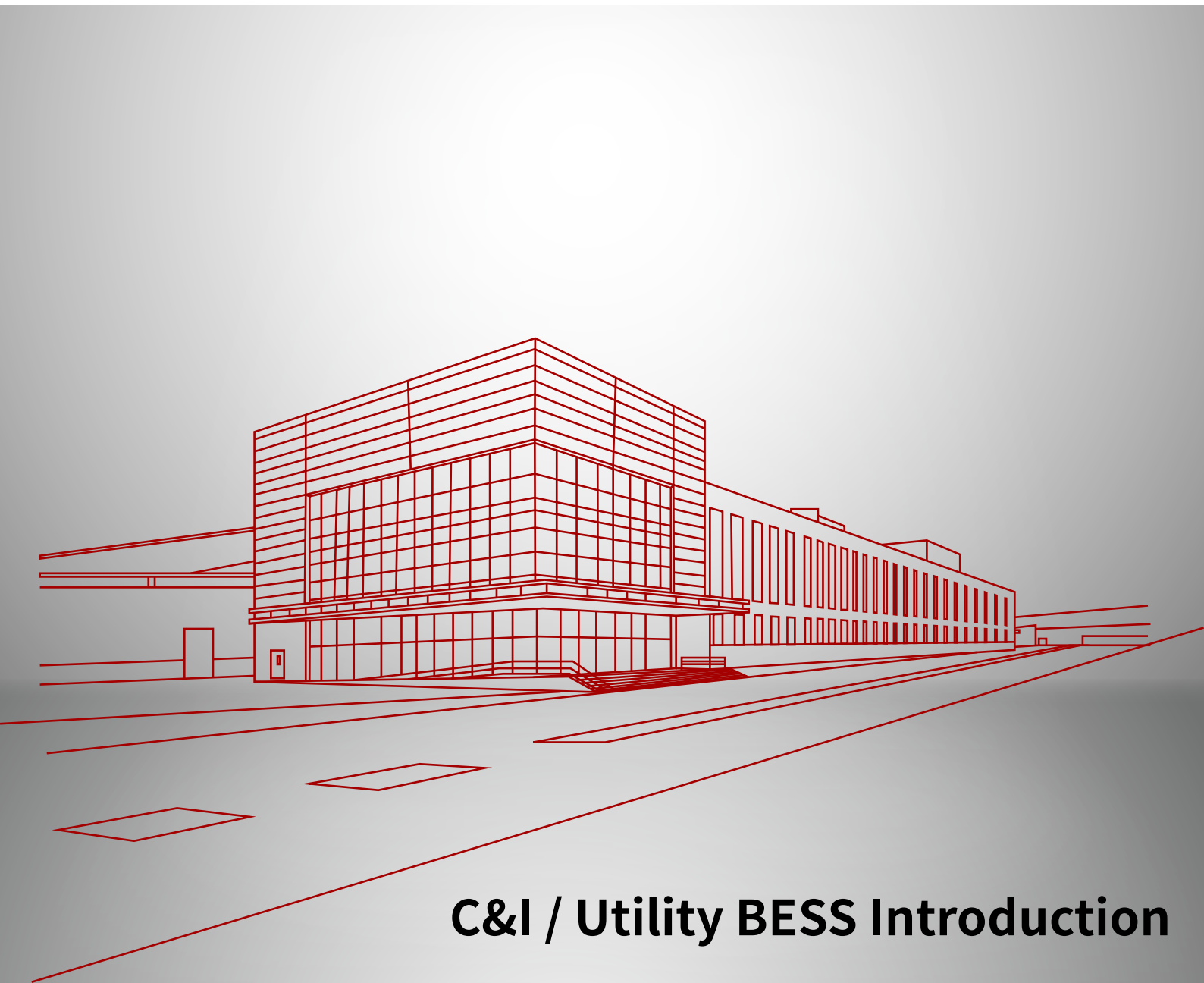




Matrix

Maximum Safety for Your Energy

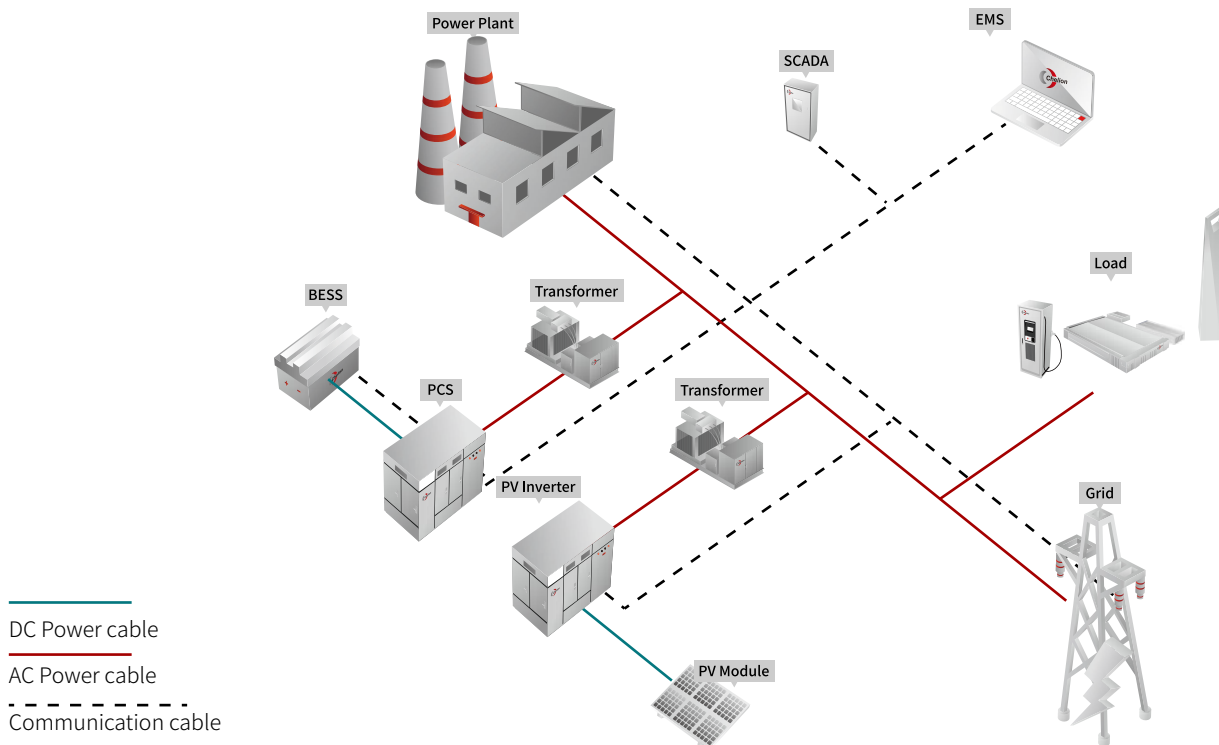


C&I / Utility BESS Introduction

Peak Shifting



Battery Energy Storage Systems (BESS) can store energy during valley time periods and discharge during peak periods. This function has multiple benefits including reducing peak demand from the grid and can compensate local transformer limits. BESS helps save construction and renovation costs of power transmission and distribution, benefiting economic operations.

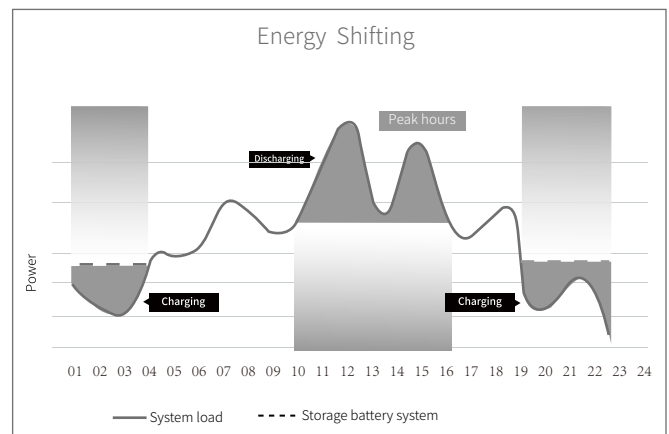


Application Scenarios

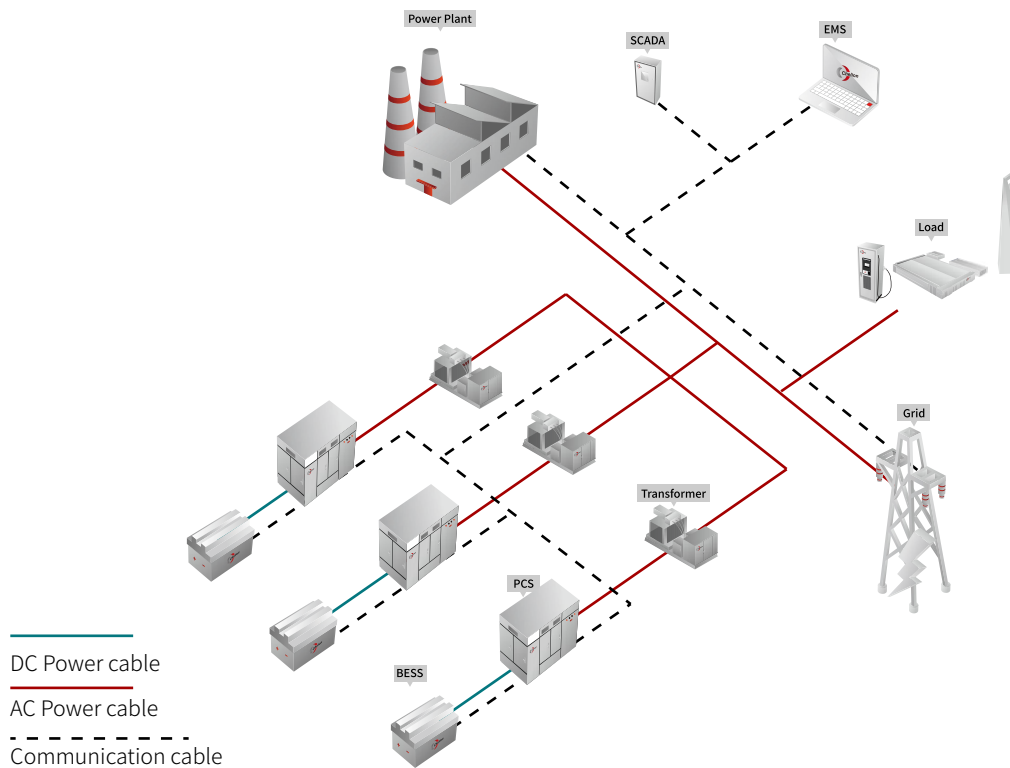
Utility power grids, commercial buildings,
industrial parks and other large consumers of electricity

Values to Customers

Significant savings of cost and peak demand charge.(C&I Customer)
Reduce operational cost of generating power during peak periods (Utilities)
Less frequent investment in infrastructure due to flatter loads with smaller peaks (Owner)



BESS has a fast regulation rate with high accuracy and a quick response time. BESS will be imperative to ensure that frequency regulating services be provided when required, meeting the charge/discharge requirements imposed on assets.

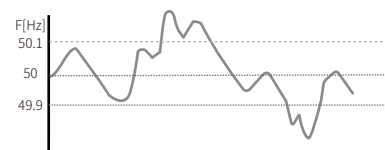


BESS installed in thermal power plants can improve the Automatic Generation Control (AGC) regulation performance of thermal power units to meet the frequency regulation requirements of power grids. BESS can also improve the deep adjustment capability of thermal power units to ensure safe and stable operation.

Application Scenarios

Utility power grids, thermal power plants with insufficient frequency and peak regulation capacity

Sequence diagram



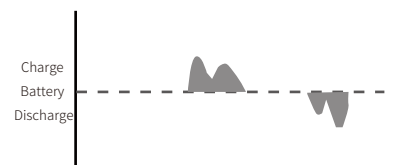
Charge battery from grid when the power abundant, Discharge battery to compensate power of grid and keep regular frequency.

