We advise not to use the ECO-mode in case of an unstable mains and critical load but only in case of a good mains supply combined with a less critical load (e.g. lighting).

After enabling the ECO-mode (please refer to service screens 4.3.3) the standard menu change to:



LP 15-31
load 37%% ECO

4.5.2 Shutdown

“Remote shutdown”:

Using communication capabilities, the computer can direct the UPS to turn itself OFF following controlled shutdown of the system.

Subsequently the UPS will remain OFF for at least a few seconds (see also 4.3).

LED “operation” will blink green.

The unit will start up again as soon as the mains returns.

“No-load shutdown”

The UPS will also switch OFF if the load is < 2% of the maximum load, and the input is absent for more than 10 minutes.

For more information see chapter 4.3.2, message “SHUTDOWN ALARM”.

“Emergency shutdown” (EPO – Emergency Power Off)

For more information see chapter 4.3.2, message “IMMEDIATE SHUTDOWN”.

4.5.3 Mains start

The UPS is able to start, even if the batteries are not connected.

Alarm messages “BATTERY FUSE FAILURE” and “BATTERY DEPLETED” will be shown.

The autonomy is zero.



4.5.4 Sleep and wake-up

Probably your UPS monitoring software allows you to program a “sleep period” of the UPS by sending two commands to the UPS:

- shutdown after # minutes and subsequently:
- shutdown during # hours.

After the first command the following screen appears:

PROG. SHUTDOWN
WITHIN 0:09:17

During the sleep period the output voltage is no longer available.

LED “operation” blinks green, and the LCD screen shows the time left until restart:

PROG. SHUTDOWN
LEFT 0:14:03

If a mains failure occurs during the sleep period and the battery voltage eventually drops below 200Vdc, the UPS will automatically switch OFF in order to save battery power.

When the mains returns the UPS will start up automatically.

The programmed sleep time however is lost.

The sleep period can be cancelled by either turning the ON/OFF switch (7) OFF for a few seconds or by sending the appropriate command via the ComConnect port.

4.5.5 Overload protection in bypass mode

The **LP 31** will protect itself in case of overload.

Upon an overload, which is caused by abnormal circumstances, the UPS will switch to bypass operation, and subsequently the bypass input fuse on the front panel will trip.

The capacity of the bypass fuse allows it to handle the inrush currents of the equipment connected to the UPS.

The fuse will only trip after more than an hour at:

LP 31 / 8 kVA:	45 A
LP 31 / 10 kVA:	57 A
LP 31 / 15 kVA:	90 A
LP 31 / 20 kVA:	113 A

In order to protect the UPS system the software will cut OFF the abnormal current:

Typ	10 minutes	2 minutes
LP 31 / 8 kVA:	41 A	52 A
LP 31 / 10 kVA:	52 A	65 A
LP 31 / 15 kVA:	83 A	104 A
LP 31 / 20 kVA:	104 A	130 A

Between 41-52A (**LP 31 / 8 kVA**), 52-65A (**LP 31 / 10 kVA**), 83-104A (**LP 31 / 15 kVA**), 104-130A (**LP 31 / 20 kVA**) the time is inversely proportional to the current.

5. INTERFACE FEATURES

5.1 COMCONNECT (RS232) INTERFACE

Located at the back of the unit, the ComConnect is a plug-in interface port (9-pin, Sub-D, male) which enables advanced communication between the UPS and the computer (interface kit required).

The microprocessor controlled and galvanically isolated ComConnect sends information concerning power levels and UPS condition to the computer or network interface.

In the event that batteries are near exhaustion, it sends commands for unattended controlled shutdown of computer systems.

The ComConnect can also receive UPS shutdown signals from computers or network interface.

When signals are sent to the computer, a written message can appear on the screen to inform the user.

Monitored conditions include:

- mains voltage availability;
- discharge level of batteries;
- temperature of the batteries;
- interactive control- and diagnostic information for stand-alone and network systems.

