UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Conductor Busbar (Busbar Insulation Coating) — Heating under continuous current, high dielectric strength (kV) and reduced busbar clearance requirements. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — CONDUCTOR BUSBAR (BUSBAR INSULATION COATING)



COATING CROSS-SECTION



Five questions define a coating system

1. **MATERIAL**
   Copper or aluminium conductor busbar; a sectioned profile with holes, bends and connection legs. The conductive substrate shows a different thermal expansion (CTE) and high thermal conductivity under the coating.

2. **SURFACE**
   Oil, oxide and machining residues are removed; chemical activation and, if needed, light roughening are applied for dielectric adhesion on copper/aluminium.

3. **GEOMETRY**
   Edge pull-back at sharp edges and corners (dielectric weakening) and a need for masking around connection holes; the conductor's high heat capacity makes curing harder.

4. **SERVICE CONDITIONS**
   Heating under continuous current, high dielectric strength (kV) and reduced busbar clearance requirements

5. **PRODUCTION TARGET**
   Medium volume; guaranteed breakdown voltage with constant film thickness and a pore-free (holiday-free) dielectric coating.

CONCLUSION: For the Conductor Busbar, the goal is not just a good-looking finish; it is a tracking-resistant dielectric powder-coated surface that covers pore-free including sharp edges and guarantees the breakdown voltage.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Conductor Busbar cannot be coated like just any part. A sound process needs measurement, pretreatment, the right coating selection, application and verification to work together.

01 **ANALYSIS** Substrate + surface
02 **PRETREATMENT** Cleaning + conversion
03 **COATING** Chemistry + film
04 **APPLICATION** Electrostatics + flow
05 **CURING** Time + temperature
06 **VERIFICATION** Test + record

A. Surface Characterisation

The condition of the substrate surface (cleanliness, roughness, oxide/scale and any weld zones) is determined. The right process starts with the right definition of the surface.

MEASURABLE INPUTS
Surface cleanliness • roughness • weld marks

B. Pretreatment Design

Degreasing + oxide removal + activation; suitable chemical preparation for copper/aluminium gives a clean, active surface before preheating.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A functional epoxy powder with high dielectric strength and RTI/UL approval is selected; the thickness is set by breakdown voltage (kV) and tracking resistance.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic spraying on thin sections; for medium/high voltage that needs a thick dielectric, fluidized-bed dipping gives 200–500 µm and above. Preheating ensures edge coverage, and holiday (pinhole) testing verifies the result.

