SOLAR INVERTERS

Solar inverters and inverter solutions for power generation

Helping you get more energy out of every day

ABB has one of the widest portfolios of solar inverters ranging from single- and three-phase string inverters up to megawatt-sized central inverters. This extensive range of solar inverters is suitable for the smallest residential photovoltaic (PV) systems right up to multimegawatt PV power plants.

For utility-scale power generation ABB is one of the most bankable suppliers standing behind the promises over the whole lifetime of the plant to maximize the return on your investment.

ABB solar inverters utilize over 40 years of experience and advances made in inverter and power converter technology that has contributed to ABB becoming one of the leading solar inverter providers globally.

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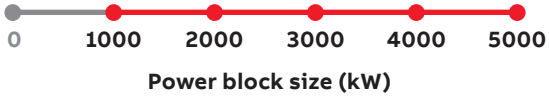
ABB solar inverters and inverter solutions

Your brightest choice for medium sized and utility-scale photovoltaic power plants

Central inverter solutions

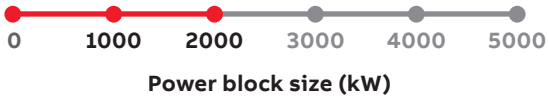
In large ground mounted multi-megawatt photovoltaic (PV) power plants the PV modules are typically installed uniformly mounted at ground level, either on fixed-tilted structures facing the sun or on tracking devices. For these land-based power plants ABB central inverters offer the most cost-effective and efficient solution for PV energy generation by feeding electricity directly to the medium voltage (MV) power distribution network (i.e. grid).
ABB's offering for large plants includes a wide range of central inverters, inverter stations, megawatt stations and medium voltage solutions.



Power block size (kW)

String inverter solutions

ABB string inverter solutions enable the smart and cost-effective designs for small and medium sized PV power plants by maximizing energy yields even in challenging land shapes and locations. ABB's offering for these plants includes complete plug-and-play inverter solutions and MV stations. The string inverter solutions can be utilized also in PV power plants of commercial and industrial buildings to minimize the needed investment.



Power block size (kW)

Meet your bankability and profit targets with ABB solar inverter solutions

Maximize the return on your PV investment with solar inverter solutions designed for high total efficiency, reliability and ease of installation

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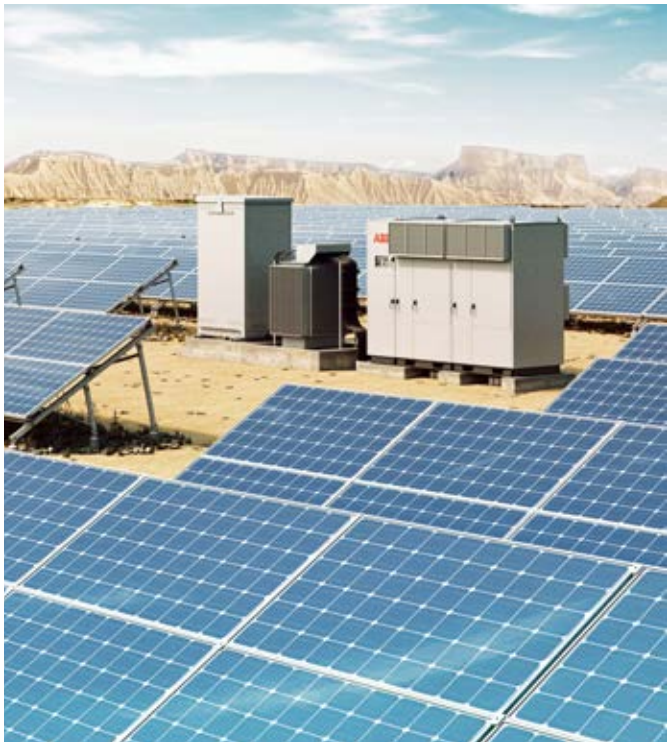
01 ABB central inverter, PVS980, and ABB medium voltage pad mounted solution, PVS980-MVP, installed on site

Proven solutions with reliability
ABB inverter solutions utilize decades of experience and advances in inverter and power converter technology as well as development and manufacturing of secondary substations and medium voltage (MV) components. Together with ABB's engineering know-how and complete product portfolio for PV power plants, ABB inverter solutions provide optimized plug-and-play experience for quick and reliable connection of the PV plant to the grid.



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Global presence with local support
ABB solar inverter solutions are supported through a worldwide sales and services network. With the global service network of ABB and life cycle service concepts, the high-performance all-ABB packages provide highly reliable, cost-effective and bankable solution for utility-scale PV power plants. Wherever your project is located, ABB is your reliable partner to support you over the whole lifetime of your plant.

ABB packaged solutions – features and benefits
- Plug-and-play solutions, designed for large-scale solar power generation – rapid installation with cost-effectiveness
- All-in-one design – ensuring maximum uptime of the plant with minimum total investment
- High reliability and efficiency with low auxiliary power consumption – high total performance
- Modular and serviceable systems – increased uptime
- Proven technology and reliable components – securing long operating life and attractive return on investment
- Smart connectivity with controllability – digital grid compatibility
- Global life cycle services and support – bankable solution

Central inverters

Superbly cost-effective, for best return on investment

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01 A view from ABB inverter station PVS800-IS, housing two PVS800 central inverters
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02 ABB central inverters PVS980, PVS800-57 and PVS800-57B

ABB central inverters
– maximized total efficiency
ABB's central inverter portfolio is based on decades of experience with power converting technology, which has now been custom adapted for the PV business. Globally, an installed base of over 100 GW is built on the same power converting technology platform used in ABB central inverters. This ensures you that the product itself, and the processes to support it over the plant lifetime, are optimized and offer to you a truly bankable solution.

The central inverter's industrial design and modularity combined with ABB's life cycle service approach simplify the operation of the inverters. This assures maximum uptime of the plant and highest return on your investment.

The all-in-one design approach of the ABB central inverters reduce the amount of external components needed. All the necessary alternating current (AC) and direct current (DC) side protections are included so the inverter can be directly connected to solar array junction boxes and the MV transformer. The high efficiency, together with high reliability and extremely low auxiliary power consumption give investors maximized total efficiency over the lifetime of the plant.

