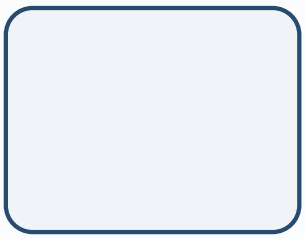
UNDERSTAND THE SURFACE BEFORE DESIGNING THE COATING.

Brake Caliper (Cast) — High temperature from braking (~200–300 °C), brake dust, brake fluid/chemicals, road salt and stone chipping. Before designing the right coating, we evaluate the material chemistry, the geometry and the service conditions together.

PART DIAGRAM — BRAKE CALIPER (CAST)



COATING CROSS-SECTION



Five questions define a coating system

1 MATERIAL
Spheroidal graphite cast iron (GJS) or cast aluminium caliper body. Casting porosity makes it prone to outgassing during curing.

2 SURFACE
Grit blasting removes the casting skin and residues; preparation and cleaning drive out pore gas.

3 GEOMETRY
Caliper corners and columns are complex geometry; outgassing from casting pores and a uniform film on thick sections are challenging.

4 SERVICE CONDITIONS
High temperature from braking (~200–300 °C), brake dust, brake fluid/chemicals, road salt and stone chipping

5 PRODUCTION TARGET
Medium volume; a visible finish that resists heat and chemicals with high colour consistency.

CONCLUSION: For the Brake Caliper, the goal is not just a good-looking finish; it is a durable powder-coated surface that withstands brake temperature, brake dust and chemicals while keeping its colour consistent.

FROM SURFACE TO PROCESS ENGINEERING FLOW

The Brake Caliper 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

Grit blasting + conversion coating; controlled preheating (degassing) before curing drives out casting pore gas.

CORE TARGET
Clean, active, uniform, repeatable surface

C. Coating System Selection

A heat-resistant powder that withstands brake temperature and brake fluid and does not lose colour under heat is selected.

DECISION CRITERIA
Durability • appearance • service life • cost

D. Application Engineering

Electrostatic powder coating, 60–90 µm; mixed robotic/manual application reaches complex corners and columns, and a low ramp rate gives uniform coverage.

GEOMETRY EFFECT
Piston bore • Casting pore • Column/corner

Managing the process with data, not by eye

µm
FILM THICKNESS
Coating uniformity

°C
PART TEMPERATURE
Actual cure condition

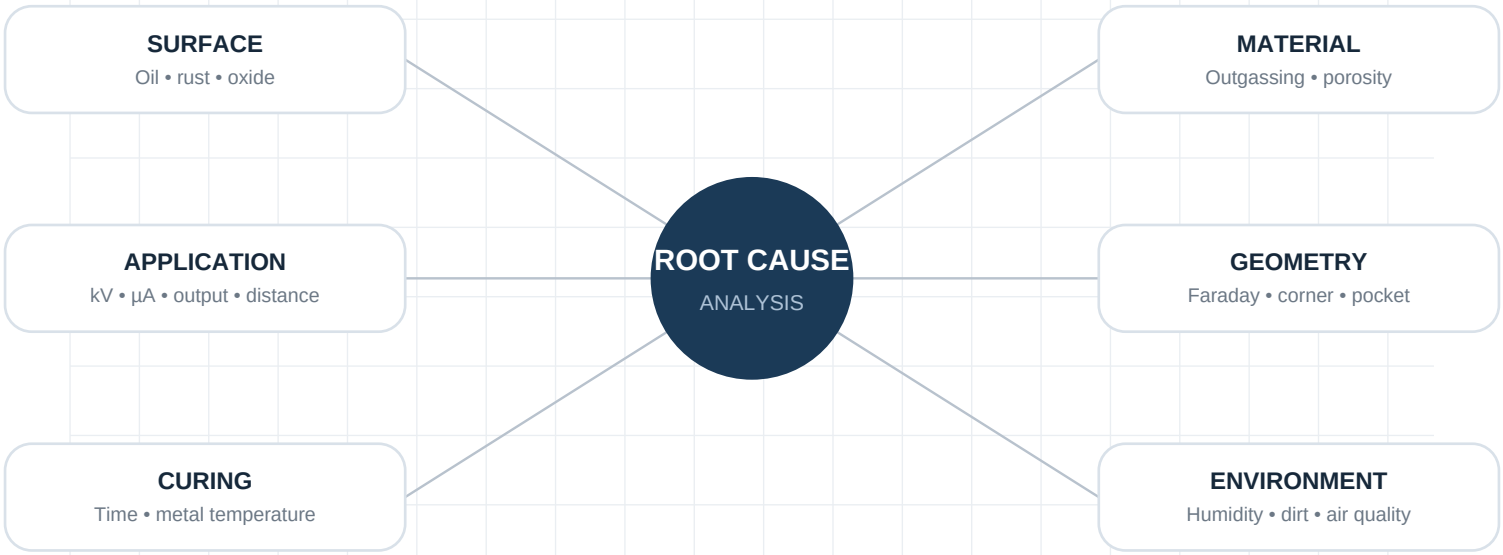
kV / µA
ELECTROSTATIC CHARGE
Transfer and penetration

Ω
GROUNDING
Charge dissipation and stability

ENGINEERING PRINCIPLE In the Brake Caliper 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 Brake Caliper.

THE RIGHT EQUIPMENT, AT THE RIGHT SCALE.

For the Brake Caliper, 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.



OWL + Smart AI

Recipe-based, zone-by-zone application in difficult areas.



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.

OWL INTEGRATION In difficult areas such as piston bore, casting pore, column/corner, OWL applies targeted, zone-by-zone coating with a Smart AI recipe. For details, see the “OWL — Cavity” application sheet.

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