ALBERTO CARINI, GLOBAL PRODUCT MANAGER

MNS-Up: mission critical power

Low-voltage switchgear combined with UPS

Product presentation
Contents

1. Why critical power solutions?

2. Product features

3. Value for users

4. Combined FAT

5. Reference

6. Available documentation
Why investing on critical power applications?

Automotive Industry
Outage cost per minute up to: 22,000 USD

Data center
Outage cost per minute up to: 16,000 USD

Hospital
Outage cost per minute... Incalculable!
Contents

1  Why critical power solutions?
2  Product features
3  Value for users
4  Combined FAT
5  Reference
6  Available documentation
Definition

MNS-Up is an innovative product offering low-voltage switchgear combined with modular UPS in a single line-up – for critical power applications such as in data centers, hospitals and light industries.
Best of both

MNS platform

Applications
Energy distribution and MCC feeders

Feeders technology
Withdrawable, plug-in and fix execution to better fit customers preference

Power quality
Fix or Plug-in capacitor banks modules with automatic insertion

DPA 500

Modules power
Only one type of 100kW

Modularity
Up to 5 modules per panel = 500KW
Up to 6 panels on parallel = 3MW

Availability
Online-swap modularity (OSM)
Serviceability – low MTTR*

*) MTTR = Mean time to repair
Data center conventional solution

Conventional switchgear and UPS layout
- Assemblies physically separated
- Separate incoming / outgoing breaker sections
- Extensive power cabling / bus duct to connect switchgear and UPS
- Expensive and space-consuming topology
- Complex to scale
MNS-Up… Breaking the rules

**MNS-Up Layout**

- Compact assembly to optimize footprint
- Reduced installation time and cost
- All-in-one solution without switchgear external interconnection
- Lower operation and maintenance
- Scalable solution

![Diagram of MNS-Up Layout](image)

- LV switchgear Incoming → UPS → LV switchgear Outgoing
- MV SWGR → Transformer → MNS-Up → PDU → Server
- Battery
Electrical scheme

Conventional solution

MNS-Up solution combining LV switchgear and UPS

Component reduction: breakers and interconnection
How it works...

**Standard conditions**
- Power coming from transformer
- Central manual bypass open
- Power passing through UPS and charging batteries
- Critical loads powered by UPS double conversion

**Network fault condition**
- Critical loads powered by batteries
- Emergency generator starting
- Incoming switch from transformer to generator feeder
- UPS back to standard condition situation charging batteries

**UPS / Batteries maintenance**
- Power coming from transformer
- Central manual bypass close
- Critical loads directly powered by transformer
Decentralized parallel architecture (DPA™) distributes the entire UPS hardware and software into each module

- Individual control panel
- Individual CPU
- Individual power unit
- Individual static bypass switch
- Individual separate battery

Each module is a complete UPS with its own CPU and intelligence.

No single point of failure
**N+1 configuration**

**Conventional configuration**
- n°5 Active UPS modules at full power 100%
- Section total power 500kW
- Power lost in case of module failure or maintenance

**N+1 configuration during standard condition**
- n°5 Active UPS modules at 80%
- Section total power 400kW

**N+1 configuration during UPS Fault**
- n°4 remaining UPS modules at 100%
- Section total power 400kW

Typical availability of N+1 modular UPS is 99,9999% (six-nines)
Xtra VFI – double conversion mode

- UPS maximizes the double conversion efficiency by engaging UPS modules based on load power.
- When load is very low compared to UPS system rated power, the overcapacity is automatically switched to stand-by mode, in which modules consume much less power and thus help save energy.
- Efficiency improvement is especially significant when load is ≤25% of full UPS system capacity.

Xtra FVI introduces a secure way to increase significantly the efficiency of systems that do not run on full load from day one.
Battery connection options

Batteries are located outside MNS-Up

Common battery
One per each section

Individual batteries
...one per each UPS module

Supported batteries type
... wide choice

- Vrla
- Flooded lead acid
- Nickel Cadmium
- Lithium-ion chemistry
  ABB choice: Samsung SDI
Flexible design

**UPS central position**
Possibility to separate critical and non-critical loads

**UPS side position**
UPS sections all on one side of MNS-Up; can be either on the right or on the left side

**Rear alignment**
To maximize space available on the front of the switchgear in case of space limited in the installation room, such as in containers

