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Energy Storage Components for the OEM

ABB Electrification USA

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Typical Battery Energy Storage System Line Diagram
Example
Typical Battery Energy Storage System Line Diagram
Low Voltage Application Overview

Selection parameters

Battery Side – DC*
- **Voltage**: up to 1500VDC
- **Protection device***: semiconductor fuse or MCB/MCCB
- **Duty**: load break and short-circuit fault level/withstand rating
- **Short-circuit**: fault level or withstand rating required

DC Main Disconnect/Isolation
- **Voltage**: up to 1500VDC
- **Isolation**: Disconnect switch or breaker disconnect
- **Duty**: load break/no-load break
- **Short-circuit**: fault level or withstand rating required

AC Side
- **Voltage**: up to 800VAC
- **Protection device**: MCCB/ACB/Fusible switches
- **Duty**: load break
- **Short-circuit**: fault level or withstand rating required
- **Automatic AC or DC disconnection (optional)**

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**Subject to high fault currents on battery type and withstand rating required (Flow: 2-5xIn, Lead-acid: >100xIn, Li-ion: 45-55xIn)**

MCB: miniature circuit breaker | MCCB: molded case circuit breaker

ACB: air circuit breaker

Breaker disconnect: breaker working as a disconnect switch w/o protection

** can be accomplished with motorized devices or contactors
**Example**
Typical Battery Energy Storage System Line Diagram
Low Voltage Component Overview

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- **Insulation monitoring, voltage and current - CMS**
- **Battery state monitoring**

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Application Overview
Energy Storage System – Inverter and Batteries

- Transformer
- LV AC
  - Switchgear
  - Switchboard
  - Panelboard
  - MCCB
  - ACB
  - SPD
  - Contactor
  - Disconnect Switch
  - Fuse Holder
  - RCD
  - Power Supply
  - Current Monitoring System
- LV DC
  - Switchboard
  - MCCB
  - MCB
  - SPD
  - Contactor
  - Disconnect Switch
  - Fuse Holder
  - Surge Protection Devices
  - Current Monitoring System
  - Pilot Device
- MCCB
- SPD
- Contactor
- Disconnect Switch
- Fuse Holder
- Pilot Device
- Insulation Monitor
- Current Monitoring System
Application Overview
Energy Storage – Commercial and Industrial

- MV
- LV AC
- LV DC

- Switchgear
- Switchgear
- Switchboard
- Panelboard
- MCCB
- ACB
- SPD
- Contactor
- Disconnect Switch
- Fuse Holder
- RCD
- Power Supply
- Current Monitoring System
- Pilot Device
- MCCB
- SPD
- Contactor
- Disconnect Switch
- Fuse Holder
- Surge Protection Devices
- Current Monitoring System
- Pilot Device
- Insulation Monitor
- Current Monitoring System
Application Overview
Energy Storage - Residential

- Load Center
- MCCB
- MCB
- Contactor
- Disconnect Switch
- Fuse Holder
- Surge Protection Devices

- MCB
- Contactor
- Surge Protection Devices
- Fuse Holder
- Pilot Device
DC side components

Used in:

- Battery Management System (BMS)
- DC side of the Inverter / Converter
- DC side of the Power Conditioning System (PCS)
- DC side of Energy Management System (EMS)
**Product Offering**

**DC Components**

<table>
<thead>
<tr>
<th>OTDC Disconnect Switch</th>
<th>Tmax T PV Circuit Breaker</th>
<th>Emax DC ACB</th>
<th>Emax 2 MS/DC-E</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 100 to 1000A; Up to 1500VDC (UL)</td>
<td>• 40 to 800A MCCB; 100 to 1000A MCS; Up to 1000VDC (UL)</td>
<td>• Frame sizes range from 800 to 5000A for a circuit breaker and 800 to 6300A for a switch disconnector</td>
<td>• E4.2 frame size from 1600 to 3200A switch disconnector</td>
</tr>
<tr>
<td>• UL disconnect switches can breaker 1 or 2 circuits at the same time</td>
<td>• 40 to 200A MCCB; 200 to 1200A MCS; Up to 1500VDC (UL)</td>
<td>• Rated up to 1000VDC (IEC)</td>
<td>• Rated up to 1500VDC and 100kA (UL)</td>
</tr>
<tr>
<td>• Modular construction, handle mechanism location variable</td>
<td>• 80 to 300A MCCB; up to 800VAC (UL)</td>
<td>• Available with accessories that allow remote open or remote closing</td>
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</tr>
<tr>
<td></td>
<td>• Remote opening with shunt trip or Open/Close with motor-operator accessory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 3 to 4 poles in series, depending on the frame size</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Product Offering

DC Components

**OVR PV Surge Protection Device**
- From 600VDC for small installation to 1000VDC and 1500VDC for large scale solar farms
- Rated both UL1449
- Pluggable cartridge, remote signaling possible, and status indicator
- Indicator window for fast visual status

**S804U-PVS5 GFDI**
- The S804U-PVS5 is for GFDI (ground-fault detector interrupter) applications in photovoltaic systems. In case of a ground fault, the breaker will trip, and the PV generator will not be damaged.
- UL 489B tested for 1000 V DC; UL Recognized for 1500V DC
- Rated current 5A
- -25 °C to 60°C ambient

