Cross-section of the secondary busbar conductor at the top of the screen



Overview

Additions of tabs and mounting holes change the cross-sectional area of the conductor, creating potential hot spots on the bus bar.

Key Takeaways

The cross-section of a secondary busbar conductor is determined by current-carrying capacity, temperature rise, and short-circuit withstand, typically calculated using the conductor width multiplied by thickness and adjusted for material and safety factors. Determining Busbar Cross-SectionThe cross-sectional area (CSA) of a busbar is calculated as the product of its thickness (t) and width (w). This area must be sufficient to carry the full load current without exceeding permissible temperature rise limits and to withstand short-circuit forces without permanent deformation.

For example, a 1250 A-rated aluminum busbar may require a CSA of 1600 mm^2 based on thermal and fault current calculations. Key Factors Affecting Cross-SectionCurrent Carrying Capacity: The busbar must handle continuous full-load current. Copper busbars typically allow 1.

2 A/mm^2 in enclosed panels, while aluminum can allow up to 2. 0 A/mm^2 in free air. Temperature Rise: Standards such as IEC 61439-1 limit the temperature rise to 70 K above ambient.

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The CS

A must ensure the busbar does not exceed this limit under sustained load.

Short-

Circuit Withstand: Busbars must resist thermal and mechanical stresses during fault currents. The minimum CSA can be calculated using the adiabatic formula: $A = \sqrt{(I^2t / k)}$, where I is fault current, t is fault duration, and k is a material constant (176 for copper, 76 for aluminum),. Mechanical Considerations: Thickness and width should maintain rigidity, accommodate mounting holes, and prevent hot spots.

The width is generally at least three times the thickness. Material Choice: Copper offers higher conductivity and mechanical strength, while aluminum is lighter and more cost-effective.

Practical Example

For a 36 kA fault current lasting 1 second on an aluminum busbar, the minimum CSA is calculated as 530 mm^2, but thermal design may require 1600 mm^2 to meet continuous current and temperature rise requirements. The higher value governs the final design.

Installation Considerations

Busbars should be supported on insulators capable of withstanding electrodynamic forces during short circuits. Proper spacing, plating, and ventilation improve heat dissipation and reduce the risk of insulation degradation.

Summary

The cross-section of the secondary busbar conductor is not a fixed value but is determined by a combination of electrical, thermal, and mechanical requirements. It is calculated using the conductor's width and thickness, adjusted for material properties, safety factors, and installation conditions. Proper sizing ensures safe operation, longevity, and compliance with standards like IEC 61439-1.

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The cross-section obtained from both calculations should be compared, and the higher value is to be considered for design. Accordingly, a busbar cross-section of 1600 mm² (Aluminium) is

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Typical Busbar Sizes If this program recommends sizes that do not fit into the ranges below, change either the number of conductors or the section thickness of the busbar and recalculate the minimum

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