# Progress of Our Gas Insulated Switchgear

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**Synopsis**

In this paper, it is described how the progress of development of Gas Insulated Switchgear has been made.

## 1. Introduction

Production of Gas Insulated Switchgear (GIS) has been commercialized in late 1960's. In comparison with conventional type substation like Air insulated substation, GIS substation has made it possible to achieve the considerable space reduction. Since its introduction, Nissin has installed more than 10,000 bays worldwide. We pioneered the compact design and technology of GIS and continue to be a leading supplier for rated voltage of 72kV & 84kV in domestic market.

Since 72kV & 84kV GIS was mainly developed in the initial stage, we have extended our product range from 7.2kV to 252kV. Global market has continued to grow and we have already established manufacturing companies both in Taiwan & China late 1990's and early 2000's to focus on regional market demand. We have been increasing the number of GIS installation in global market.

With respect to ever-increasing and diverse customer's requirements such as maintenance-free, environmental harmony, we are committed to developing, innovating and improving technology for further new application of GIS as the key equipment of substation system.

## 2. History of GIS and progress in the compact technology

### 2. 1 Production of the first GIS

We started the development work of GIS in late 1960's and completed the long-term-site test for 154 kv real circuit at the Ontake Substation by working with The Kansai Electric Power Company in October 1969. The first GIS was installed in 1972 at Tengachaya Substation of the Kansai Electric Power Company. **Fig. 1.** & **Fig. 2.** shows the actual installation, its configuration and layout respectively. 84kV GIS(single phase enclosed type) was installed on the roof of the substation building while Power Transformer was installed in 1st floor.

This is the typical feature of GIS substation in terms of space reduction which enabled customer to use the most confined building space more effectively and optimally. This GIS has been in good operation for more than 40 years.

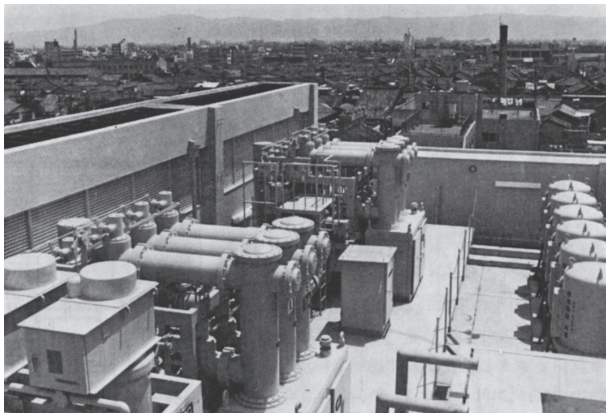

**Fig. 1** The first GIS installed at the Tengachaya substation

### 2. 2 Example of the compact technology

The first installed GIS was a single phase enclosed type, the significant GIS minimization has been able to be achieved by design of three-phase common and advanced technology for method of operating mechanism and arc distinguishing.

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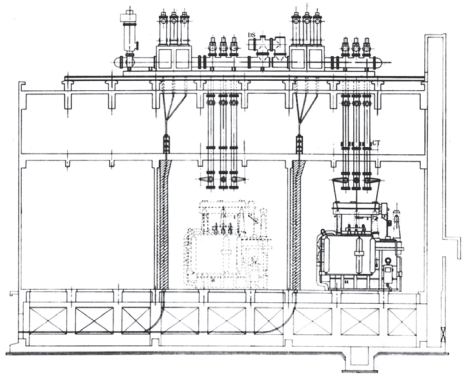
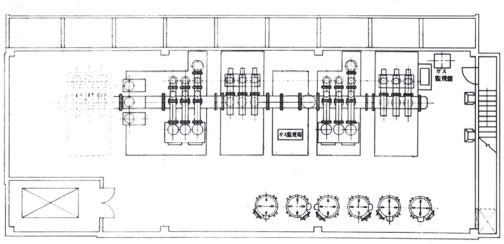


(a) The vertical sectional view



(b) The plan view

**Fig. 2** The site plan at the substation

### 2．2．1 Progress in GCB operating device

The pneumatic operating device design is quite simple, however its operating mechanism requires the additional compressor and it's frequent maintenance work. The mechanism for the pneumatic operating device is shown in **Fig. 3.** The driving part of compressed air is the valve made of synthetic rubber with frequent maintenance. In addition every operating device requires the high pressure air piping which is very costly.

The mechanism of the moter charged spring operating device is shown in **Fig. 4.** This operating device need no compressor since it doesn't use the high pressure air. Its maintenance can be done by oil lubrication every 12 years.

