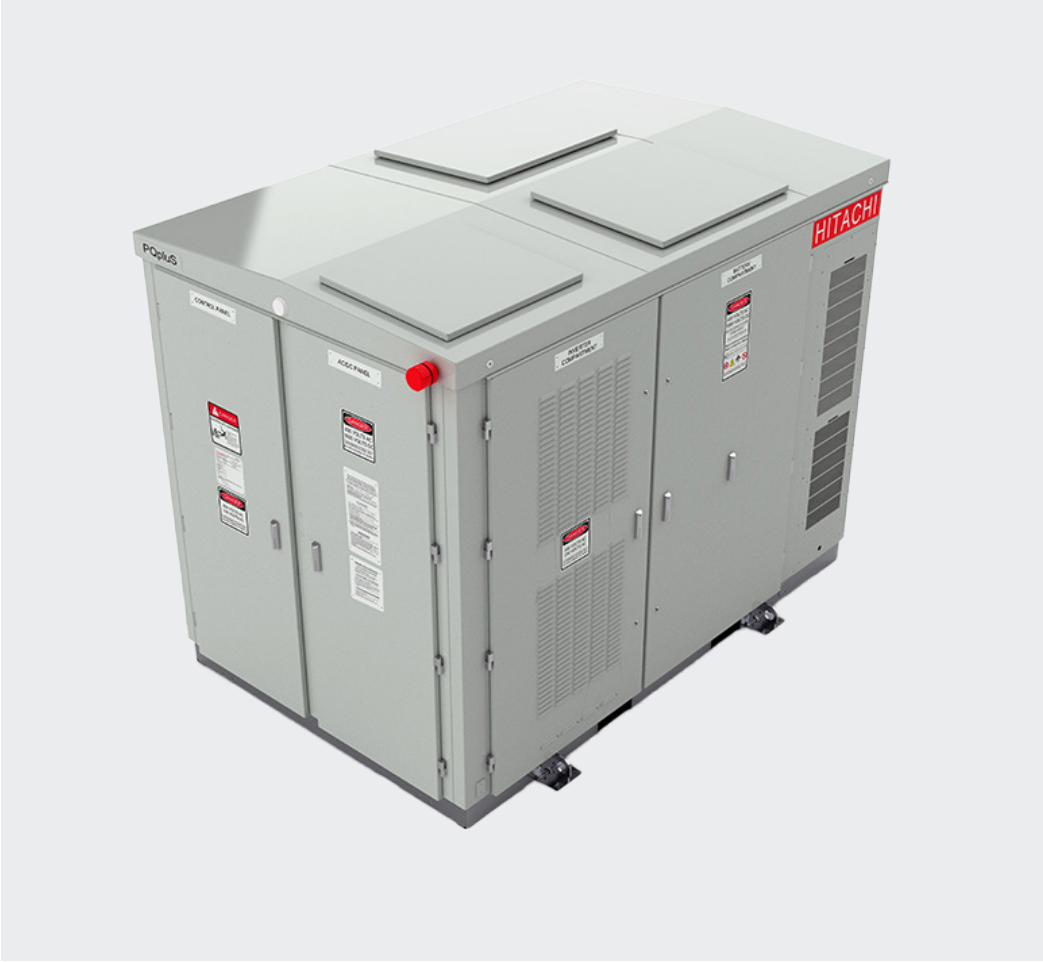
Brochure

PQpluS modular battery energy storage unit

Enhancing availability and reliability of the electrical network



