

Flexible Power and Energy Systems for the Evolving Factory



Exploring industrial drives, power supplies, and energy solutions to reduce peak power usage and installation costs, and to promote overall system efficiency

Featured solutions:

MOVI-C® automation system

MOVIDRIVE® inverters with Power and Energy Solutions modules

MOVIKIT® software modules



The manufacturing world is changing. With more plants incorporating automated machines and systems that promote flexibility and energy efficiency, power and energy management systems are a critical part of this equation. As companies look to prioritize sustainability, optimize their energy usage and monitor consumption patterns, automated factories can benefit from power and energy systems that can:

- Stabilize the grid
- Manage and reduce peak loads
- Store excess energy generated during low-demand periods
- Monitor energy consumption, increasing process transparency
- Come to a safe, controlled stop after a power outage
- Reduce the gauge size of cabling

WHITE PAPER: Power and Energy Management

As it stands, there is an opportunity to achieve these objectives using a modular and intelligent approach to managing power and energy for industrial drives. The technologies include a combination of inverters, capacitors, regenerative energy modules and a DC link coupling that optimizes the drive system's energy, reduces peak loads and lowers installation, operating and infrastructure costs.

An alternative to conventional drive technology with brake resistors, which convert all electrical energy into unusable heat, this power and energy management solution uses and stores energy, making it available to the drive system during normal operation without burdening the supply grid, as well as during power failures. The result: greater system availability, flexibility and scalability at a lower cost, allowing you to keep pace with the evolving manufacturing landscape.

AN OVERVIEW OF THE TECHNOLOGY

Part of the MOVI-C® modular automation system, this power and energy management system is suitable for machines that involve dynamic accelerations and decelerations, which waste energy during braking and spike energy during startup. Control cabinet inverters compensate for peaks by temporarily storing the braking energy generated by the machine or system, then making the energy available as needed. This technology stabilizes the energy flow and reduces spikes. Designers no longer have to design their machines and systems around power peaks. Instead, they can design their systems according to average power using smaller, lighter-weight connections, wire sizes and control cabinet components.

Other advantages of this inverter technology include:

Reduced power peaks. The storage capacitors in the DC link provide most of the required peak power, reducing energy, connection and control cabinet costs. For example, instead of requiring a supply system cable with a size of 75 mm², a 75-kilowatt (kW) system will now need a 6-mm² cable.

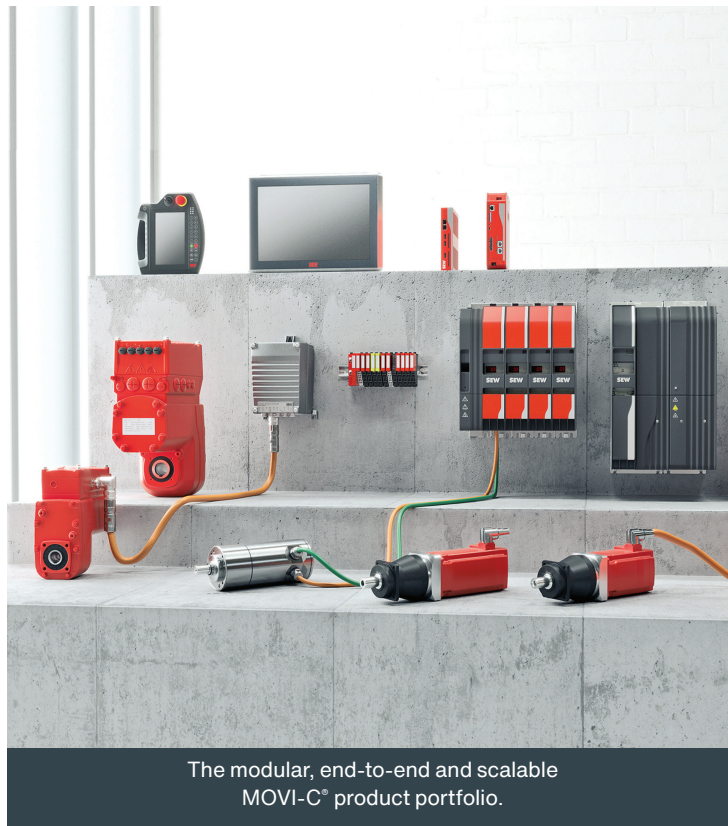
Uninterrupted system operation. Rotational energy, combined with the energy in the storage capacitors, serve as an uninterruptible power supply. This energy is used to power the drives, motor brakes and 24-volt (V) level PLC.

