The ABB Compact Solar Station
Secure grid connections for PV plants
A safe, secure plug-and-play solution

Plug-and-play
ABB has developed a portable, containerized, plug-and-play connection solution for the integration of stable and high quality renewable power from solar photovoltaic (PV) plants into the electrical grid.

ABB’s Compact Solar Station is a custom-designed transformation center that seamlessly integrates high-quality, factory-tested ABB equipment into an advanced enclosure with state-of-the-art climate control functionalities. Every detail from intake grids to the air flow path within the building has been perfected to ensure an optimal balance of temperature, humidity and dust protection. The enclosure is reinforced to withstand strong seismic activity as well as the most rigorous building codes.

Quality power
One of the challenges of renewable power generation like wind and solar is that it can be interrupted. This variability affects the stability of the power produced. It is crucial that grid connections involving renewable generation sources resolve these stability and power quality issues, particularly as more renewable generation is brought online.

With the Compact Solar Station, ABB’s broad experience in complex, utility-scale PV power systems has been distilled to a simple, safe and portable grid connection solution.

The ABB solution creates a secure and stable electrical bridge that transforms low-voltage DC current generated by PV modules into medium-voltage AC current that can be safely injected into the grid.

Easy connections, reduced maintenance
This plug-and-play containerized solution reduces maintenance, downtime and connection effort to a minimum. It works reliably across a wide range of power and voltage levels and harsh environmental conditions.

Due to the compact design and dimensioning of its custom enclosure, shipping the station is easy and cost-effective. All components inside are pre-assembled, pre-commissioned and fully factory tested, allowing fast and easy site installation that simply involves connecting low-voltage cables from the solar park and medium-voltage lines from the grid.

High quality ABB components such as central inverters, medium-voltage (MV) dry transformers and MV switchgears are used in the station, ensuring a reliable solution with minimum maintenance that has a proven lifetime of up to 35 years.

Versatile: STATCOM Grid Stabilization
ABB’s 2.4 MW Compact Solar Station surpasses other grid connection solutions by working both day and night. When the sun is up, it efficiently and reliably converts DC current to grid-compatible AC power.

When the sun goes down, ABB’s central inverters can provide ancillary services such as voltage regulation to the network by absorbing or producing reactive power, supporting the stability of grid voltage. This dual-functionality ensures customers will get the most from their investment.

Safe, secure operation
The Compact Solar Station is designed with safety in mind, including MV switchgear arc protection and a double locking enclosure system for the container. Extensive testing has been done to ensure worker safety during installation, operation and maintenance.

How the Compact Solar Station works

![Diagram of the Compact Solar Station](image-url)
Expert engineering for guaranteed reliability

Computation Fluid Dynamic Studies simulate the air flow through the Compact Solar Station and exiting through the ventilation hoods.

Computational Fluid Dynamic Studies for Ventilation Design
There are multiple sources of heat to be controlled in order to ensure optimal performance of the solar station including equipment energy dissipation, sun radiation and outdoor air temperature. The impact of these heat sources on the station depends on the equipment layout as well as locational factors like altitude, sun path and wind conditions. It is absolutely essential to take into account all these factors during the design of the solar station's climate control system.

The design of the climate control system in the Compact Solar Station reflects a series of Computational Fluid Dynamic (CFD) studies conducted to simulate air velocity and temperature profiles for a wide range of operating conditions and equipment configurations. The results of these studies as well as measurements taken at real sites guarantee the reliable performance of ABB’s solution in the field.

Enclosure Protection Testing
The advanced enclosure of the Compact Solar Station has been designed to allow the ventilation system to pull in large volumes of air while guaranteeing that everything else stays out. The protection degree of the enclosure has been verified using the European Standard EN 62271-202. The 2.4 MW Compact Solar Station achieved a protection degree of up to IP54, i.e. providing high protection against solid particles and water.

Structural Studies
Based on a 40 ft high cube shipping container, the enclosure is reinforced to guarantee long-term structural performance in the field. This was confirmed in studies of the enclosure to assure compliancy with worldwide structural codes. The structural studies simulate the behavior of the building under extreme environmental conditions like heavy snow loads, high winds (up to 170 km/h) and strong seismic activity. In addition, the building passed through very rigorous physical testing and a certification process to ensure that it can be transported without any risk.
The ABB Compact Solar Station

This comprehensive solution for PV grid connections gathers ABB’s best-in-class power components in a flexible, robust and easy-to-use containerized solution. With ABB’s 2.4 MW Compact Solar Station, converting solar power to high quality AC current has never been easier.

Metallic Enclosure
Reinforced 40 ft high cube container fulfilling American and European structural codes as well as ISO 1496-1 standards for freight containers

ABB SafeRing/SafePlus Compact Switchgear
A high-quality, flexible, modular and compact SF6-insulated switchgear solution offering total reliability and safe operation with almost no maintenance

ABB Cast Coil Dry-Type MV Transformer
Virtually maintenance free and manufactured in accordance with industry and international standards including ISO 9001

Ventilation System
Custom ventilation system with easy-to-maintain filter and grid solutions designed to keep the components at optimal air flow and operating temperature in locations all around the world
ABB PVS800 Central Inverters
Provide enhanced total performance based on high efficiency, low auxiliary power consumption, together with verified reliability and an experienced worldwide service organization.

