

Switching and protection solutions for 3rd party Central Inverters in Solar systems

IEC Utility Scale



Are you searching for Switching and Protection solutions for the Central Inverter in your Utility Scale Solar System?

To switch your solar installation and protect it from faults, overcurrent events and other hazards, you can easily find the best product for your Central Inverter thanks to a concrete example.

What are central inverters?

If you want to connect a large number of strings and inject vast amounts of power into the Grid using single inverter, then you need a central inverter. Central inverters are bigger than string inverters and their rated power can be as much as several MW.

Why you need a Switching & Protection solution

The Central Inverter requires adequate protection and switching capability on the AC and DC sides in order to switch the system - also in the load condition - and protect the entire electrical circuit from faults and overcurrent events.

Our switching and protection devices will also provide your Central Inverter with communication connectivity to the solar plant control system.

Main benefits



Smarter protection

Increase the power in your installation and reduce CAPEX by using our full range of LV components up to 1000V AC and 1500 VDC for excellent performance at different temperature and humidity ratings.



Speeds up your projects

Speed up projects thanks to preconfigured bundles comprising a coordinated range of products in 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 due to arc flash thanks to our advanced arc flash mitigation solutions.

Main trends in Photovoltaic plants



Photovoltaic plants are moving towards higher AC voltage ratings

Nowadays, most utility-scale solar systems with central inverter architecture use 1500 V DC input, enabling higher AC voltages of up to 800V (AC). Thanks to use of 1500V DC, fewer strings in parallel are required while both 1500V DC and 800V AC enable Balance of System costs to be reduced.

Highlights

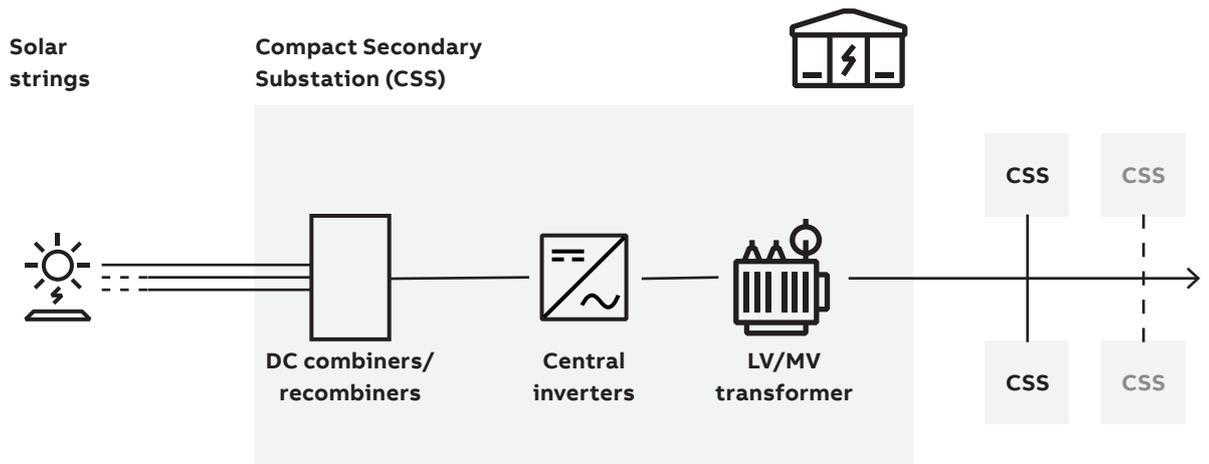
- 1500V DC supports higher AC voltage, up to 800V AC
- 1500V DC/800V AC reduce Balance of System costs (e.g. cabling).

Central inverters

Fundamentals, main components & functionalities

The power generated by solar strings and collected by DC Combiners/Recombiners is converted into AC by the DC/AC central converter and injected into the Grid through a LV/MV transformer .

The Central Inverter requires adequate protection and switching capability on the AC and DC sides in order to switch the system - also in the load condition - and protect the entire electrical circuit from faults and overcurrent events.