ABB central inverters
- Indoor and outdoor inverters
- 1000 V and 1500 V DC input voltage
- Power ratings up to 2300 kVA

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ABB central inverter
PVS800 – 500 to 1700 kW

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01 ABB central inverter PVS800
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02 ABB Central inverter PVS800 doors open
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03 ABB central inverter PVS800-57B

ABB central inverters stand out as reliable, efficient and easy to install. As indoor inverters with high protection class, small footprint and optimized low power consumption ventilation, it is easy for EPCs to install the inverters for variety of site conditions.
The inverters are aimed at system integrators and end users who require high performance solar inverters for large photovoltaic (PV) power plants. Available now from 500 up to 1700 kW, the inverters are ideal for maximizing the return on investment in multi-megawatt power plants.

World's leading inverter platform
The ABB central inverters have been developed on the basis of decades of experience in the industry and a proven technology platform. Unrivalled expertise from the world's market and technology leader in frequency converters is the hallmark of this solar inverter series.

Based on ABB's highly successful platform and the most widely used frequency converters on the market – the inverters are the most efficient and cost-effective way to convert the direct current (DC) generated by solar modules into high quality and CO_2-free alternating current (AC) that can be fed into the power distribution network.

Solar inverters from ABB
ABB central inverters are ideal for large PV power plants but are also suitable for large-sized power plants installed in commercial or industrial buildings. High efficiency, proven components, compact and modular design and a host of life cycle services ensures ABB central inverters provide a rapid return on investment.

High total performance
- High efficiency
- Low auxiliary power consumption
- Efficient maximum power point tracking
- Long and reliable service life of over 20 years

Full grid support functionality
- Reactive power compensation also during the night time
- Active power limitation
- Low voltage ride through with current feed in Grid code compatibility
- Wide country-specific grid code compliance
- Adjustability to various local utility requirements

Life cycle service and support
- ABB's extensive global service network
- Extended warranties
- Service contracts
- Technical support throughout the service life

Modular industrial design
- Compact and easy-to-maintain product design
- Fast and easy installation
- Integrated and flexible DC input cabinet

Extensive protections
- DC and AC side protection with built-in fuses, surge protection and filters
- Increased reliability and safety with DC and AC side contactors
- Heavy-duty surge protection

Proven technology
- Based on ABB's market-leading technology platform used in frequency converters

Wide communication options
- Complete range of industrial-type data communication options
- Ethernet/Internet protocol
- Remote monitoring

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ABB central inverter (1500 V_{DC})
PVS980 – 1818 to 2300 kVA

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01, 02 ABB central inverter, PVS980 – an outdoor inverter with robust enclosure
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03 ABB central inverter PVS980 doors open

ABB PVS980 central inverter raise reliability, efficiency and ease of installation to new levels. The inverters are aimed at system integrators and end users who require high-performance solar inverters for large photovoltaic (PV) power plants. PVS980 central inverters are available from 1818 kVA up to 2300 kVA, and are optimized for cost-effective, multi-megawatt power plants.

PVS980 central inverters from ABB
ABB PVS980 central inverters are ideal for large PV power plants. The high DC input voltage up to 1500 V_{DC}, high efficiency, proven components, compact and modular design and a host of life cycle services ensure ABB PVS980 central inverters provide a rapid return on investment.

PVS980 inverters feature a proven closed loop cooling system used already in other ABB industrial applications. This innovative, truly low-maintenance cooling solution is designed for demanding applications and harsh environments, cutting maintenance costs and ensuring outstanding endurance.

High total performance
- High efficiency
- Low auxiliary power consumption
- Innovative controlled cooling
- Efficient maximum power point tracking
- Long and reliable service life of at least 25 years

Outstanding endurance for outdoor use
- Water- and dustproof outdoor enclosure
- Designed to withstand the toughest environments
- Long and reliable service life following the ABB life cycle model

Modular industrial design
- Compact and easy-to-maintain product design
- Fast and easy installation
- Integrated and flexible DC input section

Life cycle service and support
- ABB's extensive global service network
- Extended warranties
- Service contracts
- Technical support throughout the service life

ABB self-contained, low-maintenance cooling system
- Closed loop cooling system based on phase transition and thermosiphon technology
- Liquid-cooled inverter power ratings with the simplicity of air cooling
- No fillable liquids, pumps, valves, inhibitors or leaks
- Low maintenance

Versatile design for largescale PV plants
- Integrated DC connection with variable number of inputs
- Wide standard option palette for tailoring
- Versatile AC connection methods

Minimizes system costs
- 1500 V_{DC} system voltage
- Wide ranged and highly efficient MPPT algorithm
- Integrated protection to minimize external components
- Fast and easy installation and commissioning

Wide communication options
- Complete range of industrial data communication options for SCADA connections
- Ethernet/Internet Protocol
- Remote monitoring

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Central inverter solutions
High performance optimized plug-and-play stations

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01 ABB inverter solutions: ABB megawatt stations PVS800-MWS and PVS980-MWS, ABB inverter station PVS800-IS, ABB medium voltage station PVS980-MVS and ABB medium voltage pad mounted solution PVS800-MVP

For large multi-megawatt PV power plants ABB central inverter solutions offer the most cost-effective solution by feeding electricity directly to the medium voltage (MV) grid. ABB's offering for large plants includes complete plug-and-play stations with inverters and MV components, inverter stations for indoor inverters as well as separate MV stations to supplement the outdoor inverters and inverter stations. Both complete stations and MV stations are available in different designs, to provide the most feasible solutions for every weather and site condition.

ABB packaged solutions for central inverters

- Inverter stations with ratings from 1.75 MW to 3.6 MW
- MV stations for connecting outdoor inverters and inverter station to the grid, with ratings from 1.9 to 4.6 MW
- Megawatt stations with inverters, transformer and switchgear, with ratings from 1 MW to 4.6 MW

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ABB megawatt station
PVS800-MWS – 1 to 2.4 MW

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01 ABB megawatt station PVS800-MWS – an optimized plug-and-play solution for large-scale solar power generation
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02 Inside view of PVS800-MWS with two PVS800 inverters, MV transformer and MV switchgear

The ABB megawatt station is a compact plug-and-play solution designed for large-scale solar power generation. It houses all the electrical equipment that is needed to rapidly connect a photovoltaic (PV) power plant to a medium voltage (MV) electricity grid. All the components within the ABB megawatt station are from ABB's product portfolio.

Turnkey-solution for PV power plants
The ABB megawatt station design capitalizes on ABB's long experience in developing and manufacturing secondary substations for utilities and major end-users worldwide in conventional power transmission installations.

