

Industrial Products & Equipment

1 IoT-compatible Industrial Controllers

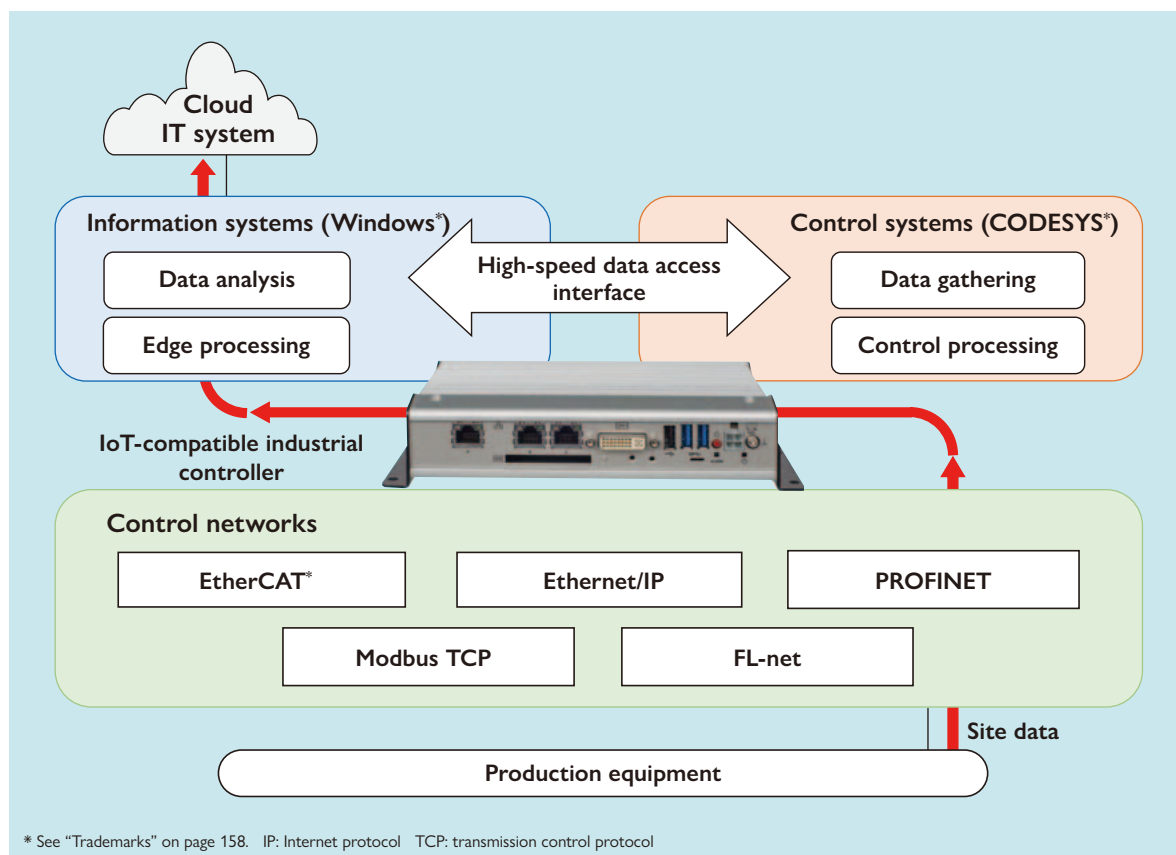
Factory automation systems are increasingly embracing the use of the Internet of things (IoT). The application of IoT technology to factory automation encompasses more than just control functions for controllers. Other controller functions such as collecting real-time data from sensors and other inputs, and for performing immediate data analysis and edge processing are in high demand.

To respond to these demands, Hitachi is planning to release the following two functional augmentations for IoT-compatible industrial controllers:

- (1) Support for control networks [Ethernet/IP^{*}, PROFINET^{*}, Modbus^{*}, Transmission Control Protocol (TCP) and FL-net] used to connect to various devices and gather data
- (2) Adding high-speed data access functions for use between control and information systems to communicate control system high-speed cycle data to information systems without omissions

IoT-compatible industrial controllers connect control systems and information systems. These functional augmentations will help bring the IoT to factory automation systems.

* See "Trademarks" on page 158.



