

Switching & Protection solutions for DC Combiners in Battery Systems

IEC Utility scale



Are you searching for Switching and Protection solutions to protect and secure DC combiners and keep them running in Utility Scale Battery Energy Storage System (BESS)?

Easily find the best solution to fit in your DC combiner and quickly configure your BESS installation thanks to our Application Bundle based on concrete examples.

What is a DC Combiner?

If you want to connect several battery racks in parallel prior to connecting to the DC side of the Power Conversion System (PCS) or to the DC Recombiner, you need a DC Combiner. The DC Combiner is a switchboard where switching and protective devices are installed along with auxiliary and/or communication circuits.

Why do you need Switching & Protection solutions?

Every feeder supplying the related battery rack requires adequate galvanically switching and protection against overcurrents which can come also from the other battery racks connected in parallel.

Main benefits



Smarter protection

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



Safety

Avoids the risk of fire in your facility and loss of valuable assets by using a complete range of Surge Protection Devices (SPDs) to protect the whole electrical system from lightning and surges.



Speeds up your projects

Reduces CAPEX and 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

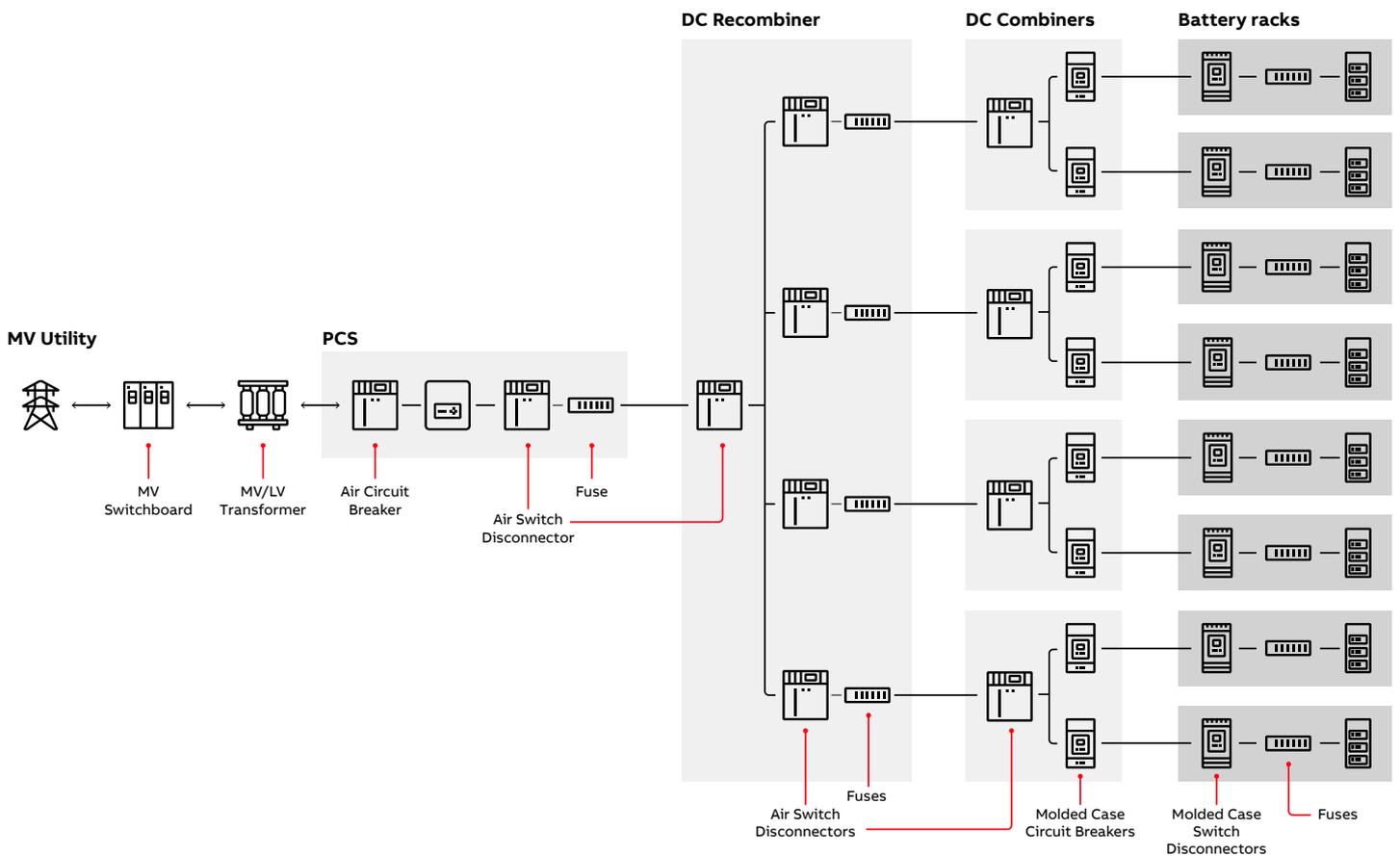
Maximizes power yield and cash generation by correct measurement of your BESS parameters.

