NIPPON KOEI
ENERGY SOLUTIONS

PRODUCTS GUIDE

NIPPON KOEI Energy Solutions
Fukushima Office

INTRODUCTION

Our Power Infrastructure Production Bases Inherit the "Monozukuri" DNA of Our Frontier Spirit

Nippon Koei was established in 1946. The blocking coils (line traps), which were our first product, represent the starting point of our "monozukuri "(Japanese-style manufacturing), which was born from the ingenuity and passion of our engineers amidst the postwar turmoil and shortage of goods.

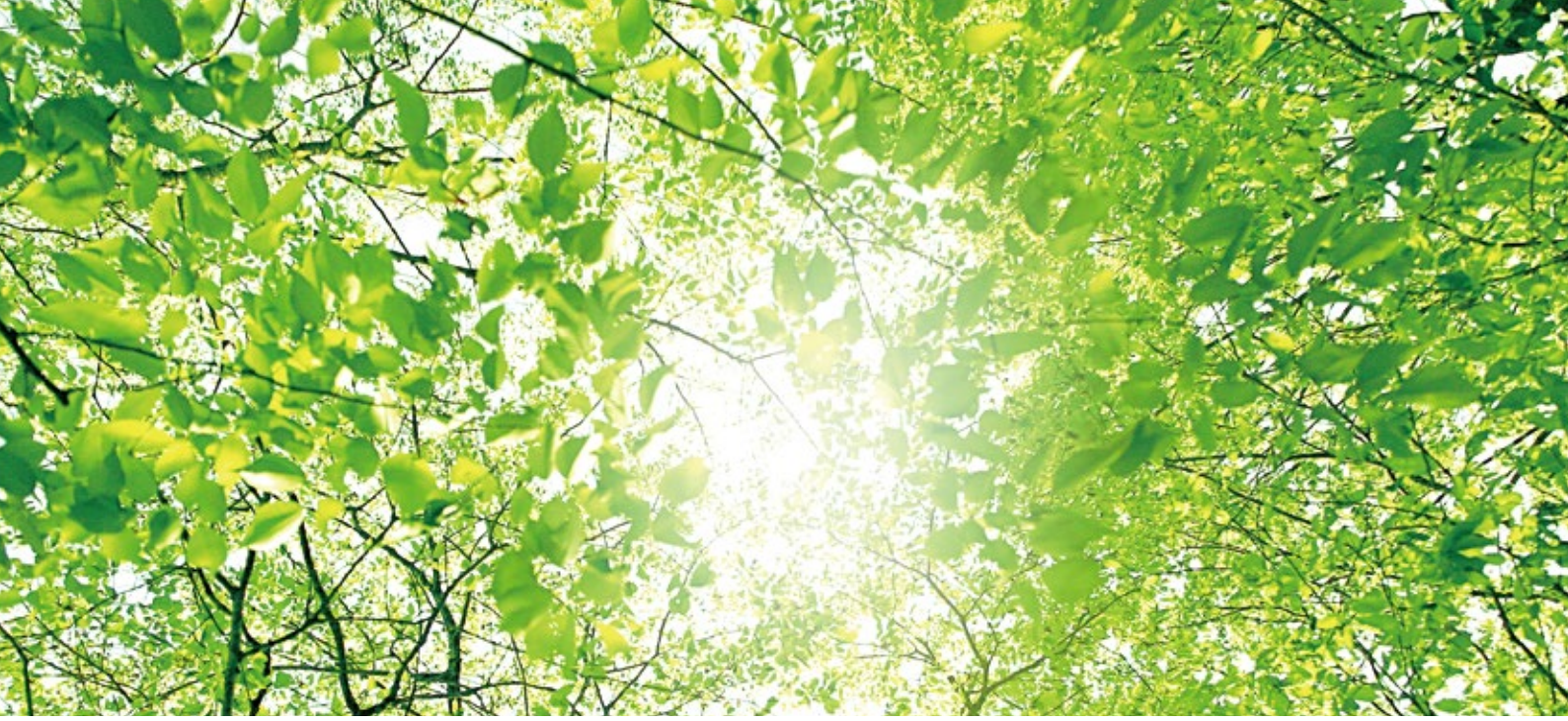
Since then, driven by the will to contribute to society through technology, we have gone on to develop one after another original products for the electric power industry. This frontier spirit with regard to "monozukuri " became the driving force that allowed us to grow from a small town factory in Kawasaki to a worldwide manufacturer specialized in the fields of power generation and transformation.

Later on, our "monozukuri " base shifted to Tokyo, Yokohama, and other locations, and new comprehensive manufacturing facilities have been established in Sukagawa City, Fukushima in 2002. The Nippon Koei Power & Digital Operations is the “Monozukuri Group” that inherits the company founder's DNA and whose comprehensive operations encompass everything from the design and manufacture of electric power industry-related machinery and equipment to the construction of new power infrastructure, equipment updating, and equipment refurbishing.

Power & Digital Operations, Nippon Koei Co., Ltd. (Outline of Production Base)

Location	1-22 Dokyu, Morijuku, Sukagawa-shi, Fukushima 962-8508, Japan
Land area	55,337 m²
Buildings (total floor area)	1. Administrative Building / Steel frame, 2 stories, 4,469 m² (Design room, employee canteen, cafe terrace, lounge with lodging facilities) 2. Systems Building / Steel frame, 2 stories, 4,796 m² (Testing room, various test equipment, thermostatic chamber, house machines for maintenance) 3. Machine Building / Steel frame, 2 stories, 4,296 m² (Turning machines, turning centers, machine tools such as NC shaft lathes, 5-axis processing machines) 4. Machine Building No. 2 / Steel frame, 2 stories, 488 m² 5. Ancillary Building / 1,215 m² (warehouse, pump room, garage, etc.)
Number of employees	291

(as of October 2020)



OUR BUSINESS

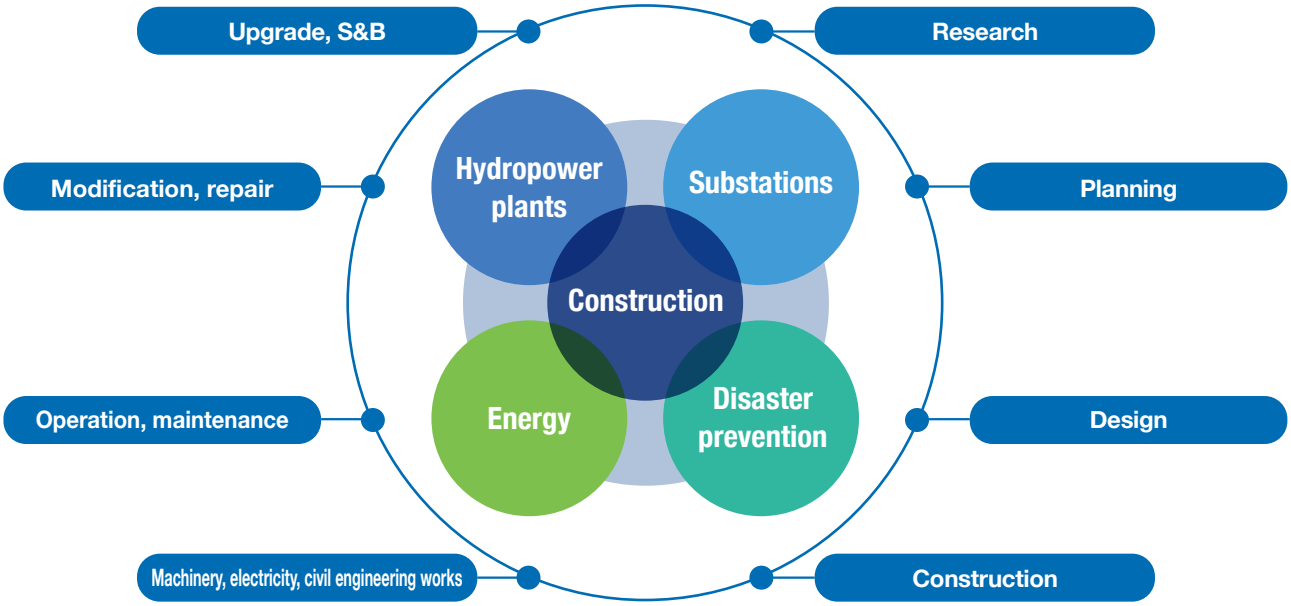
From Fukushima to the World with the Latest Technology A Global Company that Creates the Energy to Be Handed Over to the Next Generation

In the face of increasing natural disasters caused by global warming and the Great East Japan Earthquake, the world's energy composition has undergone a major change, and the need for safe and clean renewable energy that scarcely emits greenhouse gases is rapidly rising.

At the same time, expectations for smart cities, smart houses, and other energy management systems that use energy smartly and efficiently are increasing. These needs, far from being limited to Japan, have become an international need.

The Nippon Koei Power & Digital Operations has worked on numerous power infrastructure projects to efficiently and stably supply renewable energy such as hydropower since its founding. As a front-runner that has grown against the backdrop of such needs, we take pride in our mission to open up new business models in this field through the use of technology.

With "From Fukushima to the World with the Latest Technology" as our motto, we aim to further grow as a global company and create the energy to be handed over to the next generation.


Upgrade, S&B
Research
Modification, repair
Planning
Operation, maintenance
Design
Machinery, electricity, civil engineering works
Construction
Hydropower plants
Substations
Construction
Energy
Disaster prevention

From the Development of Machinery and Equipment for the Electric Power Industry to Design, Manufacture, Construction, Maintenance, and Refurbishing

It is no exaggeration to say that the business fields of the Nippon Koei Power & Digital Operations encompass an entire city. Examples of what we do include the construction of dam management systems and the manufacture of related equipment to comprehensively manage the discharge facilities of dams; the construction and refurbishment of substations, power plants, overhead and underground power transmission equipment; and the construction of central control systems for the efficient monitoring and control of power systems. Further, in recent years, our business has grown to include also various aspects related to the electric power industry, such as the utilization of renewable energy, demand for which is rising, and to respond to the various needs in that field.

Dam

Supervisory control system for dam

Multiple dams are connected to a network to realize monitoring and control from a base.

Hydropower plant

Water turbines

Production of highly efficient water turbines made to suit the characteristics of the site. Over 240 units delivered.

Control

Control

Control systems

Custom-made control systems suitable for turbine/generator specifications and operation methods.

Generators

Production of high-efficiency, high-performance generators. Over 170 units delivered.

Disaster prevention

Rockfall detection system/ Cut slope detection system

Maximum monitoring length of 4,000 m for rockfall and 200 m to 300 m for landslides.

Substations

(auxiliary equipment of transformers)

Conservators

Over 20,000 units delivered.

On-line oil filters

For preventing the deterioration of insulating oil used for tap changers of transformers.

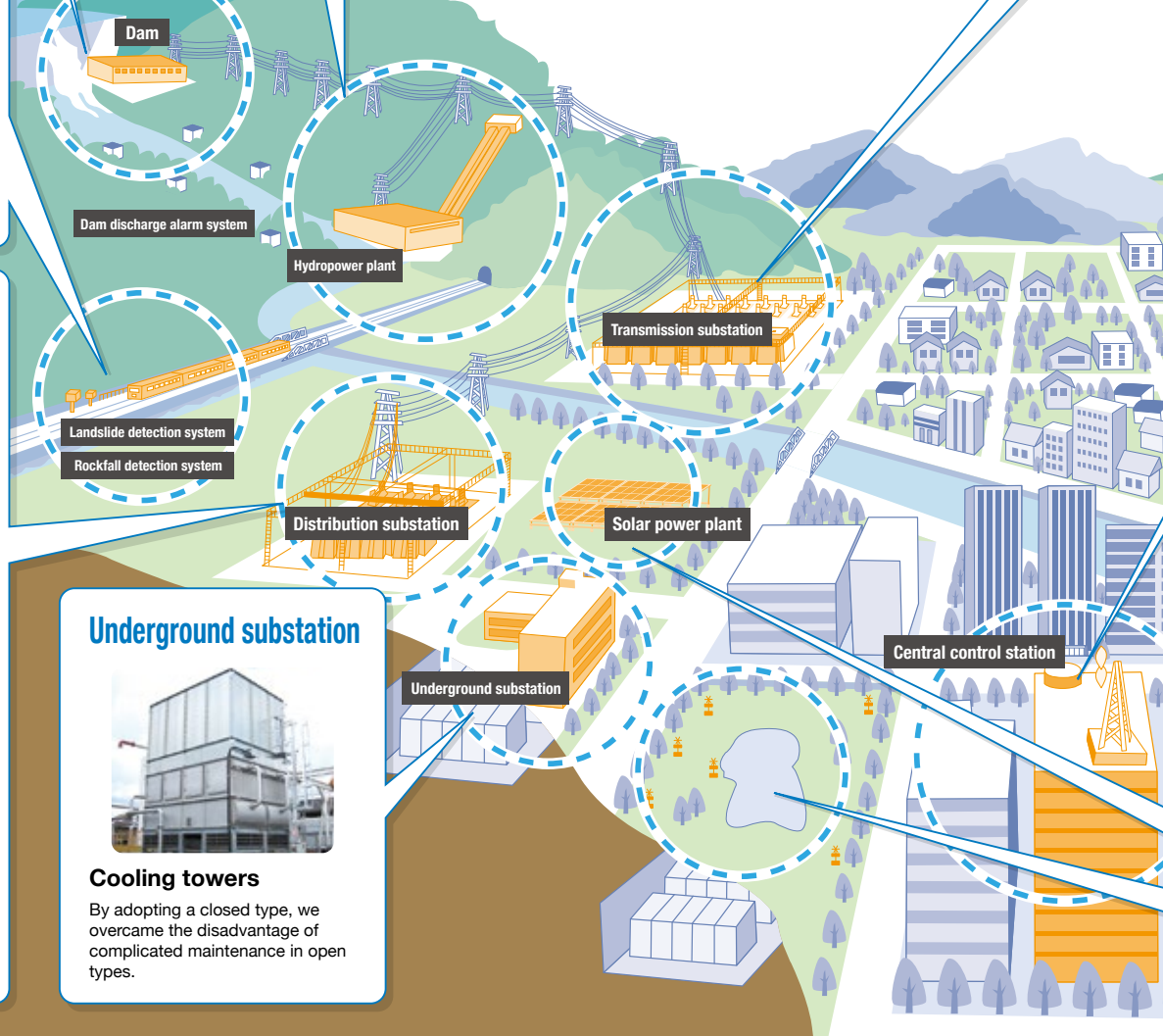
Oilless breathers

Moisture-absorbent breathers that do not require sealing oil.

Underground substation

Cooling towers

By adopting a closed type, we overcame the disadvantage of complicated maintenance in open types.



Substation (monitoring and control system)

Interface panels

Low-cost metal type, space-saving optical type, and IP type.

Remote monitoring and control system

For collecting substation information and coordinating with a central monitoring system.

Compact monitoring control panels

Optimum design according to the scale of the transmission substation.

Control station

Centralized monitoring and control system

For centralized monitoring of multiple unmanned substations.

Renewable energy

Hybrid street lights

Street lights that accumulate electricity generated by wind power and sunlight in a storage cell, and automatically turn on and off.

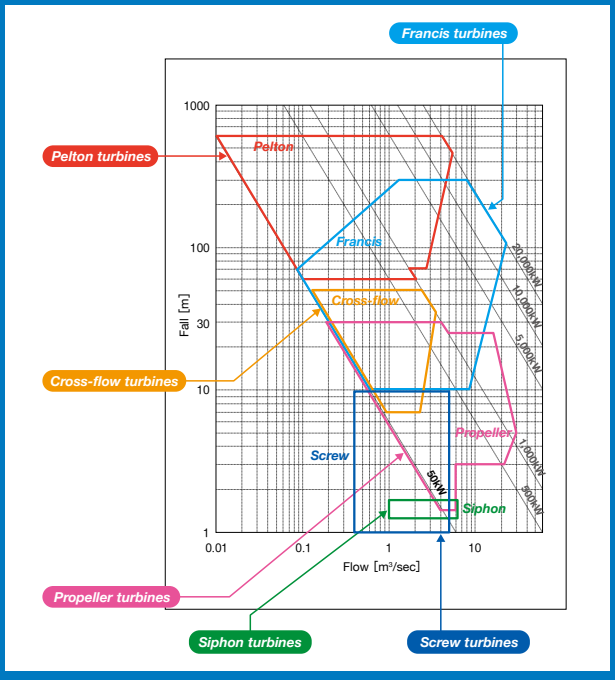
Solar power generation monitoring service

Cloud service that centrally monitors multiple power plants.

CONTENTS

Hydropower plants

Since the company was established in 1946, it has been engaged in numerous projects including the construction of hydropower plants, the renewal of facilities and the refurbishment of equipment in Japan and overseas. We are currently involved in operation and generation of power in about 150 sites in the country. Going forward, we will continue to provide comprehensive technological solutions and services tailored to the hydropower generation life cycle based on our expertise and experience.