Interface kits (cables and software) are available for most commonly used network operating systems, including Novell, UNIX, VMS, Banyan Vines, Windows Platforms, Apple, 3COM, IBM LANserver, IBM AS/400.

Remote servicing through a modem (external) is possible with **GE Service Software**.

We strongly recommend to use only original **GE** software products in combination with the ComConnect interface port.

We only guarantee proper operation of original **GE** products.

The ComConnect cable should be shielded, connect the cable shield to the computer cabinet only

For specific information on **GE's** connectivity products please contact your dealer.

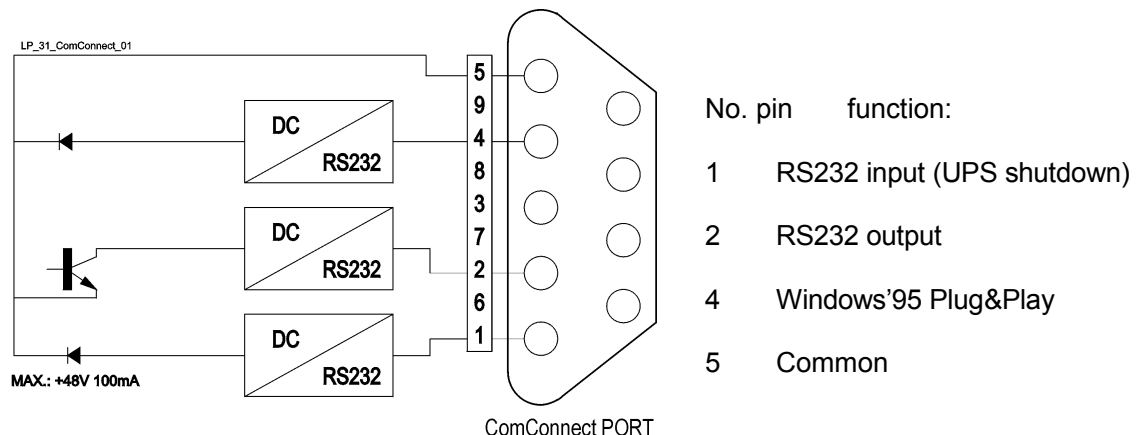


Figure 7 - ComConnect port



5.2 POTENTIAL FREE CONTACT INTERFACE

Furthermore four potential free contacts are available for signalling to a user-defined system: see fig. 6 connector 17 – Section 4.1.

Potential free contacts: functions and pin numbers			
Function	Normally open	Common	Normally closed
Bypass active	3	4	5
Battery low	6	7	8
General alarm	9	10	11
Utility failure	12	13	14

Max: 48VDC 500mA

Min.: 5VDC 100mA

5.3 SNMP INTERFACE (OPTIONAL)

The optional SNMP plug-in card allows the data interface to be connected directly to an Ethernet network (thin coax, twisted pair, AUI).

For more information please refer to the user manual that comes with the interface card. See also chapter 6.2.



6. OPTIONS

6.1 EXTENDED RUN-TIME VERSIONS

Extended run-time versions are equipped with additional batteries to increase the autonomy time of the unit.

These additional batteries are housed in a separate battery cabinet.

Additional batteries will increase the recharging time for the unit.

All other operational information is the same.

If a battery cabinet is connected, the UPS must be informed about the new total battery capacity to allow a reliable recalculation of the available runtime. Please contact your dealer. Dependent of the charge condition of the new batteries the new autonomy calculations may temporarily be unreliable.

Connecting an external charger may cause damage to the UPS. As the batteries are not galvanically separated from the mains input, the external charger must be galvanically separated from the mains.

Using an external charger will cause a false autonomy prediction during charging time, the correct autonomy will be shown 10 hours after reaching battery float charge.

Battery packs can be connected in parallel to increase the autonomy.

All the necessary protection and connection material is included in the delivery.

