

Mission to Zero-emission Micro Hydro System

## A Small Hydropower System of Compact Size



**Connecting to the Next Generation  
and Making Renewable Energy More Accessible**



SEIKO Service and Engineering Ltd  
Nakayama Ironworks Co. Ltd



## All about a containerized micro-hydropower

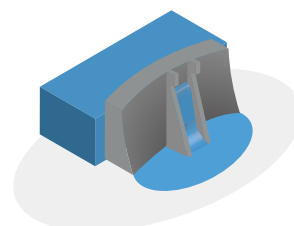
### Product Features

"Small-hydropower" is a technology that uses the flow of water from rivers and agricultural water to generate electricity.

Although there is no strict limitation to the volume of electricity produced, any such system that could generate less than 1000 kW is called a small-hydropower or simply micro-hydro.

Whereas large hydropower projects require several years of preparation time, small hydropower projects can be up and running in a very short time.

Around the World, there are many small rivers, agricultural water and locations with a great potential for electricity generation and the small micro hydropower has been designed for that purpose.



Hydroelectric power plant

In case of a  
container type  
micro-hydro



One package!



Easy to transport!



Easy to install!

Previously separated components are now offered in one package. This eliminates the need for buildings and their indoor plumbing and wiring works, shortening the construction time and improving safety.

## Different ways of use

### As a stand-alone power supply

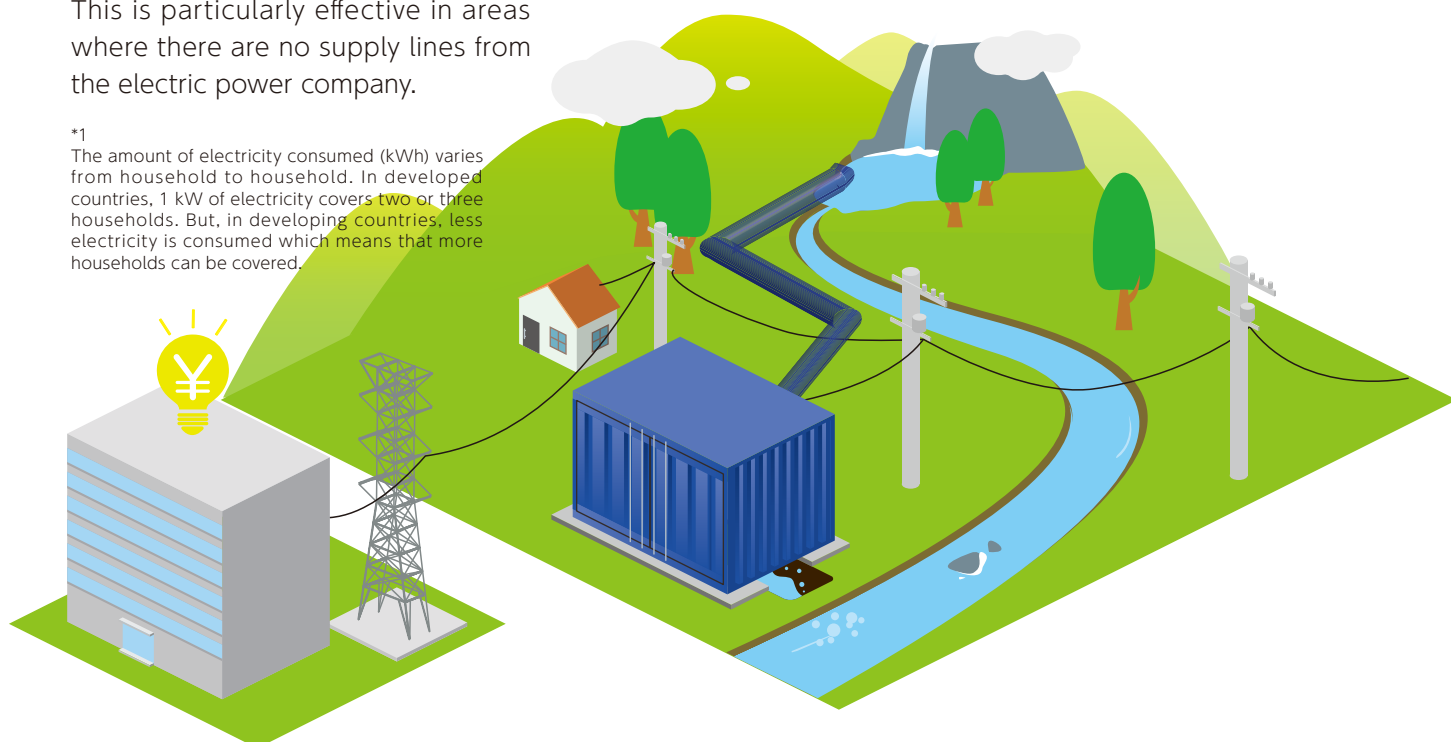
This unit is a small power station that can produce electricity and, without using the electric power company's supply lines, send it to homes in the surrounding area\*1.