Utility Scale Battery Systems

Utility scale stationary battery storage systems, also known as grid-scale front-of-the-meter storage systems, play a key role in integrating variable energy resources while providing the required flexibility. Battery storage increases flexibility in power systems, enabling an optimal use of variable electricity sources like photovoltaic and wind energy. Batteries can provide services for system operation, defer investments in peak generation and grid reinforcement.

Key characteristics of BESS in a Front-of-the-meter configuration:

- Direct connection to the AC Utility without the User's plant in parallel
- Grid support (ancillary services, fast power injection for peak requirements)
- Storage capacity typically ranging from just a few, to hundreds of MWh.

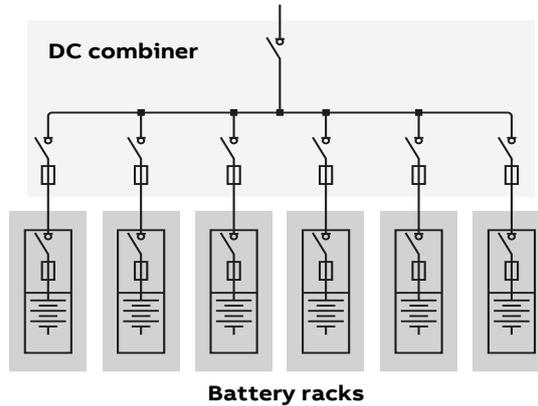


DC Combiner

Fundamentals, main components & functionalities

The power stored in battery racks and re-injected into the Utility through the Power Conversion System is collected by DC Combiners (in some cases also by a DC Recombiner).

The DC Combiner is a switchboard where several battery racks are placed in parallel by the related feeder. Every feeder requires adequate switching and protection against overcurrents.



DC combiner components

- Enclosure: System Pro-E
- Main Switch: Air switch disconnectors (E4.2 MS/DC-E)
- Surge Protection Device: OVR PV T1-T2
- Feeder switch disconnectors: Tmax PV
- ARC flash mitigation: Active, Passive & Preventive solutions

Main subsystem functionalities

- Combining of battery racks (range of hundreds of A)
- Overcurrent Protection of battery rack feeder
- Switching of battery rack feeder
- Main Switching to segregate the group of battery racks from the rest of the BESS (range of thousands of A)
- Surge Protection to protect against voltage spikes, such as from lightning