LP 31	:	8 kVA	10 kVA	15 kVA	20 kVA
Extension 1	:	7Ah	7Ah	14Ah	14Ah
Total capacity	:	14Ah	14Ah	28Ah	28Ah
Typical autonomy 100% / 50% load, minutes	:	36/78	25/58	33/75	25/58
Number of packs required	:	*	*	1	1
Extension 2	:	14Ah	14Ah	28Ah	28Ah
Total capacity (7Ah in LP 31 / 10 kVA)	:	21Ah	21Ah	42Ah	42Ah
Autonomia tipica a 100% / 50% load, minutes	:	58/120	40/92	55/120	41/96
Number of packs required	:	1	1	2	2
Extension 3	:	14Ah	14Ah		
Total capacity (14Ah in LP 31 / 10 kVA)	:	28Ah	28Ah		
Typical autonomy 100% / 50% load, minutes	:	80/162	58/125		
Number of packs required	:	1	1		
Extension 4	:	28Ah	28Ah		
Total capacity (7Ah in LP 31 / 10 kVA)	:	35Ah	35Ah		
Typical autonomy 100% / 50% load, minutes	:	101/204	78/156		
Number of packs required	:	2	2		
Extension 5	:	28Ah	28Ah		
Total capacity (14Ah in LP 31 / 10 kVA)	:	42Ah	42Ah		
Typical autonomy 100% / 50% load, minutes	:	123/256	96/188		
Number of packs required	:	2	2		

* Can be placed in standard UPS cubicle

6.2 SNMP INTERFACE CARD

A plug-in UPS network interface card, making the UPS "SNMP manageable":

it allows communication between UPS and network.

When this option is installed the ComProt communication link is no longer available to the user.



7. MAINTENANCE

7.1 GENERAL

A UPS system, like other electrical equipment, needs periodic preventive maintenance. A regular maintenance check of your installation guarantees higher reliability of your safe power supply. Preventive maintenance work on the UPS can be done only by trained *Service technicians*. We therefore recommend you sign a Maintenance and Service contract with the local **Service Centre** organisation.

7.2 COOLING FAN

The expected operational life of the cooling fans is approximately 20.000 to 40.000 hours of continuous operation.

A high ambient temperature will shorten this operational life.

7.3 BATTERIES

The service life of the battery is from 3 to 6 years, depending on the operating temperature and on the number of discharge cycles.

As a healthy battery is essential to the performance of the UPS, an automatic battery test is performed regularly to ensure failsafe operation (see chapter 4.4.1).

When the condition of the battery is critical, the warning signal will be activated (buzzer 1x per 8 secs, and alarm message "Replace battery", see chapter 4.3.2).

The batteries must be replaced as soon as possible.

Please contact your dealer.

NOTE: under certain circumstances a manual battery test can result in a false alarm: please see chapter 4.4.2 - "QUICK BATTERY TEST".

Regular deep battery tests are advised in order to re-calibrate the capacity of ageing batteries. See chapter 4.3.3 for more information.

- Never short the battery terminals. Shorting may cause the battery to burn.
- Avoid charging in a sealed container.
- Proper disposal of batteries is required: refer to your local codes for disposal requirements.
- Never dispose batteries in a fire: they may explode.
- Never disassemble or reassemble batteries; their contents (electrolyte) may be extremely toxic.
If exposed to electrolyte, wash immediately with plenty of water, when acid contacts ones eyes wash them with a lot of water and see a doctor.



7.4 SAFETY

WARNING!

*When the **LP 31** is operating, all parts of the electronics are directly connected to the mains and high voltages are present on all internal parts, including the battery. Even after disconnection from the mains, all parts inside the UPS, including the battery, conduct dangerous voltages (except the ComConnect output).*

For your safety, **only authorised service personnel** may remove the cabinet cover

7.5 STORAGE

Always store the UPS in a cool, dry location with the batteries in a fully charged state.

Storing the unit for a period exceeding 3 months can reduce the life of the batteries.

To maintain their normal life expectancy, the batteries must be recharged periodically.

Connect the unit to a mains supply and switch on all MCBs at the front panel for a period of approximately 48 hours a minimum of every 3 months.



8. TROUBLESHOOTING

Whenever a malfunction occurs, first check external factors (e.g. connections, temperature, humidity or load) to determine whether the problem is caused by the unit itself or by its environment.