**CMS-660 Current Monitoring System**
- Rated both UL and IEC, up to 1500VDC, and sensors up to 160A (TRMS)
- Up to 32 flexible monitoring points, placed where current and temperature measurement is required
- Modbus RTU protocol guarantees easy integration into plant or inverter monitoring systems
- Integration of SPD and Switch disconnector status via 2 digital inputs
Product Offering
DC Components

DC Switching Contactors

- **GF Contactor**: 210A; Up to 1500VDC (UL)
- **GAF Contactor**: 250 to 2050A; Up to 1000VDC (UL)
- **GA75/GAE75 Contactor**: 35 to 100A; Up to 1000VDC (UL)
- Can manage large control voltage variations
- Wide range of control voltage options covering 24…500 V 50/60 Hz and 20…500 V DC
- Can withstand short voltage dips and voltage sags
- Built-in surge suppression

P90 PV Fuse Holders

- **E90/32 PV**
  - Up to 1000VDC and 30A
  - 1 and 2 poles
  - Rated both UL/IEC
  - Optical blown fuse indicator

- **E90/32 PV 1500E**
  - Up to 1500VDC and 30A
  - 1 pole
  - Rated both UL/IEC
  - Compact size

OVR TC Dataline Protection

- Dataline protection for UL1449
- From 6 to 200V DC
- Available with RJ11 and RJ45 bases
- IP20 finger safe
- Operating temperature is -40 to +80 °C
Product Offering
DC Components

Insulation Monitors

CM-IWx Insulation monitoring relays
• System voltage monitoring up to 1500 V DC and 1100 V AC
• System leakage capacitance monitoring up to 3000 µF
• Versatile system monitoring for 2-wire, 3-wire, 4-wire, and battery systems
• Easy-to-configure interrupted wire detection
• Easy-to-configure non-volatile fault storage
AC side components

Used in:

- AC side of the Inverter / Converter
- AC side of the Power Conditioning System (PCS)
- AC side of Energy Management System (EMS)
Product Offering

AC Components

OT Non-Fusible Switch
- 20 to 2000A; Up to 600VAC (UL)
- Modular construction, handle mechanism location variable
- Compact and light weight
- Visible contacts
- Quick-make/quick-break

OS Fusible Switch
- 30 to 1200A; Up to 600VAC (UL)
- Modular construction, handle mechanism location variable
- Compact and light weight
- Interlocking fuse covers prevent opening while the switch is in “ON” position

Tmax XT MCCB
- 15 to 1200A; Up to 600VAC (UL)
- Full range of thermal magnetic and electronic trip units with options for metering
- Full range of accessories such as terminal options, auxiliary contacts, operating mechanisms, communications, remote control, and locks

Emax 2 ACB
- 100 to 6000A; up to 600VAC (UL)
- Electronic trip units with options for metering
- Full range of accessories such as terminal options, auxiliary contacts, remote control, communications, and locks
## Product Offering

### AC Components

#### Contactors
- 25 to 2850A, Up to 600VAC (UL)
- Wide range of control voltage options covering 24...500 V 50/60 Hz and 20...500 V DC
- Built-in surge suppression
- Add-on auxiliary contact blocks for front or side mounting and a wide range of accessories
- Reduced energy consumption, therefore increasing the energy efficiency of the complete inverter package

#### Miniature Circuit Breakers
- UL489 breakers rated for 0.2 to 63A, Up to 480Y/277VAC and 250VDC
- UL1077 breakers rated for 0.5 to 100A, Up to 600Y/347VAC and 500VDC
- Energy Limiting
- Fast breaking time 2.3-2.5ms
- Wide range of accessories including shunt trips, auxiliary contacts, handle mechanisms, etc.

#### E90 Fuse Holders
- 30 to 125A, Up to 600V AC/DC (UL)
- 1 through 4 pole options with neutral availability
- IP20 finger safe
- Optical blown fuse indicator light
- Pad lockable (when open) and sealable (when closed)
Product Offering
AC Components

Power Supplies
Power Supplies (CP-D, CP-E, CP-T, CP-C.1):
- 5, 12, 24, and 48VDC rated output voltage
- 0.42 to 40A rated output current
- 10 to 960W rated output power

Power Buffer
Power Buffer (CP-B):
- 24VDC rated input voltage
- 3 to 20ADC rated current
- 100% load current from 13s to 38sec (dep. on device)

Current Monitoring System
- CMS-600 measures current and can use up to 64 sensors
- CMS-700 measures current, power, energy, etc. and can use up to 96 sensors
- Both open-core and solid-core sensors
- Uses Modbus protocol
### Product Offering

#### AC Components

**OVR Surge Protection Devices**
- OVR T2 offers Type 2 protection according to UL 1449
- From 15kA and 40kA (150V AC to 660V AC)
- Protect 1, 2, 3, or 4 lines including neutral
- Pluggable and replaceable cartridges
- Optional auxiliary contact to signal status
- Status indicator window

**Pilot Devices**
- Wide range of pilot lights, pushbuttons, selector pushbuttons, selector switches, mushroom pushbuttons, toggle switches, joysticks, machine stops, etc.
- Self cleaning contacts
- Modular Plastic and Metal Range has snap on design that simplifies and quickens installation
- Compact Range reduces installation size in one compact design

**Residual Current Device**
- A protection device that trips when the system leaks a significant current to ground
- Contact position indicator (CPI) to always know the status of the contacts (red: closed contacts; green: open contacts) independent of the toggle position
- Up to 125A, 120 – 277VAC (2 pole), and 120 – 480V AC (4 pole)
- UL1053 compliant