

Smart connections for energy storage systems



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Natural resources are essential for human life. In recent decades, there has been a tremendous change over the energy infrastructure due to the limited availability of coal, oil and natural gas. As an alternative and in addition to nuclear power, renewable energy sources like solar, wind, and biomass have been further developed on a large scale around the world.



From Kevin Luo, Head of R&D, by Sinowatt; and Ivan Dong, Sales Manager by HARTING China



Ivan Dong



Kevin Luo

Blind-mating connector technology enables an accelerated assembly of Energy Storage Systems

What comes next is the change of concepts and habits in energy consumption. People have realised that the original way of using energy not only produces a lot of waste, but also destroys our living environment. If we want to improve our environment, we need to increase the efficiency of energy use.

Due to the progress in energy technology, in the field of resource exploration as well as in energy management, energy storage has gained in importance.

Energy storage means a process, an industry and, in principle, a technology that has been created due to the need for energy. A well-developed energy storage technology allows humanity to make the most of the available resources. In addition, it is a fact that efficient energy management can save costs and stabilise the entire electricity grid. But how have the energy storage systems emerged?

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Evolution of modular energy storage systems

In fact, electricity storage technologies already have a long history. In particular, the first common technologies such as lead accumulators and lead batteries have proved to be very bulky and harmful to the environment. Therefore, they are not suitable for future-oriented applications.

In recent years, energy storage technology has made significant progress in research and application. A good example is the development of lithium-ion accumulators. They are more environmentally friendly and less cumbersome, if compared to lead accumulators. The new technology enables a wider distribution of energy storage systems with large capacities.

At present, energy storage products are mainly applied in industrial markets, driven by high capacity requirements. However, the trend in development is towards smaller capacity needs through modularisation and standardisation targeted at modern small-scale industrial, commercial, and consumer markets, particularly in Europe and America.

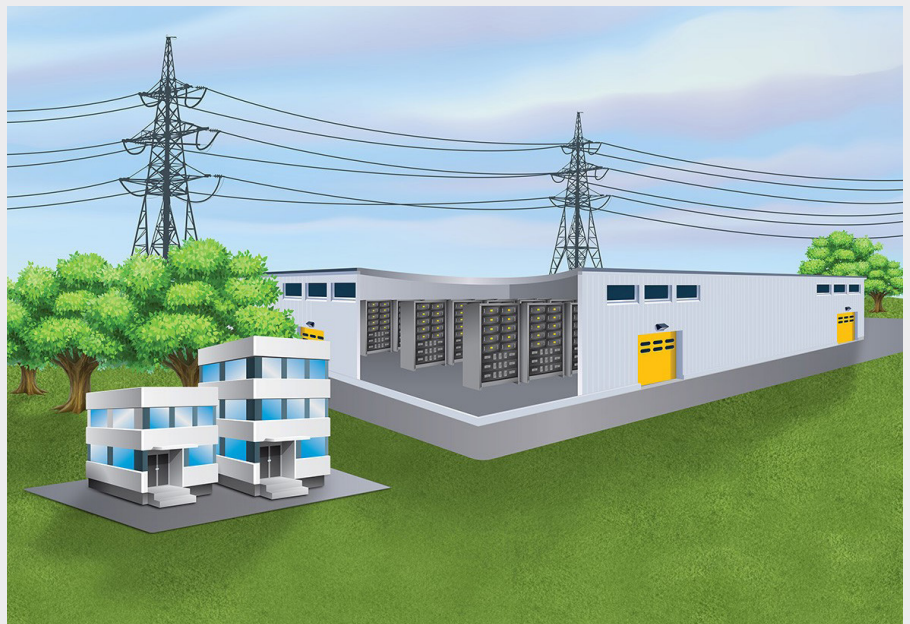
In Europe and North America, tariff models exist where customers have to pay different prices for their electricity based on time and consumption. At peak times, the electricity costs can be many times as much as in times with low tariffs, primarily at night and on weekends. Thus, consumers can significantly reduce their electricity costs by filling their battery packs during periods with low electricity

prices, in order to keep the energy available for times with high tariffs.

Moreover, the large-scale use of energy storage systems can significantly contribute to the stabilisation of the electricity grid. Energy suppliers can stabilize grid

countries' markets. Here, the systems are mainly applied by industrial and commercial customers.

ESS offer very flexible customisation options. Due to their modular design, e.g.



operation by moving consumers with special tariffs to store electricity during the periods of low load. This significantly reduces both the risk of grid failures as well as operating costs.

Sinowatt Dongguan Limited is a company specialized in energy technology with the core business of researching, developing and producing lithium-ion accumulators. Sinowatt's integrated energy storage systems (ESS) are not distributed to the Chinese consumer market, but primarily to Europe, Australia and other

the capacity can be easily adapted to customer requirements.