Francis turbines

Francis turbines with the world class high efficiency

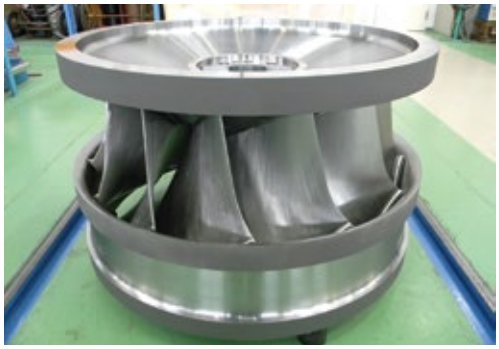
[Features]
• Suitable for a wide range of head and flow rates to suit a broad range of specific speeds
• Highly efficient turbines designed using computational fluid dynamics (CFD) analysis technology and model testing

[Specifications]

Output	Effective head	Flow rate
Up to 12,180 kW	Up to 236.2 m	Up to 23 m3/s

Horizontal Francis turbine

Vertical Francis turbine



Francis runner

Pelton turbines

Compactness that contributes to the reduction of construction costs

[Features]
• Effective for power generation at high-head sites where there is little variation in head
• In vertical-shaft designs for small-scale hydropower generation, directly installing the generator in the housing of the turbine makes it possible to reduce the construction costs of the power plant building and to make the equipment compact

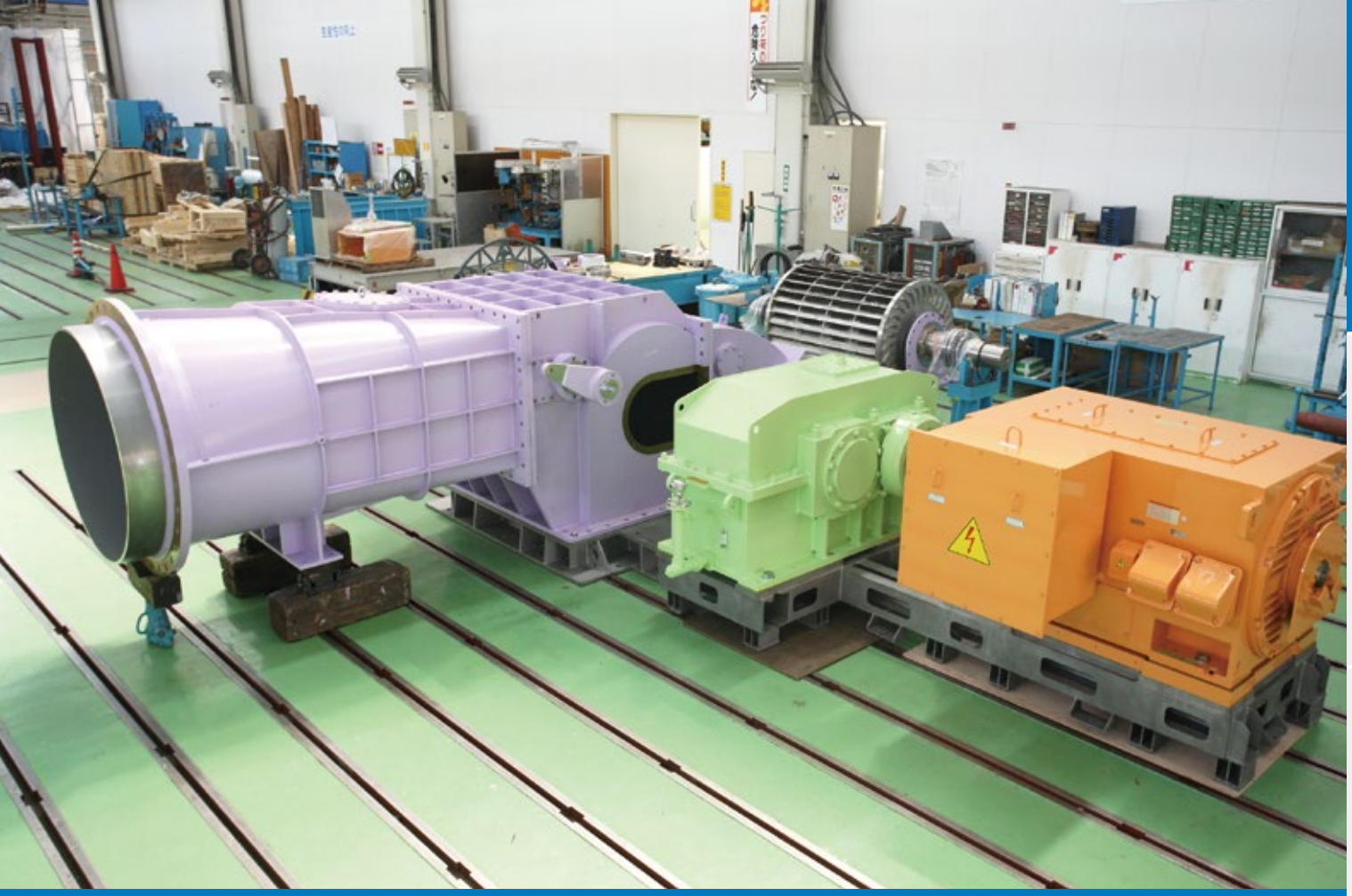
[Specifications]

Output	Effective head	Flow rate
Up to 1,530 kW	Up to 372 m	Up to 1.12 m3/s


Pelton runner


Vertical Pelton turbine being assembled at a factory


Nozzle for Pelton turbine



Cross-flow turbines

Demonstrating high efficiency across a wide range of loads and offering excellent maintainability

[Features]

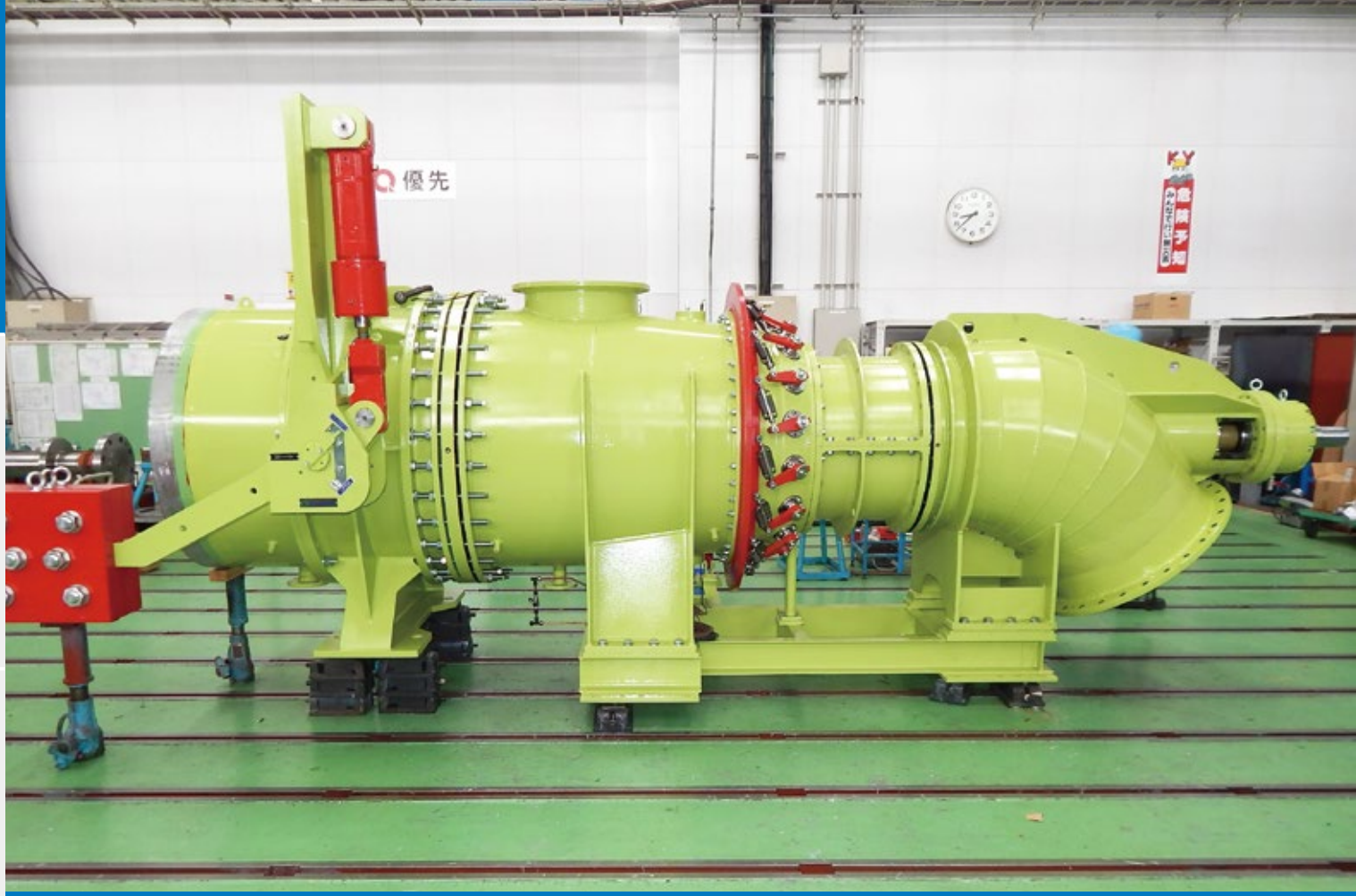
- Effective for power generation at medium-head sites where there is relatively little capacity
- By dividing the guide vane into two in the axial direction, high efficiency is achieved over a wide range of loads
- Simple structure allows easier maintenance than other water turbines

[Specifications]

Output	Effective head	Flow rate
Up to 565 kW	Up to 25.34 m	Up to 3.5 m3/s

Cross-flow runner

Cross-flow turbines



Propeller turbines

Effective for power generation at low-head sites and highly suitable for variable flow systems

[Features]
- Effective for power generation at low-head sites
- Highly efficient in variable flow rate systems by changing the runner vane angle

[Specifications]

Output	Effective head	Flow rate
Up to 1,300 kW	Up to 11.6 m	Up to 13.9 m3/s

S-type turbines

Runner of s-type turbine

Screw turbines

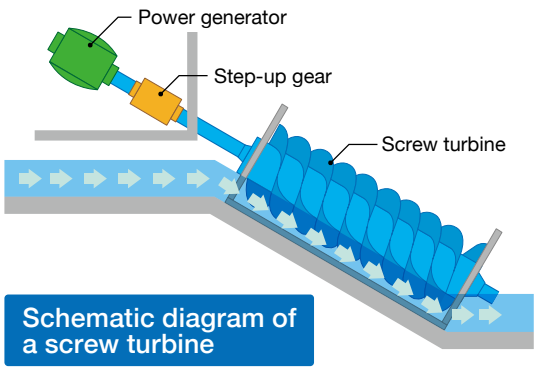
Low-cost, environmentally friendly turbines that can be installed in weirs and irrigation canals

[Features]

- Suitable at low-head sites with a low flow rate
- Simple structure reduces installation and maintenance costs
- No need for large-scale headrace or penstock, resulting in a low construction cost

[Specifications]

Output	Effective head	Flow rate
Up to 34.8 kW	Up to 3.1 m	Up to 1.5 m3/s



Schematic diagram of a screw turbine

Implementation of demonstration tests to assess environmental impact "Kotaka Hydropower Station" (Satsumasendai City in Kagoshima Prefecture)

As few screw turbines have been introduced in Japan, there are uncertainties about their efficiency characteristics, environmental impact, and so on. In collaboration with Satsumasendai City, we built a small hydropower plant that uses an intake weir for agriculture as a subsidized project. Various demonstration experiments are being conducted to test the efficiency of the turbine generator, the cost-saving effect of not having to use civil engineering construction equipment, the influence on the downstream flow of debris, the impact on fish, and noise control, among other things, with the aim to disseminate the use of environmentally friendly hydropower generation using screw turbines.

Synchronous generators

Compact, high-performance generators with excellent maintainability

[Features]

- The horizontal (shaft) generators are compact in size and reduce auxiliary equipment through the use of two bearings, which reduces the need for flywheels through generator design that withstands runaway speed, and by adopting air cooling for the bearings
- Oil-less design due to the use of electromagnetic brakes and improved maintainability due to the use of AC exciters
- In the case of vertical-shaft generators, the maintainability of the area around the lower bracket and brakes has been improved through the acquisition of a patent for the provision of electromagnetic brakes at the top as well as the reduction of auxiliary equipment

Horizontal synchronous generator

Vertical synchronous generator

[Specifications]

Output	Voltage
Up to 20,000 kW	Up to 13.2 kV

Stators

[Features]
- Design that stacks low-loss electrical steel sheets and impregnates insulated stator coils with epoxy resin
- Although a stator coil commonly has a two-layer winding, it is possible to halve the number of coils through a single-layer winding
- Sufficient insulation strength against high voltage (3.3 kV to 13.2 kV)
- On-site coil rewinding possible

Rotators

[Features]
- The rotator can be designed for high strength against centrifugal force according to the design that withstands runaway speed
- On-site incorporation of salient poles possible
- Compact design with a cylindrical rotator also possible

Induction generators

Compact generators that meet the requirement for lower prices

[Features]
- Use of an induction generator makes it possible to eliminate the need for exciters, reducing the cost of power generation equipment as well as the construction cost
- Compact and lightweight design through the use of ball bearings

Horizontal induction generator

Vertical induction generator

Integrated protection and control system

Control systems that are custom-made according to the intended application

[Application]
• Performing a series of operations and fault monitoring, from turbine generator startup to parallel operation, load regulation, and machinery protection

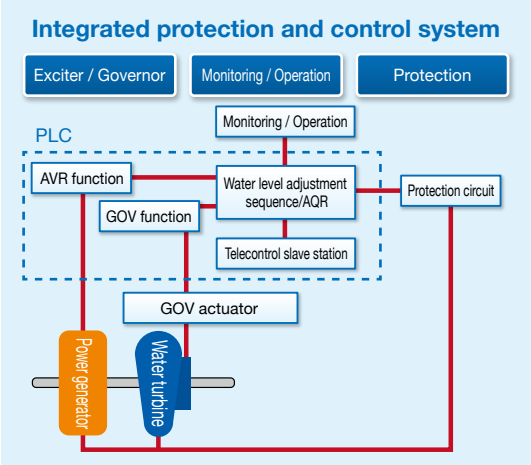
[Features]
• The systems for the main functions at hydropower plants, namely automatic sequence, speed control function, excitation function, protection function, communication function, are implemented with a PLC
• Highly reliable systems that can be designed according to the desired application and offer excellent operability and maintainability
• Can be expanded to include remote monitoring and control applications such as intake gate control and measurement
*PLC: Programmable Logic Controller

[Specifications]

External dimensions	800 mm (W) × 2,300 mm (H) × 800 mm (D)
Equipment configuration	Freestanding with front and rear maintenance access
Control power supply	110 VDC (88 VDC to 143 VDC)
Operation method	Switches, touch panel
Protection functions	Water turbine generator protection / Transmission line protection / Transformer protection
Auxiliary panel	Exciters / Governors / power plant / Turbine controls / Remote monitoring control system, etc.
Secondary adjustment functions	Water level adjustment, groyne control, autonomous recovery, flow control, etc.

*External dimensions may be modified according to specifications

Touch panel screen



*AVR: Exciter *GOV: Governor

Exciters (Static-exciter, Brushless)

Can be designed according to the characteristics of the generator

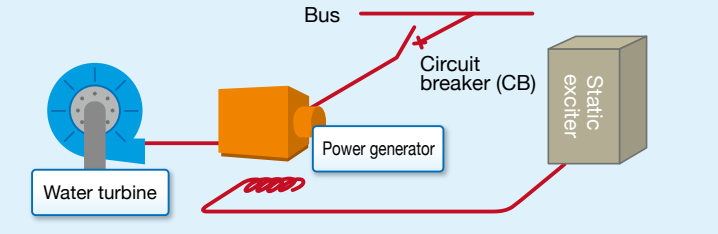
[Application]

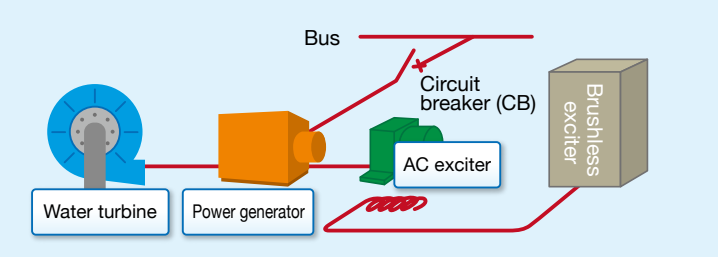
- Maintaining the voltage during steady operation of the synchronous generator at a constant level, maintaining the voltage during load fluctuations, and adjusting the reactive power to improve the dynamic stability

[Features]

- Can be designed according to the characteristics of the generator
- High responsiveness and stability during load fluctuations and accidents through thyristor control
- Appropriate allocation of reactive power when generators are operating in parallel with other generators
- Supports both static and brushless excitation

Conceptual diagrams of exciters





[Specifications]

External dimensions	800 mm (W) × 2,300 mm (H) × 1,100 mm (D)
Equipment configuration	Freestanding with front and rear maintenance access
Control power supply	110 VDC (88 VDC to 143 VDC)
Operation method	Switches, touch panel
Rectification method	Single-phase/three-phase bridge
Maximum output current	30 A to 500 A
Functions	APFR, AQR, limiter functions, etc.