Reduced harmonic load in the grid. This inverter system achieves a power factor of 0.95. From as low as 20 percent of the nominal power, the power factor is 0.09. Even under difficult connection conditions, this system does not put the grid under further strain.

Ease of maintenance. By using capacitor storage units instead of chemical batteries, this power and energy management system can be completely discharged to 0 V for setup, service, maintenance and transport tasks.

Online monitoring. Users can configure energy meters, which are triggered by external events. Measurement technology integrated into the hardware also provides full transparency of power, performance and energy consumption.

Greater availability. This comprehensive power and energy management solution increases system and machine availability and — under certain operating states — makes operation possible in the first place.



Greater scalability. Thanks to its use of various capacitor storage units, this technology scales over a wide energy range: 2 to 10,000 kW. Because the devices are modular in nature, there are few limits to its possible applications.

Connection to external DC supply systems. The DC link connects bidirectionally to external DC supply systems using a DC-DC converter.

Measurement data for ISO 50001 systems. Users can integrate the power supply modules, which measure performance data and provide energy meter readings, into ISO 50001 energy management systems.

Easy connectivity. This technology can connect to higher-level controllers via PROFINET, EtherNet/IP and Modbus/TCP. In addition, selection, installation, startup and operation are quick and easy, thanks to engineering tools and prefabricated MOVIKIT® software modules.

APPLICATION EXAMPLES

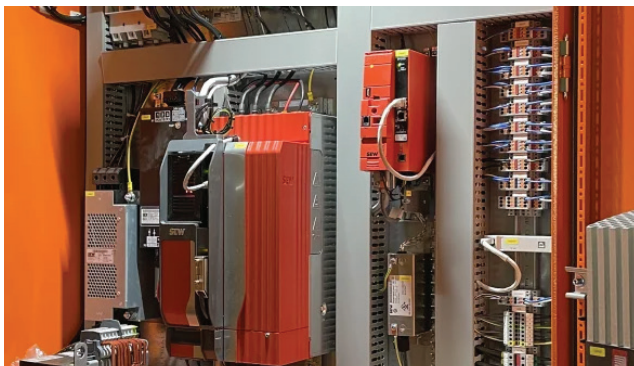
→ **Lifting and lowering goods at an automated lifting station.** This system incorporates MOVIDRIVE® Power and Energy Solution products, which are set to run in Power Mode (see sidebar for more information about supported topologies). This solution reduced the peak power output during the upward acceleration by a factor of 15. It also reduced energy costs to 60 percent compared to a previous setup that included braking resistors.

In the event of a power failure, the MOVIDRIVE system will complete the downward movement by using the energy stored in the capacitor. It will also bring the upward movement to a halt in a controlled manner — at which point it also applies the brake. Power and energy modules provide the ISO 50001 energy management system with measured values, enabling operators to visualize the system's energy consumption and identify deviations that may indicate component wear or stiffness.

Ferris Wheel Drive Example

Typical applications for SEW-EURODRIVE Power and Energy Solutions include dynamic machine modules, amusement park rides and logistics applications, including storage and retrieval systems and automated warehouses.

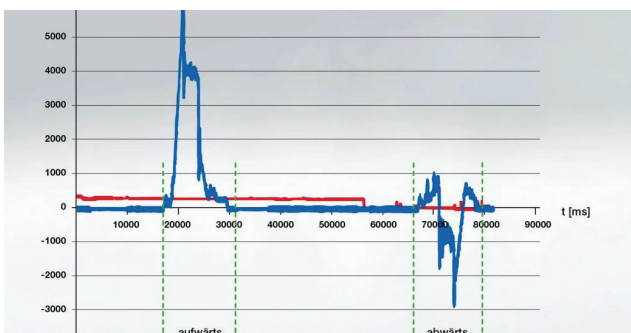
Using a ferris wheel as an example, the inverter technology reduces the starting and connected power by a factor of 6. Instead of requiring a total grid connection for > 180 kW, the same ride can be operated with 32 kW. For typical machine applications, the peak load reduction factor is > 10x. Plants with peak loads of 25 kW can now be operated on a 2-kW connection.



Inverter technology from SEW-EURODRIVE for the cold storage facility.

→ **Cold storage facility.** This facility includes many machines and systems, such as stacker cranes with shuttles, pallet transfer shuttles and rail-guided vehicles for hoists and conveyors. Some of the technical requirements for this project included: a high grid quality — and therefore no use of regenerative power supplies; no braking resistors, as their thermal output would need to be offset in the cold storage facility; a high degree of capacity utilization; and rapid return on investment. The use of energy storage capacitors and products from the MOVI-C modular system unlocked the following benefits:

- Rapid return on investment by downsizing the electrical installation.
- Reduced peak power from 140 to 25 kW per storage and retrieval system.
- High grid quality and greater energy efficiency thanks to internal energy recovery.
- Greater operating time — the diversity factor of the stacker cranes increased to 100 percent.



