

## **Appendix D-2 – BESS Equipment Specifications**

| <b>Battery Equipment Data Sheets</b> |   |
|--------------------------------------|---|
| General Electric                     |   |
| 1)                                   | GE Energy Storage Flex Reservoir Energy Storage System      |
| 2)                                   | GE Renewable Hybrids Flex Reservoir Energy Storage Unit RSU |
| 3)                                   | LV5+ Energy Storage Power Station Data Sheet                |
| Powin                                |   |
| 1)                                   | Powin Enclosure Product Line                                |
| 2)                                   | Powin Stacks Product Line                                   |



# GE ENERGY STORAGE FLEX RESERVOIR ENERGY STORAGE SYSTEM

MODULAR, SCALABLE ENERGY STORAGE SOLUTION  
FOR UTILITY-SCALE APPLICATIONS

| PRODUCT DATA*                     | UNITS              | GE FLEX RESERVOIR ENERGY STORAGE SYSTEM  |                   |  |                 |
|-----------------------------------|--------------------|--|-------------------|--|-----------------|
| Baseline Configurations           |                    |  |                   |  |                 |
| DC Block Components               |                    | Inverter: 20' ISO Reservoir Inverter Unit (RU) including Iso Transformer                   |                   | Battery: 20' ISO Reservoir Storage Unit, Batteries Preloaded |                 |
| Nameplate Power                   | MW AC, Usable      | 3+ MW (per block)  |                   |  |                 |
| Nameplate Energy                  | MWh AC Usable      | 12+ MWh (per block)  |                   |  |                 |
| Form Factor                       |                    | 4 hr: 4-5 RSU per RIU  |                   |  |                 |
| DC Block Footprint                | M <sup>2</sup>     | 200 (unstacked)  |                   |  |                 |
| Key Features                      |                    |  |                   |  |                 |
| Roundtrip Efficiency              | %, with Aux        | 85   |                   |  |                 |
| Auxiliary Load                    | % of Nameplate kVA | ≤1.5 Typical   |                   |  |                 |
| System Response Time              | ms                 | ≤250   |                   |  |                 |
| Grid Frequency                    | Hz                 | 50 / 60  |                   |  |                 |
| Self Discharge Rate               | %/month            | ≤5   |                   |  |                 |
| Availability                      | %                  | ≥98  |                   |  |                 |
| Elevation                         | m, no derating     | ≤2000  |                   |  |                 |
| Reactive Power                    |                    | 0.9 leading/0.9 lagging, Four Quadrant, Over full MW range                                 |                   |  |                 |
| Seismic                           |                    | IEEE 693-2005 (Include IBC Zone IV California), IEC 60068                                  |                   |  |                 |
| Design Life                       | Years              | 25 years (with Battery Augmentation)   |                   |  |                 |
| Performance Guarantees            |                    | Capacity / Round Trip Efficiency / Availability  |                   |  |                 |
| Battery Cycle Life                | cycles             | >20 years at 1 cycle per day, most conditions  |                   |  |                 |
| Operating Temperature             | C                  | -20 to +45 (-40 with kit; +50C with derate)  |                   |  |                 |
| Standards†                        |                    | UL 1741,IEC 62109,UN38.3,UL1973,CE,UL 9540, NFPA 855 (optional)                            |                   |  |                 |
| Operation & Controls              |                    |  |                   |  |                 |
| System Services                   |                    | Schedule Dispatch  | Ramp Rate Control | Frequency Response   | Voltage Control |
|                                   |                    | Remote P   | Peak Management   | Frequency Regulation   | Back Up         |
|                                   |                    | Remote Q   | Power Firming     | Power Factor Control   | Line Drop       |
| Advanced Functionality            |                    | Solar/Wind/Thermal Hybrid  |                   |  |                 |
| Plant Controller                  |                    | GE Proprietary Mark VIe Triple Redundant Platform available, Local HMI, Full SCADA capable |                   |  |                 |
| Controls Interface                |                    | Modbus Serial, TCP, DNP3   |                   |  |                 |
| Remote Monitoring and Diagnostics |                    | Optional   |                   |  |                 |

\* The values provided in this document are indicative based upon assumed nominal operating conditions. Contact GE for application specific data and system sizing.

† As of October 2020. Full list of certifications and compliance standards available upon request.

[www.ge.com/renewableenergy/hybrid/battery-energy-storage](http://www.ge.com/renewableenergy/hybrid/battery-energy-storage)

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# GE RENEWABLE HYBRIDS FLEX RESERVOIR ENERGY STORAGE UNIT RSU

MODULAR, SCALABLE ENERGY STORAGE SOLUTION  
FOR UTILITY-SCALE APPLICATIONS

| PRODUCT DATA*                                   | UNITS             | ENERGY STORAGE UNIT RSU                                   |
|---|-------------------|---|
| Nameplate Energy Capacity                       | kWh <sub>DC</sub> | 2839  |
| Maximum Power                                   | kW <sub>DC</sub>  | 710   |
| Maximum DC Current (Container Busbar)           | A                 | 600   |
| DC PARAMETERS                                   |                   |   |
| Battery Management System                       |                   | GE Blade Protection Unit (BPU)                            |
| Compatible Inverters                            |                   | GE LV5+ BESS  |
| Inverter Connections                            |                   | 1   |
| Augmentation Option for Lifecycle Management    |                   | Yes   |
| Design Life                                     | Years             | 25  |
| BATTERY INFORMATION                             |                   |   |
| Battery Chemistry                               |                   | Lithium Ion / LFP   |
| Continuous Discharge Rate; Pulse Discharge Rate | CP                | ≤C/4  |
| Voltage Class                                   | V                 | 1500  |
| Nominal DC Voltage                              | V                 | 1300  |
| Minimum DC Voltage                              | V                 | 986   |
| MECHANICAL INFORMATION                          |                   |   |
| Dimensions (L x W x H)                          | mm                | 6058 X 2438 X 2896  |
| Package Format                                  |                   | 20' High-Cube ISO (Exterior Access)                       |
| Fully Integrated HVAC                           |                   | Dual Self-Contained High Efficiency Units                 |
| Fire Suppression                                |                   | Stat-X (Aerosol)  |
| Installation                                    |                   | Pad / Pier (additional options available)                 |
| Cable Entry                                     |                   | Top   |
| NEMA Rating / IP Class                          |                   | NEMA 3R / IP 54   |
| DESIGN CONDITIONS                               |                   |   |
| Operating Temperature Range                     | °C                | -20 (-40 w/ optional equipment package) to +50            |
| Maximum Altitude                                | m                 | 2000  |
| Seismic   |                   | IEEE 693-2005 (Include IBC Zone IV California), IEC 60068 |
| Audible Noise (at 3m)                           | dBA               | <70   |
| CERTIFICATIONS & COMPLIANCE                     |                   |   |
| Certifications <sup>†</sup>                     |                   | UL: 9540 (9540A tested), 1973, 1741; UN38.3; CE; EMC      |
| Compliance <sup>†</sup>                         |                   | NFPA 70; IEEE C37.32; IEC: 62933, 62619, 60204; ASTM4169  |

\* The values provided in this document are indicative based upon assumed nominal operating conditions. Contact GE for application specific data and system sizing.

<sup>†</sup>As of Q1 2021. Full list of certifications and compliance standards available upon request.

[www.ge.com/renewableenergy/hybrid/battery-energy-storage](http://www.ge.com/renewableenergy/hybrid/battery-energy-storage)

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# LV5<sup>+</sup> Energy Storage Power Station Data Sheet



GE's LV5<sup>+</sup> Energy Storage Power Station combines GE Renewable Energy's LV5<sup>+</sup> 1500V inverter, with medium voltage power transformer, optional MV Ring Main Unit (RMU), and various options for a reliable, plug & play, factory integrated power conversion solution for energy storage applications.

The LV5<sup>+</sup> Energy Storage Power Station is GE's latest evolution in power electronics. Building on expertise in the renewables industry, GE now offers its latest power conversion technology for efficient, cost effective and dispatchable power.

## LV5<sup>+</sup> Energy Storage Power Station Features:

- UL or IEC compliant configurations
- 3.0 - 3.9 MVA output power
- High efficiency
- Air-cooled system
- Plug & play
- Night time disconnect option
- Direct outdoor installation
- Standard 20ft container for optimized logistics and installation
- Fibre-optic SCADA interface
- Digital ready

## 1. LV5<sup>+</sup> 1500V Energy Storage Power Station Data

| Specifications  | Units | LV5 <sup>+</sup> -1560-ESS<br>Power Station  | LV5 <sup>+</sup> -1563-ESS<br>Power Station | LV5 <sup>+</sup> -1566-ESS<br>Power Station | LV5 <sup>+</sup> -1569-ESS<br>Power Station |
|---|-------|--|---|---|---|
| Input Data  |       |  |   |   |   |
| DC Voltage Range <sup>1</sup>   | Vdc   | 853 - 1300   | 895 - 1300                                  | 938 - 1300                                  | 980 - 1300                                  |
| Max Permissible DC Voltage  | Vdc   | 1500   |   |   |   |
| Max Continuous DC Current (at 40°C / 50°C)                                    | Adc   | 4000 / 3200  |   |   |   |
| Max DC Short Circuit Interrupt Rating   | Adc   | 250 kA for 30 ms   |   |   |   |
| Number of DC Inputs   |       | Direct busbar connection or up to 48 conductors per pole, bottom or side entry available |   |   |   |
| Output Data - Medium Voltage  |       |  |   |   |   |
| Transformer HV / LV Connection  |       | Δ (Delta) / Y (Wye)  |   |   |   |
| Transformer Efficiency  | %     | 98.8 (Standard) / 99.1 (Option)  |   |   |   |
| Active AC Output Power Discharging (PF=0.92) <sup>2</sup><br>(at 40°C / 50°C) | MW    | 3.08 / 2.73  | 3.23 / 2.87                                 | 3.40 / 3.00                                 | 3.54 / 3.14                                 |
| Active AC Output Power Charging (PF=0.985) <sup>2</sup><br>(at 40°C / 50°C)   | MW    | 2.55 / 2.26  | 2.67 / 2.38                                 | 2.82 / 2.48                                 | 2.93 / 2.61                                 |
| AC Output Voltage (+10% / -10%) <sup>3</sup>                                  | kVac  | 22 / 33 / 34.5   |   |   |   |
| Rated Current HV Winding Discharging Mode (at 50°C)                           | Aac   | 72 / 52 / 50   | 82 / 55 / 52                                | 86 / 57 / 55                                | 90 / 60 / 57                                |
| Rated Current HV Winding Discharging Mode (at 40°C)                           | Aac   | 88 / 59 / 56   | 92 / 61 / 59                                | 97 / 65 / 62                                | 101 / 68 / 65                               |
| Rated Current HV Winding Charging Mode (at 50°C)                              | Aac   | 59 / 40 / 38   | 63 / 42 / 40                                | 65 / 44 / 42                                | 68 / 46 / 44                                |
| Rated Current HV Winding Charging Mode (at 40°C)                              | Aac   | 68 / 45 / 43   | 71 / 48 / 46                                | 75 / 50 / 48                                | 78 / 52 / 50                                |
| Grid Frequency ±5%  | Hz    | 50 / 60  |   |   |   |
| Power Factor (PF) Range   |       | 0 to 1 leading & lagging for charging and discharging modes <sup>3</sup>                 |   |   |   |
| Current Harmonic Distortion (TDD)   | %     | <3   |   |   |   |
| Medium Voltage Cable  |       | Designed for 630mm <sup>2</sup> / 1250 MCM max   |   |   |   |
| Efficiency & Auxiliary Power  |       |  |   |   |   |
| System Efficiency Discharging (Max / EU / CEC) <sup>4</sup>                   | %     | 97.8 / 97.6 / 97.7   |   |   |   |
| Inverter Efficiency Discharging (Max / EU / CEC) <sup>5</sup>                 | %     | 98.9 / 98.6 / 98.7   |   |   |   |
| Nighttime Aux Power <sup>6</sup>  | W     | 700  |   |   |   |
| Interfaces  |       |  |   |   |   |
| Plant Control Interface / PLC   |       | Modbus TCP, OPCUA, EGD   |   |   |   |
| Programming / Diagnostic Interface  |       | Modbus TCP, OPCUA  |   |   |   |
| Extra Analog and Digital I/O  |       | Option   |   |   |   |
| Features and Options  |       |  |   |   |   |
| Cooling   |       | Air Cooled   |   |   |   |
| Emergency Shut Down   |       | Included   |   |   |   |

