



BATTERY ENERGY STORAGE SOLUTIONS

 **Lovato**
electric

ENERGY AND AUTOMATION

BESS (Battery Energy Storage System)

Modern Battery Energy Storage Systems (BESS) rely on far more than batteries alone. Safe, reliable and grid-compliant operation depends on a fully integrated network of protection, monitoring and control technologies working together in real time. From managing high-voltage DC power within the battery racks, through intelligent power conversion and grid protection, to advanced site-wide monitoring and export control, every stage of the energy journey must be carefully controlled. Using robust solutions from LOVATO Electric, this architecture provides the protection, resilience and intelligence required to ensure safe operation, maximise system performance and maintain compliance with modern grid regulations such as ENA G99 and G100.



1. DC Storage & Protection (The Source)

This section manages the raw Direct Current (DC) stored in the battery racks. To ensure safety during maintenance or fault conditions, we utilise LOVATO GLD Series Switch Disconnectors. These are specifically rated for high-voltage DC applications (up to 1500VDC), allowing for the complete physical isolation of the battery bank from the rest of the system. For overcurrent protection, LOVATO FBE/FE Series Fuses are installed to instantly sever the circuit in the event of a short circuit, while SE2DG Surge Protection Devices divert voltage spikes (such as lightning strikes) to earth, preventing damage to the sensitive battery cells.

2. Power Conversion System (The Bridge)

While the inverter itself is a third-party component, its integration is secured by LOVATO protection gear. The Power Conversion System (PCS) acts as the gateway, converting DC from the batteries into AC for the grid (discharging). The design ensures that all power flowing in and out of this "bridge" is strictly managed by the protection devices in the adjacent AC and DC sections.

3. AC Protection & Interface (The G99 Guard)

This critical safety cluster ensures grid compliance and system protection. A LOVATO Electric P5 Series MCCB or Contactor provides primary isolation and fault protection for high commercial loads (100kW+). ENA G99 compliance is managed by the PMVF71 Interface Protection Relay, which continuously monitors voltage and frequency, disconnecting the system via BF Series Contactors or the P5 MCCB if a grid fault occurs. A DMED Series Energy Meter also acts as a generation check meter, recording the battery's gross energy output to verify system performance and warranty cycles independently of building load.