A station houses two ABB central inverters, an optimized transformer, MV switchgear, a monitoring system and DC connections from solar array. The ABB megawatt station is used to connect a PV power plant to a MV electricity grid, easily and rapidly. To meet the PV power plant's demanded capacity, several ABB megawatt stations can be combined.

Compact design eases transportation
The housing is based on a standard, insulated, steel-framed 40-foot shipping container. The small inverter footprint makes the container compact and easy to lift via a standard crane. The total package weighs only up to 21 metric tons, depending on the power rating. The optimized shipping container solution ensures cost-effective and safe transportability to the site. The station's optimized air circulation and filtering system together with thermal insulation enable operation in harsh temperature and humidity environments. The ABB megawatt station is designed for at least 25 years of operation.

Highlights
- Proven technology and reliable components
- Compact and robust design
- High total efficiency
- Modular and serviceable system
- Embedded auxiliary power distribution system
- Extendable manufacturing footprint with fast deliveries
- Global life cycle services and support

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ABB inverter station
PVS800-IS – 1.75 to 3.6 MW

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01 ABB inverter station, PVS800-IS, 1.75 to 2.4 MW
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02 Internal view of ABB inverter station
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03 ABB inverter station, PVS800-IS, 2.625 to 3.6 MW

The ABB inverter station is a compact turnkey solution designed for large-scale solar power generation. It houses all equipment that is needed to rapidly connect ABB central inverters to a medium voltage (MV) transformer station.

Turnkey solution for photovoltaic (PV) power plants
The ABB inverter station design capitalizes on ABB's long experience in the development and manufacture of secondary substations for electrical authorities and major end-users worldwide in conventional power transmission installations. The station houses two ABB central inverters and embedded auxiliary power, monitoring and air filtration systems.

It enables easy and rapid connection to an MV transformer station. Depending on the size of the PV power plant, several ABB inverter stations can be used to meet the capacity need.

Proven design with long operating life
The housing is based on a standard, insulated, steel-framed shipping container. The total package weighs only 10-16 metric tons, depending on the power rating. The optimized shipping container solution ensures cost-effective and safe transportability to the site. The station's optimized air circulation and filtering system together with thermal insulation enable operation in harsh temperature and humidity environments. The inverter station is designed for at least 25 years of operation.

Highlights
- Proven technology and reliable components
- Standard and robust design
- Protected working interior
- Modular and redundant system
- Easy connection to an MV station
- Extendable manufacturing footprint with fast deliveries
- Embedded auxiliary power distribution system
- Double-stage air pre-filtering for reduced maintenance
- Life cycle service and support through ABB's extensive global service network

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ABB medium voltage pad mounted solution and station (1000 and 1500 V_{DC})

PVS800/980-MVP – 1.9 to 4.6 MVA
PVS800/980-MVS – 1.9 to 4.6 MVA

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01 ABB medium voltage pad mounted solution PVS800/980-MVP for PVS800-IS inverter station and PVS980 central inverter

ABB medium voltage station and medium voltage pad mounted solution are designed for large-scale solar power generation and to be compatible with PVS980 outdoor central inverter and PVS800-IS inverter station. The solutions contain the medium voltage step-up transformer and the switchgear equipment needed to rapidly install and connect the inverters to the medium voltage network of the photovoltaic plant. All the components within the medium voltage station and pad mounted solution come from ABB's product portfolio to meet the performance and quality standards required for solar applications.

Cost-efficient plug-and-play solution for PV power plants

The ABB medium voltage station and ABB medium voltage pad designs capitalize on ABB's long experience in developing and manufacturing compact secondary substations for utilities and major end users worldwide in conventional power transmission installations. The solutions contain an optimized transformer, MV switchgear and signalling interfaces for the central inverter. PVS980 outdoor inverter or PVS800-IS inverter station together with the medium voltage station housing ensure easy and rapid connection of the central inverters to a plant's medium voltage network and its monitoring and communication system.

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02 ABB medium voltage station PVS800/980-MVS for PVS800-IS inverter station and PVS980 central inverter

Compact design for easy transportation
The container based steel station comes complete with all internal cablings pre-wired, whereas the pad mounted solutions is to be wired on-site. The medium voltage station is available with oil or dry type transformer and pad mounted solution only with oil type transformer. Both the designs enable operation in harsh temperature and humidity environments and are designed for at least 25 years of operation. All components used come from the ABB product range to ensure compatibility. The ABB medium voltage station weights less than 15 metric tons, and as well as the components of the medium voltage pad, the station can be lifted with a standard truck crane, thereby simplifying transportation and installation at the site with a minimal footprint. Pad mounted supports more flexibly ABB's wide global manufacturing footprint. Also with pad mounted solution it is possible to finish MV connections before the transformer arrives.

Highlights
- Proven components from one supplier – reliability
- Compact and robust design – transportability
- Integrated signalling interfaces – plug-and-play
- Modular and serviceable system – increased uptime
- Global life cycle services and support – bankable solution

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ABB megawatt station (1500 V_{DC})
PVS980-MWS – 3.6 to 4.6 MW

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01 ABB megawatt station, PVS980-MWS, with two PVS980 central inverters, MV transformer and MV switchgear
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02 ABB megawatt station, PVS980-MWS – a compact plug-and-play solution for utility-scale PV plants

The ABB megawatt station is a compact plug-and-play solution designed for large-scale solar power generation. The station houses all the electrical equipment that is needed to rapidly connect a photovoltaic (PV) power plant to a medium voltage (MV) electricity grid. All the components within the ABB megawatt station come from ABB's product portfolio to meet the performance and quality standards required for solar applications.

Turnkey-solution for PV power plants
The station houses two outdoor 1500 V_{DC} ABB central inverters and an optimized ABB dry type or oil immersed transformer. It includes MV switchgear (widely proven ABB SafeRing), a monitoring system and DC connections from solar array. The ABB megawatt station is used to connect a PV power plant to a MV electricity grid easily and rapidly. To meet the PV power plant's demanded capacity, several ABB megawatt stations can be used. All equipment is designed and optimized to provide the best performance throughout the lifetime of the plant. PVS980 turnkey solution ensures a very rapid, efficient and reliable connection to a plant's MV grid.