| Specifications                                 | Units     | LV5 <sup>+</sup> -1560-ESS<br>Power Station                        | LV5 <sup>+</sup> -1563-ESS<br>Power Station | LV5 <sup>+</sup> -1566-ESS<br>Power Station | LV5 <sup>+</sup> -1569-ESS<br>Power Station |
|--|-----------|--|---|---|---|
| Mounting Options                               |           | Piers / Pad  |   |   |   |
| Array Configurations Supported                 |           | Floating   |   |   |   |
| Nighttime Transformer Disconnect               |           | Option   |   |   |   |
| Insulation Monitoring                          |           | Option   |   |   |   |
| Power Disconnect AC Side                       |           | Motorized AC Circuit Breaker                                       |   |   |   |
| Switch-Disconnect DC Side                      |           | Motorized DC Switch  |   |   |   |
| Overvoltage Protection, DC and AC              |           | Included – IEC 61643-1 Class II / UL 1449                          |   |   |   |
| Main Power Transformer Oil Type                |           | Mineral - ONAN (Standard) / Biodegradable - KNAN (Option)          |   |   |   |
| Oil Containment                                |           | Option   |   |   |   |
| Aux Power / Customer Loads                     |           | Option (up to 45 kVA)  |   |   |   |
| Door Interlocking System                       |           | Option   |   |   |   |
| Weather Station                                |           | Option   |   |   |   |
| Noise <sup>7</sup>                             | dBa       | <75  |   |   |   |
| Weight   | kg / lbs  | approx. 17000 / 37480  |   |   |   |
| Dimensions (L x W x H)                         | m / ft    | 6.1 x 2.4 x 2.9 / 20 x 8 x 9.5                                     |   |   |   |
| Protection Rating and Ambient Conditions       |           |  |   |   |   |
| Operating Temperature Range                    | °C / °F   | Standard -10 to +55 / +14 to +131, Option -25 to +55 / -13 to +131 |   |   |   |
| Storage Temperature Range                      | °C / °F   | -40 to +65 / -40 to +149   |   |   |   |
| Cold Weather Option <sup>8</sup>               | °C / °F   | Down to -35 / -31  |   |   |   |
| Humidity                                       | %         | 5-100 (rated for outdoor installation)                             |   |   |   |
| Maximum Altitude without Derating <sup>9</sup> | m / ft    | 1000 / 3281  |   |   |   |
| Seismic  |           | Zone 2B ASCE 7 / IBC   |   |   |   |
| Maximum Wind Speed <sup>10</sup>               | kph / mph | 250 / 155  |   |   |   |
| Snow Load                                      |           | ASCE 7   |   |   |   |
| IP Class / NEMA Rating                         |           | IP 54 / NEMA 3R (Inverter & RMU)<br>IP 24 / NEMA 3 (Transformer)   |   |   |   |
| Standards                                      |           |  |   |   |   |
| Electromagnetic Compatibility (EMC)            |           | EN 61000-6-2, 62920 / CISPR 11                                     |   |   |   |
| Certifications                                 |           | IEC, CE, UL 1741 SA  |   |   |   |

<sup>1</sup> At nominal AC voltage. Additional active power limitations in case of line overvoltage apply (reactive power injection to control AC voltage).

<sup>2</sup> Active power is valid for the cited PF range up to 40°C and grid voltage ≥ nominal voltage

<sup>3</sup> Derating will apply according to PQ curves

<sup>4</sup> Preliminary, includes auxiliary power losses

<sup>5</sup> Preliminary, excludes auxiliary power losses

<sup>6</sup> No heating, no cooling, without environmental controls enabled, DC link de-energized and without transformer no load losses

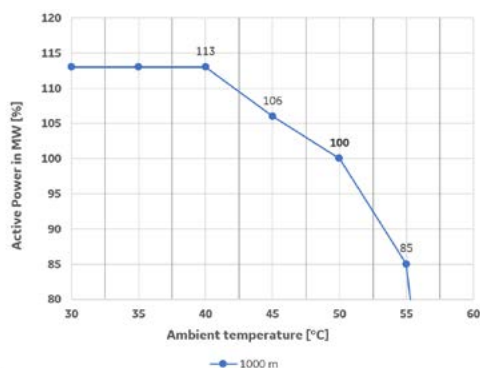
<sup>7</sup> At 10m in front of enclosure and 1m up from the ground

<sup>8</sup> Cold weather option on request

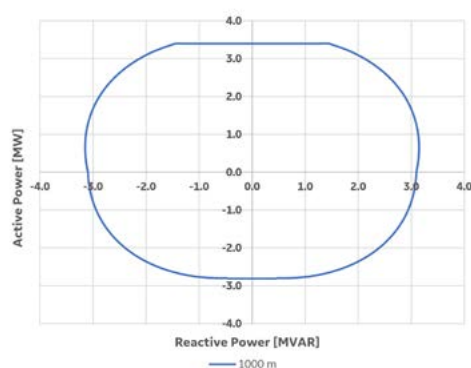
<sup>9</sup> Higher altitudes (with derating) on request

<sup>10</sup> Maximum wind speed without derating 81 kph / 50 mph

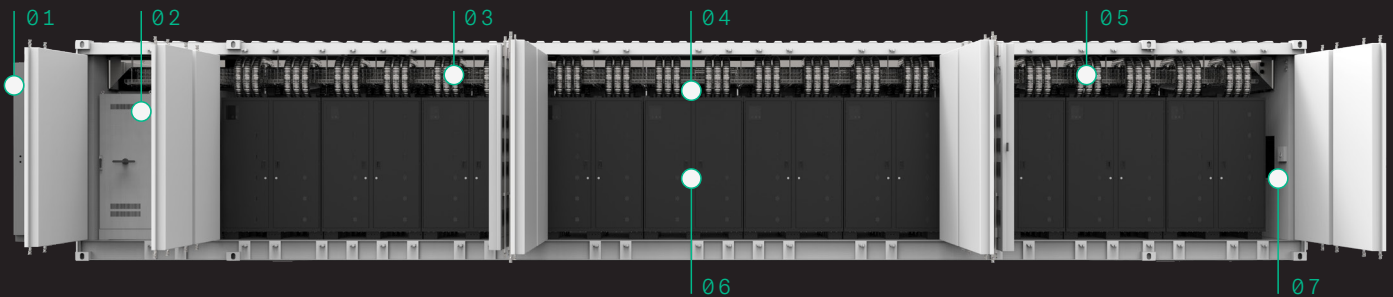
## 2. Power/ Temperature Derating Curve <sup>11</sup> & Sample PQ Diagram <sup>12</sup>



<sup>11</sup> Applicable for grid voltage ≥ nominal voltage, altitudes >1000m on request



<sup>12</sup> PQ diagram for LV5+ 1563 at nominal grid voltage, 1150 Vdc and 40°C ambient



01. One Wall mounted HVAC unit installed on each end of the enclosure

02. Powin Control Room: DC Disconnect Cabinet, AC Load Panel, HVAC Controls, Fire Detection, Hydrogen Detection, Comms and Controls

03. Pre-integrated Cable Tray that collects the DC Cable, AC Cable and Comms to each Stack

04. Fire Suppression Canisters strategically placed above each grouping of Stacks

05. Cold HVAC Air is ducted directly to the intake fans of each Stack

06. Up to 20 Stacks in a 53' Enclosure

07. Optional deflagration vent installed on every enclosure

Powin's cost effective smart enclosures are a scalable purpose-built battery solution that includes all of the balance of system (BOS) equipment that can be modified to meet local Authority Having Jurisdiction (AHJ) requirements. The thermal management of this enclosure has been meticulously designed through air ducting and HVAC, providing an optimal temperature controlled environment for the battery enabling deployment in many different geographical climate types. Powin Smart Enclosures come in 40' and 53' sizes.