4. Grid Point of Connection & Management (The G100 Control)

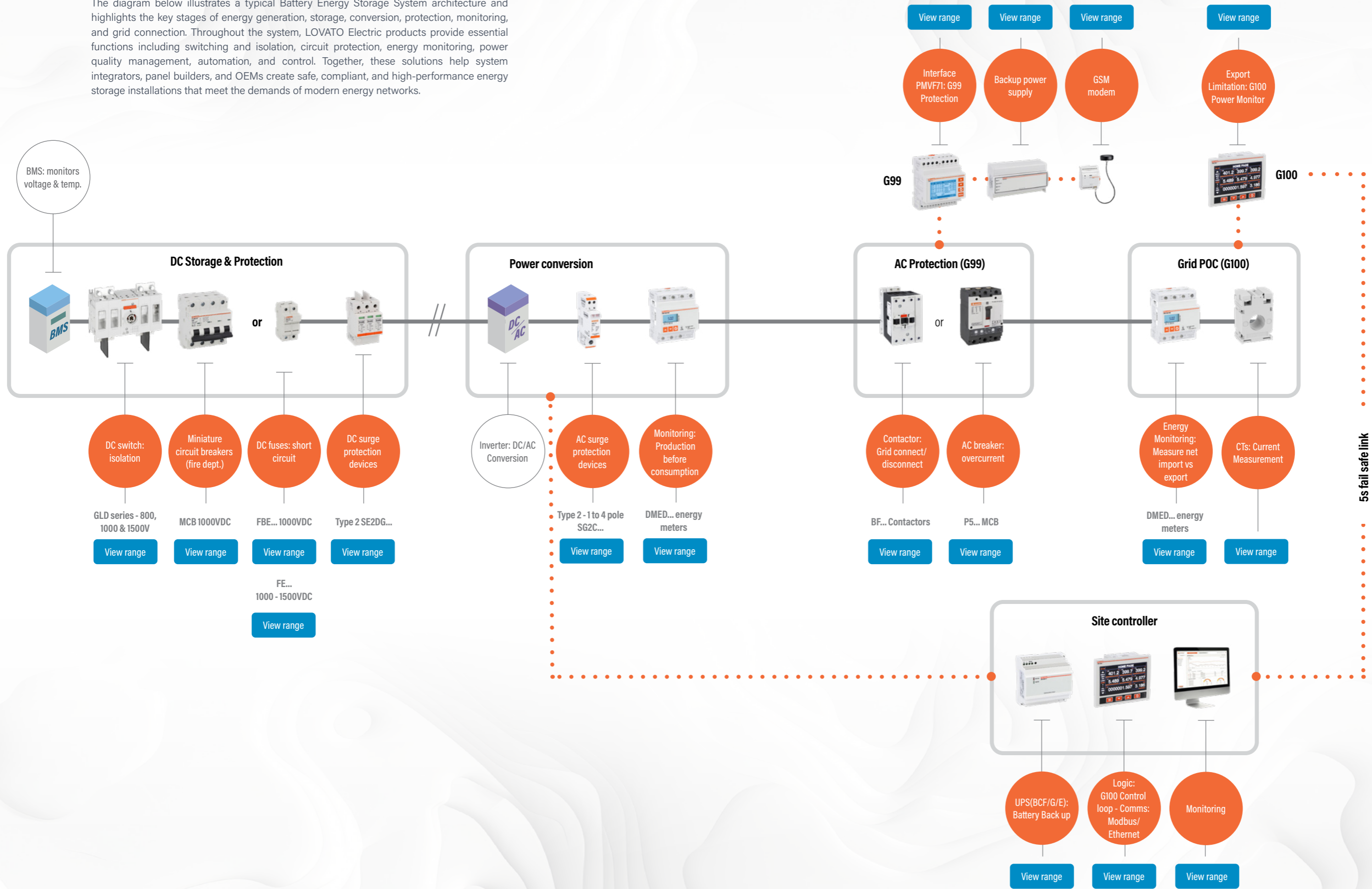
At the site boundary, the LOVATO DMG8000 Power Quality Analyser (or equivalent) acts as the G100 Control Unit, providing real-time monitoring of grid import/export levels. Data is sent to the site controller via a hard-wired fail-safe loop, enabling export limitation if thresholds are exceeded. To meet the 5-second fail-safe requirement, the LOVATO PMVFUPS02 DC-UPS (or similar) supplies uninterrupted backup power to protection relays and controllers, ensuring safety logic remains operational and capable of tripping the system, even during total grid failure.

5. Site Controller & Monitoring (The Brain)

This section acts as the system's intelligent control centre, managing energy flow between solar, battery, and grid systems. Monitoring is handled via LOVATO Synergy or Xpress, providing centralized performance tracking and alarm management. For remote connectivity, an EXC Series Gateway/Modem can securely transmit system data. The controller also manages G100 Export Limitation Logic, continuously processing the "heartbeat" signal from the boundary DMG8000 meter. To maintain safe operation during power outages, the controller is protected by a UPS, while the DMG8000's inbuilt PLC ensures fail-safe grid compliance and black-start management.

BESS Architecture

The diagram below illustrates a typical Battery Energy Storage System architecture and highlights the key stages of energy generation, storage, conversion, protection, monitoring, and grid connection. Throughout the system, LOVATO Electric products provide essential functions including switching and isolation, circuit protection, energy monitoring, power quality management, automation, and control. Together, these solutions help system integrators, panel builders, and OEMs create safe, compliant, and high-performance energy storage installations that meet the demands of modern energy networks.



