

Switching and Protection solutions for 800VAC Recoiners in Photovoltaic plants

IEC Commercial & Industrial scale



Discover the ABB Switching & Protection solutions for protecting and securing AC Recoiners. Quickly configure Commercial & Industrial Photovoltaic (PV) plants with several string inverters using our pre-configured and pre-tested Application Bundle.

What is an AC Recoiner?

If you want to connect several string inverters in parallel prior to connecting to the MV/LV transformer then you need an AC Recoiner. AC Recoiners are switchboards where switching and protection devices are installed along with auxiliary and/or communication circuits.

Why you need a Switching & Protection solution for AC Recoiners

Every feeder from the relative inverter needs adequate galvanic switching and protection against overcurrents.

Main benefits



Smarter protection

Increase power in your installation and reduce CAPEX by using the complete range of up to 1000 VAC and 1500 VDC Low Voltage (LV) components. Achieve excellent performance at different temperature and humidity ratings.



Speeds up your projects

Rapid installation thanks to preconfigured bundles using a coordinated range of products with compact sizes.



Safety

Avoid the risk of fire in your facility and loss of valuable assets by using a complete range of SPDs to protect the whole electrical system from lightning and surges. Reduce the risk of injuries from arc flash thanks to our advanced arc flash mitigation solutions.

Key string inverter architecture trends



Multi MPPT (maximum power point tracker) for string inverter architecture

The MPPT maximizes the energy yield of the connected solar string at any time during its operation. Solar inverters were originally designed to have a single MPPT capable of maximizing the output for one value of DC current. Having the solar array managed by several MPPTs, as in string inverters, helps to improve total energy production.

Advantages

- Higher plant flexibility and efficiency
- Elimination of PV string fuses on the DC input to the inverter
- DC combiner no longer required
- AC voltage distribution
- Simpler plant architecture with only 3 components: PV panels + solar inverters + MV/low-voltage compact substations.

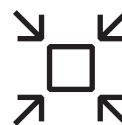


Solar plants are moving towards 800V on the AC side

Higher voltages, up to 800V AC, make the whole system more efficient, especially with string inverter architecture where the cables between the inverters and MV/LV transformer are usually very long.

Advantages

- Enhanced sustainability
- Reduced Balance of Systems costs (e.g. AC side cabling)
- Higher power enabled in the same enclosure (~30%) while maintaining the same current (fewer inverters per MW)
- 40-50 % savings on AC cables and components compared to 400 VAC string inverters
- Typically used in large Commercial & Industrial facilities (P>500 kW) where a dedicated MV/LV transformer is required by the design, regardless.



String Inverters with a higher power range and voltages up to 800VAC and 1500VDC

Thanks to string inverters with a higher power range, fewer inverters can be used in solar systems. String inverters are also scalable to support a range of power ratings and PV system sizes.

Typical features

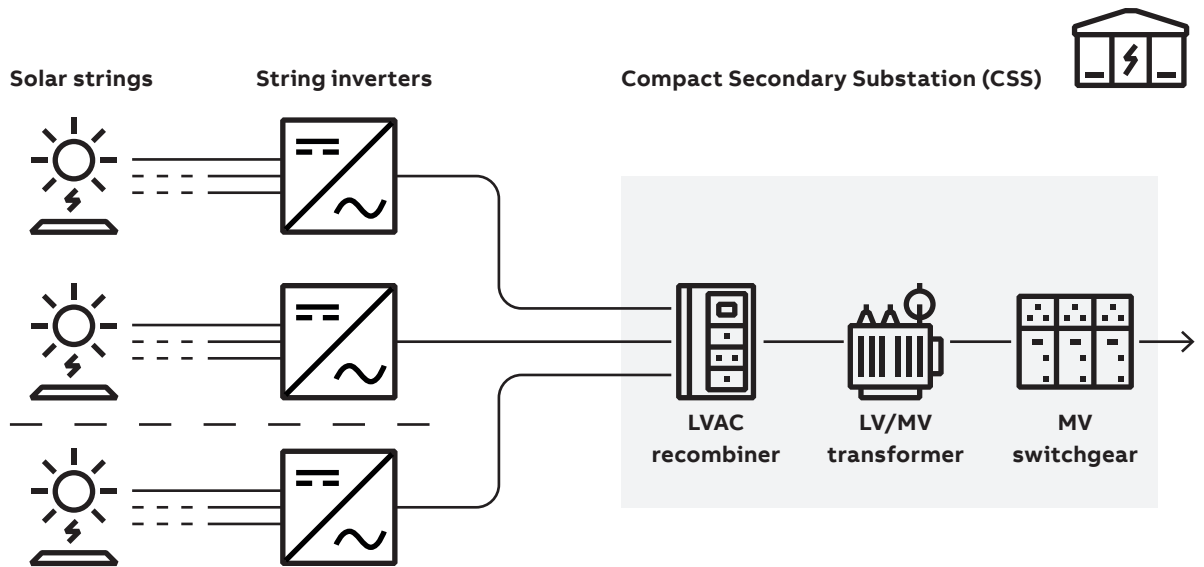
- Voltages
- DC IN: 1500V DC
- AC OUT: 800V AC
- 100-250 kW power range (330 kW upcoming)
- Output currents: 73-181A (250A upcoming)
- AC Protection nominal current: 160-250A
- AC main protection: Breaker, Fuses also used
- Certifications: IEC - CCC - UL.