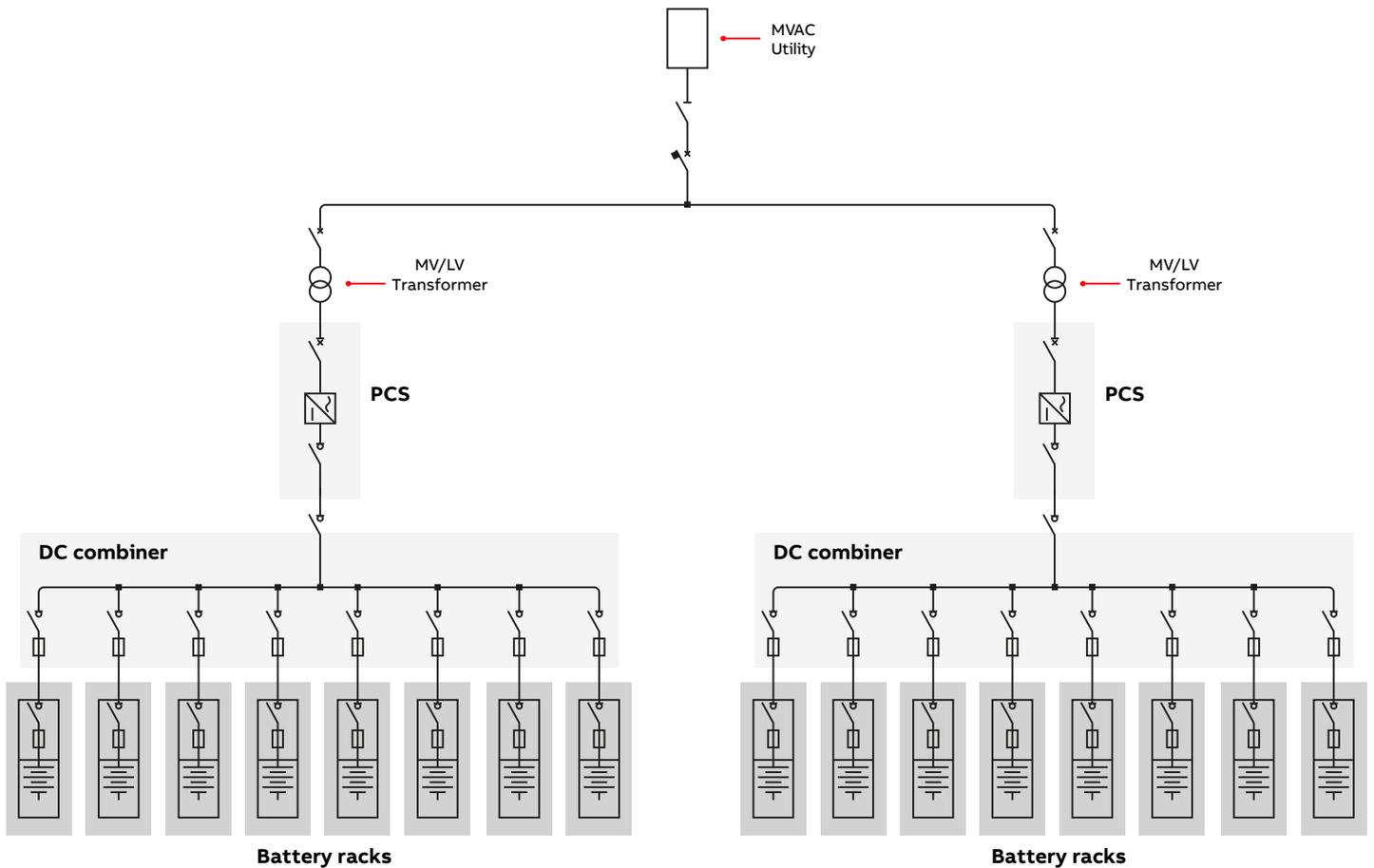
Additional subsystem functionality

- 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
- Arc flash mitigation

Switching & Protection solutions for DC Combiners

Discover our Switching & Protection solutions for easy DC combiner configuration considering 4MWh BESS architecture with two 2MWh main system modules in parallel.