POWERING THE FUTURE

50K^{SQM}
SOLAR SITE

6480
PANELS

3.3^{MW}
POWER

10
INVERTERS

3.2^{MW}
ENERGY STORAGE

80%
POWER USAGE

LOVATO ELECTRIC TAKES A MAJOR STEP TOWARDS ENERGY INDEPENDENCE

As industries around the world face increasing pressure to reduce emissions and embrace sustainable practices, energy independence has become a strategic priority for forward-thinking manufacturers. Demonstrating its long-term commitment to sustainability, LOVATO Electric has inaugurated a new photovoltaic park adjacent to its headquarters in Bergamo, Italy, marking a significant milestone in the company's journey towards cleaner, more resilient energy generation.

Known as the LOVATO SOLAR project, the initiative has been developed as a green investment focused on environmental responsibility rather than financial speculation. The project reflects LOVATO Electric's determination to create lasting value for the business, the local community, and future generations by reducing dependence on external energy sources while supporting the broader energy transition.

Located just a short distance from the company's headquarters, the new solar park spans an impressive 50,000 square metres and features a 3.3 MWp ground-mounted photovoltaic system. The installation

comprises 6,480 high-performance bi-facial photovoltaic modules, each rated at 510 Wp, arranged across 51 rows. This advanced system is designed to maximise energy generation efficiency while making optimal use of the available land.

Supporting the solar array are ten 320 kW inverters, which manage the conversion and distribution of generated power. Complementing the installation is a substantial 3.2 MWh battery energy storage system, enabling excess energy produced during daylight hours to be stored and used during periods of high demand or after sunset. Together, these technologies create a highly efficient and flexible energy infrastructure capable of supplying up to 80% of the company's energy requirements.

A key feature of the project is LOVATO Electric's decision to utilise photovoltaic panels manufactured in Europe. This choice reflects the company's commitment to quality, supply chain transparency, and responsible sourcing, while also supporting European manufacturing capabilities.

The benefits of self-generated energy extend far beyond environmental considerations. By securing a reliable and cost-effective energy source, LOVATO Electric is strengthening its ability to remain competitive while continuing to invest in local growth. The company is currently completing a new 4,200 square metre warehouse that will support the expansion of its energy-intensive moulding department, effectively doubling production capacity in this area. This development is expected to create new employment opportunities and generate positive economic benefits throughout the region.

Environmental integration has been a central consideration throughout the design of the photovoltaic park. Rather than creating a purely industrial installation, the site has been carefully planned to blend harmoniously with the surrounding rural landscape. Native trees and shrubs, including maples, hornbeams, hazelnuts, and privets, have been planted around the perimeter, creating a natural green boundary that connects with existing woodland habitats.

These ecological enhancements provide valuable shelter for local wildlife and encourage biodiversity. The site's fencing has even been designed to allow the movement of small mammals and amphibians, helping to maintain natural ecological corridors.

Further environmental measures include plans for a new wetland area featuring a water basin and diverse vegetation, creating an attractive habitat for birds and wildlife. A fruit and vegetable garden will also be established, reinforcing the site's connection to the area's agricultural heritage and promoting a stronger relationship between industry and nature.

The LOVATO SOLAR project demonstrates how technological innovation, environmental responsibility, and business growth can successfully work together. By investing in renewable energy generation, battery storage, biodiversity, and local development, LOVATO Electric is creating a model for sustainable industrial progress. It is a clear example of how manufacturers can actively contribute to a lower-carbon future while strengthening their own resilience, competitiveness, and commitment to the communities they serve.





For the full range of products and technical information, please see the general catalogue.

Available from lovato.co.uk



01384 899700 | lovato.co.uk | sales@lovato.co.uk

LOVATO Electric Ltd., Lovato House, Providence Drive, Stourbridge, DY9 8HQ

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