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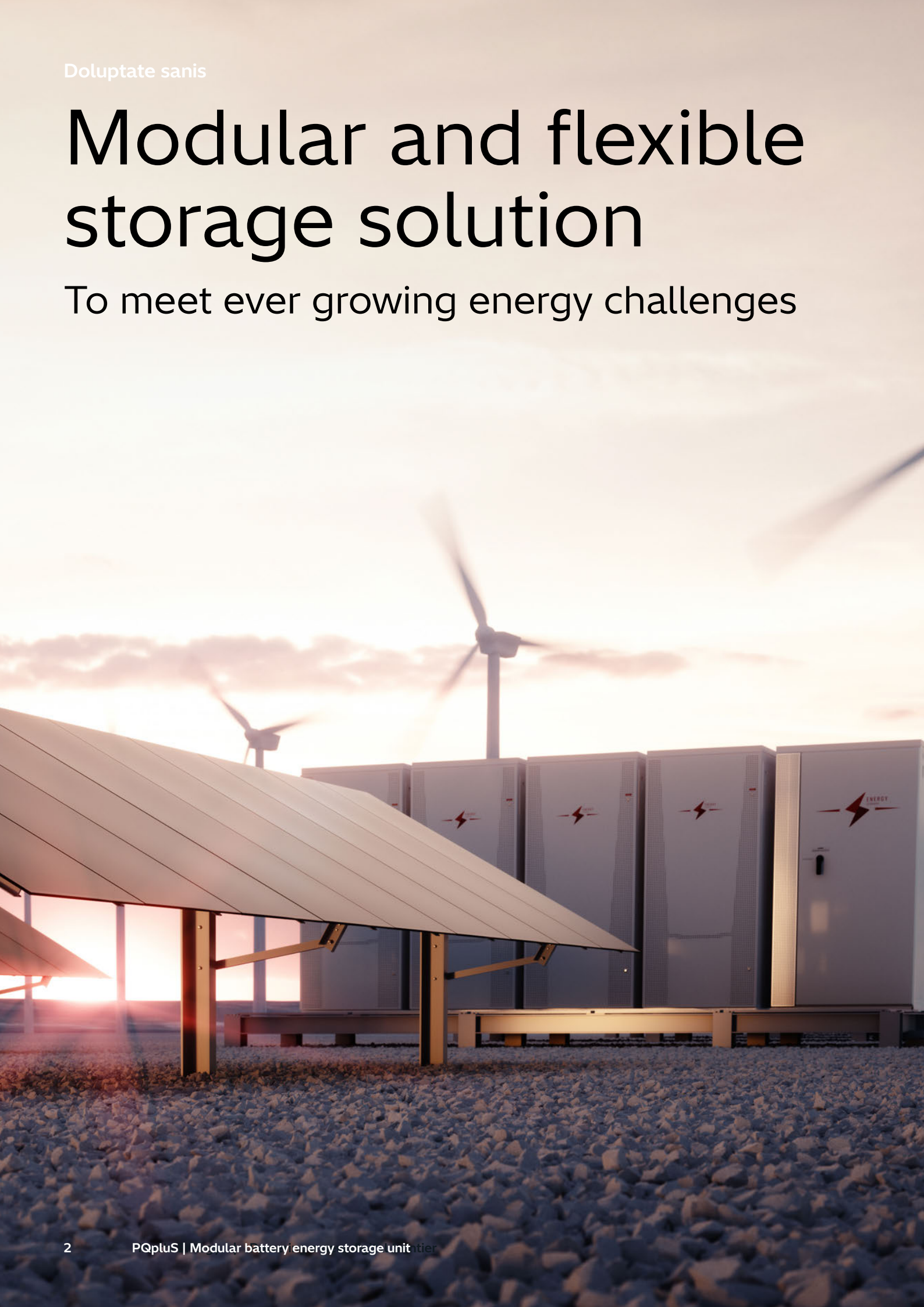
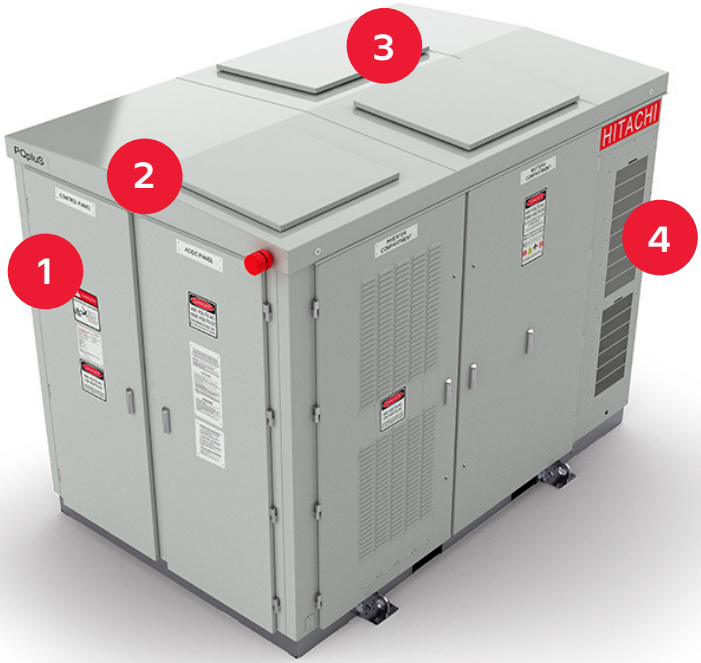
Modular and flexible storage solution

