

## Selection and Verification of Tubular Busbars



### Overview

Busbar Design in Switchgear: Key Principles & Best Practices Choosing the right busbar material is a key step in switchgear design. Material choice affects.

### Key Takeaways

Tubular busbars should be selected based on material, current rating, mechanical strength, and compliance with relevant standards, with verification through thermal, mechanical, and electrical testing. Material Selection

For new installations, aluminium tubes are typically used due to their lightweight and cost-effectiveness, while copper tubes are preferred for extensions to existing copper busbar systems unless a break in the system allows aluminium use . Material compatibility is critical, especially at copper-to-aluminium connections, to prevent electrochemical corrosion . The choice of material also affects thermal performance, mechanical strength, and electrical conductivity.

Current Rating and Sizing



Busbars must be sized according to the continuous current rating and system requirements. Standard ratings for aluminium tubular busbars are 1250 A or 2000 A . For low-voltage assemblies, the IEC 61439 standard provides guidance on calculating busbar current requirements, including the use of a diversity factor to account for non-simultaneous loads . For copper busbars, rated current calculations should include correction factors for frequent starts, high-altitude operation, and heat dissipation, with a recommended 10-15% safety margin .

### Fittings and Mechanical Considerations

All fittings, including joints, clamps, and conductor connections, must be designed to avoid deformation of the tube and ensure reliable current transfer . Fixed fittings require at least two complete clamps for mechanical stability, while sliding fittings use clamps based on current rating . Support insulators and structures must withstand short-circuit forces, wind loading, and other mechanical stresses as specified in BS EN 61936-1 .

### Verification and Testing

Verification ensures that busbars meet electrical, thermal, and mechanical performance requirements:

- Thermal verification: Temperature rise tests simulate actual operating conditions to confirm current-carrying capacity .
- Mechanical verification: Structural integrity and impact resistance are tested according to IEC 61439 and IEC 60068 standards .
- Electrical verification: Continuity, insulation resistance, and short-circuit withstand tests ensure safe operation under rated conditions .

### Environmental and Insulation Considerations

Busbars must be designed for the intended environment, including UV exposure, salt mist, and temperature extremes for outdoor installations . Insulation materials such as Nomex®, Tedlar®, Mylar®, Kapton®, and epoxy-glass provide electrical isolation and reduce inductance and impedance . Proper insulation selection enhances safety and performance.

### Summary

Selecting and verifying tubular busbars involves:

- Choosing the appropriate material (aluminium or copper) based on system compatibility.
- Calculating current ratings and applying safety margins.
- Ensuring mechanical stability with proper fittings and supports.

- Conducting thermal, mechanical, and electrical tests in accordance with IEC and national standards.
- Considering environmental conditions and selecting suitable insulation materials. Following these steps ensures reliable, safe, and efficient operation of tubular busbar systems in substations and power distribution networks.

## Article Content

### Busbar Design in Switchgear: Key Principles & Best Practices

Choosing the right busbar material is a key step in switchgear design. Material choice affects electrical performance,

### Design Guide for bus bars

Conductor material selection is critical in meeting electrical performance and mechanical rigidity

### Free Busbar Sizing Calculator: Current Capacity,

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

### Busbar Systems Design Guide for Industrial Panels

IEC 61439 busbar sizing, material selection, spacing, joints, and short-circuit verification tips for industrial panels.

### Current Rating, Temperature Rise, IEC 61439

Copper busbars have 60% higher conductivity than aluminium but cost more and weigh more (8,900 vs 2,700 kg/m<sup>3</sup>).

### How to Select the Right Aluminum Alloy Tubular Busbar

Learn how to select the appropriate aluminum alloy tubular busbar for your substation project based on alloy grade,

### Busbar Systems Explained: Key Terminology

This guide will deeply analyze the key terms, electrical performance, industry applications

### Busbar Standards: Design, Installation & IEC 61439

Understanding busbar standards is essential for engineers and panel builders to ensure safe and reliable electrical

### Busbar Design and Sizing Calculations | PDF | Electric Current

This document provides specifications for an electrical busbar including its size, number of phases, fault level, and temperature limit.

How can you select the proper busbar?

However, in some arrangements of busbars, it requires extra protection which make the system expensive and the reliability of the

IEC 61439 Compliance for Busbar Systems | PDF | Verification And ...

The document discusses the IEC 61439 standard for electrical busbar systems. It provides background on the standard and its

Operating Characteristics and State Evaluation Methods for Insulated ...

Analyzing the operating characteristics of insulated tubular bus-bar, we discussed the weak points, such as main

Aluminum Tubular Busbars for HV Use

The document discusses the advantages of using aluminum tubular busbars rather than stranded conductors for high voltage

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The use of rigid conductors for busbars is widely employed in modern HV and EHV outdoor air insulated substations (AIS). The

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Aluminium Tubular Busbar Manufacturer | Lightweight and Efficient

Aluminium Tubular Busbar Main Materials Aluminium Alloys: Busbars are typically made from high-quality aluminium alloys (e.g.,

Busbar Design in Switchgear: Key Principles & Best

Tubular busbars are hollow, lighter in weight, and help improve cooling in high-current

Types of Busbars in Electrical Systems: Complete Guide for Engineers ...

In modern electrical systems — whether industrial power plants, commercial buildings, EV charging installations, or switchgear

Busbars and Connectors in HV and EHV installations

Busbars for Outdoors Installations In HV and EHV installations and in outdoors MV installations bare

Busbar Sizing by Current & Temperature Rise

Undersized busbars are one of the leading causes of switchgear failure: they overheat, degrade insulation, and can

Medium Voltage Switchgear Copper Busbar Selection Guide

Choose the right MV switchgear copper busbar the first time—avoid overheating, fault failures, and rework with this

Commissioning substation busbars in an efficient and modern way

Commissioning substation busbars The commissioning procedure of substation busbars for differential protection and

Aluminum Tubular Buspipe | Mastar Metal

Aluminum tubular buspipe is an extruded tubular conductor used for power transmission, typically made from high-purity aluminum,

Electrical Bus Bar: Important Types And Applications

Electrical Bus Bar explained with types, materials, applications, sizing considerations, selection criteria, and industry standards.

Busbars Installation and Acceptance Standards | MachineMFG

Busbars Installation and Acceptance Standards Are you aware that improper installation of busbars can lead to costly

Comprehensive Guide to Busbars: Types, Design,

Explore the comprehensive guide to PV Solar Combiner Boxes: Learn about types,

How to Design Busbar Systems for Substations

Learn how to design efficient substation busbar systems with calculations, examples, and best practices.

High-Performance Aluminum Tubular Busbars for Efficient Power ...

Aluminum tubular busbars are the ideal solution for modern electrical applications. Designed for efficiency and high performance,

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Aluminium tubular busbars are subject to wind-generated vibration and oscillation. Because of the low self-damping of tubular

## Busbar Installation

Busbars supplying SSI equipment. Purpose This Notice Board is a reminder that, if any TFM connected to a particular

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