Vaues to Customers

Obtain more benefits in the AGC market

Ensure system frequency stability via constant and reliable balance.

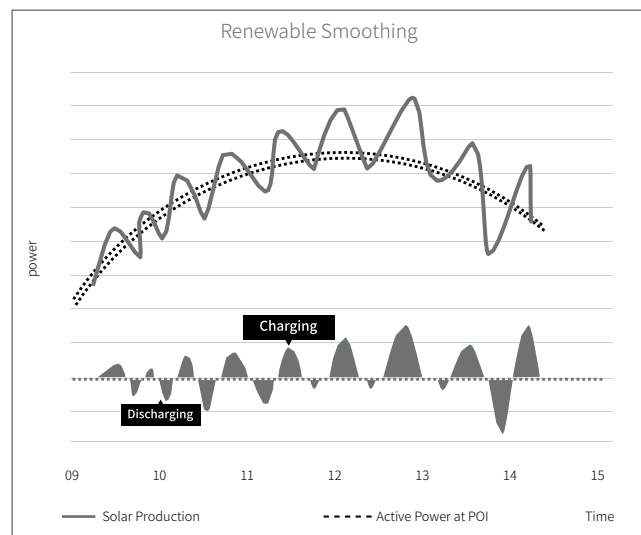
Reduce the investment of power generation, save costs and improve the life and performance of assets.



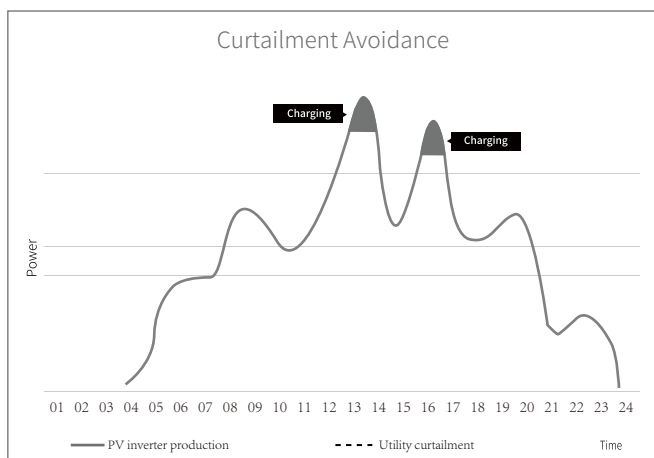
Renewable Integration



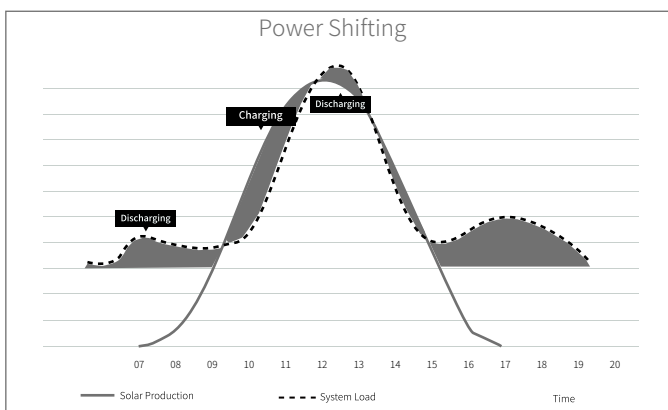
As wind and solar energy adoption continues to grow, power grids can be impacted by the intermittency of renewable sources. Incorporating a BESS is the most cost-effective method to safely and successfully integrate renewable energy. A BESS assists in smoothening the power supply and allows electricity to flow regardless of time and weather condition



Production of renewable energy may be curtailed by a grid operator for various reasons, such as increasing the stability of the network. At the same time, BESS allows excess renewable energy to be stored and delivered when needed.



BESS can shift the power generation from the PV system as energy demand fluctuates. It can store surplus PV energy during low-demand periods and discharge when needed. Energy shifting allows investors to maximize revenues from a PV plant, and enables higher DC/AC ratios for PV plants as well as time-variant grid injection



Integrating renewables brings more reliability and resiliency to the grid, as the systems can be used to manage short-term variability for voltage correction and frequency response services

PV plant and other renewable energy projects

Values to Customers

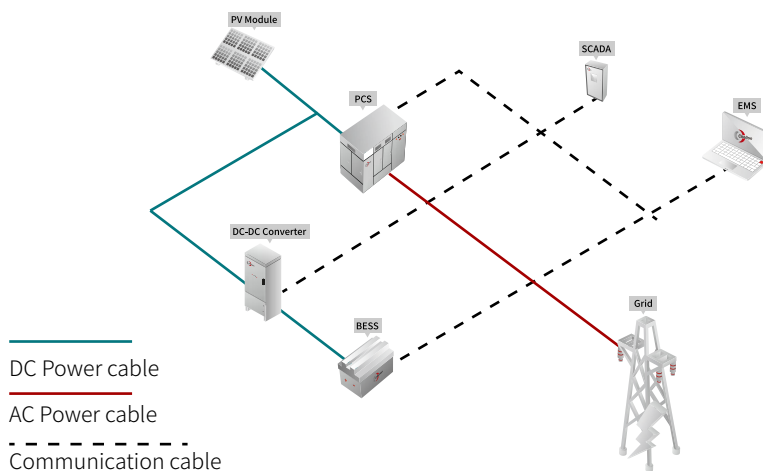
Realize renewable energy transfer and reduce inefficiencies

Reduce grid stress from the surge of renewable energy, expanding the renewable energy capacity credit

Reduce grid investment for renewable energy connections

Increase the prediction accuracy of power stations, maintaining safety and stability of the grid

Application Scheme



DC Coupled:

