

Article Overview

The span of a 10kV copper busbar is determined by its cross-sectional area, current rating, mechanical support spacing, and short-circuit withstand, following IEC standards.

Electrical Sizing

For a copper busbar, the cross-sectional area (A) is calculated using the rated current (I) and the recommended current density (J): $A = I / J$

- o For medium-voltage copper busbars, IEC 61439-1 recommends a current density of 1.5-2.5 A/mm² depending on cooling conditions .
- o Example: For a 2000 A busbar at 2 A/mm², $A = 2000 / 2 = 1000 \text{ mm}^2$. Multiple bars can be used in parallel to achieve the required area and provide margin for heating . Temperature rise must be checked to ensure it does not exceed 65 K for insulated or 105°C for bare busbars under normal operation .

Short-Circuit Withstand

Busbars must withstand short-circuit conditions both thermally and electro-dynamically:

- o Thermal withstand ensures the busbar does not exceed 250°C during a fault. The required area can be estimated using: $A \geq I \times \sqrt{t} / k$ where I is the short-circuit current, t is the fault duration, and k = 143 for copper per IEC 60865-1 .
- o Electro-dynamic withstand ensures the busbar and supports can resist peak electromagnetic forces: $F = 0.2 \times I_p^2 / d$ where I_p is the peak short-circuit current and d is the center-to-center spacing between phases in meters . Support spacing must limit deflection and stress below the yield strength of copper and insulators.

Mechanical Span Considerations

The span between supports depends on:

- o Busbar thickness and width
- o Material properties (copper yield strength)
- o Electro-dynamic forces during short-circuit
- o Allowable deflection limits Typical practice is to use insulator supports spaced to maintain deflection within safe limits, often calculated using beam bending formulas for a simply supported bar under uniform load, including its own weight and electromagnetic forces .

Practical Design Steps

Calculation of 10kV copper busbar span

- o Determine rated current and select current density to calculate cross-sectional area.
- o Check temperature rise under normal operation.
- o Calculate short-circuit thermal and electrodynamic forces.
- o Determine support spacing to limit deflection and stress.
- o Verify phase-to-phase and phase-to-ground clearances per IEC 62271-1.
- o Adjust busbar dimensions or add parallel bars if necessary to meet both electrical and mechanical requirements . Using these steps ensures the 10kV copper busbar is electrically safe, mechanically stable, and compliant with IEC standards. Online busbar calculators can simplify these calculations by providing recommended width, thickness, and support spacing based on input parameters .

Busbar ampacity (current-carrying capacity) and sizing are critical for safe, efficient electrical systems. This guide

Busbar dimensions calculation explained in a practical engineering approach. Learn how to determine correct busbar

Busbar Sizing and Calculation Guide The document provides details for calculating the size of bus bars for a panel. It includes

The document discusses busbar sizing calculation for electrical panels. It addresses that busbar sizing is often done by thumb rules

For calculations involving larger currents, we suggest you contact a Mersen engineer and refer to the ampacity table. In addition, you

The document provides an example calculation for sizing bus bars in an electrical panel. It includes: 1) Calculating derating factors

200 oC IEC 865 - Short circuit currents - Calculation of effects. 2 IEC 909 - Short circuit current calculations in three phase AC

What copper busbar grades does GRL Copper supply? Selecting the correct copper busbar size and current rating is

Busbar size calculator is an online calculator tool to determine copper (or) aluminum busbar

1936 1936-1950 1950 1952 1954-1959 1960 1962 1964 1965 1984 1996 In this new edition the calculation of current-carrying capacity

Calculation of 10kV copper busbar span

Professional IEC 60865-1 Busbar Calculator. Calculate Short Circuit Peak Force, Natural Frequency, Dynamic Stress, and Insulator

1. A busbar is a copper or aluminum conductor that collects and distributes electricity from circuits. Its size

Busbars are typically either flat strips or hollow tubes as these shapes allow heat to dissipate more efficiently due to

Calculation of span of support insulators on the basis of the force, bending strength of insulators, and factor of safety 6. Design of

Choose the right MV switchgear copper busbar the first time--avoid overheating, fault

A well-designed busbar system ensures minimal energy losses, improved reliability, and enhanced safety. This guide

Web: <https://kremgroup.co.za>