GEOMETRY EFFECT
Sharp edge • Connection hole • Bend

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

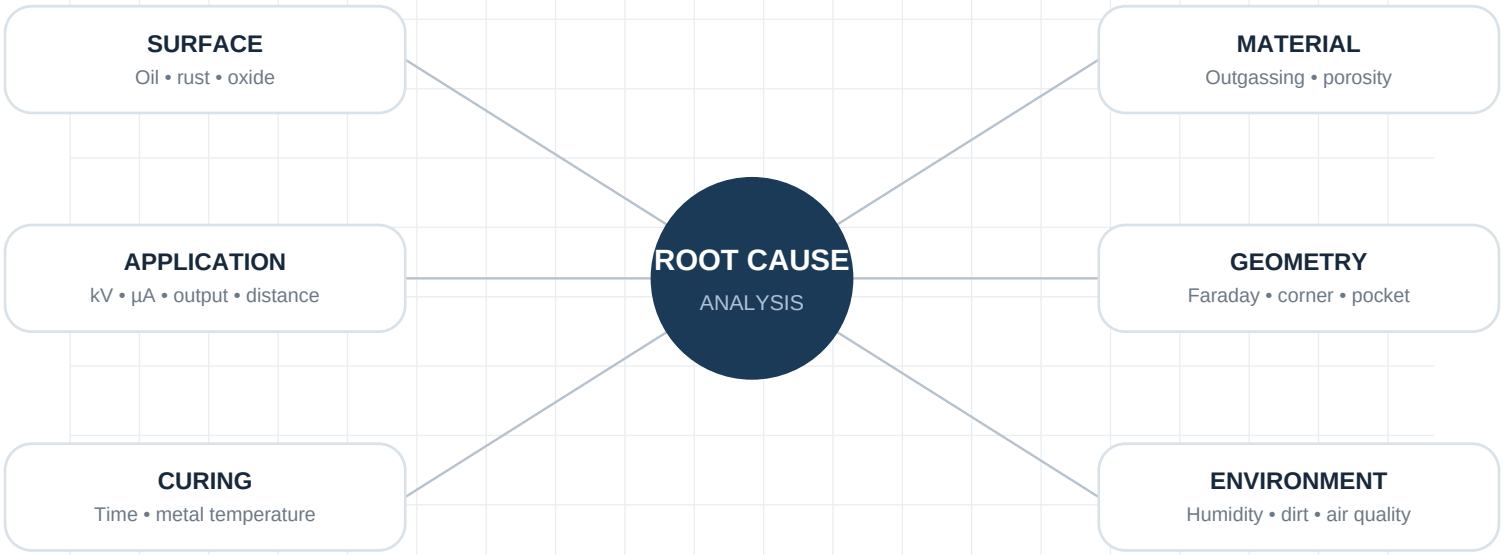
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Conductor Busbar process, we define a process window rather than a single parameter. The aim is to reproduce the same surface quality across different shifts and part conditions.

A SURFACE DEFECT IS A SYMPTOM, NOT THE ROOT CAUSE

Coating defects rarely come from a single setting. The same symptom may stem from surface preparation, material, electrostatic behaviour, film thickness or curing.



Common defects and diagnostic approach

POOR ADHESION

The coating detaches from the surface or fails in testing.

CHECK: cleaning / pretreatment / cure

ORANGE PEEL

Uneven flow; the surface looks wavy or rough.

CHECK: film / flow / temperature

PINHOLE / CRATER

Pinholes or local craters form on the surface.

CHECK: dirt / gas / humidity / oven

FARADAY ZONE

Insufficient penetration in deep corners and pockets.

CHECK: geometry / kV-µA / air

BACK-IONIZATION

Star/blister defects from overcharging.

CHECK: current / distance / thickness

UNEVEN THICKNESS

Thin and thick areas on the same part.

CHECK: position / motion / output

DIAGNOSTIC PROTOCOL

1 Define the symptom → **2** Measure the data → **3** Isolate the cause → **4** Test one variable → **5** Standardise

A GOOD SURFACE PROCESS must be measurable • repeatable • traceable • optimisable. This approach is the basis of part-specific application guides for parts such as the Conductor Busbar.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Conductor Busbar, production volume drives the equipment choice. At low and medium volume, manual systems give flexibility; in series production, automatic systems apply the same recipe to every part.

LOW / MEDIUM VOLUME

Manual application



Elite / Elite Plus

Manual powder coating units; kV, µA and air settings.



Smart AI

Suggests settings for the part; guides the operator in manual work.



Manual Powder Coating Gun

Light, ergonomic hand gun.



Manual Powder Booth

Manual application and powder recovery.



Box Oven

Curing in batch production.

SERIES PRODUCTION

Automatic line



Automatic Powder Coating Gun

Series application in fixed or moving arrays.



Smart AI

The same application on every part, by recipe.



Single / Two-Axis Reciprocator

Automates the gun motion.



PVC Monocyclone Booth

Fast cleaning and powder recovery.



Powder Center

Fast colour change on automatic lines.



Conveyor Oven & Pretreatment

Surface preparation and curing on a continuous line.

PROJECT SUPPORT Share your line, your part and your production target, and we will define the equipment selection and the booth, oven and conveyor layout together. strong3000.com · info@strong3000.com · WhatsApp +90 537 353 54 19