



Value of integrated backfeed protection and bypass fuse in UPS systems

An Uninterruptible Power Supply (UPS) is a valuable asset and it does an even more valuable job of protecting important data, equipment, business processes and people in the event of a power surge or failure. But who do you trust to protect the UPS? And how do you measure the value of safety and reliability?



Powering Business Worldwide



What Price for Peace of Mind?

By its nature, a UPS works with high voltages and consequently there is an ever-present danger that either a power surge or failure could damage equipment, impact business continuity, and even create a serious risk to personnel.

International standards specify safety requirements for people and industrial plants with regards to electrical installations, but they are open to interpretation: some safety features can be internal – i.e. installed by the manufacturer – or external and left to the end-user and installer. Safety expectations must be discussed and agreed between the consultant, manufacturer and the user.

Eaton's premium 3-phase UPS feature pre-designed, pre-tested and pre-installed components to deliver regulatory compliance and ensure safe use.

There are two major, yet distinct, safety requirements for a UPS installation to protect equipment and personnel from faulty and dangerous electrical currents. Both are important safety mechanisms but often equally misunderstood. The first is **static switch fuses** and the second is **backfeed protection**.

Static switch fuses

A UPS must feature a static switch, which can back up the inverter in some events – for example during short circuit in the load of the UPS. But a static switch cannot tolerate high short circuit currents for long durations, so depends on fuses to protect it. Improper sizing of fuses risks losing the load and damaging the static switch.

Backfeed contactor

International and European regulations demand that a UPS is protected against risks from backfeed.

The **IEC 62040-1:2008 Uninterruptible power systems (UPS) – Part 1: General and safety requirements for UPS** and a **European Normative** both set a **mandatory** requirement to ensure the safety of service personnel in UPS installations by protecting against backfeed.

What is backfeed?

Backfeeding means that there are hazardous voltages still present on a conductor after it has been disconnected from its normal power source. This can be seen as power flow from the UPS back to the power grid.



Before working on this circuit

Isolate Uninterruptible Power System (UPS)

Risk of Voltage Backfeed

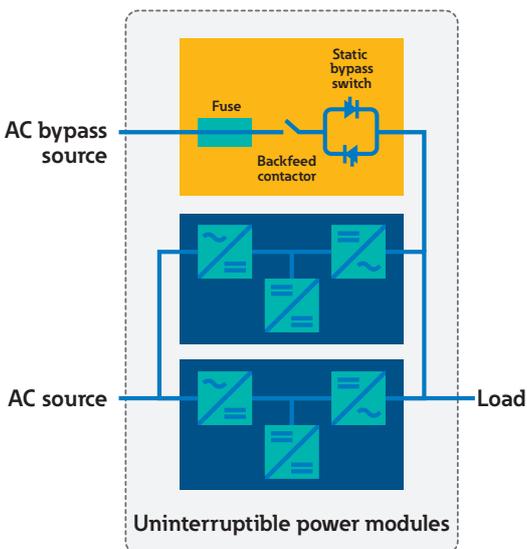
Deciding on internal or external Static Switch and Backfeed protection

The safety standards allow for two alternative implementations of protection: **Internal and External**.

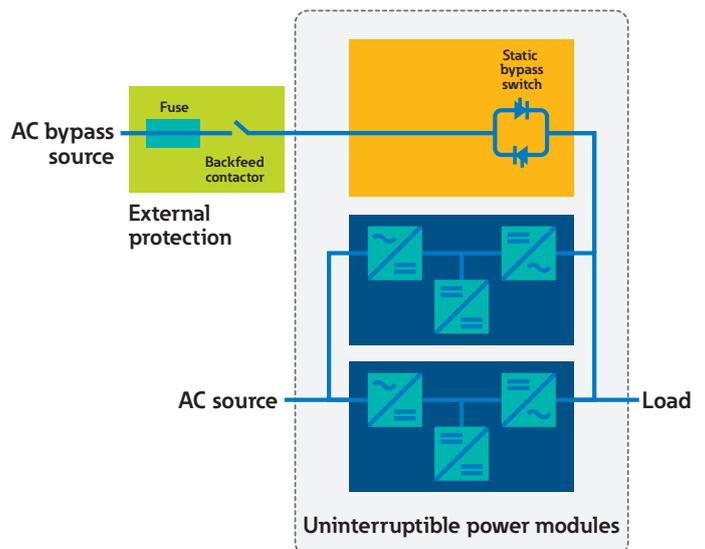
Contrary to expectations, **internal protection** is not found in every UPS design. Many UPS manufacturers choose instead to include a line in the small print that external contactors are needed to meet safety standards, forcing contractors or end-users to pay for additional external protection after the UPS is installed. And who can honestly admit to examining every line of the small print?

External backfeed protection can add 1000 € to the cost price of a 100 kW UPS, after electrical engineer costs, cabling and components are taken into consideration, but what's more it increases installation times. Similarly, external static switch fuses can add 500 € to the price of a 100 kW UPS. In contrast, **all Eaton premium UPSs feature internal backfeed protection and static bypass fuses**.

Eaton premium UPS



Typical UPS without internal static bypass fuse or backfeed contactor



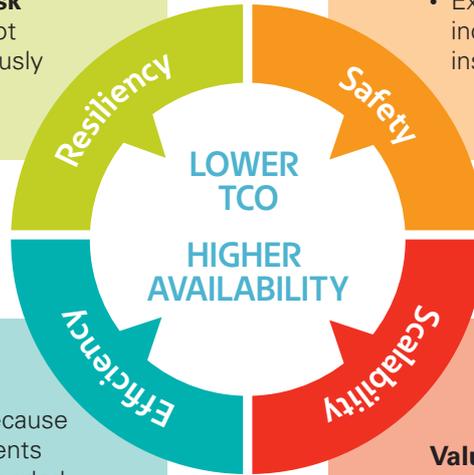
The case for internal protection is simple:

Resiliency/highest availability

- In Eaton UPS design, the backfeed contactor also **improves resiliency** by maintaining operations through double conversion or battery mode
- If the static switch fuse is improperly sized or forgotten by the designer, there is a risk that it will operate too early and **risk the critical load**, or that it does not operate at all and the UPS is ruinously **damaged by a short circuit**

Safety

- All components are designed-in and **integrated by the manufacturer and product expert** – meaning they are **designed for the job**, tested, proven, guaranteed and the safest components to use
- External components can be sized incorrectly or even missed in the installation process



Cost savings

- **Up to 1500 €** per 100 kW UPS because of no additional, external components (fuses, contactor or cabling) are needed
- No need to reserve **space** for external components and cabling
- No costs from external contractors to conduct additional sizing, **design, installation or testing** of external components
- Replacing fuses is easier and cheaper compared to replacing bypass thyristors

Value

- **Faster** install time and time to operation
- Improved **reliability**
- More **economical**
- **Safer**

**The value from internal protection is clear:
it's more reliable, more economical, faster and safer.**

More information on backfeed protection can be found in Eaton's whitepaper on UPS installation safety requirements:

http://electricalsector.eaton.com/UPS_installation_safety_requirements_WP

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