*External dimensions may be modified according to specifications

Governors (hydraulic, electric, hybrid)

Hybrid governor

Electric-powered governor

Hydraulic governor

High-performance governors that are optimally designed to meet specific needs

[Application]
• Adjusting the flow rate to the water turbine, controlling the rotation speed and adjusting the output

[Features]
• Available in three types to cover various customer needs
• Highly stable generator frequency (turbine speed) control through load variation

[Features of hybrid type]
• Control of hydraulic cylinder with hydraulic pump driven by motor power
• Low chance of oil leakage as the hydraulic circuit is contained inside the unit
• Highly customizable installation as the pump part and the cylinder part are separate structures
• A large operating force can be obtained with a small cylinder

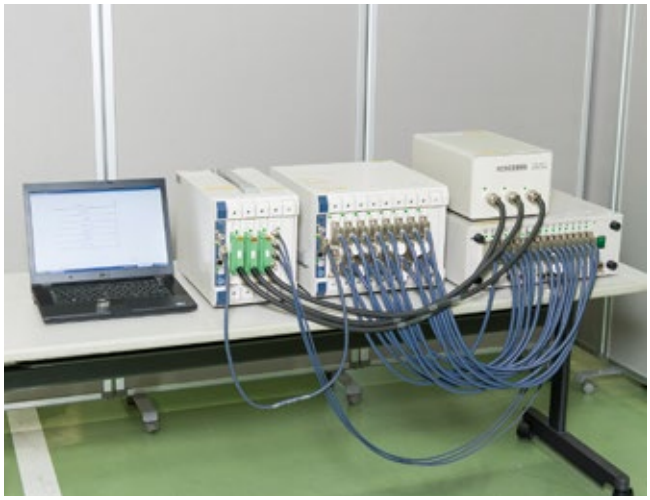
[Features of electric-powered type]
• Control of cylinder with gears driven by motor power
• Contribution to oil-less operation in power plants

[Features of hydraulic type]
• Converts electric signals to mechanical motion and performs servo motor control through hydraulics
• Can be employed for large-capacity turbines

[Specifications]

	Hybrid type	Electric-powered type	Hydraulic type
Operation method	Electrical, hydraulic	Electrical	Hydraulic
Applicable class	Y class / Z class		
Dead band	0.1% (Y class)		
Dead time	0.3 s or less (Y class)		
Rotation speed adjustment range	90% to 108% (Y class)		
Speed droop adjustment range	2% to 6% (Y class)		
Rotational speed detection method	PMG / SSG		
Control method	PID control		
Applicable turbine	Francis, Pelton, and others		

Digital test system for hydro power stations

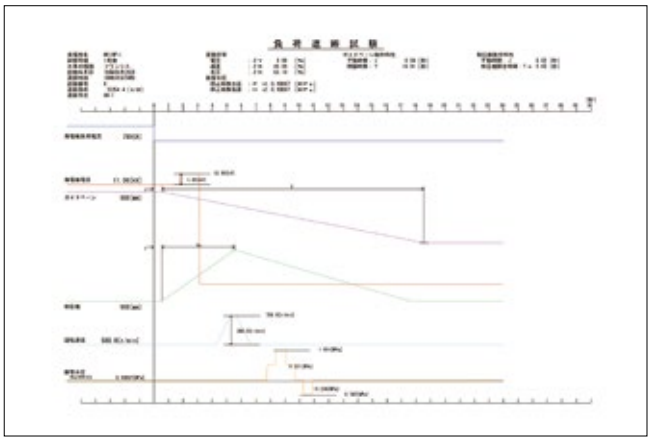


Highly efficient systems that automatically process measurement, computation, and sorting of records

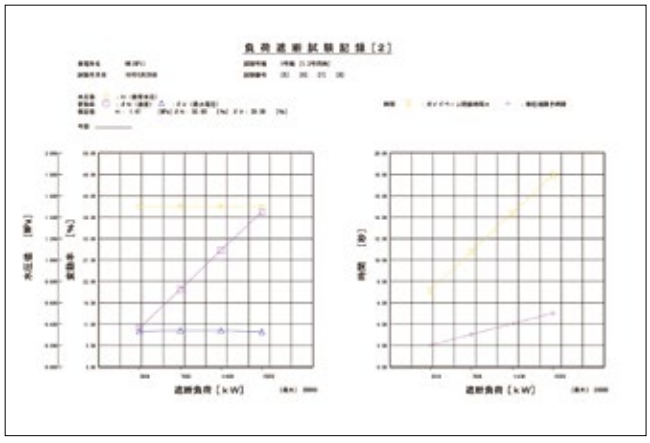
[Application]
- Connecting sensors to various equipment for each measurement test in a hydropower station and automatically processing each measured value with a computer

[Features]
- Connects water level sensors, pressure sensors, and other similar devices to various equipment such as hydraulic turbines, generators, tanks, penstock, and so on; improves work efficiency by measuring, computing, and sorting records with a computer
- Records changes over time of turbine generators through a periodic implementation of measurement tests
- Less measurement errors by measurers due to computerized sorting of records

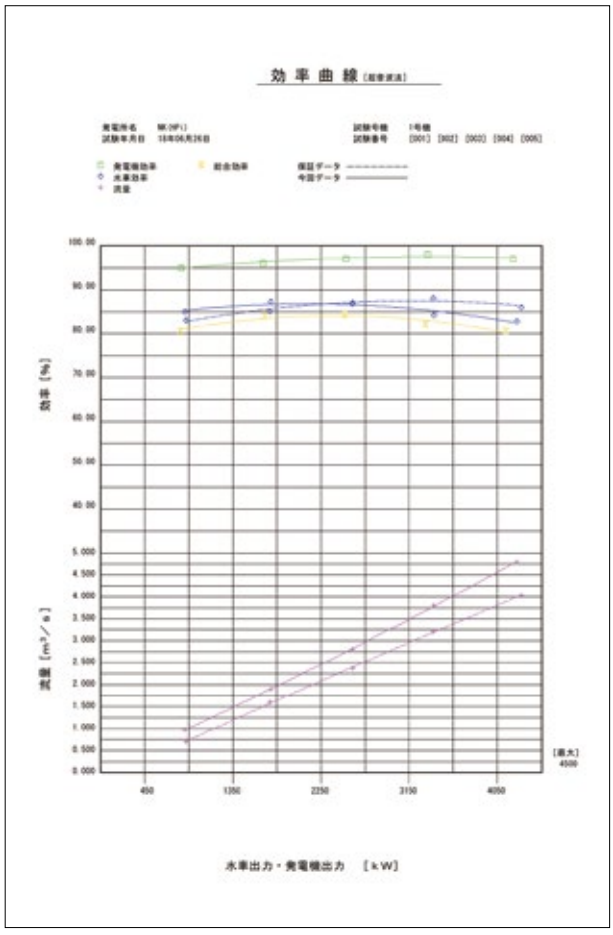
[Examples of measurement items]
- Load rejection test
- Turbine efficiency test by pressure-time method
- Turbine efficiency test by ultrasound method
- Output opening test
- Closing test without water



Sample load rejection test results (1)



Sample load rejection test results (2)



Sample efficiency test results

Substations

Nippon Koei has been dealing with a wide range of operations—from delivery of monitoring and control systems that ensure the safe and efficient operation of substations, which are critical for electrical power transmission, as well as various ancillary systems and transformer-related equipment, to provision of maintenance services. Going forward, we will continue to do our utmost to respond to all kinds of needs related to substation equipment.

Conservators

High-quality conservators with a delivery record of over 20,000 units

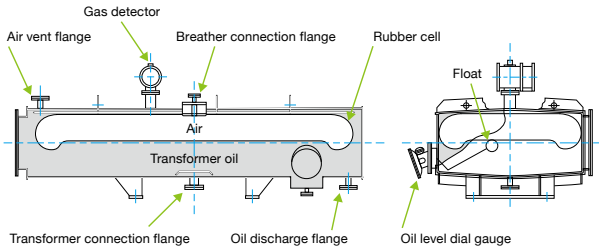
[Application]
- The conservator has an oil-resistant rubber cell inside the tank to isolate the oil surface from the atmosphere, thereby suppressing oxidation and moisture absorption of the insulating oil used in the oil-filled electrical equipment, and controlling the expansion and contraction of the oil due to changes in temperature

[Features]
- Used in many transmission and distribution transformers, reactors, etc
- Broad lineup of conservators to meet diverse needs (A, AP, and B)
- Capacity ranging from 60 liters to 10,000 liters or more

Type A conservators

[Features]
- The shape of the tank is either elliptical or a flat hexagon
- Capacity ranging from 200 liters to 10,000 liters or more

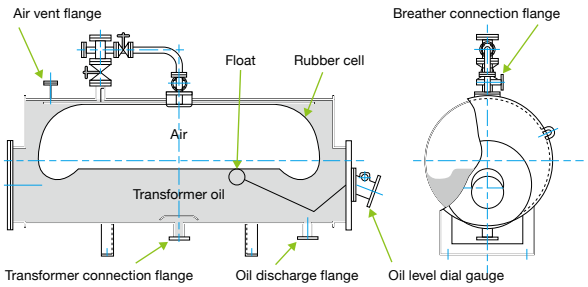
[Structural drawings]



Type AP conservators

[Features]
- The shape of the tank is cylindrical
- Capacity ranging from 125 liters to 10,000 liters or more
- Low-cost version of type A

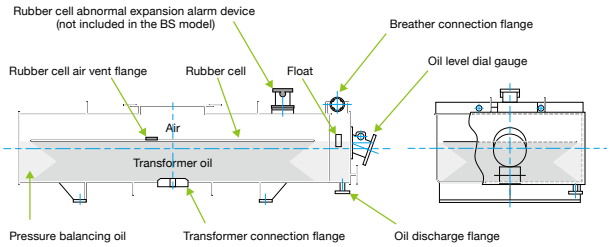
[Structural drawings]



Type B conservators

[Features]
- The shape of the tank is rectangular
- Capacity ranging from 60 liters to 5,000 liters
- Transportable while fully assembled

[Structural drawings]



Rubber cells for conservators

Highly durable rubber cells with a delivery record of over 20,000 units

[Applications]
- Rubber cells are installed inside conservators, isolating the oil from the atmosphere and protecting the oil-immersed electrical equipment
- Preventing the deterioration of insulating oil

[Features]
- Rubber cells made from materials that have excellent oil resistance, flexing resistance, and gas barrier properties
- Expected service life of 20 years owing to our special manufacturing process
- More than 20,000 rubber cells delivered for use in 275 kV class or higher power generation systems over the past 40 years
- Rubber cells vulcanized by the Rotocure method, which minimizes elution of sulfur into insulating oil, thereby maintaining the characteristics of the insulating oil
- Capacity ranging from 10 liters to 10,000 liters or more

[Rubber sheet nomenclature and specifications]

Designation	1.1Dr
Structure	3-layer
Material	Special nitrile rubber
Bag-manufacturing method	Vulcanized bonding
Thickness	1.1 mm
Tensile strength	250 N/cm or more
Stretchability	20% or more
Tearing strength	9.8 N or more
Gas permeability	72 (cm3)/(m2•24h•atm)
Cold resistance	-36°C
Heat resistance	+100°C

Gas detectors

High-performance devices that instantly detect residual gas

[Application]
- Detecting residual gases produced inside the conservator and the transformer due to factors such as the destruction of the rubber cell of the conservator, internal failure of the transformer, and intake from negative pressure areas

[Features]
- Residual gas can be sampled easily with a degassing valve
- The amount of residual gas can be confirmed with a scale (ml)
- Malfunctions caused by earthquakes are prevented with a microswitch

[Specifications]

Model	GD-2A
Operating value	450 ±50 ml
Contact rating	125 VAC, 250 V - 5 A 125 VDC - 0.5 A 150 VDC - 0.25 A
Weight	5.1 kg

On-line oil filters

High-quality on-line oil filter with a delivery record of over 5,300 units

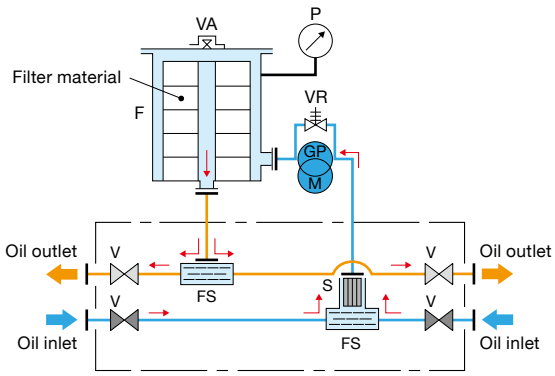
[Application]

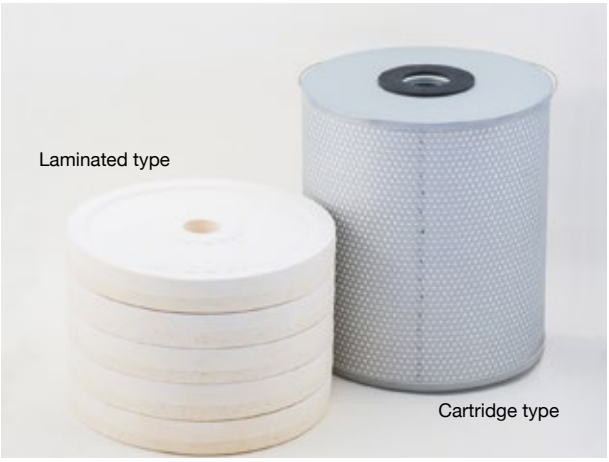
• Preventing deterioration of insulating oil used for tap changers of transformers by removing carbon and moisture in the oil generated by tap changing

[Features]

• Models: NK-10JC, NK-10JD
• Types of filter material: Laminated type and cartridge type
• Capable of capturing up to 400 g of carbon and 200 ml of moisture
• Excellent capture ability with 0.02 µm filtration accuracy
• Economical as can be used without a heater from an oil temperature of 0°C
• Automatic operation in 15-minute increments during periods of frequent tap changes
• Piping inside the unit is organized in blocks as a measure against oil leakage
• Over 5,300 units delivered

[Structural drawing]





Filter material

[Specifications]

Model	NK-10JC / NK-10JD
Power supply	3-phase - 50 Hz/60 Hz - 200 V (400 V)
Electric motor	0.2 kW
Filter material	Laminated type: ϕ300 × 40 t × 5 sheets Cartridge type: ϕ290 × ϕ50 × 324 H
Filtration flow rate	10 L/min
Filtration accuracy	0.02 µm or more
Filtration capability	400 g of carbon, 200 ml of moisture
Filtration pressure	0.03 MPa to 0.3 MPa
Pressure resistance	0.6 MPa
External dimensions	850 mm (H) × 960 mm (W) × 650 mm (D)
Weight	210 kg

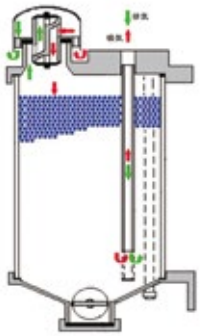
Oilless breathers (OLN Type, OLV Type)

[Application]
• Preventing moisture absorption of power substation transformers and insulating oil tanks

[Features]
• Check valve with a sealing function, eliminating worries about peripheral device contamination
• Check valve with one-touch fittings for easy maintenance
• Maximum breathing rate of 350 L/min
• Allows direct pressure application (0.05 MPa) to the breather during operation of the air seal of the conservator and testing the oil tightness of transformers and other equipment
• Easy-to-replace desiccant

Moisture-absorbent breathers that do not require sealing oil and are easy to maintain

[Structural drawing]



[Specifications]

Model	Desiccant capacity	Transformer application example	
		Transformer rating	Transformer oil content
OLN-1k	1 kg	Up to approx. 4 MVA	Up to 8,000 L
OLN-2k	2 kg	Up to approx. 20 MVA	Up to 13,000 L
OLV-4K	4 kg	Up to approx. 50 MVA	Up to 26,000 L
OLV-8K	8 kg	Up to approx. 150 MVA	Up to 55,000 L
OLV-16K	16 kg	Up to approx. 750 MVA	Up to 120,000 L

*Desiccant is not included and must be provided separately.