* See "Trademarks" on page 158. IP: Internet protocol TCP: transmission control protocol

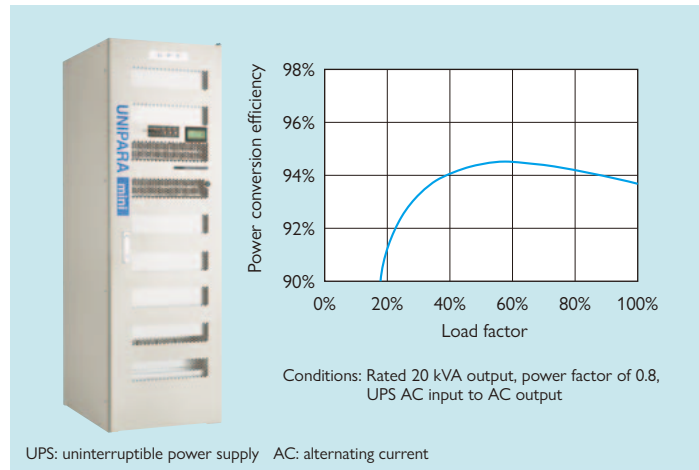
1 IoT-compatible industrial controllers for connecting control systems and information systems

2 Series of Uninterruptible Power Supply Systems

The increasing ubiquity of digital devices is making the uninterruptible supply of power for information and communication devices a concern of growing importance. The uninterruptible power supply (UPS) system series are a lineup of medium- to large-capacity UPSs previously developed and commercially released by Hitachi. Characterized by their high expandability and reliability, they are available in 20 to 1,000 kVA models. Hitachi has now expanded this lineup with the release of the UPS series of small- to medium-capacity (10 to 50 kVA) UPS systems for the small- to medium-sized business market.

These products are the first UPS systems in the industry to use silicon carbide (SiC) elements in small- to medium-capacity models, greatly reducing circuit loss and enabling compact and space-saving designs. They have an efficiency of 94.0 to 94.5%* in their practical operation range (load factors between 40 and 80%), cutting power costs and saving energy. They support a single UPS, or can be configured into highly reliable standby redundant systems. Service performance can also be improved by selecting the optional IoT-based monitoring service that enables maintenance staff to be rapidly sent to the site when equipment failures arise.

* Typical value based on power conversion efficiency at rated 20 kVA output; not guaranteed.



2 UPS series model (10 to 30 kVA) and its power conversion efficiency

3 1,500V DC High-efficiency HIVERTER-NP215i Series of PCS Systems for Large Solar Applications

Large solar power generation facilities are continually being constructed in Japan, and growth in the solar power generation market is also expected elsewhere in Asia and around the world.

1,500V DC solar panels offer more competitive construction costs by augmenting business profits from sales of electricity. They have generated worldwide interest in equipment that can make use of them and in solar power conditioning systems (PCS systems) that can support this equipment.

Hitachi has worked with local Indian subsidiary Hitachi Hi-Rel Power Electronics Pvt. Ltd. to jointly develop a lineup of outdoor 1,500 V solar PCS systems (the HIVERTER-NP215i Series). The lineup's main features are:

- (1) Efficiency equivalent to conventional Hitachi outdoor models when operated at the rated output and rated direct current (DC) voltage
- (2) Multi-maximum power point tracking (MPPT) function that divides the PCS system into three parts for MPPT control
- (3) A wide MPPT range of 820 to 1,400 V that ensures power generation capacity and handles overloads.
- (4) An outdoor standalone panel design that lowers cost by eliminating the need for buildings or outdoor packages.

Hitachi will continue to develop power electronics products that address a wide range of client needs throughout Japan and the world.



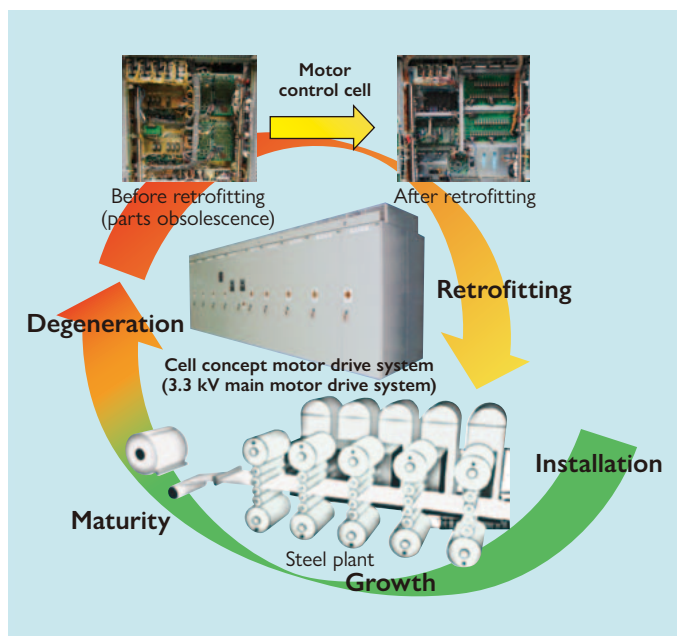
3 HIVERTER-NP215i Series of 1,500V DC-compatible solar PCS systems developed jointly with Hitachi Hi-Rel Power Electronics