To meet ever growing energy challenges



PQpluS

Plug-and-play solution for behind-the-meter applications



Size 1
150 - 300 kW
156 - 312 kWh

Wide range

- Small to large: covers a wide range of power (kW) and storage capacity (kWh)
- Group the units to get desired rating (kW/ kWh)
- Power/energy rating from 150 kW / 156 kWh

Modular and compact

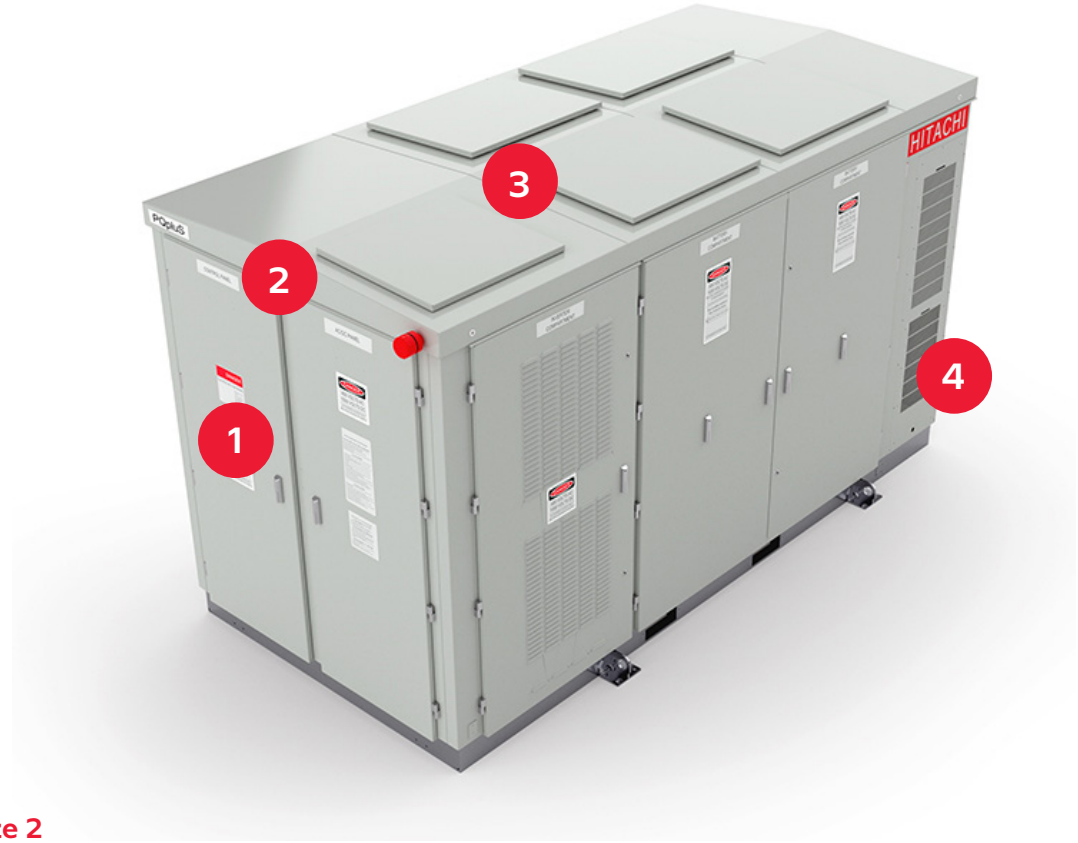
- Prepared for outdoor installation
- Separate sections for Inverters, batteries and control parts
- Firefighting system and communication unit embeded

1 Reliable metal enclosure

3 High quality NMC Li-ion battery
(Inside the enclosed compartment)

2 PQstorI inverters
(Inside the enclosed compartment)

4 HVAC unit
(Inside the enclosed compartment)



Size 2
150 - 360 kW
468 - 624 kWh

Control system with functionalities for:

