TECHNICAL NOTE

Bus plating of medium voltage metal-clad switchgear primary assemblies

The phase bus bars used in medium voltage metal-clad switchgear constructed to ANSI/IEEE C37.20.2 standards are in the most part insulated. However, the copper is exposed at bus joints, cable connections, auxiliary unit primary contact assemblies and primary switching element contact arms (usually in the form of a withdrawable breaker). The switchgear ground bus is not insulated.

The phase bus joints, cable connections and primary disconnect devices are designed to provide the highest current carrying capacity possible for the duration of the product life. ABB manufactures all phase and ground bus using high conductivity copper. We do not offer aluminum phase or ground bus.

Although the IEEE C37.20.2 standard allows unplated copper bus connections, it permits a lower temperature rise limit, which results in much more copper being needed to carry the rated current loads. When bus plating is used, such as silver or tin, the temperature rise limit is drastically increased (See Table 1) and less total copper is needed to achieve the rated continuous current.

Table 1 Temperature rise limits for bus and connections used in medium voltage switchgear assemblies

Bus connection description	Temp Rise Limit	Total Temp Rise Limit
Buses and connections with unplated copper-to-copper connecting joints	30°C	70°C
Buses and connections silver-surfaced or equivalent connecting joints	65°C	105°C
Buses and connections tin-surfaced or equivalent connecting joints	65°C	105°C
Unplated copper-to-copper connections to insulated cables	30°C	70°C
Silver-surfaced or equivalent copper-to-copper connections to insulated cables	45°C	85°C
Tin-surfaced or equivalent copper-to-copper connections to insulated cables	45°C	85°C

Table notes:

1. When bus connections have different plating, the temperature rise and limits are based on the lowest ratings permitted in the table.
2. Connections to insulated cables are based on 90°C insulated cable.

ABB standard, tested designs use silver plating on phase buses and connections for all medium voltage switchgear assemblies. Silver-plating is well suited for use in indoor, climate-controlled environments. It forms a hard surface that works well for sliding contacts, such as withdrawable breaker and auxiliary unit primary connections. Silver is known to tarnish over time. The tarnished plating still provides nearly the same conductivity as the original finish, ensuring the same current carrying performance over the life of the switchgear. However, in environmental conditions such as those containing hydrogen sulfide, silver plating will corrode.

For environmental conditions such as those containing hydrogen sulfide or other caustic substances ABB recommends using tin plating for all phase buses, bus joints and insulated cable termination pads. Tin plating, however, is much softer than silver plating and therefore cannot be used on primary sliding connection points, such as those on the breaker and auxiliary unit primary connections. For these connections we recommend coating the silver plating surfaces with a contact lubricating grease.

All ground bus used in ABB medium voltage switchgear is tin-plated, regardless of the application. This is necessary since the enclosure metal to which the ground bus is attaching to is galvanized steel.

ABB tin plating specifications are per ASTM B545-97(2009), Class B, matte finish, electrolytically applied, with a plating thickness range of 3.0-8.0 micrometers.

ABB silver plating specifications for sliding contacts are per ASTM B700-08, Class N, Type 1, Grade D with a plating thickness range of 10.0-20.0 micrometers.

ABB silver plating specifications for static contacts and surfaces is per ASTM B700-08, Class N, Type 1, Grade D with a plating thickness range of 1.27 – 3.00 micrometers.

ABB uses pre-plated bus. The bus is cut to length and holes punched prior to applying epoxy insulation. As allowed by the standards we design and test to, the inside of the holes and the exposed cut edge are no longer plated after this process. This does not affect the contact surface area conductivity nor the technical performance of the bus and bus connections.

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