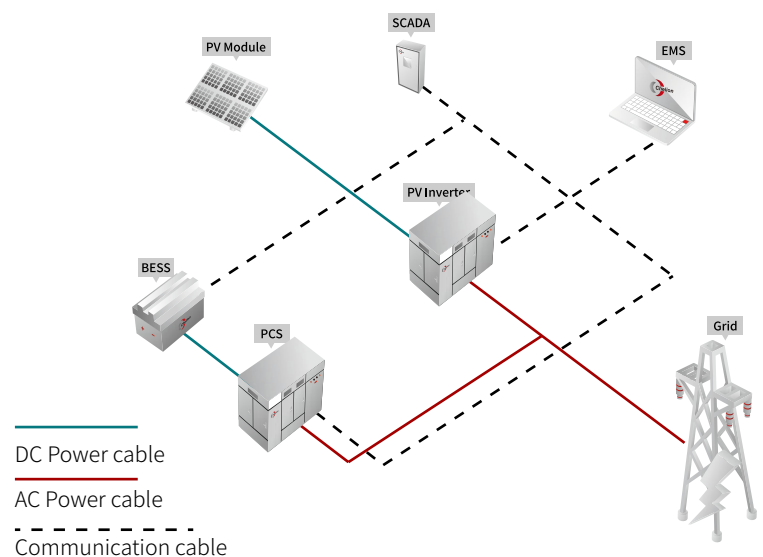
Batteries and PV modules share one inverter: PV inverter with a direct connection to PV modules and connection via DC-DC converter to batteries.

→ lower CAPEX due to less equipment

AC-Coupled:

Batteries and PV modules have their own inverters and can either share one point of connection (POC) or have separate POCs (a standalone ESS).

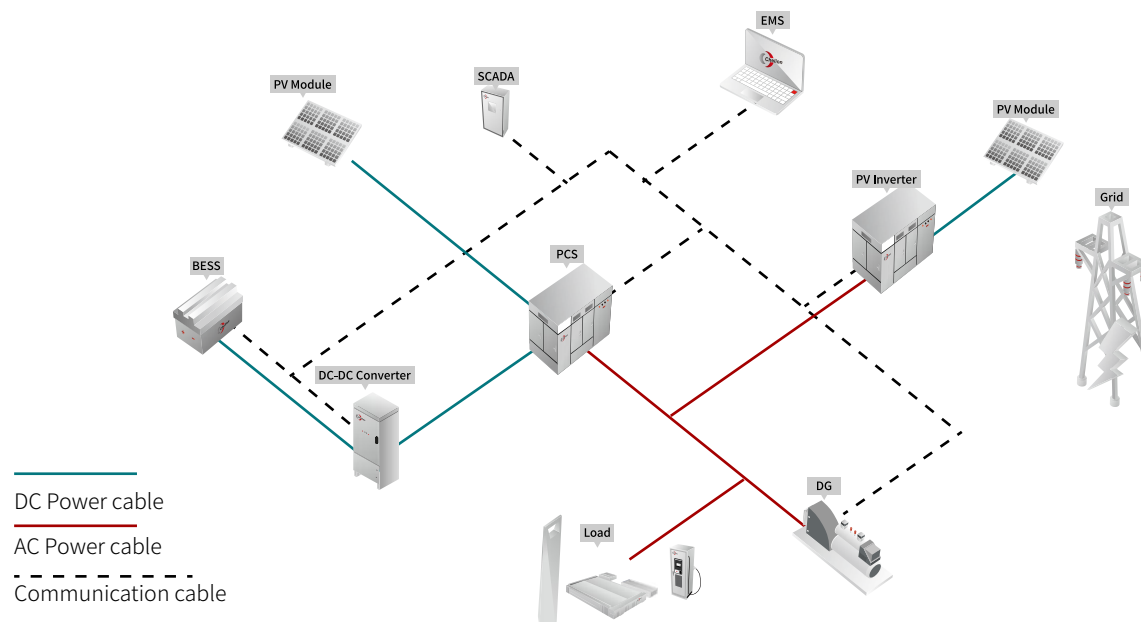
→ more operational flexibility



Microgrid



In a microgrid, using renewable energy and a BESS is the most suitable solution. When a BESS is used in a microgrid, it will greatly increase the safety and stability of the entire system, especially with off-grid operations. In addition, more renewable energies can be integrated to reduce fossil fuel consumption, optimize the power supply structure and balance the grid.



Application Scenarios

Business centers, communities, factories with multiple energy inputs and island operations

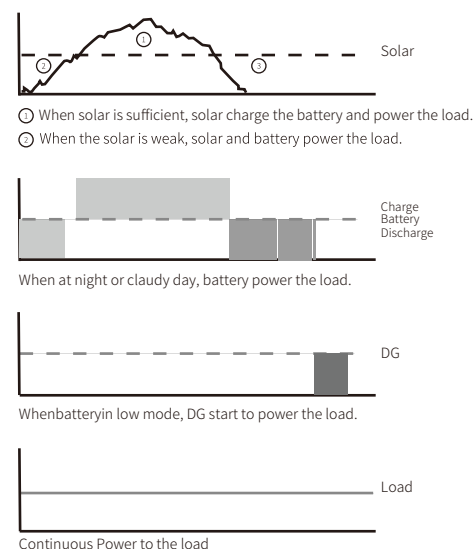
Values to Customers

Reduce electricity bills and costs of diesel generation via self-consumption of renewables

Allow diesel generators to be switched off when energy is being generated from renewables

Improve power supply reliability and overcome the grid outages more easily no matter planned or unplanned