### FULLY INTEGRATED

- Up to 20 Stack230s or 14 Stack360s per enclosure in parallel
- Powin's patented StackOS integrated Battery Management and Energy Management Platform
- HVAC & forced air with ducting that directly targets the stacks
- Fire suppression system that also provides detection and monitoring
- AC breaker panel for coms and aux loads
- DC Collection, cable and tray
- IP 54 rated
- Insulation options for hot and cold climates
- Isolation, and over current and fault protection
- Minimal on site installation requirements

### COMMUNICATION CABINET

- Full state of awareness monitoring for fire suppression/HVAC/inverter and transformer status/E stop/UPS aux
- Switch
- Router
- UPS – Control
- Linux computer
- HMI
- Controls interface can connect to any SCADA system



|                      |   | 40' ENCLOSURE  |                | 53' ENCLOSURE           |                |                         |                |
|----------------------|---|--|----------------|-------------------------|----------------|-------------------------|----------------|
|                      |   | STACK230P  | STACK230E      | STACK230P               | STACK230E      | STACK360P               | STACK360E      |
| Electrical           | DC Voltage  | 760 - 937 V  |                | 760 - 937 V             |                | 1193 - 1470 V           |                |
|                      | Duration  | 1.5+ hrs   | 3+ hrs         | 1.5+ hrs                | 3+ hrs         | 1.5+ hrs                | 3+ hrs         |
|                      | Maximum DC Energy Capacity                                    | 3,188 kWh  | 3,257 kWh      | 4,554 kWh               | 4,652 kWh      | 4,990 kWh               | 5,029 kWh      |
|                      | Rated DC Power  | 2,100 kW   | 805 kW         | 2,850 kW                | 1,150 kW       | 3,304 kW                | 1,260 kW       |
|                      | DC Energy Capacity @ Rated Power <sup>1, 2</sup>              | 3,119 kWh  | 3,229 kWh      | 4,455 kWh               | 4,613 kW       | 4,920 kWh               | 5,031 kWh      |
|                      | Duration @ Rated Power  | 1.5 hrs  | 4 hrs          | 1.5 hrs                 | 4 hrs          | 1.5 hrs                 | 4 hrs          |
|                      | Aux Load per Enclosure (Standby / Peak) <sup>3</sup>          | 1.5 kW / 63 kW   | 1.5 kW / 52 kW | 2.0 kW / 69 kW          | 2.1 kW / 59 kW | 2.0 kW / 92 kW          | 2.7 kW / 65 kW |
|                      | Daily Aux Energy per Enclosure <sup>4, 5</sup>                | 167 - 196 kWh  | 152 - 186 kWh  | 181 - 215 kWh           | 211 - 240 kWh  | 192 - 242 kWh           | 234 - 263 kWh  |
|                      | Daily Aux Energy per Enclosure, Net of Balancing <sup>5</sup> | 124 - 153 kWh  | 124 - 158 kWh  | 143 - 177 kWh           | 149 - 178 kWh  | 150 - 200 kWh           | 142 - 171 kWh  |
| Performance & Safety | DC Round Trip Efficiency @ Rated Power                        | 92%  | 94%            | 92%                     | 94%            | 92%                     | 94%            |
|                      | Energy Density  | 9.96 kWh/ft²   | 10.18 kWh/ft²  | 10.74 kWh/ft²           | 10.97 kWh/ft²  | 11.77 kWh/ft²           | 11.86 kWh/ft²  |
|                      | Battery Chemistry   | Lithium Iron Phosphate (LFP)   |                |                         |                |                         |                |
|                      | Cycle Life  | 3,650 - 7,300 cycles   |                |                         |                |                         |                |
|                      | Calendar Life   | 15 - 20 years  |                |                         |                |                         |                |
|                      | Explosion Prevention & Mitigation <sup>6</sup>                | Hydrogen detection with redundant active ventilation; deflagration panels optional                   |                |                         |                |                         |                |
|                      | Fire Suppression  | Clean agent fire suppression system with UPS backup, strobes, horn, and FDC dry standpipe connection |                |                         |                |                         |                |
|                      | Heating & Cooling   | Dual forced air HVAC with thermostat, humidity control, & economizer                                 |                |                         |                |                         |                |
|                      | Codes & Compliance <sup>7</sup>                               | NFPA 855, NFPA 68/69, UL 1973  |                |                         |                |                         |                |
|                      | Max Number of Stacks  | 14   |                | 19                      | 20             | 14                      |                |
|                      | Weight (Approximate)  | 90,500 lbs (41,050 kg)   |                | 126,415 lbs (57,461 kg) |                | 136,315 lbs (61,691 kg) |                |
|                      | Enclosure Dimensions  | 40' L x 8' W x 9'6" H  |                | 53' L x 8' W x 9'6" H   |                |                         |                |
|                      | Enclosure Type / Rating                                       | NEMA 3R / IP54   |                |                         |                |                         |                |
|                      | Ambient Operating Temperature Range                           | -10 - 50° C  |                |                         |                |                         |                |
| Software             | BMS + EMS + Solar + Environmental Controls                    | StackOS™   |                |                         |                |                         |                |
|                      | Reporting + Optimization + Data Warehouse                     | StackOS+™  |                |                         |                |                         |                |
|                      | First Responder HMI   | Powin for First Responders™  |                |                         |                |                         |                |
|                      | Communications Interface                                      | Modbus TCP (MESA/Sunspec) & REST API   |                |                         |                |                         |                |

1 Energy capacity is recorded at the DC bus and varies by use case; contact Powin for an accurate estimate

2 DC Energy Capacity for 3-hr applications: Stack230E = 3160 kWh (40 ft) | 4514 kWh (53 ft) &amp; Stack360E = 4948 kWh (53 ft)

3 Peak values are atypical and assume maximum active cell balancing current within a Stack

4 Includes recoverable active balancing energy during charge/discharge

5 Assumes 1 full cycle per day; accounts for Stack-level and enclosure-level loads, including HVAC

6 Deflagration panels not required for NFPA 855 compliance

7 Current and expected





## BATTERY ENERGY STORAGE SYSTEM



### PRODUCT LINE: **Powin Stacks**

Powin Stacks are modular, flexible, purpose-built battery arrays that are easily and cost-effectively scalable from kilowatts to megawatts. Powin's patented StackOS™ — the only seamlessly integrated EMS and BMS platform in the energy storage industry — comes installed in every Stack module. This cutting-edge battery system utilizes LFP cell technology, minimizing system footprint while maintaining a high level of safety. Powin Stacks can perform a full spectrum of advanced applications to fulfill today's energy storage requirements, and are flexible enough to support future use cases as markets change.

#### StackOS™ SOFTWARE PLATFORM

##### **Stack230 & Stack360**

- Specially designed for stationary storage applications
- Can be flexibly scaled to accommodate any energy need
- Optional Energy Management System for intelligent battery dispatch
- Controls interface can connect directly to any SCADA system
- Range of converter options available depending on application and best possible price
- Battery pack design can utilize cylindrical or prismatic cells
- Available in indoor & outdoor configurations

##### **StackOS™ CONTROLS**

- A dynamic energy management system that can serve myriad revenue streams simultaneously.
- Provides behind and in-front-of-the-meter applications that can optimize cell-level and balancing awareness, all observable through Powin and/or customer NOCs.
- Can be configured with 3rd party EMS allowing customers to still enjoy Powin's industry leading cell fidelity, global monitoring, deep analytics and advanced balancing function.
- Advanced applications include primary response to react to grid conditions, firming to forecast, peak shaving, PV smoothing, demand response and microgrid support.
- MESA 802 / SunSpec 103 & 123 compliant.

##### **StackOS™ BATTERY MANAGEMENT & SAFETY**

- Unprecedented depth of real-time battery system monitoring down to the cell level
- Patented battery management system aggregates battery data collected from Stacks for reporting to other systems, such as the EMS.
- 3-levels of control executing balancing configurations for health & safety among battery strings, packs and cells.
- Uses a distributed intelligence approach to build its battery system control hierarchy.
- Ensures that DC components of the system operate within safe margins and core battery reporting is performed correctly.
- Includes a standardized API Modbus TCP and MESA 802/SunSpec for compliance.

|   |   | STACK230P  |              | STACK230E    |              | STACK360P  |  | STACK360E    |              |
|---|---|--|--------------|--------------|--------------|--|--|--------------|--------------|
| Electrical  | DC Voltage                                      | 760 - 937 V  |              |              |              | 1193 - 1470 V  |  |              |              |
|   | Duration  | 1.5+ hrs   |              | 3+ hrs       |              | 1.5+ hrs   |  | 3+ hrs       |              |
|   | Maximum DC Energy Capacity                      | 230 kWh  |              | 235 kWh      |              | 360 kWh  |  | 365 kWh      |              |
|   | Rated DC Power                                  | 150 kW   |              | 58.3 kW      |              | 236 kW   |  | 90.8 kW      |              |
|   | DC Energy Capacity @ Rated Power <sup>1,2</sup> | 225 kWh  |              | 233kWh       |              | 355 kWh  |  | 363 kWh      |              |
|   | Duration @ Rated Power                          | 1.5 hrs  |              | 4 hrs        |              | 1.5 hrs  |  | 4 hrs        |              |
|   | Aux Load per Stack (Standby/Peak) <sup>3</sup>  | 84 W / 1,221 W   |              |              |              | 168 W / 2,045 W  |  |              |              |
|   | Daily Aux Energy per Stack <sup>4, 5</sup>      | 7.0 kWh  |              | 8.8 kWh      |              | 10.2 kWh   |  | 13 kWh       |              |
| Daily Aux Energy per Stack, Net of Balancing <sup>5</sup> | 5 - 6 kWh                                       |  |              |              | 6 - 7 kWh    |  |  |              |              |
| Performance & Safety                                      | Cycle Life <sup>6</sup>                         | 4,745 cycles   | 6,789 cycles | 7,300 cycles | 7,300 cycles | 4,745 cycles   |  | 7,300 cycles | 7,300 cycles |
|   | Calendar Life                                   | 20 years   |              |              |              | 20 years   |  |              |              |
|   | Cell Model                                      | EVE LF280L   | CATL CB2W0   | EVE LF280L   | CATL CB310   | EVE LF280L   |  | EVE LF280L   | CATL CB310   |
|   | DC Round Trip Efficiency @ Rated Power          | 93%  |              | 95%          |              | 93%  |  | 95%          |              |
|   | Cell Chemistry                                  | Lithium Iron Phosphate (LFP)                               |              |              |              |  |  |              |              |
|   | Cell Operating Temperature Range <sup>7</sup>   | 20 - 35° C   |              |              |              |  |  |              |              |
|   | Depth of Discharge                              | 100%   |              |              |              |  |  |              |              |
|   | Codes & Compliance <sup>8</sup>                 | UL9540A, UL1973, UN3480, UN38.3                            |              |              |              |  |  |              |              |
| Mechanical  | Weight (Approximate)                            | 5,000 lbs (2,273 kg)                                       |              |              |              | 7,500 lbs (3,409 kg)                                       |  |              |              |
|   | Enclosure Dimensions                            | 4'4" W x 3'2" D x 6'5" H<br>(1,321 mm x 965 mm x 1,956 mm) |              |              |              | 6'2" W x 3'2" D x 6'5" H<br>(1,880 mm x 965 mm x 1,956 mm) |  |              |              |
|   | Enclosure Type / Rating                         | NEMA 1 / IP20  |              |              |              |  |  |              |              |
|   | Ambient Operating Temperature Range             | -10° C to +45° C   |              |              |              |  |  |              |              |
| Software  | BMS + EMS + Solar + Environmental Controls      | StackOS™   |              |              |              |  |  |              |              |
|   | Reporting + Optimization + Data Warehouse       | StackOS+™  |              |              |              |  |  |              |              |
|   | First Responder HMI                             | Powin for First Responders™                                |              |              |              |  |  |              |              |
|   | Communications Interface                        | Modbus TCP (MESA/Sunspec) & REST API                       |              |              |              |  |  |              |              |