4 Cell Concept Motor Drive System for Optimizing Life Cycle Plans

Building on the long, successful track record of Hitachi's motor drive systems for steel plants, Hitachi has now released a motor drive system made possible by recent technical refinements. The system is an application of the cell concept, a design approach that achieves total functionality by dividing system functions into minimum units (cells) and selecting cells as needed.

System life cycle degeneration usually occurs when system production or maintenance can no longer be continued due mainly to parts obsolescence. In the past, systems would inevitably need to be completely updated at this point. But Hitachi's cell concept motor drive system addresses this problem by using current parts to enable the reconstruction of cells with obsolete parts, extending their life through retrofitting (renovation). Hitachi has recently created a retrofitting service for motor control cells, which are particularly vulnerable to electronic parts obsolescence.

Hitachi is planning to expand the service to include main circuit cells of motor drive systems for steel plants, and to refine the motor drive system into a product that can help users create life cycle plans for their equipment.



4 Life cycle plan of cell concept motor drive system

5 Oil-free Scroll Compressors with Built-in Amorphous Motors

Oil-free scroll compressors are increasingly demanded by industries requiring oil-free operation, low vibration, and low noise. Major users include food companies and research facilities. Users have also recently been demanding more compact models to flexibly accommodate line layout changes and distributed air compressor installation for energy-saving purposes.

To address these needs, Hitachi has developed a lineup of oil-free scroll compressors with built-in amorphous motors and outputs ranging from 3.7 to 22 kW. Their main features are as follows:

- (1) An IE5 Class* amorphous motor is built in to the scroll compressor body, enabling product dimensions 37% smaller than models currently on the market (7.5 kW output model).
- (2) Come with a color touch panel that improves visibility and operation (11, 15, and 22 kW output models).
- (3) Energy-saving operation made possible by controlling the product's multiple (two to four) compressor units.

(Hitachi Industrial Equipment Systems Co., Ltd.)

* The highest level given in the motor energy efficiency guidelines currently being drafted and discussed by the International Electrotechnical Commission as IEC 60034-30-2.



5 Oil-free scroll compressor with built-in amorphous motor (22 kW model)

6

Augmentation of Non-OSP Applicable Industrial Inkjet Printer Inks

Ensuring user safety and preventing user health problems have recently become issues of concern for products using chemicals such as inks and solvents. To address these needs, Hitachi has minimized the use of the substances subject to Japan's Ordinance on Prevention of Organic Solvent Poisoning (OSP), and has augmented its lineup of industrial inkjet printer inks and solvents that are free from the substances of high concern specified by the EU's Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) regulation.

Hitachi's total lineup consists of six ink types as of October 2018—five ethanol-based ink types and one non-OSP applicable ketone-based ink type. The ethanol-based ink types include 3112K for general-purpose applications, 3127K and 3131K which are highly adhesive on polypropylene (PP) and polyethylene (PE), 3111K for returnable containers and enabling erasure of printing using an alkaline solution, and 3128FA invisible ink that fluoresces under UV and is used for applications such as product quality control. The lineup also includes 4136K, a non-OSP applicable ketone-based ink that is highly adhesive on PP and PE and is marketed mainly to the food industry as an alcohol-resistant ink.

Hitachi will continue augmenting its lineup of non-OSP applicable inks designed to meet client needs.

(Hitachi Industrial Equipment Systems Co., Ltd.)



6 Non-OSP applicable inks and their intensifiers, along with industrial inkjet printer

7

L Series Compact, High-function Electric Chain Hoists

Electric chain hoists featuring compact/lightweight designs are used in a wide range of cargo handling and transport work. Their compact/lightweight designs make them commonly used in transportation equipment, where duty factor improvement is a common demand. Electric chain hoists are winches used to hoist up cargo, so falling objects are a constant risk and demands for safety improvements are high. Hitachi has recently developed a lineup of electric chain hoists that offer improved durability, safety, and handling. They were developed by reviewing the structure of models for rated loads of up to 500 kg. The main features of the released hoist models with rated loads of 150, 250, and 500 kg are as follows:

- (1) Improved motor output has improved the duty factor (from 25 to 40% ED), which in turn improves durability.
- (2) The chain bucket opening has been provided with a bag, improving safety by holding in loose chain lengths.
- (3) The interlocking structure of the lower hook/latch improves safety by preventing the sling from becoming uncoupled from the hook.
- (4) The size of lower hook opening has been increased (from 19 to 27 mm in diameter), improving handling.