Always check these external factors before concluding that your **LP 31** UPS is faulty. The front screen will indicate the problem and solution (if the problem is due to environmental circumstances).

If the solution is not shown on the screen, please contact your dealer.

During the self-test, performed immediately after start-up, the UPS may detect a system failure.

In this case (one of) the following messages can be displayed:

**SELFTEST FAILURE
PCB POWER SUPPLY**

One or more voltages of the internal power supply is (are) outside tolerance.
Please contact your dealer.

**SELFTEST FAILURE
AC ON OUTPUT**

An external AC voltage (not the UPSs output voltage) was detected on the output terminals.
Please contact your dealer.

**SELFTEST FAILURE
PCB CONNECTORS**

One or more of the connectors inside the unit has a defect or is not placed properly.
Please contact your dealer.

**SELFTEST FAILURE
IC CHARGE**

A hardware error occurred during start-up of the input converter. Please contact your dealer.

**SELFTEST FAILURE
Comm. FAILURE**

Malfunction of the communication circuitry.
Please contact your dealer.

**SELFTEST FAILURE
TEMP TOO HIGH**

The temperature of (one of) the components is (still) too high.
See chapter 4.3.2.

**SELFTEST FAILURE
FATAL ERROR**

During start-up from mains, a hardware error occurred.
Please contact your dealer.

**SELFTEST FAILURE
IC STEP UP**

The step-up converter, which is a part of the input converter, failed during start-up.
Please contact your dealer.

**SELFTEST FAILURE
EXT. BATTERY**

Checking the external batteries, the UPS detected a failure in the hardware.

**SELFTEST FAILURE
Uic TOO LOW**

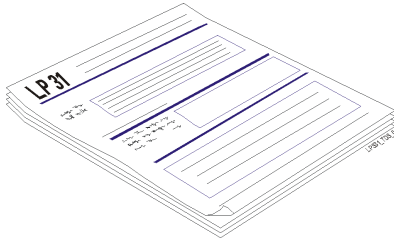
Malfunction of input circuit: voltage delivered is too low.
The batteries may be faulty or depleted.
Wait for a few hours, leave the UPS switched on.
If absence of input power (mains failure, maintenance work) is expected to last longer than a few hours, switch OFF the UPS to save battery power.
If the UPS input power is absent for several days and the UPS remains on under no-load conditions, the batteries can be discharged very deeply, resulting in a short battery lifetime.

**SELFTEST FAILURE
Q4 NOT OK**

Hardware output voltage detection "Q4" is active.
In case of a system failure the message is displayed for 30 seconds before the self test is repeated.
If the faulty situation persists, please contact your dealer.

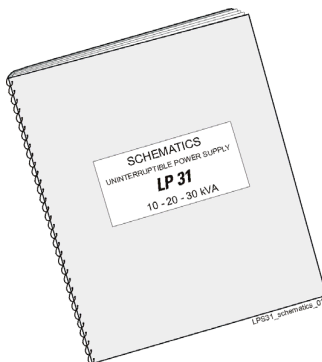
9. ANNEX

9.1 TECHNICAL DATA SHEETS



Can be found included in the last section and are listings of the technical data of the UPS.

9.2 TECHNICAL DIAGRAMS



These are included in the last sections and include assembly layouts and functional drawings.

Drawing title:

Drawing number:

Single line diagram	400 023.8	page 1/4
Wiring diagram	400 023.8	page 2/4
Service diagram	400 023.8	page 3/4
Terminals on rear	400 023.8	page 4/4
UPS to battery cabinet connection	300 404 1	page 1/2
Installation of internal batteries pack	300 404 1	page 2/2
UPS general arrangement	400 033.7	page 1/5
UPS cubicle dimensions	400 033.7	page 2/5
Dismantlement of UPS cabinet	400 033.7	page 3/5
Battery cubicle dimensions	400 033.7	page 4/5
Dismantlement of battery cabinet	400 033.7	page 5/5