1 Energy capacity is recorded at the DC bus and varies by use case; contact Powin for an accurate estimate

2 Power / Energy for 3-hr applications: Stack230E = 77 kW / 231 kWh & Stack360E = 120.3 kW / 361 kWh

3 Peak values are atypical and assume maximum active cell balancing current within a Stack

4 Includes recoverable active balancing energy during charge / discharge

5 Assumes 1 full cycle per day; includes Stack-level fans but not HVAC

6 Assumes 1 full cycle per day and includes calendar aging for the day;  
cycle EOL SoH: EVE LF280L = 60.9% (1.5hrs+) or 60.9% (3hrs+), CATL CB2W0 = 60.9%, CATL CB310 = 66.6%

7 HVAC designed to maintain all cells near 25° C; full operating range 5 - 45° C; power derated at low temperatures

8 Current and expected

| <b>Power Conversion Systems Data Sheets</b> |   |
|---|---|
| Power Electronics                           |   |
| 1)  | HEM Dry Transformer Technical Characteristics |
| 2)  | Power Electronics Inverter Information        |
| SMA   |   |
| 1)  | Sunny Central Storage 2200 US -2900 US        |
| TMEIC                                       |   |
| 1)  | Solar Ware Ninja Data Sheet                   |
| 2)  | PQ Curve for BSH-L25000GR                     |
| 3)  | PQ Curve for BSU-Lo640GR                      |

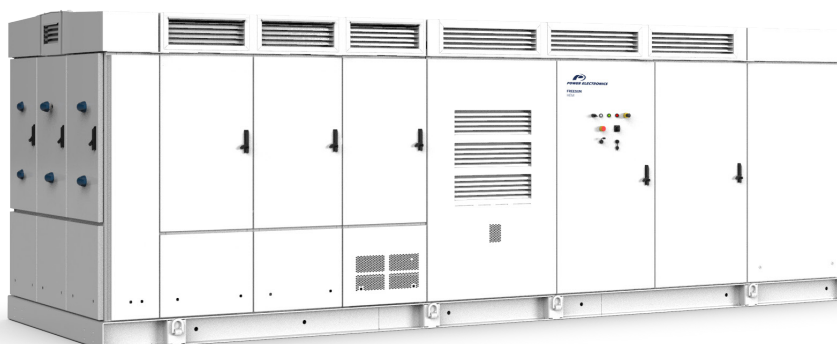
# HEM DRY TRANSFORMER

## TECHNICAL CHARACTERISTICS

|                                | PRIMARY WINDING | SECONDARY WINDING |
|--------------------------------|-----------------|-------------------|
| No. of phases                  | 3               | 3                 |
| Rating AF @50°C (kVA)          | 3510            | 3510              |
| Rating AF @40°C (kVA)          | 3630            | 3630              |
| Rated voltages (no load) (kV)  | 34,5 ±10%       | 0,66              |
| Connections                    | Delta           | Wye               |
| Maximum system voltage (kV)    | 34,5            | 2,5               |
| Power frequency withstand (kV) | 70              | 10                |
| Basic impulse level (kV)       | 150             | 20                |
| Winding material               | Aluminium       | Aluminium         |
| Type of insulation             | Encapsulated    | Impregnated       |
| Insulation temperature class   | H               | H                 |
| Temperature rise (°C)          | 115             | 115               |

### ELECTRICAL AND MECHANICAL PARAMETERS

|                                     |                |
|-------------------------------------|----------------|
| Reference Standards                 | IEEE C57.12.01 |
| No-load losses (kW)                 | 8 +15% tol.    |
| Load losses @120°C (kW)             | 27,5 +15% tol. |
| Impedance voltage (%)               | 8,5 ±7,5% tol. |
| Vector group                        | Dy1            |
| Frequency (Hz)                      | 60             |
| Cooling                             | AF             |
| Ambient temperature (°C)            | 50°C           |
| Environmental, climatic, fire class | E2C2F1         |
| Temperature sensors                 | PT100          |



## Inverter Information



### Inverter Selection

|                                 |         |
|---------------------------------|---------|
| Inverter Series:                | PCSK    |
| Inverter Output AC Voltage (V): | 530     |
| Inverter Model:                 | FP2820K |



Operating Window: 750 - 1310Vdc

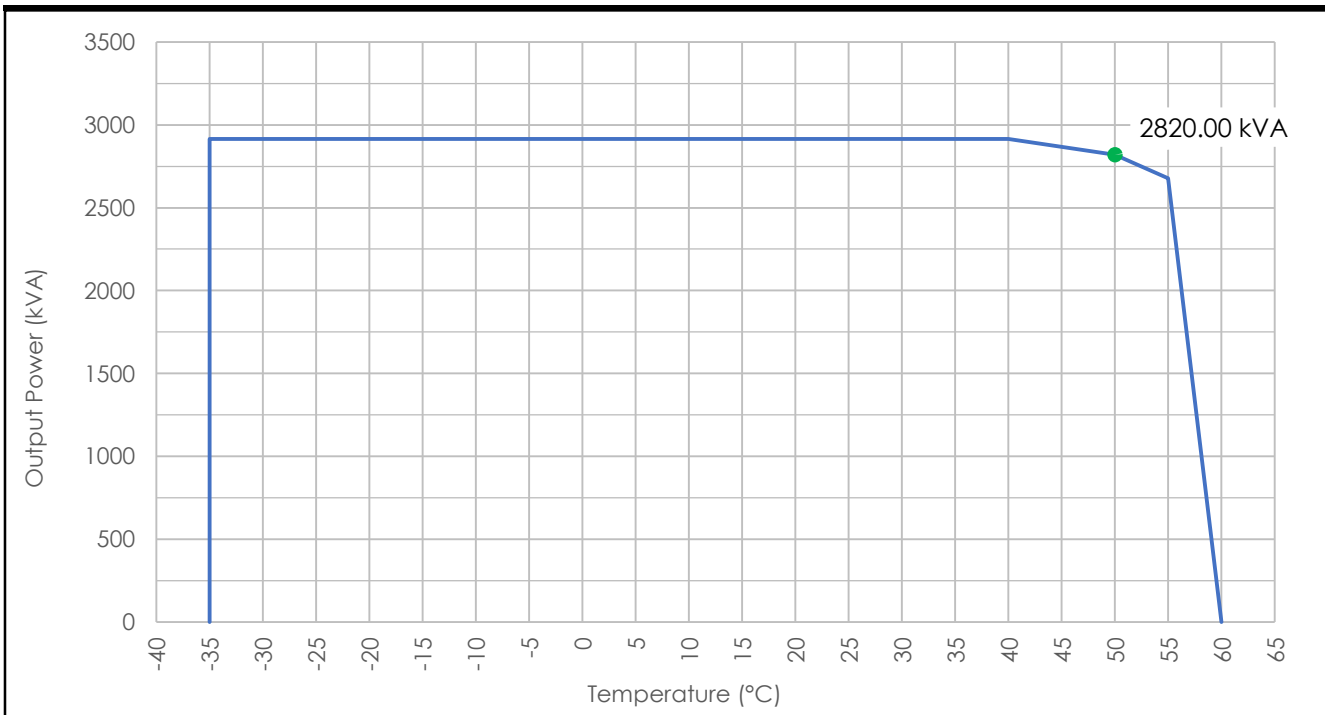
### Nominal Ratings

|  |         |                              |
|--|---------|------------------------------|
| Inverter Maximum Output Power (kVA):   | 2915.00 | @ 25°C                       |
| Inverter Nameplate Output Power (kVA): | 2915.00 | @ 40°C, Per NEC 2017   691.2 |
| Inverter Nominal Output Power (kVA):   | 2820.00 | @ 50°C                       |

### Site Information

|  |         |                                       |
|--|---------|---------------------------------------|
| Maximum Site Design Temperature (°C) : | 50.00   | ✓                                     |
| Inverter Maximum Output Power (kVA):   | 2820.00 | @ 50°C                                |
| Active Power Curtailment (kW):         |         | (Protected output limit)              |
| Apparent Power Curtailment (kVA):      |         | (Protected output limit)              |
| Terminal Voltage (Vpu-ac):             | 1.00    | ✓ Default: 1.00   Range: 0.85 to 1.15 |

### Temperature Derating Curve: PCSK - FP2820K



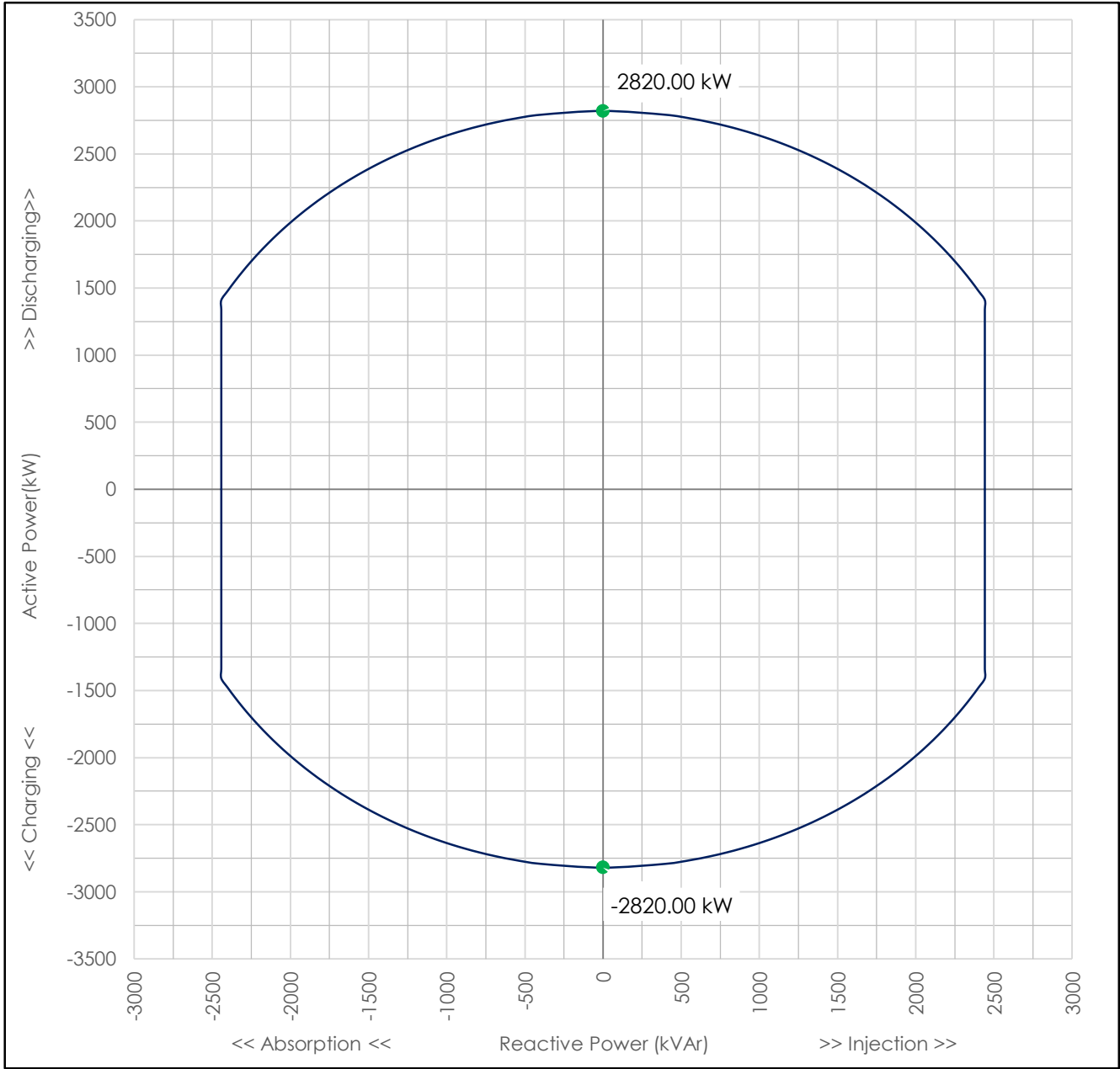
kVA vs. Temperature curve shown at nominal Vac.