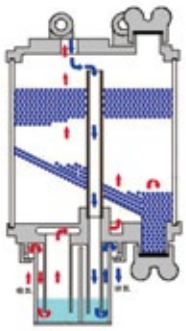
Silica gel breathers (DH-B Type)

[Application]
• Preventing moisture absorption of power substation transformers and insulating oil tanks

[Features]
• Structure with separate inlet and outlet so that air passes through the desiccant only during intake
• Easy desiccant replacement without having to detach the breather unit owing to separate desiccant input and output ports

Dehydrating breathers that allow easy desiccant replacement and offer excellent maintainability

[Structural drawing]



[Specifications]

Model	Desiccant capacity	Weight (including desiccant)	Marginal breathing rate	Transformer oil content
DH-B1000	1 kg	4.2 kg	22 L/min	Up to 8,000 L
DH-B2000	2 kg	6.0 kg	22 L/min	Up to 16,000 L
DH-B4000	4 kg	10.0 kg	30 L/min	Up to 31,000 L
DH-B6000	6 kg	15.0 kg	30 L/min	Up to 46,000 L
DH-B13000	13 kg	25.0 kg	30 L/min	Up to 100,000 L

*Desiccant is not included and must be provided separately.

Closed cooling towers

Cooling towers that offer high reliability, long life, and labor cost savings

[Application]

• Cooling of insulating oil of oil-immersed electrical equipment in underground substations

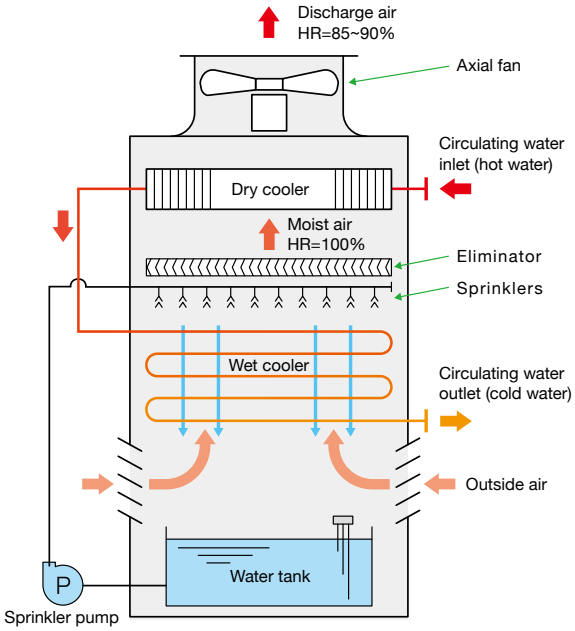
[Features]

• Greatly reduced corrosion, scaling and slime through the non-contamination of the circulating water by contaminated air or its concentration caused by evaporation, since the circulating water does not come into direct contact with the atmosphere; allows the entire cooling system to be more reliable and easier to maintain, with longer service life and labor cost savings

• Air-cooled operation (over 35% at 18°C) is possible owing to an air-cooling section (15% or more), resulting in water savings that are not possible with an open type

• White smoke suppression function

• Can be made to order to satisfy diverse specifications, making them applicable to urban substations to which restrictive conditions with regard to installation area, shape, and noise apply



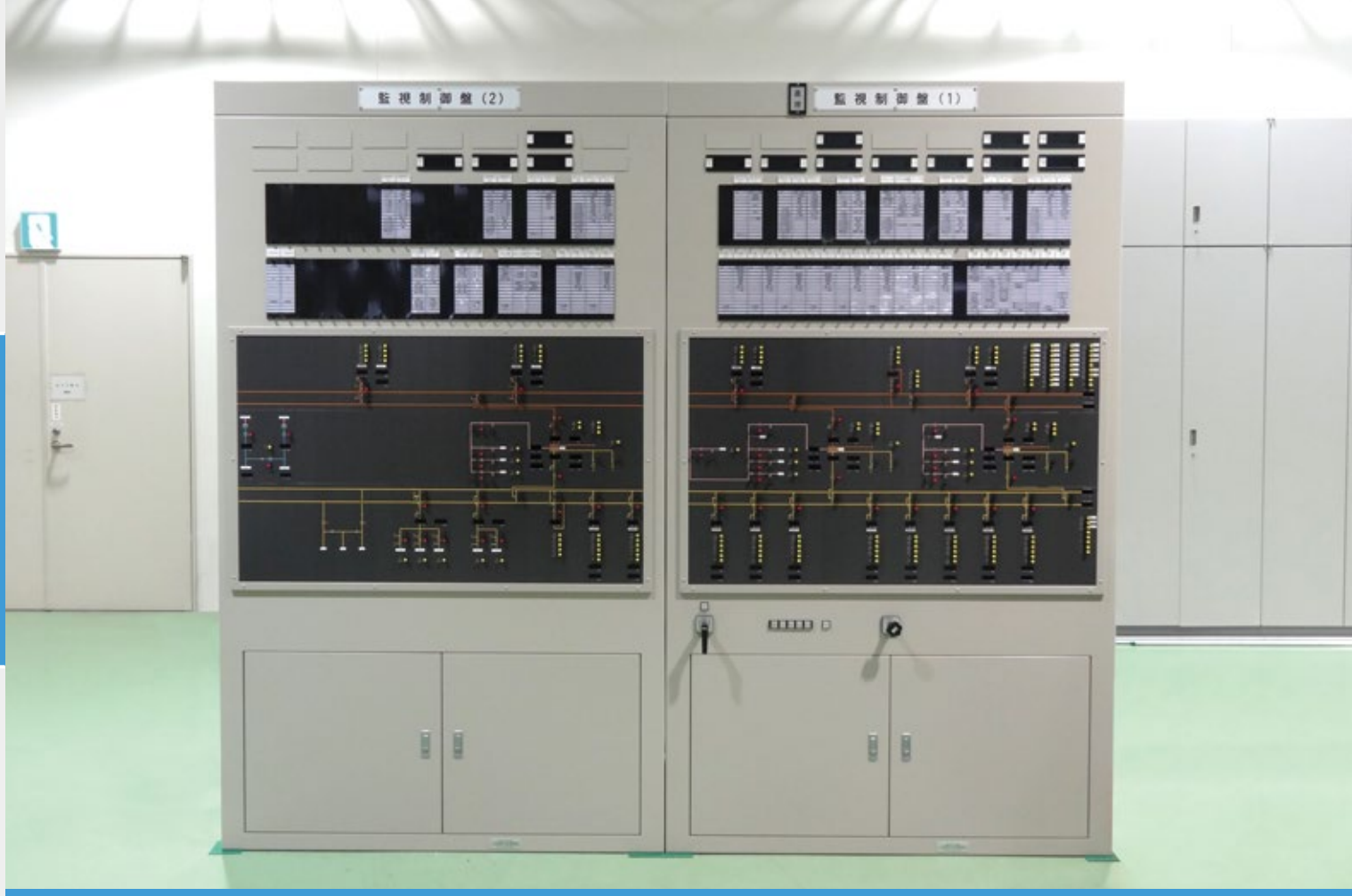
NKTD-1500 PF

NKTD-980 PF

NKTD-680 PF

[Examples of Closed cooling tower specifications]

Item \ Model		NKTD-1500 PF		NKTD-980 PF		NKTD-680 PF	
Operating condition		Wet operation	Air-cooled operation	Wet operation	Air-cooled operation	Wet operation	Air-cooled operation
Cooling capacity	(kW)	1,500	525	980	343	680	160*
Ratio of dry to wet cooling	(%)	15 or more	–	15 or more	–	–	–
Water temperature at circulating water inlet	(°C)	48.5	42.0	55.0	48.5	57.5	50.2
Water temperature at circulating water outlet	(°C)	38.5	38.5	45.0	45.0	48.0	48.0
Wet-bulb temperature of outside air	(°C)	27.0	–	27.0	–	27.0	–
Dry-bulb temperature of outside air	(mAq)	–	18.0	–	18.0	–	18.0
Circulating water rate	(L/min)	2,150		1,425		1,040	
Circulating water pressure loss	(kPa)	60 or less		70 or less		70 or less	
Design pressure	(MPa)	0.33		0.50		0.51	
Noise (Average value 2 m from tower side)	(dB(A))	67 or less		53 or less		65 or less	
Dimensions (W × L × H)	(mm)	3,000 × 4,000 × 6,075		3,300 × 3,400 × 6,883		1,720 × 2,100 × 4,284	
Approx. product weight	(kg)	15,500		12,300		4,500	
Approx. operating weight	(kg)	19,500		14,800		6,000	
Blower		7.4 kW × 2 units		7.4 kW × 1 unit		5.0 kW × 1 unit	
Sprinkler pump		3.7 kW × 1 unit		1.5 kW × 1 unit		1.5 kW × 1 unit	
Electric heater		–		5.0 kW × 1 unit		–	

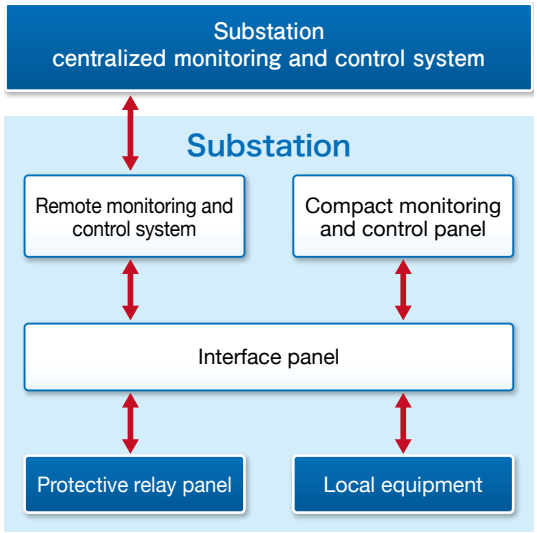


Compact monitoring control panels

Low-cost, highly reliable metal panels

[Application]
• Performing direct operation of a substation on behalf of the host system during maintenance of the remote monitoring control system

[Features]
• The hardware implementation of the circuits results in a simple and highly reliable design that allows flexible control panel replacement
• Inter-device communication implemented as electrical signals via metal cables



[Specifications]

External dimensions*		1,400 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front and rear maintenance access
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)
	Consumption current	3.0 A or less
Installation capacity	Grid block	Up to 21 columns × 3 rows
	Fault indicator	Up to 24 columns (15 points) × 1 row / 24 columns (20 points) × 1 row
	TM indicator	Up to 7 columns × 2 rows
Operation switches		Master control switch / Alarm stop / Flicker stop / Display reset / Meter reset / Lamp test
Alarm function		Electronic buzzer
Alarm output		2 elements (power failure and multiple selection)
Weight		Approx. 600 kg

*The width of the monitoring control panel can be changed according to the installation capacity.

Remote monitoring and control system for transmission substations (Unit-divided type)

A system of low-cost metal panels with a large installation capacity

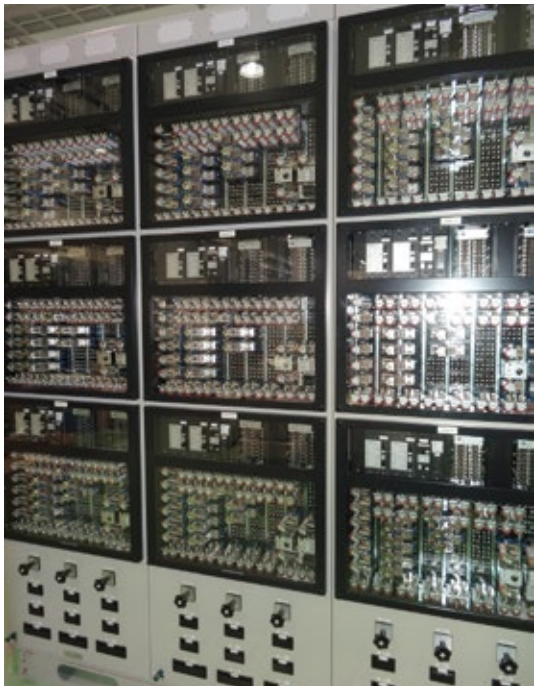
[Application]
- Relay of control commands from the host system, as well as measurement and display information from interface panels

[Features]
- Linked to the host system via HDLC transmission protocol
- Installation capacity customizable according to the size of the substation

[Specifications]

External dimensions		700 mm (W) × 2,410 mm (H) × 500 mm (D)
Equipment configuration		Freestanding with front and rear maintenance access
Equipment configuration		Logic rack: 1 unit / Terminal rack: Up to 6 units
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)
	Consumption current	10.0 A or less (L2000 actual measurement: 2.0 A or less)
Control output	Rating	110 VDC, 5 A (during current application)
	Installation capacity	Up to 800 points
Display input	Rating	110 VDC, 5 mA to 50 mA, photocoupler insulation
	Installation capacity	Up to 2,000 points
Measurement input	Rating	0 DC to 1 mA
	Installation capacity	Up to 120 points
Transmission method (to host system)	Transmission method	HDLC (ABM) protocol
	Transmission speed	2,400 bps / 4,800 bps
	Transmission lines	4-wire 2-route / 4-wire 1-route

Interface panels



Low-cost metal panels that allow circuit mounting according to the equipment

[Application]
- Importing of equipment monitoring and measurement information, control output, status and fault display contact amplification and relay

[Features]
- Can be easily maintained as they are internally divided into equipment units and circuits of multiple equipment can be mounted on a single interface panel
- Can provide interlock functions for safe operation of equipment

[Specifications]

External dimensions		700 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front and rear maintenance access
Application equipment		Power transmission lines / Bus bars and bus ties / Bus sections / Main transformer primary / Main transformer secondary / Main transformer tertiary, phase modifier / 22 kV miniclad / Synchronized, common
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)
	Consumption current	1.5 A or less
Control output	Rating	Equipment-related: 110 VDC, 10 A (during current application) Other: 110 VDC, 1 A (during current application)
Display input	Rating	110 VDC
Measurement	Rated line-to-line voltage	110 VAC, 220 VAC
	Rated phase voltage	110 VAC/√3
	Rated current	1 A, 5 A
	Rated frequency	50 Hz
	Rated power factor	1
	Tap position	Contact resistance type / selsyn type
	Load	VT: 0.2 VA or less (1 phase) / CT: 0.5 VA or less (1 phase)
Interlock circuit		Direct interlock / Indirect interlock
Weight		Approx. 400 kg or less (depends on equipment configuration and installations)

Compact monitoring control panels (Fiber optics)

Optical transmission-type panels that dispense with the use of cables

[Application]
• Performing direct operation of a substation on behalf of the host system during maintenance of the remote monitoring and control system

[Features]
• Space-saving owing to a front-maintenance design that eliminates the requirement of maintenance space on the back side, thus providing a high degree of freedom of placement, such as installation on walls
• Inter-device connection via fiber optic cables that offers great resistance to lightning surges and equipment switching surges, and reduces cabling work

[Specifications]

External dimensions		700 mm (W) × 2,410 mm (H) × 600 mm (D)	1,050 mm (W) × 2,410 mm (H) × 600 mm (D)	1,400 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front maintenance access		
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)		
	Consumption current	6.5 A or less	6.5 A or less	6.5 A or less
Installation capacity	Grid block	9 columns × 3 rows	14 columns × 3 rows	20 columns × 3 rows
	Fault indicator	Up to 10 columns (15 points) × 1 row / 10 columns (20 points) × 1 row	Up to 16 columns (15 points) × 1 row / 16 columns (20 points) × 1 row	Up to 24 columns (15 points) × 1 row / 24 columns (20 points) × 1 row
	TM indicator	4 columns × 2 rows	6 columns × 2 rows	8 columns × 2 rows
	Number of interface channels*	Up to 10 channels/unit	Up to 23 channels/unit	Up to 32 channels/unit
Operation switches		Master control switch / Alarm stop / Flicker stop / Display reset / Meter reset		
Alarm function		Electronic buzzer		
Alarm output		5 elements (KC board fault, IF board fault, KC degeneration, remote selection, multiple selection)		
43R contact amplification		No-voltage contact (10 contact points: remote/direct)		
Weight		Approx. 350 kg/unit	Approx. 500 kg/unit	Approx. 650 kg/unit

*Number of implemented channels expandable to total for 4 units

Remote monitoring and control system for transmission substations (Fiber optics)

Optical transmission-type panels that save space

[Application]

- Relay of control commands from the host system, as well as measurement and display information from interface panels

[Features]

- Linked to the host system via HDLC transmission protocol
- Installation capacity customizable according to the size of the substation

[Specifications]

External dimensions		700 mm (W) × 2,410 mm (H) × 600 mm (D)	
Equipment configuration		Freestanding with front maintenance access	
Equipment configuration		Up to 2 units	
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)	
	Consumption current	2.0 A or less/unit	
Installation capacity	Control items	Up to 800 points	
	Display items	Up to 2,000 points	
	Measurement items	Up to 120 points	
	Number of interface channels*	Up to 24 channels/unit	
Transmission method (to host system)	Transmission method	HDLC (ABM) protocol	CDT protocol
	Transmission speed	2,400 bps / 4,800 bps	1,200 bps
	Transmission lines	4-wire 2-route / 4-wire 1-route	CH1: 4-wire 2-route / 4-wire 1-route CH2: 4-wire 2-route / 4-wire 1-route CH3: 2-wire 2-route / 2-wire 1-route CH4: 2-wire 2-route / 2-wire 1-route
Weight		Approx. 310 kg/unit	

*Number of implemented channels expandable to total for 2 units

Interface panels (Fiber optics)

Optical transmission-type panels that allow circuit mounting according to the equipment

[Application]

- Importing of equipment monitoring and measurement information, control output, status and fault display contact amplification and relay

[Features]

- Can be easily maintained as they are divided into equipment units
- Can provide interlock functions for safe operation of equipment

[Specifications]

External dimensions		350 mm (W) × 2,410 mm (H) × 600 mm (D)	700 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front maintenance access	
Application equipment		Power transmission lines / Bus bars and bus ties / Sync	Category / Main transformer primary, secondary / Main transformer tertiary, phase modifier Bus bar phase modifier / 22 kV miniclad / Common
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)	
	Consumption current	1.5 A or less	
Control output	Rating	Equipment-related: 110 VDC, 5 A (during current application) Other: 110 VDC, 0.2 A (during current application)	
	Installation capacity	Up to 20 points	Up to 60 points
Display input	Rating	110 VDC, 500 mA or less	
	Installation capacity	Up to 80 points	Up to 150 points
Measurement	Rated line-to-line voltage	110 VAC, 220 VAC	
	Rated phase voltage	110 VAC/√3	
	Rated current	1 A, 5 A	
	Rated frequency	50 Hz	
	Rated power factor	1	
	Tap position	Contact resistance type / selsyn type	
	Load	VT: 0.5 VA or less (1 phase) / CT: 0.2 VA or less (1 phase)	
Interlock circuit		Direct interlock / Indirect interlock	
Weight		Approx. 250 kg	Approx. 350 kg (22 kV miniclad: 450 kg)

*Optional specifications:

- A GIS direct operation mechanism can be installed.
- An FL information input function can be implemented.
- Customizable according to the arrangement or structure of the equipment room.

