Connector for High Voltage Direct Current Distribution System

1. INTRODUCTION

In these days the electric consumption of Information and Communication Technology (ICT) instruments for servers and routers increases rapidly due to highly developed operating network environments of Internet.

Data centers which install and operate ICT instruments for the servers and routers tend to increase year by year, therefore the construction of Green-Power Supply Systems is presently becoming an important subject.

FURUKAWA POWER COMPONENTS INC. (FPCI) has developed new connectors and started in implementing in cooperation with NTT FACILITIES, INC., which fit to the High Voltage Direct Current (HVDC) Distribution System expected for next generation systems as shown in Figure 1.

The developed connector is introduced as below.



Figure 1 Outline of high voltage direct current distribution system.

2. BACKGROUND OF DEVELOPMENT

A HVDC Distribution System needs a full consideration of the safety its design compared to a DC 48 V system for available communication buildings, because its higher supply voltages, its electrical shocks and its short circuit accidents have very serious impacts on human bodies and the neighboring environment.

In general the cable connector parts of power devices are exposed because of its crimping terminals as shown in Figure 2.

A new developed connector is applied for a connector connection method having no conducting exposure parts as shown in Figure 3 and there have no short circuit risks of accident due to polarity errors during power line connection works.



Figure 2 Connection of crimping terminal.



Figure 3 Connection of connector.

3. CHARACTERISTICS OF CONNECTOR

The connector is shown in Figure 4 and its characteristics are as below.

(1) Safety design

A resin material is selected as the material for the connector covers in consideration of the applied voltages, the heat-resistance and the anti-burning properties etc., and a non-exposure construction of the conducting parts is applied with respect of safe-ty after the connector connection work is completed. And also before the connector connection operates, under consideration of safety, the resin caps are put on the conductor heads of pin plugs, receptacles and socket plugs in order to prevent electrical shocks. (Figure 5, Figure 6)

- (2) Conductor connection construction As a band-contact type plug-in construction is adopted in order to easily move on & off, the maintenance and operational handling of the connector are remarkably reduced compared with an existing type.
- (3) A wrong insertion prevention mechanism In order to prevent to insert polarity errors, rough shapes in key grooves of its cover bodies are designed and 4 types of different shapes are applied as shown in Figure 5 and Figure 6.

[Joint patent pending with NTT FACILITIES, INC.]





Figure 4 Connector for high voltage direct current distribution system.



*Common to Panel mount type and In line type

Figure 5 Pin plug and key protrusion patterns.



Figure 6 Receptacle/socket plug and key groove patterns.

4 APPLICATION RANGE

Application range of a new developed connector is shown in Table 1.

Table 1 Application range.

Rated voltage	DC/AC 400 V
Max. current	545 A (not including peak current)
Applied cable	CF·CV·EM-LMFC etc.
Applied cable size	200 mm ²

5. CONCLUSION

The newly developed connectors are expected for not only the HVDC Distribution System of data centers and communication buildings, but also for the new energy sources such as photovoltaic power generations, wind power generations and other fields like smart grids etc.

From now on, products lineup will increase including those for the application of 325 mm² of cable size in order to meet customers' needs.

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