

Sequence of Small Busbars in High Voltage Switchgear



Overview

Arrangement sequence of small busbars in high-voltage switchgearThe document outlines various busbar schemes and layouts for Extra High Voltage (EHV) switchgear.

Key Takeaways

In high-voltage switchgear, small busbars are typically arranged in a sequence that includes main, sectionalized, and bypass busbars to ensure operational flexibility, maintenance access, and fault isolation.

High-voltage switchgear often uses multiple busbar configurations to enhance reliability and operational flexibility. The sequence of small busbars generally follows these principles:

- **Main Busbars (Bus I and Bus II):** These are the primary conductors that carry the bulk of the current. In double-bus arrangements, Bus I and Bus II run in parallel, allowing one bus to be isolated for maintenance while the other remains energized .
- **Sectionalized Busbars:** These are intermediate busbars that divide the main bus into sections. Sectionalizing allows parts of the switchgear to be disconnected for maintenance or fault isolation without interrupting the entire system .
- **Bypass Busbars:** A bypass busbar connects to the main bus through a bypass branch, enabling a feeder or section to be serviced while maintaining supply continuity. This is particularly useful in critical installations where uninterrupted power is required .

- **Risers and Vertical Connections:** Small busbars often include vertical risers connecting horizontal main busbars to circuit breakers, transformers, or outgoing feeders. These risers are designed to handle electrodynamic forces during short-circuit events .

Design Considerations

- **Material and Profile:** Small busbars are usually made of copper or aluminum, with flat or laminated profiles to optimize cooling and reduce contact resistance .
- **Insulation and Spacing:** Proper insulation, creepage, and clearance distances are critical in high-voltage systems to prevent flashovers and ensure safety .
- **Short-Circuit Withstand:** Busbars must withstand high fault currents for short durations, considering both thermal and electromechanical stresses .
- **Operational Flexibility:** The sequence allows selective isolation of feeders or sections, enabling maintenance without full system shutdown. Draw-out breakers and sectionalizers are often integrated to facilitate this .

Practical Sequence Example

A typical sequence in a high-voltage switchgear cubicle may be:

- Incoming feeder connection to main bus (Bus I)
- Sectionalized bus segment connecting to branch circuit breakers
- Bypass bus linking Bus I and Bus II for maintenance flexibility
- Outgoing feeders connected via vertical risers to the main or bypass bus
- Neutral and grounding busbars positioned for safety and fault current return This sequence ensures that each branch can be isolated independently, while the main bus remains energized, maintaining continuity of supply and operational safety .

Summary

The sequence of small busbars in high-voltage switchgear is designed to balance reliability, safety, and maintainability. By combining main, sectionalized, and bypass busbars with proper material selection, insulation, and mechanical support, switchgear can handle high currents, withstand short-circuit forces, and allow maintenance without interrupting critical power supply .

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