This is particularly effective in areas where there are no supply lines from the electric power company.

\*1  
The amount of electricity consumed (kWh) varies from household to household. In developed countries, 1 kW of electricity covers two or three households. But, in developing countries, less electricity is consumed which means that more households can be covered.

### As a power generation business

This unit can also be used to produce and sell electricity to the electric power company



Effective head : 10~100m

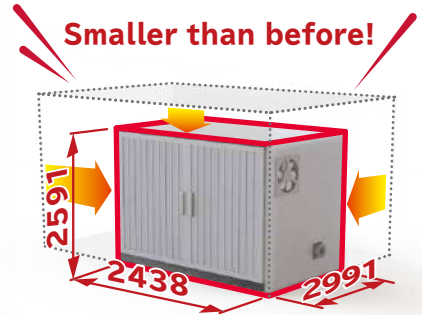
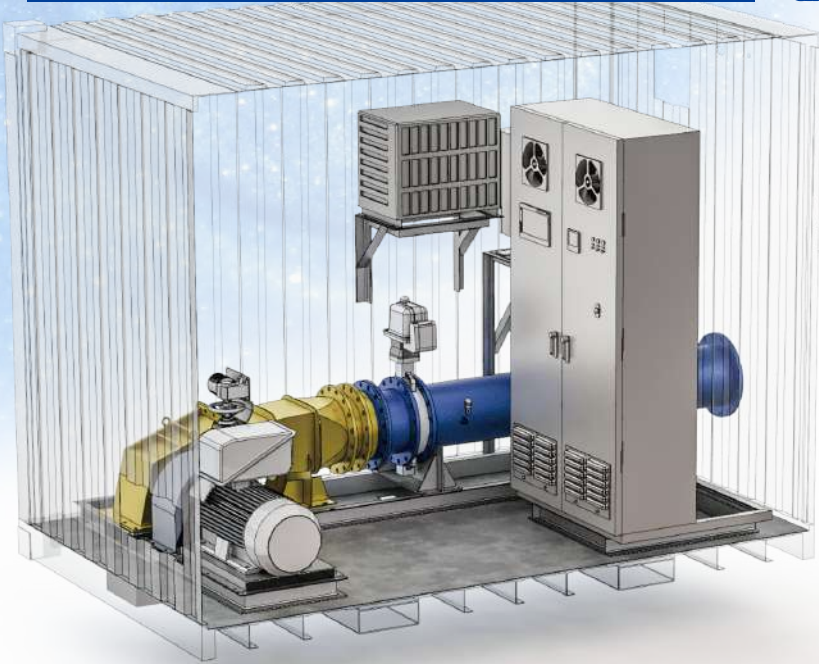
Flow rate : 0.02~0.6m<sup>3</sup>/sec.

Power generation 19.9, 30, 49.9kW

**Cost savings** ( as no building is required )

**Compact**

**and easy to install!**



★ ★ ★  
**Quality**

Quality assurance through  
completion of the product.

Reliable and Stable Power  
Generation.



**Design**

Reliable long life design.

Nakayama's unique  
packaging for noise reduction.



**System**

Optional:  
Remotely Monitoring Device



**Breakdown**

Maintaining water discharge  
even in case of failure.

Applicable to small rivers,  
springs, irrigation channels, etc.!