Single-line diagram of 4MWh, 4MW Utility Scale application

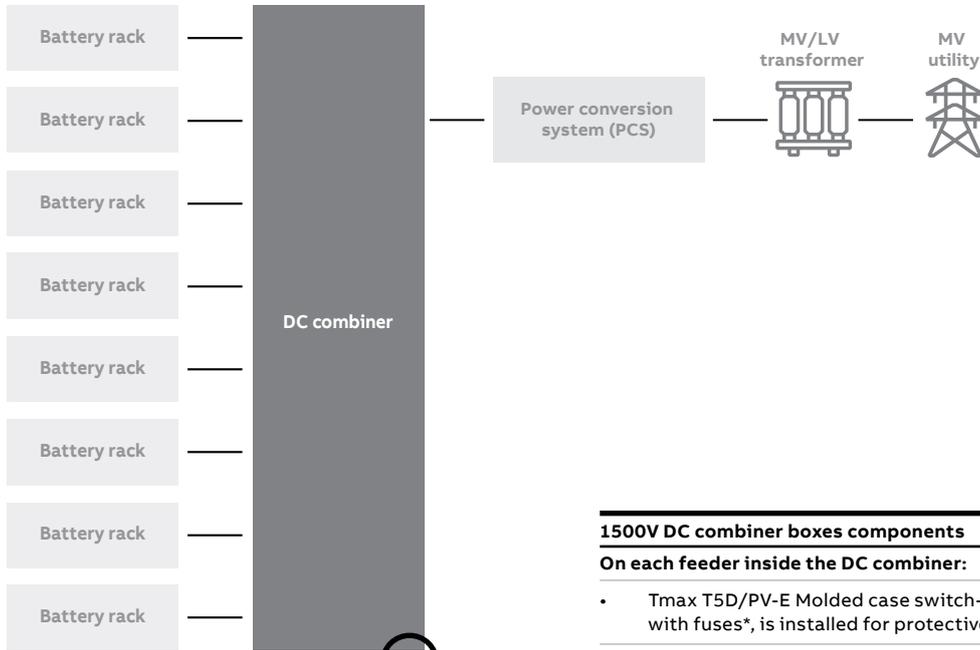


Specifications of electrical quantities for a 2MWh, 2MW module

Input data		
Rated power	[MW]	2
Rated stored energy	[MWh]	2
Rated DC voltage	[V] +12%	1200
Rated AC voltage	[V] +10%	528
Rated AC current	[A]	2703
Prospective AC short circuit current	[kA]	50
Rack rated current	[A]	330
Rack short circuit current	[kA]	12
N. containers		1
N. racks per container		8
DC bus max current	[A]	2640
DC bus short circuit current	[kA]	96
DC recombiner box		NO

ABB's offering (IEC)

DC combiner panel



1500V DC combiner boxes components

On each feeder inside the DC combiner:

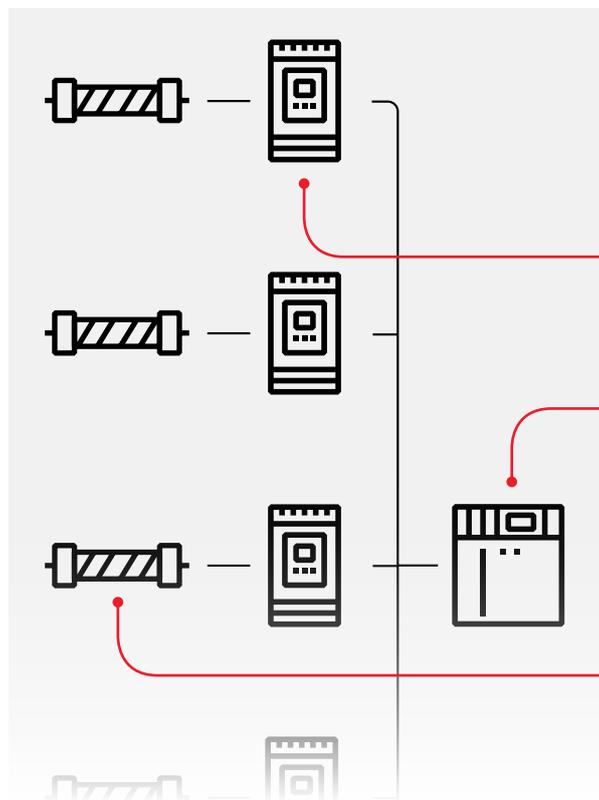
- Tmax T5D/PV-E Molded case switch-disconnector in fixed execution, combined with fuses*, is installed for protective purposes and remote switching/tripping

As main combiner switch:

- Emax 2 E4.2V MS/DC-E 1500V DC 3200A is installed for combiner switching function. The switch disconnector is installed in fixed execution and equipped with an undervoltage release YU in order to be remotely opened
- Protection against overvoltages: OVR PV T1-T2 10-1500 P TS QS
- Arc flash mitigation solution: TVOC-2 + RELT module installed on Emax 2

* The fuse must have a breaking capacity not lower than the prospective short circuit current value provided by the N-1 racks coupled inside the DC Combiner and an adequate limitation capability to protect the Tmax T5D/PV-E switch-disconnector.

DC combiner



Molded-case switch-disconnectors



Air switch-disconnector



Fuses

Product offering

Tmax T PV



Emax 2



OVR



TVOC



[Rate this document](#)



ABB S.p.A.
Electrification Business Area
Smart Power Division
5, Via Pescaria
I-24123 Bergamo - Italy
Phone: +39 035 395.111

new.abb.com/low-voltage

We reserve the right to make technical changes and modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB AG declines all and every liability for potential errors or possible lack of information in this document.

We reserve all rights to this document and to the subject matter and illustrations contained therein. All reproduction, disclosure to third parties or utilization of these contents – in whole or in part – is forbidden without the prior written consent of ABB AG. Copyright© 2022 ABB
All rights reserved