Main subsystem functionalities

- **AC switching and protection**
A disconnect function, overcurrent protection and interface protection are required since the Central Inverter is connected to a Utility. The Inverter can be supplied with a circuit breaker suitably rated for the line voltage and current from the solar plant.
- **DC switching and protection**
The DC section can contain either circuit breakers or switch-disconnectors in combination with fuses to switch and isolate the inverter from the solar field and protect the converter against faults.
- **Surge protection**
Devices designed to protect the system against direct and indirect lightning from the AC Utility or from the photovoltaic field.
- **Insulation monitoring**
Relay to detect the first ground fault in IT AC systems even with large leakage capacity
- **AC/DC Converter**
The converter is the heart of the power conversion unit. The central inverters used in this application are grid-following and able to handle up to 5 MVA converter power.
- **Auxiliary power**
An auxiliary circuit is included to provide the converter with control and auxiliary power. This circuit includes a fused disconnect switch, auxiliary power transformer, an uninterruptible power supply (UPS) and a power source for external battery heaters, if required.

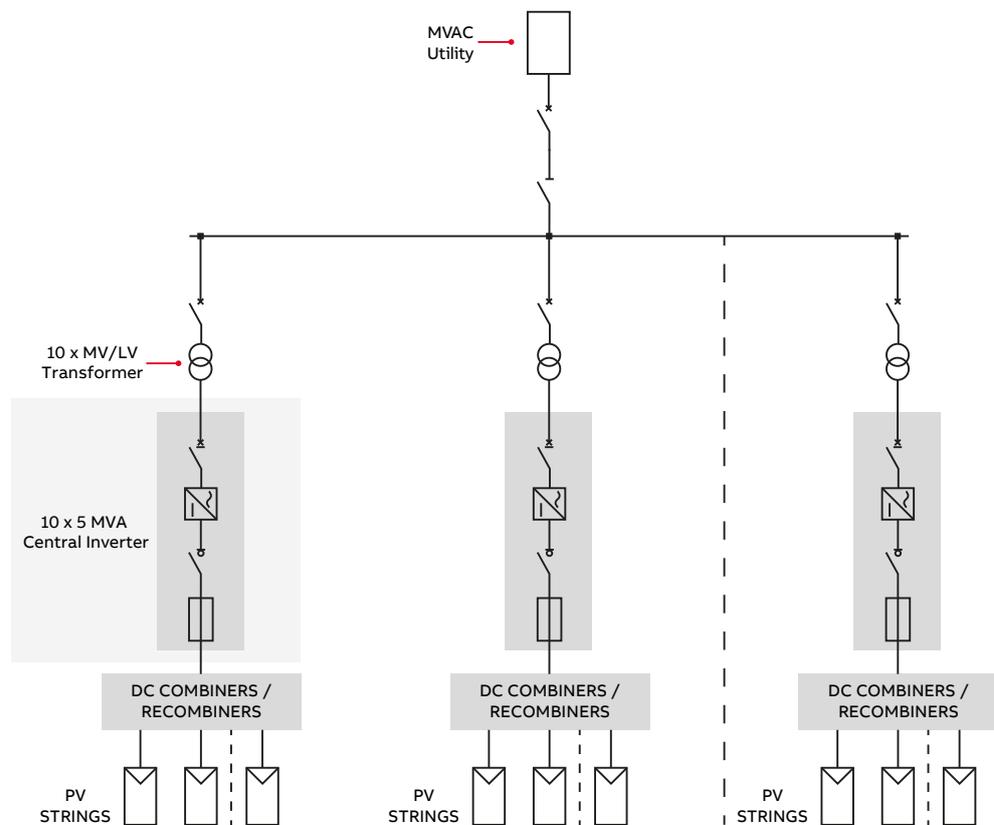
Additional subsystem functionality

- **ARC flash mitigation:** Active, Passive & Preventive solutions.
- **Surge protection device** to protect against surges through the communication lines.
- **Temperature monitoring** inside the cabinet.