Parallel synchronizer equipment (M3 type)

Highly reliable system that reliably inputs synchronizing input operations

[Application]

• For installation on the control panel of a substation or switching station, for judging the occurrence of circuit breaker inputs from the voltage, phase, and frequency measurement results upon input of a circuit breaker input command, and for automatically outputting input commands

[Features]

• Parallel judgment function for "no-voltage two-system/single system", "loop," and "different system"
• Telemeter external output with phase difference, frequency difference, and voltage difference
• Parallel display of automatic inspection functions to ensure soundness of the detection/judgment function (non-operation prevention function) and the continuous function for monitoring the inside and outside of the device (malfunction prevention function)
• Has a function that allows setting of up to five tuning operations

[Specifications]

External dimensions		306 mm (W) × 310 mm (H) × 286 mm (D)
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)
	Consumption current	0.36 A or less
VT secondary	Input	Single phase input, 2 elements (reference 1, subordinate 1)
	Rated voltage	110 VAC / 63.5 VAC
	Rated frequency	50 Hz / 60 Hz
	Max. rated voltage	127% (for both 110 VAC and 63.5 VAC)
Phase difference Detection performance	Accuracy	±0.45 degrees
	Measurement range	±180.0 degrees
	Detection period	50 Hz: 20 ms / 60 Hz: 16.67 Hz
Frequency difference Detection performance	Accuracy	±0.01 Hz
	Measurement range	±5.00 Hz
	Detection period	50 Hz: 20 ms / 60 Hz: 16.67 Hz
Voltage difference Detection performance	Accuracy	±0.5% of rated voltage
	Measurement range	0% to 127% of rated voltage
	Voltage integrity determination	80% to 120% of rated voltage
	Detection period	50 Hz: 20 ms / 60 Hz: 16.67 Hz
Input contact rating	Rated voltage	110 VDC (88 VDC to 143 VDC)
	Number of inputs	7 elements (selection signal × 5, input signal × 1, spare × 1)
Output contact rating	Rated voltage	110 VDC
	Flowing current	1.0 A
	Switching capacity	Resistance load: 0.3 A (cos θ ≈ 1) / Inductive load: 0.2 A (cos θ ≈ 0.4)
	Output circuit configuration	No-voltage contact, 5 elements (Input commands: 1a / Condition establishment: 1a / Operation completion: 1a / System anomaly: 2a)
Telemeter output		HDLC (optical, non-procedural) / Analog / CPU link
Weight		12.0 kg

Interface panels for 500kV

Uses an IP transmission protocol that allows linking with the host system

[Application]

• Importing of equipment monitoring and measurement information, control output, status and fault display contact amplification and relay

[Features]

• Space-saving owing to a front-maintenance design that eliminates the requirement of maintenance space on the back side, thus providing a high degree of freedom of placement, such as installation on walls
• Can be easily maintained as they are divided into equipment units
• Can provide interlock functions for safe operation of equipment
• Use of an IP transmission protocol for data transmission with the host system
• Change of system settings, maintenance work, status monitoring, and inspection work are all possible from a PC web browser

[Specifications]

External dimensions		350 mm (W) × 2,410 mm (H) × 600 mm (D)	700 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front maintenance access	
Application equipment		Transmission lines / Bus sections / Electric power station common	Bus ties / Main transformer primary / Main transformer secondary / Main transformer tertiary, phase modifier / Unit common / Substation common / Electric power station common
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)	
	Consumption current	1.5 A or less	2.0 A or less
Control output	Rating	Equipment-related: 110 VDC, 5 A (during current application)	
		Other: 110 VDC, 0.2 A (during current application)	
	Installation capacity	Up to 20 points	Up to 60 points
Display input	Rating	110 VDC, 500 mA or less	
	Installation capacity	Up to 80 points	Up to 200 points
Measurement block	Line-to-line / Phase voltage	110 VAC / 63.5 VAC	
	Current	1 A / 5 A	
	Frequency	50 Hz / 60 Hz	
	Tap position	Contact resistance type / selsyn type	
	Load	VT: 0.2 VA or less (1 phase) / CT: 0.5 VA or less	
Interlock circuit		Direct interlock / Indirect interlock	
Weight		Approx. 250 kg	Approx. 350 kg

*Optional specifications: • A GIS direct operation mechanism can be installed.
• Customizable according to the arrangement or structure of the equipment room.

Interface panels (IP)

System that cooperates with the host system through an IP transmission protocol and realizes direct monitoring and control via HMI

[Application]
• Relay of control commands from the host system and HMI, as well as measurement and display information from substation equipment

[Features]
• Can be used for substations with a voltage class of 275 kV or less
• Space-saving as it can support installation of up to four power transmission lines
• Can be easily maintained as they are internally divided into equipment units
• Use of an IP transmission protocol for data transmission with the host system
• Can provide interlock functions for safe operation of equipment, with conditions configurable by the user
• Direct monitoring and control via HMI on a laptop is possible
• Equipped with a synchronism detection function, allowing reliable and safe introduction of circuit breakers (power transmission lines, bus bars and bus ties, main transformer)

[Specifications]

		Description
External dimensions		700 mm (W) × 2,410 mm (H) × 600 mm (D)
Equipment configuration		Freestanding with front and rear maintenance access
Application equipment		Power transmission lines / Bus bars and bus ties, A section and B section / Main transformer primary, secondary, tertiary, phase modifier / 22 kV miniclad / substation /Common
Control power supply	Input voltage	110 VDC (88 VDC to 143 VDC)
	Consumption current	2.0 A or less/equipment unit
Control output	Rating	Equipment-related: 110 VDC, 5 A (during current application)
		Other: 110 VDC, 0.2 A (during current application)
	Installation capacity	Up to 20 points (power transmission lines, sections, substation)
		Up to 50 points (main transformer, miniclad, common)
Display input	Rating	110 VDC, 500 mA or less
	Installation capacity	Up to 90 points (power transmission lines, sections, substation)
		Up to 180 points (main transformer, miniclad, common)
Measurement block	Line-to-line / Phase voltage	110 VAC / 63.5 VAC
	Current*1	1 A / 5 A
	Frequency	50 Hz / 60 Hz
	Tap position*1	Contact resistance type / selsyn type
	Load	VT: 0.2 VA or less (1 phase) / CT: 0.5 VA or less (1 phase)
Interlock circuit		Soft interlock
Weight		Approx. 350 kg

*1: Specified when the order is placed

Remote monitoring and control system for distribution substations (Multifunctional)

Multifunctional control system that performs fault isolation and quick, safe system restoration

[Application]
- Relay of control commands from the host system and HMI, as well as measurement and display information from substation equipment
- Supporting fault isolation through an automatic switching function and quick, safe system restoration in the event of accidents inside and outside of the substation

[Features]
- Notification of control, display, and measurement information of substation equipment in coordination with the host system
- Has two separate CPUs: one for remote monitoring and the other for direct monitoring; when either of these becomes unusable, the other working CPU may be used for monitoring and control
- Direct monitoring and control via HMI on a laptop
- Can provide interlock functions for safe operation of equipment, with conditions configurable by the user

[Specifications]

External dimensions		700 mm (W) × 2,300 mm (H) (1,910 mm (H)) × 800 mm (D)	
Equipment configuration		Freestanding with front and rear maintenance access	
Substation configuration (type)		2-line receiving substation / Multi-terminal unit substation	
Control power supply	Input voltage	110 VDC (88 VDC to 121 VDC)	
	Consumption current	2.0 A or less	
Transmission method	Transmission method	HDLC (ABM) protocol	CDT protocol
	Transmission speed	2,400 bps / 4,800 bps	200 bps / 1,200 bps
	Transmission lines	4-wire 2-route / 4-wire 1-route	6-wire 2-route / 6-wire 1-route 4-wire 2-route / 4-wire 1-route 2-wire 2-route / 2-wire 1-route
Control output	Rating	110 VDC, 5 A (during current application)	
	Installation capacity	Up to 140 points	
Display input	Rating	110 VDC, 500 mA or less, photocoupler insulation	
	Installation capacity	Up to 310 points	
Measurement input	Received current	2 channels, single-phase input, 1 A / 5 A	
	Secondary current	3 channels, three-phase input, 1 A / 5 A	
	Secondary voltage	3 channels, single-phase input, 110 V, input range of 0 V to 150 V	
	Secondary zero-phase voltage	3 channels, single-phase input, 190V, input range of 0 V to 260 V	
	Tap position	17 taps / 23 taps	
	Distribution line current	8 channels × 3 banks, single-phase input, 0.1 A, input range of 0 V to 0.15 A	
Power receiving protection	CT rating	1 A / 5 A	
Inspection timer	Number of circuits	8 input circuits and 8 output circuits	
	Rating	Input: 110 VDC Output: 110 VDC / Duration: 1.0 s	
Weight		2,300 mm (H): Approx. 460 kg / 1,910 mm (H): Approx. 390 kg	

*Optional specifications:
- Change of aggregation destination of HDLC information to CDT information
- Customization of the monitoring screen (skeleton screen) for direct monitoring and control
- Equipment contact amplification for indirect interlocking of substation facilities

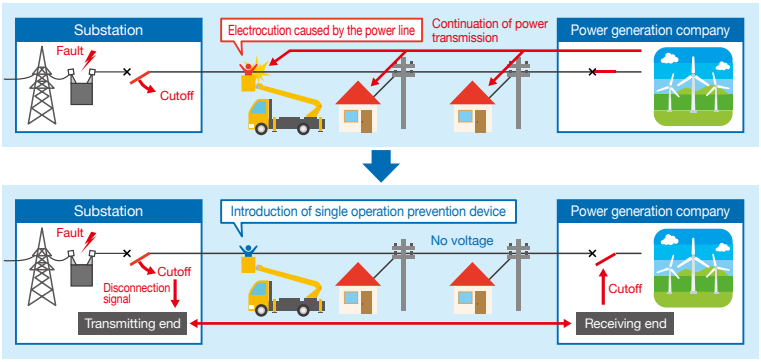
Transfer interrupting device

Prevents power grid accidents from spreading and supports coordination of distributed power supply

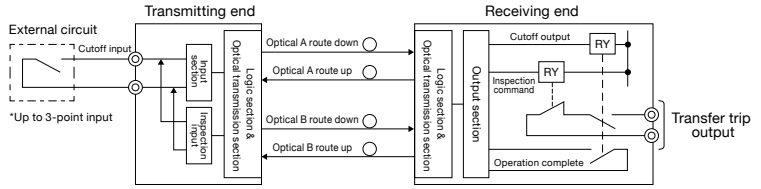
[Transfer interrupting device application]
• Eliminating accidents by tripping the circuit breaker at the transmitting end when a transformer accident occurs at the unit distribution substation without a circuit breaker on the primary side of the transformer

[Reclosing lock device application]
• Outputting a reclosing lock signal to the transmission line protection relay so that reclosing by the transmission line protection relay is not performed when a cable accident is detected

[Single operation prevention device application]
• Preventing single operation when the breaker of the electric company opens by tripping the circuit breaker of the power generation operator when diverse distributed power sources such as wind and sunlight are connected to the power grid



[Features]
• Transfer interrupting device and reclosing lock devices, which are installed at an electric power company's substation, support system protection in case of an accident
• Single operation prevention devices can prevent single operation by installing the transmitting end at an electric power company that operates and manages the distributed power supply, and the receiving end at power companies that carry out system operation



[Specifications]

		Transfer interrupting device	Reclosing lock device	Single operation prevention device
		SC-511T-A	SC-511T-B	SC-511T-COG
External dimensions		350 mm (W) × 2,410 mm (H) (including the 110-mm name plate) × 450 mm (D)		
Equipment configuration		Freestanding with front and rear maintenance access		
Control power supply	Input voltage	110 VDC (93.5 VDC to 121 VDC; 88 V to 143 V is momentarily allowed)		
	Consumption current	1.0 A or less		
Transmission specifications	Optical fiber specification	SM (single mode) optical fiber		
	Optical connector	SC connector		
	Transmission speed	128 kbps		
	Transmission line configuration	2-route configuration		
	Transmission distance	20 km*1		
Transmission time		50 ms or less	70 ms or less	50 ms or less
Number of corresponding lines		Transmitting end : Receiving end = 1 : 1 (per line)		
Installation capacity		Up to 2 lines		
Number of input and output points		Intercept input: 3 points / Intercept output: 1 point		
Weight		Transmitter: Approx. 160 kg (2 lines installed) / Receiver: Approx. 165 kg (2 lines installed)		

*1: Transmission distance can be extended to 50 km as an option.

Centralized supervisory control system

Highly functional control system for centrally monitoring multiple substation facilities

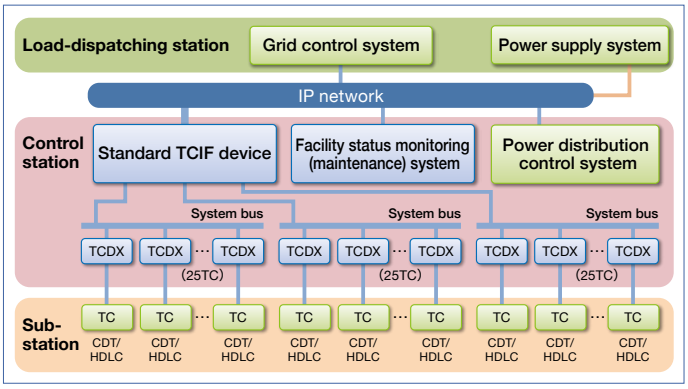
[Features] (Standard TC interface system)

- In addition to a redundant configuration using two main equipment units (duplex system), high reliability is realized by extending redundancy to communication lines and the power supply system
- Can support communication with remote monitoring control devices via CDT and HDLC conforming to power standards
- Up to 75 TC* units can be connected
- Can be connected to up to ten 2-tier control systems
- Safe remote monitoring and operation of the whole system are realized through central management of monitoring and control information and working/testing information from various locations

[Features] (Facility status monitoring system)

- System availability is realized with the use of ftServers (fault-tolerant servers) for monitoring
- A cost-effective and high-performance operating environment is realized by adopting general-purpose Linux servers for providing support functions
- Flexibility in terms of installation location and terminal expansion is achieved through the use of thin clients for the human machine interface
- Can perform remote monitoring of multiple substation facilities
- Support functions for helping maintenance personnel create local procedure charts

*TC: Telecontrol system (Remote monitoring and control system)



[Main functions of the standard TCIF system]

Function	Description
Control	The system implements functions for relaying selection control information between the host system and TC, functions for status management, and functions for management and mutual exclusion of control authority of the host system in TC units.
Monitoring	The system implements functions for editing TC and TC line statuses as well as automatic status changes/response status changes from SV and TM information received from TC, and notifying the host system accordingly.
Work in progress / Testing in progress	The system implements functions for managing work-in-progress and testing-in-progress specification information for equipment and measurement items received from host systems, functions for transmitting information to all host systems, as well as functions for not accepting selection and control information of specified devices during work.
SV and TM information editing	SV and TM information can be edited in TC units and periodically sent to the host system.
Request	The system implements functions for relaying “request” information between the host system and TC, as well as functions for status management.
Testing	The system implements functions for sending and receiving various information to/from the host system as test data, by simulating monitoring operation responses such as selection control.
System monitoring	The system implements functions that monitor the system for anomalies, and when they occur, display and record them and transmit this information to the host system.
Data maintenance	The system implements functions to capture, distribute, and switch system data.