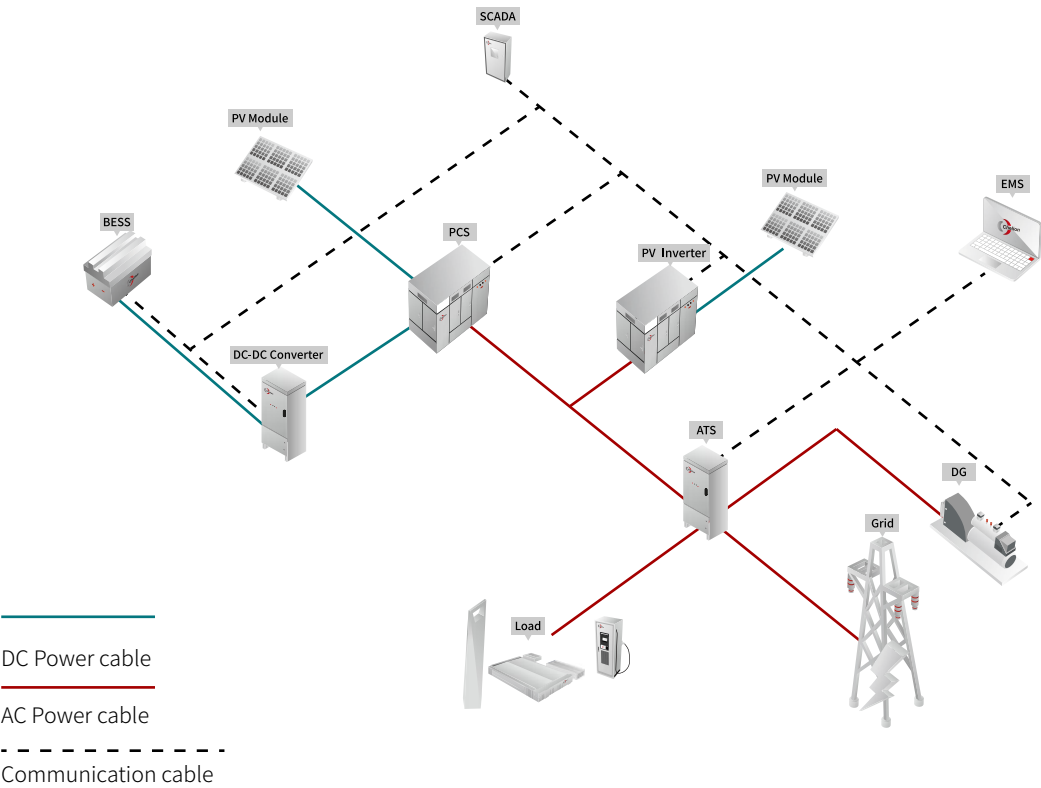
Green and sustainable source of energy



Backup or Off-Grid



BESS serve as an ideal backup for supplying power quickly and seamlessly, switching to off-grid mode in a very short time and perceiving an uninterrupted power supply. The black start function of a BESS system can provide support to the grid in case of an outage and improve power supply reliability

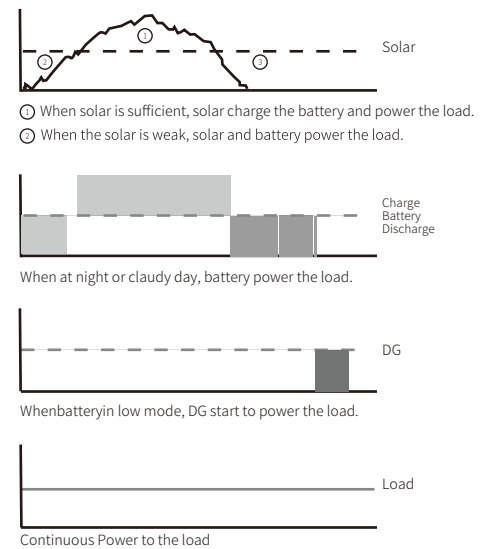


Application Scenarios

Utility power grids, critical loads, commercial buildings and industrial parks

Values to Customers

Backup energy, ensuring appliances and devices to work uninterruptedly and reduces economic losses associated with grid outages or disconnections.(Customers)
Black start capability, improving reliability of the grid (Utilities)





High Level Integration

Lithium iron phosphate battery (LFP) integrates with BMS, PDU, FFS, cooling unit, etc.

Integrated battery rack provides a convenient system for indoor and outdoor applications

Advanced integration ensures optimal system performance and lower costs



Efficient and Flexible

Modular design supports convenient installation, parallel connections and easy system expansions

Intelligent battery management system and cell-level temperature control ensures a high-level safety, efficiency, and a longer-lasting battery life cycle

Activates a vast number of business models. For instance, self-consumption, manage consumption peaks, backup or provide energy in other special use cases.



Safe and Reliable

Multi-state monitoring and actions ensure battery safety

DC electric circuit safety management includes fast breaking and anti-arc protection