Compact design eases transportation
The station has standard, 40-feet High Cube shipping container dimensions. The small inverter footprint makes the station compact and easy to lift via a standard crane. The total package weighs less than 30 metric tons. The standardized shipping dimensions ensure cost-effective and safe transportability to the site even overseas. The station's optimized air circulation and filtering system together with thermal insulation for dry type transformer or open air design for oil immersed transformer enable installations to various ambient conditions, from harsh desert temperatures to cold and humid environments. The ABB megawatt station is designed for at least 25 years of operation.

Highlights
- Proven technology and reliable components
- Compact and robust design – transportability
- High total efficiency
- Outstanding endurance for outdoor use
- High DC input voltage up to 1500 V_{DC}
- Extensive DC and AC side protection
- Self-contained cooling system for inverters
- Embedded auxiliary power distribution system
- Extendable manufacturing footprint with fast deliveries
- Modular and serviceable system
- Global life cycle services and support – bankable solution

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ABB compact skid for US market (1500 V_{DC})
PVS980-CS-US – 2 to 4.4 MVA

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01 ABB compact skid, PVS980-CS-US, for US markets
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02 ABB compact skid, PVS980-CS-US, for rapid MV network connection

The ABB medium voltage compact skid is a cost-efficient and robust US market solution designed for large-scale solar power generation using PVS980 outdoor inverters. It includes the medium voltage transformer and protections needed to connect the inverters to the medium voltage network of the photovoltaic plant. All the components within this medium voltage skid come from ABB's product portfolio to meet the performance and quality standards required for solar applications.

Solution
The ABB medium voltage skid mounted design capitalizes on ABB's long experience in developing and manufacturing medium voltage components for utility-scale solutions for major end-users worldwide. The solution contains an optimized transformer with integrated medium voltage side fusing, optional DC disconnection cabinet and signaling interfaces for the PVS980 inverter.

The solution is made to meet the safety and electrical installation standards for USA markets. All components used are from the ABB product range to ensure compatibility. LV connection is made with close coupling to inverter to minimize on-site installation. The design is optimized to provide cost-effective transportation in-lands as well as fast and easy installation on site. The pre-designed skid type foundation layouts for the outdoor type ANSI ONAN type oil transformer optimize the foot print needed and also minimize the cost and on-site works needed. The compact skid structure can serve also as a leakage reservoir for the transformer oil.

The transformer is designed and optimized for PVS980 central inverters and for photovoltaic plant load profile to provide the best performance throughout the lifetime of the plant.

The transformer is also designed to meet the reliability, durability, and efficiency required in PV applications. Transformers are available in standard sizes that are based on optimized power ratings to meet different climatic conditions and inverter station sizes. The transformers as well as the general design provide excellent mechanical and short-circuit characteristics. All ABB's transformers are manufactured in accordance with the most demanding industry and Ansi standards.

Compact and robust design for harsh environments
This skid mounted solution is pre-assembled on a factory built steel or concrete foundation. The design enables operation in harsh temperature and humidity environments and is designed for at least 25 years of operation. The ABB medium voltage skid mounted solution supports fast on-site installation and it is easy to transport in-lands. Transport of the skid can be done with a standard truck and lifted to site as one transport unit, which simplifies the installation. Together with pre-configured layout options a minimal footprint and optimum cablings can be achieved.

Highlights
- Reliability – proven components from one supplier
- Transportability – compact and robust design
- Plug-and-play – integrated signaling interfaces
- Increased uptime – modular and serviceable system
- Bankable solution – global life cycle services and support

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String inverter solutions
Smart quality at work for you

The future of energy is anchored to renewable energy sources like photovoltaics that have already driven the transformation in the way energy is produced, consumed and provided through modern distribution grids. Photovoltaics are already one of the most cost-effective energy sources in many regions of the world. When they complement with digital technologies the benefits for users are at the maximum scale.

ABB's offering includes three-phase string inverters as well as string inverter solutions with MV stations. The string inverter solutions can be used in PV power plants of commercial and industrial buildings as well as in ground mounted applications.

String inverters for commercial and industrial building applications – bright future ahead for decentralized power generation
Designed to optimize the total cost of ownership in PV projects, our inverters guarantee high total efficiency and reliability. The high power density and reduced installation and maintenance efforts enhance overall cost efficiency.

Thanks to their modularity and flexibility, our commercial and industrial inverters are the ideal solution for simplified system planning and design.

Complete string inverter solutions – decentralized energy at its full potential
Economically attractive solutions can also be built in remote locations or places where land shapes create additional challenges for the plant design. Even multi megawatt-size installations can be designed with technically and economically cost-effective results, thanks to our complete string inverter solutions. They include all MV components as well as a series of cloud based advanced communications services, which simplify the integration in smart environments. Thanks to our string inverter solutions for decentralized commercial and industrial applications, many companies can achieve greater efficiency and sustainable growth, today and tomorrow.

ABB string inverter solutions – features and benefits
- Configurable all-in-one design with built-in and monitored protection devices – reduced system cost
- Wide input voltage range with multiple MPP trackers – flexibility for system designers
- High total efficiency – rapid return on investment
- Advanced grid support functions – compatibility with grid codes
- Safe and intuitive user and service interface – fast and easy commissioning
- Robust enclosure, with IP65 rating – suitable for outdoor installation

ABB string inverters
TRIO-TM-50.0-400 / TRIO-TM-60.0-480
50 to 60 kW

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01 TRIO-TM-50.0/60.0 outdoor string inverter

The TRIO-TM-50.0/60.0 is ABB's latest three-phase string solution for cost-efficient large decentralized photovoltaic systems for both commercial and utility applications.

This new addition to the TRIO family, with 3 independent MPPT and power ratings of up to 60 kW (480 V version), has been designed with the objective to maximize the ROI in large systems with all the advantages of a decentralized configuration for both rooftop and ground-mounted installations.

Modular design
The TRIO-TM-50.0/60.0 has a modular design to guarantee maximum flexibility, thanks to the different versions available.

The separate and configurable AC and DC compartments increase the ease of installation and maintenance with their ability to remain separately wired from the inverter module inside the system.

The TRIO comes with the most complete wiring box configurations available including up to 15 DC inputs with fast connectors, string protection fuses, AC and DC switches and type II AC and DC surge arresters.

Design flexibility
The double stage conversion topology offers the advantage of a wide input voltage range for maximum flexibility of system design.

