UPS: Holding on to the Power

Higher the capacity, better the backup

The fact is, in India a remote village is declared to be 'electrified' as soon as a single light bulb illuminates it at night, regardless of the duration of its illumination. While this is an entirely different issue and not the subject of this report, it may well be mentioned as the product that we have tested and reviewed has its roots in this fundamental problem – namely insufficient or interrupted power supply. There is an increasing range of devices that run on electricity, but many parts of the country do not have enough electricity to run these. One has to rely on alternative systems that can run crucial devices in case of power outages. The commonest of all such devices is the uninterruptible power system (UPS), which is often a mediator between the main power socket and the computer's power cord. The report that follows will tell us something about backup capacity, standby strength and other relevant aspects to look for in the UPS.

A Consumer Voice Report

The UPS is probably the only affordable solution to keep the workstation – mostly comprising a desktop computer and a printer – 'on' for enough time to complete and save important work in case of power failure. Through our preliminary market research, we found out that the most common UPSs were the ones with capacity of 600VA to 1100VA and with backup time anywhere between ten minutes and one hour.

We researched further to figure out the brands that were being sold the most and bought the 10 leading brands from the organized market. Then, as per procedure, we sent them to an NABL-certified laboratory to test if they met the set standards and also delivered what they promised.

What is a UPS?

The UPS is an electrical power source connected between the main power supply and the hardware that works on electricity, especially computers, printers and a few lights. The aim of the system is to supply continuous, undisturbed and conditioned power to a specific load in case of a power failure.

The UPS uses batteries for storing of power. When the external supply is 'on', the inverter in the system keeps converting AC current into DC current that gets stored in the battery. When main power supply goes off, this stored power reverts to its original form – AC current – and powers the respective connected devices. The whole conversion and powering process happens in a fraction of a second, so that the device connected to the UPS does not even flicker when the power goes.

The device attached to the UPS can run on the stored power for a few minutes or even hours, depending on the backup capacity of the UPS.

Social Connect

Apart from helping consumers in making the best choice, the focus of this test report is also to sensitize electrical product manufacturers towards the environment so that they make efficient—and to the extent possible, eco-friendly—products. All brands that consume less power and have no/minimal standby loss are always rated better in *Consumer Voice* reports. Each watt saved by an efficient appliance or a gadget is valuable for the planet.

BRANDS TESTED

Rank	Total Score out of 100 (Rounded off)	Brand	Model	Declared Capacity, VA	MRP (in Rs)	Retail price	Manufacturer/ Marketer
	CAPACITY 1000VA–1100VA						
1	90	**APC**	APC back UPS RS 1100	1100	8,425	6,499	Schneider Electric
2	88	**iBall**	Nirantar	1000	4,490	4,299	Best IT World
3	84	**Zebronics**	ZEB-U 1000	1000	4,200	4,100	Top Notch Infotronix
3	84	**Elnova**	T-1002	1000	6,040	5,800	Elnova Pvt. Ltd
4	83	**Microtek**	Twin Guard	1000	4,890	4,649	Microtek International
4	83	**Asia power**	AP1050+	1000	5,999	5,499	Asia Powercom
4	83	**Intex**	Gamma	1000	5,038	4,899	Intex Technologies
	CAPACITY 600VA						
1	88	**Numeric**	Digital 600 EX		2,300	2,100	Novateur Electrical & Digital Systems
2	82	**Luminous**	Duo 600		2,599	2,350	Luminous Power Technologies
3	79	**V-Guard**	SESTO 600		2,500	2,050	V-Guard Industries

*Score Rating: >90: very good*****, *71–90: good****, *51–70: average****, *30–50: poor***, *<30: very poor**

Test Methodology

The draft Indian standard consulted for the comparative testing of UPS is as per Document No. ET-31 (5432), which is mainly based on IEC: 62040-1: 2008 *(Uninterruptible Power Supply UPS general and safety requirement for UPS)* and IEC: 62040-3: 1999, under development by the power electronics sectional committee of Bureau of Indian Standards.

CV Recommendation | Top Performer (1000VA–1100VA category)

APC

- Only brand in the tested lot to produce recommended sine wave (other brands produce rectangular wave that can harm sophisticated devices)
- Highest backup time of 80 minutes
- Has minimum standby loss
- At Rs 6,499, it offers a justifiable price for its qualities

CV Recommendation | Top Performer (600VA category)

Numeric

TEST RESULTS
FOR PERFORMANCE

Efficiency | Backup time | Change-over time | Capacity | Wave form | Output voltage | Frequency

◆ ***Efficiency***

All brands show efficiency level of over 85 per cent, which is just about at acceptable point.