A three-level management system design delivers high reliability

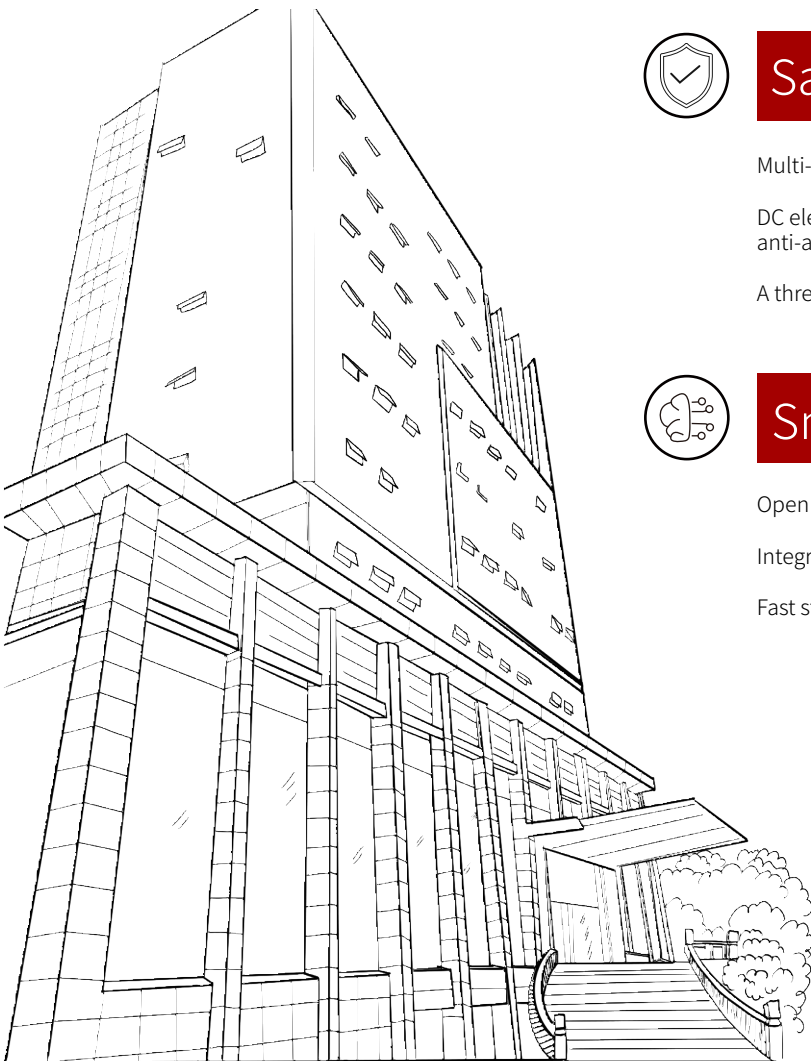


Smart and Friendly

Open battery interface ensures integration into any energy system

Integrated local controller enables single point communication interface

Fast state monitoring and faults recording enable pre-alarm and fault location



| PWS1-500KTL Power Conversion System



Features

Flexible Configuration

- 62.5kW to 500kW by 1 to 8 power modules.
- 3P3W AC output for 400/480/208/690 Vac interconnection

High Efficiency & Stability

- Maximum efficiency > 98.2%
- Multi-string technology for better battery safety and performance.

Extensive Use

- Multiple battery strings working independently allows energy expansion.
- Optional STS to achieve seamless switching between on/off grid

Compliance & Compatibility

- Compatible with various types of battery system.
- Global grid certified & listed

- Modular design and wide power range in single cabinet
- Bi-directional Power Conversion System
- Grid-support functions
- Multiple DC battery strings, different battery mixing application
- Flexible derating available

| Model | PWS1-500KTL-Mx | | | | | | | |
|-------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | PWS1-500KTL-EX-M8 | PWS1-500KTL-EX-M7 | PWS1-500KTL-EX-M6 | PWS1-500KTL-EX-M5 | PWS1-500KTL-EX-M4 | PWS1-500KTL-EX-M3 | PWS1-500KTL-EX-M2 | PWS1-500KTL-EX-M1 |

| | | | | | | | | |
|-----------------------|---|----------|----------|----------|--------|----------|----------|---------|
| Battery voltage range | 600~900V | | | | | | | |
| DC max current | 873A | 763A | 654A | 545A | 436A | 327A | 218A | 109A |
| AC voltage | 400Vac (3P3W) | | | | | | | |
| AC current | 720A | 630A | 540A | 450A | 360A | 270A | 180A | 90A |
| AC max current | 792A | 693A | 594A | 495A | 396A | 297A | 198A | 99A |
| Nominal power | 500kVA | 437.5kVA | 375kVA | 312.5kVA | 250kVA | 187.5kVA | 125kVA | 62.5kVA |
| AC max power | 550kVA | 481.2kVA | 412.5kVA | 343.8kVA | 275kVA | 205.2kVA | 137.5kVA | 68.7kVA |
| AC frequency | 50/60Hz(±2.5Hz) | | | | | | | |
| THDi | ≤3% | | | | | | | |
| AC PF | Listed: 0.8~1 leading or lagging (Controllable) | | | | | | | |
| | Actual: 0.1~1 leading or lagging (Controllable) | | | | | | | |

| | | | | | | | | |
|-----------------------|------------------|----------|----------|----------|--------|----------|----------|---------|
| Battery voltage range | 600~900V | | | | | | | |
| DC Max Current | 873A | 763A | 654A | 545A | 436A | 327A | 218A | 109A |
| AC voltage | 400Vac (3P3W) | | | | | | | |
| AC voltage range | 360~440V | | | | | | | |
| AC current | 720A | 630A | 540A | 450A | 360A | 270A | 180A | 90A |
| AC max current | 792A | 693A | 594A | 495A | 396A | 297A | 198A | 99A |
| Nominal power | 500kVA | 437.5kVA | 375kVA | 312.5kVA | 250kVA | 187.5kVA | 125kVA | 62.5kVA |
| AC max power | 550kVA | 481.2kVA | 412.5kVA | 343.8kVA | 275kVA | 205.2kVA | 137.5kVA | 68.7kVA |
| Output THDU | ≤2%（Linear load） | | | | | | | |

| | | | | | | | | |
|---------------------|--|--|--|--|--|--|--|--|
| AC frequency | 50/60Hz | | | | | | | |
| AC PF | Listed: 0.8~1 leading or lagging (Load-depend) | | | | | | | |
| | Actual: 0.1~1 leading or lagging (Load-depend) | | | | | | | |
| Overload Capability | 105%~115% 10min; | | | | | | | |
| | 115%~125% 1min; | | | | | | | |
| | 125%~150% 200ms | | | | | | | |

| | | | | | | | | |
|-------------------------------|---|-------|-------|-------|-------|-------|-------|-------|
| Physical | | | | | | | | |
| Cooling | Forced air cooling | | | | | | | |
| Noise | 70dB | | | | | | | |
| Enclosure | IP20 | | | | | | | |
| Max elevation | 3000m/10000feet (> 2000m/6500feet derating) | | | | | | | |
| Operating ambient temperature | -20°C to 50°C (De-rating over 45°C) | | | | | | | |
| Humidity | 0~95% (No condensing) | | | | | | | |
| Size (W×H×D) | 1100×2160×800mm | | | | | | | |
| Weight | 600Kg | 550Kg | 500Kg | 450Kg | 400Kg | 350Kg | 300Kg | 250Kg |
| Installation | Floor standing | | | | | | | |

| | | | | | | | | |
|--------------------------------|---|--|--|--|--|--|--|--|
| Other | | | | | | | | |
| Peak efficiency | 98.20% | | | | | | | |
| Protection | OTP, AC OVP/UVF, OFP/UFP, EPO, AC Phase Reverse, Fan/Relay Failure, OLP, GFDI, Anti-islanding | | | | | | | |
| Configurable protection limits | Upper/Lower AC Voltage/Frequency limit, Battery EOD voltage. | | | | | | | |
| AC connection | 3-Phase 3-Wire | | | | | | | |
| Display | Touch Screen | | | | | | | |
| Communication | RS485,CAN,Ethernet | | | | | | | |
| Isolation | Non-isolation | | | | | | | |
| Compatible | Battery: Lithium ion, Lead Acid, flywheel | | | | | | | |