ABB PV Plant Control System (Optional)
Production forecasting, plant monitoring, data logging, power plant control (power, ramp and power factor regulation), accessible through an advanced HMI and can integrate seamlessly with any SCADA or plant control system.

ABB PowerValue UPS (Optional)
Clean, reliable energy to temporarily ensure continuation of critical services in case of grid outages.

ABB Auxiliary Cabinet
Complete with ABB low voltage equipment, the AUX cabinet can be configured to satisfy customer self-consumption requirements.
A global partner for solar

Expert engineering support
ABB is a global power and automation company with an excellent track record of supplying premium power products. In addition to high-quality products, our customers also have access to our extensive experience and know-how in all areas of the power industry.

In the solar sector, ABB engineers support a range of activities including electrical balance of plant (EBoP) solutions for utility-scale PV plants. ABB is also leading the way in PV microgrids with the Microgrid Plus solution for control and stabilization that can interface with the Compact Solar Station to enable 100% solar penetration. Our solutions are backed up by many years of experience in engineering, system integration and control systems, as well as one of the broadest electrical product portfolios available.

ABB has been involved in PV installations totaling more than 1,200 MW around the world, including projects in Japan, India, South Africa, Canada, Honduras, Israel, Spain, Italy, the UK, France and Chile. Supply chain expertise gained as a global power and automation leader has ensured 100% on-time delivery of the 2.4 MW Compact Solar Station.

Service is one of ABB’s key competencies. Extended warranty options are available, as well as a single channel of contact with our worldwide service network. Beyond maintenance, ABB also offers a range of advanced services like performance monitoring and diagnostics. ABB’s local presence in roughly 100 countries ensures fast expert service, when and where you need it.

Executed turnkey contracts for more than 1200 MW of PV
Equipment installed on 6 continents
O&M contracts for more than 35 PV plants
### DC input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range, mpp ($U_{dc,mpp}$)</td>
<td>600-850 V</td>
</tr>
<tr>
<td>Max. input voltage, open circuit</td>
<td>1100 V</td>
</tr>
<tr>
<td>Max. DC current</td>
<td>2 x 1710 A</td>
</tr>
<tr>
<td>DC connection</td>
<td>16 or 20 DC input (+/-) by terminal lugs</td>
</tr>
</tbody>
</table>

### AC output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal power @ 45°C (1)</td>
<td>2000 kW (1)</td>
</tr>
<tr>
<td>Max. power (2)</td>
<td>2400 kW (2)</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>up to 36 kV</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz</td>
</tr>
</tbody>
</table>

### Inverter efficiency

- Max. efficiency: 98.8%
- European efficiency: 98.6%

### Operating conditions

- **Outdoor temperature range**: -15°C to 40°C (45°C Peak)
- **Pollution levels (2)**: G2 & G4 filters for low & medium pollution levels (standard) Add-on filter box for highly chemical or saline environments
- **Max. relative humidity**: 95% (non-condensing)
- **Max. altitude**: 1000 m above sea level

### Equipment

- **Inverters**: 2x ABB PVS800-57-1000kW-C
- **Transformer**: ABB cast coil dry-type MV transformer
- **Switchgear**: ABB SF6-insulated Compact Switchgear type SafePlus/SafeRing
- **Transformer protection**: Fuse/vacuum circuit breaker with ABB Relay
- **LV aux. transformer**: 15 kVA auxiliary transformer for self-consumption

### Container Specifications

- **Dimensions for transportation (W x H x L)**: 2.44m x 2.90m x 12.19m
- **Dimensions after installation (W x H x L)**: 3.10m x 2.90m x 12.19m
- **Weight**: < 20 tons
- **Corrosion protection**: CS-M anti-corrosion paint
- **Max. roof loading (snow)**: 250 kg/m²
- **Structural standards**: Eurocodes & American Standards, including high-wind conditions (170 km/h) and seismic activity (a = 0.3g) Structure Fire Behavior (IEC 62271/202)

### Safety Features

- **Container**: Mechanical and electrical interlocks to prevent accidents when the equipment is functioning
- **MV switchgear**: Arc protection according to IAC AFL class 16/20 kA 1s
- **Fire protection kit (optional)**: Portable extinguisher and fire detector

### Additional Offerings (optional)

- **Plant optimisation software**: Hourly and daily production forecasting, plant control (power and ramp regulation, power factor adjustment)
- **Solar station automation**: SCADA features, monitoring, data logging, HMI
- **Current measurement**: LVDC and/or LVAC measurements around inverter
- **Auxiliary power supply for customer use**: Up to 15 kVA additional transformer @ variable voltage levels
- **Uninterruptible power supply**: Up to 20 kVA UPS for customer use
- **Lifecycle services**: Global service network, spare parts supply and custom service agreements

### Regulatory approval (4)

- **Protection of electrical equipment**: IP44/IP54 (high protection against dust and water) IK10 (highest level of impact protection)
- **Internal earthing ring**: IEEE STD 80-2000, IEC 60479-1 Annex E
- **LV/MV installation and wiring**: IEC 60364, IEC 61936-1, IEC 60502-1

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(1) @ 45°C inverter temperature, <1000 mts, cos $\phi = 1$. See inverter manual
(2) @ 20°C inverter temperature, <1000 mts, cos $\phi = 1$. See inverter manual
(3) Not ready for Sand Storms
(4) More standards available on request
(5) IK9 for ventilation grids

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**ABB 2.4 MW Compact Solar Station**

**Data sheet**