Inverter Information



PQ Capability: PCSK - FP2820K @ 50.0°C & 1.00Vpu

Max Output: 2820 kVA (PF range: +0.5, -0.5)



# SUNNY CENTRAL STORAGE

2200-US / 2475-US / 2500-EV-US / 2750-EV-US / 2900-US



## Efficient

- High power density
- Max. efficiency is 98.7%
- Lower transportation costs (up to 4 inverters in a standard shipping container)

## Robust

- Proven OptiCool™ technology for intelligent, effective cooling
- Can be installed worldwide outdoors in any ambient condition

## Flexible

- Conforms to all relevant grid requirements worldwide
- Four quadrant operation for full reactive power support
- Stand-alone device or a medium-voltage block solution

## Versatile

- Integrated battery communication
- Customized monitoring and control of inverters
- Grid management functions for dynamic grid support
- Integrated voltage supply for internal consumption and external loads

## SUNNY CENTRAL STORAGE

**2200-US / 2475-US / 2500-EV-US / 2750-EV-US / 2900-US**

A full power class lineup for 1,000 and 1,500 V applications

Grid-connected storage systems enable the integration of large amounts of intermittent renewable energy into the utility grid while ensuring maximum grid stability. The Sunny Central Storage is the central component of the SMA system solution for integration of large-scale storage systems. It is designed to compensate for fluctuations in solar energy generation and offers comprehensive grid management services such as automatic frequency control. The battery inverter is optimized for continuous operation at nominal load and temperature of  $-25^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . Thanks to its wide DC voltage range, it is compatible with various types of battery technologies. The Sunny Central Storage is also available as a medium-voltage block solution.



# SUNNY CENTRAL STORAGE

## 2200-US / 2475-US / 2900-US

| Technical Data  | SCS 2200-US  | SCS 2475-US             | SCS 2900-US            |
|---|--|-------------------------|------------------------|
| Battery side (DC)   |  |                         |                        |
| DC Voltage range (at 25°C / at 50°C) <sup>1)</sup>  | 570 V to 950 V / 950 V   | 634 V to 1000 V / 1000V | 740 V to 950 V / 850V  |
| Minimal / Maximal DC voltage  | 545 V / 1000 V <sup>2)</sup>   | 614 V / 1000 V          | 720 V / 1000 V         |
| Max. DC current (at 25°C / at 50°C)   | 3960 A / 3600 A  |                         | 4110 A / 3600 A        |
| Max. interruption current capability <sup>3)</sup>  | 6400 A   |                         |                        |
| Number of DC cables per polarity  | 26   |                         |                        |
| Grid side (AC)  |  |                         |                        |
| Max. AC power (at 25°C / at 50°C)   | 2200 kVA / 2000 kVA  | 2475 kVA / 2250 kVA     | 2940 kVA / 2670 kVA    |
| Max. AC current (at 25°C / at 50°C)   | 3300 A / 3000 A  | 3292 A / 2993 A         | 3265 A / 2964 A        |
| Max. total harmonic distortion  | < 3% at nominal power  |                         |                        |
| Nominal AC voltage / nominal AC voltage range   | 385 V / 308 V to 462 V   | 434 V / 347 V to 520 V  | 520 V / 468 V to 572 V |
| AC power frequency / range  | 50 Hz / 47 Hz to 53 Hz<br>60 Hz / 57 Hz to 63 Hz   |                         |                        |
| Power factor at rated power / displacement power factor adjustable                        | 1 / 0 underexcited to 0 overexcited <sup>9)</sup>  |                         |                        |
| Efficiency  |  |                         |                        |
| Max. efficiency <sup>4)</sup> / European efficiency <sup>4)</sup>                         | 98.6% / 98.4%  |                         | 98.6% / 98.4%          |
| Protective Devices  |  |                         |                        |
| Input-side disconnection point  | DC load-break switch   |                         |                        |
| Output-side disconnection point   | AC circuit breaker   |                         |                        |
| DC overvoltage protection   | Surge arrester, type I   |                         |                        |
| Lightning protection (according to IEC 62305-1)   | Lightning Protection Level III   |                         |                        |
| Ground-fault monitoring / remote ground-fault monitoring                                  | ○ / ○  |                         |                        |
| Insulation monitoring   | ●  |                         |                        |
| Degree of protection: electronics / air duct & connection area (UL 50)                    | Type 3R / Type 1   |                         |                        |
| General Data  |  |                         |                        |
| Dimensions (W / H / D)  | 2780 mm / 2318 mm / 1588 mm  |                         |                        |
| Weight  | < 3400 kg  |                         |                        |
| Self-consumption (max. <sup>5)</sup> / partial load <sup>6)</sup> / average <sup>7)</sup> | < 8100 W / < 1800 W / < 2000 W   |                         |                        |
| Self-consumption (standby)  | < 300 W  |                         |                        |
| Auxiliary power supply: integrated 8.4 kVA transformer / external                         | ○ / ○  |                         |                        |
| Operating temperature range   | -25°C to 60°C  |                         |                        |
| Noise emission <sup>8)</sup>  | 66.4 dB(A)   |                         |                        |
| Temperature range (standby)   | -40°C to 60°C  |                         |                        |
| Temperature range (storage)   | -40°C to 70°C  |                         |                        |
| Max. permissible value for relative humidity (condensing / non-condensing)                | 95% to 100% (2 month/year) / 0% to 95%   |                         |                        |
| Maximum operating altitude above MSL 2000 m   | ●  |                         |                        |
| Fresh air consumption   | 6500 m³/h  |                         |                        |
| Features  |  |                         |                        |
| DC connection   | Terminal lugs on each input (without fuse) with NEMA lug hole pattern                                    |                         |                        |
| AC connection   | With busbar system (three busbars, one per line conductor)   |                         |                        |
| Communication   | Modbus TCP   |                         |                        |
| Enclosure / roof color  | RAL 9016 / RAL 7004  |                         |                        |
| Display   | ○ HMI touchscreen (10.1")  |                         |                        |
| Supply transformer for external loads   | ○ (2.5 kVA)  |                         |                        |
| Certification and approvals   | UL 1741, UL 1741 SA <sup>10)</sup> , IEEE 1547, UL 1998, UL 840 Cat. IV, CAN/CSA C22.2 107.1-1           |                         |                        |
| EMC standards   | IEC / EN 61000-6-4, IEC / EN 61000-6-2, EN 55022, CISPR 22:2008<br>modified class A, FCC Part 15 Class A |                         |                        |
|   |  |                         |                        |
|   |  |                         |                        |
| ● Standard features   ○ Optional  |  |                         |                        |
| Type designation  | SCS-2200-US-10   | SCS-2475-US-10          | SCS-2900-US-10         |

