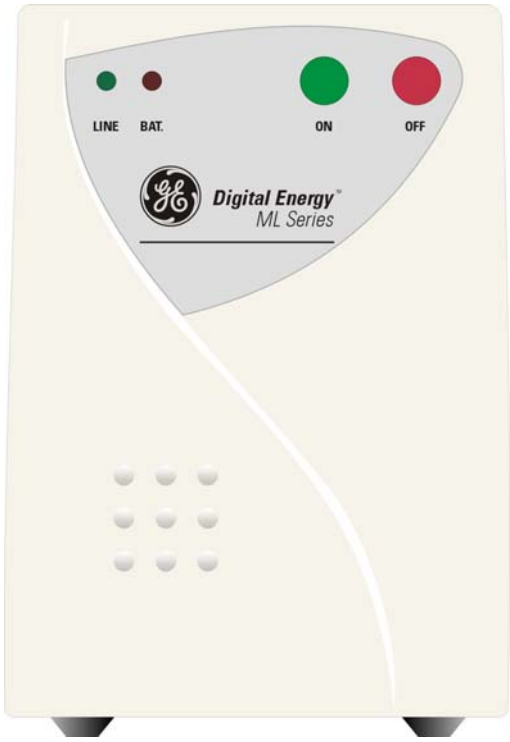
GE Consumer & Industrial
Power Protection

Product description

Digital Energy™ Uninterruptible Power Supply

Line Interactive
ML Series UPS / 350 - 500 - 700 - 1000 VA



GE imagination at work

CE

Certified
Quality System
SQS
ISO 9001 / EN 29001
Reg. No. 10448

Contents:

1 - Introduction

The **GE (General Electric) Digital Energy™ ML Series UPS** is a compact, modern, line-interactive system which incorporates the most advanced power electronics technology to provide exceptional protection for electrical equipment.

Each Digital Energy ML Series UPS is thoroughly tested and conforms within tolerance to the following specifications. (Data are mean values and are subject to change without notice.) Information applies to all models unless otherwise specified.

2 - Functional explanation

2.1 Principles of operation

The ML Series 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 a rectifier (to convert from AC to DC) and an inverter (to change energy from DC to AC). (See fig.1)

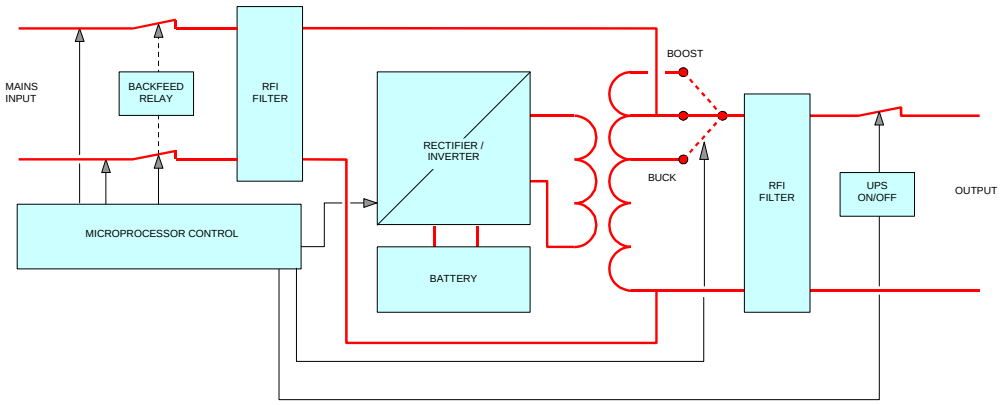


Figure 1 Block diagram of the ML 350-1000 UPS

2.2 Normal conditions

Under normal input conditions (see section 4.2) the load is supplied by the mains through a bypass circuit. Filtering capabilities guard against surges, spikes and high frequency interferences. The mains current also keeps the battery fully charged
The input voltage window is extremely wide: as long as the input voltage is between 160 - 300 Vac the Automatic Voltage Regulation (AVR) guarantees an output voltage that is between 198 - 265 Vac.

2.3 Mains failure

In the event of a mains power failure (i.e. absent or outside tolerance) the backfeed relay is opened and the load is supplied by the energy reserve stored in the battery. DC voltage from the batteries is transferred to the inverter which produces AC voltage for the load.
The transfer time is 4-10 milliseconds, sufficiently short for computers which therefore will continue to operate without interruption.
In the event of an extended mains failure, the inverter 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 load will be supplied again by the mains and the batteries will be recharged, making them ready to support future power failures.