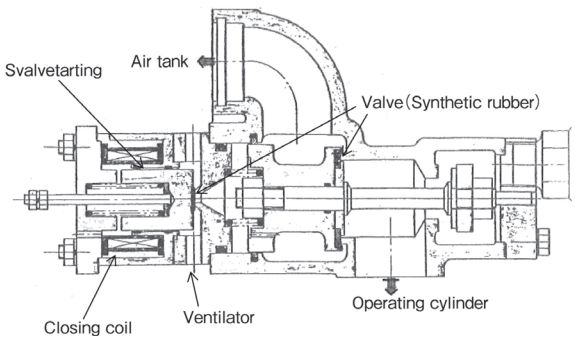



**Fig. 3** The mechanism of the pneumatic operating device

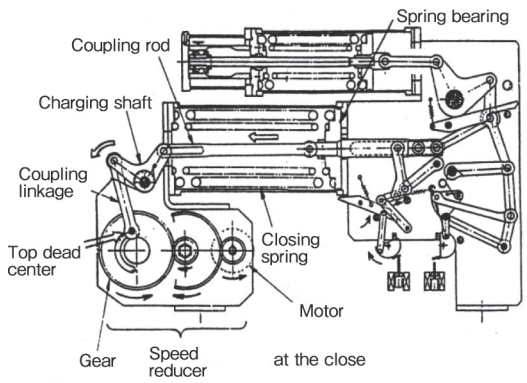



**Fig. 4** The mechanism of the power charged spring operated device

### 2．2．2 Progress in arc extinguishing chamber of GCB

Puffer type is common and standard are shown in **Fig. 5.**

We have completed compactification by individual & unique interruption method which combined the electromagnetic driving effect and the arc energy are shown in **Fig. 6.** This arc distinguishing chamber (Auto-Expansion type : AE type) doesn't require compressing the puffer cylinder and can interrupt arc with a small operating energy. **Fig. 7.** outlines considerable minimization.

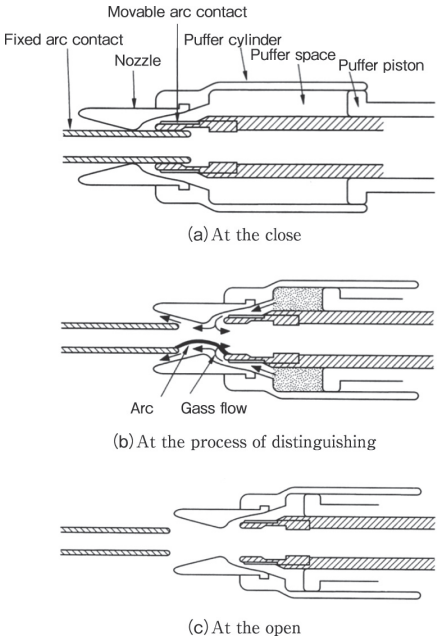



**Fig. 5** The drawing for arc distinguishing chamber of single puffer type

### 2．3 Progress of GIS compact technology

Progress of our GIS is shown below and the history of our company is shown in **Fig. 8.**

1）Single phase enclosed⇒Three-phase common
Design of three-phase common in same enclosure

2）Three-phase common⇒Compact type
Combination of a busbar and a busbar disconnecting switch, composition some equipment in same line unit

3）Compact type⇒Ultra compact type
Combination of a line unit and a transformer unit

## 3．Conclusion

We have been continuously focusing on the development of GIS compact technology. Meantime new market is beginning to emerge such as renewable energy market system and distributed power generation system.

To meet the variety of customer's requirement and new market needs, we have launched the new development work to provide the highly advanced GIS by integrating our accumulated cutting-edge and core technology.