1) Another voltage range can be offered on request

2) With power derating

3) Battery short circuit disconnection has to be done on the battery side

4) Efficiency measured without internal power supply

5) Self-consumption at rated operation

6) Self-consumption at < 75% P<sub>n</sub> at 25°C

7) Self-consumption averaged out from 5% to 100% P<sub>n</sub> at 25°C

8) Sound pressure level at a distance of 10 m

9) Depending on the DC voltage

10) Only for PF 1 / 0.8 underexcited to 0.8 overexcited

# SUNNY CENTRAL STORAGE

## 2500-EV-US / 2750-EV-US

| Technical Data  | SCS 2500-EV-US   | SCS 2750-EV-US          |
|---|--|-------------------------|
| <b>Battery side (DC)</b>  |  |                         |
| DC Voltage range (at 25 °C / at 50 °C) <sup>1)</sup>                                      | 850 V to 1425 V / 1250 V   | 875 V to 1425 V/ 1275 V |
| Minimal / Maximal DC voltage <sup>2)</sup>  | 778 V / 1500 V   | 849 V / 1500 V          |
| Max. DC current (at 25 °C / at 50 °C)   | 3000 A / 2700 A  | 3206 A / 2700 A         |
| Max. interruption current capability <sup>3)</sup>  | 6400 A   | 6400 A                  |
| Number of DC cables per polarity  | 26   |                         |
| <b>Grid side (AC)</b>   |  |                         |
| Max. AC power (at 25 °C / at 50 °C)   | 2500 kVA / 2250 kVA  | 2750 kVA / 2500 kVA     |
| Max. AC current (at 25 °C / at 50 °C)   | 2624 A / 2362 A  | 2646 A / 2405 A         |
| Max. total harmonic distortion  | < 3% at nominal power  |                         |
| Nominal AC voltage / nominal AC voltage range   | 550 V / 440 V to 660 V   | 600 V / 480 V to 660 V  |
| AC power frequency / range  | 50 Hz / 47 Hz to 53 Hz<br>60 Hz / 57 Hz to 63 Hz   |                         |
| Power factor at rated power / displacement power factor adjustable                        | 1 / 0 underexcited to 0 overexcited <sup>9)</sup>  |                         |
| <b>Efficiency</b>   |  |                         |
| Max. efficiency <sup>4)</sup> / European efficiency <sup>4)</sup>                         | 98.6% / 98.3%  | 98.7% / 98.6%           |
| <b>Protective Devices</b>   |  |                         |
| Input-side disconnection point  | DC load-break switch   |                         |
| Output-side disconnection point   | AC circuit breaker   |                         |
| DC overvoltage protection   | Surge arrester, type I   |                         |
| Lightning protection (according to IEC 62305-1)   | Lightning Protection Level III   |                         |
| Ground-fault monitoring / remote ground-fault monitoring                                  | ○ / ○  |                         |
| Insulation monitoring   | ●  |                         |
| Degree of protection: electronics / air duct & connection area (UL 50)                    | Type 3R / Type 1   |                         |
| <b>General Data</b>   |  |                         |
| Dimensions (W / H / D)  | 2780 mm / 2318 mm / 1588 mm  |                         |
| Weight  | < 3400 kg  |                         |
| Self-consumption (max. <sup>5)</sup> / partial load <sup>6)</sup> / average <sup>7)</sup> | < 8100 W / < 1800 W / < 2000 W   |                         |
| Self-consumption (standby)  | < 370 W  |                         |
| Auxiliary power supply: integrated 8.4 kVA transformer / external                         | ○ / ○  |                         |
| Operating temperature range   | −25 °C to 60 °C  |                         |
| Noise emission <sup>8)</sup>  | 64.3 dB(A)   |                         |
| Temperature range (standby)   | −40 °C to 60 °C  |                         |
| Temperature range (storage)   | −40 °C to 70 °C  |                         |
| Max. permissible value for relative humidity (condensing / non-condensing)                | 95% to 100% (2 month/year) / 0% to 95%   |                         |
| Maximum operating altitude above MSL 2000 m   | ●  |                         |
| Fresh air consumption   | 6500 m³/h  |                         |
| <b>Features</b>   |  |                         |
| DC connection   | Terminal lugs on each input (without fuse) with NEMA lug hole pattern  |                         |
| AC connection   | With busbar system (three busbars, one per line conductor)   |                         |
| Communication   | Modbus TCP   |                         |
| Enclosure / roof color  | RAL 9016 / RAL 7004  |                         |
| Display   | ○ HMI touchscreen (10.1")  |                         |
| Supply transformer for external loads   | ○ (2.5 kVA)  |                         |
| Certification and approvals   | UL 62109-1, UL 1741 Chapter 13 CRD 61, UL 1741 SA <sup>10)</sup> , IEEE 1547, UL 1998, CAN/CSA C22.2 107.1-1 |                         |
| EMC standards   | IEC / EN 61000-6-4, IEC / EN 61000-6-2, EN 55022, CISPR 22:2008 modified class A, FCC Part 15 Class A        |                         |
|   |  |                         |
| ● Standard features   ○ Optional  |  |                         |
| Type designation  | SCS-2500-EV-US-10  | SCS-2750-EV-US-10       |

1) Another voltage range can be offered on request

2) With power derating

3) Battery short circuit disconnection has to be done on the battery side

4) Efficiency measured without internal power supply

5) Self-consumption at rated operation

6) Self-consumption at < 75% P<sub>n</sub> at 25°C

7) Self-consumption averaged out from 5% to 100% P<sub>n</sub> at 25°C

8) Sound pressure level at a distance of 10 m

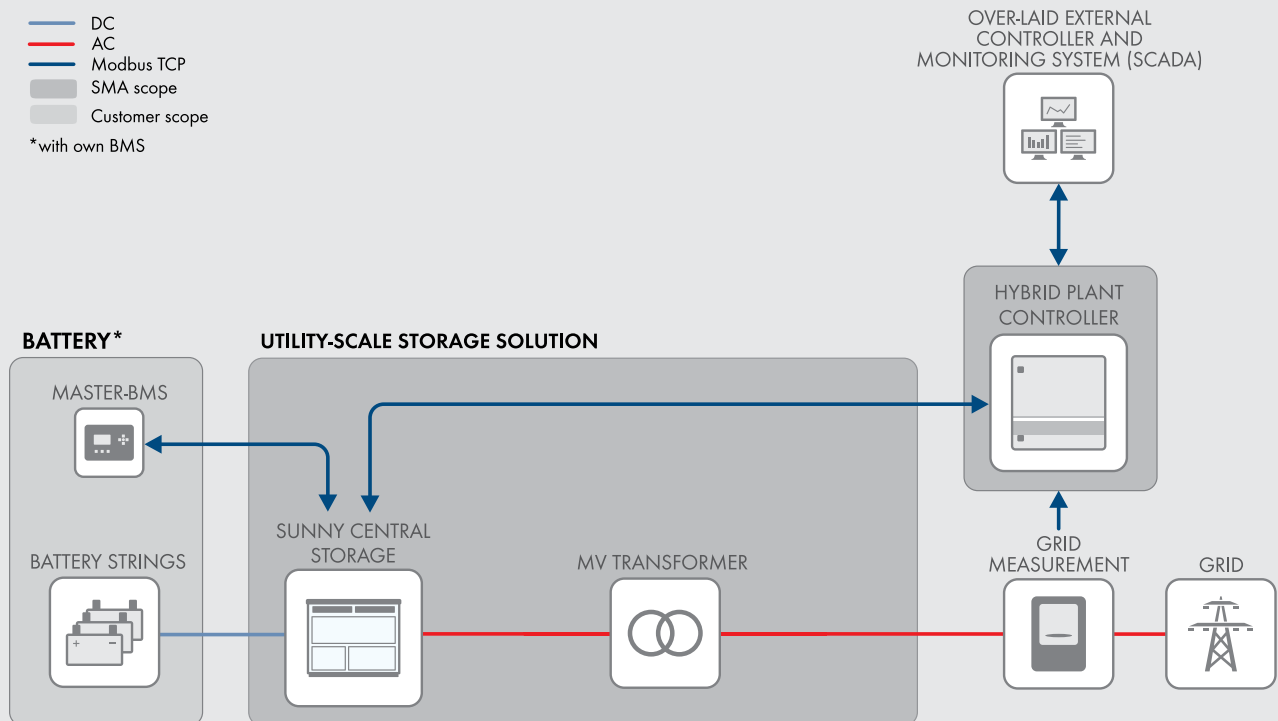
9) Depending on the DC voltage

10) Only for PF 1 / 0.8 underexcited to 0.8 overexcited

## SUNNY CENTRAL STORAGE APPLICATIONS

- Provides ancillary grid services
- Supports the growth of renewable energy in public grids
- Increases fuel saving potential in PV hybrid diesel systems

— DC  
 — AC  
 — Modbus TCP  
 — SMA scope  
 — Customer scope  
 \*with own BMS



By combining several of these schemes, higher power systems can be realized

### Grid-connected functions

- Setpoints for active and reactive power
- Static grid support Q(U), (P(f) on request)
- Dynamic grid support (FRT)
- Active islanding detection (AID)
- High compatibility with different battery types

### Compatible with energy management system functionalities

- External static grid supporting functions
- Ramp-rate control of PV power
- Peak shaving
- Energy shifting
- Genset optimization control
- Reducing necessary spinning reserve of gensets
- Battery start-up and stop sequence
- Operates the battery within optimal operation window

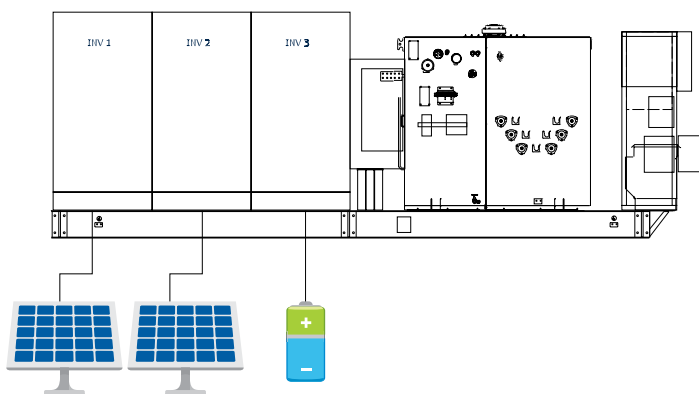
# Solar Ware Ninja™

**TMEiC**  
We drive industry

## Multiple Configurations for Maximum Flexibility

TMEiC's Solar Ware Ninja is the latest evolution of the highly successful Solar Ware family of inverters, joining over 20GW of TMEiC's globally installed photovoltaic inverters. Continuing the legacy of high efficiency, cutting-edge features, and unmatched reliability, the new Ninja modular inverter system is the culmination of input from utilities, developers, and technicians.

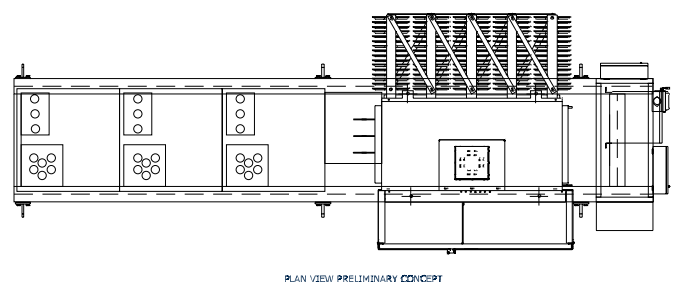
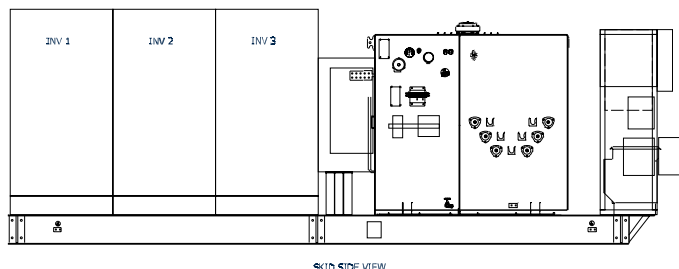
The Ninja is a global product, performing the duties of both generation and energy storage. The modular system introduces multiple layers of flexibility to allow designers an almost unlimited number of options for every project. The advanced controls system is packed with features to meet not only today's smart inverter requirements, but also new requirements as they are introduced. Like the award-winning Samurai series of inverters, the Ninja utilizes the same highly reliable IGBT based power conversion system.



## Customizable Block

Up to 6 Ninja units on the same skid. Able to combine PV and ESS inverters in the same lineup. A skid controller will manage output of the Ninja power station.