3 - External description

3.1 Front and rear panel

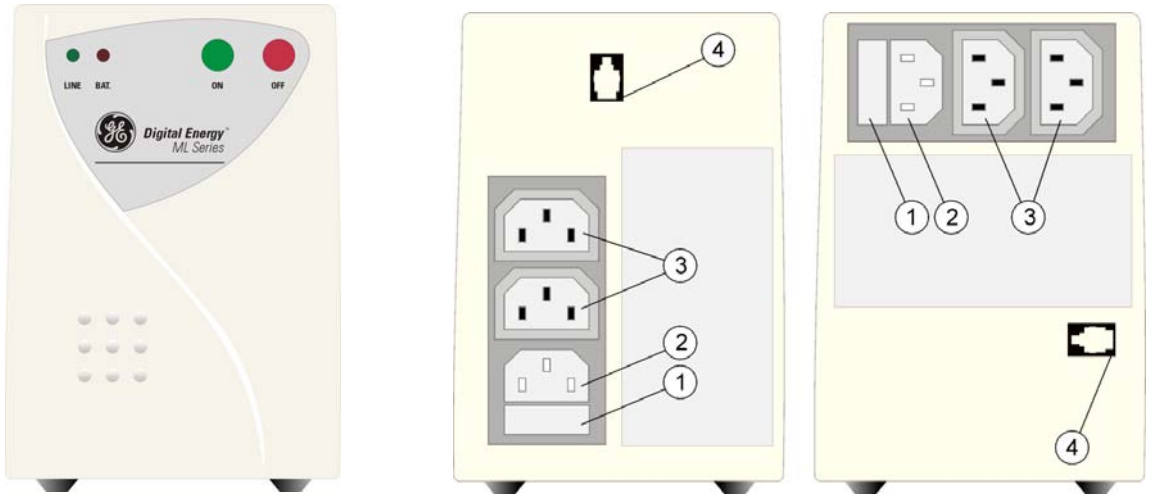


Figure 2 Front and rear panel (left ML 350-700, right ML 1000)

FRONT

LINE : green LED
BAT : red LED
Push-buttons

REAR

1 - Input fuse : IEC Ø5x20
2 - Input socket : IEC 320 C14 male
3 - Output sockets (2) : IEC 320 C13 female
4 - RS232 Interface port : RJ-11, 4P-4C

o = status indications — the operating mode
! = low priority alarms — abnormal operating situations
!! = high priority alarms — situations in which *the actual output voltage of the UPS is no longer guaranteed*; immediate action should be taken

SITUATION			*LINE*	*BAT*	*BUZZER*	*RESET BUZZER*
O	**Charger on**	Mains on. UPS output off	Green blinking 1x /sec			
O	**Normal operation**	Mains on. UPS output on	Green on			
!	**On battery**	Mains off or abnormal, UPS output on		Red on	Beeps 1x /4 sec	Possible
!!	**Battery low**	UPS on battery, battery under drained condition		Red on	Beeps 1x /sec	Not possible
!	**Replace battery**	Mains on, UPS output on. UPS has failed to pass the previous self test	Green on (mains mode) Green blinking 1x /sec (standby mode)	Red blinking 1x /30 sec	Beeps 1x /30 sec	
!!	**Overload on mains**	Mains on, output power > 105% of the rated capacity.	Green on		Continuous	Not possible
!!	**Overload on battery**	Mains off or abnormal, Output power > 105% of the rated capacity.		Red on	Continuous	Not possible
O	**Self test**	Mains on, unit switches to battery mode for 6 secs to check the bat. condition	Green on	Red on		

ML Series UPS model	**:**	**350**	**500**	**700**	**1000**

3.2 Enclosure

Construction	:	steel/plastic
Colour	:	RAL 9006 (aluminum) / RAL 7035 (light grey)
Protection	:	IP 20

3.3 Dimensions

Cabinet dimensions (hxwxd, mm)	:	150x110x300	150x110x300	150x110x420	150x110x450
Shipping dimensions (hxwxd, mm)	:	220x172x382	220x172x382	225x181x541	225x181x541

3.4 Weight

Weight (kg)	:	6.5	7.5	11	13
Shipping weight (kg)	:	7.8	8.8	12.5	14.5

4 - Electrical specifications

4.1 Ratings

ML Series UPS model	:	**350**	**500**	**700**	**1000**
Voltage Amperes (VA) / Watts	:	350 / 210	500 / 300	700 / 420	1000 / 600

4.2 Input

AC input voltage	:	220 - 240V			
AC input voltage window (mains)	:	142- 300V	142- 300V	142- 300V	160 - 254
Max. AC input voltage	:	350V			
Minimum start-up AC voltage	:	150V	150V	150V	170V
Input frequency	:	50 Hz			
Input frequency range	:	nominal ± 10%			
Typical no-load power consumption, normal operation (W)	:	12	12	27	27
AC input current (A)	:	2.5	3.6	5	6.3
AC input fuse (A)	:	5	5	6.3	10