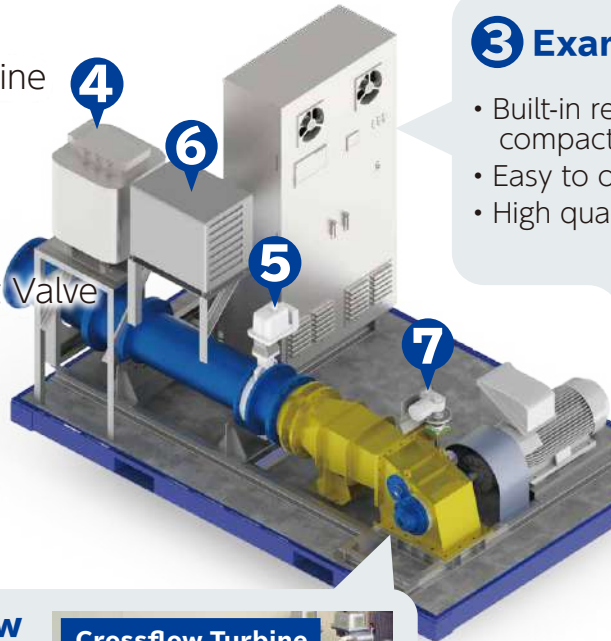


**Examples of installation**



## Package Layout

- ❶ Crossflow Turbine
- ❷ Generator
- ❸ Control Panel
- ❹ Transformer
- ❺ Automatic Inlet Valve
- ❻ UPS
- ❼ Guide vane



### ❸ Example : Control Panel

- Built-in reverse converter for compact storage
- Easy to operate
- High quality and reliability



### ❶ Crossflow Turbine ❷ Generator

- High efficiency
- Less maintenance
- Stable operation



### Inverter

manufactured by Yasukawa Electric

- Interconnecting inverter with built-in independent operation detection function (Detects and isolates irregularity for grid connection).
- Rotation speed control driver suitable for water flow adjustment (according to grid requirements).