[Main functions of the facility status monitoring (maintenance) system]

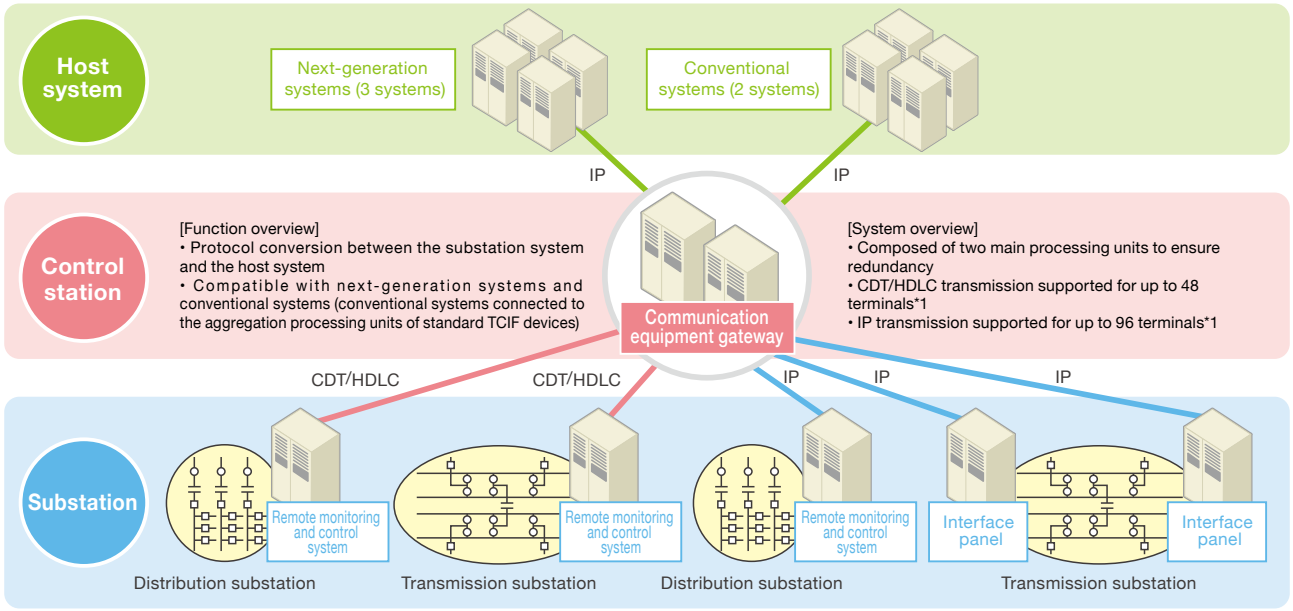
Function	Description
Substation monitoring	The system implements functions for monitoring the status of substation equipment based on TC information, SV (monitoring), and TM (measurement) information received from standard TCIF devices.
Substation equipment status setting	The system implements functions for status setting related to remotely-controlled device statuses, grounding states, work-in-progress specifications, and testing-in-progress specifications, in conformity with the work status in the substation.
Information request	The system implements functions for requesting information held by TC and standard TCIF devices, displaying return information on the screen, as well as recording and outputting information.
Recording	The system implements a function for editing the various measurement states of a substation every hour on the hour, operation takeover and record editing functions, a sampling recording function, and a direct control line transmission/reception recording function.
Procedure table creation support	The system implements functions that support the management of live parts verification diagrams, stop schedule information, and device-specific operating procedure information received from the grid control system and power distribution control system.
Data maintenance	The system implements functions to import and switch system data, as well as functions to change power distribution line names.
System operation	The system implements functions that monitor the system for anomalies, and when they occur, display and record them and transmit this information to the host system.
Messaging	The system implements functions for editing message information necessary for monitoring the status of substation equipment, outputting it to screens and saving it, as well as searching edited messages.
Testing	The system implements functions for sending and receiving simulation information to/from standard TCIF devices or grid control systems as test data.

Communication equipment gateway

A system that absorbs and unifies the differences among the various communication protocols used by substation equipment, and performs protocol conversion for collection and delivery to the host system

[Application]
- Relay of control commands from the host system and HMI, as well as display and measurement information from substation equipment

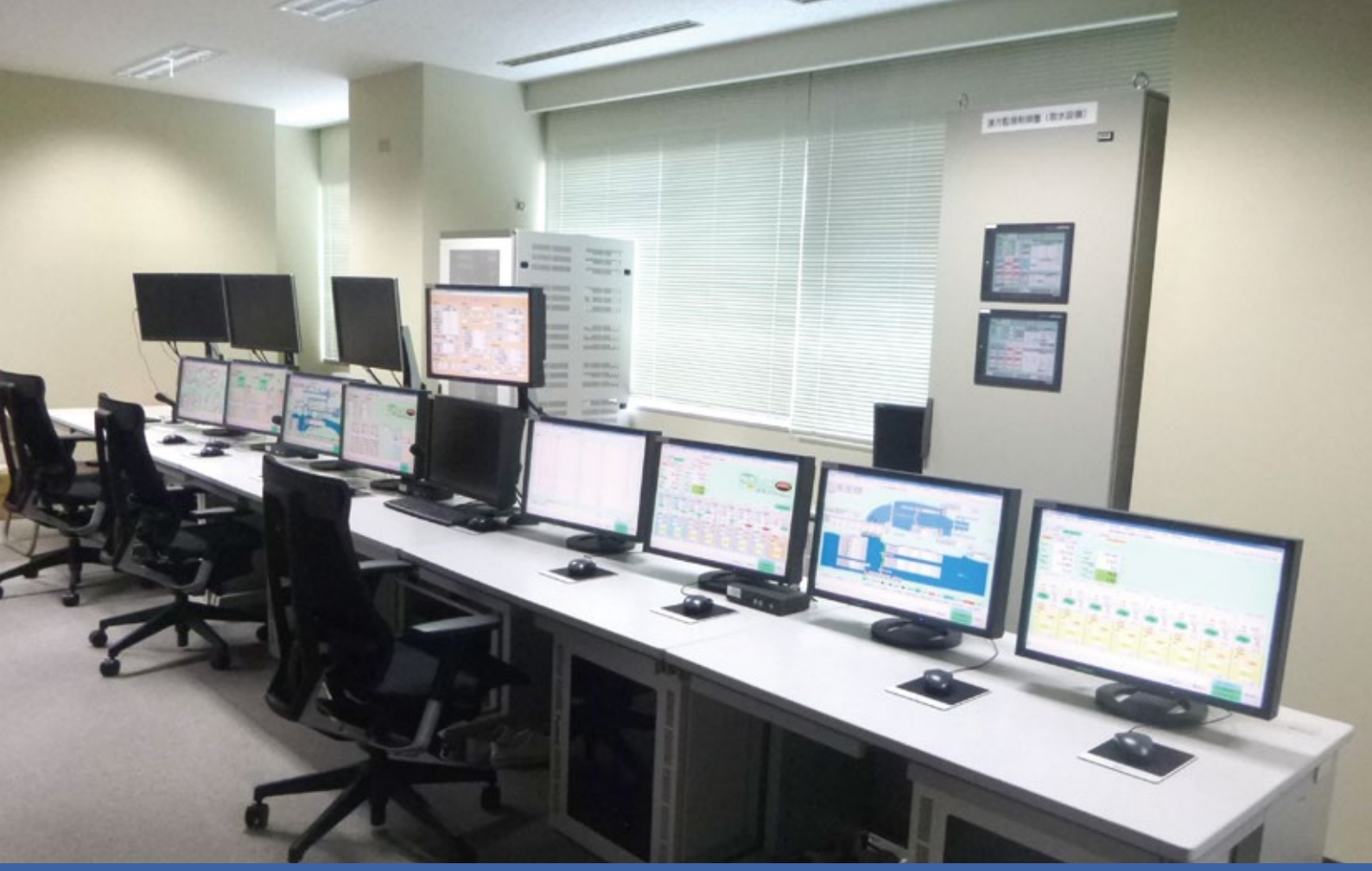
[Features]
- Composed of a basic rack that mounts the main processing unit (computer) and the corresponding IP transmission unit, and an expansion rack that mounts the corresponding CDT/HDLC transmission unit
- In addition to a redundant configuration using two main processing units (duplex system), high reliability is realized by extending redundancy to communication lines and the power supply system
- The substation equipment supports remote monitoring control equipment (CDT/HDLC/IP) and the Interface panel (IP)
- Data transmission with the host system is done via IP transmission, and data ordering and redundancy are ensured through the application of industry-standard communication protocols
- Direct monitoring and control via HMI on a laptop is possible



[Specifications]

Communication protocol of substation equipment			IP transmission only	IP transmission, CDT/HDLC transmission	
Rack configuration			1 basic rack	1 basic rack, 1 expansion rack	1 basic rack, 2 expansion racks
External dimensions			700 mm (W) (1 side) × 2,300 mm (H) (excluding the 110-mm name plate and the 50-mm channel base) × 500 mm (D)		
Equipment configuration			Freestanding with front maintenance access		
Power supply			100 VAC ±10%		
External contact input			5 points (contact a)		
Maximum number of corresponding systems/units	Host system	Next-generation system	6 corresponding systems (3 next-generation systems × 2 LAN systems)		
		Conventional system	4 corresponding systems (2 conventional systems × 2 LAN systems)		
	Remote monitoring and control system	CDT/HDLC	–	24 corresponding units*1	48 corresponding units*1
		IP	96 corresponding units*1		
	Interface panel	IP	96 corresponding units*1		
HMI			Laptop (Optional)		

*1: Up to 96 corresponding units in total for the remote monitoring and control system (CDT/HDLC/IP) and the interface panel (IP); however, the maximum number of physical connection ports between the interface panel (IP) and the remote monitoring and control system (IP) is 40.



Dam-related products

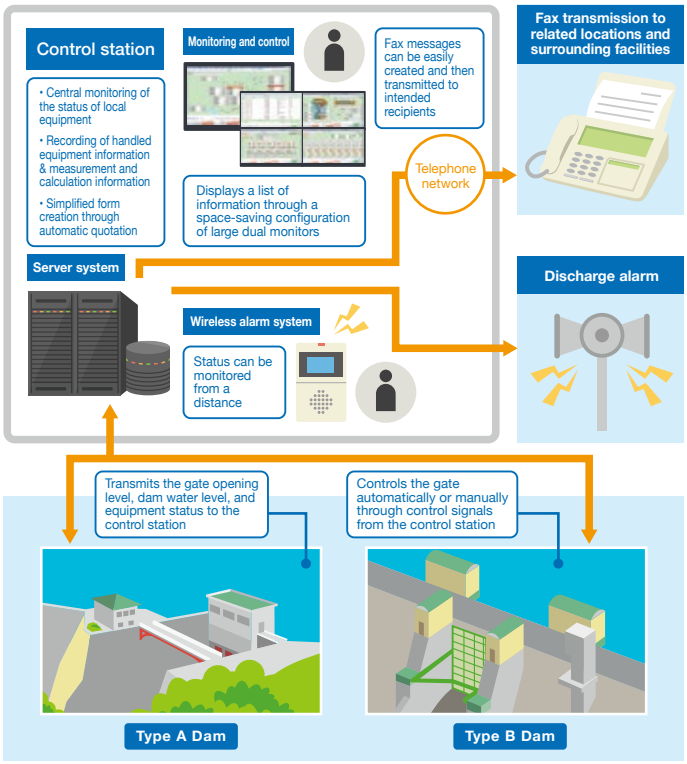
We carry out system development, design, testing, delivery, and maintenance in an integrated manner to best meet diverse needs for efficient power system monitoring and control, including Supervisory control system for dam for comprehensively managing the discharge facilities of dams, and monitoring and control systems for substations to ensure stable power supply.

Supervisory control system for dam

Highly functional control system for centrally monitoring dam-related facilities

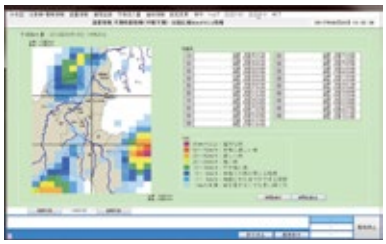
[Features]

- In addition to a redundant configuration with the main equipment and communication lines, a highly reliable system is realized by extending redundancy to the power supply system
- Dual-monitor PC achieves a good balance between space saving and information display capacity
- Human error is prevented through user-friendly operation methods, well-placed information, and guide functions
- Safe and reliable control realized by incorporating malfunction prevention measures and operation monitoring functions for gate operation
- Automatic control function for various types of dams and intakes
- Strong security against third parties through measures that include password authentication, vein scanning, and a screen non-display function
- Powerful support for reduction of users' workload through flexible collaboration with other systems, such as fax transmission to intended recipients and discharge alarm control
- Use of Excel to display forms ensures compatibility with users' OA machines
- Scalability allows smooth expansion to deal with increases in the number of linked machines and amount of data sent/received



Water system chart / Status diagram screen

Control screen



Forecast screen

[Main functions]

Function	Description
Monitoring	State monitoring function for the equipment that makes up the system, operation monitoring function for gate operation, control value monitoring function for TM (measurement) data
Gate operation support	Calculator function to assist manual operation of gates (dam release volume increment calculation function, gate allocation calculation, gate discharge flow transfer calculation, etc.)
Automatic gate control	Fully automatic function for gate control according to existing conditions, including constant water level and water storage control
Data storage	Long-term storage of various types of data through the use of a database, as well as a data search function
Forms	Improved ease of editing forms and improved compatibility with users' PCs by displaying tabulated data in Excel format
Maintenance	Flexible design allows users to freely set message display and alarm activation for equipment/quantity information handled by the system The screen can be designed to match operations through provision of functions that allow users to freely customize the information displayed on the screen
Wireless alarm (optional)	Allows status monitoring at locations away from the system through links with portable wireless alarm devices
Inflow volume prediction (optional)	Forecasts inflow volume by analogy with estimated rainfall acquired from weather data and past data
Fax message editing and sending (optional)	Allows easy composition of fax messages and delivery to their intended recipients
Coordination with discharge alarm system (optional)	Allows scheduled activation of discharge alarms
Large-screen display system (optional)	Enables the display of the data necessary for operation in list form and the status display for the entire water system for improved monitoring and operation efficiency

Dam discharge alarm equipment

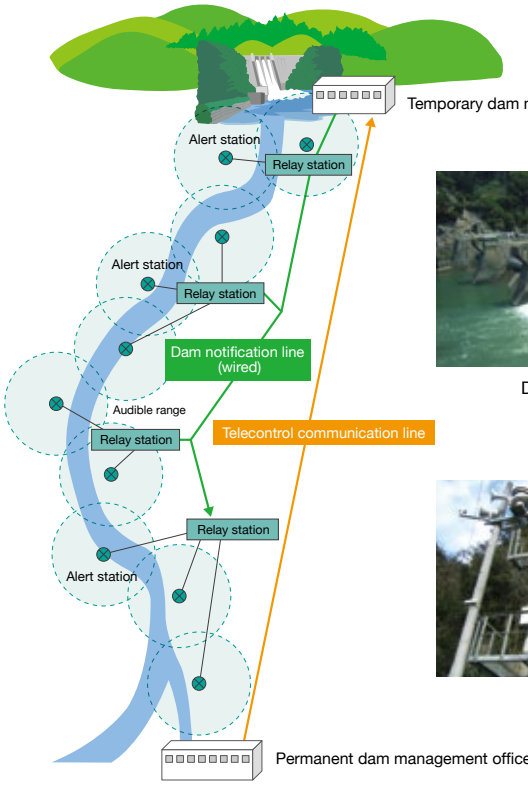
Instantaneously issues alarm commands to sirens and speakers at each alarm station

[Application]

• Issuance of alert sirens and announcements to the surrounding area before water discharge to prevent accidents caused by dam discharges

[Features]

• Receives alarm commands from the alarm control system at the dam management office, and activates the alarm of motor sirens and speakers in alert stations
• Picks up motor siren and speaker outputs, determines the alarm volume, and notifies the result to the alarm control system at the dam management office
• Can work with up to four alert stations
• Machine alarms can be activated from the system's operation section or from connected external equipment such as an alert operation box



Dam discharge

Relay station

[Specifications]

External dimensions		800 mm (W) × 2,000 mm (H) × 700 mm (D)
Equipment configuration		Outdoor specifications (Freestanding with front maintenance access)
Alarm activation system		Remote commands, machine commands (system's operation section, alert operation box)
Relay station configuration		Up to 30 relay stations/control stations
Alert stations		Up to 4 alert stations/relay stations
Control power supply	Input voltage	100 VAC ±10%, 60 Hz single-phase (200 VAC can also be used)
	Power consumption	10 A or less
Transmission specifications	Command/response transmission	40-bit CDT special, polling method
	Transmission speed	200 bps
	Transmission lines	4-wire type
Siren output		Startup contact output
Broadcast output		100 W / 100 Ω: Amplifier output (up to 4 channels)
Alarm activation determination		Siren response monitoring, built-in amplifier response monitoring, alarm volume monitoring
Weight		Approx. 420 kg or less

Automatic gate control equipment

Highly functional control panel for automatic dam intake and dam gate control

[Application]

• System for dam water level adjustment through automatic dam intake control, automatic dam gate control, and adjustment of the water flow rate in the hydropower station

[Features]

• Automatic dam intake control and automatic dam gate control based on water level and gate data

[Specifications]

External dimensions		700 mm (W) × 1,800 mm (H) × 660 mm (D)
Equipment configuration		Outdoor specifications (Freestanding with front maintenance access)
Connection to external		Terminal block, RS-232C
Control power supply		100 VAC (90 VAC to 115 VAC)
Operation method		Push-button switches, touch panel
Transmission specifications	Transmission speed	9,600 bps
	Transmission lines	4-wire type dedicated line
Controlled items		Intake gates, scour gates
Functions		Water intake control, flood control, securing of maintenance flow, etc.