AC Recombiners in String inverter architecture

Fundamentals, main components & functionalities

The power generated by solar strings and converted into AC by each string inverter is collected by the AC Recombiner. The AC Recombiner is a switchboard

where several string inverters are placed in parallel by the relative feeder. Every feeder requires adequate switching and protection against overcurrents.



AC Recombiner components

- AC switching and protection devices
- Insulating monitoring device
- Surge protection device for direct lightning
- Auxiliary circuits.

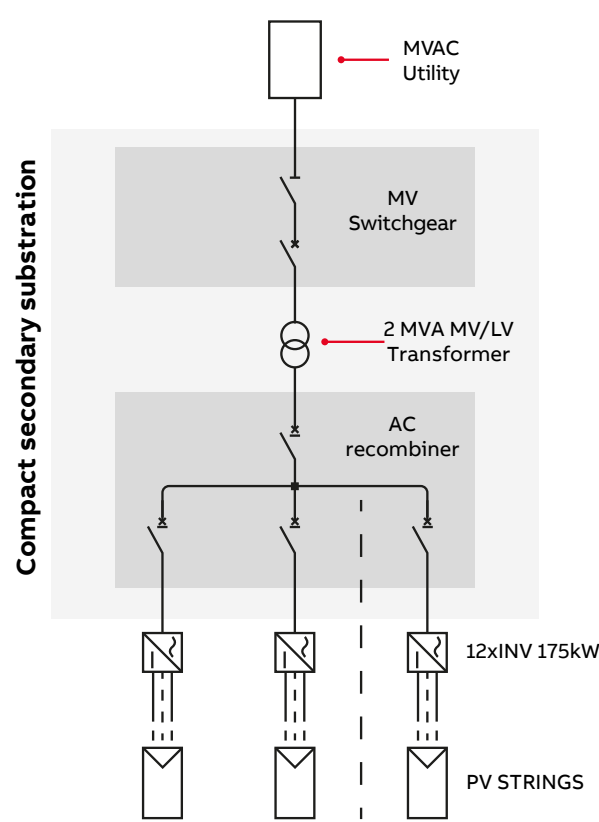
Optional components of AC Recombiner

- Arc flash mitigation: Active, Passive or Preventive solutions
- Temperature monitoring relay.

Switching and protection solutions for 800VAC Recoinbiners in Commercial & Industrial Solar plants

Discover our Switching & Protection solutions for easy 800VAC Recoinbiner configuration considering a 2MW photovoltaic plant with 12 x 175kW string inverters in parallel.

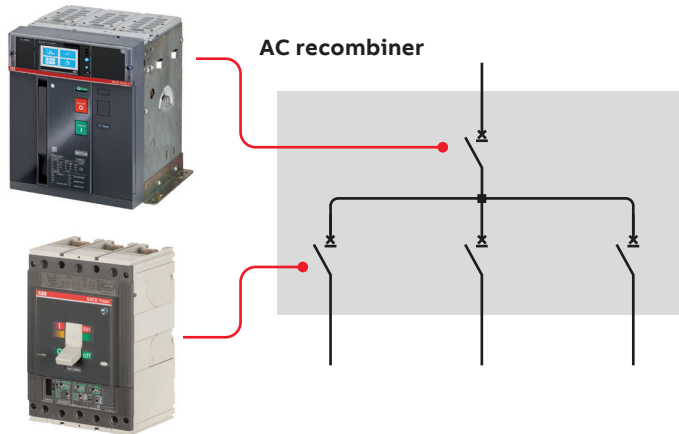
1 recoinbiner, 12 x 175kW string inverters



Input data range

Input data	IEC
System rated power [MW]	2
MV/LV transformer rated power [MVA]	2 (D/Yn)
N. Compact SubStations	1
Inverter rated power [kW]	175
N. inverters per AC recoinbiner	12
N. AC inverters	1
Rated LVDC voltage [V]	1500
Rated MVAC voltage [kV]	15
Rated LVAC voltage [V]	800
Rated LVAC inverter current [A]	140
Rated LVAC bus current [A]	1684
Short circuit current LVAC bus [kA]	30
Short circuit current LVAC feeders [kA]	32