**Back-to-back**
To reduce overall footprint with front and rear feeders accessibility
# MNS-Up technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input voltage</strong></td>
<td>380/400/415 VAC +/- 15%, 35-70 Hz</td>
</tr>
<tr>
<td><strong>Output voltage</strong></td>
<td>380/400/415 VAC +/- 1%, 50 or 60 Hz</td>
</tr>
<tr>
<td><strong>Battery voltage</strong></td>
<td>400-650 VDC</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>40°C</td>
</tr>
<tr>
<td><strong>UPS Power factor</strong></td>
<td>Input: 0.99</td>
</tr>
<tr>
<td><strong>UPS Efficiency</strong></td>
<td>Up to 96% in double conversion mode &gt;99% in eco mode</td>
</tr>
<tr>
<td><strong>UPS Capacity</strong></td>
<td>500 kW (5 x 100 kW) per frame</td>
</tr>
<tr>
<td><strong>UPS Paralleling capability</strong></td>
<td>Up to 6 frames (6 x 500 kW = 3.0 MW)</td>
</tr>
<tr>
<td><strong>Bus bar</strong></td>
<td>Up to 6300 A</td>
</tr>
<tr>
<td><strong>IEC 61439-1/-2</strong></td>
<td>Low-voltage switchgear and control gear assemblies</td>
</tr>
<tr>
<td></td>
<td>Part 1: General rules</td>
</tr>
<tr>
<td></td>
<td>Part 2: Power switchgear and control gear assemblies</td>
</tr>
<tr>
<td><strong>IEC TR 61641</strong></td>
<td>Guide for testing under conditions of arcing due to internal fault (n.a to UPS sections)</td>
</tr>
<tr>
<td><strong>IEC 60950-1</strong></td>
<td>Information Technology Equipment – Safety</td>
</tr>
<tr>
<td></td>
<td>Part 1: General requirements</td>
</tr>
<tr>
<td><strong>IEC 62040-1/-2/-3</strong></td>
<td>Uninterruptible Power Systems (UPS)</td>
</tr>
<tr>
<td></td>
<td>Part 1: General and safety requirements for UPS</td>
</tr>
<tr>
<td></td>
<td>Part 2: Electromagnetic compatibility (EMC) requirements</td>
</tr>
<tr>
<td></td>
<td>Part 3: Method of specifying the performance and test requirements</td>
</tr>
</tbody>
</table>
Contents

1. Why critical power solutions?
2. Product features
3. Value for users
4. Combined FAT
5. Reference
6. Available documentation
MNS-Up vs conventional solution cost comparison

For a correct cost comparison MNS-Up must be compared with:

- **Incoming / Outgoing LV switchgear**
- **Stand-alone UPS**
- **Cable / bus duct interconnection**
- **Time / Manpower required for installation and testing of the interconnections**
## What are the values for MNS-Up end user?

<table>
<thead>
<tr>
<th><strong>Cost saving</strong></th>
<th><strong>Reduce installation time</strong></th>
<th><strong>Flexibility</strong></th>
<th><strong>Reduce footprint</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize cost of electrical infrastructure</td>
<td>Especially on colocation DC with electrical infrastructure growing on demand</td>
<td>Possibility to adapt the infrastructure to the customers request</td>
<td>To maximize core business equipment space; like IT servers on data centers</td>
</tr>
<tr>
<td>Reduction of breakers, cubicles and connection bus duct. Up to 10% cost savings</td>
<td>LV system and UPS assembly pre-tested at ABB Factory Ready for operation; up to 20% faster</td>
<td>UPS power modular at 100kW step Flexible layout to adapt MNS-Up to installation room</td>
<td>Footprint reduction compare to conventional solution up to 30%</td>
</tr>
</tbody>
</table>
Containerized solution
Making it easier: ‘Pay as you grow’ philosophy with eHouses

An eHouse is a pre-fabricated switchroom product, containing electrical switchgear and control gear for control of utility or industrial plant equipment able to guarantee:

**Reduced cost and resources**
- Simpler bidding process
- Reduced installation and commissioning time on site

**Reduced risk**
- Lower number of suppliers
- Clear ownership, single project delivery plan

**Reduced complexity**
- Single contract with common terms and conditions
- One project manager
Containerized solution

... a real case

81m² ready to install E-house with conventional layout including:

- Dry type transformer 10.7/0.42 kV IP00 1600kVA
- Low-voltage switchgear
- 1.5MW modular UPS
- LI-ION battery cabinets
- 48 V DC cabinets
- Fire detection systems

With MNS-Up

- Footprint reduced by 14% compared to conventional layout*
- Installation and testing time reduced by 10%*
- E-House project engineering time reduced by 3%

*refers to LV switchgear, modular UPS and bus duct (not to the entire E-house)
Contents

1 Why critical power solutions?
2 Product features
3 Value for users
4 Combined FAT
5 Reference
6 Available documentation
Combined Factory Acceptance Test (FAT)

MNS-Up FAT is covering both products; LV switchgear and modular UPS

- One RFQ
- One quotation
- One order
- One project manager
- One FAT
Contents

1 Why critical power solutions?

2 Product features

3 Value for users

4 Combined FAT

5 Reference

6 Available documentation
Reference

Light Industry
Region: Europe
Volume: 3 switchgear
UPS Power: 3,4MW
Layout: Single front and Back to Back
Note: N+1 Configuration

Infrastructure (Hospital)
Region: Europe
Volume: 1 switchgear
UPS Power: 0,3MW
Layout: Single front

Telecommunication
Region: Asia
Volume: 5 switchgear
UPS Power: 9MW
Layout: Back to Back

Data center
Region: Europe
Volume: 14 switchgear
UPS Power: 12,3MW
Layout: Single front and Back to Back
Contents

1 Why critical power solutions?

2 Product features

3 Value for users

4 Combined FAT

5 Reference

6 Available documentation
MNS-Up documentation

Click on the icon to locate the document

- Web page
- Product video
- Reference video
- Leaflet
- Brochure
- Infographic
- White paper
  - Healthcare
- White paper
  - Data centers