*External dimensions do not include the roof and shield plate.

Energy management system / Renewable energy

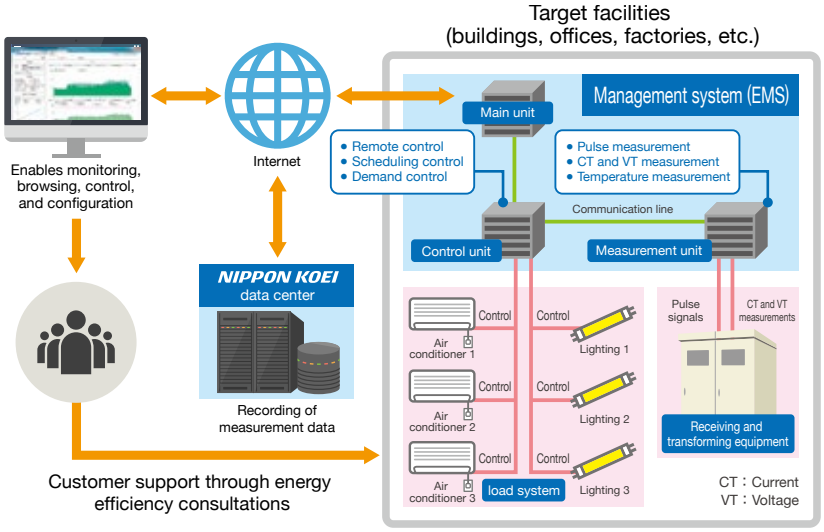
Nippon Koei handles all aspects of the electric power business from upstream operations to downstream operations. We propose and implement all kinds of projects based on our strength as a company that can handle all your needs, from the design of energy management systems to procurement, manufacturing, and construction. We are aggressively expanding into the renewable energy business by combining the hydropower, power plant construction, and system-related technologies that we have cultivated up to now.

Demand-side energy management system (EMS)

System that minimizes energy consumption through monitoring and control by EMS

[Features]
- Centralized management of multiple facilities (unified management)
- Energy saving achieved by power-saving control (scheduling control, demand control, measurement value interlock control)
- Visualization of the status of energy use

Monitor screen



Function	Description
Measurement data monitoring	Numerical display and graph display of measurement data such as power received from the grid
Anomaly/fault monitoring	Display of detected anomalies and faults; sending of notifications to the set email addresses upon detection of faults
Remote control	Remote control of load equipment (air conditioning/lighting) Multiple load equipment units can be grouped and remotely controlled at once
Scheduling control	Remote control of load equipment (air conditioning/lighting) according to the set schedule
Demand monitoring and control	Monitoring of demand power and control of load equipment (air conditioning/lighting) when the set threshold value is exceeded
Measurement value interlock control	Control of the set load equipment (air conditioning/lighting) according to measured values (temperature, etc.) when the measured value exceeds (or falls below) the set value
Setting	Setting of the schedule for each facility and email notification recipients in case of anomalies or faults
Data download	Downloading of past measurement data, summary data, and history information in CSV format
Analysis	Display of past maximum demand for power and the number of warning issuances through demand control

EMS utilization example no. 1

Narita Onsen (Koriyama City, Fukushima Prefecture)

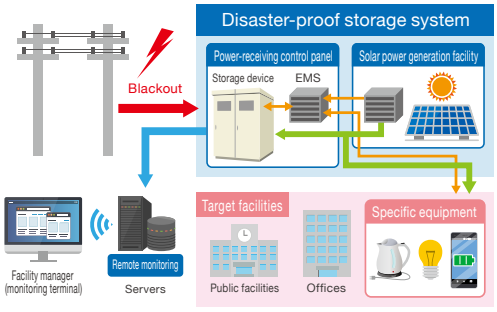
In 2016, EMS was introduced at the Narita Onsen, a natural hot spring facility, using a fiscal subsidy*1 for business operators working to improve energy use efficiency. Nippon Koei provided energy management and support services and updated the equipment used by the facility. This is an example of the subsidy rate being increased to 1/2 as the result of our introduction of EMS as an energy business operator*2. Currently, we support customers' energy conservation efforts over the long term through the provision of energy management and support services.

*1: A scheme that subsidizes part of the expenses for introducing and updating facilities for energy conservation at existing plants, business establishments, etc.
*2: The subsidy rate can be increased from 1/3 to 1/2 through the introduction of EMS and provision of energy management and support services by companies registered as energy business operators.

EMS utilization example no. 2

Strengthening of disaster prevention functions by combining EMS and storage cells
Seiryu Shirakawa Kuo-renosato Roadside Station (Shirakawa Town, Gifu Prefecture)

Seiryu Shirakawa Kuo-renosato Roadside Station is positioned as a disaster prevention center. To strengthen disaster prevention functions through power supply from an autonomous power supply at the time of power outages such as during disasters, and to realize a low-carbon area that consumes locally produced energy, Nippon Koei single-handedly took on the required design, procurement, manufacturing, and construction tasks for the energy infrastructure such as solar power generation, fuel cells, and storage cells, along with energy-saving equipment and the system for controlling all of them (EMS). As a result, we were able to contribute to strengthening the disaster prevention capabilities of the area, enabling it to supply enough electricity and hot water for 30 evacuees taking refuge at the roadside station for three days during a power outage.



Storage battery control system

System that controls storage battery according to the power needs of electricity utilities and consumers.

[Features]
- Provides a variety of services including services for electricity utilities (frequency adjustment, DR, etc.) and power-saving services for consumers (arbitrage*1, peak shift/cut, etc.) through cooperation with power aggregators
- Provides customized functions tailored to the purposes and applications of customers

*1: In areas where electricity prices differ according to the time of day, cost savings can be achieved by exploiting these price differences by charging storage batteries with power while it is cheap and using the stored power during hours when it is expensive.

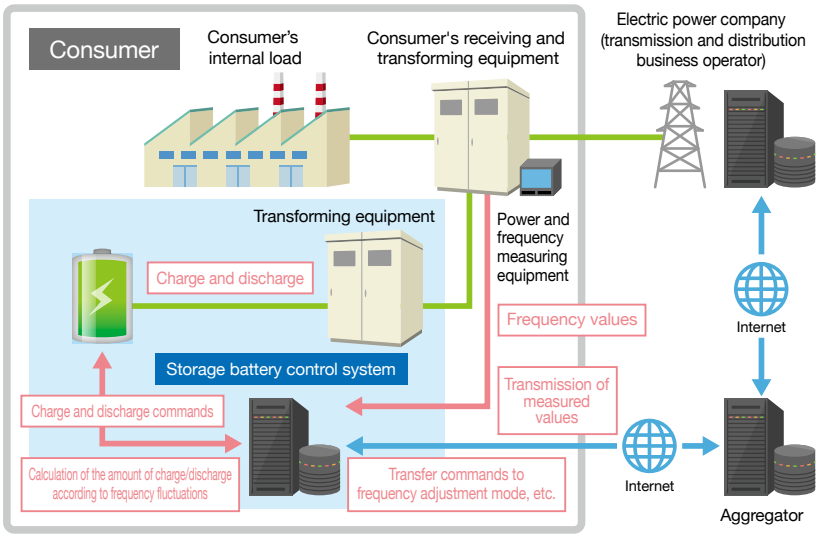


Illustration of frequency adjustment

Storage battery control system application example

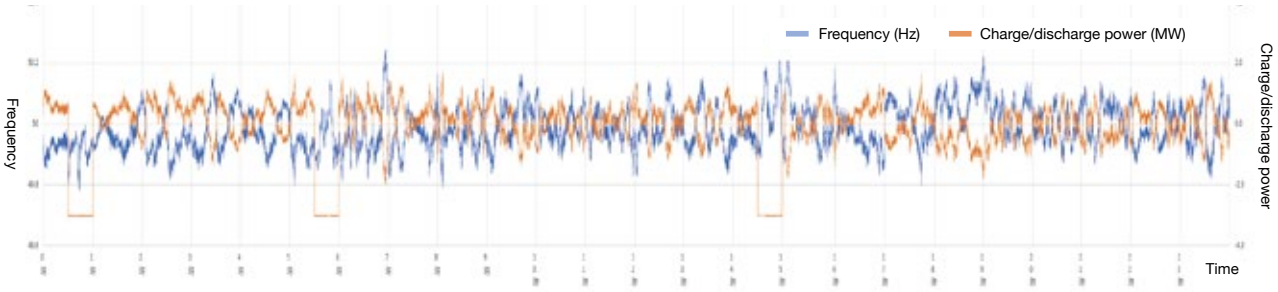
4-MW rechargeable battery system at a cement factory (Wales, UK)

In January 2018, we installed a storage battery control system for a 4-MW storage battery at a cement plant in Wales, UK.
With approval from the UK's National Grid, a power transmission company, we began offering Firm Frequency Response (FFR) since February 2018.

Full view of the 4 MW storage battery

4-MW rechargeable battery (left), Storage battery control system (right)

Storage battery control system



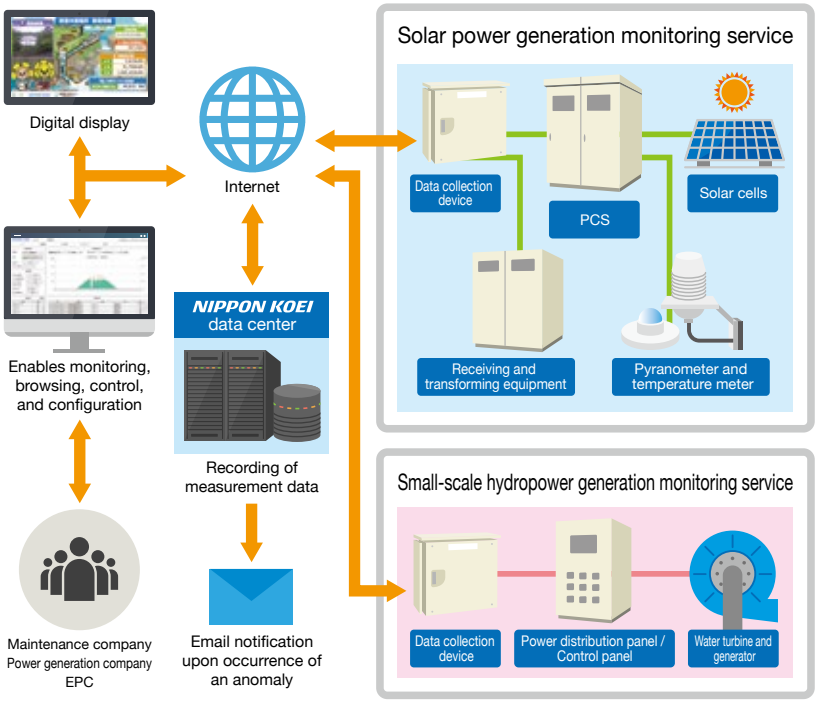
FFR operation record

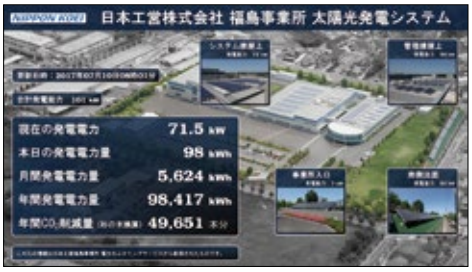
Renewable energy monitoring service

Monitoring cloud service that centrally monitors multiple power plants

[Features]
- Browser-based browsing using a web monitoring service
- Anomaly/fault monitoring of all managed power plants
- UPS installed as standard
- Compatible with all major domestic and overseas PCS manufacturers
- Supports output control functions
- Suitable also for super-high-capacity power plants
- Measurement data provided via Web API

Data collection device





Digital display of a solar power plant

Digital display of a small hydropower plant

Monitor screen

Digital display of a small hydropower plant

Function	Description
Measurement data monitoring	Numerical display and graph display of measurement data
Anomaly/fault monitoring	Display of detected anomalies and faults; sending of notifications via email upon detection of faults
Data download	Downloading of past measurement data, history information, and forms in CSV format
File sharing	Cloud management of items such as inspection reports and field photos among users
Setting	Setting of user-specific restrictions on functions, email notification recipients, etc.

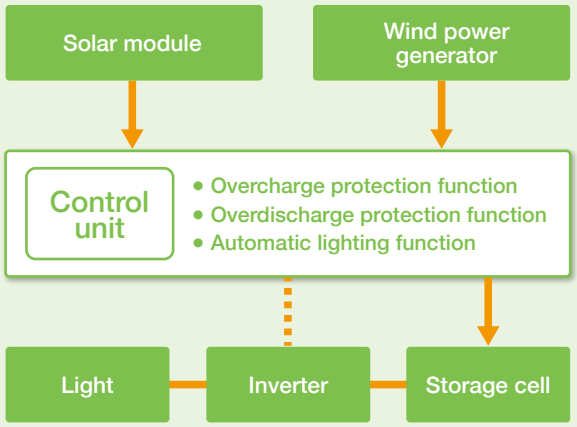
Hybrid street lights

Street lights that require no electricity and wiring work and can be installed anywhere

[Features]
- Clean lighting that does not discharge CO2 and operates on electricity generated by wind power and sunlight in a storage cell; automatically switches on/off
- Since electrical work and wiring work are not required, can be installed anywhere as long as sunlight and wind conditions are right

[Functions]
- Wind power generation: Starts at a wind speed of 2.5 m/s or more
- Solar power generation: Designed for an average solar radiation of 4 hours/day
- Control unit: Overcharge protection circuit, overdischarge protection circuit, auto light on/off function
- Lighting equipment: High-brightness LED with long service life

System configuration



[Specifications]

Wind power generator	Type	All-weather wind power generator	Storage cell	Type	Sealed lead storage cell
	Rated output	64 W or more		Rated output	12 VDC
	Rated wind speed	10 m/s	Control unit	Rated wind speed	Overcharge/overdischarge protection circuit
	Power generation start wind speed	2.5 m/s		Power generation start wind speed	Automatic-manual switch
	Survival wind speed	60 m/s		Survival wind speed	Lit at sunset, switches off at a set time
Solar module	Type	Single crystal silicon type	Inverter	Type	100 VAC
	Maximum power	50 W		Maximum power	250 W
	Maximum output current / Voltage	3.16 A / 15.8 V	Lighting equipment	Maximum output current / Voltage	High-brightness LED
	Short circuit current / Open voltage	3.35 A / 10.5 V		Short circuit current / Open voltage	10 lx or more (directly below)

Disaster prevention

Making the most of the advanced product development and quality control technology we have cultivated in the electric power equipment business, we offer one-stop business processes ranging from development of disaster prevention-related products to maintenance. We are committed to continue developing new technologies and new products to contribute to safety and security in civil engineering and railway projects in cooperation with our industry-leading consulting division in Japan.

