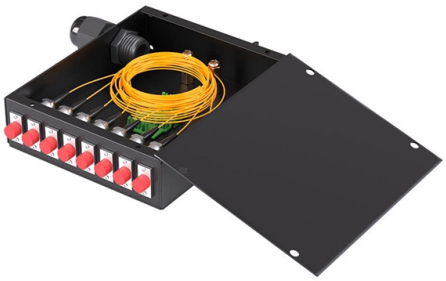
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Low-voltage switchgear busbar selection standards



Overview

This standard defines the design verification, test requirements, and thermal performance of the assemblies.

Key Takeaways

Selecting low-voltage switchgear busbars requires careful consideration of current rating, short-circuit withstand capacity, material, thermal performance, and compliance with IEC 61439 standards.Key Selection Parameters



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1. Rated Current (Ir) The busbar must carry the continuous load current without exceeding the permissible temperature rise. IEC 61439 specifies maximum temperature rise limits for copper (typically 70°C above ambient) and aluminum (typically 55°C above ambient) under continuous load conditions, ensuring insulation integrity and preventing overheating . 2. Short-Circuit Withstand Capacity (Isc) Busbars must withstand fault currents for a specified duration (usually 1–3 seconds) without mechanical deformation or failure. This ensures safety during short-circuit events and protects connected equipment . 3. Material Selection Copper and aluminum are the most common materials. Copper offers higher conductivity and better thermal performance, while aluminum is lighter and more cost-effective. Material choice affects cross-sectional sizing, heat dissipation, and mechanical strength . 4. Thermal Performance and Temperature Rise Busbar sizing must account for ambient temperature, enclosure type, and mounting orientation. Horizontal or vertical positioning affects airflow and cooling efficiency. Proper sizing prevents excessive heat buildup, which can degrade insulation and reduce equipment lifespan . 5. Mechanical Strength and Support Busbars must resist bending, vibration, and mechanical stress. Adequate support, proper bending, and anti-corrosion treatments are essential for long-term reliability . 6. Enclosure and Environmental Considerations The enclosure's IP rating, ventilation, and space constraints influence busbar geometry. Designers often standardize busbar widths and adjust thickness or layering to optimize thermal performance and space utilization . 7. Compliance with IEC 61439 IEC 61439 provides comprehensive rules for low-voltage switchgear, including verification of temperature rise, dielectric properties, short-circuit strength, and protection against electric shock. All busbars must meet these safety and performance benchmarks, regardless of assembly type . 8. Diversity Factor and Load Distribution Busbars rarely operate at maximum load continuously. Applying a diversity factor allows designers to calculate the main busbar current requirement based on the total equipment load, optimizing sizing and material usage .

Practical Design Considerations

• Standardization: Use a limited family of busbar widths and adjust thickness or layering for different current ratings to simplify manufacturing and improve thermal efficiency .

• Phase Identification: Clear marking of busbar phases enhances safety and maintenance efficiency .

• Connection Practices: Proper punching, bending, and termination techniques reduce electrical resistance and prevent hotspots . By considering these criteria, engineers can ensure that low-voltage switchgear busbars are safe, reliable, and efficient, meeting both operational and regulatory requirements.

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