4.3 Output

AC output voltage	:	230 V nominal (suitable for 220-240 V loads)			
AC output voltage tolerance					
- mains operation	:	198-265 V			
- battery operation	:	nominal + 5% / -10% (before battery low)			
Output frequency	:	50 Hz			
Output frequency stability	:	< ± 0.1 Hz (battery operation)			
Output waveform	:	step sine wave			
Crest factor handling					
- @ 50% load	:	3:1			
- @ 100% load	:	2:1			
Power factor	:	0.6 (0.7 at 90% load)			
Buck/boost voltage regulation	:	if the input voltage is within the input voltage window, the output voltage varies between 198-265Vac			
Transfer/reverse transfer voltages (ML 350VA, 500VA and 700VA)	:	super boost	⇔	battery	150 / 140
		boost	⇔	super boost	174 / 164
		normal	⇔	boost	210 / 200
		normal	⇔	buck	260 / 250
		inverter	⇔	buck	300 / 290
		buck	⇔	battery	275 / 265
Transfer/reverse transfer voltages (ML 1000VA)	:	boost	⇔	battery	170 / 160
		normal	⇔	boost	210 / 200
		inverter	⇔	normal	264 / 254

4.4 General design criteria

Safety	:	EN 50091-1-1 (EN 60950)
Electromagnetic compatibility	:	EN 50091-2

Note: The UPS is intended for use in normal domestic and office situations (see Safety: EN 50091-1-1)

5 - Performance characteristics

5.1 Environment

Ambient temperature	:	-10 to 40°C
Audible noise at 1 meter	:	less than 35 dB(A) (virtually inaudible)
Maximum relative humidity	:	95% (non-condensing)

5.2 Runtimes (ratings given for 25 °C)

ML Series UPS model	**:**	**350**	**500**	**700**	**1000**
VA / Watts					
100/ 60		25	40	60	85
350/210		3	8	14	24
500/300		-	3	7	11
700/420		-	-	3	7
1000/600		-	-	-	3

5.3 Standard features

Wide AC input voltage window
Minimises need for battery operation

Automatic voltage regulation
The buck and boost function reduces the input voltage variations to acceptable levels for the load.

Excellent high voltage protection
Protects itself and the load up to 350Vac.

Battery start (cold start)
Allows you to switch on the unit while the mains input is absent.

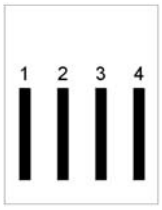
Superior battery management for maximum battery life and reliability:

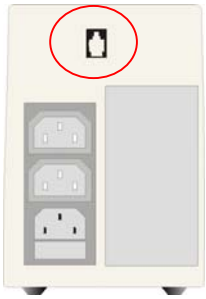
- **Quick battery test**
  The UPS performs a quick battery test, and will alert the user if the battery does not pass the test
- **Lowest battery temperature during mains operation**
  The design of the unit resulted in significantly lower battery temperature which increases battery lifetime.
- **Autocharging**
  Charger is switched on automatically when mains input is present
- **No-load shutdown**
  Whenever load <5% of maximum load and no mains power is present the UPS will switch off automatically. Load sensing during battery mode prevents unnecessary discharging of the batteries. This function cannot be de-activated.

6 - Communication

The RS232 port is a plug-in interface port (4-pin, RJ-11, 4P-4C) which enables advanced communication between the UPS and the computer. Use UPS software for unattended operation of workstations, power quality related data logging, shutdown notification and control, auto-restart, diagnostics, and battery conservation features.
We strongly recommend using only original GE Digital Energy™ software in combination with the RS232 interface port.

Pin #	Function
1	Input RS232
2	Output RS232
3	No connection
4	GND





ML 350-700

ML 1000

The communication port is available as long as the UPS is ON.

For specific information on **GE Digital Energy's** connectivity products please contact your local dealer or Internet: www.gedigitalenergy.com.

7 - Batteries (ratings given for 25 °C)

ML Series UPS model	:	**350**	**500**	**700**	**1000**
Nominal voltage (Vdc)	:	12	12	24	24
Number of batteries	:	1	1	2	2
Battery voltage (Vdc) / capacity (Ah)	:	12/5	12/7	24/5	24/7
Type	:	sealed and maintenance free			
Service life	:	up to 6 years (depending on operating conditions)			
Runtimes	:	see section 5.2			
Battery recharge current (A)	:	0.5	0.7	0.5	0.7
Battery recharge time	:	approx. 3 hours for 80% capacity			

Long term storage: see chapter 8

8 - Transport / storage

No liability can be accepted for any transport damage when the equipment is shipped in non-original packaging.

Store the UPS in a dry location with the batteries in a fully charged state.
Storage temperature must be within -20 +45 °C. If the unit is stored for a period exceeding 3 months, optimal battery lifetime is obtained if the storage temperature does not exceed 25°C.

If the unit is stored for an extended period of time, the batteries must be recharged periodically. Connect the unit to a wall outlet and recharge the batteries for 24 hours:

- if the storage temperature is within -20 and +30°C: every 3 months,
- if the storage temperature is within -20 and +45°C: every month.

A product by:

GE Digital Energy
General Electric Company
CH – 6595 Riazzino (Locarno)
Switzerland
T +41 (0)91 / 850 51 51
F +41 (0)91 / 850 51 44
E gedeinfo@ge.com

www.gedigitalenergy.com