- *Numeric with efficiency level of 91.7 per cent, APC at 89.59 per cent and Luminous at 89.13 proved to be the better performers.*

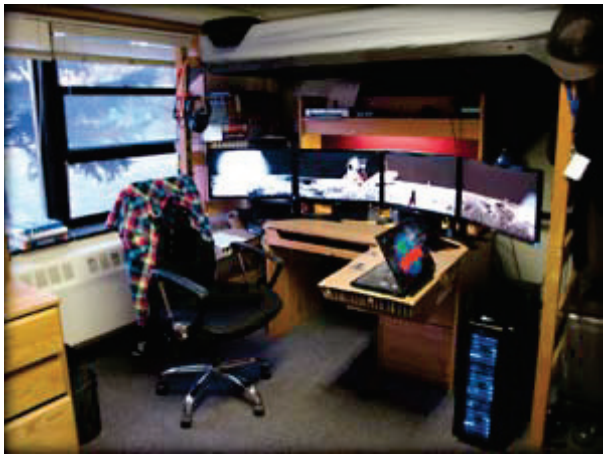
◆ ***Backup time at full rated load***

One of the most important factors with regard to a UPS is its backup time. The backup ability is directly proportional to quality as well as capacity of its batteries. It is to be noted that backup time reduces over a period of usage due to weakening of battery capacity in retaining the charge.

- *APC gave maximum backup – of 80 minutes – in the 1000VA–1100VA category.*

KEY FINDINGS

- APC produces sine waveform; all the other tested brands produce rectangular waveforms.
- APC gives the maximum backup – of 80 minutes – in the 1000VA–1100VA category. In 600VA category, Numeric gives the most backup time.
- Efficiency level was found between 85.69 per cent and 91.70 per cent. Numeric (91.7 per cent), APC (89.59 per cent) and Luminous (89.13 per cent) showed better efficiency.
- Power consumption in standby mode is lowest in APC (20W) and highest in Intex (32W).
- All the brands have relatively fast change-over time.
- Most of the brands were manufactured in China.



- *In 600VA category, Numeric topped in backup time.*

Brand	Backup Time
1000VA–1100VA	
APC	1 hour 20 minutes
iBall	63 minutes
Elnova	57 minutes
Asia Power	55 minutes
Microtek	55 minutes
Intex	52 minutes
Zebronics	50 minutes
600VA	
Numeric	15 minutes
Luminous	12 minutes
V-Guard	10 minutes

◆ *Change-over time*

This means the time taken for switching on to UPS backup power in case of electricity outage and then reverting to the mains when electricity returns. This time should, of course, be such that the power going to the device attached to the UPS is uninterrupted.

- *All the tested brands showed relatively fast change-over time for both the modes.*

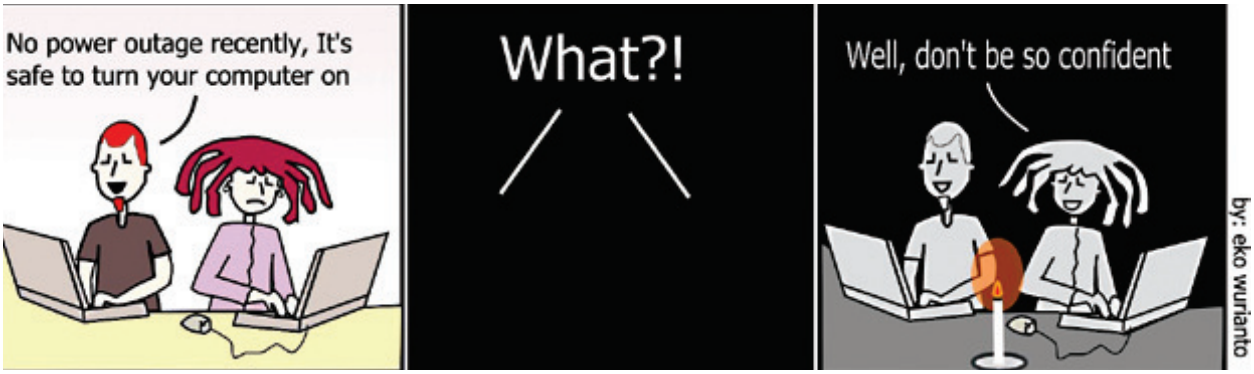
◆ *Capacity*

Before buying, consumers must see the actual capacity in watts in addition to the VA capacity, which is actually the virtual power capacity.

