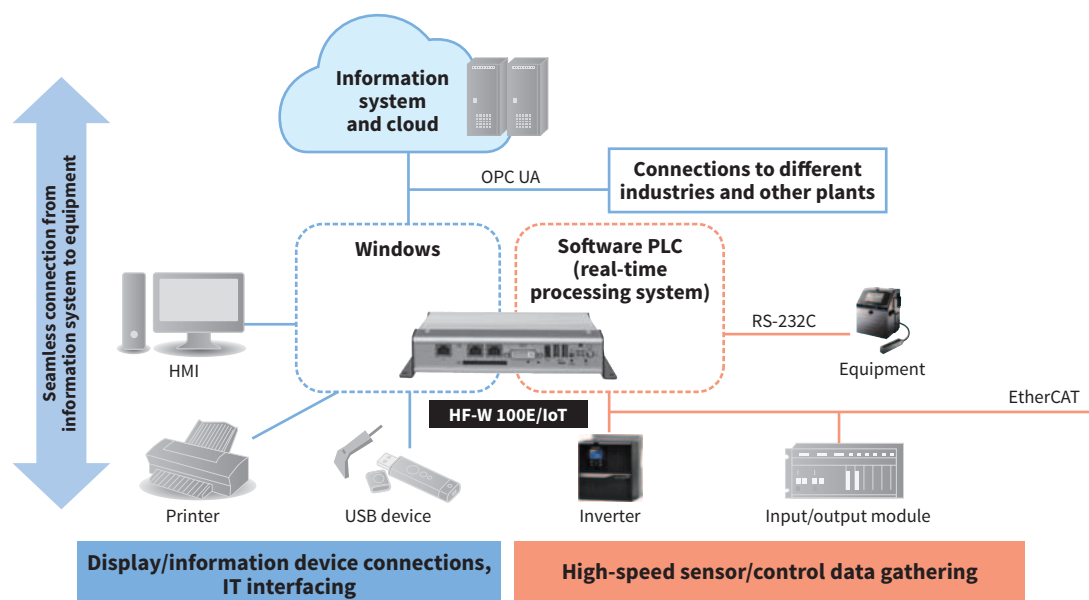


Industrial Products & Equipment



HMI: human-machine interface USB: universal serial bus

1 IoT-compatible controller series supporting industrial IoT applications

1 IoT-compatible Industrial Controllers

The use of Internet of Things (IoT) applications is becoming increasingly widespread among automation systems. Seeking to be among the first to capitalize on this trend, Hitachi released a series of IoT-compatible industrial controllers in 2015. The latest model in this series, was released in 2017. This model makes it easy to seamlessly connect information systems to equipment.

The main features are as follows.

- (1) Programmable logic controller (PLC) functions are integrated into a highly reliable industrial computer with long-term availability, enabling a single device to handle processes for both the information system (Windows*) and control system (PLC).
- (2) EtherCAT* compatibility enables the creation of a field network that provides high-speed communication with less wiring.

- (3) OPC UA* server functions are provided, enabling platform-independent data sharing.
- (4) To help reduce user development time and cost, programming languages that conform to the IEC 61131-3 international standard are supported, improving the reusability of PLC programs and enabling storage of vendor-independent PLC software assets.

* See "Trademarks" on page 148.

2 Two-pole Motor

Hitachi has added a two-pole motor to its series of motors used to drive general industrial applications. This series was released in FY2015 and is already used in a wide range of industries.

The addition of the new model enables the series of models ranging from two-pole to multiple-pole types to be provided for welded steel frame motors. The two-pole model uses



Capacity	900–5,000 kW
Voltage	3–13.2 kV
Draft cooling method	Air-cooled heat exchangers (IC01, IC611, IC81W)
Model	Horizontal shaft, fully closed/open
Temperature rise	B rise (80 K), F rise (105 K)
Noise (no-load 1 m average value)	95 dB (A)

2 Two-pole motor (top) and main specifications (bottom)

the following technology to enable a frame that is one size smaller while maintaining the same output as previous models:

- (1) An optimized design created using magnetic field analysis increases the magnetic flux density and capacity.
- (2) A vibration-dampening frame helps reduce weight and increase rigidity.

