Tubular Busbar Design Scheme



Overview

Mersen engineers are available to assist in developing the most efficient and cost-effective design to provide solutions to any power distribution problem.

Key Takeaways

A tubular busbar design scheme involves selecting the right material, cross-sectional dimensions, insulation, and layout to safely handle the required current while minimizing resistance, heat, and noise.

Material Selection

Tubular busbars are typically made from copper for high-current applications due to its superior conductivity and durability, or aluminum where weight and cost are critical factors. Copper offers higher current density and lower resistive losses, while aluminum is lighter but requires larger cross-sections to achieve the same current rating.

Cross-

Section and Current RatingThe busbar's cross-sectional area is determined by the expected continuous current and permissible temperature rise. A conservative guideline for copper in enclosed environments is 1. 5–2.

5 A/mm². The required area can be calculated as: A = I / J Where I is the continuous current and J is the current density. For example, a 300 A load at 2 A/mm² requires a minimum cross-sectional area of 150 mm².

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Tubular Geometry Considerations

Tubular busbars provide mechanical strength and allow for efficient heat dissipation. The wall thickness and diameter should balance structural rigidity with electrical performance, ensuring minimal voltage drop and uniform current distribution. Symmetry in multi-branch systems is critical to avoid uneven current sharing.

Insulation and Lamination

Insulation materials for tubular busbars include Nomex®, Mylar®, Kapton®, epoxy-glass, and powder coatings. The choice depends on voltage rating, thermal index, and mechanical protection. Laminated busbars may use multiple layers of insulation to enhance dielectric strength and reduce noise.

Terminations and Connections

Tubular busbars require secure terminations such as studs, tabs, PEM fasteners, or Radsok® connectors. Proper termination design minimizes hotspots and ensures reliable current transfer. Standoffs or spacers can help maintain alignment and mechanical tolerance.

Thermal and Electrical Performance

Key parameters include resistance, series inductance, and capacitance, which affect voltage drop and noise. Tubular busbars should be designed to handle continuous and surge currents, with attention to hotspots at terminations rather than along the bar body. Adequate spacing and airflow improve heat dissipation.

Layout and Mechanical Design

Maintain symmetry in multi-branch systems to ensure even current distribution. Plan for scalability and serviceability, allowing future expansion or maintenance. Use continuous loops or redundant paths in critical applications to enhance reliability.

Summary

A well-designed tubular busbar system balances electrical efficiency, thermal management, mechanical strength, and insulation integrity. Early involvement of design engineers is recommended to optimize cost, manufacturability, and performance. Proper material selection, cross-section sizing, insulation, and termination design are essential for safe and reliable operation in high-current applications.

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Article Content

Design Guide for bus bars

Mersen engineers are available to assist in developing the most efficient and cost-effective design to provide solutions to any power distribution problem. The

Power Plant Tubular Busbar Construction Scheme

The purpose of this document is to detail the requirements of Northern Powergrid in relation to the tubular busbar systems and associated fittings detailed within this document.

Busbar Design in Switchgear: Key Principles & Best Practices

Tubular busbars are hollow, lighter in weight, and help improve cooling in high-current systems. Laminated, or sandwich, busbars use thin conductors with insulation between layers.

Bus Bar Design and Sizing Guide | PDF | Electrical Conductor ...

The document discusses the design process for bus bars in electrical substations. It involves: 1) Choosing the conductor cross-section based on normal current and temperature rise limits. 2)

Copper for Busbars

This book provides the information needed to design efficient, economic and reliable busbar systems. In any electrical circuit some electrical energy is lost as heat which, if not kept within safe limits, may

How to Design Busbar Systems for Substations

A well-designed busbar system ensures minimal energy losses, improved reliability, and enhanced safety. This guide provides a detailed technical description, calculations, design

Busbar Design Guide

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 cost solution

Business Documentation (DBD)

1. Purpose The purpose of this document is to detail the requirements of Northern Powergrid in relation to the tubular busbar systems and associated fittings detailed within this document.

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IEEE Guide for Bus Design in Air Insulated Substations

The information in this design guide is applicable to both rigid bus and strain bus designs for outdoor and indoor, air-insulated, alternating current substations.

Busbar Design Standards for MV Switchgear

To assist engineers in comprehensively adhering to industry standards in busbar design, this section summarizes key

(PDF) Bus Bar Sizing Calculation For Substation.

Steps in bus bar design for substation: The cross section of conductors is designed on the basis of rated normal current and permissible temperature rise. The value of cross section so obtained is verified

Formulas calculating the reactance of tubular busbars and their ...

The quantitative study of this problem has to be based on establishing equivalent circuits of main wiring, when there rarely are formulas to calculate the reactance of tubular busbars.

A Review on Selection of Proper Busbar Arrangement for Typical ...

The Three Bus Scheme is preferred for high reliability in substations handling large power volumes, particularly at 400 kV. Maintenance costs increase with complexity; careful design can mitigate

Copper for Busbars – Guidance for Design and Installation

The design of the mounting system is an important factor and one that is becoming more important with the increase in harmonic currents, which

Busbar Design and Configuration for Substation Designers

Advanced Busbar Design for Electric Substations Advanced Busbar Design and Configuration in Electric Substations Electric power transmission, control, and distribution systems are the backbone of

How to Design Busbar Systems for Substations

Busbar systems are critical components of electrical substations, serving as conduits for efficient power distribution. A well-designed busbar system ensures minimal energy losses, improved ...

Layout 1

In addition to the above standards there are a number of other standards applicable for the design, installation and use of Busbar Trunking Systems, detailed in Appendix A: This Guide has been

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A Review on Selection of Proper Busbar Arrangement for Typical

ABSTRACT - In this study, a comprehensive review on selection and role of a bus-bar scheme and its possible extension is important initial step in substation design. The aspects which influence this

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

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