The TRIO-TM comes with a forced air cooling system, used also in the previous TRIO products, designed for a simple and fast maintenance, allowing a maximum flexibility of plant design. The inverter comes with mounting supports for both horizontal and vertical installations, which allow for the best use of space available beneath the solar panels.

Embedded multi communication interfaces (WLAN, Ethernet, RS485) combined with a Sunspec compliant Modbus protocol (RTU/TCP) allow the inverter to be easily integrated with any third party monitoring and control systems.

Improved Commissioning and Maintenance
Thanks to the build-in Web User Interface (WUI) the installer can commission the inverter wirelessly and change advanced parameters by using any standard WLAN enabled device (smartphone, tablet or PC).

Integrated logging capability allows remote monitoring of the plant without the need of any additional external loggers.

Remote firmware update of the inverter system and components via Aurora Vision®.

Highlights
- 3 Independent MPPT
- Transformerless inverter
- Double stage topology for a wide input range
- Large set of specific grid codes available which can be selected directly in the field
- Separate AC and DC compartments are available in different configurations
- Both vertical and horizontal installation
- 2 available sizes, 50 and 60 kW with 400 and 480 Vac of output voltage, respectively
- Wireless access to embedded user interfaces
- Ethernet daisy chain enabled
- Modbus TPC/RTU Sunspec compliant
- Remote monitoring and firmware update via Aurora Vision® (logger free)

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ABB TRIO-TM-50.0/60.0 string inverter block diagram

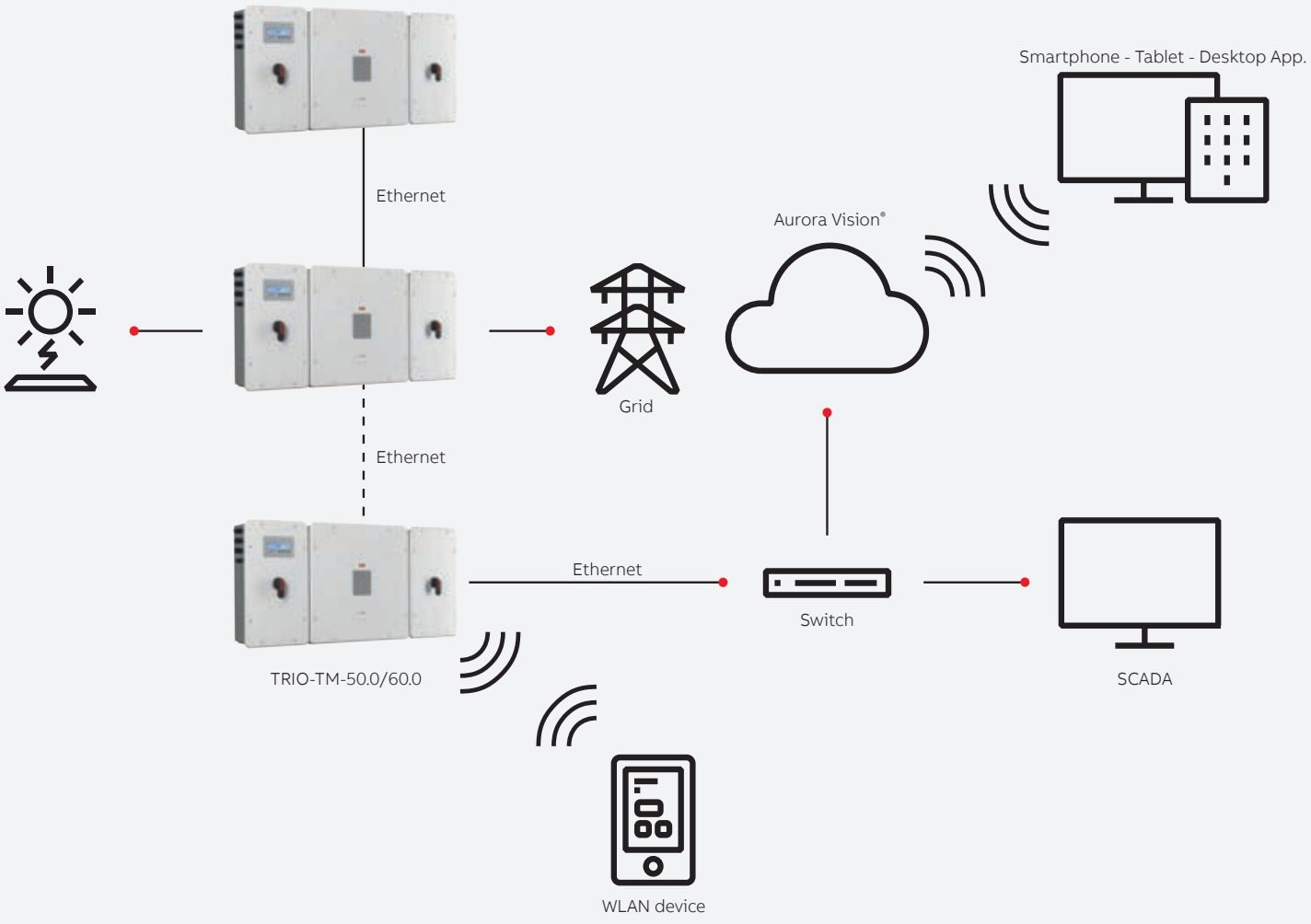

ABB medium voltage station
TRIO-50-MVS, up to 2 MW

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01 ABB medium voltage station, TRIO-50-MVS, with ratings up to 2 MW
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02 View to inside of TRIO-50-MVS medium voltage station

TRIO-50-MVS is the new package solution specifically developed for decentralized solar plants realized with ABB string inverters. The new TRIO-50-MVS is predisposed to connect up to 40 TRIO-50.0 inverters, for a maximum power of 2 MW.

Thanks to innovative design, the TRIO-50-MVS allows the integration of all the components necessary for the connection of the decentralized system to the medium voltage: LV distribution panel, MV switchgear and MV transformer.
The use of protected feeders, dedicated to each inverter, helps avoid the use of parallel string switchboards, simplifying the connections on the field and reducing the overall costs of the system.

Moreover, thanks to the integration of the ABB PLC AC500 family, the TRIO-50-MVS can be easily integrated into simple or hierarchical communication infrastructures that implement efficient “closed loop” control algorithms in line with the requirements of the utilities.