Motor dimensions and weight have previously been a problem when upgrading existing motors or installing new equipment on a site, making some motors difficult to install. The smaller dimensions and lighter weights of Hitachi's series of motors facilitate client engineering work when installing equipment.

3 KPIC Large Centrifugal Compressors

Six casings for the main centrifugal compressors used in an ethylene plant have been delivered to Korea Petrochemical Ind. Co., Ltd. (KPIC). Start-up of the new equipment was completed in June 2017.

The delivered equipment replaces five existing centrifugal compressors that Hitachi delivered to the KPIC ethylene plant (located in Onsan, South Korea) in 1990. One new compressor has also been added. These replacements meet



3 Charge gas compressor

the customer's needs by debottlenecking from 470,000 to 800,000 metric tons per year.

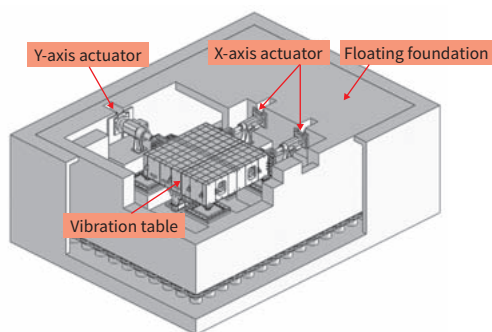
The main features are as follows.

- (1) To accommodate dimensional restrictions by using existing foundations, 3D flow analysis was used to optimize intake flow channel shapes and attain the specified compressor performance.
- (2) New structures with reduced maintenance mass were used to improve maintainability.
- (3) The five replacement compressors use the existing foundations. The compressor gas seals for these casings were changed from the existing oil-film seals to dry gas seals, and a new seal gas control and monitoring system was installed.

Hitachi will continue to provide centrifugal compressor renovation and replacement solutions meeting a wide range of customer needs such as increasing compressor capacity and saving energy.

4 Horizontal 2D Vibration Table for the University of Tokyo

Hitachi has recently delivered a horizontal two-dimensional (2D) vibration table to a lab building at the Institute of Industrial Science, The University of Tokyo. A horizontal 2D vibration table is a device used in tests that vibrate test samples for applications such as earthquake resistance tests and behavior elucidation tests of vibrated structures. The delivered table can recreate seismic waves corresponding to the Kobe waves defined by the Japan Meteorological Agency (JMA) and Level 2 simulated waves defined by the Building Center of Japan (BCJ-L2 waves).



Item	Specification
Maximum load mass	10 t
Table dimensions	5 m × 5 m
Vibration axes	Horizontal axes (X, Y)
Drive system	Hydraulic
Coupling system	Hydrostatic coupling
Maximum displacement	X ±300 mm
	Y ±300 mm
Maximum speed (during sine wave vibration)	X 150 cm/s
	Y 140 cm/s
Maximum speed during simultaneous biaxial vibration	3 s
Maximum speed during continuous vibration (single-axis sinusoidal vibration)	X 20 cm/s
	Y 20 cm/s
Maximum acceleration (with maximum load mass)	X ±2.0 G
	Y ±3.0 G
Vibration frequency range	DC to 50 Hz
Allowable overturning moment	300 kN-m
Allowable yawing moment	300 kN-m

DC: direct current

4 Simplified schematic of the 2D vibration table (top) and specifications (bottom)

The table measures 5 meters square and has a maximum load mass of 10 metric tons. It can produce horizontal vibration with a maximum acceleration of 3.0 G (29.4 m/s², Y-axis direction), a maximum speed of 150 cm/s (X-axis direction), and a maximum displacement of ±300 mm. The unit has a floating foundation structure and a vibration damper that reduces the propagation of vibrations to the surrounding area as an environmental measure. It has been designed for lower-cost operation, with a power-saving mode that can be used during standby operation to reduce the power consumption to less than two-thirds of the amount used during rated operation.