- External PLC controller
- Integration with customer's EMS
- Remote monitoring & control

PQpluS

Ideal for behind-the-meter applications performance

Our grid is transforming. A commercial and industrial (C&I) customer can also be an electricity producer as well as a consumer (i.e., a prosumer). Therefore, a battery energy storage system is becoming integral to the changing relationship between utilities and their customers. PQpluS enables its users to reduce energy costs and makes the network more resilient while improving the power system's efficiency, reliability, and availability. It helps the electricity consumer by actively managing the timing and profile of their energy usage through the following functions:

Peak shaving

The energy consumption pattern in the C&I segment follows a cycle of peak and low load conditions. Peak load periods coinciding for several consumers can lead to a shortage of power supply. To avoid such situation, utilities often charge premium prices for energy consumed during peak hours, resulting in high energy costs to the consumer. PQpluS is used for peak demand shaving, resulting in a uniform load distribution around the complete load cycle and saving penalties for the consumer.

Easier use of self-generation and time-of-use tariffs

PQpluS units offer multiple ways for consumers to reduce their electricity bills without requiring changes in consumption habits. In regions with dynamic time-of-use pricing, they can charge their batteries either from their rooftop solar PV system or from the grid during off-peak hours and then discharge as needed during peak hours, thereby obtaining the cost savings of demand shifting without actually changing the times when they use energy.

Facilitating connection of renewable resources

Limited predictability is a critical drawback of green energy sources such as wind and solar plants. Due to its unpredictable behaviour, a significant renewable energy source imposes an additional burden on the network operators. The PQpluS units can minimize the impact of renewables on the network by offering a “buffer” that can absorb excess power and release it when the output from these sources falls short.

Integration of fast EV chargers

PQpluS units accompany fast EV chargers in remote places along highways where grid operators cannot offer enough power connection for ultra-fast or fast charging service. With PQpluS, you can avoid or postpone grid investment while still using high-power chargers.

Features and Benefits

The PQpluS offers excellent value to customers requiring energy storage for small and medium C&I sites. Packed with features to facilitate RES and EV integration, the PQpluS units are essential for the local Energy Management Systems.

Footprint

For applications in commercial buildings and industries where real estate comes at a premium, the compact design of PQpluS consumes minimum space for installation.

Modularity

Based on our experience, we selected the energy and power combinations most sought after by our C&I customers. With this knowledge, we engineered and tested standard battery energy storage units in our manufacturing facility. As a result, we reduced the time needed for commissioning and can offer the user a choice of broad power/ energy ratings to suit many specific C&I applications.

Ready for integration with EMS

While the PQpluS can be used with any third-party controller for various applications, it can also be integrated with the local energy management software, facilitating increased self-consumption and improving energy efficiency.

High-quality and proven components

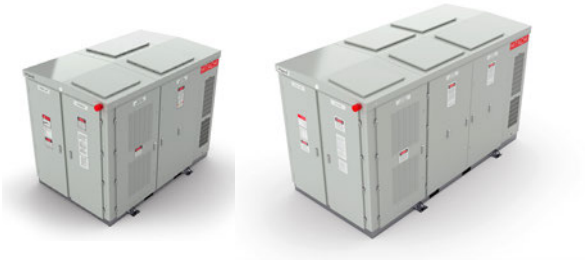
We have deployed PQpluS units to serve our customers for many years. Careful component selection and integration of PQstorI inverters, Li-Ion NMC battery modules, HVAC system, PQconnecT, and many other minor elements create together valued reliability.

User-friendly interface

The touchscreen user interface of PQpluS allows the operator full access to the PQpluS parameters. It can be used to consult data, define parameters and communicate with customer controller systems through Modbus TCP/ IP protocol.