Certifications and compliance

PWS1-500KTL-Mx and PWS1-500KTL-xM

CE

UNE 217002:2020

UNE 206007-1:2013 IN

EN 50549-1:2019

PWS1-500KTL-EX-M1 and PWS1-500KTL-EX-1M

UE 2016/631

PWS1-500KTL

CE

Outdoor Cabinet



Specification

| Physical | |
|-------------------------------|--|
| Cooling | Forced air cooling |
| Enclosure | NEMA3R / IP54 /C5(optional) |
| Operating ambient temperature | -20°C to 50°C |
| Humidity | 0~95% (No condensing) |
| Size (W×H×D) | 1500×2450×1150 mm /4.92×8.04×3.77ft |
| Weight | 450~500kg |
| Feature | |
| | |
| Connection | Bottom wiring or Side wiring |
| Compatible with | Sinexcel PWS1-500KTL |
| Installation | Floor standing, liftable by forklift |

Matrix CAIO Series



All In One design with a highly integrated ESS and a protective structural design for outdoor applications



Modular design that includes optional DC/DC converter, supporting DC coupling solution with ESS and PV

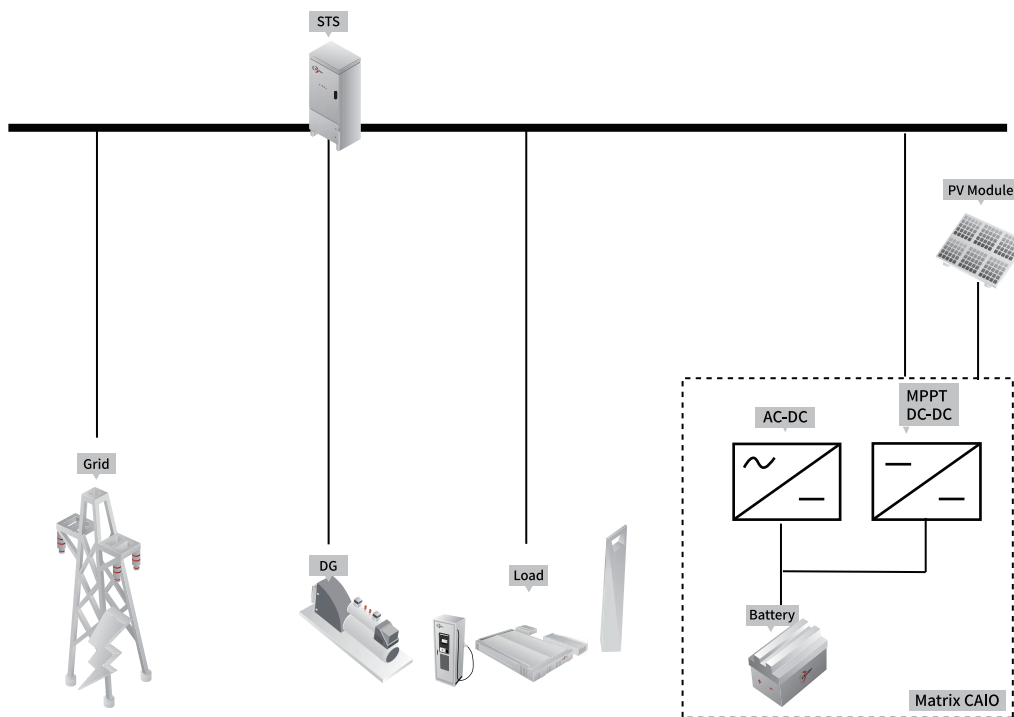


Three-level BMS structure guarantees highly efficient cooperation and safety performance



Easy on-site installation saves costs

Typical Application Diagram



Outdoor Cabinet ESS for micro-grid island, hotel, farm and other suitable applications

PCS Power optional power range: 30 - 60 kW

Battery optional capacity range: 62.51 - 96.61 kWh (28.42 - 56.83 kWh derated)

Matrix CAIO Series



| Battery Data | |
|--|--|
| Rated Energy (kWh) | 96.61 |
| Rated Voltage (V) | 652.8 |
| Operating Voltage (V) | 550.8~734.4 |
| Max. Operation Current (A) | 148 |
| Max. Battery Module Qty / Rack. | 17 |
| Battery Cell Type | Li-ion(LFP) |
| Round-trip Efficiency(@0.5C) | 0.95 |
| General Data | |
| Dimension (W*H*D mm) | 1450*2000*1100 |
| Weight(kg) | 590 |
| Enclosure Protection Rating | IP65 (battery room)+IP54 (PCS room) |
| Anti-Corrosion | C3 (Optional upgrade to C5) |
| Operation Temperature Range (°C) | -20 to +60 |
| Humidity | 0~95% or 5%~95% |
| Altitude(m) | <3000 |
| Cooling Concept (PCS Cabinet) | Forced Air Cooling |
| Cooling Concept (Battery Cabinet) | HVAC |
| Auxillary System Peak Power Requirement (kW) | 3.5 |
| Communication | Ethernet / Modbus TCP |
| Certification | PCS: CE / Battery: CE / IEC62619 / UN38.3 / UN3536 |
| On/Off Grid Switch | Optional STS module, switching time <20ms |
| AC Output Data / On-Grid Mode (Optional) | |
| Rated AC Power(kW) | 30 (Expandable to 2*30) |
| Rated AC Output Voltage (V) | 400 |
| Max. Apparent Power (kVA) | 33 (Expandable to 2*33) kVA |
| Rated AC Output Frequency (Hz) | 50 |
| Power Factor | Listed: 0.8~1 leading or lagging, actual: 0.1~1 leading or lagging |
| Max. THD of Current | ≤3% |
| Isolation Method | Transformerless |
| Rated Grid Voltage | 3W4P+PE, 400 (±15%) Vac |
| Peak Efficiency | 0.973 |
| AC Output Data / Off-Grid Mode (Optional) | |
| Rated AC Output Power (kW) | 30 (Expandable to 2*30) |
| Power Factor | Listed: 0.8~1 leading or lagging, actual: 0.1~1 leading or lagging |
| Overload Capacity | 110%~120%, 10 min; 120%~150%, 200 ms |