Supplying this equipment lets Hitachi assist research designed to explicate the dynamic behavior and limit performance of structures.

5 IoT-compatible Rotary Screw Air Compressors

The recent growth in the use of IoT applications for industrial equipment is creating a growing



5 Oil-flooded rotary screw air compressor (top) and oil-free rotary screw air compressor (bottom)

demand for cloud connectivity of plant equipment and device data. Hitachi has responded with the release of a pioneering series of air compressors that provide a function for communication with cloud servers as a standard feature. The series includes a total of 212 models released simultaneously in two sub-series, a series of oil-flooded rotary screw air compressors, and a series of oil-free rotary screw air compressors.

These new models come with a new communication board developed by Hitachi with a built-in mobile carrier communication function. They feature a color touch panel with a function for checking the intent of communications. The user can connect to a private Hitachi cloud server by operating the panel. The air compressors are designed to connect to the IoT simply

and securely. They enable real-time, round-the-clock checking of site operational states from a personal computer (PC), smartphone, or tablet device. Stored operational data can be downloaded at any time, enabling predictive maintenance and early identification of failure causes. The air compressors can also be used with a cloud monitoring service, enabling equipment management time reviews, optimized repairs/servicing, and efficient operation proposals. (Hitachi Industrial Equipment Systems Co., Ltd.)

* This product is available only in Japan.

6 New Large Air Compressors

In March 2017, Hitachi released a series (200 to 450 kW models) of air compressors with augmented control board IT functions. These new models were released as part of Hitachi's oil-free rotary screw air compressor series that provide clean compressed air for a variety of industries. The board used in these models is the type used in the 15 to 240 kW models to meet demand for air compressor operational state trend monitoring and manufacturer maintenance and management support. The use of this board has now been expanded to large models also. The release of the series has brought communication functions to Hitachi's lineup of oil-free rotary screw air compressors in the 15 to 450 kW output range.

The main features are as follows.

- (1) Modbus^{*} communication compatibility and other augmented communication functions
- (2) Energy-saving control with a terminal



6 Oil-free rotary screw air compressor (450 kW water-cooled, two-stage model with built-in starter panel)

pressure controller

- (3) High-definition color touch panel providing better operability

Hitachi is planning to release another series of large (460 to 680 kW) models with expanded communication functions.

(Hitachi Industrial Equipment Systems Co., Ltd.)

* See "Trademarks" on page 148.

7 New Inverter Hoist Models

Electric hoists are used with equipment such as ceiling cranes. An increasing percentage of models have inverters built-in to provide features such as making it easy to change the operating speed. Hitachi has developed inverter-driven electric hoists in response to recent growth in demand for greater ease of use and maintainability. Traditionally, when a suspended load being transported is stopped, load sway can result and must be dampened by operations performed by skilled workers (follow-up notch operations). The new models have automated these operations and have improved maintainability by enabling easy recording and display of operational information.

The main features are as follows.



7 New inverter hoist model

(1) A load sway reduction function is provided as a standard feature. The amount of load sway caused when stopping a suspended load that is being transported has been reduced to less than one-fourth the amount enabled by previous products.

(2) Information such as load weight-specific operation times and error histories can be saved to the hoist's internal memory or USB memory. Data saved to USB memory can be freely processed in charts or graphs on a PC.

Hitachi has now started taking orders for hoisting/traversing equipment with rated load capacities of 1 to 5 metric tons, and is planning to progressively release a model series.

(Hitachi Industrial Equipment Systems Co., Ltd.)