PQpluS

Technical specifications



Size 1 **Size 2**

Parameter	Size 1	Size 2
Electrical characteristics		
Connection method	AC grid tied connection – 3Ph+N+PE	
Network voltage (+/- 10%)	400-415 Vac	
Network frequency (+/- 5%)	50 Hz	
Network THDv	<5%	
Network fault level (max)	50 kA/1s	
Insulation level	3 kV BIL	
Rated power (at 400 V)	Up to 300 kW	Up to 360 kW
Rated capacity	Up to 312 kWh	Up to 624 kWh
Inverter technology	IGBT based 3-level inverter, 3-wires+PE connection	
Battery technology	NMC lithium-ion	
Maximum C-Rate	1.0 C	0.57 C
Expected cycles	< 8000 @ 0.5 C, DOD 5-95%,SOH 70%	
Environmental characteristics		
Operating ambient (outdoor) temperature	-20°C up to 50°C * For extreme temperature (below -10 and above 40 °C), a derating may apply Detail can be found in operation and maintenance manual	
Storage ambient temperature	Inverters: -25°C to 70°C Batteries: -20°C to 45°C	
Humidity	Maximum 90% non-condensing Maximum 85% in battery compartment	
Altitude	Up to 1000m (2000m with derating)	
Cooling	Forced fan cooled PCS compartment HVAC cooled Battery compartment	
Noise level	<70 dB at 1 m	
Interface / communication		
Communication protocol	Modbus TCP/IP over Ethernet	
Human Machine Interface	10.1 inches touchscreen HMI	

Parameter	Size 1	Size 2
Physical characteristics		
Enclosure material	Mild steel Powder coated, HDG Plinth	
IP degree	IP54	
Pollution degree	PD2 – normal non-conductive	
Impact level	IK10	
Dimensions (WxLxH)	2000x3100x2420mm	2000x4100x2420mm
Weight	Up to 5000kg (loaded with inverters and batteries) Up to 2700kg (unloaded)	Up to 8000kg (loaded with inverters and batteries) Up to 3600kg (unloaded)
Handling	Fork and crane lifting via base	
Color	RAL 9002	
Cable entry	Bottom through 3mm AL gland plates	
Earthing	Through Internal or External Earthing connection	
Standards	IEC 61439-1 IEC 62933-2-1 IEC 62933-5-1/-2 IEC 60529 IEC 60664 EN-62-262 IEEE693 Level 4 NFPA68 Deflagration venting UL9540A (Batteries' cells & modules level)	
Certifications	CE mark	
Grid code compliance (combined inverter and NS-protection relay)	VDE-AR-N 4105 (DE) VDE-AR-N 4110 (DE) G99 type A and B (UK) TR3.3.1 (DK) – Cat A and B, DK1 and DK2 EN 50549-1/-2	

Application example

Solution for integrating renewables and power quality in Copenhagen

In a world where climate change has become one of the biggest concerns, the Danish capital, Copenhagen, has set itself an ambitious goal - to be the world's first carbon neutral city by 2025. In order to achieve this, breakthrough innovations are being implemented into its energy system.

One of these innovations is the Energy Lab Nordhavn project that has transformed a part of the new residential area Nordhavn, into a "full scale living lab". The project, funded by The Danish Energy Technology Development and Demonstration Program, aims to develop and demonstrate the energy solutions of the future – integrating electricity and heating, energy-efficient buildings and electric-powered transport into an intelligent, flexible and optimized energy system.

A significant part of the project is the battery energy storage system supplied to Radius, Denmark's largest power distribution company by us. Installed in an urban environment, it is able to supply power to approximately 200 apartments at the time of the day where the demand for power is at its highest. This technology is the first of its kind in Denmark.

In Energy Lab Nordhavn, solar and wind energy power produce the majority of the electricity. Together with these two renewable energy sources, a modular battery energy storage system is installed, which comprises Li-ion batteries and intelligent energy storage inverter.

The storage system is a key element of the energy supply, as it improves the power quality of the electrical network by performing the functions of peak load shaving and frequency response. These two functions can be extremely helpful in certain markets: peak shaving can reduce penalties paid
by customers for excess of consumption by reducing their peak load demand and, at the same time, can release network stress by providing a more uniform load distribution through the day; frequency response, a mechanism used by National Grid, can help manage grid stability, leading to an improvement of productivity for connected loads and grid reliability.

"By integrating battery storage in Nordhavn we have the opportunity to learn more about how new technological solutions and market mechanisms interact with the grid. I expect, that battery technology, on the longer horizon, holds the potential to reduce the load on the grid and make it run more cost-efficiently."

Knud Pedersen

Chairman of the Board, Radius Elnet,

Orsted's electrical grid division