ABB offering (IEC)



Main components

Emax 2.2S/E9 2000 Ekip Touch LSIG FHR 3p + Ekip Measuring package main circuit breaker fixed version In=2000A for protection and isolation, equipped with Ekip com Modbus TCP communication module and with YO/YC and motor to open/close remotely

Tmax T5X-HA 400 PR222DS-LSIG In=320 3p FF feeder circuit breaker fixed version In=160A + auxiliary contacts for protection and isolation

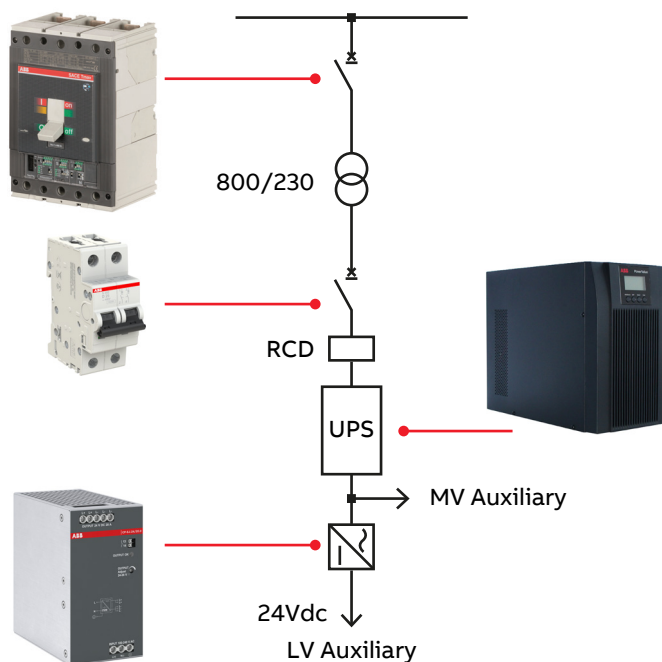
to be replaced with "OVR T1-T2 3L 12.5-440s P TS QS + OVR T1-T2 12.5-440s P TS QS to protect against overvoltages from AC Utility

Optional components

TVOC-2-48C Arc monitor with HMI-COM + **CSU-2LV** low voltage current sensing unit + **RELT Module** Ekip Signalling 2k-3 for Arc Flash Mitigation

CM-TCN.011S temperature monitoring relay to measure temperature inside recombined

Auxiliary components



Auxiliary components

Tmax T5X-HA 400 PR222DS-LSIG In=320 3p FF circuit breaker to protect 800/230 transformer against short circuits

DS201 C16 A30 miniature circuit breaker and residual current device, In=16A, IΔn=30mA, for auxiliary circuit switching and protection against both overcurrents and electric shock

PowerValue 11T G2 UPS An=3kVA to supply auxiliary circuits (MV relay included) in case of AC Utility outage

CP-S.1 24/20.0 power supply to supply LV auxiliary circuits at 24 VDC



Bill of materials

Main components

Device	Part number	Total quantity
E2.2S/E9 2000 Ekip Touch LSIG FHR 3p	1SDA104324R1	1
Ekip Measuring package for E2	1SDA107525R1	1
Motor-M E2.2 24-30V AC/DC	1SDA073722R1	1
YO E1.2..E6.2 24V AC/DC	1SDA073668R1	1
YC E1.2..E6.2 24V AC/DC	1SDA073681R1	1
Ekip Supply 24-48V DC	1SDA074173R1	1
Ekip Com Modbus TCP	1SDA074151R1	1
Tmax T5X-HA 400 PR222DS-LSIG In=320 3p FF	1SDA107746R1	12
AUX-C 3Q 1SY 24V DC	1SDA054915R1	12
OVR T1-T2 3L 12.5-440s P QS + OVR T1-T2 12.5-440s P QS	2CTB815710R4700 + 2CTB815710R2900	1 + 1

Optional components

Device	Part number	Total quantity
RELT Ekip Signalling 2k-3	1SDA074169R1	1
TVOC-2-48C	1SFA664001R1004	1
CSU-2LV	1SFA664002R5001	1
TVOC-2-DP2	1SFA664003R1020	1
TVOC-2-OP2	1SFA664004R1020	1
CM-TCN.011S	1SVR750740R0110	1

Auxiliary components

Device	Part number	Total quantity
Tmax T5X-HA 400 PR222DS-LSIG In=320 3p FF	1SDA107746R1	1
DC201 C16 A30	2CSR255180R1164	1
CP-S.1 24/20.0	1SVR320761R1000	1
UPS POWERVALUE 11T G2 3 KVA CEI 016	4NWP100162R0005	1

APPLICATION FINDER

We've made it simpler for you to set up your project!
Click here to find the reference architecture that best fits your needs and download the Bill of Materials.