8 HX Series Hybrid Model IoT-compatible Industrial Controller

Hitachi has added a hybrid model to its series of IoT-compatible industrial controllers. The new model features enhanced IoT functions and tightly couples a control system (manufacturing site) to an information system. It has the same control specifications as the current model, up to 32 MB of storage memory for information processing programs, 512 MB of operating memory, and a container platform that keeps control programs and information processing programs separate. It also provides an online modification function that enables the replacement of information processing programs while control programs are running.

Control operation processing and information processing that requires an information



8 HX series hybrid model

system are both software. Using software to perform these types of processing is a concept known as a software-defined controller (SDC). An SDC is defined as a controller that can flexibly modify its functions in response to the demands of a host system without affecting the control of devices. The hybrid model is a product that achieves this concept. It shares data with control programs to create on-premise data visualizations, provide data for use by various analysis platforms, and enable manufacturing site edge computing. It can be used for various industrial IoT aims such as productivity improvement, quality assurance, faster delivery, cost-cutting, and predictive maintenance.

(Hitachi Industrial Equipment Systems Co., Ltd.)

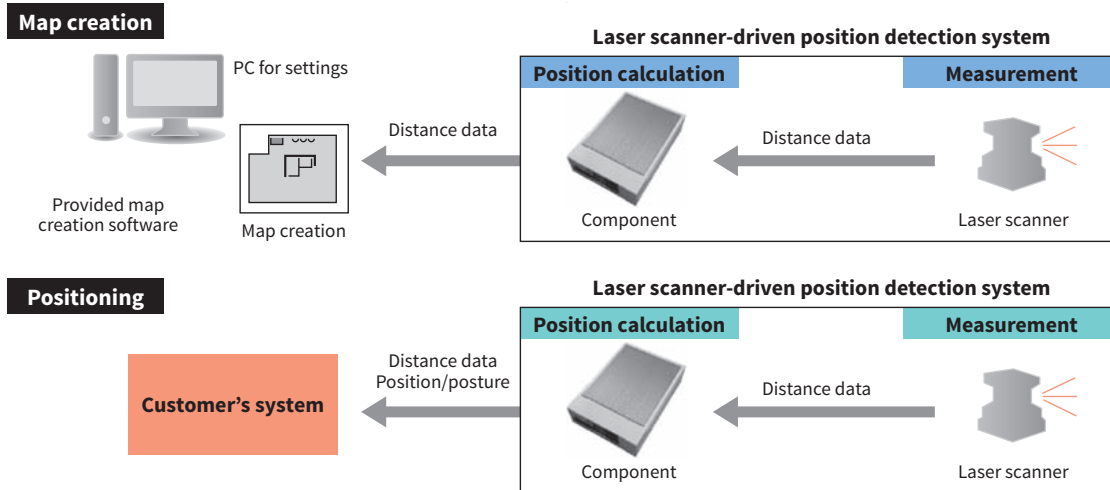
9 New Laser Positioning System

Recent staff shortages at distribution sites have been creating interest in automation technology for distribution applications. Hitachi Industrial Equipment Systems Co., Ltd. has responded to this demand by developing a laser scanner-driven position detection system.

Using only a laser scanner, this system can create a map showing the layout of the structures and other objects in a site, and detect its own location and posture in that map. The high precision and speed (± 50 mm, 25 ms cycles) of its positioning enables position and posture control of moving objects from its data alone, making it easy to configure trackless automatic transport carriers.

2-AX is a new model that expands the map data range from 2,500 m² to 10,000 m². The map can also be switched during operation, enabling continuous positioning over a range exceeding 10,000 m². The model also has a function enabling stable positioning in locations where the layout changes frequently, enabling use at a wide range of sites.