Switching and Protection solutions for 3rd party Central Inverters in Utility scale Solar systems

Discover our Switching & Protection solutions for both the AC and DC sides of 3rd party central inverters considering a 50 MVA Utility Scale Solar System with 10 x 5 MVA system modules.

Single-line diagram of a 50 MVA Utility scale Solar System with 10 x 5 MVA system modules

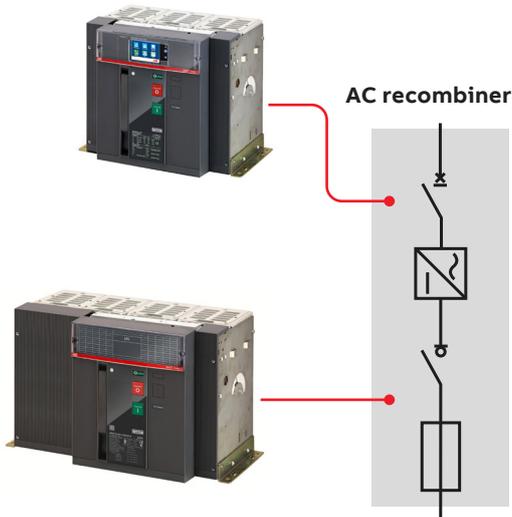


Specifications of the electrical quantities of each 5 MVA system module

Input data	Central inverter configuration
PV plant rated power [MVA]	50
N. Central inverters	10
Inverter rated power [MVA]	5
Rated AC voltage [V] (IEC)	800
Rated AC inverter current [A] (@35°C)	3609
Prospective AC short circuit current [kA]	50
Inverter Max DC voltage [V]	1500
Max DC inverter MPP current [A]	3340

ABB offering (IEC)

5MVA central inverter



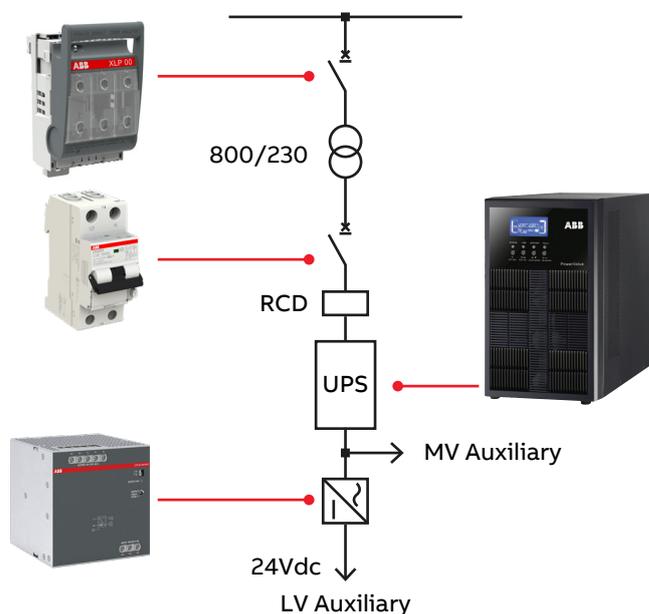
Main components

- AC side**
- Emax E4.2S/E9 4000 Ekip Dip LSIG FHR 3p** main circuit breaker fixed version $I_n=4000A$ for protection and isolation, equipped with Ekip com Modbus TCP communication module, YO/YC and motor to open/close remotely
 - Emax E4.2S/E9 4000 Ekip Touch LSIG FHR 3p + Ekip Measuring package** main circuit breaker fixed version $I_n=4000A$ for protection and isolation, equipped with Ekip com Modbus TCP communication module, YO/YC and motor to open/close remotely
 - Emax E4.2S/E9 4000 Ekip Hi-Touch LSIG FHR 3p** main circuit breaker fixed version $I_n=4000A$ for protection and isolation, equipped with Ekip com Modbus TCP communication module, YO/YC and motor to open/close remotely
 - CM-IWM.10** Insulating monitoring relay to detect the first ground fault in IT AC systems even with large leakage capacity
 - OVR T1-T2 3L 12.5-440s P TS QS + OVR T1-T2 12.5-440s P TS QS** surge protective devices to protect against overvoltage from the AC Utility
- DC side**
- Emax E4.2S MS-DC/E 4000 4p** switch disconnecter equipped with YO/YC and motor to open/close remotely, and combined with fuses to protect the converter
 - OVR PV T1-T2 10-1500P TS QS** surge protective device to protect against overvoltage from the photovoltaic field