- *Capacity in watts for all the brands is above or negligibly less (1watt–10 watts) compared to their rated capacity. Hence, all brands passed this test.*

PERFORMANCE

	% Weightage	APC	iBall	Zebronics	Elnova	
Efficiency	14	12.51	12.28	12.29	12.30	
Backup time at full rated load	15	13.33	12.60	9.99	11.4	
Change-over time	6	5.59	5.45	5.26	5.54	
Output voltage	2	1.94	1.96	1.98	1.99	
Frequency	2	1.99	2	1.97	1.97	
Capacity	5	5	5	5	5	
Overload capacity	3	2.26	2.63	2.26	2.26	
Output wave form	4	4	2	2	1.4	



◆ *Overload capacity at 15 per cent higher load (than rated capacity)*

To ascertain whether the UPS can handle overload, they were loaded with 15 per cent more than their rated capacities and the backup time was noted.

- *All the brands could withstand the extra load for 1 minute to 1.8 minutes.*

◆ *Output waveforms*

Ideally the output wave of a UPS should be sine wave as it is safe for sophisticated devices. In the tests, though, we found that except for APC all the brands produced rectangular wave.

- *Only APC produced sine wave.*
- *Amplitude of rectangular wave in Elnova and Luminous is quite high, so they should be avoided for sophisticated devices.*

◆ *Output voltage*

All brands except Microtek (at 228.4V, but within limit) provided the output voltage close to their respective rated voltage of 230V.

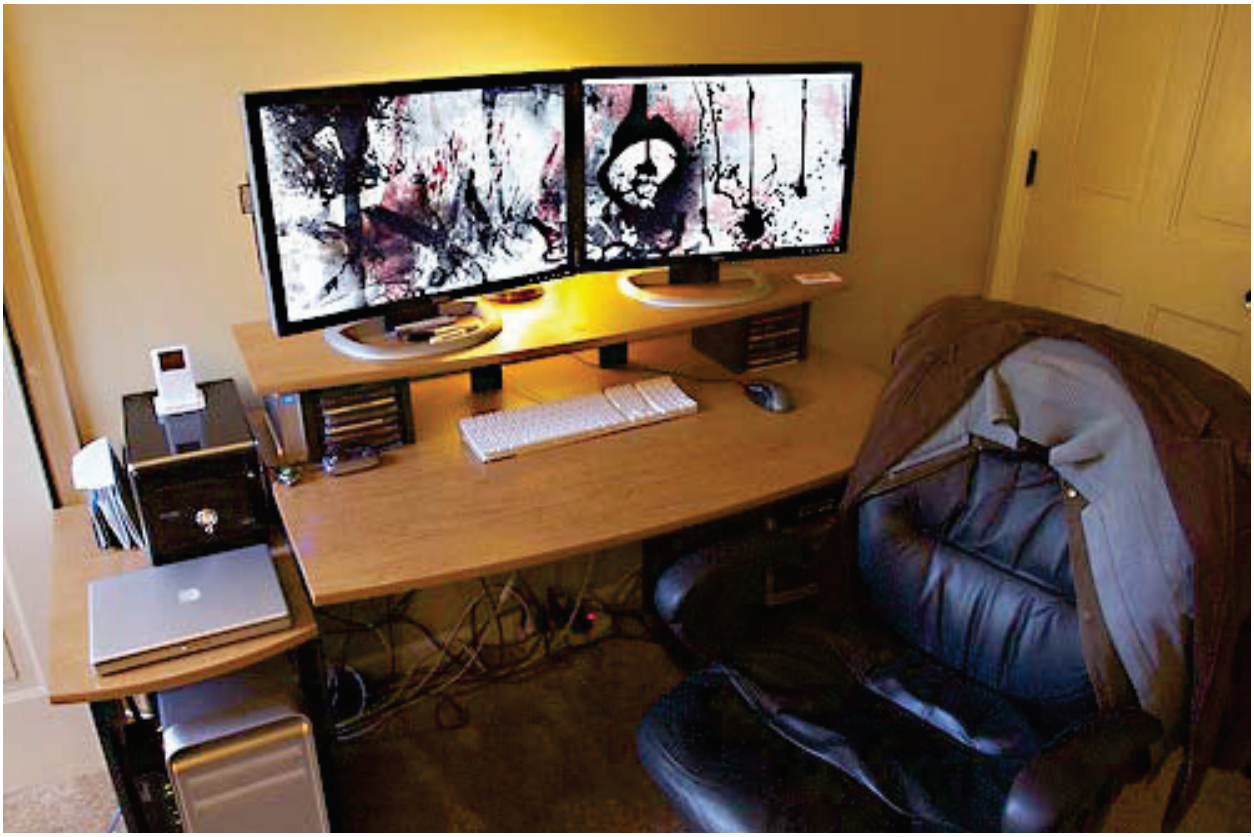
◆ *Frequency*

The UPS must give a frequency of 50 Hz with acceptable tolerance. The output frequency should also be stable.