The ESS control system has a modular design with an energy storage module serving as basic unit. The module has a storage capacity of 2.4 kWh. Various modules can be placed in a rack, side-by-side with the power and data transfer lines. The modular approach facilitates standardisation as well as capacity scaling, which allows for a quick adaptation of the ESS to customer requirements.

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Integrated ESS can be used flexibly, if they are equipped with adequate, quick and easy mounting interfaces. Thus, ESS storage drawers that are equipped with Han-Modular® docking frames can

be easily grasped at the front grips and be pushed into the racks of a storage cabinet. Due to the Han® docking frame, the energy storage unit is blind mating, i.e. automatically sliding into the correct posi-

tion to establish the required connections to the system's power and control bus. Except from the insertion of the drawers, no additional steps are needed to install the entire storage system.



„With the Han-Modular® Docking Frame, HARTING offers a floating connection solution. It combines the effective transmission of signal and power with reliable insulation. HARTING significantly adds value to Sinowatt products. The Han® product family stands for safety, reliability, and a user-friendly design.“

Kevin Luo, Head of R&D

Quick and easy installation and service

The Han-Modular® docking frame enables the “blind” mating of the ESS' components. In the Sinowatt application, the interface consists of three modules, two Han® 70 A modules and one Han® 12 DD module. The Han® 70 A module transmits power and the Han® 12 DD module transmits signals. Due to the “blind mating” functionality, the energy storage units can inserted and removed as rapidly as drawers; the type of installation is simple, clean and timesaving.

Han® connectors meet the requirements of energy storage systems not only due to their reliability. In addition to the blind-mating functionality (implying a guided plug-in process for the connection of storage units), HARTING solutions

are highly efficient and flexible due to manifold features like different cable diameters, insulation characteristics, and designs of contacts, inserts, and hoods/housings. Further options can be included like switch control, transmission of digital or analogue control signals, and other features relevant for transmission like shielding.

Advantages of connectors

A connector-based design of energy storage has the following advantages:

The most important aspect is safety. With finger protection guaranteed by design, Han® connectors are reliably protected against incorrect handling – in the commissioning phase as well as during service & maintenance operations (even at higher voltages). Currently, systems

available on the market form greater storage capacities by combining large numbers of accumulators. The connections required for power transmission and system control are established manually. This bears the risk of connection errors and damages to the product, explosion hazards included. By using connectors for the assembly of larger storage units, these risks can be minimised. The risks of manual hardwiring are avoided; safety is improved.

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The second advantage lies in reliability. HARTING connectors ensure a high-quality transmission of signals, providing excellent electric insulation properties. Floating connection is a key for efficient ESS. In systems with numerous and complex communication nodes and electrical contacts, industrial connectors in combination with pre-tested cable assemblies safeguard an uninterrupted performance.



The third advantage is simplicity. The Han-Modular® docking frame can be blind mated due to a position tolerance of ± 2 mm and a guided section, which is 4 mm long. The option of "blind mating" simplifies, in particular, the installation and maintenance of the system. Standardisation and modularisation overcome the disadvantages of traditional hardwired cabling. Cables must be exchanged less frequently, potential default risks are reduced. The ESS has less downtime and losses. In addition to the increase in performance, the absence of pre-fabricated hardwired cabling simplifies the design of the ESS enormously.



Increasing value by using smart connectors

Connectors are important components of ESS. They significantly contribute to the safeguarding and stabilisation of the ESS' lifeblood, i.e. the transmission of power and signals. Energy storage systems consist of many modules creating complex requirements for communication, management and control. In particularly complex arrangements, traditional hardwiring may increase the risk of incorrect interconnection and make maintenance more difficult. The use of connectors is a cost-reducing and safe alternative.

For Sinowatt, HARTING connectors do not only meet the functional requirements of the ESS, but also improve the product value. They perfectly meet customer requirements concerning high flexibility, communication stability, and robustness – making the design of the whole system easier as well as inspiring the R&D on ESS by opening up manifold new design options.

Sinowatt Dongguan Ltd., founded in June 2010, Develops and manufactures lithium-ion accumulators, from the storage cell to the complete energy storage system. The subsidiary of China Electronics Corporation offers solutions for portable electronic products such as smart phones, but also for stationary and mobile energy storage systems. Inter alia, they are used to drive electric motors for vehicles or to store electricity from solar power plants.

An energy storage system ESS consists of capacitors that are combined in larger groups for receiving and delivering great amounts of electricity – via HARTING connectors and docking frames. A modular energy storage system is scalable, fast to set up and easy to maintain.

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