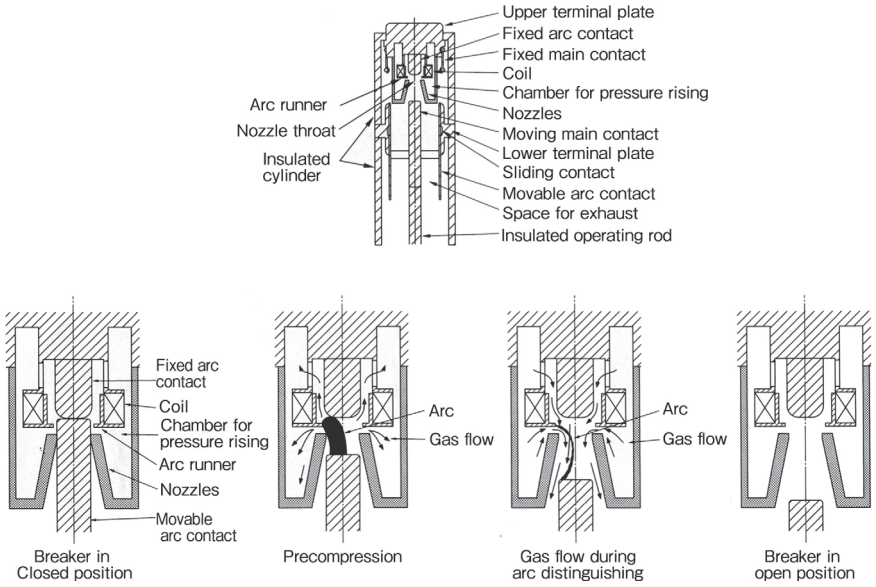



**Fig. 6** The method of the electromagnetic driving and arc distinguishing chamber for thermal puffer（AE Type）

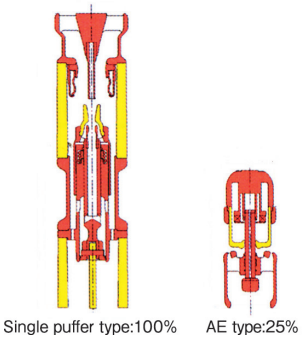



**Fig. 7** The comparison with arc distinguishing chamber

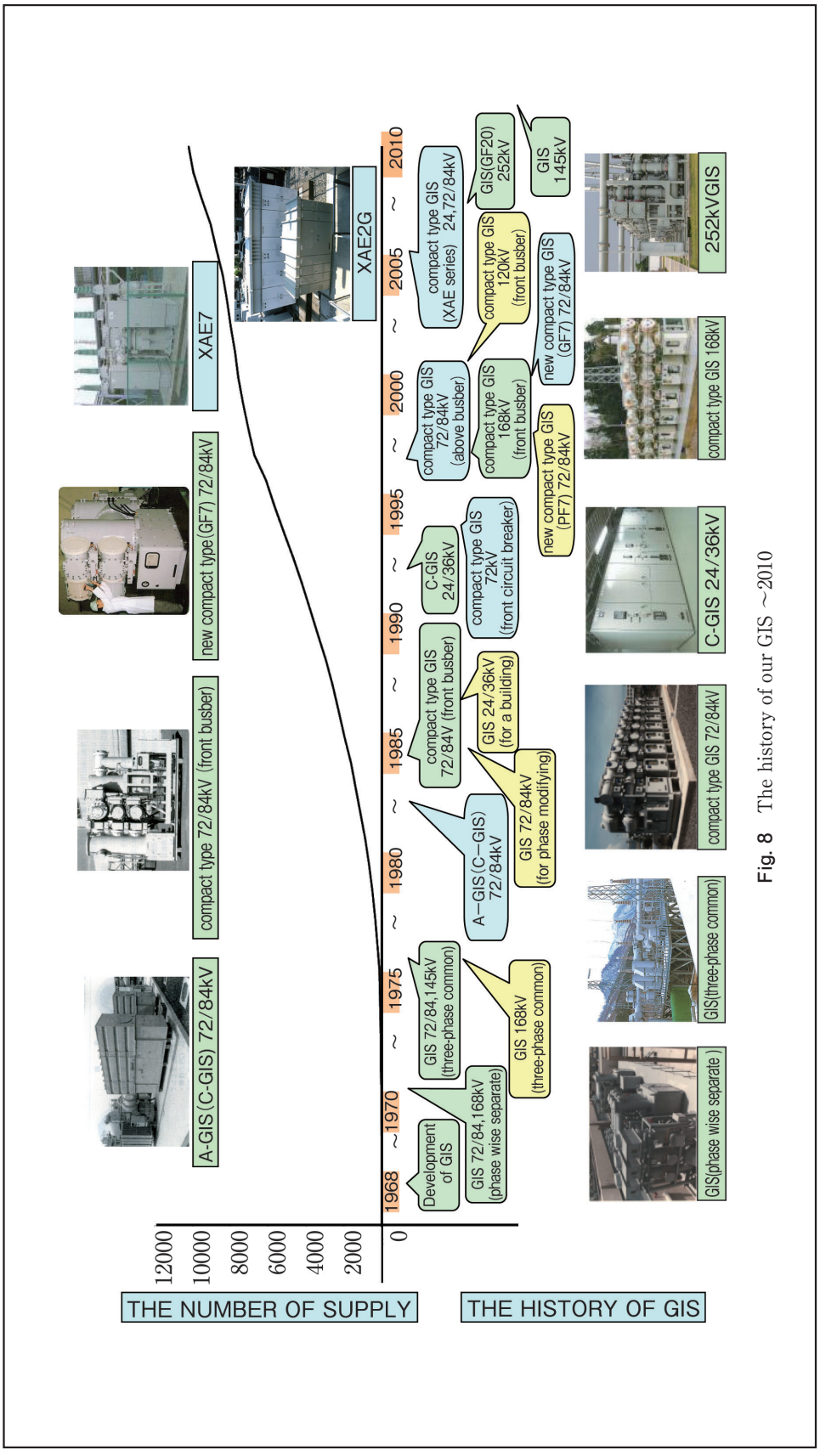



Fig. 8 The history of our GIS ~2010

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