- Fully Modular design means:
  - Completely independent inverters for increased availability
  - Individual MPPT for greater energy yield
  - Latest generation of Smart Inverter controls platform
  - Multiple output options with various MPPT ranges
- DC Zone monitoring is standard
- UL or IEC certified global design
- PV or Energy Storage (bi-directional)
- Outdoor rated enclosure



## TMEiC is Bankable

- Stable, with multi billion \$USD revenue
- Diversified, with decades of power electronics experience in a variety of heavy industries, including metals, oil & gas, mining, and container cranes industries
- Manufacturing in the US and several other locations

## TMEiC is Reliable

- Over 20GW of PV and ESS inverters globally
- Own exclusive use of Mitsubishi Electric's 3 level NPS technology
- Industry leading fleet availability

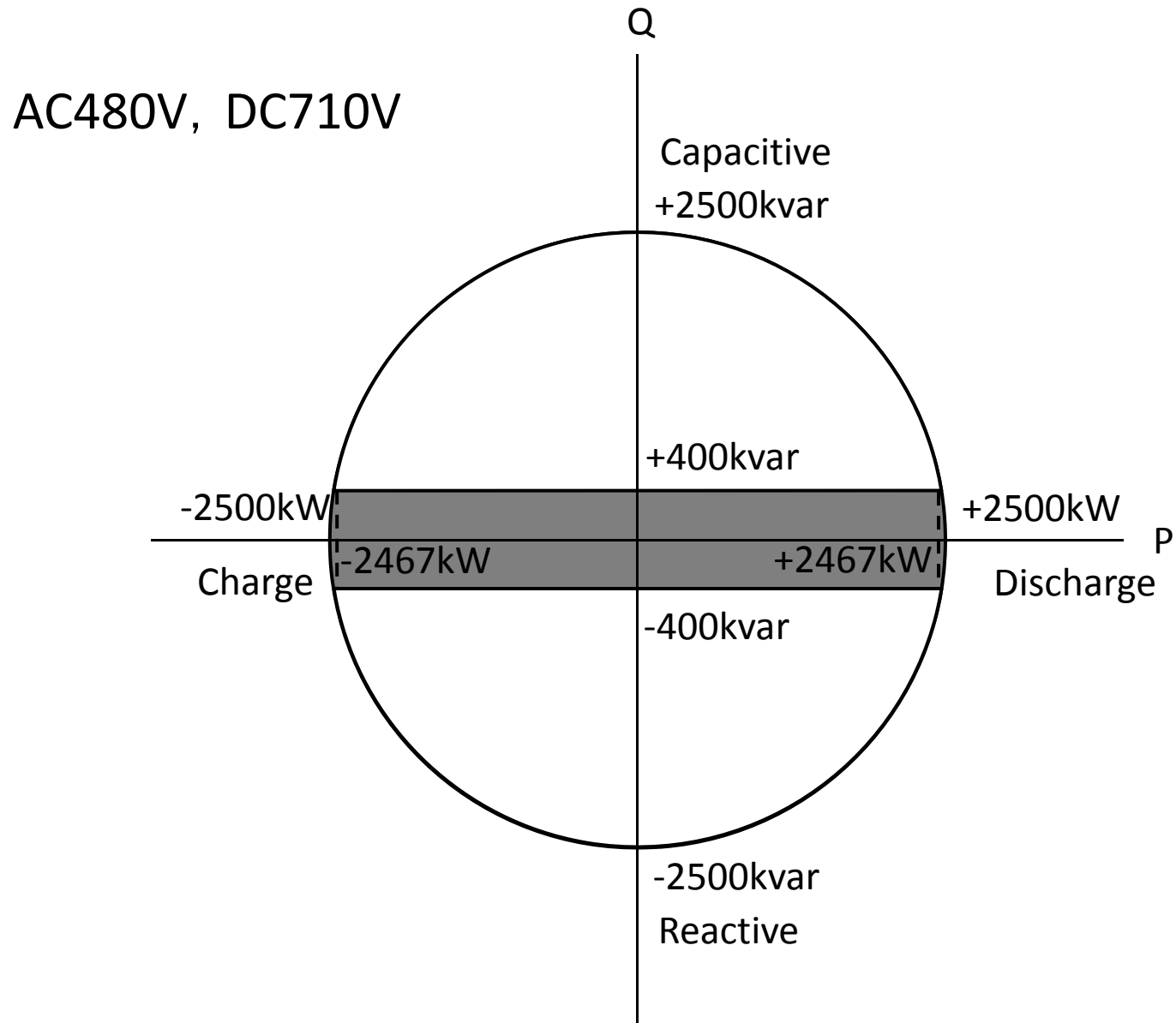
## TMEiC is Support

- Award winning service
- 24/7 US based hot line
- Over 30 years PV inverter manufacturing and R&D experience
- Comprehensive customer training programs
- Authorized Service Provider program available

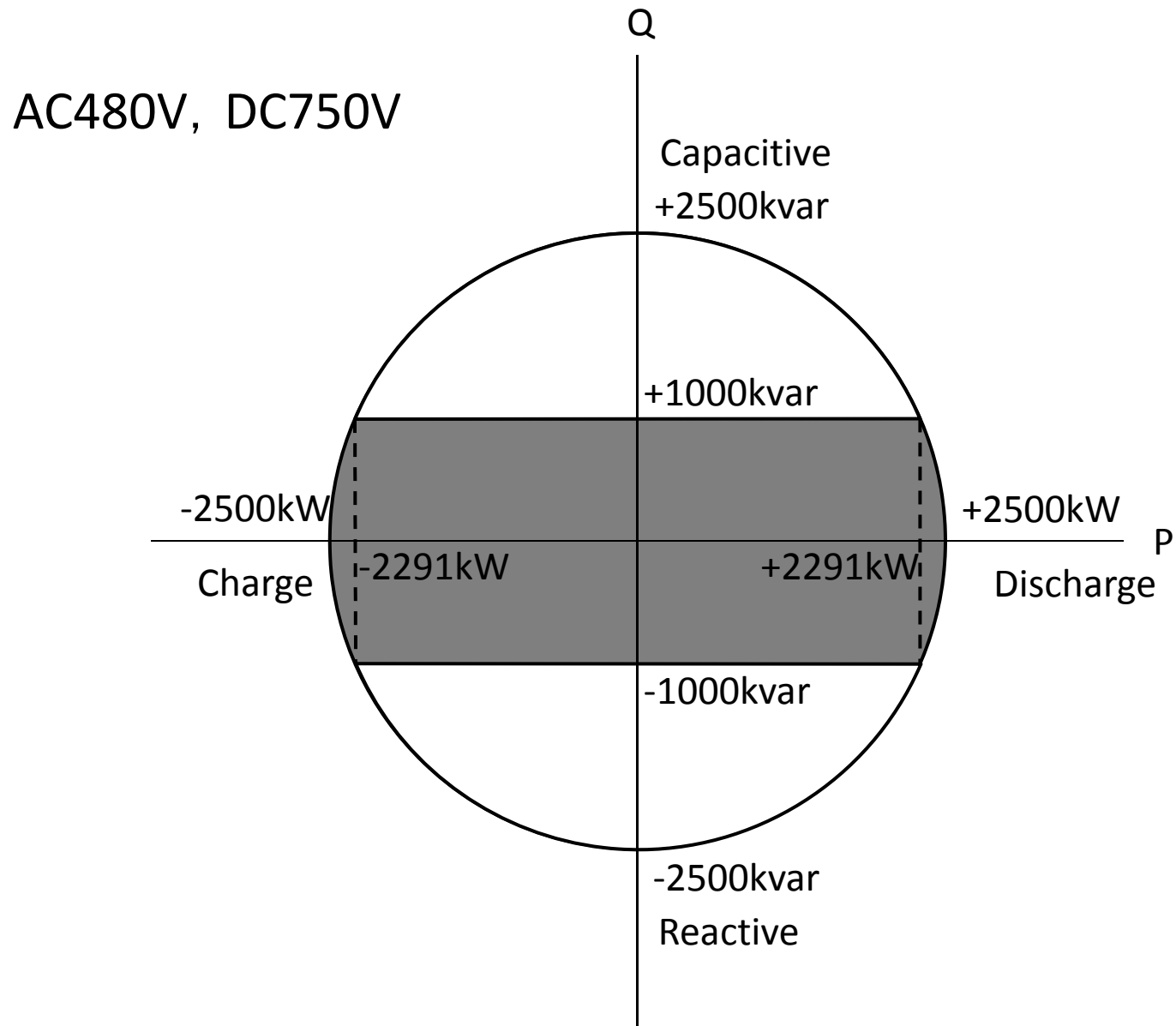
|                                   |                            | PV-PCS   |                 |                 |                 | ESS-PCS                   |               |               |
|-----------------------------------|----------------------------|--|-----------------|-----------------|-----------------|---------------------------|---------------|---------------|
| Type                              |                            | PVU-L0800GR  | PVU-L0840GR     | PVU-L0880GR     | PVU-L0920GR     | BSU-L0640GR               | BSU-L0800GR   | BSU-L0840GR   |
| Output side (AC)                  | Rated Power@25°C           | 800kW  | 840kW           | 880kW           | 920kW           | 640kW                     | 800kW         | 840kW         |
|                                   | Rated Power@50°C           | 730kW  | 765kW           | 800kW           | 840kW           | 570kW                     | 730kW         | 765kW         |
|                                   | Rated Voltage              | 600V +10%, -12%  | 630V +10%, -12% | 660V +10%, -12% | 690V +10%, -12% | 480VAC                    | 600VAC        | 630VAC        |
|                                   | Rated Frequency            | 50Hz / 60Hz (+0.5Hz, -0.7Hz)   |                 |                 |                 |                           |               |               |
|                                   | Rated Power Factor         | >0.99  |                 |                 |                 |                           |               |               |
|                                   | Reactive Capability        | ±421 kVAR  | ±442-kVAR       | ±464 kVAR       | ±485 kVAR       | -512-640 kVAR             | -640-800 kVAR | -672-840 kVAR |
|                                   | Rated Current              | 702 Arms @50 °C  |                 |                 |                 |                           |               |               |
|                                   | Maxium Current             | 770 Arms @25 °C  |                 |                 |                 |                           |               |               |
|                                   | Maximum Efficiency         | 98.9% *Tentative   |                 |                 |                 |                           |               |               |
|                                   | CEC Efficiency             | 98.5% *Tentative   |                 |                 |                 |                           |               |               |
| Input side (DC)                   | Maximum Voltage            | 1500 Vdc   |                 |                 |                 |                           |               |               |
|                                   | MPPT Operation Range       | 875-1300VDC  | 915-1300VDC     | 960-1300VDC     | 1005-1300VDC    | 710-1300VDC               | 875-1300VDC   | 915-1300VDC   |
| Environ. Conditions               | Ingress Protection Ratings | IP54 / NEMA3R  |                 |                 |                 |                           |               |               |
|                                   | Installation               | Outdoor  |                 |                 |                 |                           |               |               |
|                                   | Ambient Temperature Range  | -25° to 50°C   |                 |                 |                 |                           |               |               |
|                                   | Maximum Altitude           | >2000 m power derating (Max. 4000m)  |                 |                 |                 |                           |               |               |
| Protective Functions              | Input (DC) Side            | DC Protection: Fuses Ground Fault, DC Reverse Current, Over Voltage, Over Current  |                 |                 |                 |                           |               |               |
|                                   | Grid (AC) Side             | AC Protection: MCCB and Fuse, Anti-islanding, Over/Under Voltage, Over/Under Frequency, Over Current                             |                 |                 |                 |                           |               |               |
|                                   | Grid Assistance            | Reactive/Active Power Control, Power Factor Control, Fault Ride Through (optional)   |                 |                 |                 |                           |               |               |
| Harmonic Distortion of AC Current |                            | ≤ 3% THD (at rated power)  |                 |                 |                 | ≤ 5% THD (at rated power) |               |               |
| Communication                     |                            | Modbus/TCP   |                 |                 |                 |                           |               |               |
| Fault Analysis                    |                            | Fault Event Log, Waveform Acquisition via memory card  |                 |                 |                 |                           |               |               |
| Compliance                        |                            | UL1741, UL174SA / IEEE1547 / NEC2017 / IEC62109-1,2 / IEC61000-6-2,4 / IEC61727, IEC62116 / IEC61400, BDEW / IEC61683 / IEC60068 |                 |                 |                 |                           |               |               |
| Cooling Method                    |                            | Forced Air Cooling   |                 |                 |                 |                           |               |               |
| Number of Inputs                  |                            | Standard 6 inputs for PV (maximum 8 per inverter)  |                 |                 |                 | 1 per Inverter            |               |               |
| Standard Control Power Supply     |                            | Control Power Supply from Inverter output and Capacitor backup circuit (3 sec. compensation)                                     |                 |                 |                 |                           |               |               |
| Weight                            |                            | <1000kgs *Tentative  |                 |                 |                 |                           |               |               |
| Dimensions (H x W x D)            |                            | 1100 X 1100 X 1900 mm (L x W x H)  |                 |                 |                 |                           |               |               |
| Floor Space                       |                            | 1875.5 sq. in. (1.21 m²)   |                 |                 |                 |                           |               |               |
| Color                             |                            | Cabinet: Sand White #Dic583  |                 |                 |                 |                           |               |               |