Matrix CA Series



Each battery cabinet contains 4 battery strings.
 Each battery cabinet is equipped with 2 sets of HVAC, 1 set of aerosol FPS
 0.25CP configures 3 kW air conditioner, 0.5CP configures 5kw air conditioner



Convenient installation and expansion, reducing on-site installation costs and commissioning time



Support back-to-back installation and side outlet, no need to preset cable trench / cable rack, reduce installation space



Comes with on-board transportation, reducing transportation and installation costs

| | |
|-----------------------------------|--|
| Rated Energy (kWh) | 532.4 |
| Usable Energy (kWh) | 521.8 |
| Rated Voltage (V) | 665.6 |
| Operating Voltage (V) | 582.4 ~ 748.8 |
| Round-trip Efficiency(@0.5C) | ≥94% |
| Dimension (W*D*H mm) | 2200*1400*2443 |
| Weight (kg) | 5800 |
| Max. Charge/Discharge Current (A) | 200 |
| Operating Temperature Range (°C) | -30 to +55 |
| Humidity | 5%~95% No condensing |
| Altitude(m) | ≤3000 |
| Communication | Ethernet / RS485 / CAN |
| Enclosure Protection Rating | IP54 / NEMA 3R |
| Rack Parallel Connection | Max. 16units (8 cabinets) in parallel (@0.25CP) |
| Certification | IEC62619 / UL1973 / RCM / CE EMC / FCC EN 61000-6-1 & EN61000-6-3 |
| Battery Cell Type | Li-ion (LFP) |
| Cooling | HVAC |

Parallel Application



Matrix UP Series



Modular design with different densities. Suitable for all scenarios.



A three-level battery management system design delivers high reliability



Open battery interface ensures integration into any energy system



Rack mounted or a container-based configuration



Advanced integration ensures optimal system performance and lower costs



Flexible voltage range, up to 1500VDC

Power Converter System

PCS model

PWS1-500KTL series

PCS power

62.5 * n kW (n=1,2,...,8) * n, units (n=1,2)

AC voltage

380V @ PCS, 480 or 400V @ AC interface

Battery Voltage Range

600 - 900 V

| | 20H-M2 | 40H-M2 |
|---------------------------------|--|--|
| Rated Energy(kWh) | 1432 / 1454 | 2983 / 3273 |
| Rated Voltage (V) | 806 / 1228 | 806 / 1228 |
| Voltage Range (V) | 680~907 / 1036~1382 | 680~907 / 1036~1382 |
| System Charge/Discharge Rate | 0.5C | 0.5C |
| Dimension (W*D*H mm) | 2462*6058*2896 | 2462*12192*2896 |
| Weight (Ton) | 18 | 35 |
| Operating Temperature Range(°C) | 10~40 | 10~40 |
| Humidity | 5%~95% (No condensing) | 5%~95% (No condensing) |
| Ambient Temperature (°C) | -20~50 | -20~50 |
| Altitude (m) | <4000m | <4000m |
| Enclosure Protection Rating | IP54 | IP54 |
| Battery Certification | IEC62619 / UN38.3 / CE / UL1642 / UL1973 / JIS C 8715-2 / UKCA / WEEE / REACH / RoHS | IEC62619 / UN38.3 / CE / UL1642 / UL1973 / JIS C 8715-2 / UKCA / WEEE / REACH / RoHS |
| Communication | Ethernet / CAN / RS485 | Ethernet / CAN / RS485 |
| Cooling | HVAC | HVAC |







LFP Lithium Ion Energy Storage System
Battery Module

PowerCube-M2A-180
HM2A180

Please contact us for the optional DC/DC converter and STS module. For certifications of the PWS1-500KTL series, please refer to Page 12.

Matrix UE Series



-  Liquid cooling technology with three-level anti-leakage design.
-  Highly integrated and supports back-to-back installation. Saves up to 34% floor space
-  Accurately thermal control over cells, increasing service life by up to 23%
-  Pre-installed design with no battery module handing on-site. Transportation and installation costs are reduced
-  Liquid cooling technology reduces auxiliary consumption by up to 50%
-  Complete FSS, ensuring system safety

| | |
|------------------------------------|--|
| Rated Energy(kWh) | 3727 |
| Rated Voltage (V) | 1331.2 |
| Voltage Range (V) | 1164.8~1497.6 |
| Charging/Discharging Power (0.25P) | 0.93MW |
| Dimension (W*D*H mm) | 2462*6058*2896 |
| Weight (Ton) | ~35 |
| Operating Temperature Range (°C) | -25 to +55 |
| Humidity | <95% No condensing |
| Storage Temperature(°C) | -40 to +60 |
| Altitude(m) | <4000 |
| Noise | <80dB winthin 1.2m |
| Enclosure Protection Rating | ISO 12944, C3~C5 |
| Certification | IEC 62477/EN IEC 61000-6-2/EN IEC 61000-6-4/IEC 62619/IEC 62933-5-2/IEC 63056/ UL 1973/ UL 9540A/ CE/ UN3536 |
| Communication | Ethernet / CAN / RS485 |
| Cooling | Liquid: 50% Ethylene glycol aqueous solution |
| Auxiliary power supply (0.25P) | Voltage Range: 3 Phase AC 380V...480V, 50/60Hz, Maximum Power: 36.3kW@25°C |