- *All brands passed these tests.*

TESTS

	Microtek	Asia Power	Intex	Numeric	Luminous	V-Guard
	12.02	12.13	11.99	12.83	12.47	12.19
	10.99	10.99	10.39	11.25	9.0	7.5
	5.25	5.32	5.27	5.55	5.31	5.33
	1.92	1.97	1.94	1.97	1.98	1.99
	1.97	1.99	1.99	2.0	1.98	1.97
	4.49	4.94	4.97	5	5	5
	2.63	2.63	2.26	2.85	2.63	2.26
	2	2	2	2	1.4	2



RELATED ELECTRICAL TESTS

Standby loss | THD | Batteries charging | Input power/voltage

◆ *Power in standby mode*

This refers to wastage of electricity when the battery is fully charged; therefore it should be minimal. The tested brands showed standby loss between 20 watts and 32 watts.

- *APC showed lowest loss of 20 watts, while Intex with 32 watts had highest standby loss.*

◆ *THD*

The total harmonic distortion (THD) should not exceed five per cent as it can affect the sound quality of audio-video gadgets in the vicinity.

- *The total harmonic distortion of the tested brands was between 2.5 and 4.8, and is thus not a concern. It will not disturb the electronic gadgets operating in the vicinity.*

◆ *Batteries charging*

The built-in battery charger of the UPS should be able to charge the fully discharged battery in the time as declared by manufacturer. The condition/status of the fully charged battery is to be indicated on the front panel/bezel of the UPS.

◆ *Battery-charging time*

The battery-charging time should neither be too quick (as it may deteriorate the battery) nor should it be too low. The UPS must always retain enough power to take the load in case of frequent power outages.

- *In 1000VA capacity, iBall and Zebronics took the least time to charge the battery (6.10 hours and 6.20 hours, respectively); Asia Power took more than 12 hours.*
- *In 600VA capacity, Numeric charged the battery in just 4.10 hours. The highest time – 6 hours – was taken by V-Guard.*

◆ *Input voltage range*

The UPS should be able to operate on the input voltage range as declared on the rating plate/operating manual.

- *All the brands complied with the requirement.*

SAFETY TESTS

Endurance | Temperature | High voltage | Insulation resistance | Electrical shock

◆ *Endurance*

The endurance test was conducted for 10 cycles – in each cycle the UPS was charged seven hours and discharged for one hour.

- *All the brands withstood the endurance test.*

◆ *Temperature rise*

All brands were tested to check if there was an exceptional rise in their temperature after 50 per cent charging. Temperature rise was measured on three sides of the UPS body at room temperature.

- *None of the brands exceeded 40 degrees Celsius during charging. Hence, all of them can be considered safe.*

◆ *High voltage*

This was to check if the UPS could withstand voltage of 1500 V at 50 Hz for one minute.

- *All brands passed this test.*

◆ *Insulation resistance*

This test was carried out at a voltage of 500V DC to be sure that the insulation did not break down or melt at high voltage.

- *All brands passed the insulation resistance test as well as the test to check protection against electrical shocks.*

GENERAL TESTS

Packaging | Marking | Operating manual | Physical observations

◆ *Packaging*

The packaging has to permit convenient handling and protect the UPS against any loss or damage during transit and storage

- *Packaging of APC was very robust, followed by of Microtek and V-Guard.*

◆ *Marking*

Mandatory information includes source of manufacture, serial number, date of manufacturing, warrantee/guarantee time, and the rated voltage and Hz capacity.

- *All tested brands had complete information on their respective rating plates.*

◆ *Operating manual*

The operating manual must include instructions for installation, battery (charging and maintenance) and safety, along with a schematic diagram of internal connections showing terminals, components and sub-assemblies.

- *V-Guard's instruction manual contained the least amount of information.*
- *Asia Power and Numeric's manuals did not have schematic diagrams.*

A three-member expert panel checked and rated all the brands for their workmanship, aesthetics, robust construction as well as ventilation provision, and found all of them to be equally good.

Our conclusion is that it is advisable to buy a UPS of higher capacity – of minimum 1000VA – if PCs, laptops, etc., as well as other supported peripherals are needed to be used during power outages. In terms of actual capacity and backup time, brand APC emerged as an excellent performer (backup of 80 minutes on full rated load usage). Brand iBall lasted for 63 minutes in our tests, while the remaining five brands of 1000VA capacity gave backup of below one hour (52 to 57 minutes). Brands with 600VA capacity have given backup of only 10 to 15 minutes.

Difference in kW and VA

Watts (W) and volt-amperes (VA) are units of measurement for electrical power. Watts refer to 'real power', while volt-amperes refer to 'apparent power'. Electronic products show one or both of these values to provide information about how much energy they will consume or how much current they will draw.