Note: Standard configuration not limited configuration. Contact TMEIC for detailed information.

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PQ curve for BSH-L2500GR

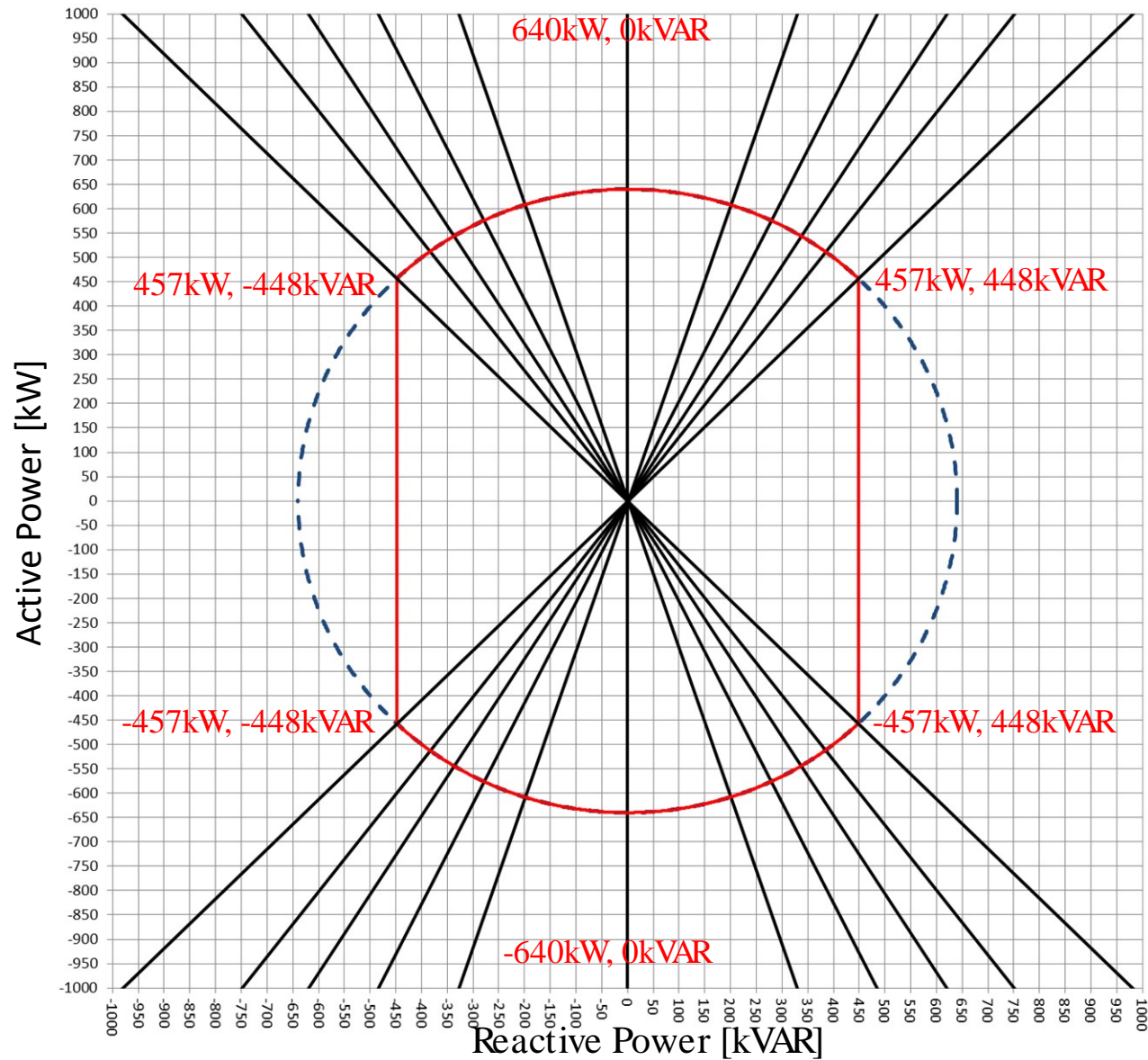


PQ curve for BSH-L2500GR



Ind: 0.714PF 0.8PF 0.85PF 0.9PF 0.95PF

0.95PF 0.9PF 0.85PF 0.8PF 0.714PF:Cap

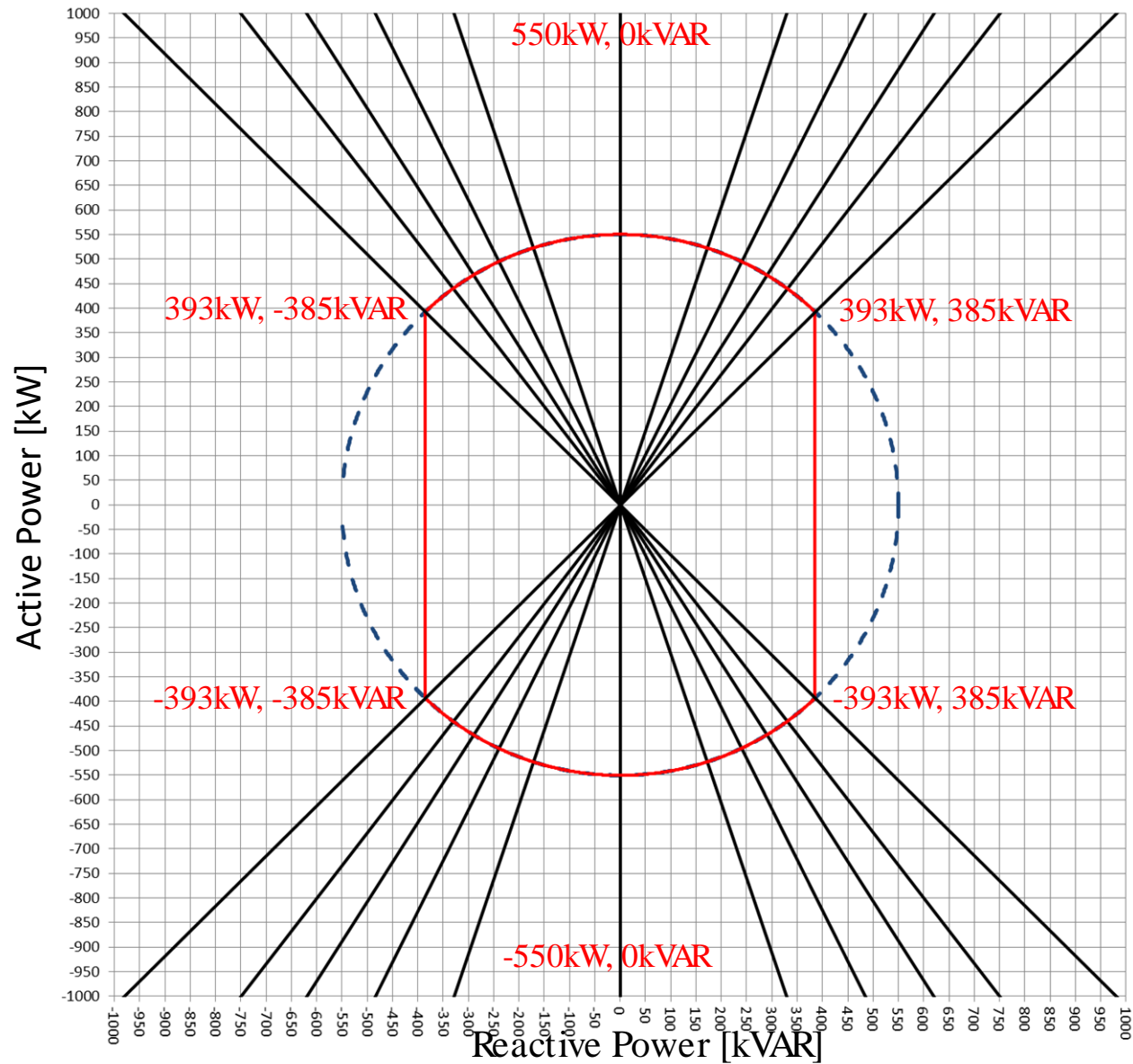


\* Operation area will be curtailed by input DC voltage, output AC voltage.

PQ curve for BSU-L0640GR (25°C)

Ind: 0.714PF 0.8PF 0.85PF 0.9PF 0.95PF

0.95PF 0.9PF 0.85PF 0.8PF 0.714PF:Cap



\* Operation area will be curtailed by input DC voltage, output AC voltage.

PQ curve for BSU-L0640GR (50°C)