Highlights
- Robust Housing construction based on 20’ HC Container allowing a self-transportable solution, optimizing logistic costs
- Compatible with several structural regulations worldwide and fulfilling high seismic levels
- 100% Premium ABB Products inside
- Optimized layout for integration of all components necessary for Medium Voltage connection
- Dry Transformer version with very low maintenance (IEC or Ecodesign)
- Oiled sealed transformers in different variants (IEC or Ecodesign)
- Single Inverter feeders with protection for a simplified and cost optimized Balance of System (BoS)
- Closed loop control by mean of AC500 series PLC

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Control and monitoring solutions
Connecting your needs with our experience

ABB's solar inverter solutions are complemented with control and monitoring solutions based on decades of knowledge and practical experience in vast variety of applications. This vast experience is channeled now to create dedicated and optimized products for different type of monitoring and control needs. Thus, control and monitoring solutions can be easily utilized with ABB solar inverters for large and medium size solar power systems. Furthermore, the modular design of the control and monitoring solutions means that the options can be fitted to the system during the initial installation or any time.

Selection of options
Control, monitoring, configuring or diagnosing the status of the solar power plant is easily carried out within an ABB monitoring system, either locally on site or remotely, via various levels. At its simplest, an ABB solar inverter can be accessed via its control unit to undertake configuration changes or performance evaluations locally. ABB's sophisticated SCADA solutions allow large multiple inverter systems to be monitored and controlled from local control room or via remotely.

Centralized monitoring room
ABB SCADA with remote monitoring options integrates PV power plants located in remote, inaccessible or unmanned areas making asset management and service actions easier to plan and follow. Users with multiple sites benefit by being able to view performance of each solar site from one central location. It also allows OEMs and system integrators to offer their customers the ability to check up on any plant, anywhere in the world at any time of the day. Smooth integration with ABB remote monitoring options enables rapid commissioning for system integrators and saves installation costs.

Plant under control
Scalable ABB solar power plant controllers are programmed to acquire information at all levels of the plant including plant's point of connection, MV stations and inverters. Controller features all the most common control algorithms and covers all the required grid code functions which together with ABB solar inverters secure the plant compatibility with local requirements.

Secure performance
Included among the data that can be monitored, configured or analyzed are inverter parameters, module string performance, energy production and weather data. All of this helps the user to improve performance of the power plant and maximize the return on investment, whatever form of data communication is chosen.

Control and monitoring solutions for medium and large power plants

Automation solutions for solar power plants

ABB offers a range of automation solutions and plant controllers for medium and large-scale solar power plants. Symphony Plus for Solar is a versatile and scalable automation solution dedicated for monitoring and control of PV power plants. The solution spans from plant automation including panel position control, plant diagnostics and power management, going up to enterprise SCADA to enabling remote operations & management of PV plants. For smaller plants simpler cost-effective ABB monitoring solutions are available. ABB inverters are also compatible with major 3rd party monitoring and control solutions.

Plant automation solutions
Symphony Plus for Solar employs a SCADA system for monitoring all key plant components, from PV panels (with and without tracking systems) to the inverters, transformers and switchgear, grid connection and meteorological stations. It supports a broad range of communication protocols like Modbus TCP, OPC, IEC 6087-5-104, enabling it to connect and exchange data with all plant components. With a real-time database and a historian, relevant plant data can be acquired and either stored on site, or forwarded to a remote management center.

One of the key differentiators of Symphony Plus for Solar is the capability to monitor and control plant and substation equipment using the IEC 61850 protocol. This enables ABB's solution to integrate generation and electrical components into a single information and control system. With the built in interlocking schemes, secure and easy operation of the protection equipment in the plant or at the grid, connection is achieved, from site or remote.

An ergonomic human-machine interface (HMI) designed by our scientists together with our customers facilitates immediate observations of field problems and enables fast operator reactions. The HMI allows operation of all plant equipment and increases effectiveness due to its real time update features.

Power management
The heart of the automation solution is the power plant controller that secures the grid code compliance and seamless integration of the plant into the grid. ABB Symphony Plus for Solar controls the power production of the plant according to grid codes applicable in the country where the plant is located. ABB's control solution for PV solar plants manages active and reactive power, power factor and also provides voltage and frequency control.

A high-performance controller is connected to all relevant actuators (inverters, tracking systems and – if applicable – capacitor banks, STATCOMs or energy storage), and performs real-time calculations to regulate the plant's power production in accordance with the specifications.

Power management features:
- Central plant controller coordinates all inverters and other actuators to achieve the required control procedure
- Provides power factor and voltage control at the point of connection to the utility grid
- Controls the ramp rate of power production according to specifications in grid codes
- Limits power production of the plant according to required setpoint
- Accounts for outages and scheduled maintenance of the inverters.

Remote monitoring and asset management
Plant owners need to minimize O&M costs by quickly identifying underperforming components, use predictive maintenance to reduce downtime, extend equipment life cycles and evaluate the impact of equipment failure. They also require speedy access to service engineers and product experts.

ABB automation solution support these requirements through following features:
- Alarms and notifications
- Dynamic presentation of collected data
- Predictive maintenance
- Production and performance cockpits reporting and ticketing system security.

String combiners for solar photovoltaic systems

A plug-and-play solution for photovoltaic solar installations

—
01 String combiners range
—
02 1500V DC string combiner with monitoring

In a photovoltaic system the modules are arranged in strings and fields depending on the type of inverter used, the total power and the technical characteristics of the modules. The connection of modules in series is made on the modules themselves, while the parallel connection of the strings is made inside string boxes that accommodate, along with the interconnection systems, also the overcurrent protection devices, disconnectors and surge protection devices. The string boxes form subsystems that can be standardized according to the number of strings, voltage and rated current. ABB offers different product ranges, each dedicated to specific installation conditions with typical configurations.

String boxes without monitoring
The installation of a photovoltaic system often occurs in complex logistic situations, critical from the environmental and time perspective. The availability of tested and certified pre-assembled components allows the installer to avoid unnecessary on-site assembly, wiring and certification activities for the string boxes. String boxes enclose functions such as string protection, protection against overvoltage and disconnect, with components suitable for the string's various voltage levels and the number of connected strings.