(Hitachi Industrial Equipment Systems Co., Ltd.)



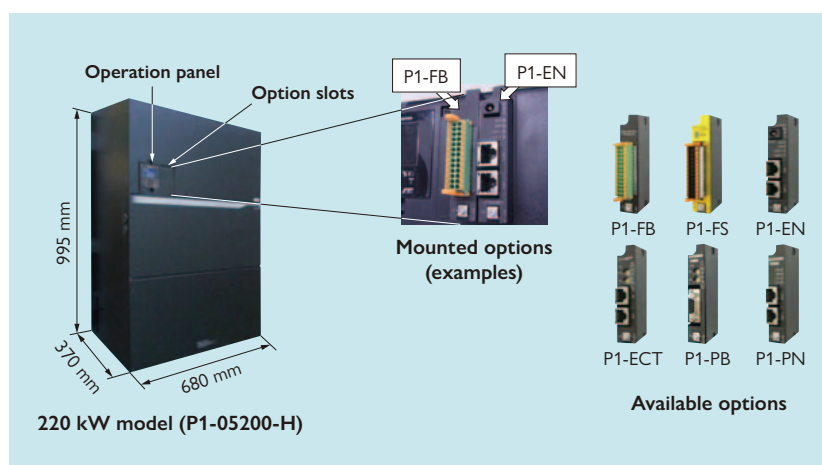
7 L series electric chain hoist

8 Improvement and Expansion of General-purpose SJ-P1 Series Inverters

The expanding application demands on general-purpose inverters have further increased the demands for communication functions and functional safety in addition to simply driving motors. The SJ Series Type P1 (SJ-P1; 0.4 to 132 kW), which Hitachi released in 2016 as a lineup of a high-performance inverter models, flexibly support high-performance motor control such as sensor-less vector control for both induction motors and permanent magnet motors, and closed-loop vector control by using a feedback option (P1-FB). Moreover, to meet market demands such as system and IoT support, Hitachi has recently augmented the series with a functional safety option, communication option, and an expanded output capacity of up to 220 kW. The functional safety option (P1-FS) provides safety functions of Safety Integrity Level 3 (SIL3) without high-speed sensors, including Safe Stop 1 (SS1), Safely Limited Speed (SLS), and Safe Brake Control (SBC), which enables a high standard of functional safety system configuration at low cost. On the other hand, the communication option meets a wide range of needs, supporting Ethernet (P1-EN), EtherCAT (P1-ECT), PROFIBUS[®]-DP (P1-PB), and PROFINET (P1-PN) communication. The output capacity range of SJ-P1 has been expanded with an output capacity of up to 220 kW maintaining the same drive performance and usability. Hitachi plans to expand it by supporting additional communication protocols and to expand the output capacity for larger capacity models.

(Hitachi Industrial Equipment Systems Co., Ltd.)

* See "Trademarks" on page 158.