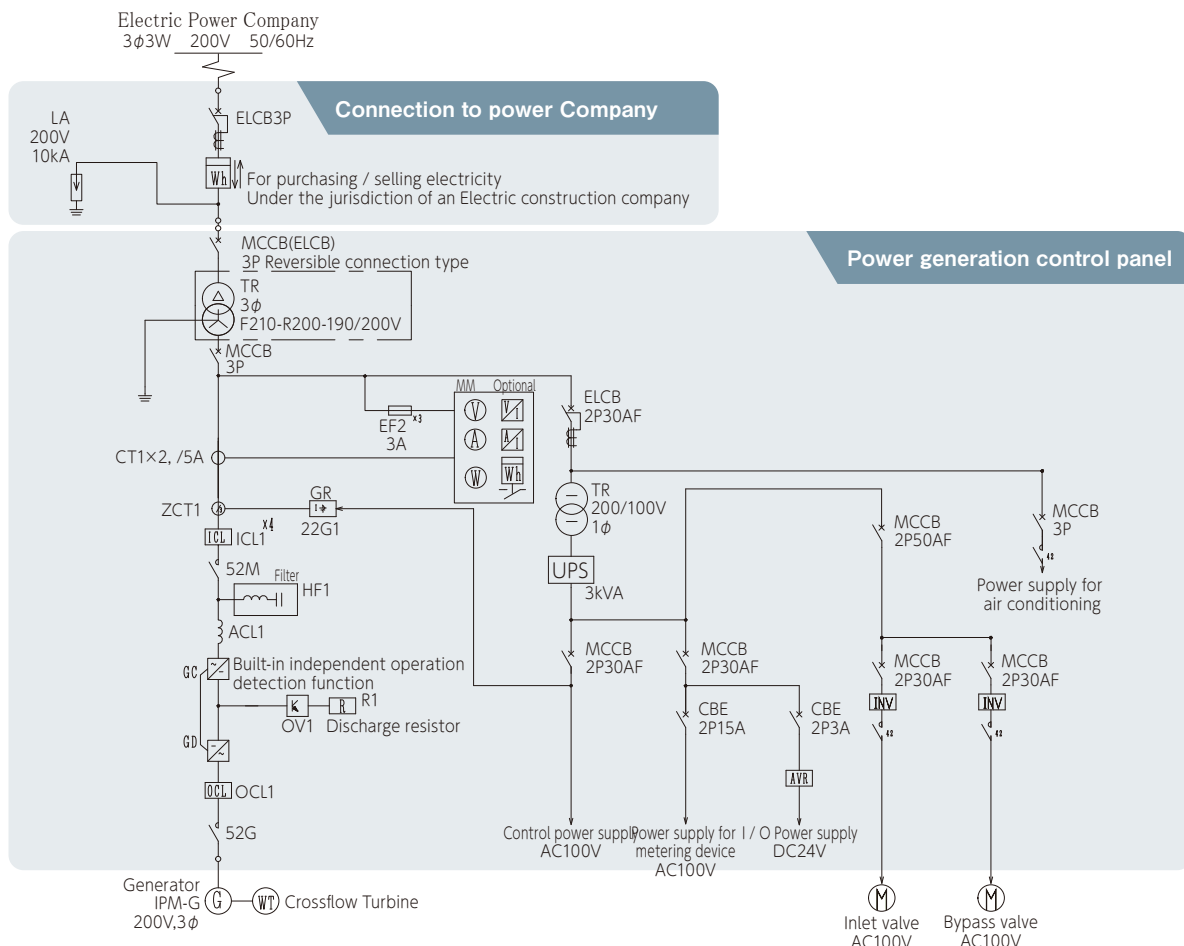


Generator control driver



Grid-connected inverter

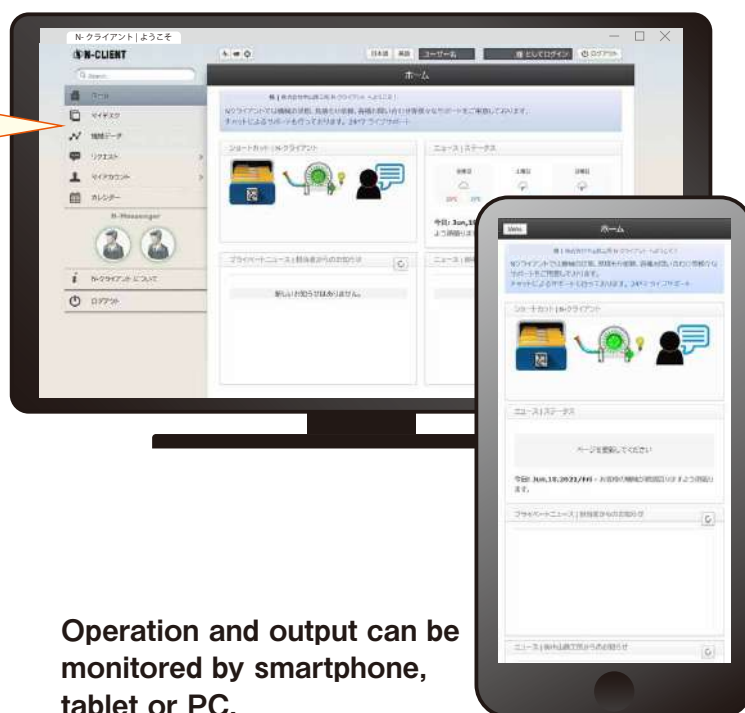
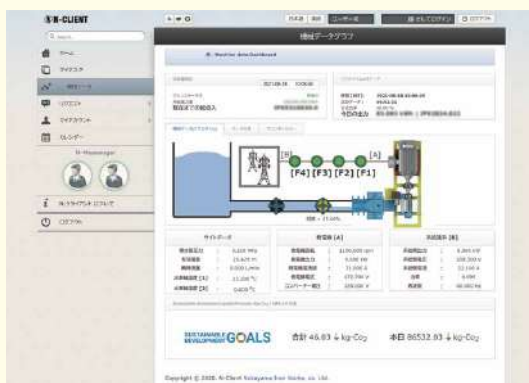
## ◆Example of single line distribution diagram





## Introduction of other useful systems

The total amount of CO<sub>2</sub> emissions reduction, electricity generated, and electricity sales revenue can be checked on a dedicated page (online).



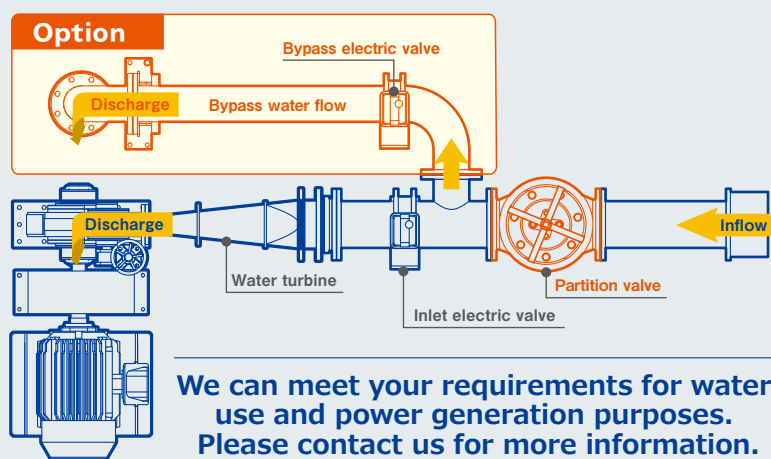
Operation and output can be monitored by smartphone, tablet or PC.