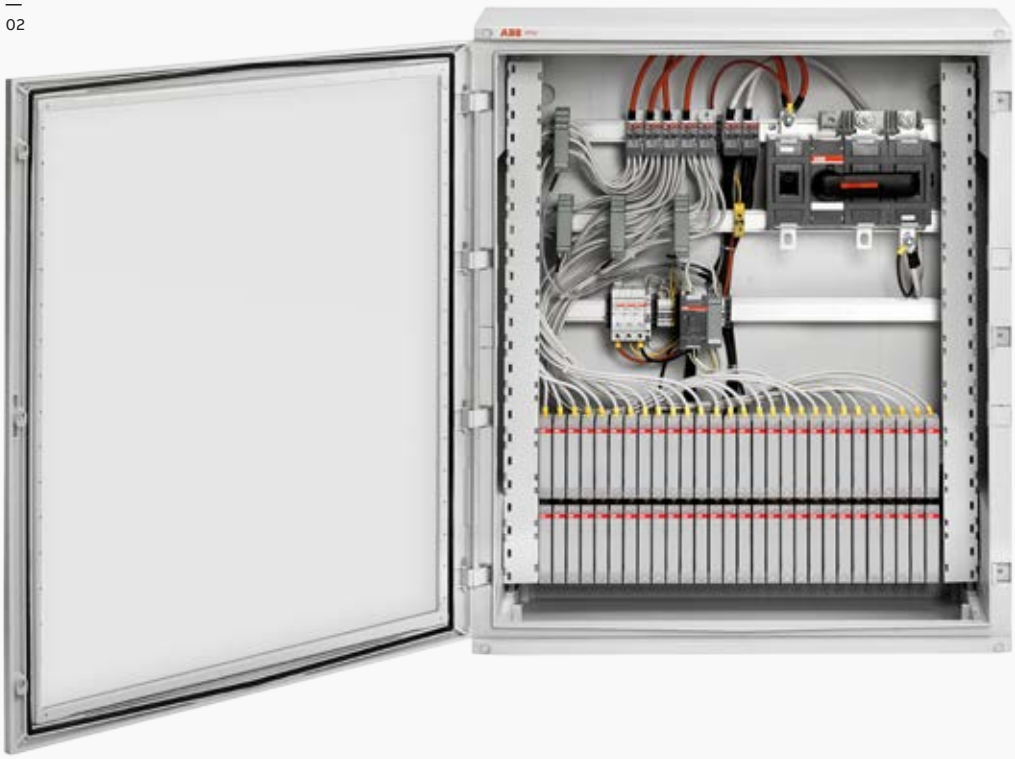
String boxes with monitoring
The string monitoring is an important function in running medium and large size installations, since it allows to improve the efficiency and maintenance of the system. ABB offers a series of pre-wired string boxes for all installation conditions: they are equipped both with devices necessary for string protection, surge protection and disconnection, and with components for string current and monitoring as standard. Optionally we can also integrate to measure voltage inside the combiners.

Design, production, quality and service
An essential factor in determining the success of a photovoltaic system is the accurate selection of its components, with particular attention to connections, and protections from the modules to the inverters. As the photovoltaic system has to perform for more than 20 years in harsh environments, the products used should be considered of high quality and as a good investment for long lasting performance.

The string combiners are particularly important as they are usually installed under the photovoltaic panels and therefore exposed to the most harsh environment.

- ABB combiners host ABB components specifically made for photovoltaic applications, making it easy during maintenance to rely on one single producer and supplier, from components to the whole system.
- Capacity to deliver all over the world at your site.
- Comprehensive documentation for easy assembly at site.
- Service and support through ABB local sales organization worldwide.

01



02

Life cycle services for solar inverters
Strong expertise with local support

The services offered for ABB solar inverters span over the whole lifetime of the solar power plant. To support this ABB has developed a solar inverter life cycle management model aimed at providing proactive services to maximize availability and performance.
This model provides optimum support to end users over the whole lifetime of the solar power plant securing the value of solar power plant assets to the owner.

Pre-purchase
ABB pre-sales support helps our customers to select the right inverter and services for their applications. This ensures higher yield and performance of the entire system and compatibility with customer requirements.

Order and delivery
Orders can be placed through any ABB office, and spare parts can also be ordered online through the web. Our sales and service network offers timely deliveries worldwide.

Installation and commissioning
ABB certified engineers can advise or undertake the commissioning of the solar inverters and supervise the installation.

Operation and maintenance
ABB helps ensure a long lifetime for its solar inverters by providing on-site preventive maintenance. Preventive maintenance consists of annual inspections and component replacements according to specific maintenance schedules. Reconditioning provides more in-depth maintenance which is carried out at ABB's authorized service workshops. Reconditioning of the solar inverter includes full inspection, thorough cleaning, individual component analysis and replacement, and complete testing.

Upgrade and retrofit
We can advise on the latest hardware and software upgrades that can continue to maximize the performance of your solar inverters even if the grid codes change.

Life cycle model
The Life cycle model divides a product's life cycle into four phases: active, classic, limited and obsolete. Each phase has different implications for the end user in terms of services provided.

Benefits of life cycle management
Life cycle management maximizes the value of the solar inverter and its maintenance investments by:
- Ensuring spare parts and ABB competence availability throughout the lifetime
- Enabling efficient product support and maintenance for improved reliability
- Adding functionality to the initial product by upgrading or retrofitting
- Providing a smooth transition to new technology at the end of the product lifetime

The ABB service offering:
- ABB Service agreements
- Tailor-made Service contract
- Spares availability
- Training
- Technical support
- Extended warranties
- ABB global service network