8 SJ-P1 Series enhancement

9 HX Series of IoT-compatible Industrial Controllers Augmented Edge Computing Programming Environment

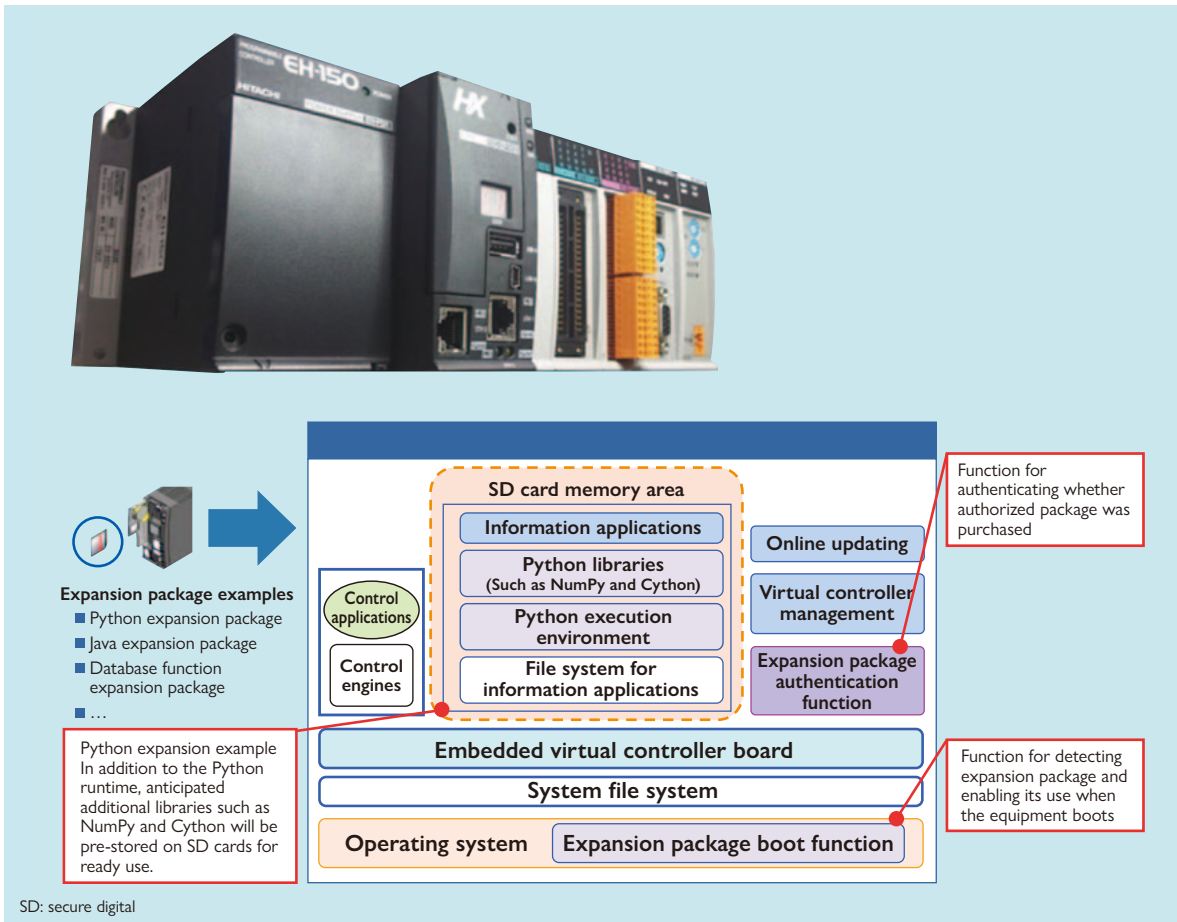
Hitachi's HX Series of IoT-compatible industrial controllers has been expanded with the release of a hybrid model that provides augmented IoT-compatible functions for forming close connections between manufacturing sites (control systems) and information systems. The model contains an embedded virtual controller board that separates control programs and information processing programs. Information programs can share data with control programs, and there is an online switching function that can switch information processing programs while control programs are running.

Enabling IT engineers to write information system programs in the programming languages they are familiar with is a key requirement for bringing IoT functions to manufacturing sites and performing various types of study and analysis at these sites (processes known as edge computing). To meet the user demand for implementation of the new functions in this product, Hitachi is planning expansion packages that add to the programming languages already supported by the current model (C/C++) by also supporting Python^{*} (with extensive libraries for mathematical functions and machine learning) and Java^{*} (suited to web application development). While the standard hybrid model provides the virtual controller in built-in flash memory, the expansion packages will provide it on secure digital (SD) cards so that the supported programming languages can be changed or expanded by changing cards.

To realize industrial digitalization, Hitachi is aiming to provide a controller that comes with real-time control functions and enables flexible information processing.

(Hitachi Industrial Equipment Systems Co., Ltd.)

* See “Trademarks” on page 158.



9 HX Series hybrid model (top) and expansion package overview (bottom)

10 Vortex Blower Unit with Inverter

Vortex blowers are installed for use in soundproof boxes for noise reduction. They have always been produced and demanded as sets, but the market share for vortex blowers with inverter-driven variable-speed operation has been growing every year for applications such as hertz-free running and saving energy. To combine these two types into a single unit, Hitachi has developed a vortex blower unit with an inverter. The use of an original Hitachi cooling structure enables soundproof boxes with a compact design and noise reduction of about 5 to 10 dB. A programmed operation function in the unit's inverter enables simple sequence control without commands from the host. This feature enables simple control operation by the unit in a standalone configuration without the need to provide a separate control board. An air filter and noise filter can be mounted as options, enabling customization tailored to the user's needs. These functions should enable the unit to support air blowing and a wide range of other applications.

(Hitachi Industrial Equipment Systems Co., Ltd.)



10 Vortex blower unit with inverter