Rockfall detection system

Safety system that reliably detects rockfalls that directly affect the area being monitored and notifies the railway signaling system and monitoring centers

[Applications]
- Installation of “wire switch sensors” for the detection of rockfalls on structures such as fences and reinforced rockfall protection embankments installed in areas being monitored, in order to reliably detect the displacement and collapse of structures, which are caused by falling rocks, by the stretch of wire ropes
- Transmission of rockfall information to the signaling system to prevent train accidents
- For road disaster prevention and erosion control

[Features]
- System for detecting falling rocks from the top of slopes with rockfall detection sensors
- Four detection fences for different snow depths are available for use from flat land to snowy mountain areas
- Maximum monitoring distance of 4,000 m

[Specifications]

External dimensions	800 mm (W) × 800 mm (H) × 250 mm (D)
Equipment configuration	Control panel: Up to 3 units (1 main unit, 0 to 2 sub units)
	Sensors: Up to 60 units (4,000-m monitoring length)
Control power supply	100 VAC (80 V to 120 V)
Consumption current	5.25 A or less
Output information	Alarms, battery operation, failure

Cut slope detection system

Safety system that reliably detects landslides from the top of cut slopes that directly affect the area being monitored and notifies the railway signaling system and monitoring centers

[Applications]
- Fences or reinforced rockfall protection embankments installed in areas being monitored detect displacement or collapse of a mass of 2 m^2 or more by breaking of "disconnection sensor cables with weak points"
- Transmission of landslide information to the signaling system to prevent train accidents
- For road disaster prevention and erosion control

[Features]
- System for detecting earth and sand to prevent them from getting on the tracks when a cut slope fails
- Maximum monitoring distance of 300 m

[Specifications]

External dimensions	705 mm (W) × 530 mm (H) × 250 mm (D)
Equipment configuration	Control panel: 1 unit
	Sensor cable: Up to 300 m
Control power supply	100 VAC (85 V to 115 V)
Consumption current	2.0 A or less
Output information	Alarms, battery operation, failure

Embankment slope collapse detection system

Safety system that uses "tilt sensors" buried in the soil of the railroad construction ground plane (rail foundation structure) to detect landslides and earthfalls (fall-offs) that occur below the formation level and notifies the railway signaling system and monitoring centers

[Applications]
- Detection of earthfalls (fall-offs) and sensor disconnection due to ground tilting or sloping using “tilt sensors” embedded in the soil of the railroad construction ground plane (rail foundation structure)
- Transmission of landslide information and other data to the signaling system to prevent train accidents
- For road disaster prevention and erosion control

[Features]
- System for detecting collapse or fall-in of embankment slopes
- Detection of ground tilting caused by landslides in two directions, i.e., horizontal and orthogonal
- Maximum monitoring distance of 200 m

[Specifications]

External dimensions	705 mm (W) × 503 mm (H) × 250 mm (D)
Equipment configuration	Control panel: 1 unit
	Sensors: Up to 99 units (200-m monitoring length)
Control power supply	100 VAC (80 V to 120 V)
Consumption current	2.0 A or less
Output information	Alarms, battery operation, failure

Automatic ash rain gauge

Ashfall meter capable of automatic and continuous measurement of volcanic ashfall during volcanic activity with the use of water, as well as measurement of rainfall

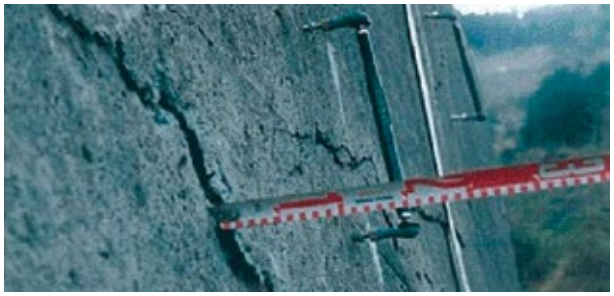
[Applications]
- Measurement of ashfall accompanying volcanic activity
- Ashfall range can also be determined through the use of multiple systems
- Currently in use at volcanoes in various parts of Japan, including Sakurajima

[Features]
- Safe and automatic measurement of ashfall and rainfall in real time without human intervention during volcanic eruption
- Jointly developed with the Public Works Research Institute

[Specifications]

External dimensions	Ash capture unit: 600 mm (W) × 1,330 mm (H) × 500 mm (D) System unit: 500 mm (W) × 1,320 mm (H) × 500 mm (D)
Equipment configuration	Ash capture unit: 1 unit
	System unit (control panel): 1 unit
Control power supply	100 VAC
Consumption current	3.0 A or less
Output information	Volcanic ash deposition amount, volcanic ash deposition thickness, hourly rainfall

Crack gauge (measurement)



Developed for easy measurement of crack displacement in concrete structures and bedrocks; Can be used to measure cracks in structures such as landslide areas and slope faces;
Obtained an industrial product certification from Sukagawa City in 2013

[Application]
- Simple and inexpensive tool for visual measurement of crack displacement in all types of concrete structures and bedrocks

[Features]
- Can be easily installed by anyone with a drill
- Can be read accurately by anyone with consistent readout values
- Clearly visible vernier scale with 0.5-mm increments

[Specifications]

Model	NKK-100
Measurement range	Up to 100 mm
Minimum readout unit	0.5 mm
Material	Corrosion-resistant aluminum
Universal joint	Moving angle of 45°
Weight	Approx. 300 g

Other

Since Nippon Koei was established, we have delivered more than 25,000 line traps (blocking coils), which were our first product, and we have gone on to develop various original safety equipment indispensable for work sites such as power stations, substations, distribution stations, power lines. We are committed to continue developing high-quality, high-performance products that contribute to the power industry.

Mold line traps

Compact and lightweight line traps with a delivery record of over 25,000 units

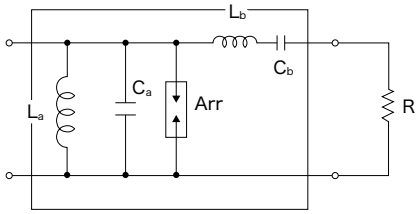
[Application]

- Line traps are inserted in series on transmission lines, with low-impedance characteristics for commercial frequencies and high-impedance characteristics for high frequencies; loss reduction for high-frequency transmission circuits, stabilization of transmission characteristics, and prevention of interference by the transmission circuits of other power systems

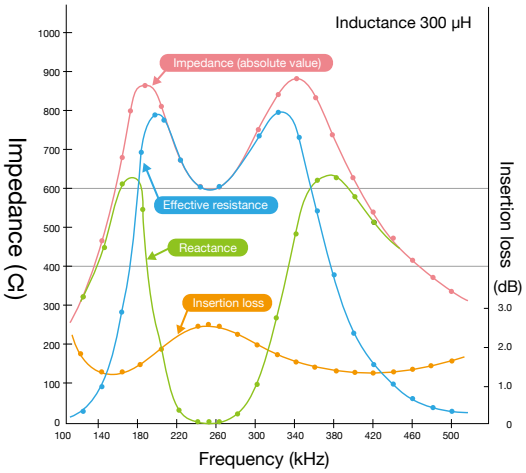
[Features]

- Line trap circuits can be selected according to their intended use, i.e., filter type, single-frequency tuning type, and two-frequency tuning type
- The filter type, which reduces the influence of reactance on the bus and downstream power equipment, is the most commonly used
- The main coil of the line trap is a heat-hardened structure that has been impregnated with resin after winding an aluminum transposed conductor in the shape of a coil
- Depending on the installation location, the installation method can be either hanging or stationary
- Built-in tuner and lightning arrestor and a structure that can withstand large currents during power line accidents and lightning strikes

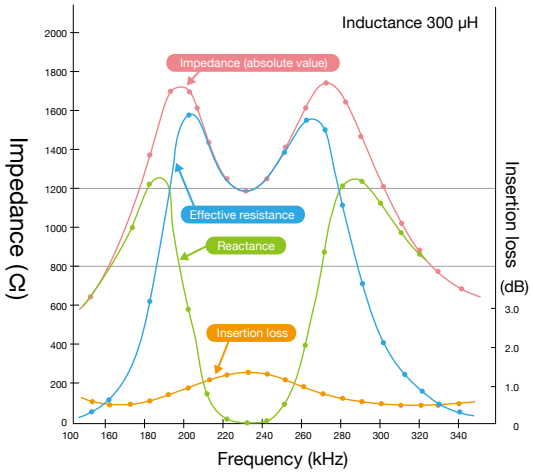
Model	Rated current (A)	Impedance (μH)
Mold	800 / 1,200 / 1,600 / 2,000	100 / 200 / 300 / 400 / 500
	3,000 / 4,000	100 / 200 / 300



Filter type impedance characteristics



Example of impedance and insertion loss of a filter line trap (low-impedance type)



Example of impedance and insertion loss of a filter line trap (high-impedance type)

Special high pressure Voltage detector

Detectors that do not require a power supply and can be used for a broad range of applications


Type A


Type H


Neon tube lighting status

[Application]
- Safety tools for the detection of charges and power outages in special high-voltage electric circuits, machines, and other equipment

[Features]
- Lightweight and compact design that allows use in narrow spaces, such as between lines
- Emits light during voltage detection with the use of a neon tube that does not require a power supply
- Ensures safety during voltage detection as the neon tube emits light when the voltage equals or exceeds the minimum voltage value for detection
- Easy angle adjustment of the light-emitting part
- Can be applied to a wide range of applications such as power plants, substations, distribution stations, and power transmission lines.

Detector checker testers

[Specifications]

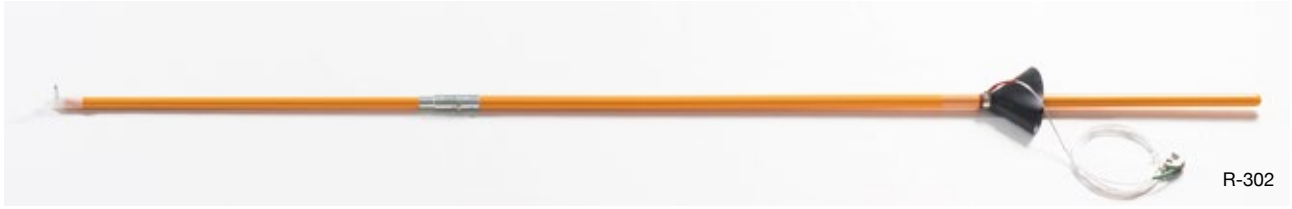
Model	Working voltage	Total length	Weight	Minimum detection voltage	Remarks
H-33kV	11 kV to 33 kV	0.45 m	0.6 kg	3 ±0.5 kV	For hook rods
H-66kV	55 kV to 77 kV	0.55 m	0.7 kg	6 ±1 kV	
A-154kV	154 kV	2 m to 5 m	2.7 kg	12 ±2 kV	For telescopic insulated rods
A-275kV	275 kV	1.8 m to 6 m	3.5 kg	30 ±3 kV	
Soden -33kV	11 kV to 33 kV	1.3 m to 1.8 m	2.0 kg	3 ±0.5 kV	
Soden -66kV	55 kV to 77 kV	1.8 m to 2.9 m	2.5 kg	6 ±1 kV	

*Checker testers for checking the operation of the voltage detector are also available.

[Specifications]

Model	Generated voltage	Weight	Applicable power detector	Application
T-275	8,000 V	0.5 kg	For 275 kV	For checking the soundness of the neon tube
T-66	2,000 V	0.8 kg	For 66 kV	For checking the soundness of the neon tube
T-22	4,500 V	6 kg	For 33 kV	For checking the soundness of the detector

Electrical insulation hook bar


R-302

Highly durable hook rods that help reduce of the number of safety tools

[Applications]
- For operating isolators
- For attaching and detaching grounding tools, and for voltage detection in special high-voltage parts

[Features]
- Uses FRP, a light and high-strength resin with excellent insulation properties and weather resistance
- Can be used in common with our voltage detectors and grounding tools, helping reduce the number of tools
- One-touch type connection that allows easy attachment/detachment

[Specifications]

Model	Total hook rod length	Weight	Max. usable voltage (kV)	Remarks (standard)
R201	2 m	1.1 kg	22	For indoor use
R302	3 m	2.0 kg	77	For outdoor use
R402	4 m	3.0 kg	77	〃
R502	5 m	3.6 kg	154	〃
R603	6 m	4.5 kg	275	〃
R703	7 m	6.5 kg	275	〃

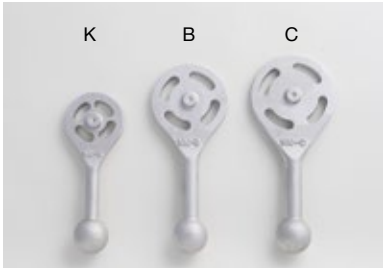
*Those for outdoor use are provided with an umbrella and a grounding device.

Grounded metal

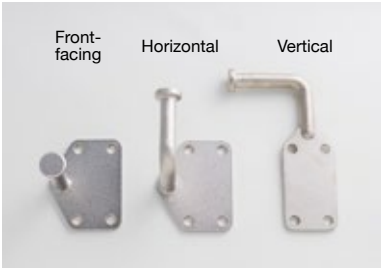
Highly durable grounded metal that can also be used in salt-affected areas

[Application]
• Prevention of damage due to spark discharge resulting from direct attachment to an electric circuit

[Features]
• Grounding location indicated on grounded metal
• Can be used in salt-affected areas as the main body has anti-rust plating and the fixing bolts are made of stainless steel
• Reduction of electrolytic corrosion through a material similar to that of electric power lines



[Features of models for electric wires]
• Free angle adjustment
• Has a corona prevention tool (shielding cap) for use when the working voltage is 154 kV



[Features of models for copper bands]
• Three types are provided for various structures

[Specifications of models for electric wires] Working voltage: 66 kV to 154 kV

Model/wire type	H (HDCC) (hard-drawn copper conductor)	HAL (hard-drawn aluminum conductor)	ACSR (aluminum conductor steel-reinforced cable)
K	38 mm² to 250 mm² ϕ7.8 to ϕ20.7	38 mm² to 240 mm² ϕ7.8 to ϕ20.3	32 mm² to 200 mm² ϕ7.8 to ϕ20.3
B	325 mm² to 600 mm² ϕ23.4 to ϕ31.9	300 mm² to 860 mm² ϕ22.4 to ϕ33.3	240 mm² to 610 mm² ϕ22.4 to ϕ34.2
C	725 mm² to 1,000 mm² ϕ35.2 to ϕ41.6	850 mm² to 1,030 mm² ϕ37.8 to ϕ41.8	680 mm² to 810 mm² ϕ35.1 to ϕ38.4

*When ordering, please specify the model, wire type, application range, etc.

[Specifications of models for copper bands]

Model	Copper band type	Weight (g)
Front-facing	50×t6	950
	75×t6	1,100
Horizontal	50×t6	1,150
	75×t6	1,300
Vertical	75×t6	1,260
	100×t6	1,350

Special high pressure earthing device

Safety tools that can be used for various grounding tasks


BL


MCL


QL


C

[Applications]
• Used after stopping the electric circuit of special high-voltage equipment

[Features]
• Lightweight and easy to use
• Can be used for various types of grounding work for electric wires, miniclad, cubicles, and power transmission lines
• The BL model is easy to use; simply twist half a turn to attach to or detach from an electric circuit
• The BL and MCL models can function with one operating rod as the metal fittings holding the electric circuit can be attached and detached
• The QL model ensures grounding of the copper band by accommodating a wide range of mounting angles
• The BL, MCL, and QL models use an interlock mechanism to prevent unintentional grounding/ungrounding

[Specifications]

Model	Application range	Weight (kg) per set	Usable voltage (kV)	Remarks
BL-30	ϕ6 to 27 mm	3.2	For 33 kV to 275-kV electric wires	Standard 7-m ground wire; for hook rods
BL-50	ϕ21 to 49 mm	3.4		
C-30	ϕ6 to 27 mm	2 to 3	For 33 kV to 154-kV power transmission lines	66 kV: Standard 2.5-m ground wire 154 kV: Standard 5-m ground wire
C-50	ϕ21 to 49 mm			
MCL-6kV	Electric wire: 60 to 150 mm² Copper band: t6 to 15 mm	2.3 (operating rod 0.6)	For 6.6-kV miniclad	Standard 4-m ground wire
MCL-20kV		2.3 (operating rod 1)	For 22-kV miniclad	
QL-50	ϕ50 mm	2 to 3	For 6.6/22-kV cubicles	6.6 kV: Standard 2-m ground wire 22 kV: Standard 4-m ground wire
QL-75	ϕ75 mm	2.5 to 3.5		

JAPAN Fukushima

About the City of Sukagawa in Fukushima Prefecture, Home to Nippon Koei's Power & Digital Operations

The city of Sukagawa in Fukushima Prefecture, where our manufacturing base is located, is a regional city about 180 km north of Tokyo. Fukushima Prefecture, where Sukagawa City is located, is the third-largest prefecture of Japan by area size. While it has many modern towns with many buildings, it is also blessed with rich nature and valuable historic assets. It still has towns where traditional culture is still alive, and it is a very attractive region with spots that offer different views across the seasons.

Located in the middle of such prefecture, Sukagawa is a historical city that prospered as a castle town of the Nikaido clan since the Kamakura period, and as one of the best post towns along the Oshu Kaido route during the Edo period. The center of the city is served by the Tohoku Expressway and the Tohoku Shinkansen line connecting it to Tokyo and the Tohoku region. Fukushima Airport in the southeast part of the city connects Sukagawa to domestic as well as overseas locations, making it a convenient city that allows transport to any location.


Mt. Bandai and Inawashiro Lake


Tsuruga Castle (Aizu-Wakamatsu City)
An Edo-period castle that boasts a 400-year history.


Ouchi-juku (in the town of Shimogo in Minamiaizu District)
Traditional buildings that represent the streets of the Edo period.


Soma Nomaoi Festival (in Minamisoma City)
A traditional event with a history of more than 1,000 years.

Sights and festivals of Sukagawa City


Sukagawa Peony Garden
A flower garden that boasts some 7,000 stems of peonies of 290 varieties.


Taimatsu Akashi Fire Festival
One of Japan's three largest fire festivals.


Shakado River Fireworks Display
A summer festival where about 10,000 fireworks color the night sky.

ID&E
A member of Tokio Marine Group

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