## Flow Control

- Smooth start/stop operation
- Water flow continuity ensured, even in case of breakdown or power failure.
- Maximum output control according to the water volume.
- Handling of additional functions to support variable water level and volume.

### Available options for various water use:

- Control of constant water level in the intake tank.
- Control of constant water discharge.
- Control of Pressure reduction.



We can meet your requirements for water use and power generation purposes. Please contact us for more information.

## ◆ Equipment size

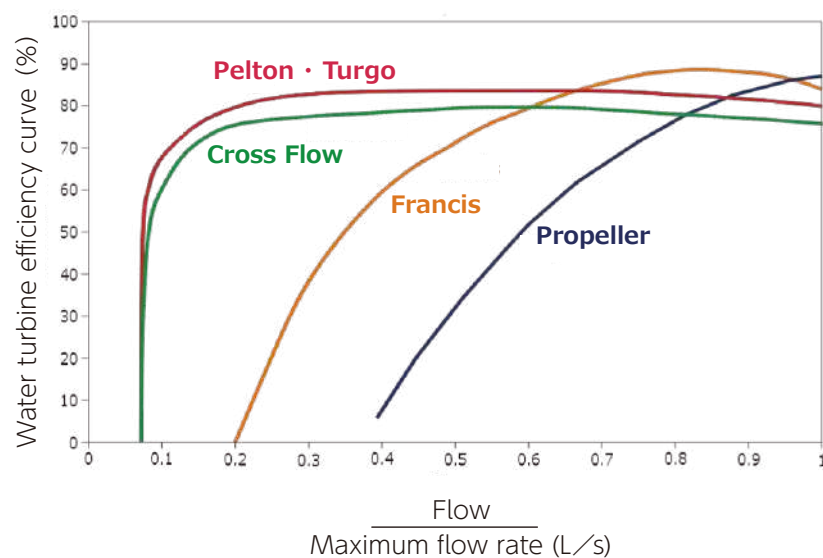
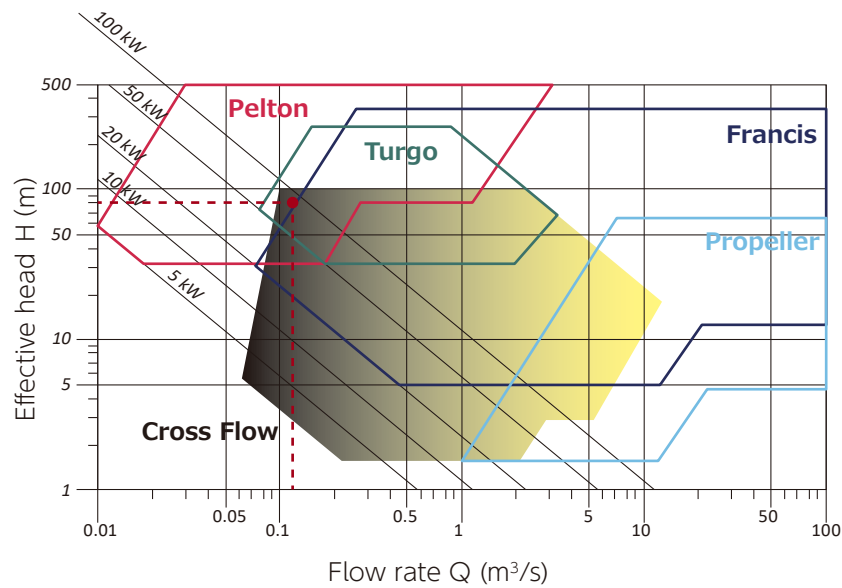
| Output | Package type | Dimensions (mm)*1                  | Pipe size*3 | Weight (t)*3 |
|--------|--------------|------------------------------------|-------------|--------------|
| 49.9kW | SN-0499_v1   | 107インチ型※2<br>W2438 × L2991 × H2591 | Φ400～Φ500   | 5            |
| 30kW   | SN-0300_v1   | 107インチ型<br>W2438 × L2991 × H2591   | Φ250～Φ300   | 4            |
| 19.9kW | SN-0199_v1   | 107インチ型<br>W2438 × L2991 × H2591   | Φ250～Φ300   | 3            |

\*1: L: Inlet flange to discharge port.