Reducing the peak power in an automated lifting station.

Power and Energy Solutions: MOVIDRIVE® Modular Inverter Technology

Hardware	Technical Features
Power Supply Module with Controlled DC Link Voltage	Nominal line voltage: 3 × AC 200 to 500 V Controlled DC link voltage: DC 0 to 800 V Nominal power: 25 kW Overload capacity: 160% Option for parallel connection
Switched-mode Power Supply Module with AC and DC Supply	Input voltage: 1 × AC 200 to 3 × AC 500 V, or DC 150 to 800 V Nominal output voltage: DC 24 V Nominal output current: 22.5 A Option for parallel connection
Capacitor Module	DC link connection DC link voltage supply system: DC 560 V Operating voltage range: DC 0 to 800 V Maximum voltage: DC 900 V Nominal capacity: 11.8 mF ± 20% Usable energy: 2 kW from 500 to 800 V Connection via DC bus Option for parallel connection
External Capacitors	Voltage range: DC 0 to 800 V Energy content up to: 3,000 kW Connection via DC cable Options for both parallel and series connection



Software Modules for Stacker Cranes

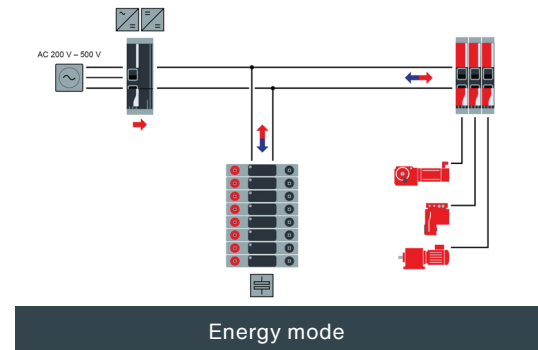
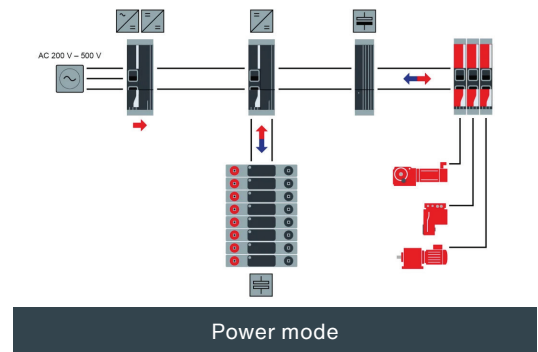
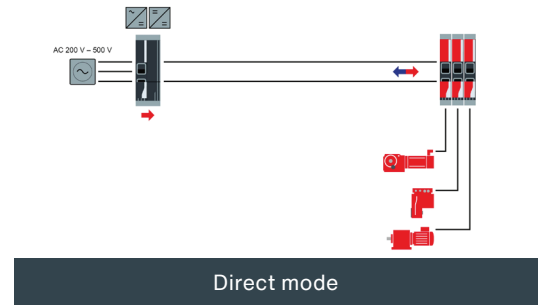
The MOVIDRIVE® modular application inverter supports four topologies. In addition to an alternating current configuration, each one can be implemented in a direct current configuration:

Direct mode. Users can operate the power supply module within an input voltage range of 3 x AC 200 V to 500 V. They can also set the DC link voltage independently of the input voltage, making it possible to temporarily operate drives at a higher speed.

Power mode. This topology reduces power peaks from the grid, along with energy costs, and is suitable for high power ratings. Its power fail-safe covers outages lasting seconds — or even minutes.

Energy mode. This topology reduces power peaks from the grid, along with energy costs, and is suitable for large energy volumes. Its power fail-safe covers outages lasting several minutes.

Flexible mode. This topology reduces power peaks from the grid, along with energy costs, and is suitable for high power ratings and large energy volumes. Its power fail-safe covers outages lasting several minutes.



MOVING TOWARD THE MODULAR FACTORY

Modern factories must be more flexible than ever — especially as manufacturers face mounting pressures to expand digitalization, increase throughput, support sustainability and meet ever-changing customer requirements. Power and energy management technologies must take these various developments into account in a way that optimizes the energy consumption of automated systems, unlocking new productivity, sustainability and economic benefits.



→ Learn more about power and energy management solutions here.

SEW EURODRIVE

SEW-EURODRIVE, Inc.
220 Finch Rd.
Wellford, SC 29385
P: (864) 439-7537
seweurodrive.com