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 the temperature inside the cabinet
- OVR RS485 (for RS485 and fieldbus), OVR Cat-5e or OVR Cat-6 (for Ethernet)**, surge protective device connected in series with the signal line to protect against surges through the communication lines

Auxiliary components



Auxiliary components

- Easyline XLP00** fuse switch-disconnector $I_e=125A$, to protect the 800/230 transformer against shortcircuits
- DS201 C32 A30** miniature circuit breaker and residual current device, $I_n=32A$, $I_{\Delta n}=30mA$, for auxiliary circuit switching and protection against both overcurrents and electric shock
- PowerValue 11T G2** UPS $A_n=6kVA$ to supply the auxiliary circuits (MV relay included) in case of AC Utility outage
- CP-S.1 24/40.0** power supply, to supply 24VDC to the auxiliary circuits

Bill of materials

Main components - AC side

Device	Part number	Total quantity
E4.2S/E9 4000 Ekip Dip LSIG FHR 3p	1SDA104378R1	10
E4.2S/E9 4000 Ekip Touch LSIG FHR 3p	1SDA104384R1	10
Measuring package E1.2..E6.2	1SDA107525R1	10
E4.2S/E9 4000 Ekip Hi-Touch LSIG FHR 3p	1SDA104385R1	10
Motor-M E2.2..E6.2 24-30V AC/DC + MC24V	1SDA073729R1	10
YO E1.2..E6.2 24V AC/DC	1SDA073668R1	10
YC E1.2..E6.2 24V AC/DC	1SDA073681R1	10
Ekip Supply 24-48V DC	1SDA074173R1	10
Ekip Com Modbus TCP	1SDA074151R1	10
CM-IWM.10	1SVR470670R1000	10
OVR T1-T2 3L 12.5-440s P TS QS	2CTB815710R3500	10
OVR T1-T2 12.5-440s P TS QS	2CTB815710R2900	10

Main components - DC side

Device	Part number	Total quantity
E4.2S MS/DC-E 4000 VR	1SDA115400R1	10
Kit for terminals and jumpers, insulated network upper terminals	1SDA115473R1	10
Motor-M E2.2..E6.2 24-30V AC/DC + MC24V	1SDA073729R1	10
YO E1.2..E6.2 24V AC/DC	1SDA073668R1	10
YC E1.2..E6.2 24V AC/DC	1SDA073681R1	10
OVR PV T1-T2 10-1500 P TS QS	2CTB812101R1500	10

Optional components

Device	Part number	Total quantity
RELT Ekip Signalling 2k-3	1SDA074169R1	10
TVOC-2-48C	1SFA664001R1004	10
CSU-2LV	1SFA664002R5001	10
RC200-05	1SFA664005R2005	10
TVOC-2-DP2	1SFA664003R1020	10
TVOC-2-OP2	1SFA664004R1020	10
CM-TCN.011S	1SVR750740R0110	10
OVR RS485	7TCA085400R0311	10
OVR Cat-6	7TCA085400R0291	10

Auxiliary components

Device	Part number	Total quantity
XLP00	1SEP101890R0001	10
DS201 C32 A30	2CSR255180R1324	10
CP-S.1 24/40.0	1SVR320861R1000	10
UPS POWERVALUE 11T G2 6KVA B2	4NWP100163R0002	10

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.