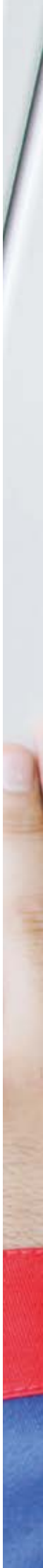



ABB
EMERGENCY

ABB solar inverters around the globe
Installed base over 26 GW

References

Bulgaria – Popeda
50.6 MWp
Power plant
1

Romania – Stanesti
7.5 MWp
Power plant
2

UK – Vine Farm
46 MWp
Power plant
3

Germany – ECOS 1&2
19.5 MWp
Power plant
4

Slovakia – Sirkovce
1 MWp
Power plant
5

Greece – Domokos
5.9 MW
Power plant
6

Italy – Celano
20 MW
Power plant
7

Finland – Kivikko
0.85 MWp
Commercial / industrial
8

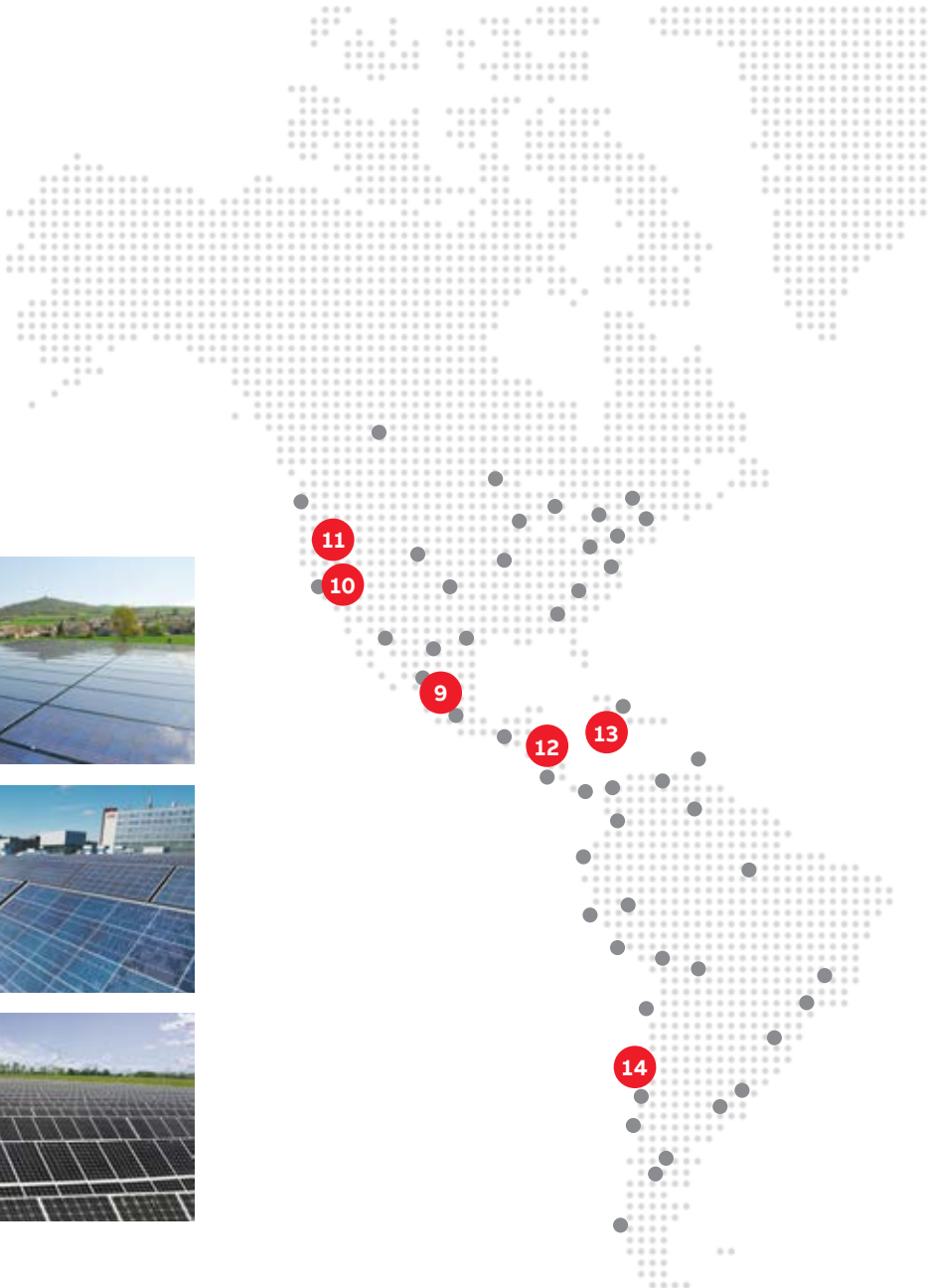
Mexico – San Luis Potosi
1.2 MWp
Commercial / industrial
9

US – California
215 MW
Power plant
10

US – Nevada
20 MW
Power plant
11

Honduras – Valle and Nacaome
146 MWp
Power plant
12

Sales and service offices



Jamaica
20 MW
Power plant
13

Chile
196 MW
Power plant
14

South Africa – Soutpan
30.9 MWp
Power plant
15

South Africa – Prieska
86 MWp
Power plant
16

Mauritius
15.2 MWp
Power plant
17

India – Mithapur
17 MW
Power plant
18

India – Mahagenco
125 MW
Power plant
19

Jordan – Mafraq
10 MW
Power Plant
20

Turkey – Kayseri OSB
51 MWp
Power plant
21

Russia – Buribaevsk
10 MWp
Power plant
22

China
10 MW
Power plant
23

Japan – Fukuroda
26 MW
Power plant
24

Philippines
14 MWp
Power plant
25

Thailand – Petchaburi
42 MW
Power plant
26

Australia – Sandfire
10 MW
Power plant, micro grid
27

Egypt – Toshka
10 MW
Power plant
28

ABB – your trusted solar inverter partner

The size, history, reputation, financial foundation, and product portfolio are key variables that influence the credibility of any company in the PV sector. As one of the largest engineering companies in the world, and a recognized leader in the power and automation technology business, ABB as a company has very strong credentials in all of these categories to fulfill the requirements of a trusted solar inverter partner.

Size, history and brand reputation
ABB has a truly international footprint, operating in over 100 countries worldwide and employing around 135,000 coworkers. It has a history of more than 120 years of technological leadership and a long and illustrious record of innovation in numerous industries. The ABB brand is today recognized as standing for quality, performance and innovation.

Financial strength and diversity
In terms of financial strength, the ABB group is very robust, with annual revenues of around $34 billion in 2016 and R&D investments of more than $1.3 billion annually. It is also a diversified company with four major divisions which are further structured into business units. This diversification means that ABB has many legs to stand on instead of being concentrated in only one business.

Complete product portfolio for PV market
ABB offers the PV business a complete product portfolio, with the exception of solar modules and module mounting systems. The product program includes solar inverters, low voltage products, transformers, switchgear and substations for medium and high voltage grid connection. ABB can also offer optimized packaged solutions to support variety of project and customer needs. On top of this, world-class plant automation and monitoring systems are also part of ABB's portfolio.

Global company with local presence
ABB as your partner can support you – our trusted partner – globally, where ever your project is, with expertise and a local presence. Together we can build a lasting success story for years to come.

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www.abb.com/solarinverters
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