

How to select the main busbar for a high-voltage switchgear

Article Overview

Selecting a busbar for high-voltage switchgear requires balancing current-carrying capacity, short-circuit withstand, material, shape, insulation, and compliance with IEC standards.

Key Considerations

1. **Rated Current and Thermal Performance** Busbars must carry the switchgear's rated current without overheating. Use current-carrying capacity tables and adjust for ambient temperature, installation method, and ventilation. In high-temperature environments, larger cross-sections may be required to maintain safe operating temperatures .

2. **Short-Circuit Withstand** High-voltage switchgear must survive short-circuit forces. Busbars should be mechanically robust to withstand electrodynamic forces during fault conditions. This includes considering peak short-circuit current, duration, and support spacing .

3. Material Selection

- o **Copper:** High conductivity, mechanical strength, and corrosion resistance; preferred for high reliability and limited space .

- o **Aluminum:** Lower cost and weight but reduced conductivity and strength; suitable where space allows and cost is critical .

4. Shape and Configuration

- o **Rectangular busbars:** Good heat dissipation, low skin effect, easy to connect; often used in parallel for high currents .

- o **Circular or tubular busbars:** High mechanical strength, lighter weight, improved cooling for high-current systems .

- o **Laminated busbars:** Thin conductors with insulation between layers, reducing inductance and improving thermal performance .

5. **Insulation and Spacing** Busbars can be bare or insulated. Proper spacing prevents arcing and ensures safety. Insulation choice depends on voltage level, environmental conditions, and maintenance access .

6. **Compliance with Standards** Follow IEC 61439 for switchgear assembly and IEC 60287 for current-carrying capacity. These standards define temperature rise limits, short-circuit withstand, and environmental considerations, ensuring safety and reliability .

How to select the main busbar for a high-voltage switchgear

7. Installation and Maintenance Considerations Consider accessibility for maintenance, expansion, and connection to breakers or transformers. Flexible busbars may be used for connections subject to vibration, while rigid busbars are preferred for main power distribution .

8. Economic and Practical Trade-offs Balance cost, space, and performance. Oversized busbars increase cost unnecessarily, while undersized busbars risk overheating, voltage drops, and reduced equipment life .

Selection Workflow

- o Determine voltage class, rated current, and fault level.
- o Choose material based on reliability, space, and cost.
- o Select busbar shape and cross-section to meet thermal and mechanical requirements.
- o Verify short-circuit withstand and spacing for insulation and safety.
- o Ensure compliance with IEC standards and consider maintenance access.
- o Document all parameters in the compliance file for verification and future expansion .

By following these steps, engineers can ensure that high-voltage switchgear busbars are safe, reliable, and efficient, minimizing the risk of overheating, mechanical failure, or electrical faults.

Understand the components and functions of high-voltage switchgear. Learn how this critical equipment

When specifying and planning medium voltage switchgear for a substation, functions and influencing factors must be

Learn how switchboard busbars are designed, sized, and verified to IEC/UL. Compare Cu vs Al, spacing, and testing.

Although separate busbar sections exist, the switchgear classification will remain a single busbar arrangement, as each

Busbars so produced therefore help in maintaining a voltage balance in the three phases unlike in a conventional bus system. It is

Medium Voltage Switchgear Let's discuss the most critical factors that influence the correct

Substations and switchgear in an electrical system perform the functions of voltage

In electric power distribution, a busbar (also bus bar) is a metallic strip or bar, typically housed inside

How to select the main busbar for a high-voltage switchgear

Choosing the right busbar material is a key step in switchgear design. Material choice affects

The earth and neutral are 50% of the phase bars. Where is busbar used? Busbars are used in electrical panel boards to connect the

Most busbar configurations are not insulated to improve convective cooling and allow easy access for new

How to Select Busbars in an Electrical System - A Practical Guide Busbars are the backbone of any LV/MV

Conductor material selection is critical in meeting electrical performance and mechanical rigidity requirements. Common materials

Switchboard Busbar: Design, Standards, and Selection Guide Busbars are the backbone of a low-voltage

The busbar sizing calculator determines the required busbar dimensions based on the continuous current rating, short

1 Standards on low voltage assemblies and relevant applicability The recent publication of the new Standard IEC 61439 has imposed

Web: <https://www.morwarreconst.co.za>

