Switching & Protection solutions for Battery Racks in Battery Systems
UL Commercial & Industrial

Are you searching for Switching and Protection solutions to protect and secure Battery Racks in Utility Scale Battery Energy Storage System (BESS)?
Easily find the best solution to fit in Battery Racks and quickly configure your BESS installation thanks to our pre-configured and tested Application Bundles.

What is a Battery Rack?
A Battery Rack is a cabinet where more battery modules are installed in series to reach the system rated voltage. In addition to the batteries, switching and protective devices are installed along with auxiliary and/or communication circuits.

Why do you need Switching and Protection (S&P) solutions?
Every battery rack requires adequate galvanically switching and protection against overcurrents caused by battery modules. Unlike in PV strings, the overcurrents caused by batteries can be very high according to the battery technology.

Main benefits

- **Smarter protection**
  Increases power in your installation and reduces CAPEX by using the full range of 1500 VDC LV components.

- **Speeds up your projects**
  Speeds up your projects by using a range of products in compact sizes able to provide excellent performance at different temperatures and humidity ratings.

- **Smarter metering & monitoring**
  Maximizes power yield and cash generation by correct measurement of your BESS parameters.
Commercial & Industrial Battery Storage

Commercial & Industrial BESS, also known as customer-sited behind-the-meter storage systems, represent an ideal solution for managing energy costs by leveraging on peak shaving, load shifting and maximization of self-consumption. By providing critical backup power for commercial & industrial facilities, BESS prevent revenue losses due to production outages and enable fuel savings by replacing gensets during electricity grid power outages of short-medium duration.

Key characteristics:
- Reduce electricity costs, minimize carbon footprint and improve resiliency.
- Manage energy consumption by leveraging on peak shaving, load shifting and maximization of self-consumption.
- Provide critical backup power by supporting/replacing gensets during electricity grid power outages of short-medium duration.
- Allow EV chargers to be installed without a dramatic increase in contractual power from the grid.
Battery Racks
Fundamentals, main components & functionalities

In Battery Energy Storage Systems, battery racks are responsible for storing the energy coming from the grid or power generator. They provide rack-level protection and are responsible for connecting/disconnecting individual racks from the system.

A typical Li-on rack cabinet configuration comprises several battery modules with a dedicated battery energy management system. The most commonly used batteries in energy storage installations are Lithium-ion batteries; the main topologies are NMC (Nickel Manganese Cobalt) and LFP (Lithium Iron Phosphate).

![Battery racks diagram]

**DC Battery rack main components**
- Switch-disconnector (Tmax PV/OTDC)
- Fuses
- Enclosure
- Battery modules

**Main functionalities:**
- Overcurrent protection of battery modules
- Switching and isolation of battery modules

**Additional functionality**
- Monitoring: mainly where any drop in BESS plant performance may represent a significant economic loss
- Voltage, current, or temperature monitoring
- Communication: to communicate parameters to centralized monitoring system.
- Remotely-operated: need for remote control
Discover our Switching & Protection solutions for easy Battery Racks configuration considering 500 kWh BESS architecture with one single 500 kWh system module.

**Specifications of electrical quantities of each single module**

<table>
<thead>
<tr>
<th>500 kWh input data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power</td>
</tr>
<tr>
<td>Rated stored energy</td>
</tr>
<tr>
<td>Rated DC voltage</td>
</tr>
<tr>
<td>Rated AC voltage</td>
</tr>
<tr>
<td>Rated AC current</td>
</tr>
<tr>
<td>Prospective AC short circuit current</td>
</tr>
<tr>
<td>Rack short circuit current</td>
</tr>
<tr>
<td>Number of containers</td>
</tr>
<tr>
<td>Energy per rack</td>
</tr>
<tr>
<td>Number of racks per container</td>
</tr>
<tr>
<td>Rack rated current</td>
</tr>
<tr>
<td>DC bus max current</td>
</tr>
<tr>
<td>DC bus short circuit current</td>
</tr>
</tbody>
</table>
ABB’s offering (UL)

Battery Rack components
OTDC200UGV11-ESS switch-disconnector combined with fuses, is installed for switching and protective purposes if remote tripping isn’t needed
T4N/PV-E molded case circuit breaker, is installed for switching and protective purposes if remote tripping is needed

Moulded case circuit breaker

OTDC
## ABB offering – List of components

<table>
<thead>
<tr>
<th>Product</th>
<th>Part number</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTDC200UGV11-ESS</td>
<td>1SCA161992R1001</td>
<td>2P 200A DC SW 1500VDC FOR HIGH SCCR</td>
<td>3</td>
</tr>
<tr>
<td>T4N/PV-E</td>
<td>1SDA107431R1</td>
<td>T4N/PV-E 250 TMF 200 4P FF 1500VDC N100%</td>
<td>3</td>
</tr>
</tbody>
</table>

## Product offering

### Tmax T PV

![Tmax T PV](image)

### OTDC

![OTDC](image)

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