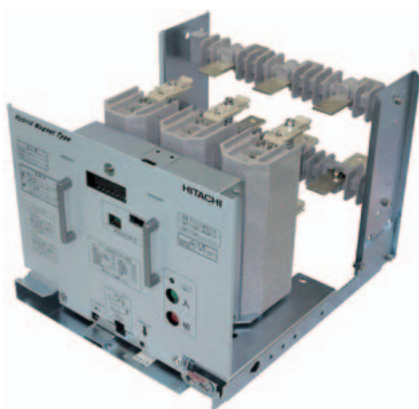
(Hitachi Industrial Equipment Systems Co., Ltd.)



9 Laser scanner-driven position detection system configuration

10 New Hybrid Vacuum Circuit Breaker

The hybrid vacuum circuit breakers (VCBs) made by Hitachi Industrial Equipment Systems (HIES) enable grease-free operation by using solid lubricant bearings in a simple operation mechanism. High reliability and lower maintenance are the main benefits. Grease-free operation eliminates the operation problems encountered by VCBs with conventional



10 New hybrid VCB (top) and its interior (bottom)

electric spring operation when grease dries out or becomes sticky. Hybrid models also eliminate the need for periodic lubrication, reducing maintenance work and running costs.

HIES has recently developed a new hybrid VCB that maintains the benefits of previous hybrid VCBs while reducing the size and weight. The new model is 20% shorter and 30% lighter than current models. The height was reduced by using a smaller main circuit insulator. The weight was reduced by re-thinking the major components such as vacuum valves and hybrid electromagnetic actuators, along with nearly every other component.

The smaller and lighter design improves ease of use such as by facilitating multilayer stacking of VCBs in panels. HIES wants to exploit these benefits to boost sales of the new model for use in both Hitachi's and competitors' panels. (Hitachi Industrial Equipment Systems Co., Ltd.)

11 Power Monitoring Systems

Large facilities have recently been handling larger amounts of power and energy, calling for higher-performance energy monitoring and control systems. But systems for monitoring and controlling voltages ranging from middle to low values have complex configurations, increasing the workload needed to install and maintain them. By drawing on expertise accumulated over the company's history, Hitachi has recently



11 Energy-saving solution system

developed and released an energy-saving solution system. The new system's features include enhanced network functions and insulation monitoring functions supporting voltages from middle to low.

The main features are as follows.

(1) Comprehensive system supporting voltages ranging from middle to low values

The system supports both middle and low voltages for monitoring and controlling a comprehensive range of energy facilities. It can be used with equipment such as electrical substations, heat source facilities, compressor facilities, air conditioning equipment, and water/sanitation facilities. A variety of graphing functions are also provided for visualizing facility information.

(2) Predictive maintenance technology

The system enables continuous monitoring of insulation deterioration primarily for middle-voltage cables. Insulation deterioration in low-voltage devices can be monitored by connecting the system to the insulation monitoring system. (Hitachi Industrial Equipment Systems Co., Ltd.)

12 UX Twin-nozzle Model Industrial Ink Jet Printer

Industrial ink jet printers are in high demand throughout the world. They are used in the food, beverage, cosmetics, pharmaceutical, and other industries to mark products with quality control information such as manufacturing date, best-by date, and lot number.

To add to the UX series released in July 2015, Hitachi has recently developed a twin-nozzle

model that has been refined for added reliability, attractiveness and simplicity.

The main features are as follows.

(1) A dual-nozzle print head enables multi-level printing of up to 8 levels and double the printing speed* of the single-nozzle models.

(2) Can print large characters of 32 dots (with one nozzle) or 64 dots (with two nozzles). A function for editing 64-dot logos or symbols lets users print a wide range of designs.

(3) A proprietary system keeps solvent consumption low by controlling ink recovery and managing the equipment temperature. It greatly reduces solvent consumption to help reduce running costs and reduce environmental impact.

(4) A simplified screen configuration makes it easy to enter information for the two nozzles, improving operability.

(Hitachi Industrial Equipment Systems Co., Ltd.)

* The speed gain is relative to UX series single-nozzle models (two-level printing), as determined by an in-house study.



12 UX series twin-nozzle model industrial ink jet printer