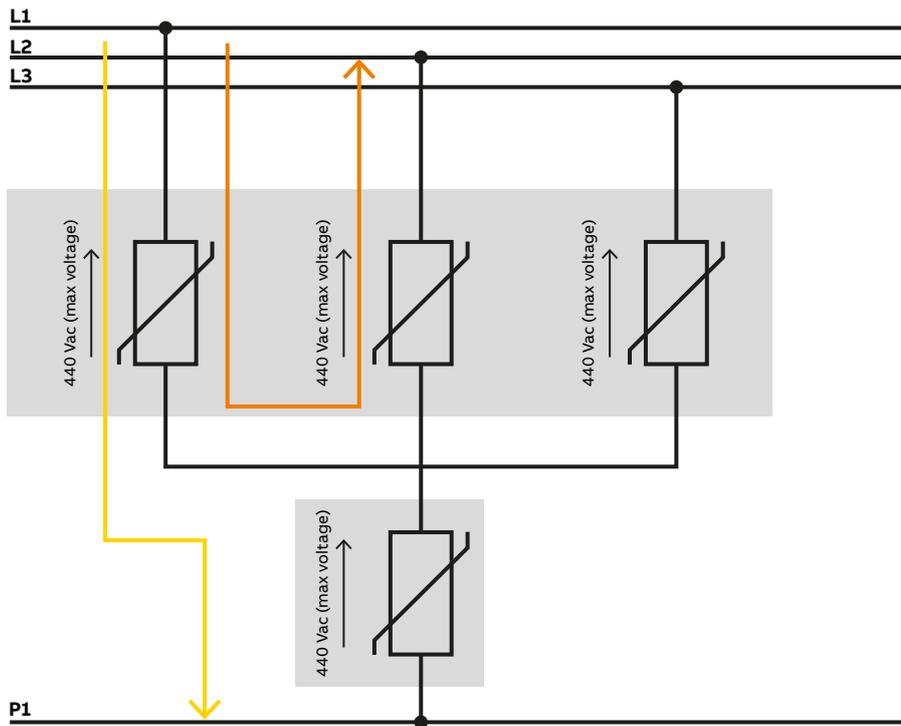
OVR T1+T2 12.5-440s P TS QS Surge protective devices up to 440V AC in series

Using OVR for Power collection panels up to 800V AC:
The important point is to check the U_c of the OVR.

Look at the drawing, $V(L1-L2) = 440V + 440V = 880V$ AC, as the current has to pass through both MOVs ($U_c=440V$ AC each).

Same situation for $V(L2-L3)$ or $V(L3-L1)$ or $V(Lx-PE)$; there are always two 440V MOVs to pass through

- Test class I +II
- Maximum discharge current I_{max} 100KA
- Integrated thermal disconnecter
- End of life indicator back up protection: gG gL Fuse or C curve MCB $I < 125A$
- IEC 61643-11.



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



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

Product offering

Emax 2:



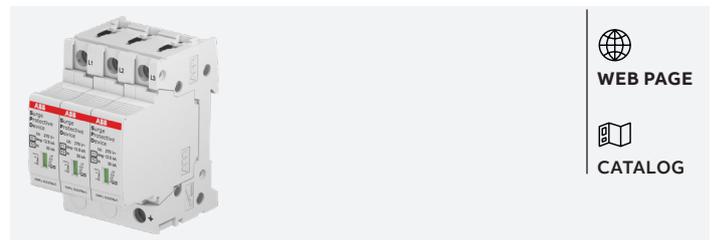
Insulation monitoring relays:



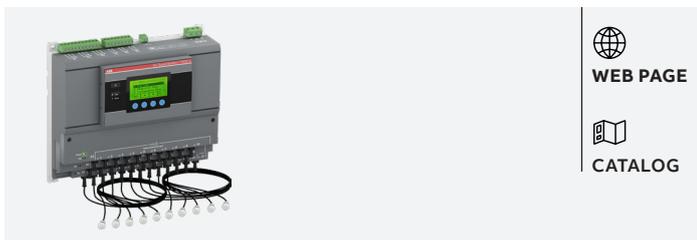
Temperature monitoring relays:



OVR:



TVOC:



CP.S1 power supply:



Miniature circuit breaker:



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Easyline XLP00:



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M4M:



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PowerValue:



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CATALOG

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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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