\*2: For an output of 49.9kW, a 12-ft container can be used if a bypass channel is prepared outside. We will consider the design and waterway conditions through consultation.

\*3: Reference values.

## Selection of water turbine and power generation output (effective head and flow rate)



Example of Selection

Effective head : 80m

Flow rate : 0.11m³/sec.

Power generation output : 66kW

Water turbine type Cross flow

If your application is outside this range, please contact us.

### Output and grid connection - installation of chief engineer

Low voltage interconnection (200V, 3 $\phi$ ) is possible for grid interconnection contracts of less than 50kW.

## CO<sub>2</sub> emission reduction

$$\text{CO}_2 \text{ emission reduction} = \text{Estimate[kWh]} \times 0.36 \sim 0.505^*1 [\text{kg CO}_2/\text{year}]$$

\*1 Varies depending on the power company.

# Society 5.0 for SDGs

Society 5.0 is the fifth new society in the history of human social development.

In the Fifth Science and Technology Basic Plan of the Cabinet Office, it is defined as "a human-centered society that achieves both economic development and solutions to social problems through a system that highly integrates cyberspace (virtual space) and physical space (real space)".

We believe that small-scale hydroelectric power generation can be one approach to achieving the 17 Sustainable Development Goals set by the United Nations, as well as a key element of the future society that Japan should aim for.

## Promoting the SDGs through Small Hydropower



### Goal 7

Ensure access to affordable, reliable, sustainable and modern energy for all.



### Goal 11

Make cities and human settlements inclusive, safe, resilient and sustainable.



### Goal 13

Take urgent action to combat climate change and its impacts.



### Goal 14

Conserve and sustainably use the oceans, seas and marine resources for sustainable development.

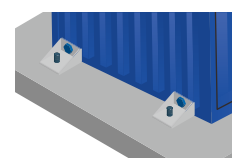
## On-site installation process



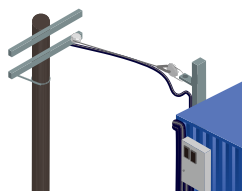
1 Transport the container by truck.



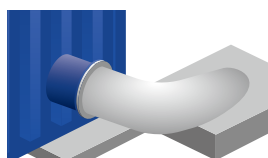
2 Place it at the site where you want to install the unit.



3 Secure the four corners of the container with anchor bolts.



4 Wire the container to the electrical wires.



5 Connect the container piping to the water pressure pipe at the site.

Note: Be sure to check the size of the pipe and the size of the flange (5k, 10k, 16k, etc.).



6 The installation is now complete.

### What the customer needs to do

1. Construction of water intake facilities; piping, container foundation and installation work.
2. Power wiring (from the power reception point to the container inlet) and installation of meters for transactions (power purchase/sale).

## Equipment Specifications

| Item  | Description  | Remarks  |
|---|--|--|
| Effective head<br>Water volume                      | 10~100m<br>0.02~0.6m³/sec  | Contracted Power for grid connection<br>19.9、30、49.9kW   |
| Water quality                                       | Fresh water (with no corrosive elements)<br>Allowable diameter of dust, stones, small fragments, gravel, grain sand, etc. : Φ15mm or less  | Varies depending on the water turbine model.   |
| Quality of power connected to the grid              | Compliant with JEAC-9701<br>Voltage : 202V±10%<br>Frequency: 50/60Hz, ±3Hz<br>Current distortion rate:<br>Less than 5% in total<br>Less than 3% each time (less than 40 times)   | Application for Grid-Connection Consultation<br>Preliminary preparation of technical materials<br>Independent operation detection function<br>OV、UV、OF、UF<br>Passive method (voltage phase jump)<br>Active method (reactive power fluctuation) |
| Related laws<br>Standards<br>Standards, regulations | Electricity business Act<br>Technical Standards for Hydroelectric Facilities used to generate electricity<br>Technical Standards of Electric Installation<br>Grid Interconnection Guidelines<br>JIS, JEM, JEC<br>Grid Interconnection Regulation JEAC 9701 |  |

### Important notes :

Please take measures to prevent overflow of water at the upstream side.

Also, prepare a desilting tank, forebay tank and screen for stones, small pieces, gravel, and granular sand upstream.

### Contact information

Nakayama Ironworks Co. Ltd.

2246-1 Amagu, Asahimachi, Takeo City., Saga Pref. 843-0001 JAPAN

TEL: +81 954 22 4171

Website: <http://www.ncjpn.com>