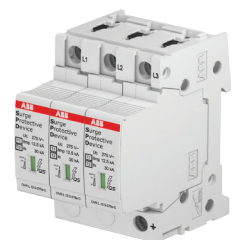
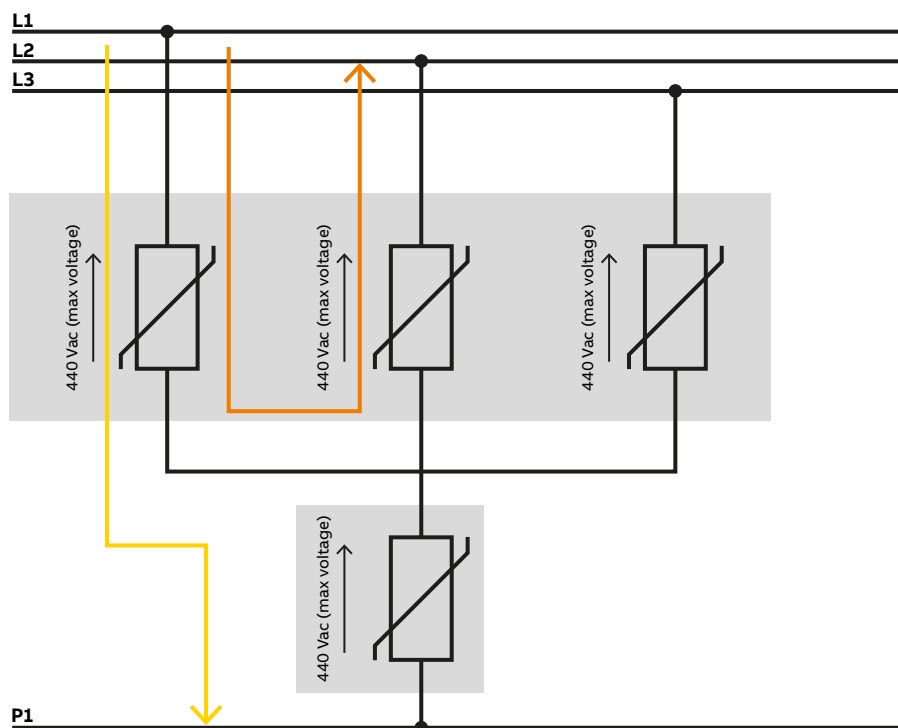


Surge protective devices

OVR T1+T2 12.5-440s P TS QS Surge protective devices up to 440VAC in series

Using OVR for power collection panels up to 800VAC:

- Important point is to check U_c of the OVR.
- Look at the drawing, $V(L1-L2) = 440V + 440V = 880VAC$, as current has to pass through both the MOV ($U_c=440V$ AC each).
- Same situation for $V(L2-L3)$ or $V(L3-L1)$ or $V(Lx-PE)$; there are always two 440V MOV to pass through.



OVR
T1-T2 3L 12.5-440s P QS
 $U_c: 440V$



OVR
T1-T2 12.5-440s P QS
 $U_c: 440V$

UniPack - Compact Secondary Substation (CSS)



- A CSS equipped with SafePlus medium-voltage switchgear, REF 615 protection relays and LV 800 VAC board has been installed to enclose the application and complete solution
- UniPack is our fully enclosed solution. It offers the highest degree of safety and is ideal for installation in publicly accessible sites

Benefits:



High safety level

- Internal arc fault tested



Safe working conditions for installed equipment

- Type tested according to IEC 62271-202
- ABB Ability™ enabled, providing predictive maintenance and remote management



Long life cycle & minimal maintenance cost

- Corrosion resistant enclosure material using Glass fiber Reinforced Polyester (GRP) with UniPack-G



Easy and fast installation, commissioning and relocation

- Lightweight and factory assembled



Flexible, with wide range of ratings

- Up to 40.5kV, 3.5MVA transformer, 800V and 5000A on Low Voltage Board

Product offering

Emax 2:




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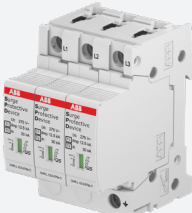
Tmax T:






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OVR:




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Temperature monitoring relays:




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CP.S1 power supply:






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TVOC:





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PowerValue:




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Miniature circuit breaker:





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APPLICATION FINDER




Find the reference architecture tailored to your needs and speed up your project thanks to our new Application Finder Tool!




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CONTACT US




Do you have a similar project and you are searching for the right Application configuration?
Contact us to talk to our experts!




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