

Article Overview

The maximum short-circuit current of a 35kV busbar depends on its material, cross-sectional area, and spacing, and is determined by thermal and electrodynamic withstand limits per IEC 61439-1 and IEC 60865-1.

Thermal and Electrodynamic Considerations

The short-circuit withstand of a busbar has two main components:

- o Thermal withstand ensures the busbar does not exceed its maximum temperature during a fault. For copper, the short-time temperature limit is typically 250°C. The required cross-sectional area A can be estimated using the adiabatic formula: $A \geq I \sqrt{t/k}$, where I is the RMS short-circuit current, t is the fault duration in seconds, and k is a material constant (143 for copper, 13 for aluminium).
- o Electrodynamic withstand ensures the busbar and supports can withstand the peak electromagnetic forces during a short circuit. The force per unit length between parallel busbars is: $F = 0.2 \cdot I_p^2 / d$ (N/m), where I_p is the peak short-circuit current and d is the center-to-center spacing between phases. The busbar support spacing must limit deflection and stress below yield limits.

Standards and Typical Ratings

- o IEC 61439-1 and IEC 60865-1 provide guidelines for short-circuit current ratings and busbar sizing.
- o ANSI C37.23 specifies design requirements for busbars and bus ducts rated up to 35kV, including short-circuit withstand and mechanical strength.
- o UL 508A and UL 891 tables provide practical SCCR values for busbar arrangements, e.g., edge-to-edge spacing with proper insulators can achieve SCCR up to 50 kA for certain 35kV switchgear.

Practical Estimation

For a 35kV busbar, the maximum short-circuit current is not a fixed number but depends on:

- o Busbar material: Copper allows higher currents than aluminium for the same cross-section.
- o Cross-sectional area: Larger busbars carry higher short-circuit currents.
- o Support spacing and arrangement: Closer spacing and robust supports increase electrodynamic withstand.
- o Fault duration: Typically 1 second for short-time ratings. As an example, a properly designed copper busbar in a 35kV switchgear with adequate cross-section and spacing can typically withstand tens of kiloamperes RMS for 1 second, often in the range of 40-50 kA, depending on the exact design and standards compliance.

Conclusion

Short-circuit current of 35kV busbar

The maximum short-circuit current of a 35kV busbar is determined by its thermal and electrodynamic limits, busbar material, cross-section, and spacing. Using IEC 61439-1, IEC 60865-1, and ANSI C37.23 standards, designers can calculate or select busbars capable of withstanding short-circuit currents up to 50 kA RMS for typical high-voltage switchgear applications. Proper design ensures both electrical safety and mechanical integrity during fault conditions.

Calculate HV busbar short circuit withstand capability using IEEE C37.20.1 thermal and mechanical methods. Includes

Abstract. The analysis of simplified expressions allows us to estimate the electrodynamic effects of short-circuit currents on the main

Example: Calculate Size of Bus bar having Following Details Bus bar Current Details: Rated Voltage = 415V, 50Hz,

Busbar sizing calculator for copper and aluminum per IEC 61439. Current rating, temperature rise, short-circuit forces,

Short-circuit calculations are a daily requirement for electrical engineers who design, operate, or protect power systems. Knowing the

#8 "Re: Bus bar short circuit calculation" by BabyGuinness on 09/03/2008 7:10 PM (score 2)

Professional busbar sizing calculator with current-carrying capacity per IEC 61439,

Abstract: THE mechanical forces acting on busbar supports during short circuit are determined both by the magnitudes of the mutual

A three-phase busbar arrangement with straight rigid conductors carrying short-circuit currents is investigated.

The busbar sizing calculator determines the required busbar dimensions based on the

The voltage, the rated current and the rated frequency are often known or can easily be defined, but how can we calculate the short

It also covers short-circuit current calculation, selection of electrical equipment, and lightning protection and grounding design. The

A step-by-step short-circuit calculation using the MVA method with results validation using the calculation

methods based on IEC

This document provides short-circuit withstand strength test results for various Rittal busbar systems and components: - It describes

The following calculator computes the expected time for a cable, conductor, or bus bar to rise in temperature under short circuit or

Abstract: This study presents a coupled electric-magnetic-thermal-mechanical analysis of busbar systems under short- circuit

Web: <https://bssoda.pl>

