

Uninterruptable Power Supplies (UPS) - Guidance

Occupational Health & Safety Service
HSD188P (rev 2)

Uninterruptable Power Supplies (UPS)



Introduction:

UPS systems are 'back-up' power supplies that ensure continuity of supply for equipment where power failure would be a serious issue. They range from the larger installations with replaceable batteries, often used by Estate Management and IT Services, to small portable units connected by 13A plugs which may need discarding after their expected life.

UPSs can pose risks not normally associated with electrical mains equipment because they store large amounts of energy and continue to generate potentially lethal electrical power even when isolated from the mains supply.

If undertaking work on equipment supplied by a UPS, ensure that the equipment is disconnect from UPS (not just the UPS from the supply), and prove the equipment is 'dead' using an approved method.

Working Life:

UPS systems have a finite life, but are often not replaced or seen as a problem until they fail. Failure becomes much more likely as the units age. NB: They can fail in a potentially dangerous manner due to the amount of energy stored.

UPS systems have failed and caught fire !

Since UPS systems continue to supply power when their supply is isolated they pose a risk

to firefighting and electrical maintenance and it is important to maintain the protective earth.

Note: Systems with less battery capacity store less energy and may not pose the same level of risk. However they still pose a very real risk of overheating if they fail.

Reliability:

A number of UPS systems at the University have failed, overheated and caught fire!

Problems are typically due to cascade battery failure or failure of the charger.

As UPS systems age they will become noticeably less reliable and at some point the battery cells will start to fail and this may cause a runaway over-heating condition.

UPS systems also have a relatively high probability of failing due to stressed, high power electrical components. Probability increases significantly over time. These failures can also lead to UPS overheating.

UPS systems can be expensive to maintain and maintenance must include key items such as batteries.

Batteries:

Most UPSs will use sealed or maintenance-free batteries (VRLA). Such batteries are generally much safer to handle than the traditional (wet) lead-acid battery, but they must be treated with respect.

Typically smaller UPS systems are supplied with batteries designed to last for 5 years. After that period they will have typically half of their original capacity remaining and the likelihood of outright failure increases.

Always Follow the Manufacturer's Advice:

After the manufacturer's 'design life', typically 3 to 5 years, UPS systems or their batteries should be replaced and the old units or batteries disposed of appropriately.

However, in some cases it may not be economic, nor advisable, to replace the batteries alone.

Remember, UPSs are rarely operated under ideal conditions and so the expected manufacturer's 'design life' may be reduced as a result.

Responsibilities:

Departments / Institutions should:

- Consult Estate Management before a UPS larger than 10kW is to be installed
- Control their purchase and installation
- Ensure UPSs are suitable for purpose
- Keep a register of their UPSs
- Undertake regular recorded inspections as per the manufacturer's instructions
- Ensure UPSs undergo any maintenance required by the manufacturer.
- Replace UPSs when they show any sign of failure or at the time interval set by the manufacturer, whichever occurs first.
- Ensure redundant UPSs are disposed of correctly in a timely manner i.e. as 'WEEE' or as 'hazardous waste'.

Installation:

When selecting a location for a UPS system you should consider:

- Temperature. The recommended operating range is usually 15°C to 25°C.

- Floor loading. Some UPSs can be heavy enough to need special consideration.
- Ventilation on all sides and top. Select a 'clean' location that will not become cluttered, particularly with flammable or combustible materials such as paper. Do not allow such materials to be stored on or near a UPS
- Access. There must be sufficient access to maintain the UPS safely.
- Some UPSs require a separate earth

Maintenance and Monitoring:

- If available and financially viable get an extended warranty for the life of the unit.
- Fixed installations should be on a maintenance contract in accordance with the manufacturer's instructions.
- **UPS batteries should be replaced at the end of the expected battery life.**

Inspection and Monitoring:

Departments should keep a log of their UPS systems, including a record of the following:

- **UPS specifications:**
 - o Location
 - o Description
 - o Manufacturer
 - o Model
 - o Serial number
 - o Power rating
 - o Designed Autonomy (Backup time)
- **Maintenance information:**
 - o Date of purchase
 - o Expected design life.
Consult manufacturer; often 5 years
 - o PAT test and Visual inspection interval
 - o Maintenance interval (if applicable)

- o Date of last test and visual inspection
- o Record of preventative maintenance
- o Date and route of disposal

- **Purpose:**

- o Description of equipment protected
- o Departmental contact name and phone number

Maintenance should only be carried out by competent engineers.

Emergency Information:

Emergency information and instructions, including contact details, should be clearly posted in a location that can be easily identified and in a form that can be easily read in case of overheating and fire. This should include a clear warning of the voltage and potential risk of electrical shock even after the UPS has been isolated from its electrical supply.

Where possible, there should be a means to safely switch off / electrically isolate the UPS from a position of safety should it overheat or catch fire.

Appropriate fire extinguishers (dry powder and/or carbon dioxide) should be readily available and clearly signed. Whilst, in most cases these would already be 'available' in a Department; in certain circumstances they may need to be provided (subject to risk assessment).

Note: Large UPS systems (>1kVA) should be separately earthed and may require consideration in the fire risk assessment.

Safety Office
Greenwich House, Maddingley Road
Cambridge, CB3 0TX
Phone: 01223 333301
Fax: 01223 330256
Email: safety@admin.cam.ac.uk
www.safety.admin.cam.ac.uk/