

Variable Module Management System

VMMS



Applications

Typical applications where VMMS is particularly efficient include:

- UPSs in redundant N+1 and 2N systems
 - Lightly loaded: UPSs in these systems typically operate at low loads, < 45% load level
- Data centres, especially when the UPS system feeds dual-corded servers
- Any applications where load is not constant

Variable Module Management System (VMMS)

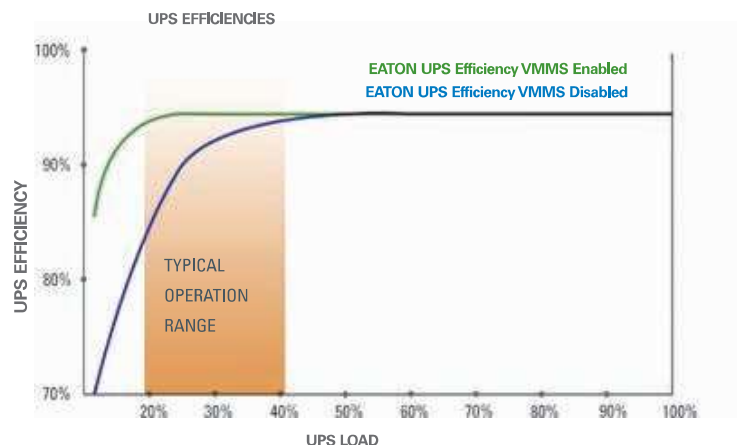
The rising demand for highly available, reliable and efficient power is a continuous challenge for data centre operators. Higher energy efficiency helps to address increasing environmental, regulatory and economic pressures.

Eaton has developed innovative and proprietary technologies that improve system efficiency without compromising on reliability. Variable Module Management System (VMMS) is one of these technologies.

Typical field operations are usually within low load range, but UPSs do not operate at optimal efficiency when used for lighter loads.

In some multi-UPS parallel systems used with lighter loads, the system maximises the load percentage of the UPSs by putting the UPSs that are not needed to power the load into idle mode. This results in partial energy savings and is limited to multi-UPS systems, with no efficiency improvements for -single-UPS systems.

Variable Module Management System (VMMS) technology maximises efficiencies at lighter loads without compromising reliability.



Variable module management technology maximises efficiencies at lighter loads

Variable Module Management System (VMMS)

Maximised energy efficiency

VMMS optimally employs uninterruptible power modules (UPMs) in the UPS to achieve higher efficiencies in double-conversion mode in order to maximise the percentage load level of the remaining active UPMs by switching UPMs that are not needed to ready state*.

This is calculated according to the UPMs' VMMS load threshold – 80% by default – and the system configuration (redundancy requirements). This results in maximised energy savings.

VMMS is only possible thanks to Power Xpert 9395P UPS modularity. VMMS can also be applied in multimodule single-UPS systems.

***In "ready state", the UPM rectifies the DC-link, generates logic level PWM (Pulse Width Modulation) signals and filters EMI and lightning spikes.**

No compromise on reliability

When a disturbance or load increase occurs on a critical bus, all the UPMs in ready state are able to react quickly, immediately switching back to double-conversion mode connecting the existing PWM signals to the IGBT gates.

In VMMS, all UPMs will switch to double-conversion if:

- the output voltage fluctuates by more than 3% for any reason
- any UPM reaches its current limit or discharges its battery
- battery recharge is necessary.

Once the above conditions are resolved, the system switches back to VMMS, after a customer-preset time delay (1 to 60 hours): once the load stabilises, Eaton proprietary design and algorithms allow the system to determine which UPMs to switch back to ready state to maximise efficiency according to the new operating conditions.

Extensive configurability

Customers can decide how to configure their system, establishing the number of redundant UPMs and the max percentage load level per UPM allowed in VMMS setting other UPM's in ready state.

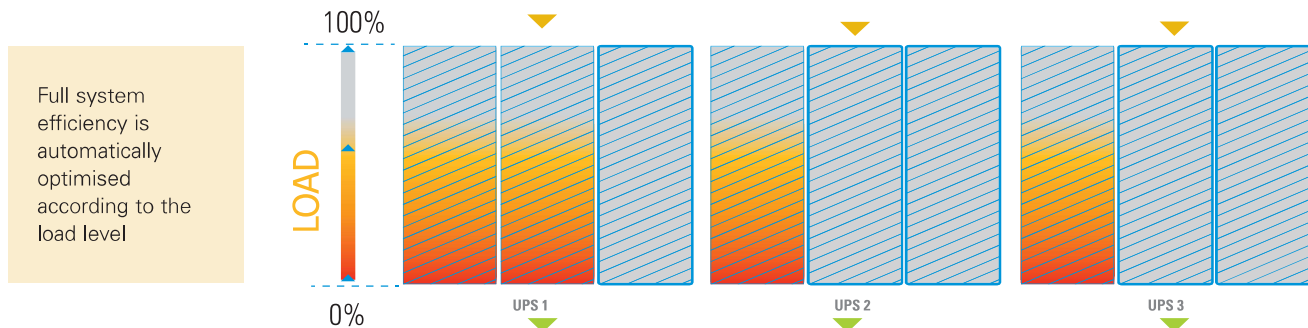
VMMS can be used in all multi-module (multiple-UPM) Power Xpert 9395P systems:

- Single 9395P units from 550 kVA to 1100 kVA
- All parallel 9395P systems

Existing installations can also be upgraded with VMMS capability:

- VMMS maintains redundancy and achieves higher efficiency by intelligently controlling the load levels of UPMs
- Number of redundant UPMs can be selected (N+0, N+1, N+2, N+X)
- UPMs in ready state can be used as redundant units (N+0)

VMMS Parallel Power Xpert 9395P – 900 kVA modular UPS and VMMS



Data centre with dual-corded servers, Power Xpert 9395P-900 kVA UPS on A and B side - 320 kVA load

UPS configuration	Without VMMS	With VMMS
Efficiency @ 320 kVA load	94.6%	96.1%
UPS energy savings	Used as reference for savings calculation	41 MWh / year
UPS energy savings	Industry-leading UPS efficiency in double conversion	- Additional energy savings from reduced cooling in VMMS (typically 30-40% on top of UPS energy savings) - UPMs in VMMS ready state available for redundancy

